# ESSAYS ON INFLATION AND UNEMPLOYMENT

by

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I hereby certify that the work embodied in this thesis is the result of original research and has not been submitted for a higher degree to any other University or Institution.

*(Signed)* _____

## *Acknowledgments*

**For Ellen**

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# Abstract

This thesis is a collection of essays on the theme of inflation and unemployment – the twin macroeconomic evils. The fundamental tenet, which binds the essays together, is the central role that the government should play in creating conditions for full employment. Many of the essays contrast the Monetarist position against active government intervention to the Keynesian and Post-Keynesian advocacy of public sector involvement in the economy. The Chapters mix conceptual argument with econometric and statistical analysis. The aim is always to create information conducive to the development of policies, which will reduce unemployment and maintain stable inflation rates.

Chapter 2 explores the origins of the Phillips curve in terms of the rivalry between the Monetarist and Keynesian paradigms. It is argued that the publication by Phillips (1958) was hardly novel. The later attacks by Friedman (1968) and Phelps (1968) were part of an attempt to restore the discredited pre-Keynesian monetary economics. Chapter 3 develops and estimates a wage adjustment function for Australia that is subject to hysteresis. Chapter 4 explores the claim that the natural rate of unemployment rose in Australia during the 1980s due to structural changes. The empirical results reject the claim. Chapter 5 examines the applicability of the wage setting approach in Scandinavian economies for Australian wage setting. The conceptual and empirical analysis rejects its applicability. Chapter 6 juxtaposes the natural rate and hysteresis hypotheses and uses unit root testing techniques to shed light on the relevance of each. While the testing is subject to known difficulties, a new concept of persistence is developed. The evidence supports active government intervention in the economy following external shocks. Chapter 7 tests whether the upgrading mechanisms associated with high-pressure economies identified by Okun (1973) have endured given the large changes that have occurred in the economy since the 1980s. It is concluded that the changing composition of industry output (towards services), the rising participation of females, and the increasing use of fractional employment have combined to reduce the gains previously identified. Chapter 8 estimates a wage adjustment function for Australia at the end of the Accord process and confirms earlier studies by the author that the period of wage setting guidelines were effective in controlling wage inflation in Australia. Chapter 9 introduces the Buffer Stock Employment model (Mitchell, 1998a) and explains how it generates full employment and price stability. Chapter 10 considers some of the financial criticisms of the Buffer Stock Employment approach and uses econometric tests to reject the Monetarist critique. The results support the use of budget deficits to provide public sector employment and create full employment.

# List of Acronyms

| | |
|---|---|
| ABS | Australian Bureau of Statistics |
| ACTU | Australian Council of Trade Unions |
| AWC | Australian Wool Corporation |
| BER | Buffer Employment Ratio |
| BSE | Buffer Stock Employment |
| DS | Difference-stationary process |
| FNUR | Full Employment Unemployment Rate |
| HH | Hysteresis hypothesis |
| MRU | Macroequilibrium Rate of Unemployment |
| MUG | Macroeconomic Unemployment Gap |
| NAIBER | Non Accelerating Inflation Buffer Employment Ratio |
| NAIRU | Non Accelerating Inflation Rate of Unemployment |
| NRH | Natural rate of unemployment hypothesis |
| NRU | Natural Rate of Unemployment |
| OECD | Organisation for Economic Cooperation and Development |
| RATS | Real Analysis of Time Series |
| SM | Scandinavian Model |
| SUI | Structural Unemployment Index |
| SUIF | Female Structural Unemployment Index |
| SUIM | Male Structural Unemployment Index |
| TDC | Trade Development Centre |
| TDH | Twin Deficits Hypothesis |
| TS | Trend-stationary process |

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# Chapter 1                    Introduction

The essays in this collection reflect the interest I have had since I began my research career in unemployment and inflation and the link between the two. The essays are in chronological order with the exception of Chapter 2. Of the nine substantive chapters, excluding this introduction and the conclusion, Chapters 3, 4, 5, 6, 8 and 8 have been published in refereed journals; Chapter 7 has been published in a longer form in a book which I jointly authored; and Chapter 10 has been accepted in an edited collection to be published in the coming year. Chapter 2 comprises some of the material, which will appear in a forthcoming book on the Phillips curve. The last two chapters represent my current research program.

This collection represents a sample of my work in this area as my career has progressed. I thought about how I might assemble the collection. One way would have seen me rewrite each paper by bringing all the theoretical argument into one chapter following a literature survey. Empirical work would then follow in a subsequent chapter or chapters. I rejected this view because, in part, it would have limited the scope of my collection. The collection reflects, in my view, considerable change in the way that I conduct economic research, particularly in the sophistication of the econometric modelling. I believe that this diversity and development is best illustrated by a collection based on the original published or to be published work. This introduction serves to tie it together.

I have been very interested in the work and approach of Arthur Okun since my early days as a student of economics. I was attracted to the way he used economic reasoning to develop conceptual structures, which provide magnificent insights into policy. His work on the relationship between unemployment and output in 1962 was one of two major dynamic aggregates (with the Phillips curve) in Keynesian macroeconomic system. It has proven very useful to me in my search for understanding of adjustment processes and the path of unemployment. His ability to develop simple relationships and to extract, via regression, interesting measurement has been very influential in the development of my work. I was also very attracted to his policy focus (Okun, 1983). I had early worries about my decision to leave mathematics and to pursue economics because I was initially confronted with a maze of rather abstract, though simplistic mathematics, under the guise of economic theory. Essentially, I wanted to make a contribution to debates, which would lead to policy initiatives that advanced the well being of the community. I saw unemployment as the principal reason for poverty and disadvantage and it became my research

focus. Like Okun, I had an abiding view that the government was our agent to redress the economic problems that emerged from the conduct of private market activities. In that sense I wanted to be able to produce research output that influenced policy decisions. Given the period that I entered post-graduate study, a research program focused on the way government could eliminate unemployment had to simultaneously address the inflation issue. The two macroeconomic "evils" became the dominant focus of my subsequent research development. Figure 1.1 charts the history of inflation and unemployment in Australia since the mid-1960s. The experience is common for most OECD countries (Mitchell, 1996, 1999a).

**Figure 1.1 Unemployment and Inflation in Australia, 1966 to 1997**
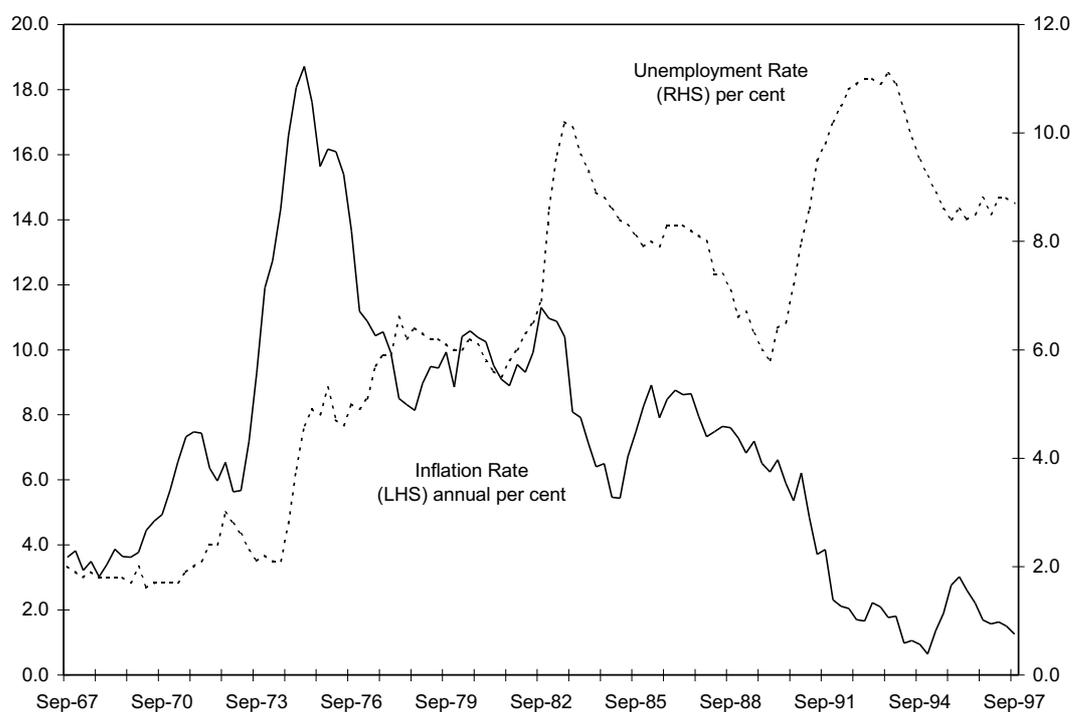


I first started my doctoral work as a Commonwealth Fellowship holder under Professor Michael Artis at Manchester University in the mid-1980s. Professor Artis had published widely on issues relating to the so-called Phillips Curve and the area of research was of significant attraction to me. I began to work on the question of the stability of the Phillips curve in Britain and Australia and also on the issue that had not yet emerged in the professional literature - path dependence or hysteresis.

There were two striking developments in economics in this period. On the one hand, a major theoretical revolution was becoming entrenched in macroeconomics; while on the other hand, unemployment rates had risen and were persisting at the highest levels known in the Post World War II period. The two developments were, in my view, inconsistent.

In the 1970's, the long-standing dominance of so-called Keynesian macroeconomic theory and policy was abandoned by a large number of economists, particularly those in academic institutions in the United States. Blinder (1988: 278) says that by "about 1980, it was hard to find an American macroeconomist under the age of 40 who professed to be a Keynesian. That was an astonishing turnabout in less than a decade, an intellectual revolution for sure."

The rise in acceptance of Monetarism and its new classical counterpart was not based on an empirical rejection of the Keynesian orthodoxy, but "was instead a triumph of *a priori* theorising over empiricism, of intellectual aesthetics over observation and, in some measure, of conservative ideology over liberalism. It was not, in a word, a Kuhnian scientific revolution" (Blinder 1988: 278). However, the resurgence of pre-Keynesian monetary thinking was aided by empirical estimates of the Phillips curve.

The natural rate of unemployment hypothesis (NRH) became a central tenet of the anti-Keynesian stance. Prior to 1970, the Keynesian model considered real output (income) and employment as being demand-determined in the short-run, with price inflation being explained by a negatively sloped Phillip's curve, relating the percentage change in nominal wages, and, via a productivity function, the inflation rate to the rate of unemployment. The policy questions of the day were often cast in terms of a trade-off between output (unemployment) and inflation. Policy-makers were supposed to choose between alternative mixes of unemployment and inflation subject to a socially-optimal level of unemployment and inflation. During this period, the Phillip's curve was considered to be negatively sloped in both the short-run and the long-run. The first major challenge to this view was provided by Friedman's 1968 address to the American Economic Association (Friedman 1968) and the brilliant article by Phelps (1968). In fact, Friedman (1968: 60) first stated that "there is no long-run, stable trade-off between inflation and unemployment." These papers stimulated a new wave of econometric research, which focused on the estimate of the coefficient on the price expectations term in the wage adjustment function.

The empirical models were generally like:

**Eqn 1-1** $$\dot{p}_t = \alpha \dot{p}_t^e + \beta(U_t - U^*) + e_t$$

where $\dot{p}_t$ is the inflation rate at time t, $\dot{p}_t^e$ is the expectation of that rate formed in the last period (t-1), $U$ is the actual unemployment rate, $U^*$ is the Natural Rate of Unemployment (NRU), and *e* is a white-noise error process.

This model structured the debate over the validity of the NRH. It was shown that if $\dot{p}_t = \dot{p}_t^e$ (that is, expectations are realised), then

**Eqn 1-2** $$\dot{p}_t = \frac{\beta}{(1-\alpha)}(U_t - U^*)$$

Accordingly, the ability to exploit $U_t \neq U^*$ at the expense of some finite inflation (the so-called Phillips curve trade-off) relied on $\alpha < 1$. The debate became transfixed on the value of $\alpha$. Gordon (1976: 193) reported that prior to 1971 empirical estimates of $\alpha$ were well below unity suggesting a trade-off. However, once inflation had started to rise, it "caused the computer to yield ever higher values of $\alpha$ as the passage of time provided additional observations until finally … tests with a sample period including early 1971 were unable to reject" the hypothesis that $\alpha =1$.

This simple transition provided the empirical authority for the NRH to directly attack the major tenets of Keynesian stabilisation policy. Gordon (1976: 191) noted that "Policy maker indifference curves drawn on the inflation-unemployment axes, which had formerly allowed the choice of an optimum point on a stable Phillips Curve, were now irrelevant."

At the same time the economic performance of the OECD economies was failing badly. In 1972, Australia's inflation rate was 6.2 per cent, but following the first OPEC oil shock in 1974, aided by some large wage increases, the inflation rate reached 15.4 per cent in 1974, and 17 per cent in 1975. By the end of the 1970s, despite a period of subdued activity and rising unemployment, the inflation rate was still high in relation to Australia's trading partners at 9.2 per cent. The wage increases that followed the breakdown of the period of wage indexation pushed the inflation rate, once again above 10.4 per cent, and provided the background to the introduction of the Accord in 1983. At that time, the unemployment rate and the inflation rate were at around 10 per cent due to the sluggish economy.

The Accord period in Australia was associated with strong employment and Gross Domestic Product (GDP) growth from 1983-84 to 1989-90, negative growth during the recession of 1989-90 to 1992-93, and then a strengthening recovery after 1993-94. For the period 1984-85 to 1994-95, Australia's total employment growth per annum averaged 2.19 per cent, while the corresponding growth per annum for the OECD countries in total was 1.05 per cent. For the 1984-85 to 1989-90 period of expansion, the Australian figure was 3.43 per cent compared to 1.65 per cent for the OECD. Over the recession of 1990-91 to 1994-95, Australia's employment growth was 0.70 per cent per annum compared to the OECD outcome of 0.33 per cent per annum. Yet despite the strong employment growth Australia still could not reduce its unemployment below 6 per cent

By this time, any Keynesian remedies proposed to reduce unemployment were met with derision from the bulk of the profession who had embraced the NRH and its policy implications. Yet despite the predominance of Monetarist thought there was very little evidence presented to substantiate these effects in any economy in the world. The NRH reinstated the early classical idea of a rigid natural level of output and employment. Essentially, the NRH asserted that in the long-run there was no trade-off between inflation and unemployment, because the economy would always tend back to a given NRU, no matter what had happened to the economy over the course of time. Time and the path the economy traced through time were thus irrelevant. Only microeconomic changes would cause the NRU to change. Accordingly, the policy debate became increasingly concentrated on deregulation, privatisation, and reductions in the provisions of the Welfare State (Thurow, 1983; Ormerod, 1994).

This was the backdrop to the beginning of my own academic research. The policy outlook being presented by Monetarism was bleak and contrary to the insights provided by my prior readings of Okun and other research coming out of, say, the Brookings Institute. Further, I was attracted to the sentiment expressed by Piore (1979: 10), an antagonist to the orthodox position, that:

> Presumably, there is an irreducible residual level of unemployment composed of people who don't want to work, who are moving between jobs, or who are unqualified. If there is in fact some such residual level of unemployment, it is not one we have encountered in the United States. *Never in the post war period has the government been unsuccessful when it has made a sustained effort to reduce unemployment*. (emphasis in original)

I considered that the NRU concept really only belonged in models of perpetual full employment, which is to be expected given the neo-classical inheritance. The NRH was merely a standard prediction from the orthodox competitive model, which lacked empirical substance. It was not difficult to find empirical evidence which was contrary to the edicts of the NRH (for example, Thurow, 1983). In the real world, booms in activity stimulates on-the-job training opportunities and raises potential output above the level that would have persisted had the economy remained at low levels of activity. Alternatively, as activity falls due to demand failure, both training opportunities decline and actual skills are lost, as workers lie idle. The potential capacity level falls as a result. Blinder (1988: 292) concludes that there is "no natural level of employment … the equilibrium level depends on what came before."

However, there was a need for a Keynesian counter-attack to be made on conceptual grounds. Early Phillips curve representations clearly indicated that any permanent unemployment rate was possible (within realistic allowances for frictions) as long as the associated permanent inflation rate was acceptable. The idea of a unique natural rate of output and employment was quite foreign to Keynesian theory. The question of cyclical invariance of the so-called natural rate of unemployment became terrain to mount one battle against Monetarism.

My own interest in this issue can be traced to a clue provided by Phelps (1967: 254-81),

> The transition from one equilibrium to the other tends to have lingering effects on the labour force, and those effects may be discernible in the equilibrium rate for a long time. The natural rate of unemployment at any future date will depend on the course of history in the interim. Such a property is called hysteresis.

A further passage in Phelps (1979) led me to start working on models of hysteresis. Phelps (1979: 103-104) said that a "long-run Phillip's Curve cuts through the natural unemployment rate considered as a point, with the characteristically negative slope but only within some band roughly centred on the natural rate." He concludes that the inadequacy of the NRU hypothesis (as an exact economic law) is just a reflection of the inadequacy of orthodox economic theory. In other words, Phelps was saying that the natural rate of unemployment hypothesis is only an approximation because it neglects feedback upon the unemployment rate from the variables that are explicitly recognized in the theoretical framework.

Further, Cross (1982: 96-97) wrote

> In principle, however, there is no reason why aggregate demand factors should not also affect the natural rate of unemployment, given that this concept merely defines the unemployment level which is consistent with an unchanging inflation rate.

This idea became known as the hysteresis hypothesis (HH) and was the major early thrust of my research work. It was an exciting retaliation against Monetarist orthodoxy. Models, which are subject to hysteresis properties, postulate that the equilibrium of the economy is not independent of the past track that the economy has followed. Blinder (1988: 291) argues that hysteresis models "in which the economy's equilibrium state depends on the path we follow to get there ... bring Keynesian economics back with a vengeance." Hysteresis turns the classical truism of supply creating demand on its head. In essence, the fiscal authority is seen to be able to permanently increase the level of employment (for given labour-force aggregates) up to some amount dictated by frictions, through expansionary policy stimulation of aggregate demand. Blinder (1988: 391) refers to this as a "neat reversal of Say's Law, ... [where] ... demand creates its own supply."

Hysteresis went beyond the simple Keynesian (passive) vision of supply. In hysteresis models the supply-side of the economy adjusts to demand changes such that in times of low demand, labour skill declines and potential output shrinks. Similarly, upgrading of labour skill and potential output accompanies an increase in demand. Accordingly, the concept of a natural rate of unemployment would only make sense in an economy that that had experienced stable, full employment aggregate demand levels for a long period.

This raised a series of questions for me; some technical and others concerning the way paradigms develop. If the NRU hypothesis was only an approximation then why was it elevated to the status

of an economic law where it would be given such a pervasive influence on the conduct of economic policy? Surely, the research program that should have been followed would have focused on the real world factors that pose serious questions regarding the relevance of the natural rate theory in all its forms (Thurow, 1983). What were these factors? How could we write the model out with the hysteresis hypothesis embedded? What were the properties of such a model?

James Tobin (1980a: 62) put the issue of the approximation succinctly

> It is possible that there is no NAIRU, no natural rate, except one that floats with history. It is just possible that the direction the economy is moving in is at least as important a determination of acceleration and deceleration as its level. These possibilities should give policy makers pause as they embark on yet another application of the orthodox demand management cure for inflation

Soon after I embarked on this tack, I discovered the seminal paper by Hargreaves-Heap (1980) which had been published in *The Economic Journal*. This was the first formal paper in economics to discuss hysteresis. The simple model emerged to show that the nominal price change variable was a function of the deviation of the unemployment rate from its natural rate, and the natural rate was itself a function, in Hargreaves-Heap, of a weighted-average of the actual unemployment rate and the equilibrium rate of the last period. The model was simple and served to show that the so-called natural rate was not constant but tracked the actual rate in some way. He outlined some human capital factors, which could generate the hysteretic effects. Phelps (1979) had also discussed some of these factors.

I set about estimating a wage adjustment function derived from a model of hysteresis, which also recognised the unique nature of the Australian wages determination system. In part, I also wanted to test the impact of the wage indexation guidelines that operated over the 1975 to 1981 period on aggregate wage outcomes. The prevailing viewpoint about wage adjustment functions at the time was expressed by Robert Gordon (1976), who said that the major debate between Monetarists and Keynesians over the Phillips curve after 1968 concerned the value of the coefficient on the price expectations variable. The NRH was rejected because until 1971, the published empirical work could not support homogeneity. By 1972, homogeneity was being detected in the simplistic expectations-augmented Phillips curve and the rally against the long-run trade-off gathered strength (Gordon, 1972). The only issue being debated at the time was the temporal horizon over which price expectations adjusted.

There was still some debate about factors which may prevent homogeneity in the short-run, including staggered contracts (Taylor, 1979). But the issue of homogeneity was somewhat moot in deciding whether a trade-off existed or not if there were hysteretic effects operating. I tinkered with simple models and it was clear that hysteresis would generate a long-run trade-off even if homogeneity properties held in the price (wage) adjustment function. I then estimated an econometric model with these properties. Simple tests of restrictions would allow me to determine

whether the unemployment displayed state-dependence or whether it impacted on wage inflation as a cumulative distributed lag.

Unfortunately, a serious illness in my immediate family forced me to abandon my studies at Manchester. I returned to Australia and soon after gained a full-time lecturing position at Flinders University in South Australia in order to service the extensive financial burden associated with the illness. The demands to get tenure then led me to start publishing the research that I had been involved in up until that time.

Chapter 3, *The NAIRU, Structural Imbalance and the Macroequilibrium Unemployment Rate*, which was published in the *Australian Economic Papers*, was the first paper to emerge from the groundwork done at Manchester. It was the first Australian study of hysteresis and one of the first international studies, although by then Blanchard and Summers (1986) had been published.

This Chapter explores the idea that persistently weak aggregate demand creates a labour market, which mimics features conventionally associated with structural problems (Okun, 1973; Baily, 1982). The specific hypothesis examined is that the equilibrium unemployment rate is a direct function of the actual unemployment rate and hence the business cycle - the so-called hysteresis effect (Phelps, 1979; Hargreaves-Heap, 1980). The work was designed to support an earlier paper by Burns and Mitchell (1985) who had swum against the orthodox tide of the day by advocating aggregate policy expansion to reduce unemployment.

The research included an innovation in the way hysteresis was modelled and estimated. I desired to include a broader array of wage influences in the econometric equation. The labour market pressure effect was introduced directly using a variable I called the macroeconomic unemployment gap, MUG that is represented as $(u_t^* - u_t)$. The Macroequilibrium Rate of Unemployment (MRU), $u_t^*$, was modelled as an adaptive-expectations adjustment function. At the time it was common to eliminate the unobservable $u_t^*$ from the wage equation using a Koyck procedure. To overcome the well-known econometric problems that arise in this transformation, I chose to use a grid search procedure inspired by the work of Solow (1969). Instead of eliminating $u_t^*$ from the wage equation and estimating $\lambda$, the MRU adjustment coefficient, indirectly from the coefficient on the lagged dependent variable, I assumed a range of plausible values for $\lambda$ and simulated the auxiliary MRU equation to generate a number of MRU time series. The MUG variable was the $u_t^*$ series (for a particular $\lambda$) less the actual unemployment rate. A model selection process then selected the value of $\lambda$.

The paper cast theoretical and empirical doubt on the notion of a cyclically invariant Non-Accelerating Inflation Rate of Unemployment (NAIRU). The econometric work could not reject the hypothesis that the MRU was cyclically sensitive and therefore sensitive to aggregate demand policies. The results also supported the hypothesis that the period of wage indexation (from the first quarter in 1975 to the second quarter of 1981) moderated wage outcomes in Australia.

The first 1987 paper (Chapter 3 here) is now widely referenced although it is an artifact of its time, particularly in terms of the econometric technique employed. For its day, the techniques were sound, but I feel that theoretical developments in time series econometrics that have occurred since then have made it dated. The paper also did not clearly establish the difference between hysteresis and persistence, a distinction that was also unclear in the literature at the time. Subsequently. I approached that matter formally in a later paper published in *Applied Economics*, which is included in this collection as Chapter 6. I will discuss that paper in turn. Chapter 3 also signals the beginning of my work in the impact of incomes policy on aggregate wage outcomes. I was also interested in the manner in which incomes policies impact on the relative wage structure but the work in that area is not germane to this collection (for example, Watts and Mitchell, 1990b). Chapter 8, *Modelling the Impact of the ACCORD on wage inflation in Australia*, is my latest work on the aggregate effects of incomes policy and is in contrast to Chapter 3 in terms of the way to model wage adjustment functions using modern econometric techniques.

Two papers then followed from this work, which extended the themes established. They link Mitchell (1987a) to Mitchell (1993) and reflect the development of my modelling approach. While they were jointly authored articles the econometric modelling involved was my major contribution to the work. At the time I was learning the techniques of the emerging London School of Economics approach to econometrics (for example, Hendry and Mizon, 1978; Davidson *et al*., 1978; Hendry and Richard, 1982). The approach of David Hendry and associates has its roots in the classic article by J.D. Sargan (1964), "Wages and Prices in the United Kingdom: A Study in Econometric Methodology". The revolution in time-series econometrics was also under way with the work of Granger (1981), Engle and Granger (1987), Nelson and Plosser (1982), Dickey and Fuller (1979, 1981) and it was becoming more widely discussed and applied. The concepts of ,and tests for, unit roots and cointegration were just beginning to become commonplace.

Watts and Mitchell (1990a) began my work in that area. It examined the effects of incomes policy on aggregate wage outcomes in more detail. The paper was motivated by 13 years of near-continuous wage guidelines being administered by the Australian Arbitration Commission and also attempted to further my work on hysteresis in a more sophisticated modelling and estimating framework. The paper used general-to-specific econometric modelling and cointegration techniques to examine the impact of incomes policies, the presence of hysteresis, and whether real-wage resistance could be detected.  It concluded that "the different eras of wage-fixing guidelines can be statistically differentiated and are robust across different specifications" (Watts and

Mitchell, 1990a: 160). It also concluded that despite the nominal wage guidelines being effective considerable real wage flexibility was evident and traced to "the guidelines themselves rather than appealing to conventional aggregate labour market pressure explanations" (Watts and Mitchell, 1990a: 160). The other major finding was that

> aggregate money wage outcomes are not determined by conventional market forces. The existence of a conventional Phillips curve relating inflation to unemployment is not supported. ... The pressure variable enters ... in a difference form which suggests that there is not a steady state or natural rate of unemployment ... the hysteresis property is based on a firm-based measure of pressure rather than an aggregate labour market measure. ... The change in capacity utilization contributes to the determination of aggregate wage inflation. ... Stimulatory policy will cause a higher but stable rate of money wage and price inflation rather than an ever-increasing rate, which is associated with the expectations, augmented Phillips curve. ... an on-going fall in inflation ...[without incomes policy]... requires continuous declines in capacity utilization" (Watts and Mitchell, 1990a: 160).

These findings were supportive of Mitchell (1987a). They did, however, raise more questions and this led to Watts and Mitchell (1991). In this paper, the modern cointegration techniques (for example, Engle and Granger, 1987; Johansen, 1988) were to the fore. The paper recognised that the two major Keynesian aggregate relationships linking the static expenditure model to a dynamic price-adjusting model were the Phillips curve and Okun's law. Monetarists and others had attacked both because they were considered inherently unstable due to structural changes and the role of expectations (for example, Friedman, 1968; Phelps, 1968; Lucas and Rapping, 1969, Lilien, 1982). In Watts and Mitchell (1991) Okun's law was cast as a long-run time series relationship which had been misspecified in previous studies. We argued that the source of instability could be traced to this misspecification, in a similar way to the breakdown of consumption functions in the late 1970s (Davidson *et al*, 1978). It was also argued that the relation in levels form was in danger of producing spurious results if the variables were integrated processes. We approached the issue in a cointegration framework where a steady-state cointegration equation was estimated.

We argued (Watts and Mitchell, 1991: 1829) that

> Okun's original work and subsequent studies ... have all calculated the Okun coefficient on the basis of an assumed natural rate of unemployment. ... we are able to estimate the Okun coefficient and the steady-state unemployment rate jointly, thus overcoming some of the arbitrariness of the other techniques.

This was accomplished by simulating a potential output series directly. The cointegration regression thus was construed as modelling the long-run equilibrium unemployment rate directly with the residuals from that model reflecting the degree of disequilibrium or error-correction input. The dynamic model, which uses the error correction component, reflected the way unemployment adjusts over time in relation to short-run influences and the degree of disequilibrium.

The usefulness of this framework was due to the cointegrating relationship we found between the "steady-state" unemployment rate and, among other variables, the level of capacity utilisation. This indicates that the steady-state unemployment rate is sensitive to cyclical factors (in addition to other factors that formed part of the cointegration vector). Combining this relationship with that found in the Manchester School article (Watts and Mitchell, 1990a) allowed us to complete the Phillips curve circle.

The Chapter 3 work (Mitchell, 1987a) and the Watts and Mitchell (1990a) work established my position among the aggregate wage modellers in Australia. It led to some interesting collaborative work with Bruce Chapman and the late Fred Gruen from the Australian National University on estimating the wage outcomes under the Prices and Incomes Accord in Australia. Chapman and Gruen (1990) "invited five practitioners of wages estimation in the Australian macroeconomy to participate in a modelling exercise" (Chapman, 1990: 40) to estimate the Accord impact. Of the five models, "three of them – Treasury's NIF 88, and those of Chris Murphy and Bill Mitchell – have wage inflation as the dependent variable. The other two, from Phil Lewis and Ian Russell are concerned with the determination of real wages" Chapman (1990: 41). The reference to the Mitchell model was then established (Chapman, 1990: 42), and I have tried to maintain that presence with the work in Chapter 8.

Chapter 4, *What is the Full Employment Unemployment Rate? Some Empirical Evidence of Structural Unemployment in Australia, 1966 to 1986*, was the second publication to come out of my early work at Manchester and it was published in the *Australian Bulletin of Labour* in 1987 (Mitchell, 1987b). Australia had been experiencing relatively strong employment growth following the upturn after the 1983 recession. Yet despite this growth in job creation, the aggregate unemployment rate had not declined significantly. While various explanations were being offered to account for this paradox, the most popular notion claimed that the full employment unemployment rate (FNUR) has risen from around 2 per cent in the 1960s to 8 per cent in the 1980s. This was based on the orthodox NAIRU concepts and was used as a powerful argument against Government aggregate demand policies aimed at reducing the unemployment rate (Sloan and Wooden, 1987).

The work sought to assess the claim that a structural deterioration in the Australian unemployment situation had occurred by examining some possible factors. I calculated some indicators of structural changes in the labour market (Kleiman, 1968), in addition to examining the hypothesis that compositional changes in the labour force (increased participation of women) had increased the steady-state unemployment rate (Perry, 1970). This analysis did not reveal any effects of sufficient magnitude to justify the structural deterioration claim. Further, an index of structural unemployment, which traced changes in the distribution of the burden of unemployment across specific labour force groups over time, was calculated using demographic (age-gender) data. I found that in the period of rising unemployment both the male and female indexes had risen. Of

note was the fact that both indexes rose during the mid-70s as the aggregate unemployment rate rose but fell again despite the persistence of high aggregate unemployment rates. This indicated that the unemployment burden has become more evenly distributed across labour force groups over time, which is a result more consistent with a demand deficit economy rather than an economy stricken by structural imbalance. A final section of the paper employed regression analysis in an attempt to isolate the possible structural (time) effects on the unemployment rate by age and gender.

The basic findings of this research were that the cyclical factors were the predominant influence on the behaviour of unemployment rates since 1967 for a variety of age groups (both males and females). There was some evidence that structural changes had influenced these unemployment rates but the magnitude was minimal and variable. Importantly, labour force participation rate changes only appeared to influence the unemployment rate of young males and females. The overriding evidence derived from an array of indicators consistently pointed to a 'structural rise' in the unemployment rate of approximately 2 to 3 per cent. The FNUR was thus estimated to be around 4 to 4.5 per cent of the labour force. A figure of 8 per cent is unsupported. I acknowledged that only proximate indicators were used to provide some limited insight into the questions, which labour economists, cannot agree on. Unfortunately, the type of questions we would like to ask are difficult to translate into concepts which can be meaningfully tested against the available data.

I would now say that the econometric work in that article was limited. I believe a more direct approach to modelling the steady-state unemployment rate within a cointegration-error correction framework could, perhaps, have given further knowledge. That task is in fact part of a research project I am working on with Martin Watts at present.

Chapter 5 is entitled *The Scandinavian Model of Inflation and its Applicability to Australian Wage Setting* and was published in March 1990 in the *Australian Bulletin of Labour*. At the time, there had been a long period of wage guidelines under the ACCORD introduced by the Labour Government in 1983. The policy debate concerned the impact of these guidelines, which had been dominated by price indexation, on our international competitiveness. Australia was beset by on-going external payments problems and there had been explicit discounting of wage increases in the National Wage Case decisions to account for the import price effects on the Consumer Price Index.

The Minister of Trade at the time, Mr. Dawkins sponsored, through the Trade Development Council, the ACTU/TDC Mission to Western Europe, which reported its findings in 1987.[1] The Mission had been extremely impressed by the consensual approaches to centralised wage fixing in Sweden, Austria, and Norway. The ACTU/TDC Mission Report (1987: xii) said "The success of the Swedish Wage Solidarity policy in containing aggregate wage growth has not been achieved at the cost of equity or labour market flexibility:"

The Report led to a debate about the applicability of the Scandinavian model (SM) of centralised and institutionalised wage setting to Australia. While there were a lot of public commentators arguing its merits there was no actual study of this question in empirical terms. I set about this task by comparing Sweden and Australia. The parallels between the two economies were, superficially, that we were both small, open economies with a necessity to maintain competitiveness in the traded-goods sector. Further, it was noted that institutions dominated wage fixing in Australia and Sweden, although there are substantial differences in the nature of the centralised institutional interaction in each country.

The SM dichotomises the economy into a competitive sector (C-sector) and a sheltered sector (S-sector). The C-sector produces products, which are traded on world markets, and its prices follow the general movements in world prices. The C-sector serves as the leader in wage settlements. The S-sector does not trade its goods externally. Under fixed exchange rates, the C-sector maintains price competitiveness if the growth in money wages in its sector is equal to the rate of change in its labour productivity (assumed to be superior to S-sector productivity) plus the growth in prices of foreign goods. Price inflation in the C-sector is equal to the foreign inflation rate if the above rule is applied. The wage norm established in the C-sector spills over into wages growth throughout the economy. The S-sector inflation rate thus equals the wage norm less its own productivity growth rate. Hence, aggregate price inflation is equal to the world inflation rate plus the difference between the productivity growth rates in the C- and S-sectors weighted by the S-sector share in total output. The domestic inflation rate can be higher than the rate of growth in foreign prices without damaging competitiveness, as long as the rate of C-sector inflation is less than or equal to the world inflation rate.

The SM was shown in this article to be unsuitable for Australian wage determination. Despite obvious similarities, there are significant differences between the Scandinavian economies and Australia, and consequently the SM cannot adequately explain the Australian inflationary process. On an empirical level, it was difficult to dichotomise the Australian economy clearly along SM lines. Industries like agriculture serve both the export and domestic markets and shift production between the two in response to world price trends and government marketing schemes. It was also difficult to find any consistent productivity differences along SM lines in the Australian economy. Further, while institutional dominance characterises both wage determination systems, the manner in which the Australian institutions interact differs substantially from the pattern described above. The Swedish employer/employee groups negotiate at a peak level independent of government and an arbitration authority. Bargaining may reflect governmental goals, but essentially the outcomes reflect the relative aims of the employees and employers. The imposition of an incomes policy has been consistently rejected by the peak groups. At that time in Australia, the pivotal role played by the Arbitration Commission and industry level bargaining (with key awards transmitting wage pulses throughout the wage structure), is not replicated in the Swedish system. Also, the players in

the Australian system have negotiated for lengthy periods under the auspices of defined national income policy guidelines. The SM would thus appear to have limited applicability for the Australian system.

I also established a wage simulation model to provide some guide to the outcomes that would result from an application of SM wage norms. I used three different industry aggregations to define the C-sector (agriculture and mining; agriculture alone; and mining alone). This reflected the dominance of primary commodity exports in the Australian case. This Chapter concludes that the SM would be an unsuitable basis for wage guidelines in Australia. Its use would lead to violent and uncertain fluctuations in wages growth and unit labour costs and a higher average growth rate in wages than has actually occurred over the last decade. In addition to the aggregate problems, the use of SM guidelines would not unambiguously maintain the competitiveness or profitability of the export and import-competing industries. The application of the SM when agricultural prices rise would lead to profit squeezes and impaired competitiveness in the mining industry. Any exchange rate accommodation of the improved agricultural terms of trade would further exacerbate the mining industry's plight.

Chapter 6 entitled *Testing for Unit Roots and Persistence in OECD Unemployment Rates* was published in *Applied Economics* in 1993 (Mitchell, 1993). It continued my research into hysteresis, which began with Mitchell (1987a) and evolved through Watts and Mitchell (1990) and Watts and Mitchell (1991), among other articles published by myself or in partnership with Martin Watts. By now I had changed my whole approach to econometric estimation and realised that it was crucial to attempt to determine whether the data was non-stationary, and if it was to work out the source of this non-stationarity. The distinction between trend-stationarity and difference-stationary processes became important and I developed testing routines to accomplish the various tasks found in the literature. At this stage, the software designers had not yet caught up with the shift in econometric practice and the testing algorithms had to be performed by hand. The non-parametric tests due to Perron (1988) were very time-consuming to program in RATS.[2]

I was also becoming increasingly uncomfortable with the hysteresis hypothesis. Its initial attraction was the theoretical license it gave to expansionary aggregate policy at a time when macroeconomics was firmly in the vice of Monetarism. With high and persistent unemployment economists were searching for supply side solutions which seemed unable to address the issues. Chapter 7, *Arthur Okun's High Pressure Economy – its Relevance in the 1990s*, discusses some of these ideas. The hysteresis hypothesis represented a major challenge to Monetarist orthodoxy. There were now two main alternative hypotheses about the relationship between the business cycle and the steady state in macroeconomics: the natural rate hypothesis (NRH) and the hysteresis hypothesis (HH). Each presented a distinct prescription for the design and conduct of aggregate

economic policy. One part of my research documented in this collection was clearly concerned with developing this difference and providing some empirical discrimination of the viewpoints.

However, my parallel research in the more formal developments of time series statistics pointed to problems in extending the hysteresis concept to the unemployment rate. Nelson and Plosser (1982) compare trend-stationary (TS) to difference-stationary (DS) processes. They say that macroeconomics commonly separates a non-stationary "secular or growth component" from a stationary "cyclical component" when decomposing real (and sometimes nominal) economic time-series. The transitory disturbances are due to monetary shocks. This representation is termed a TS process. Alternatively, integrated (DS) processes exhibit non-stationarity, which is stochastic and displays no automatic tendency to return to any deterministic trend. DS processes cannot provide long-term forecasts based on the mean of the series. Whereas the past history of the TS process does not influence its long-term value, the magnitude of a variable following a DS process is the sum of its past.

In Chapter 6, I show how the two competing economic hypotheses – the NRH and the HH can be represented as TS and DS processes respectively. This mapping from economic theory into statistical theory provided the potential for using the developments in unit root testing to cast light on the HH compared to the NRH. I believe this was a new development in the literature. However, there were immediate problems. A hysteretic process would have statistical properties akin to a unit root process. This indicated that hysteresis, in theory, had to be associated with time series with non-finite variances. But the unemployment rate is bounded from above and below and therefore it could not follow a "pure unit root process" (Brunello, 1990). This was a significant issue for me because it then led to the consideration of the relationship between hysteresis and persistence, two terms, which had been used almost synonymously in the literature.

For example, Blanchard and Summers (1986: 15-29) begin by observing that for twenty years most of Western Europe experienced negligible unemployment, whereas

> since the early 1970's...a protracted period of high and rising unemployment ... [has evolved] … European experience compels consideration of alternative theories of hysteresis which contemplate the possibility that increases in unemployment have a direct impact on the natural rate of unemployment … [and] … if wage bargaining is a prevalent feature of the labour market, the dynamic interactions between employment and the size of the group of insiders may generate substantial employment and unemployment persistence.

I do not believe that Blanchard and Summers (1986) understood, at the time, the distinction that emerged in Mitchell (1993) between persistence and hysteresis.

I also identified an apparent tension between the theoretical and the empirical literature on unit roots and hysteresis. Much of the theoretical work on hysteresis uses the path dependence of the

steady-state unemployment rate as a model of hysteresis (Blanchard and Summers, 1986, 1987; Franz, 1990). Nelson and Plosser (1982) found that the unemployment rate was the only time-series to reject the unit root hypothesis (see also Evans, 1989). Perron (1989: 1363) did not "analyse the unemployment rate series since there is a general agreement that it is stationary." Perron (1988: 321) confirmed this belief and concluded for the United States that "the unemployment rate series … [is] ... stationary around a linear trend (albeit a zero trend.) .…" The problem was simple. Either the theoretical possibility of hysteresis in the unemployment rate was erroneous or there was a need for more comprehensive unit-root testing. However, the unit roots testing framework was limited because of the low power of the tests. The standard tests found it hard distinguishing between a pure unit root process and a near-unit root process. The latter is a long-memory TS process.[3]

So while the distinction between the NRH and the HH was clear in theory, on a practical basis the divide was somewhat blurred. The concept of unemployment persistence became very important in this regard. In analytical terms, Chapter 6 shows that persistence is a special case of the NRH. An economy with strong persistence takes many periods to adjust back to equilibrium following a shock. So even if the NRH is a true model of the economy, persistence means that the effects of shocks have long memories and that short-term macroeconomic policy can be effective. The tests in Chapter 6 detect the presence of unit-roots in OECD unemployment rates over an extended sample. This has significant implications for the conduct of economic policy, even though, over an infinite sample, the variance of the process may operate within finite bounds. The only other model that is plausible, given the low power of the unit root tests, is a highly autoregressive process.

To gauge how much persistence exists in the data, steady-state unemployment rates were derived from autoregressive models for each OECD economy examined. The equilibrium was shocked by introducing an output gap – a 3% negative shock and the time-paths back to equilibrium were computed. There was considerable inertia in the adjustment processes which led to the conclusion that even if we failed to formally establish the unit root hypothesis, in practical terms the policy implications are equivalent given the high degree of persistence evident in the data. Clearly, macroeconomic policy can be designed to minimize the costs of each shock (that is, reduce the output gaps) before the next shock impacts. A non-interventionist policy would see the impacts of previous shocks still 'substantially' in the system as the next shock arrives. Thus, the Okun losses would be magnified.

Chapter 7, *Arthur Okun's High Pressure Economy - its Relevance in the 1990s* which was published in Mitchell *et. al.* (1995), reassesses the notion of cyclical upgrading, popularised by Arthur Okun (1973) and others (Thurow, 1975; Vroman, 1978) in the 1960s and early 1970s. The upgrading hypothesis and the related high-pressure economy model provided a coherent rationale for Keynesian policy positions. However, there has been vast economic changes over the last 20

years, particularly within the labour market, like the rising importance of females in the labour force and the changing composition of industry employment and output (good-producing to service-provision).

Okun's (1973) upgrading hypothesis is based on several related propositions, which Okun found empirical support for. First, the most cyclically sensitive were dominated by prime-age males and offered high-paying jobs, other remuneration characteristics (fringes), which encouraged long-term attachments between employers and employees, and displayed above-average output per person hour. Second, in demographic terms, when the economy expands prime-age males exit low-paying industries and take jobs in other higher paying sectors and their jobs are taken mainly by young people. Third, in the advantaged industries, adult males gain large numbers of jobs but less than would occur if the demographic composition of industry employment remained unchanged following the expansion. As a consequence, other demographic groups enter these 'good' jobs. Finally, the demographic composition of industry employment is cyclically sensitive. The total shift effects in 1970 are estimated by Okun (1973) to be of the same magnitude as the scale effects (the proportional increases in employment across demographic groups assuming constant shares). This indicates that a large number of labour market changes (the shifts) are generally of the ladder climbing type within demographic groups from low-pay to higher-pay industries.

More recent evidence indicates that the low productivity service sector has been responsible for most of the growth in employment in Australia since the late 1970s (Mitchell, 1999a). If two further related facts are added to the discussion, namely, (a) that these industries have higher part-time employment shares, and (b) larger female and teenage participation, then a less glamorous picture of upgrading emerges. This evidence motivated the focus on the labour market aspects of the upgrading hypothesis and the Chapter examines four issues. First, how does the labour force participation rates of different age and gender groups behave over the economic cycle? Second, for a given arbitrary full employment level, what is the potential employment levels for groups and the economy in total, and how are the employment gaps (defined as the difference between potential and actual employment) distributed across demographic groups? Third, how is the total employment gap distributed across industries? Finally, to reconcile the demographic gaps and the industry gaps, how does the demographic composition of industry employment respond to changes in the total gap? What do the demographic gaps by industry look like?

The results show that the upgrading thesis has to be questioned. It would appear that recovery would be accompanied by the creation of a preponderance of low productivity, low paid jobs. The projections accord with the explanation for the slowdown in productivity since the mid-1970s based on increasing shares in output of low productivity service industries. With more jobs projected to be created in the service sector than the goods producing sector this trend towards lower productivity growth is likely to continue. The principle source of upgrading comes from the changing demographic composition of industry employment. It is estimated that in many

industries, the employment shares of prime-age women and teenagers increase as the total employment gap is closed. In other words, these groups gain a larger share of the extra jobs than their current share in industry employment would predict. Prime-age males lose shares in most industries. Substantial improvements are projected for teenagers who gain the most in higher paying industries, while some improvements for prime-age females are estimated. The share increases for prime-age women, however, are mostly in the service sector.

I interpreted the analysis and results as challenging the basic policy orthodoxy of Post Keynesian economic thinking (Davidson, 1994). Okun's upgrading hypothesis provided a powerful rationale for demand stimulus to maintain a high-pressure economy. The results in Chapter 7 caution against using generalised aggregate demand expansion as the panacea for reducing unemployment. There seemed to be a case for differentiating between types of high-pressure economies. In other words, I was seeking to introduce a quality dimension to the high-pressure economy. This search prompted the next phase of research, which concerned the development of the Buffer Stock Employment model (see Chapters 9 and 10).

In Chapter 8, *Modelling the Impact of the ACCORD on Wage Inflation in Australia*, which will be published as Mitchell (1999d), is the latest wage adjustment function that I have estimated and comes at the end of the Accord period. With the Accord now history, this Chapter updates my previous econometric modelling to assess the extent to which the wage guidelines influenced the path of wage and price inflation. A model is estimated to test for cointegration as the first stage in modelling an error-correction representation of the wage-setting dynamics. This is an advance on the work of Watts and Mitchell (1990a) and Mitchell (1987a) in that the modelling explicitly considers the possibility of integrated data.

The Chapter also introduces a new way of viewing the estimation of the wage adjustment function. After comprehensive unit root testing it was concluded that the level of all variables (wages, prices, capacity utilisation, the unemployment rate, and productivity) were non-stationary. The interesting result then was that the level of capacity utilisation, the unemployment rate and productivity were considered to be seasonally-integrated of order one, whereas the change in average weekly earnings and the price level were found to have this status. This meant that a cointegration relationship could be explored between the annual change in the log of average weekly earnings, the annual change in the log of the price level (the annual inflation rate), and the logs of quarterly capacity utilisation, the unemployment rate and productivity. This is interesting because it means that the cointegration regression will be estimating an equilibrium or steady-state wage inflation model rather than the level of average weekly earnings. The unemployment rate was found not to be part of this cointegrating relationship, which is consistent with earlier research, by Watts and Mitchell (1990a). The income policy variables were highly significant in this cointegrating relationship.

Once the corresponding dynamic error-correction model was estimated it was found that fluctuations in wage inflation around the conditional steady-state wage inflation rate was heavily conditioned by the error-correction mechanism (from the cointegrating equation). The incomes policy variables did not, in general, impact on the quarterly variation in the annual wage inflation rate. Their role seemed to be confined to the annual change in wage inflation.

The Chapter shows that the incomes policy variables are all highly significant and negative. In general, the Accord period exerted a much stronger downward influence on annual wages growth than the earlier period of incomes policy. The different phases are all robustly defined. So, despite the advances in econometric techniques and methods, the results confirm the previous conclusions that since 1975 in Australia, incomes policy has exerted a strong moderating influence on the annual wages growth and insofar as this pushes against inflation, it provides more "room" for governments to stimulate their economies. The only thing stopping governments is the will to do it. The policy solution, however, is not to assume that with the wage guidelines moderating inflation a general expansion in aggregate demand will allow sustainable low levels of unemployment to be achieved. Adding to the conclusion in Chapter 7, this Chapter concludes that environmental constraints suggest that the global economy can't support levels of aggregate demand sufficient to fully employ the available workforces.

The solution appears, however, to lie in the role of the government as an employer. The capitalist system has cast aside the long-term unemployed and rendered then "valueless" in terms of their contribution to production. The social costs of this are enormous and threatening (Mitchell and Burgess, 1998a). The role of the government given the environmental constraint has to lie in getting "value" out of the long-term unemployed via government employment schemes that will be in harmony with the natural environment.

Chapters 9 and 10 introduce my most recent work on the path to full employment and price stability via a Buffer Stock Employment approach. Chapter 9, *The Buffer Stock Employment Model and the NAIRU: The Path to Full Employment* was published in *the Journal of Economic Issues* in June 1998. Chapter 10*, The Buffer Stock Employment model in a Small Open E*conomy, will be published in the *Economic and Labour Relations Review* in the first half of 1999. The work is in its infancy and will constitute my major research program over the period ahead.

The research program has also spawned a number of related published or forthcoming papers (Mitchell and Watts, 1997; Mitchell and Burgess, 1998a, 1999b, 1999c; Mitchell, 1999b; 1999c, Burgess, Mitchell, O'Brien and Watts, 1999). Mitchell and Burgess (1998a) outline a case for the introduction of a full employment policy based on the buffer stock employment (BSE) model developed by Mitchell (1998a). Mitchell and Burgess (1998b, 1999c) place the BSE approach within the context of human rights and argue that the government has to be responsible for the maintenance of rights in this regard.

The stimulus to this research was my increasing dissatisfaction with Post Keynesian solutions to unemployment and the findings that are outlined in Chapter 7. I had been advocating public sector job creation in several publications (for example, Mitchell, 1994a, 1994b, 1996; Green, Watts and Mitchell, 1993; Mitchell *et. al.*, 1995). But I realised that this solution relied heavily on income policy guidelines and were not comprehensive enough. Further, the stimulus that would be forthcoming from the public spending had to be more focused to support another goal that I saw as being crucial – environmental sustainability. In this context, I returned to work that I had conceived, but not developed, when I was a fourth-year student. To some extent it represents my view that the presence of a Phillips curve (stable or otherwise) is an artifact of the way in which governments conduct their fiscal and monetary policy.

The motivation for the Buffer Stock Employment work began while I was a fourth year student at the University of Melbourne in 1978. The basis of the policy came to me during a series of lectures in the Honours program by A.G. Lloyd on the Wool Floor Price Scheme introduced by the Commonwealth Government of Australia in November 1970. The scheme was relatively simple and worked by the Government establishing a floor price for wool after hearing submissions from the Wool Council of Australia and the Australian Wool Corporation (AWC). The Government then guaranteed that the price would not fall below that level. There was a lot of lobbying to get the floor price as high above the implied market price. The price was maintained by the AWC purchasing stocks of wool in the auction markets. The financing of the purchases came from a Market Support Fund (MSF) accumulated by a small contribution from growers based on the value of its clip. Fund shortages were made up with Government-guaranteed loans. The major controversy for economists was the "tinkering with the price mechanism" (Throsby, 1972: 162). There was an issue as to whether it was price stabilisation or price maintenance. This was not unimportant in a time when prices were in sectoral decline and a minimum guaranteed floor price implied ever-increasing AWC stocks. Other problems included the problems of substitutability from synthetic fibres and the maintenance of production levels, which would by themselves continue to depress prices. The debate over the scheme (adequately summarised by Parish, 1964; and Lloyd, 1965) focused on the price intervention.

I thought at the time that by applying reverse logic one could utilise the concept without encountering the problems of price tinkering. In effect, the Wool Floor Price Scheme generated "full employment" for wool production. Clearly, there was an issue in the wool situation of what constituted a reasonable level of output in a time of declining demand. The argument is not relevant when applied to available labour. I considered full employment to be the state where there was no involuntary unemployment and that was determined by the supply of labour at the current money wage rates. The corresponding demand for labour at the existing money wage rates merely determined the magnitude of involuntary unemployment. I rejected the notion that all unemployment was voluntary and that full employment was defined by market relations – the

intersection of the labour demand and supply curves at some "equilibrium price" (for example, Phelps, 1967; Friedman, 1968; and Lucas and Rapping, 1969). I also rejected the orthodox economic viewpoint that related the excess supply of labour (observed as unemployment) to excessive wage aspirations by the unemployed (for example, Layard, Nickell and Jackman, 1991). I considered that mass unemployment was a macroeconomic problem related to deficient demand.

The reverse logic implied that if there was a price guarantee below the "prevailing market price" and a buffer stock of working hours constructed to absorb the excess supply at the current market price, then we could generate full employment without encountering the problems of price tinkering. That idea was the seed of the BSE model. At the time, I also considered that the scheme could be financed by a levy on existing incomes, which was analogous to the MSF. As a result of other work, I now do not consider that there is a financing problem (Mitchell, 1996; Mosler, 1997, Wray, 1998; Bell, 1998, Mitchell and Mosler, 1999).

I also read the work of Benjamin Graham (1937) who discussed the idea of stabilising prices and standards of living by surplus storage. He documents the ways in which the government might deal with surplus production in the economy. Graham (1937: 18) said "The State may deal with actual or threatened surplus in one of four ways: (a) by preventing it; (b) by destroying it; (c) by 'dumping' it; or (d) by conserving it." In the context of an excess supply of labour, governments had at this time and now adopted the "dumping" strategy via the NAIRU. It made much better sense to use the conservation approach. Graham (1937: 34) notes that

> The first conclusion is that wherever surplus has been conserved primarily for future *use* the plan has been sensible and successful, unless marred by glaring errors of administration. The second conclusion is that when the surplus has been acquired and held primarily for future *sale* the plan has been vulnerable to adverse developments …

The distinction was important to developing my thinking on the BSE model. The Wool Floor Price Scheme was an example of storage for future sale and was not motivated to help the consumer of wool but the producer. The BSE policy is an example of storage for use where the "reserve is established to meet a future need which experience has taught us is likely to develop" (Graham, 1937: 35). Graham also analysed and proposed a solution to the problem of interfering with the relative price structure when the government built up the surplus. In the context of the BSE policy, I devised that this meant setting a buffer stock wage below the private market wage structure, unless strategic policy in addition to the meagre elimination of the surplus was being pursued. For example, the government may wish to combine the BSE policy with an industry policy designed to raise productivity. In that sense, it may buy surplus labour at a wage above the current private market minimum. These considerations form part of my on-going research. In the first instance, I wanted to show the basic BSE model with a wage floor below the private wage structure. While I consider this an eminently better outcome in terms resource use and social equity, I believe it is just the beginning of the matter.

Graham (1937: 42) considered that the surplus should "not be pressed for sale until an effective demand develops for it." In the context of the BSE policy, this translated into the provision of a government job for all labour, which was surplus to private demand until such time as private demand increases.

On the financing issue, Graham was particularly insightful. Once again the distinction between conservation for future use (the BSE) and conservation for future sale (Wool Floor Price Scheme) is important. Graham (1937: 43) said that the latter

> suffered from the fundamental weakness that they depended for their success upon advancing market prices … A price-maintenance venture is inherently unsound must in all probability … result in serious financial loss … But a rational plan for conserving surplus … should not involve the State in financial difficulties. *The state can always afford to finance what its citizens can soundly produce.* (emphasis in original)

Graham (1937: 90) foresaw the NAIRU approach when he said that "unemployment operates as a crude mechanism for correcting the unbalance of demand and supply." His "Reservoir system" proposes that the State buys and stores "composite units" of basic raw materials when they are in surplus at a unit price (the money value of the unit being the quantity of combined commodities equivalent to a dollar) fixed at some appropriate level. The composite units are paid for by new currency and are convertible. The surplus production is thus stored without destroying incentives in the markets. The system generates price stability because the price level for the composite price level is fixed in the some way that gold was fixed under the gold standard.

He thought that the scheme would deliver an absence of cyclical unemployment because demand levels would be maintained. The BSE policy does not encounter the problems associated with the storage of raw materials. It can be seen as "storing private labour services" and putting them to use in public projects. In this way, the production of private commodities reflects the level of demand and the unwanted labour resources are re-allocated to areas that the private sector does not service.

I have unsuccessfully tried to locate my original essay written as an honours student on these thoughts. With the exception of the financing issue and more modern terminology, Chapter 9 more or less captures what my young mind was thinking at the time. The work contributes some new thinking for Post Keynesians. Under the BSE scheme, the government continuously absorbs workers displaced from the private sector. The "buffer stock" employees would be paid the minimum wage, which defines a wage floor for the economy. Government employment and spending automatically increases (decreases) as jobs are lost (gained) in the private sector. The approach generates full employment and price stability. The BSE wage provides a floor that prevents serious deflation from occurring and defines the private sector wage structure. However, if the private labor market is tight, the non-buffer stock wage will rise relative to the BSE wage and the buffer stock pool drains. The smaller this pool, the less influence the BSE wage has on

wage patterning. Unless the government stifles demand, the economy will then enter an inflationary episode, depending on the behavior of labor and capital in the bargaining environment.

In the face of wage-price pressures, the BSE approach maintains inflation by choking aggregate demand and inducing slack in the non-buffer stock sector. The suppression of non-buffer sector output asserts the numeraire price -- the BSE wage. This leads to the definition of a new concept, the Non-Accelerating Inflation Buffer Employment Ratio (NAIBER), which, in the buffer stock economy, replaces the NAIRU/MRU as an inflation control mechanism. The Buffer Employment Ratio (BER) is the ratio of buffer stock employment to total employment. As the BER rises, due to an increase in interest rates and/or a fiscal tightening, resources are transferred from the inflating non-buffer stock sector into the buffer stock sector at a price set by the government; this price provides the inflation discipline. The disciplinary role of the NAIRU, which forces the inflation adjustment onto the unemployed, is replaced by the compositional shift in sectoral employment, with the major costs of unemployment being avoided. That is a major advantage of the BSE approach.

Chapter 10, *The Buffer Stock Employment Model in a Small Open Economy*, focuses on the financial implications of the BSE model in the context of a small open economy. In addition to the normal arguments that Monetarists and others use to justify their case against fiscal activism (crowding out, inefficient resource usage), it is often argued that increased globalisation imposes further restrictions on the ability of governments to pursue independent fiscal and monetary policy. In Australia's case, it is alleged that budget deficits only result in growing current account deficits and rising debt levels. Reacting to this, it is alleged that external funds managers can enforce higher interest rates and thus even lower growth and higher unemployment in the domestic economy.

The Chapter considers several testable hypotheses included in the monetarist case, which are rarely confronted with empirical scrutiny. First, is there evidence of a relationship between budget deficits and short-term and long-term interest rates? If there is no discernable statistical relationship found it is difficult to argue against fiscal activism based on financial crowding out arguments. Second, is there evidence of a relationship between long-term interest rates across countries in globalised financial markets? If there is no relationship detected then the view that financial traders in the large markets like Japan and the United States can render domestic monetary policy ineffective is problematic. Third, is there any evidence that the relationship between domestic long-term and short-term interest rates is unstable? Stability implies that the cash rate, which is set as a policy instrument, and the longer-term interest rates, which are influenced by market considerations, move together in a proportional manner over the long-run and that therefore the determinant is the officially controlled cash rate. Finally, is there any evidence to support the twin-deficits hypothesis that imposes causality from the fiscal deficit

changes to changes in the current account deficit? A lack of such a direct relationship also provides further support for the use of budget deficits under the BSE policy.

It is found that none of the principal claims used against fiscal activism are empirically sustainable. The evidence is supportive of the conceptual basis of monetary theory that underpins the BSE model (Mitchell, 1996; Mosler, 1997, Wray, 1998; Bell, 1998, Mitchell and Mosler, 1999).

There are several strands of this research that I am now pursuing. I am working on the open economy model in more detail to consider Balance of Trade and Capital Account implications in an analytical sense. There is continuing work on the mechanics of the model at the microeconomic level. The philosophical considerations, first considered in Mitchell and Burgess (1998b, 1998c) are being expanded. In the latter case, I am very interested in the definition of work and what constitutes work. The argument being developed is that in the next period our conception of "gainful employment' will change to accommodate technological developments and environmental constraints. There will also be increasing service needs that are not provided by the private sector. The juxtaposition of these ideas leads directly to the BSE approach. Related, is a need to develop the BSE approach within an analytical model of sustainable growth.

The work is now part of an international collaborative research agenda which directly involves Randall Wray and Mathew Forstater from the Levy Institute in the United States, Edward Nell and Stephanie Bell from the New School in New York, Warren Mosler, a fixed-rate bond trader in the United States, and members of the newly established Centre of Full Employment and Equity (COFFEE) research at the University of Newcastle (of which I am the Director). We are also forming relationships with scholars elsewhere in Australia following the conference the COFFEE hosted in December 1998. A number of graduate students working within COFFEE are involved in aspects of the work.

The only chapter that is currently not published or about to be published is Chapter 2. *The Origins of the Phillips Curve.* This chapter will form part of a book I am writing on the Phillips curve that will be published next year by Edward Elgar. The Chapter is long, by design. Given the choice explained earlier to present the work as self-contained chapters reflecting the development of my research agenda on inflation and unemployment, I considered it better to keep this chapter as a standalone discussion. The discussion reflects my fascination with the historical development and econometric estimation of the Phillips curve. The theme of the book I mention above is the discontinuity and opportunism in the development of macroeconomic thinking and I use the relationship between inflation and unemployment as the vehicle for my discussion.

Given the impact that macroeconomic theory has on policy design, and then the impact that changing government policies have on the well-being of the community, it is fundamental that we

understand where these ideas come from. The history of the "Phillips curve" is a prime example of the discontinuity in economic thinking. There was some discussion of the so-called trade-off between inflation and unemployment among the classical economists. By the 1920s, Irving Fisher (1926) was setting the groundwork for what became Monetarism some 42years later (Friedman, 1968). The work of Fisher was obscured by the rise of Keynesian macroeconomic orthodoxy. The Phillips curve, reflecting the adjustment of nominal magnitudes to real disequilibrium in the labour market, was a central expression of the confidence that policy makers had acquired with respect to eliminating the business cycle during the 1960s. However, Friedman with others (for example, Friedman and Becker, 1957; Friedman and Meiselman, 1963; and Friedman and Schwarz, 1963) were working on the foundations of a resurgence of neoclassical macroeconomics based on the Quantity Theory of Money during the 1950s and 1960s. The Phillips curve became their opportunity and the empirical havoc that the 1970s oil price shocks created among macroeconomic time series seemed to add weight to their (flawed) arguments. Nothing had really changed in the modern statement of Monetarism that had not been shown to be deficient, albeit in different terms, by Keynes (1936) and the work of Kalecki (1971), among others.

This opportunism of Friedman and others exploited the vulnerability of the prevailing Keynesian paradigm, which had conducted successful policy throughout the Post World War II period up until the late 1960s with largely misspecified models (see Davidson *et al.*, 1978). The Phillips curve was just one of a number of macroeconomic equations that ignored inflationary expectations. The misspecification was not significant while inflation was negligible. Once the inflation rates soared throughout the world in the early 1970s after the oil price rises, all these misspecified relations broke down and the theoretical edifice that was erected upon them also fell into disrepute (Ormerod, 1994). Monetarist thought emerged from this wreckage as being eminently plausible. It was a serendipitous period for the neoclassicals because they had actually reasserted the issue of real wage bargaining before the empirical relations broke down. The shift in the Phillips curve was interpreted as validating their theoretical structure, which had undergone harsh criticism from economists like Robert Clower (1965) and Axel Leijonhufvud (1968).

An examination of the literature between Fisher (1926) and Phillips (1958) shows that the Keynesians exploring the relationship between inflation and unemployment clearly knew about the role of inflation expectations and in one case the problem of instability in the relationship (Brown, 1955). How the Phillips (1958) model became the exemplar is then the interesting question. If the work of Brown (1955), for example, had have gained more prominence, the subsequent development of macroeconomic theory and policy may have been quite different. For instance, Brown's discussion of incompatible claims and real wage resistance was a very rich story of the inflation process and could have easily accommodated the oil shock instability. Chapter 2 examines these issues in some detail.

**Notes:**

[1] ACTU is the Australian Council of Trade Unions and the TDC was the Trade Development Council.

[2] RATS is the Real Analysis of Time Series econometric software package.

[3] I was also working with a colleague Ping Wu on alternative tests of non-stationarity using the TS hypothesis as the null (Mitchell and Wu, 1995). The research used the same data set as Mitchell (1993) and accepted the null in most cases. The issue was that the tests at our disposal were not powerful enough to discriminate between a unit root process and a near-unit root process (the so-called long memory or fractionally integrated processes).

# Chapter 2            The Origins of the Phillips Curve

## 2.1    Introduction

The essays contained in this thesis are focused on inflation and unemployment and the usefulness of aggregate demand management and incomes policy to reduce unemployment to some irreducible minimum. The Phillips curve in its various guises promotes a relationship between these macroeconomic aggregates and raises the question of the existence and nature of a trade-off between nominal and real economic outcomes. It has sometimes been cast as an empirical correlation upon which a theoretical edifice was built (Lipsey, 1978; Sawyer, 1983).[1]

 Sawyer (1989: 100) says, "it could be said that the discussion of inflation has been dominated by the notion of the Phillips curve, even if there were several notions of Phillips curve which were sometimes loosely related to the original concept of Phillips." Tobin (1972: 4) considers Phillips 1958 article to be "probably the most influential macro-economic paper of the last quarter century". Richard Lipsey (1978: 51) recalls that it was Samuelson who "coined the phrase 'the Phillips curve' to describe the relationship between price inflation and the unemployment rate in his "extremely influential text".

The Phillips is, of-course, A.W. Phillips who in his 1958 *Economica* publication established a relationship between nominal wages growth and the unemployment rate. Paul Samuelson and Robert Solow (1960) were the first to explicitly build on Phillips's 1958 work and discuss the relationship in terms of a trade-off between price inflation and the unemployment rate. There has been an industry within economic modelling and policy analysis built on these beginnings. What is curious is why it was this paper that spawned such activity given the well-established theoretical and empirical modelling of this relationship prior to Phillips's 1958 publication (Sawyer, 1989; Leeson, 1998).

At the outset, we should be cautious with the terminology. It is typical to refer to the Phillips curve in terms of a trade-off between inflation and unemployment (for example, Gordon, 1984). In terms of modelling the reference is highly misleading. There is not a structural relationship specified in terms of a trade-off between the change in the price level and the unemployment (rate) level in any reasonable macroeconomic model. In fact, as Klein (1985: 151) says "it is the parametric relationship between two reduced form expressions – one for the rate of change of price and one

for unemployment, each of which are endogenous variables in a complete system." If the arguments in the structural relations are the same – specified in terms of initial conditions and exogenous history – then there is an implicit relationship between the two endogenous variables. Klein (1985: 151) concludes, "this is the trade-off relation between price change and unemployment."[2] In this sense, the trade-off summarises the interaction of several factors within the system. This also makes it difficult attempt to explain the Phillips curve as an optimising function. We will return to this issue presently.

The usual understanding of the relationship between inflation and unemployment, as presented in the textbooks (for example, Gordon, 1984; McTaggart, Findlay, and Parkin, 1996), ignores the long history of discussion of the relationship. The influential textbooks of the 1960s, like Samuelson's 1964 sixth edition of *Economics: An Introductory Analysis*, and Richard Lipsey's *1963 An Introduction to Positive Economic Science*, established the Phillips curve as the centrepiece of macroeconomic policy analysis. But in doing so they stylised the relationship and blurred its history.[3] In their zeal to pronounce that the neoclassical synthesis represented an end to ideological division in economics, the textbooks not only obscured critical developments in inflation-unemployment analysis but also left the door open for the subsequent monetarist takeover. Economies and economics to this day are still suffering from the policy reversals that accompanied monetarism in the 1970s.

In this chapter, three interrelated issues are discussed. First, was the Phillips curve pre-Keynesian? What relevance is the literature on the relationship between inflation and unemployment, which was, published prior to Phillips (1958)? Second, we examine that the work prior to Phillips (1958) linking wage and price adjustment, which certainly considered inflationary expectations to be important. Further, in this period there was significant research published which considered that the relationship between the change in money wages (prices) and the unemployment rate was not stable over a long time period The stability properties that Phillips (1958) claimed became the foundation of macroeconomic policy in the 1960s. The two strands of research lead naturally to a consideration of the Friedman-Phelps expectations-augmented Phillips curve, which played on the lack of an expectations term and the assumed stability of Phillips' own model. Third, is it valid to see the expectations-augmented Phillips curve, as represented in the textbooks, as a development of the work of Phillips (1958)? What was the basis of the Monetarist resurgence in the late 1960s? The textbook history of the Phillips curve usually develops five sequential versions of the relationship (Humphrey, 1985). The lack of context and history in the textbook treatment leaves it open for one to interpret the sequence as representing a paradigm with increasing theoretical and empirical content. This chapter argues that there is no such sequence. The expectations-augmented Phillips curve, in fact, represented a paradigmatic change to pre-Keynesian thinking. It also did not fully embrace the richness of pre-Keynesian discussion on the relationship between price changes and the unemployment rate. Sawyer (1989: 105) says, "there are several distinct (and sometimes contradictory) meanings which have been attached to the term Phillips curve."

The five models usually included in the textbook sequence are (for example, Frisch, 1983; Gordon, 1984; Wells, 1995; McTaggart, Findlay, and Parkin, 1986):

1. A model of the relationship between the change in nominal wages and the unemployment rate where excess demand in the labour market drives the price variable changes (Phillips, 1958).

2. With fixed markups over costs, the change in prices can replace the change in wages. This was the model first published by Solow and Samuelson (1960) and provided the policy menu trade-off between inflation and unemployment.

3. A range of shift-variables can be added to either model. Various variables were added to the models including trade union bargaining power and strike activity, past price inflation, unemployment dispersion, and demographic factors (for example, Hines, 1964).

4. The biggest development was seen to be the expectations-augmented Phillips curve of Friedman (1968) and Phelps (1967, 1968). This model had major policy implications and spearheaded the resurgence of pre-Keynesian macroeconomic thinking in the form of Monetarism. The concept of the natural rate of unemployment (NRU) became central to the idea that the trade-off between inflation and unemployment captured in the Phillips curve was in fact a trade-off between unemployment and unexpected inflation. Once expectations are realised as workers gain more information the trade-off vanishes. At this point there is only one unemployment rate consistent with stable inflation – the NRU.

5. The expectations-augmented Phillips curve led to the New Classical representation, which presumes that the labour market is continuously in equilibrium. The discrepancies between the actual unemployment rate and the NRU are exclusively due to misperceptions of the actual inflation rate. When expectations are realised the economy is always at the NRU and any unemployment is chosen. Combined with the assumption that expectations are formed in a rational manner (Muth, 1961), then misperceptions are only random variables. Thus, tradeoffs that are observed arise because of random shocks to the system, which are beyond the scope of policy (for example, Lucas, 1972; Sargent, 1973)

It is possible to conceive of a further development in the form of New Keynesian Macroeconomics, which emphasise "microfoundations of imperfectly competitive labour markets and product markets" (Carlin and Soskice, 1990: vi) and introduces hysteresis and feedback effects. However, in terms of the popular textbooks, this development, while welcome, has not yet become standard faire.

In terms of what we might call the "textbook treatment of inflation and unemployment" - Models 4 and 5 outlined above represent a major theoretical break from the previous three versions of the

Phillips curve. The former conceptions are based on a disequilibrium notion of the relationship between inflation and unemployment in that they model the adjustment of prices and wages to some labour market imbalance between supply and demand. The causality is strictly from the labour market disequilibrium to the price adjustment function. There is no presumption that full employment is inevitable or a tendency of a capitalist monetary economy.

The Friedman-Phelps story and the later developments under the rubric of rational expectations and the New Classical School represent a major break from the previous depiction of the relationship because it is based on a market clearing relation. The causality is reversed. Unemployment is considered to be voluntary and the outcome of optimising choices by individuals between work (bad) and leisure (good). Full employment is assumed to prevail (with unemployment at the natural rate) unless there are errors in interpreting price signals. The tendency is always to restore full employment by market mechanisms. There is no discretionary role for aggregate demand management.

It is thus misleading to see these models as part of a continuous development of theory supported, in part, by empirical analysis. We argue in this Chapter that the conception, which underpinned Phillips (1958) publication, was paradigmatically different to the conception that underpinned the Friedman (1968) and Phelps (1968) publications. Far from being an augmentation of the Phillips curve, the Friedman Natural Rate of Unemployment (NRU) and inflation models were part of an on-going attempt to resurrect the neoclassical free market paradigm, which had fallen into discredit during the Great Depression. The natural rate version of the Phillips curve is traced back to Irving Fisher who was a prominent and influential exponent in this century of the neoclassical paradigm.

The Chapter is set out as follows. Section 2.2 considers the pre-Keynesian origins of the Phillips curve and discusses some of the historical contributions of the English classical economists and their contemporaries up to Irving Fisher. The aim is to assess the extent to which the insights contained in Phillips (1958) and the subsequent textbook depictions of the Phillips curve can be labelled pre-Keynesian. Section 2.3 moves on to consider the contribution of the post WWW 2 econometricians and the pre-1958 Keynesians with the aim of establishing the Keynesian roots of Phillip's work and also to shed light on the stability issue. Section 2.4 builds on the argument and considers the macroeconomic context that prevailed at the time of the publication of Phillips (1958). The task in this section is to show that the subsequent theoretical permutations of the "Phillips curve" presented in textbooks were in fact a reversion to the pre-Keynesian period and cannot be considered a paradigmatic development, in the sense of adding knowledge to a particular paradigm. The final section 2.5 in the light of the discussion considers why the Phillips curve has been so influential. Concluding remarks follow.

## 2.2 Pre-Keynesian inflation and unemployment theory

### 2.2.1 The English classical economists

The background to the writings of the classical economists on inflation and unemployment centred on the convertibility of the note issue into gold, which was suspended in 1794 at the outset of the Napoleonic War and did not resume until 1819-1821. The intervening period of inconvertible paper was marked initially by rampant inflation. Subsequently, in the period between 1814-16, many country banks in England failed and this led to a destruction of country-bank paper and a sharp contraction in the money supply. The deflation had harsh effects on the poor and working class and it became worse with the resumption of cash payments (at the gold parity, which existed prior to the suspension). A fierce debate followed and the role of the Bank of England became a major issue (see O'Brien, 1975: Chapter 6).

O'Brien (1975: 162) says, "very few Classical writers … were prepared to argue that changes in the stock … [of money] … did not affect the level of activity, although there were several versions of the way in which money achieved its effects." O'Brien traces the Classical thinking back to the pre-Classical writers like Cantillon, Potter and Law. The major statement of what we might now call the relationship between inflation and unemployment came, however, from David Hume.

**David Hume**

In 1752, Scottish economist David Hume wrote an essay entitled "Of Money" which subsequently was reprinted in "Writings on Economics" (1955). His most explicit statement of the link between money, inflation and real activity is as follows (1955: 37-40)

> … though the high price of commodities be a necessary consequence of the encrease of gold and silver, yet it follows not immediately upon that encrease; but some time is required before the money circulates through the whole state and makes its effect be felt on all ranks of people. At first, no alteration is perceived; by degrees the price rises, first of one commodity, then of another; till the whole at last reaches a just proportion with the new quantity of specie… In my opinion, it is only in this interval or intermediate situation, between the acquisition of money and rise of prices, that the encreasing quantity of gold and silver is favourable to industry. When any quantity of money is imported into a nation, it is not at first dispersed into many hands, but is confined to the coffers of a few persons, who immediately seek to employ it to advantage. … they are thereby enabled to employ more workmen than formerly, who never dream of demanding higher wages, but are glad of employment from such good paymasters. If workmen become scarce, the manufacturer gives higher wages, but at first requires an encrease of labour; and this is willingly submitted to by the artisan, who can now eat and drink better, to compensate his additional toil and fatigue. He carries his money to market, where he finds every thing at the same price as formerly, but returns with greater quantity and of better kinds, for the use of his family. The farmer and the gardener, finding, that all their commodities are taken off, apply themselves with alacrity to the raising of more; and at the same time can afford to take better and more cloths from their tradesmen, whose prices is the same as formerly, and their industry only whetted by so much new gain. It is easy to trace the

money in its progress through the whole commonwealth; where we shall find, that it must first quicken the diligence of every individual, before it encreases the price of labour.

Accordingly, we find, that in every kingdom, into which money begins to flow in greater abundance than formerly, everything takes a new face: labour and industry gain life; the merchant becomes more enterprising, the manufacturer more diligent and skilful, and even the farmer follows his plough with greater alacrity and attention.

A nation, whose money decreases, is actually at that time, weaker and more miserable than another nation, which possesses no more money, but is on the encreasing hand. … the workman has not the same employment from the manufacturer and merchant; though he pays the same price for everything in the market. The farmer cannot dispose of his corn and cattle; though he must pay the same rent to his landlord. The poverty, and beggary, and sloth, which must ensue, are easily foreseen

From the whole of this reasoning we may conclude, that it is of no manner of consequence, with regards to the domestic happiness of a state, whether money be in a greater or less quantity. The good policy of the magistrate consists only in keeping it, if possible, still encreasing; because by that means, he keeps alive a spirit of industry in the nation… There is always an interval before matters be adjusted to their new situation; and this interval is as pernicious to industry, when gold and silver are diminishing, as it is advantageous when these metals are encreasing.

The argument is illuminating and is very reminiscent of the later Phillips curve relationship. The expansionary effect begins via a rise in cash balances. There is a presumption that the economy is at less than full employment. The economy, with excess capacity in the labour market, adopts a quantity adjustment to the higher demand. The expansion lowers unemployment but eventually the excess demand in the labour market brings forth costs increases (via money wage increases) and price rises.

Is the trade-off described here transitory or permanent? Further discussion by Hume suggests that his "model" is based on two building blocks. First, disturbances to unemployment (which see it vary from its equilibrium rate) arise from price expectation errors (difference between actual and perceived prices). Second, these price expectation errors can only continue while prices are changing. We can express these ideas in the following way

**Eqn 2-1**     $U = g(p - p^e)$

**Eqn 2-2**     $(p - p^e) = m\left\{\delta p/\delta t\right\}$

where $U$ is the variation in unemployment around it equilibrium value, $p$ is the actual price level, $p^e$ is the expected price level, $\delta p/\delta t$ is the change in the price level over time, $m$ is the price perceptions adjustment coefficient and assumed to be positive (see Humphrey, 1985).

By substitution, the familiar "Phillips curve" form is derived

**Eqn 2-3**  $U = f\left(\delta p/\delta t\right)$

Hume argued that it was necessary to continuously increase prices to keep unemployment at a desired low level. The continuous rises in the price level were required to create price-forecasting errors, which generate the "trade-off". In modern parlance, employment can be increased to some high level (low unemployment) as a result of monetary-driven price increases.

Hume's writings can be easily interpreted in terms that we use today. His trade-off is between unemployment and unexpected changes in prices driven by unexpected changes in money. In a fully realised economy there is no trade-off and in some sense we might consider that to place Hume in a natural rate world. Further, if there was a once and for all increase in the price level, price expectations would adjust over time to the new actual level. The value of $m$ in Equation (2.2) determines how quickly the expectations adjust. But to continuously achieve the trade-off, monetary authorities, according to Hume, would have to continuously increase the money stock and the price level.[4]

Despite Hume invoking surprise in price increases as a basis for real fluctuations he cannot be seen as providing the reasoning, which forms the basis of Friedman's 1968 model based on adaptive expectations. For Hume, once the monetary authority turned off the tap, inflation would stop accelerating (and the price level would become stationary), and changes in output and employment would cease. Hume clearly did not anticipate the rational expectations literature. The trade-off is possible because price expectations are lagged (implying that $0 < m < 1$) and monetary authorities can continue to drive a gap between the actual and expected price level.

Hume believed that the processes of inflation and deflation were symmetrical. A monetary authority intent on continuous deflation would generate high unemployment. So in the long run the monetary authority can choose a mix of unemployment and inflation that suits its purposes. There is thus a long-run trade-off in this conception (Humphrey, 1985: 19). Nelson (1981: 2) summarised Hume's "Phillips curve" in the following way

> Hume was clearly of the opinion that the level of activity would be raised permanently by a steady increase in the quantity of money, prices, and wages. Hume was therefore a believer in a stable, long-run Phillips curve.

This interpretation is at odds with that of Gordon (1976: 191) who claims that Friedman's (1975) statement that monetary expansion could only have temporary effects was "merely restating in dynamic form Hume's original proposition that a monetary expansion could 'excite' real output only temporarily." There is nothing in Hume that indicates that he thought the trade-off was

temporary and that employment would fall back to the level that prevailed before the monetary expansion. Further, Hume (in the above quotation) supported the use of inflation as good policy to increase real output and employment.

**Henry Thornton**

David Hume's analysis of inflation became the standard starting point for the Classical economists (O'Brien, 1975: 163). The debate tended to be about redistribution between creditors and debtors or fixed-income persons. Hume died in 1776 when British economist Henry Thornton was 16 years of age. In 1802, Thornton wrote his major work entitled *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain 1802*, which was published in modern form in 1939 with an extensive introduction written by Hayek. Hayek suggests that the publication by Thornton marked "a new epoch in the development of monetary theory. … although … overshadowed by the greater fame of Ricardo, it has now come to be recognised that in the field of money the main achievement of the classical period is due to Thornton" (Thornton, 1939: 36).

Thornton, in developing a theory of credit, was a forerunner of Keynesian liquidity preference theory (Hayek, 1939: 47). Thornton is what O'Brien (1975: 149) called a moderate bullionist[5]. Thornton disputed the strict concept of a unique stock of currency held by the rigid bullionists because he considered there were other factors, in addition to excess currency, which could lead to a depressed exchange (when the price of gold was higher than its mint price).[6] The additional factors included bad harvests and remittances to foreign governments who were prosecuting wars on behalf of the England (Thornton, 1939: 156).

However, he gave particular attention in his exposition to the "extraordinary demand for metal" or what he called the internal drain. Thornton (1939: 118-119) realised that large reductions in the issue of Bank of England paper (money notes) were related to downturns in real activity. In periods of depressed exchange, when Ricardo would argue that there was excess currency that had to be reduced, Thornton argued that the contraction could be domestically disastrous. Thornton (1939: Chapter 5) argued that when there was an internal drain operating then note issue should be increased. This was in stark contrast to Ricardo and the rigid bullionists.

Hayek (1939: 49) argues that in Thornton's penultimate chapter he reaches "the height of his intellectual power … [and] … breaks entirely new ground in an attempt to elucidate the effects of a credit expansion in greater detail." It is this part of his work that Thornton provides an early analysis of the relationship between inflation and unemployment in a credit economy.[7]

He says (1939: 235)

> There seems to be only two modes in which we can conceive the additional paper to be disposed of. It may be imagined either, first, to be used in transferring an encreased quantity of articles, which it must, in that case, be assumed that the new paper itself has tended to create; or, secondly, in transferring the same articles at a higher price.

In modern parlance, this dichotomy is representative of what Lipsey (1978: 49) refers to as the "prevailing macroeconomic model" of the early fifties. However, Thornton sees an expansion in terms of a mix of real and nominal effects. Thornton's transmission mechanism linking increased money to employment increases arises

> When the Bank of England enlarges its paper, … favoured persons conceive … that they have additional … capital. … the antecedently idle persons to whom we may suppose the new capital to give employ, are limited in number, … , therefore … will set to work labourers, of whom a part will be drawn from other, and, perhaps, no less useful occupations.

Thornton clearly saw the trade-off between rising prices and falling unemployment. In this part of his work, he outlined a model very similar to that captured in Equation (2.3). He argued (1939: 237) that

> … that the new circulating medium will, … create for itself much new employment. … Let the reader, however, take notice, that it assumes the demand both for goods and labour to become more eager than before. Now, the consequence of this encreased eagerness in the demand must, unquestionably, be an enhancement of the price of labour and commodities, which is the very point for which I am contending. … we seem obliged to admit, that, although additional industry will be one effect of an extraordinary emission of paper, a rise in the cost [i.e., price] of articles will be another. Probably no small part of that industry which is excited by new paper is produced through the enhancement of the cost of commodities.

Further Thornton (1939: 239) says that it has been "admitted that paper possesses the faculty of enlarging the quantity of commodities by giving life to some new industry." In other words, he saw that monetary growth could stimulate real activity including employment. But it is not the level of money that is important. Rather, Thornton is consistent with Hume and focuses on the stimulatory effects of changes in money and prices. He makes this point in several places. He (1939: 242) says, "… the effect produced by paper credit on the price of articles depends not merely on the quantity of paper in existence, but … on the rapidity of its circulation." And in a later passage, Thornton (1939: 256) confirms this point

> It is the progressive augmentation of bank paper, and not the magnitude of its existing amount, which gives the relief. It thus appears, that the moderation and forebearance among borrowers, which were supposed likely to restrain the too great emission of paper, are only to be excited by the means of its perpetual encrease … (see also Humphrey, 1985: 19)

So the trade-off is driven symmetrically by continuous growth in money, pushing inflation and exploiting the Phillips curve. The split between the rate of real and nominal expansion, which

results, was discussed but not analytically derived. Thornton, though, was not in a reverse-L shaped supply world.

How does the trade-off work? It is somewhat unclear from Thornton's writings about the way in which the higher prices drove higher output. There is scant reference to the labour market and no reference to the way in which the trade-off would endure. Humphrey (1986: 19) says

> As for the tradeoff's source, Thornton attributed it chiefly to a tendency for money wages to consistently lag behind prices. He explicitly stated (1) that inflation stimulates activity, (2) that is does so by reducing real wages and raising real profits, (3) that this output-enhancing redistribution occurs because money wages lag behind prices, and (4) that this wage lag persists as long as inflation is sustained.

Humphrey, however, takes some liberty with his interpretation of Thornton trade-off dynamics. There is no labour market theory in Thornton. He traces the trade-off via the reaction of entrepreneurs to the rising prices. There is some inconsistency in Thornton's analysis as to whether the money wage rises or not. Thornton (1939: 237) says

> the consequence of this encreased eagerness in the demand, must, unquestionably, be an enhancement of the price of labour and commodities, which is the very point for which I am contending."

He suggests that in a climate of rising demand and prices, entrepreneurial activity is (1939: 237) "more than ordinarily profitable." The source of the increased activity is the time lag between purchasing inputs and/or commodities and selling final goods at the higher prices. But later on Thornton says (1939: 239)

> It must be also admitted, that, provided we assume an excessive issue of paper to lift up, as it may for a time, the cost of goods though not the price of labour, some augmentation of stock will be the consequence.

It is unclear if money wages rise or not. One could build a labour market model of involuntary unemployment whereby the trade-off mechanics explicitly stated by Thornton (the increase in entrepreneurial activity) with the real wage constant. But Thornton (1939: 239) definitely believes that the real wage falls and the workers suffer a decline in purchasing power as a consequence.

Does Thornton believe the trade-off is permanent? There are two cases to consider: (a) an expansion and then a return to the previous money stock, and (b) an expansion and maintenance of the money stock at the new, higher level. He noted (1939: 239)

> … soon, however, as the circulating medium ceases to encrease, the extra profit is at an end; and, if we assume the augmented paper to be brought back to its ordinary quantity, we must suppose industry to languish for a time, through the ill success which will appear to attend mercantile transactions.

In other words, there are no enduring real effects if the money stock expands then contracts back to its original level. In this sense, he is not inconsistent with Hume. But he does not discuss the second case in any reasoned terms. If the money stock rises and is then maintained – does the new employment level persist? The answer is that it probably does not. A clue is in his reference to Hume's work. Thornton (1939: 238) said

> Mr. Hume has an observation in his Essay on Money, which, in some degree, confirms the remarks, which have been made in the text. Having represented the influx of money as exciting industry… "At first," he says, "no alteration is perceived; by degrees the price rises first of one commodity, then of another, till the whole, at last, reaches a just proportion with the new quantity of specie which is in the kingdom. In my opinion, it is only this interval or intermediate situation between the acquisition of money and rise of prices that the encreasing quantity of gold and silver is favourable to industry."

In a footnote to this passage Thornton (1939: 239) says that an increase in money "tends to afford temporary encouragement to industry." He cites, as an empirical authority, the Mississippi scheme in France. Humphrey (1986: 19) supports this interpretation and argues that for Thornton the increase must be continuous or else the trade-off vanishes. It is not absolutely clear from Thornton's own writing though that this should be the case.

Another departure from Hume's analysis is Thornton's distaste for a policy designed to exploit this temporary trade-off. The loss of purchasing power for workers via real wage cuts and those on fixed incomes leads Thornton to eschew the trade-off as a viable strategy for monetary authorities. Thornton (1939: 239) says

> … the labourers … may be forced by his necessity to consume fewer articles, though he may exercise the same industry. But this saving, as well as any additional one which may arise from a similar defalcation of the revenue of the unproductive members of the society, will be attended with a proportionate hardship and injustice.

Thornton's policy advice is very clear. The Bank should let the total amount of paper issued (1939: 259)

> … vibrate only within certain limits; to afford a slow and cautious extension of it, as the general trade of the kingdom enlarges itself; to allow of some special, though temporary, encrease in the event of any extraordinary alarm or difficulty, … To suffer either the solicitations of merchants, or the wishes of government, to determine the measure of the bank issues, is unquestionably to adopt a very false principle of conduct.

Thornton also believed that the trade-off between output (employment) and inflation, if exploited, would be relatively small. In modern parlance he saw a steep Phillips curve. Thornton said (1939: 239) that while it is true that a growth in money will stimulate real activity ("giving life to new industry"), "the encrease of industry will by no means keep pace with the augmentation of paper" as prices continue to rise.

The lack of a labour market model, particularly on the supply side, incorporating the way in which workers formulate their supply decisions means that Thornton did not anticipate the expectations-augmented Phillips curve developments. He is completely silent on why the workers would continue to supply more labour as they faced continuous real wage declines. Perhaps, he did not work through all the temporal considerations of this idea because he was opposed to the policy approach and did not see it as a practical alternative. In fact Thornton says (1939: 243) that the "directors of the bank have never augmented their notes in such a degree as to be likely to produce any material alteration in the general price of goods."

**Thomas Attwood**

Neither Hume nor Thornton were an "unambiguous inflationist"(O'Brien, 1975: 164).[8] However, in contradistinction, Thomas Attwood clearly wanted policy makers to use inflation to increase the level of prices and generate full employment.

Thomas Attwood, a Birmingham banker, recognised a trade-off between inflation and unemployment. His thinking was significantly influenced by the effects of the deflationary strategies of the Bank of England after the Napoleonic Wars as they sought to resume specie payments. He became a central figure in the opposition to the attempts by the Bank of England to bring the currency notes back to parity with gold at the expense of economic activity (Fetter, 1964). The Bank was trying to resume specie payments after the 1797 suspension. The suspension followed a run on specie as the public panicked early in the wars against the French.

Attwood was a monetary heretic in his times. He stood for inflationary policies because he saw they were the means to full employment. He is thus firmly in the tradition of modern economists who saw a long-run trade-off between inflation and unemployment and who may weight the costs of unemployment higher than the costs of inflation. The harsh deflationary policies adopted by the Bank of England in 1815 and 1816 saw many brass and iron workers in the Birmingham area, who were largely occupied in the armaments industry, lose their employment. Attwood stood out from the contemporary opposition to the deflation because he was not concerned with the distributional consequences (Fetter, 1964: xiii). Fetter (1964: xiv) says that

> Attwood opposed deflation because of its "effect upon the willingness of business men to expand operations, to assume financial commitments, to hire labour. … He believed that employer and employee alike were suffering from a lack of purchasing power to buy their products at remunerative prices. Unlike those who thought of heavy taxes as aggravating the problem of a falling price for debtors, Attwood thought of reduction of taxes as contributing to the distress, by curtailing government spending and hence reducing aggregate demand.

Attwood 's goal was full employment. His causal model is simple. A deflationary policy aimed at reducing prices (especially the reduction of public war expenditure) stops production and exhausts stocks.

Attwood said (1964: 59) that the depression results

> in diminishing the general expenditure, until the greater part of the stocks of the country are exhausted, and until the productive industry of the country is so far diminished, as to bear no proportion to the inevitable consumption of the country. … all classes of the community suffer, except the creditor and the money-holder; … The rich man suffers from the difficulty of discharging his debts, and from necessity of discharging his servants, and of curtailing his expenditure in every way; and the poor man suffers more cruelly, by the consequent diminution of his wages and of his bread.

Attwood continues to outline a model of cumulative expenditure effects similar to what we think of as the multiplier. He argues that the wealth of the community is based not on money but on property (real production), money being (1964: 62) merely an invention to facilitate the exchanges of property; and is of no other use than that of effecting and promoting those exchanges." He is somewhat contradictory in this part of his argument because he recognises the motives for holding money are to reduce uncertainty about the future, a centrepiece of Keynesian economics. While he sees the holding of money balances independent of transactions motives, as a (1964: 62) "diseased action of the mind", he is (1964: 62) not "surprised that they should seek to relieve themselves by exchanging their property for money." This is because Attwood recognises holding property (real stocks and the like) "subjects the holders to losses and danger."

The solution was outlined clearly by Attwood in *The Remedy*, where he (1964: 9) says

> … the natural remedy for a country to have recourse to, whose eyes are open to its own interests, is a forced creation of additional currency. After awhile, when the general consumption and prosperity of the country shall have been restored, such additional currency may be withdrawn gradually, without injury or inconvenience.

This statement clearly distinguishes Attwood's understanding of the process from Hume and Thornton. Unlike Hume and Thornton, Attwood expressed the trade-off in terms of levels of unemployment and prices (or deviations from normal values) (Humphrey, 1985). This is clear because both Thornton and Hume argued that a reduction in the growth of money would plunge the economy back into depression. For Attwood it is high prices (not price changes) that leads to low unemployment. The exact way in which the trade-off between price levels and unemployment work in Attwood's writings is not entirely clear. The mechanics of his expansion is the fall in value of money as the price level rises. Attwood (1964: 62-63) says

> Money may fall in value, and in so doing will contribute to the prosperity of the country, by exciting and rewarding industry…By expanding the money supply, the public will demand property. Let them be glutted with money. They will then seek property; and the prosperity of the country will be restored. … Restore the depreciated state of the currency, and you restore the reward of industry, you restore confidence, you restore production, you restore consumption, you restore every thing that constitutes the commercial prosperity of the nation.

So for Attwood it is a real-wealth effect that provides the stimulus. As long as the real value of property rises prosperity (production and employment) rises. But the expansion is also dependent on what we might now call expectations. Attwood places a strong emphasis on public confidence. He argues (1964: 69) that "the depression of prices has produced depression of mind, and both have produced very general impoverishment and distress."

Attwood pushed the inflationist position because he believed that the capitalist system had an inherent tendency to deflation, where falling prices causes stocks of goods to decline and, in turn, engendered pessimistic expectations. A downward spiral of gloom followed and the descent was only interrupted by price rises at the bottom of the trough due to stock shortages (Attwood, 1964: 60-61).

Ricardo was particularly dismissive of Attwood's ideas (Fetter, 1964: xix) and, in part, this was because Attwood was not particularly analytical. Fetter (1964: xviii) proposes that

> From 1817 on Attwood had a central theme, that the test of the adequacy of the monetary supply was a state of full employment. But when faced with the necessity of saying what the monetary standard should be, he bobbed around from inconvertible paper, to silver, or to a gold standard at a price of gold that seemed to vary… without logic.

The position taken by Attwood can be expressed in modern terms as an opposition to the proposition that an unfettered market would maintain full employment. This brought him into conflict with John Stuart Mill during the 1820s.[9] Attwood's position is characterised by the following extract (1964: 47-48)

> … and whilst these poor creatures were perishing for want of bread, it would be but a little consolation to them to be told, that they must wait a few years, and then the capitalists of the country would be enable to maintain them through the medium of their private expenses, in the same way as they now maintain them through the medium of Government expenses. What a cruel mockery of sufferings is this! Nothing can feed the labourers, nothing can serve the country, unless it has the effect of creating, or *bringing into action*, an additional quantity of the currency, or circulating medium of the country. Until this object is accomplished…  the consumption of the country will not be restored…

In concluding *The Remedy*, Attwood is very explicitly in favour of discretionary policy (1964: 70-71)

> … In short, shall we see all the property, and all the active and vital energies of the country laid prostrate at the feet of the monied interest; or shall we use the reason which God has given us, and by one slight movement of the nation, one easy harmless exertion, shake of this ideal pressure, this night-mare of the mind, that paralyzes the sinews of our strength, and weighs heavier upon our hearts than all the terrors of Napoleon's sword?

Mill (1964) was a major critic of the position taken by Hume and Attwood and rejected the idea of a permanent trade-off between inflation and unemployment.[10]

**John Stuart Mill**

Mill approached the inflation-unemployment argument in the context of the discussion of inconvertible paper currencies, which he considers in Book 3, Chapter 13 of *his Principles of Political Economy,*[11] although he also broached Attwood's argument in Volume I of his *Dissertations and Discussion*. Mill has been labelled an unoriginal and inconsistent writer who largely followed Ricardo (Schwartz, 1972 debates this view with a critical perspective). On the issue of the inconvertible currencies, Mill (1964: 542-546) said that only a convertible currency could not be issued in excess. Blaug (1977: 200) considers that "This is merely a reproduction of Ricardo's argument, and a very uncritical reproduction at that."

Mill's (1964: 550) main statement on the issue is as follows:

> Another of the fallacies from which the advocates of an inconvertible currency derive support, is the notion that an increase of the currency quickens industry. This idea was set afloat by Hume, in his *Essay on Money*, and has had many devoted adherents since; witness the Birmingham currency school, of who Mr. Attwood was at one time the most conspicuous representative. Mr. Attwood maintained that a rise of prices, produced by an increase of paper currency, stimulates every producer to his utmost exertions, and brings all the capital and labour of the country into complete employment; and that this has invariably happened in all periods of rising prices, when the rise was on a sufficiently great scale. I presume, however, that the inducement which, according to Mr. Attwood, excited this unusual ardour in all persons engaged in production, must have been the expectation of getting more commodities generally, more real wealth, in exchange for the produce of their labour, and not merely more pieces of paper. This expectation, however, must have been, by the very terms of the supposition, disappointed, since, all prices being supposed to rise equally, no one was really better paid for his goods than before.

Mill at this stage believed in a model like Equation 2-1. Mill (1964: 550) says

> Those who agree with Mr. Attwood could only succeed in winning people on to these unwonted exertions by a prolongation of what would in fact be a delusion … that by a rise of money prices, every producer shall always seem to be in the very act of obtaining an increased remuneration which he never, in reality, does obtain … It calculates on finding the whole world persisting for ever in the belief that more pieces of paper are more riches, and never discovering that, with all their paper, they cannot buy more of anything than they could before.

He differentiates Attwood and Hume by considering the former thought that a general rise in prices would occur and stimulate activity whereas Hume "thought that all commodities would not rise in price simultaneously" (Mill, 1964: 551). According to Mill, Hume thought that the increase would come from a perversion of relative prices, where for a particular seller, the sale price of their commodity would rise relative to the prices of other commodities that they purchase. Mill rejects the stimulatory potential of these inflationary effects because "for every person who thus gains more than usual, there is necessarily some other person who gains less" (Mill, 1964: 551).

Mill's analysis is deficient because he fails to consider the context in which Attwood was proposing inflation. The tract against Attwood assumes full employment of all resources. Attwood

proposed inflationary-motivated growth because he had witnessed the effects of the post-Napoleonic recession on the local Birmingham industry.

There is also some inconsistency in Mill's writings. In the Principles (1964: 550) Mill says that, in theory, delusion that confusion between nominal and real prices could generate Attwood's expansion. Yet, in Mill (1865: 79), he says that such a mistake "may create a false opinion of an increase of demand … [and] … to an increase in production" (see also Humphrey, 1977). However, Mill (1964: 550) rejects that such an error was ever made "during any of the periods of high prices" that Attwood cites as evidence. Yet, Mill knew that there had been a strong growth during the Napoleonic Wars. There was no evidence that public armament spending had, as classical theory predicted, "crowded out" private capital investment (O'Brien, 1975).

Mill did not reject, however, that monetary expansion was neutral. He built an argument to show that monetary expansion could have real effects on the gains made by debtors in real terms. After noting that the issuer of the money levies a virtual tax on holders of the notes (with inconvertibility) because of the depreciation in the value of money, Mill (1964: 552) said

> But besides the benefits reaped by the issuers, or by others through them, at the expense of the public generally, there is another unjust gain obtained by a larger class, namely those who are under fixed pecuniary obligations. All such persons are freed, by a depreciation of the currency, from a portion of the burden of their debts … On a superficial view it may be imagined that this is an advantage to industry; since the productive classes are great borrowers, and generally owe larger debts to the unproductive … than the unproductive owe to them … It is only thus that a general rise of prices can be a source of benefit to producers and dealers; by diminishing the pressure of their fixed burdens.

Blaug (1977: 200) says

> Without making any reference to the existence or nonexistence of idle resources, Mill suddenly introduces a new pro-inflationary argument never contemplated by 18th-century economists; a rise in prices lowers the real value of debt and hence favors debtors against creditors.

The problem is that independent of the source of the extra demand the only way it can translate into a real expansion is if there is unemployment (of labour and capital) existing prior to the monetary increase. For Mill to trace out one mechanism which provides increased spending and production yet rejects another is inconsistent. The fact is that Mill (1964: 552) had a moral objection to the real debt route – "this might be accounted an advantage, if integrity and good faith were of no importance to the world, and to industry and commerce in particular."

In his discussion on capital (Book I, Chapter V, Section 2), Mill acknowledged that when there is less than 100 per cent capacity utilisation, "governments may, in various ways … bring it nearer to that limit … They can create capital" (Mill, 1964: 65-66). He went on to recognise that government efforts to increase the productive power of capital would tend "to increase the

employment for labour" (Mill, 1964: 66).[12] Blaug (1977: 199) also notes that in the sixth edition of the Principles, Mill admitted to the argument of forced saving as a means by which inflation could create capital and increase employment. Blaug (1977:200) summarises

> The denial of the doctrine that 'money stimulates trade' is therefore allowed to stand side by side with the footnote admission of forced saving and the debtor-creditor argument without any effort at reconciliation.

Humphrey (1977) considers that Mill was a forerunner of the expectations-augmented Phillips curves and the natural rate hypothesis, because he claims that Mill saw misperceptions as the means to gain temporary expansion. It is hard to agree with this interpretation. With all the confusion and inconsistency that Mill displays in this section of his argument aside, his basic objection to the inflationist cause of Attwood is moral. It is hard to imagine that Milton Friedman would concede that the case against using monetary expansion to reduce unemployment only comes down to a moral objection. But, although Mill is inconsistent, he more typically adopts the argument that monetary expansion is undesirable.

**Conclusion**

This section was motivated by my search for the origins of the Phillips curve and the Monetarist revolution that followed. The relationship between inflation and unemployment was discussed by the Classical economists and there is no common thread leading to the resurgence of Monetarism. Contrary to some opinion (for example, Gordon, 1976), Hume is clearly not the foundation for the natural rate analysis and his discussion is entirely consistent with the outcomes in Phillips (1958). Thornton, despite being ambiguous on key issues, like what happens if the new, higher level of money stock is maintained, is more likely a precursor to the Monetarists but not Phillips (1958). Attwood's analysis is also consistent with Phillips (1958) and in contradiction to the Monetarist developments. His major critic, Mill is unclear and inconsistent, although he has been interpreted as providing analysis consistent with the vertical long run Phillips curve (Humphrey, 1977).

### 2.2.2 Irving Fisher – "I discovered the Phillips Curve"

The editor of the Journal of Political Economy in the 1973 edition said

> It is not generally known that the first statistical investigation of the relationship between inflation and the unemployment rate was performed not by A.W. Phillips in 1958 but by Irving Fisher in 1926.

Donner and McCollum (1972: 323) agree that the genesis of the empirical work on the trade-off between inflation and unemployment was "being carried out by Irving Fisher at least as early as 1926… Some of Fisher's empirical results are recorded in a neglected paper of 1926 in the International Labor Review, entitled 'A Statistical Relation Between Unemployment and Price

Changes.'" The 1973 Journal of Political Economy reprinted the 1926 article by Fisher under the heading "I discovered the Phillips Curve by Irving Fisher".  Gordon (1981: 212) also claims that the "curve should actually be called the 'Fisher curve', since the relationship between the unemployment and inflation rates had been pointed out much earlier [by Fisher 1926]." Dimand (1997: 442) says, "Fisher's monetary theory of economic fluctuations anticipated later developments such as Phillips curves and adaptive expectations."[13]

While superficially Fisher produced a correlation between employment and a complex lagged version of price inflation, it is difficult to argue that his model was a precursor to the type of models that eventually became embodied under the Phillips curve umbrella. Further, we have already seen that the English classical economists discussed the inflation-unemployment relationship and knew that a trade-off could be exploited, although in varying ways and with varying temporal horizons. We will argue that Fisher's conception of the relationship is paradigmatically at odds with the stream of thinking within which Phillips is placed. Referring to the *Journal of Political Economy* title on the reprint of Fisher's 1926 paper and considering the content of that paper (and a similar 1936 paper by Fisher), Solow (1997: 433) argues,

> In that case he would have been anticipating the Phillips curve. Some readers have adopted this interpretation. Actually, he has the causality going in the other direction: the volume of employment is explained by the lagged values of the rate of change of wholesale prices.

Fisher's causal train is from a money expansion to rising prices, rising profits, increasing output and then higher employment starting from a full employment level (which we would term the natural rate of unemployment now). Fisher's explanation for the relationship is as follows (1973: 498)

> … when the dollar is losing value, or in other words when the price level is rising, a business man finds his receipts rising as fast, on the average, as this general rise of prices, but not his expenses, because his expenses consist, to a large extent, of things which are contractually fixed, such as interest on bonds; or rent, which may e fixed for five, ten , or ninety-nine years; or salaries, which are often fixed for several years; or wages, which are fixed sometimes either by contract or custom, for at least a number of months. For this and other reasons, the rise in expenses is slower than the rise in receipts when inflation is in progress and the price level is rising or the dollar falling. The business man, therefore, finds that his profits increase. In fact, during such periods of rapid inflation, when profits increase because prices for receipts rise faster than expenses, we nickname the profit-taker the 'profiteer;' Employment is then stimulated-for a time at least.

Fisher's words are similar those used by Thornton and he also thought exploiting this trade-off was bad because longevity issues aside, the workers have more jobs but they have lower wages. In other words, the trade-off is accompanied by lower real wages (money wages rise more slowly than prices). Similar to Thornton, is Fisher's insistence that the relationship is between changes in prices and unemployment. The level of prices (1973: 499) "has …  nothing whatever to do with employment."

It is important to consider Fisher's contribution in perspective. In a later publication, *Money Illusion*, Fisher (1928) coined the term money illusion, which became a central concept in the attack on Phillips curve orthodoxy by Friedman (1968) and Phelps (1968) and with the rise of monetarism in the 1970s. In *Money Illusion*, Fisher argued that individuals regularly were confused between real and nominal values. Fisher believed that assuming rationality is a useful starting point for the economic analysis of individual behaviour. But he was aware that actual studies of human behaviour suggest that a strict adherence to rational principles "fail to describe the world we live in" (Thaler, 1997: 439). Fisher only considered models built on rational behaviour to hold in conditions of "foresight". Thaler (1997: 441) equates this with rational expectations. He argues that Fisher's theory of savings (intertemporal choice model) and the famous Fisher equation are only true if rational expectations hold.

Fisher's own empirical work in 1926, though not based on regression techniques, reflect his view that nominal amounts are slow to adjust to price level changes. He introduced the distributed lag, a dynamic structure common in econometrics from the 1950s on, to capture this notion. Fisher was also aware that his work did not establish causality. He says (1973: 502),

> this relationship …[that changes in the price level foreshadow or anticipate changes in employment] … might … not be causal. So far as statistics are concerned, instead of … [price changes being the cause of employment] … both might conceivably be caused by some third influence. Or it might be conceived that price-change simply represents a forecast of good or bad business. In fact, I have little doubt that both these views contain elements of truth.

Fisher's (1936) paper was accompanied by an incisive commentary by Morris Copeland (1936), who also questioned the causality in Fisher's work[14] (see also Solow, 1997). Fisher concluded that both directions of causality, what we now term bi-directional causality, was not excluded by his work. He also challenged Copeland to test for the opposite causality – in others words, to estimate the Phillips Curve.

Another interesting aspect of Fisher's empirical work is how it stands up now. Economists have used empirical work to provide an authority to their theoretical claims. They were not the first to appeal to numbers as science. Ormerod (1994: Chapter 5) discusses the battles between the various Christian churches in the C17th which involved the "science of numerology" (Ormerod, 1994: 92). While paradigms seem to resist empirical degeneration, the influence on policy increases with factual content.[15] It is interesting to see theoretical authority, however, in the context of the development of econometric techniques and knowledge. The type of modelling that we do today in terms of time series is significantly different to the work that Fisher did in 1926 and even from the work of the 1960s.

Would our view of the theoretical linkages change if the empirical authority failed to persist with the changing and improving techniques? Solow, for one, has been interested in this. In his 1997 note on Fisher he argues casts considerable doubt on the veracity of Fisher's statistical work. He says (1997: 434) after quoting Fisher's qualifications that the "correspondence between the actual and computed fluctuation in employment is naturally far from exact" that "that does not quite get it across that the model systematically understates the depth of recessions (if that is what is actually happening)".[16] Solow (1997), using data very similar to Fisher's data set, regressed employment on a few lagged dependent variables and inflation (lagged one period) for the period 1919-1935. He failed to find a significant relationship supporting Fisher's model. He then reversed the causality and found a highly significant relationship between employment and price changes – a Phillips Curve.

In terms of modern econometrics, several further questions are raised by Fisher's relationship. To what extent can there be a relationship between a variable in first-difference and a variable in level terms if both are non-stationary in levels? Are the series non-stationary and if so what is the source of the non-stationarity? If we detect difference-stationarity, what are the orders of integration of the series? Can we find evidence of cointegration between the price level and the employment level (assuming both are I(1) variables)? Can we find evidence of cointegration between the inflation rate and the employment level (assuming the employment level is I(1) and the price level is I(2))? Can we detect Granger-causality between employment and inflation?

While not being able to assemble the exact data set that Fisher used, I accessed the historical database of the National Bureau of Economic Research and constructed a monthly series for Factory Employment and the Consumer Price Index for the United States between January 1889 and December 1923. This was a longer data set than that used by Fisher but essentially similar. Using standard Dickey-Fuller and Augmented Dickey-Fuller tests, I was unable to reject the hypothesis that both series were integrated of order one (in other words they required first differencing to become stationary). This makes it very hard for there to be a relationship between inflation and the level of employment. Marginal, at best, bi-directional causality was detected between the two series in levels and first-differences using Granger-causality tests. I could not find any evidence of cointegration between the variables in any configuration. In that case, one might conclude that there is no simple error-correcting model linking the variables and it would be then be difficult to establish Fisher's outcomes.[17]

This is no surprise. The work of the Cowles Commission in the 1940s was also not supportive of his theory. Fisher was a critic of the Commission's work even though he was a founding member of the Econometric Society (Epstein, 1987: 103-104). He did not like the structural modelling - the heart of the Cowles work under Lawrence Klein. Epstein says that his real basis for complaint was not the structural modelling, although he couched his criticism in these terms, but rather "the detailed monetarist view of the business cycle he had developed over many years." Indeed the

early work of the Cowles Commission was largely concerned with "defending a simple Keynesian macro-approach" (Epstein, 1987: 103) and "measuring the effects of policy" (Marchak, 1946)

Fisher did not discover the Phillips curve. He re-asserted the Quantity Theory of Money, with flimsy empirical work to backup his claims. Fisher's work on misperceptions certainly laid the ground for the later work of Milton Friedman, who spent much of the period leading up to the 1960s following the lead of Fisher in believing that the strongest constant in economics was the causal relationship between the stock of money and nominal income. The expectations-augmented Phillips curve did not just materialise as a response to Phillips (1958). It was just a new manifestation of the work that Fisher began in the 1920s and became Friedman's research agenda in between. Epstein (1987: 108-109) says that Friedman "believed the Keynesians models were fundamentally mistaken and he strove to prevent the use of deliberate countercyclical policies … He went on to predict that models such as Klein's will 'in due time be judged failures'." Friedman was also a harsh critic of the structural modelling carried out at the Cowles Commission during the 1940s and 1950s. But that did not stop him attempting to establish the empirical validity of the money-income relationship. Friedman and Becker (1957), Friedman and Meiselman (1963), and Friedman and Schwartz (1963) resorted to a standard of econometric research that was, at the very least, problematic (see Desai, 1981). In summary, it is fair to interpret Fisher as the most coherent precursor to this theoretical development.

## 2.3   The Keynesian era – expectations and stability

### 2.3.1   The Econometricians

Friedman's work, which unambiguously aimed to build on the early research of Irving Fisher was up against a new macro orthodoxy, which was about to "hold fast to Okun's Law and the Phillips Curve" (Epstein, 1987: 110). The Keynesian paradigm was developing in a parallel fashion: the textbook synthesis of the linear expenditure system to a competitive labour market, and, the work of the Post World War II econometricians referred to in the last section. While the famous debate between Keynes and Tinbergen left no one unclear that Keynes didn't like the empirical work being done "in his name", the econometricians played a significant role in the development of Keynesianism at a policy level. Suffice to say, that at this early stage of econometric work there was considerable skepticism. The Keynesian models, initially were not an empirical success in terms of forecasting. Leeson says (1998: 605), that "Postwar Keynesianism *rose and fell* to the accompaniment of econometric failure, but after the first forecasting failure, the econometricians did not lose faith in their chosen strategy."

There was no doubt that the likes of Klein, a key player in establishing the ascendancy of postwar Keynesian, thought that it was better to use econometrics to assist in the process of policy making.

His 1946 *Journal of Political Economy* paper, which assessed the forecasting performance of the national income modelling, makes his contempt for "armchair" commentary clear. Klein says (1985: 532)[18] that there are "two possible reactions" to the failures of the models to forecast accurately. "We may now discard these new-fangled and difficult econometric methods … and relax again into the armchair comments about the future course of economic events. … [or] … We may tackle the forecasting problem with renewed vigor making use of the valuable information that we have gained from this trial." The renewed vigor spawned work which, in part, led to Phillips (1958).

We now turn briefly to the work of the econometricians prior to Phillips (1958) and show that Phillips was not the first to estimate a Phillips curve. Importantly, the pre-Phillips work had incorporated the idea that the relationship between wage or price changes and the level of activity was conditioned, among other things, by the state of expectations of inflation.

## Jan Tinbergen

Dutch economist Jan Tinbergen published the first econometric study of the trade-off between inflation and unemployment in 1936. Tinbergen became famous for his 1939 League of Nations project which attempted to provide empirical justification for the emerging Keynesian view that governments should intervene to stabilise business cycle fluctuations (Tinbergen, 1939). Tinbergen's work was severely criticised by Keynes himself and later Friedman, Frisch and Koopmans (see Patinkin, 1976, Stone, 1978; Hendry, 1980; Pesaran and Smith, 1985; Mitchell, 1995). In many cases, particularly the Keynes-Tinbergen interchanges, the critics showed extreme ignorance of Tinbergen's work (see Mitchell, 1995).

For our discussion, however, we begin with Tinbergen's first macrodynamic model, which was estimated as part of a Netherlands Economic Association's desire to find solutions to the malaise of the depression. The paper that resulted (Tinbergen, 1959)[19] was presented to the Association in October 1936. It has been seen as a "remarkable piece of work, involving not only building and estimating a model of the whole economy but also using the model to simulate the likely impact of various policies" (Morgan, 1990: 102). The model was certainly remarkable for its time - modelling 22 relationships and 31 variables. The structure of the model distinguished between definitional relationships, technical equations, and causal equations. The equation explaining wage changes was part of the causal equation block.

In contradistinction to Fisher, Tinbergen's wage equation was the first Phillips curve if we take that to mean a model with causality running from excess demand in the labour market to wage changes. The model was thus based on price adjustment reacting to quantity disequilibrium with no presumption of full employment. It was only in the choice of the excess demand proxy that it is

different from Phillips. In Tinbergen's case, the excess demand proxy was modelled using employment relative to its trend level.[20]

Tinbergen also foresaw the nominal/real dilemma, which Friedman seems to get credit for much later, and included a price change term, lagged one period. He said it was to represent catch-up behaviour or cost of living adjustments to nominal wages. In other words, Tinbergen had a model of wage inflation dependent on excess labour market demand and a shift parameter (in his case the lagged inflation term). The estimated model clearly implied a trade-off between wage inflation and the state of the labour market.

This approach to modelling nominal wage adjustment became an integral part of his work for the next 20 years. He explained the equation in some detail in Tinbergen (1951: 50) when he stated "the theory expressed … may be given the well-known formulation that a high unemployment figure exerts a pressure on the wage rate and that, on the other hands, a small unemployment figure causes wages to go up." The econometric problems of Tinbergen's model are discussed in Morgan (1990) and Mitchell (1995). But relevant here is the conclusion that there is no doubt that it was Tinbergen who began the practice of estimating wage adjustment functions using excess demand proxies and shift parameters. He understood the issues of non-linearities and the possibility that several shift factors could be present. The contribution of Phillips (1958) is part of the tradition that Tinbergen began.

## Lawrence Klein and all

Lawrence Klein was another significant figure in the development of Phillips curve estimation. Klein's early work at the Cowles Commission in the 1940s was dominated by his macromodel building. Epstein (1987: 115) says

> Klein framed his own research program after leaving the Cowles Commission in 1947, which constituted still another effort to meet the basic criticisms against Tinbergen-style models leveled by Friedman, Keynes and others.

His first major article, based on his doctoral dissertation at MIT, was published in 1947 by the *Journal of Political Economy*. In that paper, "Theories of effective demand and employment", Klein (1985: 13) constructed a labour market

> in such a way that classical equations for supply and demand for labor in terms of the real wage rates were combined with a dynamic adjustment equation for the nominal wage rate as a function of imbalance in the labor market, indicated by unemployment. This was a macrotheoretical exposition of what much later came to be known as the Phillips Curve.[21]

Klein used this work as input into the 1950 Cowles Commission publication *Economic Fluctuations in the United States, 1921-41*. That work estimated wage inflation adjustment

functions with unemployment and price change variables on the right hand side. Klein attributes the motivation for this modelling to Tinbergen. Klein (1985: 17) says a

> statistical estimate was published in the Cowles Commission monograph describing the first models. I got my idea about this equation from Tinbergen's works, but he formulated it in terms of wage level rather than wage change.

The Cowles work on wage adjustment led to Klein's cooperation with Arthur Goldberger and between 1951-3 they constructed the Klein-Goldberger model, published in 1955. The model was designed for public policy analysis, which had become an industry after World War II, as governments around the world assumed the goals of full employment and price stability (Klein 1985:16). The wage adjustment function in that model confirmed his desire to include a price change term on the right hand side (Klein and Goldberger, 1955).

The equation published expressed the annual change in money wages (first-difference annual data) on a time trend, the unemployment rate (in linear form), and the annual change in prices (lagged one period). The model is one where disequilibrium in the labour market drives the annual growth in wages. Unemployment increases reduce annual wage inflation. The model is clearly not homogenous (the coefficient on the price change variable had a coefficient of 0.52 with unity not included in the 95 per cent confidence interval). The justification for the model is (Klein and Goldberger, 1955: 18)

> … the main reasoning behind this equation is that of the law of supply and demand. Money wage rates move in response to excess supply or excess demand in the labour market. High unemployment represents high excess supply, and low unemployment below customary frictional levels represents excess demand.

The Klein-Goldberger model marked a turning point in the rise in importance and acceptance of econometrics. The forecasting performance of the model was significantly better than earlier models although there will still debates about the "economic meaning of the estimated structure" (Epstein, 1987: 117). The model was published in the same year that James Tobin assumed the role of director of the Cowles Commission (replacing Koopmans) and the Commission moved from Chicago to Yale. Tobin was responsible for a reemphasis on structural modelling and the liaison with Arthur Okun, who was working at Yale at the time. The link between the wage adjustment estimation (the Phillips Curve) and Okun's own work (which became Okun's Law) was the foundation stone for the 1960s Keynesians – these became the centrepiece of macroeconomic orthodoxy in place of the Quantity Theory of Money (Lodewijks, 1988).

Klein thus, extended the work on wage adjustment that Tinbergen had started before Phillips had turned to his own research.[22] Klein considers himself to be working on wage adjustment functions contemporaneously to Phillips. He describes how Jim Ball and himself worked together on building a United Kingdom version of his US model while he was at Oxford in the 1950s. The contribution to this work, which was not part of Phillips' more simplistic excess-demand story,

was the inclusion of wage drift (the difference between earnings and wage rates). The work was published in the *Economic Journal* in 1959, after Phillips, but Klein (1985:17) says that the work was "completed in 1957". Apparently, the authors had several editorial discussions with the editor, Roy Harrod, which delayed publication for 2 years.

The work with Ball was significant. They noted that (1959: 467) that "Economic theory has given us no reason to say whether dynamic movements of *relative* or *absolute* prices are associated with market clearing. We assume that money wages move over time in response to excess supply or demand in the labor market."[23] However, unlike a crude interpretation of this as assuming agents suffer from money illusion (a vital part of the Friedman-Phelps critique of Phillips), Klein and Ball (1959: 467) said, "both sides are only too aware of the 'real' nature of economic affairs. Movements in the cost of living are prominent facts at the bargaining table." From this they conclude (1959: 467)

> Instead of saying that dynamic movements in real wage rates are functionally related to unemployment, we take the somewhat more general and more realistic view that the time rate of change in money wage rates is a function of the level of unemployment and the time rate of change of the price level.[24]

In other words, the economy could undergo nominal wage inflation independent of the state of the labor market if bargaining agents formed expectations that the inflation rate was rising. The term used to capture this shift parameter was the actual inflation rate. The question then arises as to how agents form these expectations. Klein and Ball (1959) explicitly modelled the change in money wages as a function of lagged inflation because they considered it took time for real wage aspirations to feed into bargained outcomes. It makes you wonder, however, why Friedman and Phelps have been given so much attention in terms of "adding expectations to the Phillips Curve". In the technical sense, with causality running from labour market disequilibrium to wage/price adjustment, the nominal-real issue was modelled long before the publication of Friedman (1968). The important point to which we turn later is that the monetarist counterattack in the late 1960s merely used the naïve Phillips curve to force a paradigm change.

In summary, the work by Tinbergen and later Klein and his cohort advanced the Keynesian paradigm by giving it empirical authority, even though at times, this authority was rather sketchy. Importantly, the econometricians had estimated "Phillips curves" with expectations variables included. They did not, however, provide a strong theoretical basis for their models nor did they embrace the stability issue. Klein *et al* were not the only economists working on inflation and unemployment, either before Phillips or contemporaneously with Phillips. Another significant, yet virtually unknown work was that by Leeds economist Arthur Joseph Brown published in 1955. Before we consider that work, a reflection of Phillips' own 1954 work is fruitful.

### 2.3.2    Phillips (1954)

Phillips had laid out the theoretical basis for his later empirical work in an article published in 1954. Lipsey (1978: 49) says

> the now-famous curve made its debut in 1954 in Phillips' first major published paper, 'Stabilization in a Closed Economy'. In fact, this relationship was between the derivative of the price level and the level of production (a proxy for the level of economic activity). Sawyer (1989: 126) points out that "there is some confusion in the argument over the changes in the level of production and differences in the level of production.

A close reading suggests that it is the difference in the level of production that sends the demand signal. He considers both fix-price systems driven by mark-ups on unit costs and flex-price systems driven by moving factor prices. Phillips (1954: 307) says,

> …there will be some level of production and employment, which, given the bargaining powers of the different groups in the economy, will just result in the average level of factor prices remaining constant, this level of production and employment being lower, the stronger and more aggressive the organization of the factors of production. If aggregate real demand is high enough to make a higher level of production than is profitable, entrepreneurs will be more anxious to obtain (and to retain) the services of labour and other factors of production and so less inclined to resist the demands for higher wages and other factor rewards. Factor prices will therefore rise. The level of demand being high, the rising costs will be passed on in the form of higher product prices. Factor and product prices will continue to rise in this way so long as the high level of demand and production is maintained, the rate which they rise being greater, the higher the level of demand and production….

Phillips went on to assert the symmetry of the relationship when the level of demand was below what we might call the steady-state level. Further on he says (1954: 309) "If prices… are flexible, the error in production will also cause prices to change at a rate proportional to production." This led Lipsey (1978: 50) to formalise his interpretation of Phillips (1954), as a relationship between the rate of change of the price level to the deviation of actual production from the "full employment level" of production. Phillips clearly had a notion of what we would call the NAIRU although he pitched the steady-state in terms of the level of output and employment. Desai (1975) would probably disagree with this claim given that he pictures the Phillips (1958) exercise as modelling a series of long-run equilibrium points.

Importantly, in terms of the claim by Fisher (1973) that he discovered the Phillips curve, Phillips (1954) was articulating a process where disequilibrium in the real sector caused changes in nominal aggregates. We saw that Fisher's version of the relationship between price changes and employment (real activity) levels was cast in terms of the reverse causality and considered to be an equilibrium relation. Phillips published two further papers before 1958 on time-forms in dynamic economic models and stabilisation policy. The lineage is clear – and culminated in the famous 1958 publication in *Economica*.

### 2.3.3 Arthur Joseph Brown (1955)

Tony Thirlwall (1972: 325) stated in a short historical note, published in *Economica*, that

> as a matter of historical fact, A.J. Brown's The Great Inflation, published in 1955, antedates both Sultan and Phillips. Brown not only discusses in some detail the theoretical and institutional reasons why one might expect an inverse relation between the percentage level of unemployment and the percentage rate of increase of wages and prices, but, more significantly, he plots a Phillips-type relation for the United Kingdom for the periods 1880-1914 and 1920-51, and for the United States for the period 1921-48. I have often thought that the "Phillips" Curve ought to be called the "Brown" Curve-unless, of course, Brown himself had precursors.

While A.J. Brown published his major work *The Great Inflation, 1939-51* in 1955, well before the 1958 Phillips publication in *Economica*, it is hard to argue that he anticipated the Phillips curve in the way Thirlwall imagines. The published work of Phillips between 1954 and 1958 (Phillips, 1954, 1956, 1957) was already pointing to the Phelps-Brown inspired empirical study published in 1958. It is easier to argue the case that Brown provided an account of the role of expectations and real wages in the determination of the trade-off between inflation and unemployment, thus adding theoretical substance to the estimation that Tinbergen and Klein *et al* in this regard. Brown was firmly in the Keynesian mould and his discussions of expectations and real wage resistance was not an anticipation of the later work of Friedman and Phelps in the 1960s.[25] It is also important to note that Brown was the first to talk about the instability of the wage change-unemployment relationship.

Again, we can argue that the introduction of the expectations-augmented Phillips curve was not about a sudden discovery that expectations of inflation in wage adjustment were important. Rather, the model was part of a long campaign by Friedman and others to restore the Quantity Theory to the position it had prior to the Keynesian revolution. The Phillips curve was merely the vehicle that was used to pursue those aims. If this was not so, then it would raise the question of why Friedman and Phelps have been given the credit for the introduction of expectations into the Phillips curve and raising the issue of its stability?

Brown also outlined the relationship between the price-wage spiral mechanism, which can drive inflation and the distributional struggle over available real income. In this sense, he anticipated a competing claims explanation of inflation, which became popular in the 1970s among Post-Keynesians and Marxists (see Goodwin 1967; Tobin 1972; Desai 1973; and Rowthorn 1977).

This is not to say that the work of Brown and Phillips was equivalent. Sawyer (1989: 102) says,

> The approach of Brown can be contrasted to that of Phillips in three respects. First, Brown places the statistical relationship into a much fuller discussion of the process of inflation…. Second, Brown did not attempt to draw any curve through his data. … Third,

Brown did not argue that the wage change-unemployment relationship observed for pre-First World War period held thereafter.

Brown seeks at the outset to explain the underlying causes of the inflationary gap, which he (1955: 16) says "is in principle a good measure of the pressure making for inflation in the market or set of markets in question." He argues that to merely characterise the inflationary gap as "a propensity of the community to spend more than its current income… does not throw much light upon the causes of inflation" (1955: 16). Brown wants to investigate "the reason for this propensity" (1955: 16)

In pursuing this explanation he says (1955: 17) that

> … though it may be possible to give a generally valid formal description of what constitutes inflation, the causal mechanisms by which it happens are various and their roots may go deep into the market institutions and the social and political structures of the communities concerned. For this reason it is not profitable to approach the events of the inflationary-period treated in this book with a single theoretical scheme into which they must be fitted.

Brown assumes an open economy where price setting power is used and fixed contracts are common. He also recognises the costs of price adjustment (1955: 80). Prices are (1955: 80) "fixed by producers in relation to costs of production (which depend on factor prices), and for wages to be fixed either automatically or by bargaining in relation to the prices of consumers' goods." The wage-price dependency is "principally responsible for giving the process of adjustment and inflationary power of its own" (1955: 81). Brown sees the changes in real income shares as being a crucial determinant of inflation.

Brown (1955: 100-101) produced two "Phillips curve" scatter plots showing the relationship between the rate of unemployment (on the horizontal axis) and the percentage change in wage rates (on the vertical axis), in one case, and the percentage change in hourly earnings (1920-51), in the second diagram (1920-1948). The data was for the United Kingdom. He is motivated by Abba Lerner (1951) to explore the inverse relationship between the changes in wages and prices and the level of unemployment. Brown (1955: 90) says[26]

> It seems, however, that empirical investigation has not hitherto been directed towards verifying the existence of such a relation, or to finding the level of unemployment beneath which the price-wage spiral seems to come strongly into operation in any one economy.

He excludes pre-World War I data on the grounds that (1955:90) the particular events between 1880 and 1914 "reduces the probability that experience over these years will throw light on the present problem." We will return to Brown's belief that the inflation-unemployment relationship was unstable.

The causality underlying the scatter plots is Keynesian. He sees the business cycle as being driven by fluctuations in effective demand (1955: 91). Labour market disequilibrium in an expansion increases bargaining power of unions and reduces unemployment and (1955: 91) "the *rate* at which it can raise wages is increasing." When the expansion ceases there is a (1955: 91) "sudden fall in the rate of wage increase." During expansion and contraction, expectations of the movement in the cycle also drive the wage changes in both directions.

Brown also articulated a non-linear relationship between wage changes and the unemployment rate. He notes that wage changes are larger when the unemployment rate is low than when the unemployment rate is high. The curve implied is very flat at high unemployment rates and then becomes very steep, if not vertical, at low unemployment rates. Brown (1955: 92) attributes this to "the belligerence of organized labour and the employers' fears of provoking disastrous conflicts … there is probably and absolute limit to the rate at which wage rates can be reduced." There is no such limit in an upward direction when the economy and labour market is strong.

In Chapter 5, entitled "The Price-Wage Spiral and Income Distribution", Brown develops a rich analysis of the role of distributional changes in conditioning the wage-price spiral. He argues (1955: 104) that the motives for demanding "wages increases and price increases are connected to distribution." An important consideration not often explicitly stated is Brown's recognition that in a world of contractual or fixed wages and prices (in the Keynesian mould) there has to be some model explaining how and when these rates change. Brown says (1955: 104)

> It would be hardly surprising if, in a world where both prices and wages were contractual (at any rate, possessed some rigidity), entrepreneurs and wage earners respectively customarily sought all the time to raise them.

On the supply side, wage earners demands (and their successes) are seen as a function of income distribution (the size of profits and the level of real wages). Brown develops an early real wage resistance theory. On the demand side, it is the observation that many industries maintain a fixed percentage profit margin that provides the link between price setting and income distribution. In addition, firms often enter contractual arrangements (or are otherwise bound by regulation) to keep profit margins fixed absolutely or proportionately to costs. Labour costs tend to be a major part of total costs and thus the link between wage movements and price movements in both directions is established. Brown thus introduces the notion of the wage-price spiral in a period when the predominant emphasis of economists at the time was on demand-pull concepts of inflation either derived from the Quantity Theory of Money or from Keynes' inflationary gap (see Samuelson and Solow, 1960: 177-180).[27]

He also recognises that the development of a wage-price spiral is dependent on the (1955: 105) "aims of the two parties who are competing for the real income of the country or their success in achieving those aims." This is very reminiscent of the competing claims literature, which depicts

the inflation process as resulting from incompatible claims on total nominal income by workers, and firms exceed the total available. Workers negotiate real wage targets via money wage demands on firms, who in turn pursue some target markup (as a vehicle for a desired rate of return). Prices may be slow to adjust in a time of rising costs due to the costs of price adjustment. If the sum of the claims exceeds national income, either or both parties may use their price-setting power to achieve their targets. Inflation is the outcome of the distributional conflict (see Goodwin 1967; Tobin 1972; Desai 1973; and Rowthorn 1977).

Brown would thus have violated Milton Friedman's (1976: 218) requirement that "the vertical axis should refer not to the nominal wage rate but to the real wage rate." Tobin's (1972: 3) insight that "Keynes emphasised the institutional fact that wages are bargained and set in the monetary unit of account" applied equally to Brown's model even though Brown recognised that ultimately distribution was a real phenomenon and the aspirations were pitched in real terms. Thus Brown anticipated the expectations-augmented Phillips curve in the sense that he explicitly included inflationary expectations in his wage-price spiral. He (1955: 5) says

> Once prices have been given a sufficiently strong upward push by any cause whatever, it is possible that further increases may be expected, and the automatic fulfillment of this expectation, in advance of the time at which the further increase was anticipated, may then cause a further upward revision of prices expected to rule in the future. A mechanism of this kind can, clearly, produce an indefinitely accelerating price increase, provided that certain requirements are met.

The conditions outlined by Brown (1955: 5-6) whereby expectations of inflation can drive price increases independent of excess demand factors are:

- Prices have to be flexible enough to change when expectations change
- Money supply growth must be sufficient to match price inflation or else real demand falls.[28]

The speed of adjustment of price changes to changes in price expectations does not rely on perfect flexibility. It can take some time for expectations to work their way through the price change process without negating their influence.

Another important aspect of Brown's work, which was swamped by the 1960s interpretation of Phillips (1958), was his insistence that the relationship between wage changes and the unemployment rate was not stable. He argued convincingly that the relationship went through several discrete periods – Pre World War I, between the wars, then Post World War II. Brown noted (1955: v) that

> the institutional machinery by which prices and wages have been determined and changed have been quite largely different during the period of inflation from what had been assumed in the theoretical formulations; most of the theorists have not caught up with actuality.

Moreover, his motivation, expressed in his Preface (1955: vi-vii) was to counter the "analyses which are currently put forward by economists and taught to students are still quite largely based upon the very different world economy which existed (or was supposed to exist) before 1939…"

This discussion of instability is linked to the development of administered prices. His discussion aimed to explain movements in what he termed (1955: 93) "the critical unemployment rate", which is the tantamount in modern language to the NAIRU or steady-state unemployment rate. The discussion is very modern in tone. Brown (1955: 94) asks, "Can this very large apparent rise in the critical unemployment rate since before 1914 be attributed simply to the increased bargaining power of organized labour?" Cornwall (1983) would refer to this argument as an increase in the inflationary bias in capitalist economy, although he would include large corporations and government among the unions as being implicated in the process. Brown, however, also notes the rise in structural unemployment after 1920 as compared to before 1914 due high unemployment in localized industries that subdue wage rises in those industries and immobility, which prevents labour movements suppressing wage rises elsewhere. A more even "distribution … [of unemployment] … will mean that the critical level of unemployment below which there is a rise in average labour costs to industry as a whole will be lower than when a large part of unemployment is of a structural character (1955: 94)."

Brown, thus provided a very full treatment of the inflation emphasising institutional structure in the labour and product markets as well as incorporating inflationary expectations into his analysis. He also was fully cognisant of way in which the wage and price setting changed over the course of his analysis. Sawyer (1989: 103) said

> In contrast, an implication of the work of Phillips (1958) was that the relationship between wage changes and unemployment held for nearly a century across many social and political changes. This could be seen as asserting the importance of the operation of underlying economic forces through varying institutional arrangements.

Once again it raises the question of why it was Phillips (1958) work, which became the model, given that it was based on questionable econometrics (see Desai, 1975), simplistic economic theory, and a questionable assertion of stability. This is especially when one considers the depth of analysis provided by A.J. Brown.

### 2.3.4    Paul Sultan (1957) – "I discovered the Phillips curve"!

In the same way that the *Journal of Political Economy* in the 1973 edition reprinted Fisher (1926) under the heading "I discovered the Phillips curve", some economists (Amid-Houzier, Dick and Luchter, 1971) have attributed the same discovery to an American text-book writer, Paul Sultan (1957). While Brown went within one stroke of producing the graphical Phillips curve, Sultan (1957: 555) is the first person to publish a "Phillips curve" graph. Amid-Houzier, Dick and

Luchter (1971: 320) argue "that Phillips' work was an independent empirical verification of the hypothetical relationship which, unknown to him, had been earlier postulated explicitly by Sultan."[29] Their understanding of history is a bit amiss because they claim (1971: 319) that "Phillips produced the first empirical work on the relationship between inflation and unemployment." We have shown that this perception is false. Further, Sultan's graph is in terms of the annual percentage change in the price level and the rate of unemployment, which is not the relationship that Phillips modelled. The errors are illustrative of the way textbook writers and others have started history with Phillips (1958) and confused the Phillips curve (Phillips, 1958) with the textbook versions of the same (in terms of price inflation) (Sawyer, 1989: 110-113).

Sultan's theoretical justification for the curve, which he called "The Hypothetical Relationship of the 'Fullness' of employment to Annual Price Changes, was firmly within the prevailing Keynesian orthodoxy of his day. Sultan writes (1957: 555)

> … the line relating unemployment to inflation … [reference to his Figure 24] … is strictly hypothetical, but it suggests that the tighter the employment situation the greater the hazard of inflation. …Assuming that a fairly precise functional relationship exists between inflation and the level of employment, it is possible to determine the 'safe' degree of full employment. In our hypothetical case, we are assuming that when unemployment is less than 2 per cent of the work force, we face the dangers of inflation. And when unemployment is larger than 6 per cent, we face the problem of serious deflation.

There is no discussion of the work of the Keynesians before him on the role of expectations and the question of stability. In effect, the textbook version of the Phillips curve was born in Sultan's exposition.

### 2.3.5 Conclusion

Neither Sultan nor Brown had the subsequent influence on the profession that Phillips (1958) had. Sawyer (1989: 102) says,

> In terms of the textbook and policy discussion the advantage of an estimated curve is that it can be used, without the accompanying data and caveats, to illustrate general relationships. Further, a loose statistical relationship was in effect translated into what appeared to be a precise empirical relationship.

The profession was probably not yet ready for the work of Klein *et al*. Phillips (1958) was published at a time when a number of related developments occurred. Each may help to explain the reason the previous work on inflation and unemployment was supplanted by the Phillips curve. Not only did the sophistication of national income data improve in the 1950s, but it coincided with the introduction of larger and more powerful computers which made regression analysis more accessible (see Lucas and Sargent, 1978; Friedman, 1991). It was also a period when macroeconometric modelling was increasingly seen as an "essential ingredient " in the debates

between Monetarists and Keynesians  (Leeson, 1998: 608-609).[30] In the next section, we place the developments discussed to date within an overall macroeconomic context in order to better understand the contribution of Phillips (1958) and also the later Monetarist developments that attempted to regain the ground lost since the publication of the General Theory in 1936.

## 2.4    The macroeconomic context

Any discussion of the Phillips curve necessitates an analysis of the context within which it was placed. At the time Phillips published his work there was a major debate proceeding concerning the microfoundations of macroeconomics. The neoclassical paradigm hardly considered macroeconomics to be a separate conceptual structure to microeconomics. The emergence of Keynesian economics in the 1930s had coincided with "the emergence of macro as an enquiry separable from microeconomics." (Dow, 1985: 82-83).

The break with neoclassical thinking came with the failure of markets to resolve the persistently high unemployment during the 1930s. The debate in the ensuing years is consistent with the issues that surround the development of the Phillips curve from 1958 through to the early 1970s. The issues, in part, were about the existence of involuntary unemployment. The 1930s experience suggested that Say's Law, which was the macroeconomic component and closure of the neoclassical system based on the optimising behaviour of individuals, did not hold. The neoclassical economists continued to assert that unemployment was voluntary and optimal but that some factors not previously included in the model prevented Say's Law from working. Keynes, following Marx and Kalecki, adopted the distinctly anti-orthodox approach and refuted the basis of Say's Law entirely.

The Friedman-Phelps challenge to the Phillips orthodoxy in the late 1960s can be seen in this light. Prior models of the wage/price adjustment process, like that of Tinbergen (1936), Klein (1947), Klein and Goldberger (1955), Klein and Ball (1959), including Phillips's own model (1958) were in the tradition of Keynes and saw price adjustment as a response to disequilibrium arising from the labour market. Unemployment in this type of model could be involuntary.[31]

The emergence of Friedman (1968) and Phelps (1967, 1968) was really an expression of this neoclassical discontent with the lack of optimising microfoundations in Keynesian macroeconomics.[32] They reasserted neoclassical microfoundations and were then left to explain why Say's Law did not work all the time. To overcome that problem they followed Irving Fisher and identified misperceptions of inflation as the factor that prevented Say's Law from working according to the market-clearing model. Ultimately, under their natural rate hypothesis, Say's Law imposed itself in the long run. They assumed an adaptive expectations mechanism for the purposes of exposition but this meant that in times of ever-increasing inflation, economic agents would

always be lagging behind. Why would the agents not learn from the mistakes and adopt better prediction mechanisms? In part this question was superceded by the addition of rational expectations to the misperceptions-type of story. Under extreme versions of rational expectations, Say's Law always holds.

To put a finer point on this argument it should be noted that there was no association between the emergence of the natural rate hypothesis (and its implications for the Phillips curve) and the observed instability of the inflation-unemployment relationship in the 1970s after the first OPEC oil price hike. As Okun (1981: 237) notes

> Milton Friedman and Edmund Phelps independently attacked the logic of the Phillips curve at a time when that approach was scoring empirical successes. Basically their message was a pessimistic forecast – not an interpretation or explanation of experience – that inflation would accelerate if the unusually low unemployment rates of the mid-sixties were maintained.
> Although the accelerationist theory is defective in many ways, the prophetic accuracy of its pessimism must be admired.

The theoretical push to reassert Say's Law by neoclassical economists was severely dented by the work of Robert Clower (1965) and Axel Leijonhufvud (1968). They had demonstrated, in different ways, how neoclassical models of optimising behaviour were flawed when applied to macroeconomic issues like mass unemployment. Clower (1965) showed that an excess supply in the labour market (unemployment) was not usually accompanied by an excess demand elsewhere in the economy, especially in the product market. Excess demands are expressed in money terms. How could an unemployed worker (who had notional or latent product demands) signal to an employer (a seller in the product market) their demand intentions? Leijonhufvud (1968) added the idea that in disequlibrium price adjustment is sluggish relative to quantity adjustment. Tobin (1972: 4) notes

> Axel Leijonhufvud's illuminating and perceptive interpretation of Keynes argues convincingly that, in chapter 1 as throughout the *General Theory*, what Keynes calls equilibrium should be viewed as persistent disequilibrium, and what appears to be comparative statics is really shrewd and incisive, if awkward, dynamic analysis. Involuntary unemployment means that labor markets are not in equilibrium. The resistance of money wage rates to excess supply is a feature of the adjustment process rather than a symptom of irrationality.

In other words, the basis on which Friedman and Phelps constructed their natural rate re-interpretation of the Phillips curve was already flimsy and unconvincing.

Friedman's emphasis on expectations in 1968, which changed the direction of policy in the 1970s, was rooted in developments a long time before this. It was already recognised that the Quantity Theory of Money was a long-run theory, which allowed for non-neutrality in periods of adjustment between equilibrium. Friedman (1956b) revitalised the Quantity Theory, as did Patinkin (1956). The former restated the Quantity Theory in terms of a demand for money function, which included

an expected inflation term. In the long run, all analysis could be conducted in real terms because the price level was proportionate with the stock of money. At this level of analysis, a larger money stock does not mean a larger real output level. Output is independent of the price level and the stock of money. But changes in the money stock cause changes in the price level, and on-going monetary expansion creates inflation. Friedman saw that expectations of inflation in disequilibrium then had to be formally incorporated into the money demand function.

Patinkin (1956) was also instrumental in the resurgence of Quantity Theory when he showed that one could analyse the adjustment between two long-run equilibrium positions by focusing on the real balance effects that occur. This allowed him to argue that the long run conditions – Quantity Theory, neutrality and Walras' Law – could not all hold when the money supply changed. With disproportionate movements between the money stock and the price level generating real balance changes, aggregate demand could rise in the short-term. The exact way in which real balance effects influence output in disequilibrium was a topic of debate but the introduction of disequilibrium adjustment processes allowed the neoclassical economists to embrace short-term departures in unemployment from the natural rate.[33]

By extending the role of inflation expectations to the labour market, Friedman was able to solve the problem that Phillips's 1958 model and subsequent developments (like Samuelson and Solow, 1960) presented for neoclassical monetary theory. Phillips's model clearly refuted long-run neutrality. Lipsey (1978: 56) argues that the "famous prediction" that the government could maintain a given disequilibrium in the labour market and thus choose, indefinitely, a combination of real output and inflation defined by the Phillips curve was firmly embedded in the consciousness of policy makers in the 1960s.[34]

While the development of what is called the Expectations-Augmented Phillips Curve (EAPC) was not based on empirical grounds, the cost instability after the first OPEC oil shock in 1974 and the resulting inflation was very fortuitous indeed. It gave the Monetarist developments a credibility that it could not get in terms of the theoretical debate. Clower and Leijonhvud had exposed significant flaws in the monetarist conceptual structure. But the Monetarist challenge to what was called the Neo-classical synthesis, which had relied on the notion of a stable Phillips curve to justify their demand management and stabilisation policy stance, was given an open slate by the price chaos in that period. The Monetarist explanation seemed almost self-evident, especially when the Keynesian approach to inflation and unemployment seemed to be inapplicable when both were present. Skidelsky (1977) termed this period the end of the Keynesian era. Lucas (1981) claims that the simultaneous rise in both inflation and unemployment in the 1970s destroyed the illusion of an exploitable trade-off and ended the period of stabilisation policy.

One must be very careful in attributing cause and effect though. The Keynesian policies since World War II had delivered unprecedented stability and strong growth and rising living standards

for 25 years. In Australia, for example, inflation began to rise before unemployment in the early 1970s. The unemployment started to rise as the Government began to adopt harsh aggregate policies. The inflation rate in Australia, for example, rose in 1974 prior to the unemployment rate rising. The latter increased as Monetarist macroeconomic policies started to impact. A similar experience occurred in other countries (see Dow and Earl, 1982).

The Phillips curve became the vehicle for the paradigmatic battle between the dominant Keynesians and the Monetarists led by Friedman. Solow (1997: 433) says

> Monetarists interpreted the correlation as Fisher did, with changes in prices eliciting, one way or another, opposite changes in unemployment. On the whole, Keynesians thought they were seeing a disequilibrium relationship, with high or low unemployment eliciting small or large changes in wages and prices. In this they were closer to Phillips, not to Fisher.

Of-course, we could also say that Fisher considered the relationship between unemployment (factory employment) and the rate of changes in wholesale prices, whereas, Phillips was concerned with the labour market relation more directly and substituted money wage changes for the price change variable. Sawyer (1989: 103) agrees and says "the implied causation [in Fisher] runs from inflation to employment… Indeed, the explanation given by Fisher is along the lines of what later became known as the 'surprise supply function'."

In the Keynesian strand, the issues were the existence of involuntary unemployment and, as Coddington (1983: 39) says "the extent to which, and the speed with which, an increase in real demand engineered by the authorities may be offset by a rising wage and price level." It is here that the Phillips curve was a great development for a Keynesian (as opposed to a Keynes) perception of the economy. The prevailing macroeconomic model in the 1950s was closed by two conditions where output was either at full employment or below full employment as determined by the intersection of the IS-LM relations, and inflation was either zero or a function of the inflationary gap (see Lipsey, 1978). Accordingly, demand expansion had clear, dichotomised effects on the real and nominal variables in the system. When output was below full employment, any demand expansion was translated completely into real effects. Once the economy reached full employment, the expansion only had nominal effects. This was the reverse-L shaped model common in textbooks at the time (see Okun, 1981).

Economists knew that the real world did not accord to this dichotomised behaviour. The econometricians clearly modelled the nominal-real split.[35] A.J. Brown (1955) also saw the imperative of understanding the way in which a nominal expansion is split between real and nominal effects. Lipsey (1978: 49) considers Phillips also saw it as an imperative to "remove this dichotomy". He says "It was obvious to him … [Phillips] … that any disturbance to the system had both real and monetary effects in the short term."

Lipsey (1978: 54) concludes

> What Phillips does for the model is to provide a possible explanation, absent from the dichotomised model, of the division of impact effects between real and monetary variables when the model is in disequilibrium.

The Phillips curve became the missing equation in the Keynesian macroeconomic model (Desai, 1981: 4).[36] But, Sawyer (1985: 63) says that the

> Phillips curve should be regarded as essentially non-Keynesian. By Keynesian we simply mean an approach which emphasises the role of aggregate demand in the determination of the level of output and downgrades the importance of relative prices.

Sawyer's argument is based on the expectations-augmented Phillips curve, which he believes is inconsistent with Keynes (Sawyer, 1985: 65), who "was concerned with money wage movements" not real wage movements. The point is mitigated, however, when we consider that the Phillips curve is not an optimising relationship (see endnote 29). Importantly, the Keynesian developments leading up to the Phillips curve had formally addressed this issue by adding variables (or theoretical discussion), that captured the real aspirations of agents who bargain in nominal terms.

However, despite the rich Keynesian history discussed earlier, it was easy for Friedman and others to hijack the debate. The Keynesians, like Lipsey (1960), were operating in a dichotomised framework – at the macroeconomic level they had adopted the Phillips curve, yet they were tense about the microeconomic underpinnings of the relation. Lipsey (1960) tried to justify the Phillips curve as a Walrasian adjustment process. It was easy for Friedman (1968) to then assert that if it was a Walrasian mechanism then it "contains a basic defect – the failure to distinguish between *nominal* and *real* wages." If Lipsey and others had have followed the theoretical work of Brown, for example, then the pedigree of the Phillips curve would have been completely in the spirit of Keynes (and Kalecki).

The Phillips curve was susceptible to a sudden and/or large increase in inflation in the same way that the aggregate consumption functions that excluded inflation terms were. The work of Davidson *et al* (1978) showed that the failure of the large-scale econometric models to forecast such variables as savings and consumption in the early 1970s could be traced to the misspecification (via omitted variables) of the structural relationships. The breakdown of the Phillips curve was another function that was misspecified.

The work of Fisher reemerged, after the Keynesian period, in the work of Friedman (1968) and Phelps (1967), although Friedman had been pursuing the case against stabilisation policy throughout the 1940s and 1950s. The publications were prior to the empirical problems that the Phillips curve encountered due to its misspecification. Taken in one way, their work can be easily incorporated into the Keynesian Phillips curve paradigm. Thus, the short-run Phillips curve is

inevitably unstable and is highly likely to shift outwards in a period of sustained expansion (tight labour markets). Accordingly, inflation will accelerate if people build the history of inflation into their bargaining behaviour and attempt to maintain a constant real wage or real profit margin (Okun, 1981). Tinbergen, Klein and Brown all understood this proposition well.

But this would be trivial and misses the fundamental issue that Friedman and Phelps were pursuing. Accompanying their attack on the prevailing view that there is a stable trade-off between inflation and unemployment was an attempt to reclaim the terrain that Neo-classical monetary theory had lost after the Great Depression. Friedman's 1968 paper "The Role of Monetary Policy" argued that monetary policy could only have real effects in the short-run, at an increasingly worse trade-off. The starting point was classical monetary theory, which suggests that monetary policy cannot have real effects. All that it does is alter prices and nominal incomes in a proportionate way. To gain a short-run trade-off in this paradigm Friedman had to appeal to the notion of expectational errors and adaptive learning behaviour. Accordingly, when labour markets tighten and demand pressure pushes money wage rates up, workers supply more labour because they mistake the rise in money wages for a rise in real wages. Information is assumed to be asymmetric so firms do not make these relative price mistakes. As workers realise their errors they withdraw the extra labour and the economy's output and employment levels fall again – to their natural levels.

The unemployment rate that is commensurate to these natural output levels was termed the natural rate of unemployment and is sensitive in the long run to monetary policy. The only way the workers can be induced to supply higher hours than are implied by the natural rate of unemployment is for the monetary authority to maintain ever-increasing money wage rate inflation.

There were many versions of the way misperceptions worked and on what variables they worked on (see Phelps, 1970; Okun, 1981) The crucial point of the exercise was not related to the research program of Phillips. It was to restore classical monetary theory to the dominant position by way of reconciliation between its neutrality properties and the empirical finding of a short-run trade-off between inflation and unemployment. The economy oscillates around a natural rate of unemployment (which is invariant (neutral) to monetary and aggregate fiscal policy), because economic agents make expectational errors. The errors cannot be exploited permanently without ever-accelerating inflation. The model they introduced can be written as:

**Eqn 2-4** $$U_t = U_t^* - \alpha(\dot{P}_t - \dot{P}_t^e)$$

where $U$ is the unemployment rate, $U^*$ is the natural unemployment rate, $P$ is the price level, and $P^e$ is the expected price level, the time subscripts indicate the period, and the dot on the price

variable indicates a time-derivative. So the actual unemployment rate is equal to the natural unemployment rate if expected inflation equals actual inflation. The only way the economy can deviate from the natural rate of unemployment is for expected inflation to be in discord with actual inflation. The short-run trade-off is then between unexpected inflation and unemployment and the extent of it is determined by the magnitude of $\alpha$.

This conception of the economy is at odds with the Keynesian model. The textbook representation of the history of the inflation-unemployment trade-off from Phillips to Friedman and then onto rational expectations with complete short-run and long run neutrality is thus misleading. First, it ignores what went before Phillips, and, second, the movement from Phillips to Friedman was a paradigm shift rather than an extension of the model.

## 2.5    The success of the Phillips curve

Several writers have tackled the question as to why the Phillips curve was so successful and became the "textbook" model (Lipsey, 1978; Sawyer, 1989; Leeson, 1998 among others). We should note that the Phillips curve was not the relationship that became popular. The turning point was the estimation of the price inflation-unemployment rate relationship by Samuelson and Solow (1960). In their paper for the American Economic Association annual meeting, they examined the various explanations for inflation in the USA since the end of World War II. Their paper was very influential because it was able to show that the existing debate about demand-pull and cost-push inflation suffered from observational-equivalence. Both influences delivered a similar outcome captured in the "Phillips curve". The estimated model they presented was an excellent aid to economic policy makers and thus united academe and the bureaucracy. Samuelson and Solow (1960) showed that for zero inflation, the unemployment rate had to be kept between 5 to 6 per cent. If the economy wanted full employment, then considered to be around 3 per cent, they would have to bear an inflation rate of between 4 and 5 per cent.

The implications were profound. The policy-making bureaucracy now seemed to be in control of both aggregates – the twin evils. As long as the relationship estimated was stable then the government could choose what inflation rate they would have by an appropriate mix of fiscal and monetary policy operating on unemployment. The "Phillips curve" of Samuelson and Solow (1960) thus mapped perfectly into the existing set of aggregate demand management tools (Ormerod, 1994).

The period also saw the "blossoming of the applied econometrician as an expert consultant to government" (Epstein, 1987: 130). Epstein (1987: 130) says

> The fascination with attempts to estimate an aggregate Phillips curve, the level of many econometric policy discussions during the 1960s, was symptomatic of a major change in research emphasis compared to the early work by Tinbergen and the Cowles Commission. It marked the extreme concern with model *estimation* as distinct from model *evaluation*. The Phillips curve was actually a prime example of all the conceptual difficulties encountered in estimating structural relations: autonomy, exogeneity, structural change, aggregation and expectations. The enormous number of different curves that were estimated … would indicate that multiple hypotheses and costs of model misspecification were still pressing problems. As a general matter, however, most studies hardly seemed aware of these issues and they seldom indicated the robustness of their results or the (true) levels of the reported significance tests.

In fact, if we take Brown's work into account, one of the major hypotheses that we would have tested in these equations would have been the homogeneity of the estimates over the sample. While the debate between Keynes and Tinbergen, for example, and the earlier exchanges between Schultz (1928), Ezekial (1928) and Robbins (1932), show that economists were well aware of structural instability in statistical models of economic behaviour, the mainstream tests did not emerge until much later. However, in this new era of estimation in place of testing, researchers rarely reported evidence that they had tested for structural stability (even if they had used, for example, a Chow (1960) test).

In the same way that the authority of Fisher (1926) is based on statistical relations that are unlikely to be robust, Phillips work does not stand empirical scrutiny (see Desai, 1975; Gilbert, 1976). The same can be said for the work of Tinbergen and Klein among others (see Epstein, 1987: 146). But it remains that the econometrician had become an essential part of the process of economic policy making.

The lack of scrutiny and testing by applied econometricians was complemented by the way the textbooks treated the Phillips curve. Sawyer (1989) surveyed the major textbooks and concludes that the Phillips curve is often "presented as a well-established fact (Sawyer, 1989: 110). There is very little doubts cast on the empirical validity of the relationship. Leeson (1998: 609) also discusses the "authority of the textbook". Leeson (1998: 609-10) says, "these textbooks have tremendous power to propagate myths and distortions … Samuelson, and to a lesser extent Lipsey, were *content makers*; the other textbook writers were largely *content takers*." Leeson concludes that the popularity of the Phillips curve was strongly influenced by the way the key textbooks promoted it. More work needs to be done on the role of textbooks in influencing the way economist thinking develops.

It is clear that the period immediately after the publication of Phillips (1958) was a fertile time for Keynesian economists and the applied econometricians who supported this theoretical edifice. Leeson (1998: 612) says

> the 1960s were, at least for a while, a golden age, when economists – and one strand of Keynesian economists in particular – were generally held in high esteem. Many economists … concluded that the business cycle had been tamed, if not completely eliminated … The Phillips curve captured many of the confident intellectual currents of the period.

The Phillips curve also became a tool in the hands of the Monetarists to regain the ground they had lost to the Keynesians. With the support of the textbooks the model endured even though the original model was lost in the process.

Phillips' (1958) model was ideal for the way in which economics was being taught in universities around the world. The simplistic graphical and algebraic representation of the textbooks within an IS-LM framework made it a popular vehicle for introducing inflation into the Keynesian model. The work of Brown, for example, was richer and more insightful but, perhaps, too ground in the institutional literature to be acceptable for textbook representation. It is probable that had Brown's work on instability and the way changes in the institutions of wage and price determination change the trade-off between inflation and unemployment and the steady-state unemployment rate been more recognised, the subsequent history of the Phillips curve might have been different.

## 2.6    Conclusion

The chapter has shown that the Phillips (1958) was hardly a path-breaking piece theoretical and empirical development. Humphrey (1985: 23) concluded

> Phillips was far from the first to postulate an inflation-unemployment tradeoff or to draw the curve bearing his name. Even the econometric wage-price equations employed in modern Phillips curve analysis together with their excess demand and alternative market clearing interpretations long predate Phillips. In short, Phillips and his successors inherited … these concepts; they did not invent them.

We have shown that the history of the "Phillips curve" is an example of the discontinuity and opportunism in the development of macroeconomic thinking. There was some discussion of the so-called trade-off between inflation and unemployment among the classical economists. By the 1920s, Irving Fisher (1926) was setting the groundwork for what became Monetarism some 42years later (Friedman, 1968). The work of Fisher was obscured by the rise of Keynesian macroeconomic orthodoxy. The Phillips curve, reflecting the adjustment of nominal magnitudes to real disequilibrium in the labour market, was a central expression of the confidence that policy makers had acquired with respect to eliminating the business cycle during the 1960s. However, Friedman with others was working on the foundations of a resurgence of neoclassical

macroeconomics based on the Quantity Theory of Money during the 1950s and 1960s. The Phillips curve became their opportunity and the empirical havoc that the 1970s oil price shocks created among macroeconomic time series seemed to add weight to their (flawed) arguments. Nothing had really changed in the modern statement of Monetarism that had not been shown to be deficient, albeit in different terms, by Keynes and others.

This opportunism by Friedman and others exploited the vulnerability of the prevailing Keynesian paradigm, which had conducted successful policy throughout the Post World War II period up until the late 1960s with largely misspecified models. The Phillips curve was just one of a number of macroeconomic equations that ignored inflationary expectations. The misspecification was not significant while inflation was negligible. Once the inflation rates soared throughout the world in the early 1970s after the oil price rises, all these misspecified relations broke down and the theoretical edifice that was erected upon them also fell into disrepute. Monetarist thought emerged from this wreckage as being eminently plausible. It was a serendipitous period for the neoclassicals because they had actually reasserted the issue of real wage bargaining before the empirical relations broke down. The shift in the Phillips curve was interpreted as validating their theoretical structure, which had undergone harsh criticism from economists like Robert Clower and Axel Leijonhufvud.

An examination of the literature between Fisher (1926) and Phillips (1958) has shown that the Keynesians exploring the relationship between inflation and unemployment clearly knew about the role of inflation expectations and in one case the problem of instability in the relationship (Brown, 1955). How the Phillips (1958) model became the exemplar is then the interesting question. If the work of Brown (1955), for example, had have gained more prominence, the subsequent development of macroeconomic theory and policy may have been quite different.

**Notes:**

[1] Leeson (1998: 599) notes that "In the absence of firm theoretical foundations, a large amount of intellectual effort was expended to locate respectable empirical foundations for this relationship." Leeson argues that the theoretical legitimacy of the Phillips curve can be traced to its patrons (1998: 603) the "seven leading Phillips-curve Keynesians … Paul Samuelson, Robert Solow, Franco Modigliani, James Tobin, and Lawrence Klein, … the acknowledged intellectual leaders of an elite community."

[2] The price and unemployment equations, which form part of the macroeconomic model can be written (following Klein, 1985: 151) as

$$(\Delta p / p)_t = f \text{ (initial conditions, exogenous history)}$$

$$U_t = g\text{(initial conditions, exogenous history)}$$

Given that $f$ and $g$ have the same arguments, a trade-off between the two can be expressed.

[3] Leeson (1998: 609) says, "these textbooks have tremendous power to propagate myths and distortions." Samuelson (1983: 216) noted "the fiction that Keynes assumed rigid money wages was found to be a useful fiction."

[4] O'Brien (1975: 163) says, "the effect is only transitional and does not continue once prices have adjusted to the new money supply."

[5] O'Brien (1975: 148-49) compares Thornton to Ricardo, who he terms a rigid bullionist. He (1975: 148) says that Ricardo believed that "if currency was in excess, it must be contracted." In other words, the rigid bullionists in the period of convertibility believed in a "uniquely correct stock of currency" at any point in time.

[6] Thornton refers to exchange as the relative premium or discount on bills of exchange drawn on different financial markets (see O'Brien, 1975: 148).

[7] Despite the praise by Hayek, Thornton's analysis in this section is seriously compromised because he did not seem to understand the difference between a flow and a stock. He considered increases in bank deposits to be increases in the velocity of circulation rather than an increase in the money stock. Further, he did not consider bills of exchange or bank cheques when he analysed the relationship between money and the price level (see O'Brien, 1975: 143).

[8] O'Brien (1975: 164) explains that "the reason for this is clear enough. Without a continual increase in world gold production … inflation must, under a gold-standard system, soon be checked and indeed reversed. Since convertibility was a major objective … this rules out inflation."

[9] O'Brien (1975: 165) does not classify Attwood among the Classical economists, although he recognises that his analysis was derived from classical thought. He believes Attwood is distinct because his primary aim was full employment and he didn't care much for the convertibility issue. He also thought that the economy was inherently unstable in a deflationary direction.

[10] Care must be taken here to associate the meaning of trade-off in the way the author discussed it. There is a fundamental difference between the trade-off in price level terms and the trade-off in terms of the derivative of the price level, and further, in terms of the second derivative of the price level. There are several interesting interchanges between economists about the meaning of the term inflation (see Solow, 1975; Tobin, 1966; and Leeson, 1996).

[11] The version of Mill's *Principles of Political Economy* referred to in this essay is the Kelley Publisher's *Reprints of Economic Classics* edition edited by W.J. Ashley and published in 1964. It is the text of the seventh edition (1871), the last one that Mill revised.

[12] Blaug (1977: 183) notes that in this section Mill is in stark contrast to Ricardo.

[13] Barber (1997: 447) believes that Fisher was obscured, unjustly, by the "Keynesian ascendancy … it meant that some of his achievements were overlooked and literally had to be rediscovered. In 1926, Fisher … anticipated by more than three decades the essential insight contained in what was later to be labelled the Phillips curve."

[14] Solow (1997: 433) refers to Fisher's remark "that if Copeland thinks there may be a relationship between changes in the price level and a distributed lag of employment then Copeland should go and look for it. If only he had!"

[15] In relation to the Phillips curve, Leeson (1998: 605) considers the role of the econometricians was essential in it becoming the dominant model of inflation and unemployment in the 1960s. He says that "Samuelson and Solow's casual empiricism had been rapidly transformed into high theory, high-powered technical econometrics, and high-level policy advocacy."

[16] Solow doubts whether Fisher actually performed any regression analysis so the graphs he produced showing actual and predicted employment were based on some other (spurious) means. The fit implied is extremely poor. For a young econometrician, the failure of Fisher to report accurately how he did things is frustrating.

[17] All results are available from the author on request.

[18] Klein (1985) is a collection of his famous papers, including the 1946 Journal of Political Economy article.

[19] The original article was published in Dutch in 1936. It was reprinted in Tinbergen (1959).

[20] Tinbergen (1951) raised the issue that the wage equation (in this case for the United Kingdom) could be improved by replacing the employment term with the inverse of the unemployment rate to capture for non-linearities.

[21] Klein (1985: 17) says that as part of his work in developing the theoretical aspects of the Keynesian model which prevailed in the 1940s, he "formulated an expression for the wage-rate determination that was the same thing as the Phillips Curve, back in the 1940s, when I was at the Cowles Commission."

[22] In 1956, Bent Hansen and Gosta Rehn published a study of wage drift and money wage dynamics in the Swedish economy. Their model assumes that market forces determine the drift (the difference between earnings and wage rates, the latter being fixed by institutional forces). They also used a proxy term for excess demand based on the difference between vacancies and unemployment.

[23] Compare this to Friedman's (1975: 217-19) statement that

> Phillips's analysis seems very persuasive and obvious. Yet it is utterly fallacious. … because no economic theorist has ever asserted that the demand and supply of labour are functions of the *nominal* wage. Every economic theorist from Adam Smith to the present would have told you that the vertical axis should refer not to the *nominal* wage rate but to the *real* wage rate.

Klein and Ball (1959) were modelling disequilibrium phenomenon where the appropriate adjustment may be a function of the money wage rate. Phillips (1958) model was also in this spirit. They added (1959: 322)

> [the wage change equation] is a key equation in the UK model because it displaces, in a sense, the money balance equation for the absolute determination of prices and wages. It is difficult, again following the Walrasian idea, to say what determines what is a truly interrelated system, but the main function of [the wage change equation] is to complete the system in respect of the determination of absolute wages and prices, while the cash-balance equation has the main function of completing the system in respect of the determination of the interest rate. The state of the labour market displaces the state of the money market in determining the course of absolute prices or wages.

This fundamental shift in causality in the macroeconomic model is also developed in Klein and Goldberger (1955) and in Klein (1954). The recognition of the role of the wage equation by Klein clearly distinguishes the different schools of thought.

[24] In fact the estimating equation also contained a political factor (a step dummy variable taking the value of unity post 1952) to capture the change in behaviour of the trade unions when the Conservative Government was elected in 1952.

[25] Brown (1955: v) says

> One of the main difficulties encountered by anyone trying in the last five or six years to understand the inflationary processes which had been going on since 1939, and were still very much in progress, arose from the unsatisfactory and rapidly changing nature of the theoretical framework at his disposal. Modern dynamic economics is a young subject, and the process of price increase under the pressure of excess demand or under the influence of expectations, after having attracted very interest in the years before 1939, have been discussed in considerable detail since then and especially since the war."

[26] Brown makes no reference in his book to any of the econometric work that had been done on this question, specifically, Tinbergen and Klein *et al*.

[27] There were some early cost-push theories even as far back to Thomas Tooke (1844), but the demand-side explanations were by far the dominant viewpoint.

[28] Before we conclude that Brown would have supported a Quantity Theory notion of inflation it should be noted that he thought people would economise on idle cash balances and this leads to interdependence between the supply of money and the total value of transactions. Brown (1955: 6)

says that "a great deal of inflation of prices is generally possible without any increase in the quantity of money – a revision of expectations may bring it about."

[29] Amed-Houzier, Dick and Luchter (1971: 319-320) say, "While the general relationship between price changes and unemployment had been recognised earlier, Sultan was the first to show explicitly the trade-off between percentage changes in price level and unemployment in diagrammatic form."

[30] Here we are using the term Monetarist to describe the work of economists like Friedman who were attempting to re-establish the Quantity Theory of Money as the centrepiece of macroeconomics.

[31] Dow (1985: 83) says

> The predominant macro problem was persistent unemployment, the inability of the labour market to clear. This contrasted with the market clearing framework of neo-classical macro. It became conventional, as a result, to view macroeconomics as dealing with co-ordination failures and microeconomics with co-ordination successes.

[32] It is interesting to note that the Phillips curve is not an optimising function that is derived from rational, maximising behaviour. Klein (1985: 151) says

> It is simply a market clearing relation. On the one hand, there are optimizing decisions of households (and trade unions) about labor supply and, on the other hand, optimizing decisions of firms about labor demand. When employee and employer representatives come to the bargaining table, with all the institutional apparatus that such a process entails, a wage bargain is struck on the basis of labor market and other economy-wide considerations. It is surely an accepted part our subject's view of the working of markets that wages move in response to excess supply or demand in order to set up a tendency towards restoration of equilibrium. It is just a way of introducing dynamic adjustment processes into the reconciliation of two optimising decisions, and it is fruitless to look about for some optimizing explanation of the Phillips curve."

[33] The October 1960 edition of the Review of Economic Studies concentrated on the mechanisms that operate in disequilibrium and how the Quantity Theory reasserts homogeneity and Walras' Law.

[34] Lipsey (1978: 56) does not believe the idea of a permanent trade-off was a prediction that Phillips made. He recognises that it was a controversial proposition even before Friedman (1968). Lipsey, himself (1960: 31-32), cautioned against assuming the money wage inflation-unemployment rate relationship would be stable in the face of a long period of tight labour markets. Yet, he writes (1978: 56-57) , by way of self-confession, that these "warnings were, … , quickly forgotten, and many economists, including myself … were soon plotting Phillips curves …[with inflation against unemployment] …, along with policy makers' indifference curves, and determining the optimal combinations of …" inflation and unemployment.

[35] Epstein (1987, Chapter 4, Section 3) argues that the early work of the Cowles Commission "retreated from structure" and it was not until Tobin took control that macroeconomic theory and microeconomic underpinnings became more important. Certainly, the Klein and Goldberger (1955) model made attempts to add theoretical sophistication to the econometric model.

[36] Desai (1981: 4) says the Phillips curve "seemed to most economists … to provide the missing element in the Keynesian model. Now there was a theory of inflation which could be integrated into the IS-LM framework and the Keynesian edifice was complete."

# Chapter 3      The NAIRU, Structural Imbalance and the Macroeconomic Equilibrium Unemployment Rate

## 3.1      Introduction

Recent policy orientation in the U.K., the U.S.A. and in Australia is based, it seems, on the view that inflation is the basic constraint on expansion (and fuller employment). A popular belief is that fiscal and monetary policy can no longer attain unemployment rates common in the sixties without ever-accelerating inflation rate of unemployment. The natural rate of unemployment (NRU) which is the rate of unemployment consistent with stable inflation is considered to have risen over time. The non-accelerating inflation rate of unemployment (NAIRU) is a less rigorous version of the NRU but concurs that a particular, cyclically stable unemployment rate coincides with stable inflation. Labour force compositional changes, government welfare payments, trade-union wage goals among other "structural" influences are implicated in the rising estimates of the inflationary constraint.[1] The NAIRU has achieved such rapid status among the profession as a policy-conditioning concept that it warrants close scrutiny.

This Chapter explores the idea that persistently weak aggregate demand creates a labour market, which mimics features conventionally associated with structural problems (Okun 1973; Baily, 1982). The specific hypothesis examined is that the equilibrium unemployment rate is a direct function of the actual unemployment rate and hence the business cycle - the so-called hysteresis effect (Phelps, 1979; Hargreaves-Heap, 1980). An understanding of the labour market mechanisms, which could promote the hysteresis, provides support to the conclusions of Burns and Mitchell (1985) who advocate aggregate policy expansion.

While the degree of slack necessary to control inflation may have increased, the underlying cyclical labour market processes analysed in this Chapter, can be exploited by appropriate demand policies to reduce the steady state unemployment rate. To the extent that the inflationary constraint operates through expectations of a minimum level of unemployment (say, 7 per cent) being built into individual behaviour within the economy  (independent of whether a NAIRU actually exists or has increased over time), an explication of the possible cyclical influences could modify this source of rigidity.

The plan of the Chapter is as follows. Section 3.2 shows that the conventional NAIRU estimates derived from aggregate wage equations may be influenced by the business cycle. It is plausible that rising estimates reflect prolonged recession rather than increasing structural rigidities in the labour market. Section 3.3 outlines the cyclical labour market adjustments, which promote the hysteresis effect and increasing structural imbalance at low levels of activity. Section 3.4 seeks to link wage determination and inflation to these cyclical market responses by specifically examining the manner in which increasing structural imbalance in the labour market may affect wage movements. We outline a conceptual unemployment rate, which is associated with price stability, in that it temporarily constrains the wage demands of the employed and balances the competing distributional claims on output. This *macroequilibrium unemployment rate* (the MRU) is importantly, sensitive to the cycle due to the impact of the cyclical labour market adjustments on the ability of the employed to achieve their wage demands. In this sense, the MRU is distinguished from the conventional steady state unemployment rate, the NAIRU, which is not normally conceived to be cyclically variable. Section 3.5 develops the formal properties of the MRU, particularly emphasising the hysteresis effect (that is, the cyclical sensitivity) to conceptually demarcate it from the NAIRU. It can be demonstrated that the MRU model yields the possibility of a long-run inflation-unemployment trade-off, a result not available in a conventional NAIRU model. Sections 3.6 and 3.7 provide some supporting econometric analysis of the MRU model and test the plausibility of the hysteresis hypothesis (that is, that cyclical labour market adjustment shifts the MRU). The link between the MRU and wage determination is modelled with reference to Australian data

## 3.2    Measuring the NAIRU

Could the increasing NAIRU estimates reflect a decade or more of high actual unemployment rates and restrictive fiscal and monetary policies, and hence, not necessarily be indicative of increasing structural impediments in the labour market? The NAIRU is popularly derived by solving a system of difference equations (wage and price) for their steady state properties. The wage adjustment process is written as function of excess demand for labour, and usually, the unemployment rate is used as a negative proxy for the excess demand. Consequently, two mappings must be modelled. First, the wage-excess demand relationship and, second, the unemployment-excess demand relationship. Combining these relations produces the wage adjustment function, from which the NAIRU is estimated.

The following simple (linear) wage model is assumed

**Eqn 3-1** $\qquad \dot{w} = \alpha_1 + \alpha_2 Z + \alpha_3 \dot{p}^e$

where $\dot{w}$ is money wage inflation, $Z$ is the excess demand for labour, $\dot{p}^e$ is the term for inflation expectations and $\alpha_1$ reflects forces which promote real wage growth independent of $Z$ (like, productivity growth and variations in profit margins, both of which could be cyclically sensitive).[2] The unemployment-excess demand equation is

**Eqn 3-1** $\qquad u = \beta_1 - Z$

where $u$ is the unemployment rate, $\beta_1$ is the measure of frictional and/or structural unemployment (that is, labour market rigidities), and $Z$ is scaled so that its coefficient is unity.

Summing (3-1) and (3-2) gives

**Eqn 3-3** $\qquad \dot{w} = \alpha_4 - \alpha_2 + \alpha_3 \dot{p}^e$

with $\alpha_4 = (\alpha_1 + \alpha_2 \beta_1)$. Clearly, $\alpha_4$ is a composite of structural and nominal demand influences, although separate identification is difficult. Solving for the steady-state unemployment rate, $u^*$ yields:

**Eqn 3-4** $\qquad u^* = \left( \alpha_1 / \alpha_2 \right) \beta_1$

which shows the composite influence on the conventional measures of the NAIRU.

The strict NRU concept, faithful to Friedman insulates the NRU from aggregate demand influences. In this case $\alpha_1 = \dot{g}$ and the influence of other variables like $\dot{m} \neq 0$ is not accounted for. We contend that $\alpha_1$ is cyclically unstable and does not exclusively indicate productivity growth. Even if $\alpha_1 = \dot{g}$, endogenous productivity changes (associated with labour hoarding, for example) allow the cycle to influence the estimated NAIRU (Thirlwall, 1983).

Given that the rising NAIRU estimates have occurred over a decade of excess capacity, high unemployment rates, slack demand and low productivity growth it is plausible that these increases reflect cyclical forces rather than basic structural labour market changes. Recent work by Dornbusch and Fischer (1984) and Mitchell (1984) negates the view that major increases in unemployment are due to the structural changes like demographic changes or welfare payment distortions.

## 3.3    Hysteresis and cyclical labour market adjustment

The interaction between the actual and equilibrium unemployment rates has been termed the *hysteresis* effect (Phelps, 1979; Hargreaves-Heap, 1980; State of Play 3, 1984). The significance of hysteresis, if it exists, is that the unemployment rate associated with stable prices, at any point in time should not be conceived of as a rigid non-inflationary constraint on expansionary macro policy. The equilibrium rate itself can be reduced by policies, which reduce the actual unemployment rate. We therefore use the term MRU, as the non-inflationary unemployment rate, as distinct from the NAIRU, to highlight the hysteresis mechanism. The idea is that structural imbalance increases in a recession due to the cyclical labour market adjustments commonly observed in downturns, and decreases at higher levels of demand as the adjustments are reserved. Structural imbalance refers to the inability of the actual unemployed to present themselves as an effective excess supply.

The non-wage labour market adjustment that accompany a low-pressure economy, which could lead to hysteresis, are well documented (see Okun, 1975; Hargreaves-Heap, 1980). Training opportunities are provided with entry-level jobs and so the (average) skill of the labour force declines as vacancies fall. New entrants are denied relevant skills (and socialisation associated with stable work patterns) and redundant workers face skill obsolescence. Both groups need jobs in order to update and/or acquire relevant skills. Skill (experience) upgrading also occurs through mobility, which is restricted during a downturn.

## 3.4    Inflation, wage determination and structural imbalance

An extensive literature links the concept of structural imbalance to wage and price inflation. It can be shown that a non-inflationary unemployment rate can be defined which is sensitive to the cycle. The main strands of this literature are summarised below. Inflation results from incompatible distributional claims on available income, unemployment can temporarily balance the conflicting demands of labour and capital by disciplining the aspirations of labour so that they are compatible with the profitability requirements of capital (Kalecki, 1971). The wage-price spiral lull could be termed a macroequilibrium

state in the limited sense that inflation is stable. The implied unemployment rate under this concept of inflation is termed in this paper the MRU and has no connotations of voluntary maximising individual behaviour which underpins the NAIRU concept (Sawyer, 1983).

Wage demands are thus inversely related to the actual number of unemployed who are potential substitutes for those currently employed. Increasing structural imbalance (via cyclical non-wage labour market adjustment) drives a wedge between potential and actual excess labour supply, and to some degree, insulates the wage demands of the employed from the cycle. The more rapid the cyclical adjustment, the higher is the unemployment rate associated with price stability.[3]

Stimulating job growth can decrease the wedge because the unemployed develop new and relevant skills and experience. These upgrading effects provide an opportunity for real growth to occur as the cycle reduces the MRU.[4] Why will firms employ those without skills? An important reason is that hiring standards drop as the upturn begins. Rather than disturb wage structures firms offer entry-level jobs as training positions. It is difficult to associate wage demands (in excess of current money wages) with the workforce.[5] While the increased training opportunities increase the threat to those who were insulated in the recession this is offset to some degree by the reduced probability of becoming unemployed.

Phelps (1979), himself, argues that the natural rate hypothesis is only an approximation because it neglects feedback upon the unemployment rate from the variables that are explicitly recognized in the theoretical framework. Phelps, (1979: 103-104) says that a "long-run Phillip's Curve cuts through the natural unemployment rate considered as a point, with the characteristically negative slope but only within some band roughly centred on the natural rate." He concludes that the inadequacy of the NRU hypothesis (as an exact economic law) is just a reflection of the inadequacy of orthodox economic theory. One wonders why the NRU hypothesis has become so ingrained given Phelps's early belief in its approximate nature. James Tobin (1980a: 62) put it succinctly

> It is possible that there is no NAIRU, no natural rate, except one that floats with history. It is just possible that the direction the economy is moving in is at least as important a determination of acceleration and deceleration as its level. These possibilities should give policy makers pause as they embark on yet another application of the orthodox demand management cure for inflation.

## 3.5    The MRU model

It can be shown that a long-run trade-off between inflation and unemployment exists, other things equal, if hysteresis is operating. The general wage adjustment function can be written as:

**Eqn 3-5 -**       $\dot{w} = \alpha_4 - \alpha_2(u_t - u_t^*) + \alpha_3 \dot{p}^e$

where $u_t^*$ is the current MRU, and all other things are defined as before. The hysteresis effect, that is, the tracking of the actual unemployment rate by the equilibrium rate of unemployment could be modelled in a number of ways. Coe and Gagliardi (1985) defined $u_t^*$ as a distributed lag on past values of actual unemployment while Hargreaves-Heap (1980) represented $u_t^*$ as a weighted average of the actual unemployment rate and the equilibrium rate in the last period.[6] The following adjustment model employs the latter specification and is a plausible, though an *ad hoc* representation of the hysteresis idea.

**Eqn 3-6**       $u_t^* - u_{t-1}^* = \lambda(u_{t-1} - u_{t-1}^*)$

The value of $\lambda$ measures the sensitivity of $u_t^*$ to the state of activity.[7] The higher is $\lambda$, other things equal, the greater the capacity of aggregate policy to permanently reduce unemployment without ever-accelerating inflation.

From (3-6) deviations of the actual unemployment rate from the MRU lead to changes in the MRU of the order:

**Eqn 3-7**       $u_t - u_{t-1}^* = (1/\lambda)(u_t^* - u_{t-1}^*)$

This implies that (3-5) can be written as:

**Eqn 3-8**       $\dot{w} = \alpha_4 - (\alpha_2/\lambda)(u_{t+1}^* - u_t^*) + \alpha_3 \dot{p}^e$

For any MRU, as long as $\lambda > 0$, a long-run trade-off between the inflation rate and the unemployment rate is implied by the MRU model, even if conventional homogeneity properties $(\alpha_3 = 1)$ are assumed. The orthodox NAIRU model is a special case of the general MRU model and requires $\lambda$ to be constrained to zero.[8] While the traditional trade-off test involved questions about the magnitude of $\alpha_3$, the relevant test between the NAIRU and the MRU models focuses on the values of $\lambda$.

The cyclical sensitivity of the MRU requires $\lambda > 0$. The MRU model suggests that a government can choose an inflation-unemployment combination subject to the value of $\lambda$ and the sensitivity of $\dot{w}$ to deviations of $u_t$ from $u_t^*$. The smaller the latter (say, via an incomes policy) the greater the ability of government to forge real growth. By targeting a rate of unemployment ($t_U$) below the current MRU ($u_t^*$) some initial inflation occurs. Yet, due to the hysteresis the gap between $t_U$ and $u_t^*$ progressively decreases, reducing subsequent inflation until convergence occurs (MRU = $t_U$) and inflation stabilises.[9]

## 3.6    Estimation

To provide some empirical support for the MRU model (the hysteresis effect) an awards equation and an earnings equation are estimated. While desiring simplicity in our specification, the unique nature of the Australian wage determination must be embraced. Estimating a simple expectations-augmented Phillip's Curve earnings model, as is conventional practice, would ignore the institutional richness of our system.[10]

### 3.6.1    The Awards equation

This equation is the basis for a complete wage-price model if the Arbitral Tribunals (which cover about 85 per cent of wage earners) play a central exogenous role in the determination of earnings. The specification of the MRU model estimated is expressed in quasi-reduced form with variables reflecting institutional, employer and employee behaviour.

Thus, the model becomes

**Eqn 3-9** $$\dot{w} = \alpha_0 + \alpha_1 \dot{w}_{t-1} + \alpha_2 \dot{p}_{t-1} + \alpha_3 \dot{r}w_t + \alpha_4 S_{t-1} + \alpha_5 (u_t^* - u_t) + \alpha_6 \text{DI} + \varepsilon_t$$

**Eqn 3-10** $$u_t^* = (1-\lambda)u_{t-1}^* + \lambda u_{t-1}$$

where $\dot{w}$ is the four-quarter logarithmic change in award wages, $\dot{p}$ the lagged four-quarter logarithmic change in the price index, $\dot{r}w$ is the four-quarter logarithmic change in real wages, $S$ is the logarithm of the four-quarter moving-average of strikes, $(u_t^* - u_t)$ is the divergence between the MRU and the actual unemployment rates, DI is an incomes policy dummy.

A four-quarter change specification relies on certain assumptions about the timing of wage settlements. It may also induce serial correlation. The latter is an empirical question and should not constrain the specification. Unlike Kirby's work (1981), a simple quarterly model was found to be inferior in a statistical sense. The important issue is that the four-quarter model is a better depiction of successive wage rounds, given the lagged and staggered nature of awards determinations.

**The Cyclical Sensitivity of the MRU**

Two effects are estimated in the wage equations. First, the influence of $(u_t^* - u_t)$, where $u_t^*$ is modelled as the conventional, yet plausible adjustment function (3.10). There are several ways to estimate the wage equation - MRU adjustment mechanism. A common technique is to eliminate the unobservable $u_t^*$ from the wage equation using a Koyck procedure. This transformation unfortunately introduces a number of well-known econometric difficulties.[11]

To overcome these problems we use a grid search procedure inspired by Solow (1969). Instead of eliminating $u_t^*$ from the wage equation and estimating $\lambda$ indirectly from the coefficient on the lagged dependent variable we assume a range of plausible values for $\lambda$ and simulate the MRU equation (3-7) to generate a number of MRU time series. In each case, the initial $u_t^*$ value is chosen to equal the actual **u** for 1966 (1), which is far enough from the start of our estimation period to minimise its effect on each series. The MUG variable is the $u_t^*$ series (for a particular $\lambda$) less the actual unemployment rate. A range of MUGSs for each assumed $\lambda$ was created. The preferred equation is derived from the

value of $\lambda$ which maximises the corrected $R^2$. Assuming the diagnostics reveal no serious specification errors, the highest corrected $R^2$ criterion generates the best parameter estimates.

Given the traditional role of the level of unemployment in aggregate wage equations one might argue that the MUG variable is just replicating the influence on wages of the actual unemployment rate. We nested both variables in the wage equations and the traditional measure (in various linear and non-linear guises) was never significant. A Koyck transformation would replace $(u_t^* - u_t)$ with the four-quarter change in the unemployment rate. The change and level variables were also nested in the same regressions and as before the level of unemployment was never significant (Harvey, 1981: 177). This is in striking contrast to the findings of Dornbusch and Fischer (1984), among others (see Hughes, 1985: 407).

## Inertia

The lagged dependent variable is included to capture the effects of institutional lags, catch-ups, inertia and wage-wage interactions, which typify a staggered wage-setting process. Submissions to wage cases focus on the path the economy has taken up to the hearings.

## Forward-looking behaviour

Real wage resistance theories believe that workers expect that the purchasing power of their wages be maintained over time. The likelihood of productivity growth could also promote expectations that awards should increase independently of the price-indexed component. To capture the forward-looking behaviour implied by these expectations the current four-quarter change in real awards is used. This variable is the proxy for expectations formed at the start of any bargaining period yet raises endogeneity considerations because it clearly is simultaneously determined by $\dot{w}$ and $\dot{p}$. Single equation OLS estimates are biased and inconsistent two-stage least squares (2SLS) is used to remove the inconsistency.

An interesting point emerges quite apart from the econometric justification for using 2SLS. We use $\dot{rw}_t$ as the proxy for forward-looking behaviour. The expectations are exogenous (predetermined) in the current period but are dependent on the current values of the variables in the system. The

instrument (fitted value) for $\dot{r}w_t$ is the best linear combination of the exogenous variables implied by the wage-price system and could be interpreted as the efficient (but not perfect) expectation of $\dot{r}w_t$.

## Expectations

Modelling price expectations in wage equations has been a major preoccupation of applied economists since Friedman (1968). Many *ad hoc* hypotheses have been tested with varying success. We use a simple expectations-generating hypothesis in our model.[12] The Arbitration Commission considers the immediate past price change as indicative of changes in the cost of living. Consistent with the aim of simple specification the one period lagged price change variable is included, as the relevant price variable.

## Strikes and Incomes Policy

The tribunals are an important arbitrator in industrial conflict and hence, the use of trade union power variables in wage studies has a long history. The measures used in this study, *S*, is the ratio of average working days lost to the number of civilian wage and salary earners.[13] A simple dummy, *DI* is used to test for shifts associated with incomes policy. It is equal to one for 1975(1) to 1981(2) and zero otherwise.

### 3.6.2   The Earnings equation

The estimated equation took the form of

**Figure 3-11**      $$\dot{E}_t = \beta_0 + \beta_1 \dot{E}_{t-1} + \beta_2 \dot{w}_t + \beta_3 (u_t^* - u_t) + e_t$$

where $\dot{E}$ is the four-quarter logarithmic change in earnings. Earnings inflation can be expressed as the sum of awards inflation and the rate of change in drift. The awards-earnings relationship is the subject of an ongoing debate. Three distinct positions are identifiable. First, market forces determine price changes and arbitration is a rubber stamp - a chimera of authority. The rate of awards inflation, being itself a function of excess demand, has no independent place in the earnings equation (Challen and Hagger, 1979). Second, non-market (institutional) forces exclusively determine award wages. The awards variable is constrained, a priori, to unity in the earnings equation, which, therefore, becomes a wages drift equation (Klein and Ball, 1959). Third, the earnings equation includes the four-quarter

change in awards as an independent but may be associated with a decrease in the over-award component (Johnson, Maher and Thompson, 1974). The awards equation then includes variables reflecting inertia, wage relativities and other institutional forces in addition to quantity constraints imposed by the level of activity. By adopting this approach our earnings equation reflects the view that the arbitral tribunals are a dominant influence via their award decisions. *A priori*, we expect the awards variable to have a positive (but less than one) coefficient. Unfortunately, no acceptable technique is available to categorically decide the question of causality.

The inclusion of the lagged dependent variable and MUG is justified as before. As MUG increases the probability of unemployment falls, although the potential excess more closely approximates the actual unemployment. A variety of other variables in level and rate of change form were tests, including productivity, vacancies, hours, prices and overtime. None were satisfactory. Prices appear to impact via awards. The other variables may be reflected in the lagged dependent of in MUG.

## 3.7    Results

Both models were estimated on quarterly data from 1969(3) to 1983(4). The awards results are presented in Tables 3.1 to 3.4 and the earnings results in Table 3.5. The principal findings are summarised as follows.

A value of $\lambda$ between 0.5 and 0.6 was associated with the best-specified awards equation. The sensitivity of the equilibrium unemployment rate to movements in the actual unemployment rate, implied by $\lambda$, is lower and the lags more complex in the earnings equation. The hysteresis hypothesis is thus not inconsistent with the data in both equations.[14] With $\lambda = 0.5$ a one percent increase in the actual rate of unemployment increases the natural rate by 0.5 per cent by the end of the next quarter. This is a fairly rapid work-skill attrition rate, which requires more analysis elsewhere.

The awards equations are homogenous with respect to price variables and the appropriate restriction on nominal variables is data-accepted. The homogeneity restriction on the awards variable was rejected in every earnings equation. This implies that while award wages are fully indexed in the long run and pass on to earnings quickly they impact by reducing drift.

Even with homogeneity, the innovative nature of the MRU model yields a long-run trade-off between award inflation and divergences between the actual unemployment rate and the MRU. A similar earnings inflation-MUG trade-off is also not inconsistent with the data.

In all equations the coefficient signs are *a priori* consistent and the simple diagnostics are favourable. Table 3.1 displays the results of OLS and 2SLS regressions of awards with the value of $\lambda$ constrained to equal 0.5. Equation 1.2 assumes that $\dot{r}w$ and MUG5 are endogenous and uses instruments for both. 1.3 more realistically, only instruments $\dot{r}w$. While 1.2 and 1.3 are similar, suggesting that MUG5 is presenting no endogeneity problems, taken together they are substantially different and superior to the OLS equation 1.1.

**Table 3.1 Awards Equation, $\lambda$=0.5, 1969(3) to 1984(4)**

|              | 1.1     | 1.2     | 1.3     | 1.4     | 1.5     | 1.6     |
|              | OLS     | 2SLS    | 2SLS    | OLS     | 2SLS    | 2SLS    |
|--------------|---------|---------|---------|---------|---------|---------|
| Constant     | 0       | -0.008  | -0.01   | -0.004  | -0.009  | -0.01   |
|              | (1.27)  | (1.20)  | (1.48)  | (1.68)  | (1.69)  | (1.88)  |
| $\dot{w}(-1)$ | 0.15   | 0.42    | 0.46    | 0.27    | 0.52    | 0.59    |
|              | (2.43)  | (5.42)  | (5.60)  | (4.78)  | (8.13)  | (8.41)  |
| $\dot{p}(-1)$ | 0.74   | 0.54    | 0.49    | 0.70    | 0.56    | 0.51    |
|              | (6.52)  | (4.39)  | (3.91)  | (9.62)  | (5.75)  | (5.11)  |
| $\dot{r}w$   | 0.85    | 0.44*   | 0.41*   | 0.82    | 0.55*   | 0.54*   |
|              | (11.87) | (3.36)  | (3.00)  | (13.61) | (5.22)  | (4.80)  |
| $S$          | 0.10    | 0.17    | 0.18    | 0.06    | 0.08    | 0.07    |
|              | (2.34)  | (2.64)  | (2.61)  | (1.80)  | (1.46)  | (1.21)  |
| MUG 5        | 0.03    | 0.07*   | 0.06    | 0.04    | 0.06*   | 0.07    |
|              | (2.24)  | (2.46)  | (3.18)  | (3.35)  | (2.87)  | (4.67)  |
| D1           | -0.006  | -0.02   | -0.02   | -0.004  | -0.01   | -0.01   |
|              | (1.66)  | (3.60)  | (3.37)  | (1.30)  | (2.86)  | (2.43)  |
| D2           |         |         |         | -0.03   | -0.05   | -0.06   |
|              |         |         |         | (4.82)  | (5.33)  | (5.73)  |
| $\overline{R}^2$ | 0.96 | 0.94   | 0.93    | 0.97    | 0.96    | 0.96    |
| s.e. (100)   | 1.00    | 1.00    | 1.00    | 0.80    | 0.96    | 0.96    |
| D.W.         | 2.04    | 1.87    | 1.85    | 2.28    | 2.32    | 2.30    |

*t*-statistics are in parentheses
\* indicates an instrument was used in place of the variable

Table 3.2 presents the restricted regression results for awards. Given the asymptotic estimation technique used, an $F$ test based on small sample properties can only be approximately relied upon. A $\chi^2$ -test (-2 log (SSRU/SSRR) is used instead and the restrictions were accepted in every case (Dawson, 1981).[15] The summed coefficients on the lagged nominal variables are never significantly different from unity (at 5 per cent).[16] Unrealistic coefficient values on the other variables may indicate misspecification despite the strong homogeneity. In Equation 1.3, for example, a 10 per cent increase in strikes leads to a 1.8 per cent increase in awards. The long-run value is 3.3 per cent. The indexation dummy indicates a small constraining influence on wage inflation. These results seem reasonable

**Table 3.2 Awards Equation, $\lambda = 0.5$, 1969 (3) - 1983(4)**

| | Restrictions Imposed[1] | | | |
|---|---|---|---|---|
| | 1.2R 2SLS | 1.3R 2SLS | 1.5R 2SLS | 1.6R 2SLS |
| Constant | -0.008 | -0.008 | -0.007 | -0.009 |
| | (1.27) | (1.20) | (1.48) | (1.68) |
| $\dot{w}(-1)$ | 0.42 | 0.45 | 0.51 | 0.58 |
| | (5.45) | (5.65) | (8.07) | (8.36) |
| $\dot{r}w$ | 0.45* | 0.42* | 0.52* | 0.50* |
| | (3.57) | (3.20) | (5.11) | (4.63) |
| S | 0.16 | 0.16 | 0.12 | 0.12 |
| | (2.94) | (2.81) | (2.54) | (2.60) |
| MUG 5 | 0.07 | 0.06 | 0.05* | 0.07 |
| | (2.96) | (3.55) | (2.67) | (4.49) |
| D1 | -0.02 | -0.02 | -0.01 | -0.01 |
| | (4.14) | (3.95) | (2.66) | (2.18) |
| D2 | | | -0.05 | -0.05 |
| | | | (5.22) | (5.65) |
| $\bar{R}^2$ | 0.94 | 0.94 | 0.96 | 0.96 |
| s.e.(100) | 1.40 | 1.00 | 1.00 | 1.00 |
| D.W. | 1.89 | 1.88 | 2.28 | 2.28 |

$t$-statistics in parentheses
\* indicates an instrument was used in place of variable
1.The homogeneity restriction took the form of $\alpha\dot{w}(-1)+(1-\alpha)\dot{p}(-1)$

Interpretation of the coefficient on MUG5 in 1.3 shows the unique features of our model. The long-run elasticity of wage changes with respect to MUG is 0.11. If from equilibrium, the actual rate of unemployment is pushed below the current MRU by say, 1 per cent, award wages inflate by 0.11 per cent, a fairly flat response. However, given the value of $\lambda$ (0.5) the next period MRU is 0.5 per cent is consequently smaller. Importantly, the acceleration of award wage inflation is finite as $u^*$ converges on the actual unemployment rate. Table 3.3 depicts this process.

Equation 1.6 includes an additional dummy, *D2* (taking value of unity in 1975(3) and zero otherwise). All the equations under-predicted (significantly) the actual rate of change in awards for 1975(3). An institutional approach allows non-economic factors to impact on the variables in the model and this irregularity is considered the result of extraordinary political instability during that quarter. Indeed, industrial disputes increased by 192 per cent between June and July 1975. This view is reinforced by the reduced significance of *S* when the dummy, *D2*, is included.[17]

**Table 3.3. Hysteresis and Cumulative Inflation**

| Time | $(u_t^* - t_u)$ | Cumulative Wage Inflation |
|------|-----------------|---------------------------|
|      | **(per cent)**  | **(per cent)**            |
| t    | -1.0000         | + 0.1100                  |
| t+1  | -0.5000         | +0.1600                   |
| t+2  | -0.2500         | + 0.1875                  |
| t+3  | -0.1250         | +0.2012                   |
| t+4  | -0.0625         | + 0.2080                  |
| t+5  | -0.0313         | + 0.2114                  |
| t+6  | -0.0156         | + 0.2131                  |
| t+7  | -0.0078         | + 0.2140                  |
| t+8  | -0.0039         | + 0.2144                  |

Table 3.4 replaces MUG5 with the change in the unemployment rate. Recall that this variable would have appeared if we had eliminated $u^*$ by a Koyck transformation. The equation indicates that a change in actual unemployment would be only mildly inflationary (long-run coefficient of 0.04). The level of unemployment was never significant when nested in this equation. The overlapping rate of change specification increases the possibility of our serial correlation whose existence would indicate misspecification. In our equations the DW statistic is not strictly valid although it can alert us to severe

problems. Autocorrelation functions were examined and a series of residual regressions (on lagged residuals and other variables used in 2SLS equations) were performed. Only 1.2 and 1.3 showed any evidence of autocorrelation, where small fourth-order spikes were present.

**Table 3.4 Awards Equation, Δu(-1) 1969(3) to 1984(4)**

| | Unrestricted | | Restriction Imposed[1] | |
|---|---|---|---|---|
| | 3.1 OLS | 3.2 2SLS | 3.1R OLS | 3.2R 2SLS |
| Constant | 0 | -0.002 | 0 | -0.002 |
| | (0.23) | (0.40) | (0.12) | (0.38) |
| $\dot{w}(-1)$ | 0.22 | 0.51 | 0.23 | 0.51 |
| | (3.97) | (7.26) | (4.11) | (7.31) |
| $\dot{p}(-1)$ | 0.73 | 0.51 | | |
| | (9.56) | (4.87) | | |
| $\dot{r}w$ | 0.85 | 0.53* | 0.86 | 0.52* |
| | (13.84) | (4.54) | (13.92) | (4.63) |
| $S$ | 0.04 | 0.05 | 0.04 | 0.06 |
| | (1.02) | (0.80) | (1.10) | (1.39) |
| Δu(-1) | -0.01 | -0.02 | -0.01 | -0.02 |
| | (2.55) | (2.33) | (2.79) | (2.33) |
| $D1$ | -0.002 | -0.01 | -0.003 | -0.009 |
| | (0.70) | (1.98) | (1.08) | (1.95) |
| $D2$ | -0.02 | -0.04 | -0.02 | -0.04 |
| | (2.89) | (3.70) | (3.09) | (3.74) |
| $\overline{R}^2$ | 0.97 | 0.95 | 0.97 | 0.95 |
| s.e.(100) | 0.90 | 1.20 | 0.90 | 1.10 |
| D.W. | 2.02 | 2.19 | 2.07 | 2.19 |

*t*-statistics in parentheses
* indicates an instrument was used in place of variable
1.The homogeneity restriction took the form of $\alpha\dot{w}(-1)+(1-\alpha)\dot{p}(-1)$

Within-sample stability tests (Chow) were satisfactory for all the equations in Table 3.1.[18] Desirable within-sample properties may be the result of extensive data searches and still be associated with poor structural approximation. Out of sample error calculations help to detect misspecification. We use the

Salkever method (1976) to generate *out-of-sample* forecasts and evaluate the prediction errors. The regressions were re-estimated with three *forecast* dummies included each to correspond to the last three quarters of our sample. Each was set to unity for the relevant data point and zero otherwise. The coefficient for each dummy equals the forecast error for that quarter. A simple *t*-test on each coefficient determines the significance of the error. No significant (at 5 per cent level) forecast errors were detected.

**Table 3.5. Earnings Equations, 1969(3) to 1983(4)**

|  | 2SLS | | | | ARI (Cochrane-Orcutt) | | |
|---|---|---|---|---|---|---|---|
|  | 6.1 | 6.2 | 6.3 | 6.4 | 6.5 | 6.6 | 6.7 |
| Constant | 0.02 | 0.02 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 |
|  | (3.15) | (3.24) | (3.87) | (3.97) | (3.53) | (3.17) | (3.55) |
| $E(-1)$ | 0.36 | 0.35 | 0.35 | 0.34 | 0.46 | 0.42 | 0.39 |
|  | (3.24) | (3.25) | (3.40) | (3.39) | (4.98) | (4.05) | (3.80) |
| $w$ | 0.49* | 0.49* | 0.49* | 0.49* | 0.42* | 0.46* | 0.48* |
|  | (5.76) | (5.89) | (6.12) | (6.24) | (6.15) | (6.05) | (6.25) |
| $MUG6(-1)$ | 0.05 | 0.05 |  |  |  |  |  |
|  | (2.44) | (2.39) |  |  |  |  |  |
| $MUG8(-1)$ |  |  | 0.05 | 0.05 | 0.05 |  |  |
|  |  |  | (3.19) | (3.16) | (3.96) |  |  |
| $MUG8$ |  |  |  |  |  | 0.04* | 0.03* |
|  |  |  |  |  |  | (2.29) | (2.00) |
| $DX$ |  | 0.03 |  | 0.02 | 0.02 |  | 0.03 |
|  |  | (1.98) |  | (2.03) | (1.68) |  | (1.83) |
| $\hat{\rho}$ |  |  |  |  | -0.22 | -0.15 | -0.16 |
|  |  |  |  |  | (1.74) | (1.10) | (1.26) |
| $\bar{R}^2$ | 0.81 | 0.82 | 0.82 | 0.83 | 0.84 | 0.80 | 0.81 |
| s.e.(100) | 1.90 | 1.90 | 1.80 | 1.80 | 1.80 | 2.00 | 1.90 |
| D.W. | 2.01 | 2.15 | 2.31 | 2.28 | 2.06 | 2.06 | 2.04 |

*t*-statistics in parentheses
* indicates an instrument was used in place of variable

Table 3.5 displays the earnings equation results. Each equation reveals a relatively large degree of inertia. Award wages appear to be a positive but restraining influence on total earnings inflation. The best fitting equations (that is, the best specified) required MUG to enter in a lagged form. The resulting dynamics are therefore more complex. The lower sensitivity of $\lambda$ (between 0.6 and 0.8) means that for any given deviation of the actual unemployment rate from the MRU the convergence is lower and the long-run earnings adjustment function steeper (relative to the awards equations). The impact elasticities of MUG on earnings are very small and even though convergence is slower the actual inflation generated by the deviation is not substantial.

One significant residual error (1981(1)) was detected in all equations. This corresponds in a timing sense to the large Metal Trades award in that quarter. A dummy, *DX*, was included to proxy this influence. Autocorrelation functions were examined and no evidence of significant error was detected. Some marginal first-order serial correlation was found in equations with MUG8(-1). Within-sample stability tests (CUSUM, without the dummy and Chow) were favourable. The Salkever test was repeated to investigate post-sample forecasting capabilities and revealed no significant (at 5 per cent level) forecast errors.

## 3.8    Conclusion

Theoretical and empirical doubt has been cast on the concept of the NAIRU. The alternative model, the MRU, employs plausible notions of labour market imbalances and cyclical adjustment processes and explains how these mechanisms condition wage determination. The hypothesis that these mechanisms contribute to a cyclically sensitive, macroequilibrium unemployment rate is not rejected by the data.

The NAIRU hypothesis suggests that any aggregate policy attempt to permanently reduce the unemployment rate below the current natural rate inevitably is futile and leads to ever-accelerating inflation. The vertical Phillips curve is accepted by most economists, monetarists and Keynesians alike (see Tobin, 1980a; Lucas, 1981). Lucas (1981: 560) argues that the major macroeconomic research in recent years has tried to combine a plausible account of cyclical behaviour with the 'long-run' NRU hypothesis. We suggest that a short-run analysis based on non-NRU concepts is inconsistent with a Friedman long-run. The long-run is a sequence of short-runs (Fair, 1984: 31). Given our analysis it is remarkable that the long-run properties of the NRU models have retained credence. This implies that the 'major macro-research efforts' have been misdirected. Indeed, the evidence would suggest that the NAIRU-NRU concepts do not provide a robust foundation upon which useful theory can be built.

## Appendix

The following data was derived from NIF-10 Model Database (ABS 1313.0). All data is seasonally unadjusted:

$w$ - log of adult weekly award wages

$p$ - log of all groups CPI on a weighted average capital cities basis

$E$ - log of average weekly earnings of non-farm wage and salary earners

$U$ - ABS survey unemployment rate


Other data:

$S$ - log of average working days lost to number of civilian non-farm wage and salary earners, ABS 6322.0, 6203 respectively.

**Notes:**

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[1] The NRU and NAIRU both associate a particular level of unemployment with a stable inflation rate. The former is strictly confined to a Walrasian general equilibrium world. The NAIRU is less constrained and can be consistent with disequilibrium phenomena not arising from misperceptions or slow adjustment. The plausibility of the NRU hypothesis is widely challenged (see Tobin, 1980a; Burns and Mitchell, 1983).

[2] Assuming simple price mark-up model, $\dot{p} = \dot{w} - \dot{g}$ if the mark-up ($m$) is constant. $\dot{w} < \dot{g}$ is fully transmitted into $\dot{p}$ through $m$. Firms facing quantity constraints in the product market may cut margins as wage pressures mount rather than lose their market share. Thus $\dot{p} = \dot{w} - \dot{g} + \dot{m}$, where $\dot{m}$ is normally assumed to be zero. The equilibrium real wage growth (assuming a simple Phillip's Curve) can be written as $\dot{w} - \dot{p} = (\dot{g} - \dot{m}) + f(u)$; $f(u) = 0$. The expression $(\dot{g} - \dot{m})$ reflects forces, which influence real wage growth independent of excess demand for labour. Other variables could add generality to the constant term (see Thirlwall, 1983).

[3] In the medium term, increasing labour market segmentation (more jobs subject to internal labour market arrangements) also promotes the wedge between potential and actual excess labour supply and thereby increases the upward bias (a ratchet) in the excess supply of labour-wages demand relationship.

[4] Okun (1973) and Vroman (1977) provide impressive evidence that the gains from mobility, skill acquisition and output by maintaining a high-pressure economy are significant. Okun maintains this as the basic reason why government should eschew deflationary strategies.

[5] If firms are quantity constrained (excess capacity) and workers are not at their margin of indifference, then both parties respond to increased demand for the output and/or services in quantity terms. With rationing a firms labour demand is not a function of the real wage. Dornbusch and Fischer (1984) claim that Burns and Mitchell (1983) argue that current and expected sales, not wages determine employment. This misrepresents the argument, which is contingent on the state of the cycle and the existence of positive adjustment costs. Some cost pressures may accompany an expansion (via OJT) but if involuntary unemployment exists the current real wage is sufficient to induce labour supply. Procyclical productivity growth would help offset any adjustment costs associated with a firm's labour force expansion.

[6] Hargreaves-Heap (1980) uses an equation like (3.7) to show that the 'natural rate' is not constant from one time period to another. He argues that a range of explanations (including neoclassical and neo-Keynesian) can be used to justify the hysteresis hypothesis. Our explanation is post or neo-Keynesian in flavour.

[7] Hargreaves-Heap (1980) draws an interesting comparison between $\lambda$ and the adjustment coefficient found in an adaptive price expectation model. In the same way that people may only begin to internalise inflation after several years of high inflation, "... it is plausible to argue that another year of high unemployment will increase the numbers structurally unemployed when there has been a recent history of high unemployment."

[8] Even if $\lambda = 0$, the NAIRU estimates are cyclically sensitive as shown in Section 3.2.

[9] Coe and Gagliardi (1985: 11) estimate a wage equation for 10 OECD countries including Australia. They argue that the "implications of this hypothesis of hysteresis in the natural rate hypothesis: if the other structural factors affecting the natural rate are unchanged, then the deflationary (inflationary) impact will disappear over time as the natural rate catches up with the actual rate."

[10] Mitchell and Vella (1985) test rival explanations of award wage behaviour with an expectations-augmented Phillips Curve being outperformed in every guise by an institutionally specified equation

[11] We avoid the bias, non-minimum variance, multicollinearity (although unlikely with first differences) and any degrees of freedom problems associated with a Koyck Transformation. No overlapping residuals are constructed. A Koyck equation was estimated but matrix inversion problems associated with multicollinearity produced unreliable results. Both approaches were used successfully on UK data. Significantly, the estimated value of $\lambda$ derived from the Koyck equation (1-coefficient on lagged dependent) was very close to the value of $\lambda$ derived from the grid search procedure. A number

of starting dates were tried to test the sensitivity of the results. A complete description of the procedure including the various runs using different values of lambda is available from the author.

[12] The available macro data inhibits our ability to develop sophisticated expectations variables. Kirby (1981) correctly notes that any test of an expectations coefficient involves a joint test of the parameter and the generating mechanism. Discriminating between the two is difficult. We experimented with Box-Jenkins model as a possible proxy expectations generator. The logic is as follows. Some unknown model generated the actual price series. If an adequate forecasting model can be discerned then via observational equivalence postulates it can be used as if it is the true model. The main conclusion by this author is that the actual series is virtually identical to the forecasts if the ARIMA process is identified properly. Given the paucity of economic meaning behind such modelling we did not use the forecasts in the subsequent estimation.

[13] Non-wage strikes were excluded with no noticeable changes. One clarification is necessary. If $u^* = u$ (MUG zero) then by definition the inflationary impulses emanating from the bargaining process are zero. S represents bargaining conflict and shows of strength by workers to the Commission. If S entered the wage equation in its current form a zero restriction must be placed on it when $u^* = u$. By lagging S we avoid this complexity and maintain our general *inertia-lagged impact* approach.

[14] The results with $\lambda = 0.6$ were similar and indicate that the properties of the model were not predicated on a convenient value of $\lambda$. Values below 0.5 and above 0.6 produced poor results. The stability of the MUG5 equations could indicate that $\lambda$ itself does not fluctuate within the sample period.

[15] SSRU is the unrestricted sum of squared residuals and SSRR is the restricted counterpart. The ratio is asymptotically distributed as $\chi^2$ with degrees of freedom equal to the number of imposed restrictions (Dawson, 1981).

[16] Estimated coefficients on lagged dependent variables are generally biased downwards in small samples and no attempt is made to gauge the extent of the bias. The bias decreases proportionately with the number of observations, but expands proportionately with the number of observations, but expands proportionately to the order of lag. Overlapping lags thus maintain the bias even though quarterly data is used.

[17] Mitchell and Vella (1985) use an interactive variable to test for non-linearities in the strike response. It successfully subsumes the strike and dummy variables into one variable.

[18] The Chow $F$ statistics were very low but are only an approximate guide due to the large sample estimation technique employed.

# Chapter 4 What is the Full Employment Unemployment Rate? Some Empirical Evidence of Structural Unemployment in Australia, 1966 to 1986

## 4.1 Introduction

Australia has recently witnessed growth in employment, which has compared favourably with contemporary trends in job creation in other economies and with our own historical achievements. Despite the growth, we have not seen a large decline in the national unemployment rate. Various explanations have been offered to explain this disturbing paradox. A popular account suggests that the full employment unemployment rate (FNUR) has risen from around 2 per cent in the 1960s to 8 per cent in the 1980s.

This Chapter assesses the claim that a structural deterioration in our unemployment situation has occurred. Section 4.2 briefly reviews the concepts of structural and cyclical unemployment. Section 4.3 section examines some indicators of structural changes in the labour market and calculates the effects of compositional changes in the labour force on the aggregate unemployment rate. Further, an index of structural unemployment, which traces changes in the distribution of the burden of unemployment across specific labour force groups over time, is calculated. Section 4.4 employs a regression framework designed to measure the possible structural (time) effects on the unemployment rate. Section 4.5 concludes that some unexplained structural effects have occurred in the Australian labour market since 1966 but they are not large enough to support the view that the FNUR is now around 8 per cent.

## 4.2 Structural and cyclical unemployment hypotheses

Demand deficient unemployment occurs when the number of people wanting gainful employment exceeds the number of vacancies being offered. The composition of the unemployed relative to the skills demanded is not the binding constraint. Alternatively, the classification of unemployment as structural describes unemployment that results from imbalances in the supply of, and demand for, labour in a disaggregated context. A simple case arises which highlights the difference as to which constraint is promoting the unemployment. If at the aggregate level the number of unemployed is equal to the number of vacancies then (abstracting from seasonal and frictional influences) this unemployment would be termed structural.

Structuralists suggest that structural imbalances can originate from both the demand and supply sides of the economy. Technological changes, changes in the pattern of consumption, compositional movements in the labour force and welfare programme distortions are among the pot-pourri of influences listed as promoting the structural shifts.

The distinction between demand deficient and structural unemployment is usually considered important at the policy level. Macro policy will alleviate demand deficient unemployment, while micro policies are needed to redress the demand and supply mismatching characteristic of structural unemployment. In the latter case, macro expansion may be futile and inflationary.

Recently, some economists have argued that structural changes may be cyclical in nature (the hysteresis effect). A prolonged recession may create conditions in the labour market which mimic structural imbalance but which can be redressed through aggregate policy without fuelling inflation (see Mitchell, 1987a).

Very little econometric work has been done in Australia to determine whether the FNUR has risen to 8 per cent. A major difficulty is that proximate indicators of the structural factors must be relied upon because the underlying structural characteristics are largely unobservable. The Organisation for Economic Cooperation and Development (1986), for example, argues that wage equation studies, which compute the unemployment rate where wage and hence price inflation is stable, reveal that the non-accelerating inflation rate of unemployment (NAIRU) has risen. However, a number of articles have recently shown the possible flaws in this approach to deducing the natural rate of unemployment from aggregate wage and price equations (see Mitchell 1987a).[1]

Despite this difficulty several indicators of labour market activity can be examined to help us assess in probabilistic terms, at least, the relative strengths of the various hypotheses seeking to explain the current unemployment situation.

## 4.3    Some simple empirical indicators of structuralism

### 4.3.1    Compositional Changes in the Labour Force

Perry (1970), seeking a 'non-natural' explanation for the ostensible shift in the Phillip's curve during the late 1960s, popularized the idea that the FNUR had increased because the share of groups with higher than average unemployment rates in the labour force had increased.[2]

Mitchell (1984: 137) argues that

> … if demographic factors are to blame for the upward shift in Australia's unemployment rate, then the groups experiencing high unemployment rates must have grown drastically as a proportion of the work force. This has not been the case in Australia, where conflicting tendencies have been at work.

Table 4.1 confirms this conclusion. The unemployment rate in column 2 is the specific unemployment rate for the group in question as at November 1985 and the aggregate unemployment rate (total) is the weighted-average of these specific rates using 1985 labour force weights. Column 5 calculates the weighted-average of the specific unemployment rates as at November 1985 using the labour force weights, which prevailed in November 1968. Thus, the adjusted unemployment rate shows the unemployment rate, which would have existed in November 1985 if the composition of the labour force with respect to age and sex had been the same as it was in November 1968. The male unemployment rate would have been lower (by only 0.07 percentage points), while the female rate would have been slightly higher (by 0.71 percentage points). The aggregate (persons) rate is 0.3 percentage points higher when age-sex changes are allowed for.

Columns 6 and 7 show the changing percentage contributions of each specific age-sex group to the relevant aggregate 1985 unemployment rate. This change is expressed in terms of the compositional variations that have occurred since 1968. The offsetting nature of the compositional changes is clearly shown. For example, the 15-19 group (for persons) now contributes less to the aggregate unemployment rate in weighted, relative terms. Smaller contributions are also made by the above 45 years group.

On the other hand, the 20-44 prime-age group is now relatively more important in weighted terms as a consequence of the labour force changes.

Consequently, we reject the view that compositional changes in the labour force have been responsible for anything but the smallest increase in the aggregate unemployment rate (based on age-sex participation adjustments).

**Table 4.1 Comparison between November 1985 Unemployment Rates (UNE Rates) by Age and Sex using Current and 1968 Labour Force Weights**

| Age Group | November 1985 UNE Rate | LF Weight | | Weighted UNE Rate | | Contribution to Total 1985 UNE rate (per cent) | |
|---|---|---|---|---|---|---|---|
| | | 1985 | 1968 | 1985 Weight | 1968 Weight | 1985 Weight | 1968 Weight |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **Males** | | | | | | | |
| 15-19 | 16.6 | 0.09 | 0.09 | 1.49 | 1.49 | 21.50 | 21.63 |
| 20-24 | 10.9 | 0.13 | 0.13 | 1.42 | 1.42 | 20.44 | 20.62 |
| 25-34 | 6.1 | 0.27 | 0.22 | 1.65 | 1.34 | 23.75 | 19.46 |
| 35-44 | 4.0 | 0.24 | 0.22 | 0.96 | 0.88 | 13.83 | 12.78 |
| 45-54 | 4.6 | 0.16 | 0.19 | 0.74 | 0.87 | 10.65 | 12.63 |
| 55-59 | 6.0 | 0.07 | 0.09 | 0.42 | 0.54 | 6.05 | 7.84 |
| 60-64 | 6.8 | 0.04 | 0.05 | 0.27 | 0.34 | 3.88 | 4.94 |
| Total | | 1.00 | 1.00 | 6.95 | 6.88 | 100.00 | 100.00 |
| **Females** | | | | | | | |
| 15-19 | 18.6 | 0.13 | 0.19 | 2.42 | 3.53 | 30.06 | 40.31 |
| 20-24 | 9.1 | 0.17 | 0.19 | 1.55 | 1.73 | 19.25 | 19.75 |
| 25-34 | 6.9 | 0.26 | 0.17 | 1.79 | 1.17 | 22.24 | 13.35 |
| 35-44 | 5.9 | 0.24 | 0.20 | 1.42 | 1.18 | 17.64 | 13.47 |
| 45-54 | 4.6 | 0.14 | 0.17 | 0.64 | 0.78 | 7.95 | 8.91 |
| 55-64 | 4.5 | 0.05 | 0.08 | 0.23 | 0.36 | 2.86 | 4.11 |
| Total | | 1.00 | 1.00 | 8.05 | 8.76 | 100.00 | 100.00 |
| **Persons** | | | | | | | |
| 15-19 | 17.6 | 0.10 | 0.13 | 1.76 | 2.29 | 24.02 | 30.00 |
| 20-24 | 10.1 | 0.15 | 0.15 | 1.52 | 1.52 | 24.74 | 19.92 |
| 25-34 | 6.4 | 0.27 | 0.21 | 1.73 | 1.34 | 23.61 | 17.56 |
| 35-44 | 4.7 | 0.24 | 0.21 | 1.13 | 0.99 | 15.42 | 12.98 |
| 45-54 | 4.6 | 0.15 | 0.19 | 0.69 | 0.87 | 9.42 | 11.40 |
| 55-59 | 5.6 | 0.06 | 0.07 | 0.34 | 0.39 | 4.64 | 5.11 |
| 60-64 | 5.7 | 0.08 | 0.04 | 0.17 | 0.23 | 2.32 | 3.00 |
| Total | | 1.00 | 1.00 | 7.33 | 7.63 | 100.00 | 100.00 |

All weights are calculated with respect to the relevant total labour force total. Labour force participants in the age group >65 were deducted from each sex category.

**Sources:** ABS, *The Labour Force*, Cat. No. 6203. ABS, *The Labour Force, 1964 to 1968, Historical Supplement*, Ref. No. 6.22.

## 4.3.2  The structure of unemployment

How has aggregate unemployment been distributed across the labour force? At any point in time a number of distributions of unemployment rates among the various labour-force groups can be consistent with any one aggregate unemployment rate. The more disproportionate the dispersion in unemployment relative to the labour force distribution, the greater will be the proportion of unemployment accounted for by structural unemployment.

The structure of unemployment has been defined as the distribution of the unemployed among different groups of workers relative to the distribution of the labour force (Kleiman 1968: 146). The structure of unemployment therefore changes whenever the unemployment rates of specific labour force groups exhibit non-equiproportionate movements. These changes could be due to structural variations in the composition of final consumer demand, to frictional factors whereby some workers in specific labour force cohorts) move between jobs more quickly than others, or to aggregate demand fluctuations impacting unevenly across the labour market groups.[3]

A useful ratio can be constructed which measures the relative variation of the unemployment rate of the unemployed to the unemployment rate of the labour force in general. From the point of view of the person unemployed, the probability of leaving unemployment is inversely related to the unemployment rate of the specific labour force group to which that worker belongs. The *average* unemployed worker's probability of resuming employment therefore is related to the unemployment rate of the sector to which the *average* unemployed worker belongs. This rate $\left( u^* \right)$ is defined as the average of the individual group unemployment rates weighted by the composition of unemployment.

If $ur_i$ is the specific unemployment rate of the $i^{th}$ group, $u_i$ is the total unemployed belonging to the $i^{th}$ group, and $u$ is total unemployment, then

**Eqn 4-1** $$u^* = \sum ur_i \left( u_i / u \right)$$

The aggregate unemployment rate *urt* is the labour force weighted average of the specific unemployment and represents the probability that the average worker in the labour force will become unemployed.

Thus if $L_i$ is the labour force of the ith group and $L$ is the total labour force, then

**Eqn 4-2** $$urt = \sum ur_i \big( L_i / L \big)$$

If the specific group unemployment is proportional to the labour force distribution $u^*$ will equal *urt*. The ratio $\big( u^*/urt \big)$, which we term the Structural Unemployment Index (SUI), indicates the extent to which unemployment is distributed disproportionately with respect to labour force composition across specific groups.

The SUI will only change if changes in the aggregate unemployment rate for the group in question are associated with changes in the dispersion of unemployment rates for the groups comprising the aggregate (see Hirschman, 1964). Thus if large variations in the SUI occur when the overall unemployment ratio fluctuates it is indicative of the changing fortunes of the various groups. Figure 4.1 shows the male and female SUI's plotted against time.

The male index (SUIM) is above the female index (SUIF) for most years although the overall unemployment level was higher among females over the sample period. A plausible explanation for this could relate to a lower degree of relative specialization among females and greater relative homogeneity of skills within female occupations. Both indices clearly rise as the overall level of unemployment rises.

Figures 4.2 and 4.3 plot the SUIM and SUIF against the aggregate unemployment rate respectively. In terms of the structural hypothesis there appears to be a distinct change in the relationship between SUIF and *urt* since 1975. For males, the change is similar but less intense. Of note is the fact that both indices rose during the mid-70s as *urt* increased, but have fallen again despite the persistence of high aggregate unemployment rates. This means that the unemployment burden has become more evenly distributed across labour force groups over time, which is a result more consistent with a demand deficit economy rather than an economy stricken by structural imbalance.

## 4.4    Proportionality or structural shifts? – a regression framework

The analysis in the previous section albeit simple and selective does not suggest that large-scale structural deterioration in the labour market has occurred. In this section, regression analysis is used to examine the structural hypothesis in more detail. At any point in time the unemployment rate of a specific age-sex group *ur* can be modelled as a function of the aggregate unemployment

rate *urt* and other unspecified factors. Referring to Figure 4.4, let **a** and **b** represent observations of *ur* and *urt* at two points in time. We could interpret the rise in *ur* as a movement along some given function indicating a downturn in the business cycle. An alternative view could explain the movement from **a** to **b** in terms of a structural shift in the function. The shift could be gradual over time or the result of a sudden change. A related hypothesis is that the slope of the function could change.

Each of these hypotheses can be nested in a simple econometric model. We use the following equation

**Eqn 4-3** $$ur_t = \alpha_0 + \alpha_1 urt_t + \alpha_2 \text{time} + \varepsilon_t$$

where *ur* and *urt* are as defined above, time is a linear time trend, and $\varepsilon$ is a random noise term.

Three structural hypotheses can potentially be examined in this model:

(a)     that the functional relationship between *ur* and *urt* has shifted smoothly over time (evidenced by a significant time coefficient);

(b)     that the relationship has shifted in a one-off or sudden way at some specific point in time (evidenced by any finding of instability in the equations); and

(c)     that the function has changed its slope.[4]

We should clearly note that our model does not allow us to draw conclusions about the specific sources of any detected structural changes. If the variables designed to capture (a), (b) and (c) are statistically significant then the structural hypotheses in general cannot be hastily rejected. However, in distinguishing smooth from discontinuous shifts the model may guide our thinking about the likely factors involved.

### 4.4.1    Unemployment by sex

Equation (4-1) was initially estimated for males and females using quarterly data. The results for males are reported in Table 4.2. Some problems with autocorrelation were encountered although serious misspecification is not indicated. The signs and the magnitudes of the coefficients are plausible and the equations satisfied some more detailed diagnostic testing (reset test, parameter constancy tests and LM tests for residual variance were all satisfactory).

**Table 4.2. Male Unemployment Rate Regressions: 1967(1) to 1986(3)**

| Variable | Equation | | | |
|---|---|---|---|---|
| | 2.1[a] | 2.2[a] | 2.3[a] | 2.4[b] |
| Constant | -0.50 | 1.21 | 1.35 | 0.59 |
| | (31.41) | (1.52) | (1.76) | (0.99) |
| Time | 0.003 | 0.004 | 0.004 | 0.004 |
| | (3.78) | (4.33) | (4.35) | (4.27) |
| urt | 1.13 | 1.13 | 1.14 | 1.13 |
| | (45.78) | (46.91) | (48.38) | (43.35) |
| fpr | | -0.47 | -0.51 | -0.38 |
| | | (2.16) | (2.43) | (1.57) |
| D704 | | | 0.12 | 0.11 |
| | | | (2.61) | (2.59) |
| | | | | |
| $R^2$ | 0.99 | 0.99 | 0.99 | |
| S.E. (x 100) | 4.56 | 4.43 | 4.23 | 4.05 |
| DW | 1.17 | 1.25 | 1.23 | 1.14 |

*t* statistics in parentheses.
(a) Equations were estimated for 1967(1) to 1986(3) using OLS. The dependent variable in each case was the log of the male unemployment rate regressed on a constant, a linear time trend, the log of the aggregate unemployment rate (urt), the log of the female participation rate (fpr) and seasonal dummies. D704 is a dummy equal to unity in 1970(4) and zero otherwise.
(b) Instrumental variable estimation for 1968(2) to 1986(3) with urt and for being instrumented. Instruments used were urt (-1), urt (-2), fpr (-1), fpr (-2) and other exogenous regressors in the model. A Durbin-Hausman test for the endogeneity of urt and frp was performed. The real hypothesis (of no endogeneity) was accepted and thus it is not surprising that the instrumental variables estimates reported in equation 2.4 are very similar to the OLS counterpart in equation 2.3.

The aggregate unemployment rate dominates the level of the male unemployment rate and the results indicate that males suffer disproportionately in a recession. All estimated equations reveal that a significant upward trend has occurred, increasing the male unemployment rate for any given aggregate unemployment rate by approximately 1.25 per cent over the entire sample.

No structural breaks in the basic model were detected despite some instability in the early 1970s. An examination of the residuals from equation 2.2 (in Table 4.2) reveals that some instability occurred in 1970(4). In estimated equation 2.3, a dummy (D704) was included and an examination of the latter indicated that a significant shock to the relations occurred in this quarter.

**Table 4.3. Female Unemployment Rate Regressions: 1967(1) to 1986(3)**

| Variable | Equation | | | | |
|---|---|---|---|---|---|
| | 3.1[a] | 3.2[a] | 3.3[c] | 3.4[d] | 3.5[d] |
| Constant | -1.08 | -2.92 | -2.58 | -0.21 | -1.68 |
| | (1.23) | (2.95) | (2.26) | (0.18) | (1.13) |
| Time | -0.005 | -0.009 | -0.01 | -0.005 | -0.007 |
| | (5.91) | (6.31) | (6.51) | (3.03) | (4.21) |
| urt | 0.88 | 0.91 | 0.95 | 0.91 | 0.71 |
| | (34.87) | (35.75) | (33.13) | (30.09) | (15.75) |
| fpr | 0.45 | 0.98 | 0.89 | 0.27 | 0.75 |
| | (1.97) | (3.57) | (2.82) | (0.67) | (1.87) |
| D7986 | | 0.08 | 0.09 | | |
| | | (3.13) | (3.85) | | |
| | | | | | |
| $R^2$ | 0.99 | 0.99 | | 0.98 | 0.98 |
| S.E. (x 100) | 4.65 | 4.38 | 4.11 | 4.27 | 2.39 |
| DW | 0.77 | 0.87 | 0.79 | 1.10 | 1.82 |

$t$ statistics in parentheses.
(a) See note (a), Table 4.2.
(b) D7986 is a dummy variable equal to zero until 1979(3) and unity thereafter.
(c) See note (b), Table 4.2.
(d) Equation 3.4 was estimated over 1967(1) to 1979(2) whereas equation 3.5 was estimated over 1979(3) to 1986(3). The $F(7,65)$ statistic for parameter constancy in equation 3.1 was equal to 6.599 indicating that the split in the sample at 1979(2) is significant.

One possible influence on unemployment rates is the level of labour force participation. The male participation rate however was found to exert no influence. Following Wachter (1976), the female participation rate (fpr) was included to pick up possible substitution effects. Estimated equation 2.2 indicates that the male unemployment rate is favourably affected by the increased for over the sample period.[5]

In contrast to the male results, estimated equation 3.1 in Table 4.3 shows that the relative position of females improved over time. Time factors account for a 1.5 per cent decrease in the level of the female unemployment rate for any given urt. Time factors appear to be a more important part of the explanation for females compared to males.[6] Another difference is that females do not suffer as much as males when urt increases.

The fpr variable was significant and reveals that increases in the female participation rate has exerted upward pressure on the female unemployment rate. This could suggest that the increased female participation observed over the sample period was not induced by an increased demand for

female labour but was more likely to be the result of supply side changes (attitudes to women, and the like).

Estimated equation 3.2 includes a dummy variable (D7986) because evidence of instability in the behaviour of the residuals was detected in estimated equation 3.1 for the post 1979 period. The significance of this term indicates that after 1979(3) the female unemployment rate was a level higher than it was in the earlier period. Estimation of the female equations was plagued by serial correlation problems and other evidence of misspecification (appropriate reset and LM tests were not favourable). These problems would be consistent with a structural break in the model. An *F*-test for within-sample parameter constancy (sample split at 1979(3) did not support the null and this confirms the conclusion drawn from equation 3.2 (significance of D7986) that a structural break occurred in the model in the late 1970s. It is clear that problems of misspecification are reduced when the model is estimated for the later period.

The equations were also estimated in difference form with the constant term indicating the significance of time factors. Simple quarterly changes (assuming rho = 1) were unsatisfactory but a four quarter change specification appeared to overcome the severe autocorrelation and confirmed the results in equation 3.3 with respect to the significance, signs and magnitudes of the regressors used.[7]

### 4.4.2    Unemployment by age and sex

The highly aggregated male and female regressions only measure broad labour market changes. The model for males and females was disaggregated into age groups and re-estimated to explore age effects. A popular *a priori* expectation is that significant time effects should be found for the young (both sexes) and less so for the prime-age groups. However, the disaggregation was not without a cost. Annual data (August quarter) was only available and this reduces the degrees of freedom considerably. Caution must therefore be exercised in interpreting the results.

Table 4.4 reports the results for males from 1966 to 1986. Estimated equations 4.1 and 4.2 focus on the 15-19 age group. As expected this group suffers disproportionately in a cyclical downturn (a 1.15 per cent increase in their unemployment rate for every 1.00 per cent increase in the national unemployment rate in estimated equation 4.2). The use of last-in-first-out hiring practices (especially in the relatively unskilled occupations) and the lack of experience and training among the youth can explain this result.

The hypothesis of a smooth structural deterioration in the relative position of this group is not rejected by the results. Over the sample period gradual increases in the 15-19 year old male unemployment rate for any given aggregate unemployment rate is estimated to be approximately

2.50 per cent, a significant though small change. Estimated equation 4.2 shows that some instability was detected in 1973, when a one-off increase in the group's unemployment rate occurred. Evidence of significant supply effects (independent of cyclical participation changes) was found.

**Table 4.4. Male Unemployment Regressions by Age Groups, 1966-1986[a]**

| Variable | Age Group | | | | |
|---|---|---|---|---|---|
| | 15-19 | | 20-24 | 35-44 | 45-54 |
| | Equation | | | | |
| | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 |
| Constant | 0.24[b] | 0.19[b] | -0.20 | -0.73 | -0.74 |
| | (2.74) | (2.55) | (5.84) | (20.80) | (13.75) |
| Time | 0.04 | 0.02 | 0.03 | 0.00 | -0.03 |
| | (2.21) | (1.37) | (3.21) | (0.21) | (2.40) |
| urt | 1.02 | 1.15 | 1.15 | 1.05 | 1.44 |
| | (8.73) | (10.13) | (15.19) | (14.66) | (10.02) |
| Pop 15[c] | 3.38 | 2.80 | | | |
| | (2.81) | (2.62) | | | |
| D73[d] | | 0.28 | | | |
| | | (2.55) | | | |
| D7581[d] | | | | 0.25 | |
| | | | | (6.64) | |
| D7580[d] | | | | | -0.29 |
| | | | | | (3.98) |
| $R^2$ | 0.98 | 0.99 | 0.99 | 0.99 | 0.98 |
| S.E. (x 100) | 10.92 | 9.48 | 7.31 | 7.38 | 11.38 |
| DW | 1.90 | 2.20 | 1.82 | 2.25 | 1.96 |

*t* statistics in parentheses.
(a) OLS regressions with the log of the specific unemployment rate regressed on a constant, the log of the aggregate unemployment rate (urt), a linear time trend, a population variable, and dummy variables where appropriate.
(b) Constant times 100.
(c) Pop 15 represents the total number of working age 15-19 year olds relative to the total working age population.
(d) D73 = 1 in 1973, zero otherwise; D7881 = 1 for 1978 to 1981 (inclusive) and zero otherwise; D7580 = 1 for 1975 to 1980 (inclusive) and zero otherwise.

Estimated equation 4.3 for 20-24 year olds shows that recession impacts disproportionately. Statistically significant structural shifts are detected, and over the sample period account for an autonomous increase in the 20-24 year olds unemployment rate of approximately 1.9 per cent. No sudden shocks or supply effects were detected.

**Table 4.5. Female Unemployment by Age Groups, 1966-1986[a]**

| Variable | Age Group | | | | |
| | 15-19 | 15-19 | 15-19 | 20-24 | 35-44 |
| | Equation | | | | |
| | 5.1 | 5.2 | 5.3 | 5.4 | 5.5 |
|---|---|---|---|---|---|
| Constant | 0.13 | 0.11 | 0.13 | 0.57 | -0.70 |
| | (6.78) | (5.38) | (8.03) | (14.47) | (3.19) |
| Time | 0.05 | 0.04 | 0.05 | -0.02 | -0.02 |
| | (3.34) | (3.25) | (4.77) | (1.81) | (2.44) |
| urt | 0.97 | 0.78 | 0.84 | 0.98 | 0.30 |
| | (10.20) | (5.33) | (7.79) | (11.92) | (5.35) |
| Pop 15[b] | 6.20 | 5.03 | 6.26 | | |
| | (6.32) | (4.84) | (7.37) | | |
| D75[c] | | 0.30 | 0.22 | | |
| | | (2.28) | (2.08) | | |
| D78[c] | | | -0.25 | | |
| | | | (3.65) | | |
| D7881[c] | | | | 0.12 | |
| | | | | (2.35) | |
| Pop 24[b] | | | | | -8.17 |
| | | | | | (3.59) |
| D71[c] | | | | | -0.19 |
| | | | | | (3.19) |
| $R^2$ | 0.98 | 0.98 | 0.99 | 0.98 | 0.95 |
| S.E. (x 100) | 8.89 | 8.04 | 6.04 | 8.00 | 5.45 |
| DW | 1.72 | 1.81 | 1.22 | 2.51 | 1.93 |

*t* statistics in parentheses.
(a) See note (a) Table 4.4
(b) See note (c), Table 4.4. Pop 24 is the corresponding ratio for the 24-65 years old group.
(c) D73 = 1 after 1975, zero before D78 = 1 in 1978, zero otherwise and D71 = 1 in 1971 and zero otherwise.

Estimated equation 4.4 shows the prime-age male unemployment experience is dominated by near proportional cyclical effects (the 95 per cent confidence interval on *urt* is 0.91 to 1.19). When dummy variables were used in estimated equation 4.5 to correct for instability in the late 1970s, the time effects were found to be negligible. The results for the older male prime-age group did not mirror the 35-44 year olds' group. This group clearly suffers disproportionately in the downturn, possibly due to redundancy and skill obsolescence. Significant favourable time effects are also revealed.

Table 4.5 reports similar regressions for female age groups. While the time effects replicate the results for the male (15-19 group), estimated equations 5.1 and 5.2 suggest that the cyclical impact on the females is lower. Supply effects were found to be a significant influence in explaining the upward rise in this cohort's unemployment rate. Estimated equation 5.1 was not stable and a dummy variable D75 in equation 5.2 indicates that a significant structural break in the model occurs after 1975.

Equation 5.5 shows that the severity of the cycle decreases as age increases, a result, which is explained by the idea that firms and workers form long-term attachments that go beyond the cycle. Prime-age females appear to be even more insulated from cyclical downturns than their male counterparts. Gradual time effects, while detrimental to the 15-19 year old age group, appear to be favourable for older females. Unfortunately, data restrictions did not allow regressions for older females to be estimated.


## 4.5    Conclusion

The following points can summarize the basic findings of this research:

- Unemployment rates in Australia since 1967 for a variety of age groups (both males and females) are predominantly a function of cyclical factors.
- Structural changes have influenced unemployment rates. The position of certain demographic groups has deteriorated while for others the relative change has been favourable. The SUI for males and females suggest that some dislocation (that is, increased severity in the structure of unemployment) occurred in the labour market during the mid-1970s but that unemployment is now more evenly distributed with respect to labour force composition.
- Participation rate changes only appear to influence the unemployment rate of young males and females.
- The overriding evidence derived from an array of indicators consistently point to a 'structural rise' in the unemployment rate of approximately 2 to 3 per cent. The FNUR may, therefore, realistically be considered to be around 4 to 4.5 per cent of the labour force. A figure of 8 per cent is unsupported and would appear to be imaginative.

Unfortunately, the type of questions we would like to ask are difficult to translate into concepts which can be meaningfully tested against the available data. This Chapter has used a range of proximate indicators to provide some limited insight into the questions which labour economists find bedevilling. The author recognises the problems, which are associated with most of the results reported, and prefers them to be seen as part of an on-going attempt to paint a more finely detailed picture. Clearly, the study has exposed a range of interesting statistical facts, which require more empirical analysis, guided by carefully formulated theory.

**Figure 4.1 Structural Unemployment Indexes**



**Figure 4.2 SUIM and the Aggregate Unemployment Rate**
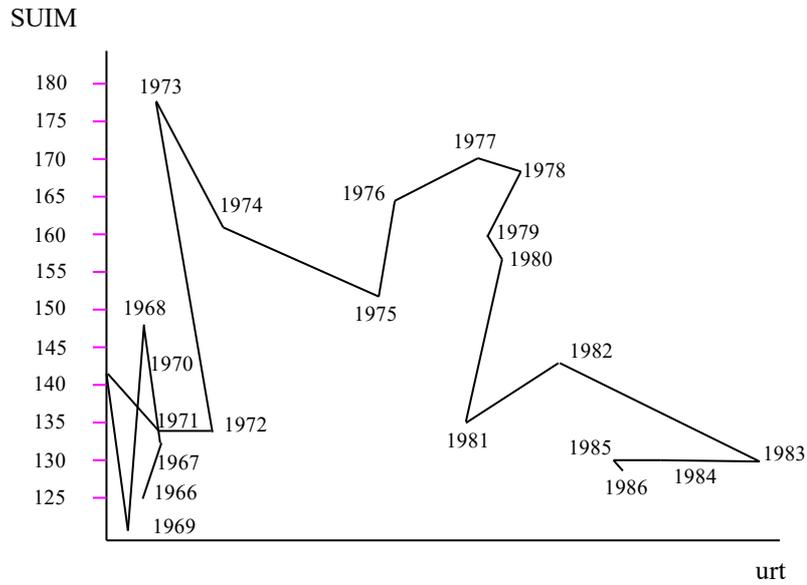
**Figure 4.3 SUIF and the Aggregate Unemployment Rate**
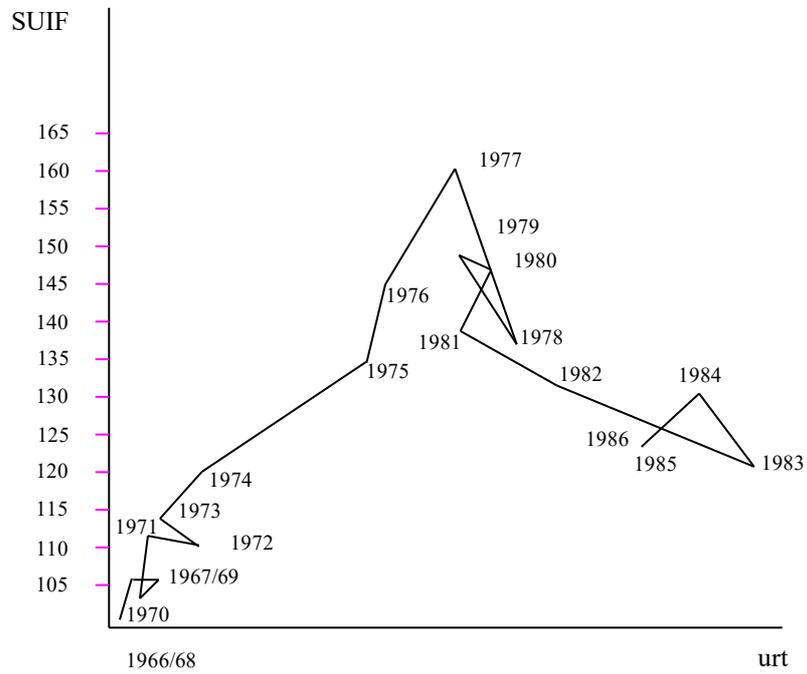


**Figure 4.4 Structural and Cyclical Shifts**
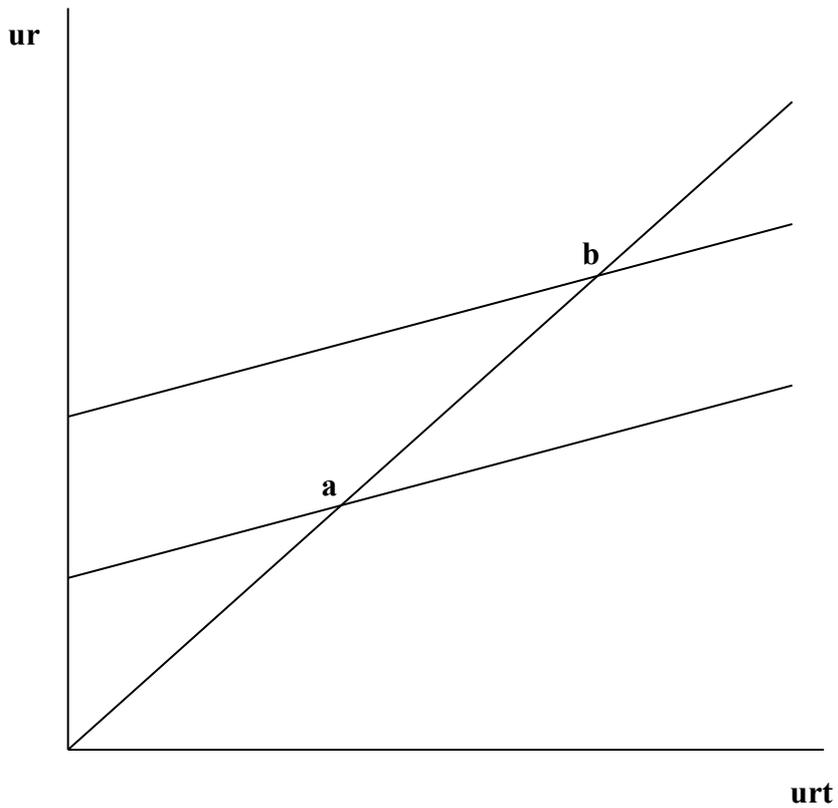
**Notes:**

[1] The NAIRU and the FNUR are not equivalent although they are usually considered to be. The former relates some specific unemployment rate to a steady rate of inflation, whereas the latter is more generally a description of quantity relations (demand and supply) in the labour market.

[2] Other decompositions could be studied, like changing educational or industrial composition, which would tend to lower the aggregate unemployment rate over time.

[3] The structure of unemployment can be distinguished from the conventional notion of structural unemployment, which is usually defined in terms of non-cyclical causes.

[4] Attempts to distinguish between shift and slope changes in the empirical analysis were hampered by collinearity problems (largely data based) and the results are not reported.

[5] The population variable was the working age population in the relevant age-sex group as a proportion of the total population of working age. A relative labour force variable was also used but due to the obvious endogeneity of the latter the more general population variable was considered superior (see Wachter, 1976).

[6] The partial correlation coefficients for the time variable in male and female equations were 0.16 in estimated equation 2.1, 0.21 in estimated equation 2.2, 0.21 in estimated equation 2.3, 0.33 in estimated equation 3.1 and 0.35 in estimated equation 3.2.

[7] The regressions were re-estimated after a maximum likelihood correction for first order serial correlation was made. The results were not significantly different from the uncorrected estimates. The complete results are available from the author.

# Chapter 5          The Scandinavian Model of Inflation and its Applicability to Australian Wage Setting

## 5.1     Introduction

This Chapter discusses the applicability of the so-called Scandinavian Model (SM) of inflation to the design of wage setting principles in Australia. It is motivated by three major factors. First, Australia like the Scandinavian countries (Sweden being typical) is a small economy exposed to international trading markets. Second, institutions dominate wage fixing in Australia and Sweden, although there are substantial differences in the nature of the centralised institutional interaction in each country. Third, with Australia beset by on-going external payments problems, the task of maintaining international competitiveness is a central concern for wages policy.

Local commentators have argued that adjusting wages in line with domestic price movements endangers our international competitiveness. These concerns have led to the explicit discounting of wage increases in National Wage Cases (NWC) to account for the import price effects on the Consumer Price Index (CPI). The SM describes a wage setting system whose primary goal is to maintain the competitiveness of the trading sector. Accordingly, the SM could be useful in designing wage setting principles for Australia.

In this Chapter, we summarise the SM (with a more formal exposition appearing in the Appendix) and extend it to incorporate flexible exchange rates. We discuss how discretionary taxation policy can act as a quasi incomes policy by frustrating nominal wage demands. Finally, the empirical applicability of the SM for Australia is assessed.

## 5.2     The Scandinavian model

The SM dichotomises the economy into a competitive sector (C-sector) and a sheltered sector (S-sector). The C-sector produces products, which are traded on world markets, and its prices follow the general movements in world prices. The C-sector serves as the leader in wage settlements. The S-sector does not trade its goods externally. Under fixed exchange rates, the C-sector maintains price competitiveness if the growth in money wages in its sector is equal to the rate of change in its labour productivity (assumed to be superior to S-sector productivity) plus the growth in prices of foreign goods. Price inflation in the C-sector is equal to the foreign inflation rate if the above rule

is applied. The wage norm established in the C-sector spills over into wages growth throughout the economy.

The S-sector inflation rate thus equals the wage norm less its own productivity growth rate. Hence, aggregate price inflation is equal to the world inflation rate plus the difference between the productivity growth rates in the C- and S-sectors weighted by the S-sector share in total output. The domestic inflation rate can be higher than the rate of growth in foreign prices without damaging competitiveness, as long as the rate of C-sector inflation is less than or equal to the world inflation rate.

In equilibrium, nominal labour costs in the C-sector will grow at a rate equal to the *room* (the sum of the growth in world prices and the C-sector productivity). Where non-wage costs are positive (taxes, social security and other benefits extracted from the employers), nominal wages would have to grow at a lower rate. The long-run tendency is for nominal wages to absorb the room provided. However in the short-run, labour costs can diverge from the permitted growth path. This disequilibrium must emanate from domestic factors.

The main features of the SM can be summarised as follows:

1) the domestic currency price of C-sector output is exogenously determined by world market prices and the exchange rate;

2) the surplus available for distribution between profits and wages in the C-sector is thus determined by the world inflation rate, the exchange rate and the productivity performance of industries in the C-sector;

3) the wage outcome in the C-sector is spread to the S-sector industries either by design (solidarity) or through competition; and

4) the price of output in the S-sector is determined (usually by a mark-up) by the unit labour costs in that sector. The wage outcome in the C-sector and the productivity performance in the S-sector determine unit labour costs.

## 5.3    The role of Incomes Policy

An incomes policy would have to establish wage guidelines which would set national wages growth according to trends in world prices (adjusted for exchange rate changes) and productivity in the C-sector. This would help to maintain a stable level of profits in the C-sector. Whether this was an equilibrium level depends on the distribution of factor shares prevailing at the time the

guidelines were first applied. Clearly, the outcomes could be different from those suggested by the model if a short-run adjustment in factor shares was required. Once a normal share of profits was achieved the guidelines could be enforced to maintain this distribution.

A major criticism of the SM as a general theory of inflation is that it ignores the demand side. Uncoordinated collective bargaining and/or significant growth in non-wage components of labour costs may push costs above the permitted path. Where domestic pressures create divergences from the equilibrium path of nominal wage and costs there is some rationale for pursuing a consensus based incomes policy.

An incomes policy, by minimising domestic cost fluctuations faced by the exposed sector, could reduce the possibility of a C-sector profit squeeze, help maintain C-sector competitiveness, and avoid employment losses. Significant contributions to the general cost level and hence prices can originate from the actions by government. Payroll taxation, various government charges and the like may in fact be more detrimental to the exposed sector than increased wage demands from the labour market.

## 5.4    Flexible exchange rates

Although the SM was originally developed for fixed exchange rates, it can accommodate flexible exchange rates. Exchange rate movements can compensate for world price changes and local price rises. The domestic price level can be completely insulated from the world inflation rate if the exchange rate continuously appreciates (at a rate equal to the sum of the world inflation rate and C-sector productivity growth). Similarly, if local price rises occur, a stable domestic inflation rate can still be maintained if a corresponding decrease in C-sector prices occur. An appreciating exchange rate discounts the foreign price in domestic currency terms (see Mitchell 1989: 23).

For Australia, the prices for our commodity exports are determined in world markets, and are largely invariant of our supply intentions and our domestic cost structure. Thus, higher prices, other things equal, reflect increased world demand and indicate an increased ability to compete on world markets. Exchange rate movements can change the competitive position of the C-sector because they alter the relative price of our goods compared to foreign goods. Profitability in the C-sector will thus be influenced by both unit labour cost movements (wage and productivity changes) and by exchange rate changes.

Two considerations are therefore important. First, the C-sector is not necessarily as homogenous as the simplistic SM postulates. Second, exchange rate changes do not always reflect discretionary policy adjustments, and can occur in response to world price movements.

First, the SM developed by Aukrust, classified mining and manufacturing as key industries, whereas the agricultural industry was considered to be sheltered, oriented to home production (Aukrust, 1977). Agriculture and mining are the two key C-sector industries in Australia. If world demand for minerals and mineral prices rose, the SM would suggest that increased room was available to expand money wages. The government could stabilise domestic inflation by appreciating the exchange rate, but this would damage the competitiveness of the agricultural sector whose world demand was stable (or falling). Alternatively, if the wage rises occurred in response to the increased prosperity in the mining industry (with a fixed exchange rate), the increased costs would squeeze rural profitability. Either way the C-sector industries do not all experience uniformly favourable circumstances.

Second, exchange rates for commodity exporters have historically responded sympathetically to terms of trade changes. For example, the exchange rate may appreciate in response to a terms of trade improvement, as was the case in the 1974 and 1981 mining booms, which were both accompanied by massive investment in capital infrastructure. Further, expectations of boom conditions fuelled large industry wage bargains (led by the Motor Vehicle Industry Award in 1974, and the Metal Industry Agreement in 1981). This demand-induced wages growth was then transmitted throughout the wage structure locking certain industries (for example, the rural sector), and, eventually the whole economy, into an uncompetitive position. When the world prices fell, the exchange rate had to fall by a larger amount than it had risen to maintain competitiveness. The exchange rate fall had to compensate for the fall in world prices, in addition to the rise in domestic costs due to the wage rise.

One may ask why the employers did not demand wage restraint as the dollar appreciated (as they would have under SM guidelines). The crucial point is that the exchange rate movements respond to terms of trade changes after a lag. Thus, as the terms of trade improves, the expectations of prosperity lead to industry wage bargains before the exchange rate has risen sufficiently to provide the signal that restraint is in order.

The lesson is obvious. Terms of trade changes, which in the SM justify wage rises, also (in practice) stimulate sympathetic exchange rate changes. This combination locks the economy into an uncompetitive bind because of the relative fixity of nominal wages. Unless the exchange rate

depreciates far enough to offset both the price fall and the wage rise, profitability in the C-sector will be squeezed.

The problem could be ameliorated through an incomes policy. Such a policy could be designed to prevent the destabilising wage movements, which respond to terms of trade improvements. This conclusion is even more relevant, given that the 1974 and 1982 examples in Australia of such problematic wage bargaining occurred when formal wage guidelines were not operating. In other words, wage bargaining, consistent with the mechanisms defined by the SM may be detrimental to both the domestic inflation target and the competitiveness of the C-sector, and may need to be supplemented by a formal incomes policy to restore or retain consistency.

## 5.5 The SM and fiscal drag

The SM can also be modified to accommodate taxation. Mitchell (1989) shows that a rise in pre tax money wage inflation can lead to rising (falling) net real income depending on the marginal and average tax rate settings. With sufficient tax progressivity it is impossible for the wage earners in total to generate real net income gains via money wage increases. In other words, the government is in a position to offer tax concessions in return for wages restraint, and raise the real net income of wage earners. Alternatively, the government can frustrate the real income objectives of the trade unions by manipulating the tax system.

However, this type of tax system while giving the government a powerful lever to control the wage bargaining process, might lead to excessive wage rises and in turn generate rapid domestic price inflation. Calmfors says "a progressive tax system, stabilising though it may be from the demand side, may be very destabilising from the cost side" (Calmfors, 1977: 533).

## 5.6 Implications for wage setting in Australia

The SM predicts that movements in domestic wages and prices are largely determined by trends in international prices, subject to exchange rate fluctuations. Domestic prices (expressed in world currency terms) cannot persistently deviate from world prices. If exchange rate stability and economic growth is desired, the government must use wages restraint to influence the trend of domestic inflation. Conversely, the exchange rate can be varied to stabilise the trend in domestic inflation (ignoring the balance of payments implications).

Aukrust (1977: 123) states that

> ... a country that revalues by 10 per cent is virtually guaranteed over the ensuing years to experience 10 per cent less inflation than other countries, and less than it would otherwise have had. The trouble is that foreign exchange rate changes cannot always be manipulated freely, nor are they well suited as regular instruments of price policy because exchange rate changes, when they are foreseen and expected, are bound to create unwanted speculation.

The government could use demand restraint to insulate the domestic cost effects of applying the SM norm, although this would be very costly in terms of unemployment and future capital formation. Other options like price controls and subsidies are also problematic. The tariff debate is relevant here. Reducing tariffs can reduce the room available for wage rises as it lowers the domestic equivalent of the world price. Yet, tariff changes should reflect long term industry strategy rather than the short run exigencies of wages policy.

In the medium term, aggregate demand policy can help to moderate the incidence of wage drift over and above the SM guidelines. In reducing the domestic cost rise by restraining money wage gains, the government would be redistributing income towards the profit share in the C-sector. This point emphasises the conflict, which arises between price stability goals and income distribution stability objectives, when the SM is used as a framework for wage setting.

Local industries in the sheltered sector can increase their share of national income through price rises. Wage earners in the same sector can push for wage rises in excess of the guidelines to insulate themselves from the higher domestic prices. In other words, the burden of wage and price restraint rests on the relatively small C-sector industries, because the other groups can increase their shares through inflation. The SM as a framework for wage setting is therefore prone to inflationary problems and income distributional instability.

## 5.7    Does the Australian Economy operate within a SM structure?

A basic issue is whether the Australian economy resembles a typical SM economy in structure. First, are the competitive and sheltered sector's well defined? Second, is labour productivity in the export- and import-competing industries higher than the domestic oriented industries? Third, do the SM wage setting, spill-over, and domestic inflation mechanisms operate in Australia.

Despite obvious similarities, there are significant differences between the Scandinavian economies and Australia, and consequently the SM cannot adequately explain our inflationary process. It would also be a poor framework for wage setting.

On an empirical level, it is difficult to dichotomise the Australian economy clearly along SM lines. Industries like agriculture serve both the export and domestic markets and shift production between the two in response to world price trends and government marketing schemes.

It is also difficult to find any consistent productivity differences along SM lines in the Australian economy. If the mining and agricultural industries are arbitrarily classified as C-sector, and electricity, gas and water, construction, and wholesale and retail trades as sheltered industries, then Australian Bureau of Statistics (ABS) statistics indicate that no discernible (statistically significant) productivity differences exist (Australian National Accounts, Gross Product by Industry, Cat No. 5211.0). While certain industries are clearly more productive than others, the differences cannot be consistently applied on a C-sector/S-sector basis.

These difficulties point to the informational problems, which would hinder the practical use of the SM. It is one thing to specify the theoretical concept of the room for wage increases but another to agree on the actual magnitudes involved. For the SM concepts to be applicable, all parties involved in the wage determination process would have to agree on the empirical facts. The paucity of high quality and unambiguous statistical data in Australia, particularly in terms of productivity would mitigate against such a consensus. The incongruous statistical submissions that are placed before the NWC by the various parties, is indicative of the difficulties, which would be faced. The SM requires that all parties accept some objective source of empirical data.

Central negotiations in the Nordic countries between trade unions and the employers typically result in an annual wage contract, although in some uncommon cases a two year agreement is reached. Once the contract is formalised the parties do not seek to change the agreement during the settlement period specified. The bargaining process is, in general, not staggered across a wide variety of unions and employers. These institutional aspects of the wage bargaining process are similar to the Australian situation, especially when national wage fixing guidelines are administered through the NWC.

While institutional dominance characterises both systems, the manner in which the Australian institutions interact differs substantially from the pattern described above. The Swedish employer/employee groups negotiate at a peak level independent of government and an arbitration

authority. Bargaining may reflect governmental goals, but essentially the outcomes reflect the relative aims of the employees and employers. The imposition of an incomes policy has been consistently rejected by the peak groups. In Australia, the pivotal role of the Arbitration Commission and industry level bargaining (with key awards transmitting wage pulses throughout the wage structure), is not replicated in the Swedish system. Also, the players in the Australian system have negotiated for lengthy periods under the auspices of defined national income policy guidelines. The SM would thus appear to have limited applicability for the Australian system.

## 5.8    Statistical analysis

The following calculations provide some guide to the outcomes that could result from an application of SM wage norms. Assume that wage setting occurs at the start of each financial year using the data at hand at June 30. The SM wage norm says that the annual growth in nominal wages equals the sum of the $A equivalent of the growth in world prices and the growth in productivity in the C-sector. Some alternative measures of the wage norm can be constructed depending on the manner in which the C-sector is classified.

The degree to which we aggregate industries into the C-sector is rather arbitrary. Three simple classifications might be used:

1)    the C-sector is comprised of the Australian Standard Industrial Classification (ASIC) Divisions (A) and (B), that is agriculture and mining;

2)    the C-sector is represented only by agriculture;

3)    the C-sector is wholly comprised by mining.

Under these assumptions the relevant wage norm established will be referred to as wage norm-1, wage norm-2 and wage norm-3 respectively. All calculations are based on data reported for gross product at average 1979-80 prices per person employed (ABS Cat. No. 5211.0), export price indices (ABS Cat. No. 6405.0), exchange rate data (Reserve Bank Bulletin), and wage and employment data (ABS Cat. Nos. 6248.0, 6312.0 and 6302.0).

Table 5.1 compares the growth in actual weekly award wages, average weekly earnings and the outcomes implied by the application of wage norms -1, -2 and –3. Figures 5.1, 5.2 and 5.3 graph the comparisons. The results are indicative of the problems that our wage fixing system would face under SM guidelines.

**Table 5.1 Growth in Weekly Awards, Average Weekly Earnings and Wages Under Norms -1, -2 and –3, (1976-77 to 1985-86)**

|         | Awards | AWE  | Wage Norm -1 | Wage Norm -2 | Wage Norm -3 |
|---------|--------|------|--------------|--------------|--------------|
| 1976-77 | 13.0   | 12.4 | 18.9         | 4.8          | 10.1         |
| 1977-78 | 9.4    | 9.9  | 4.7          | -2.0         | 10.3         |
| 1978-79 | 6.3    | 7.7  | 21.4         | 27.1         | 3.5          |
| 1979-80 | 9.0    | 9.9  | 11.9         | 6.0          | 5.4          |
| 1980-81 | 11.6   | 13.5 | -1.1         | -2.3         | -0.4         |
| 1981-82 | 12.3   | 13.7 | 4.7          | 18.1         | 3.9          |
| 1982-83 | 11.5   | 11.2 | 2.1          | -17.5        | 27.8         |
| 1983-84 | 5.2    | 8.5  | 29.2         | 45.5         | -0.1         |
| 1984-85 | 5.4    | 6.9  | 16.1         | 11.3         | 21.4         |
| 1985-86 | 4.5    | 5.9  | 1.2          | -6.6         | 10.9         |

The most realistic comparison is between the growth in award wages (reflecting the arbitrated outcome under the various NWC guidelines and related industry award changes), and the wage norm-1 outcome. The wage norm-1 is based on the C-sector classification, which includes agriculture and mining.

The C-sector productivity growth is the weighted-average of the individual productivity increase in agriculture and mining. The data in Table 1 indicates the unrealistic degree of fluctuations that would result using the SM norm. The export sector in the Scandinavian economies is comprised mainly of manufacturing industries whose prices are not subject to violent annual changes. Our export sector is dominated by primary commodity producers who face large swings in their prices that are beyond their control. This is crucial to the inapplicability of the SM to Australian wage fixation.

Further, the overall average result over the period is around two per cent per annum higher than the growth in actual award wages, and one per cent higher than actual weekly earnings growth. In other words, the SM wage-norm would result in highly uncertain wage outcomes, with violent fluctuations occurring on a yearly basis, and an overall mean growth (over the period shown) in excess of the actual mean growth delivered by the process of arbitration.

The results listed as wage norm-2 and wage norm-3 (see Figures 5.2 and 5.3), illustrate the lack of uniformity across the two export industries in terms of yearly fortunes.

Tying the C-sector room for wages growth to the movement in agricultural prices and agricultural productivity growth alone, yields the same pattern of fluctuations but a lower mean growth in wages over the period than delivered under arbitration (about 0.4 per cent lower than average award wage growth). Wage norm-3 uses the mining sector as the C-sector and results in large fluctuations and a higher mean outcome than the average growth in awards.

The important point is that the capacity to pay may rise in the agricultural sector at times when the capacity is falling in mining (and vice versa), due to the disparate movements in the individual prices faced by the individual industries. In other words, the profitability in each sector would not be uniformly protected by the SM wage guideline.

Figure 5.4 shows this affect in terms of movements in unit labour costs (ULC) implied by the wage norm-1. Actual growth in ULC are calculated as the ratio of the growth in awards to mining sector productivity, whereas ULC growth under wage norm-1 is the ratio of wage norm-1 to mining sector productivity. The results confirm the evidence previously discussed. That is, that the ULC implied by the SM wage norm would not only fluctuate violently, but would also be higher on average than the actual arbitrated outcome. Figure 5.5 shows the affect on mining ULC if wage increases were based on the capacity in the agricultural industry.

Tying wages growth to the performance of the mining sector exclusively (wage norm-3) would not improve the outcome, and would certainly be more detrimental to the agricultural sector (as would wage norm-2 based on agriculture's performance be harmful to mining).

## 5.9    Conclusion

This Chapter concludes that the SM would be an unsuitable basis for wage guidelines in Australia. Its use would lead to violent and uncertain fluctuations in wages growth and unit labour costs, and a higher average growth rate in wages than has actually occurred over the last decade.

In addition to the aggregate problems, the use of SM guidelines would not unambiguously maintain the competitiveness or profitability of the export and import-competing industries. The application of the SM when agricultural prices rise (for example, in the current wool price boom),

would lead to profit squeezes and impaired competitiveness in the mining industry. Any exchange rate accommodation of the improved agricultural terms of trade would further exacerbate the mining industry's plight.

One useful insight relates to the ability of government to provide *costless* real income growth through tax-wage trade-offs without impairing the profitability of the C-sector, which is clearly relevant to Australia. In other words, the wage determination debate should not focus exclusively on the rate of growth in nominal wages. Rather, participants should recognise the interrelationships, which exist between policy settings and wage rates.

## Appendix

The SM model can be summarised by the following equations:

**Eqn 5A-1**     $\dot{w}_c = \dot{p}_w + \dot{g}_c$

**Eqn 5A-2**     $\dot{w}_s = \dot{w}_c$

**Eqn 5A-3**     $\dot{p}_c = \dot{w}_c - \dot{g}_c$

**Eqn 5A-4**     $\dot{p}_s = \dot{w}_s + \dot{g}_s$

**Eqn 5A-5**     $\dot{p} = \alpha p_c + (1-\alpha) p_s$

where $\dot{w}$, $\dot{p}$ and $\dot{g}$ refer to the percentage rate of growth in money wages, prices and labour productivity, respectively. The subscript $c$ and $s$ refer to the competitive and sheltered sectors described above. The weights $\alpha$ and $(1-\alpha)$ indicate the relative importance of the two sectors in the economy. $p_w$ is the rate of growth in foreign goods prices that compete with domestically produced traded goods. $C$-sector productivity is greater than $S$-sector productivity.

Equation (5A-1) describes the wage norm established in the $C$-sector. Equation (5A-2) shows this norm spills over into $S$-sector wages growth. Equations (5A-3) and (5A-4) are the respective sectoral inflation rates, while Equation (5A-5) shows that the aggregate inflation rate is the weighted-average of the sectoral inflation rates. Aggregate price inflation can be re-expressed (by substituting equations 5A-1 to 5A-4 into 5A-5), to get

**Eqn 5A-6**     $\dot{p} = \dot{p}_w + (1-\alpha)[\dot{g}_c - \dot{g}_s]$

Equation (5A-6) shows that domestic inflation can be higher than world inflation without damaging competitiveness, as long as the rate of $C$-sector inflation be less than or equal to the world inflation rate.

**Figure 5.1 Wage Growth under Norm-1 Guidelines compared to Actual Awards**
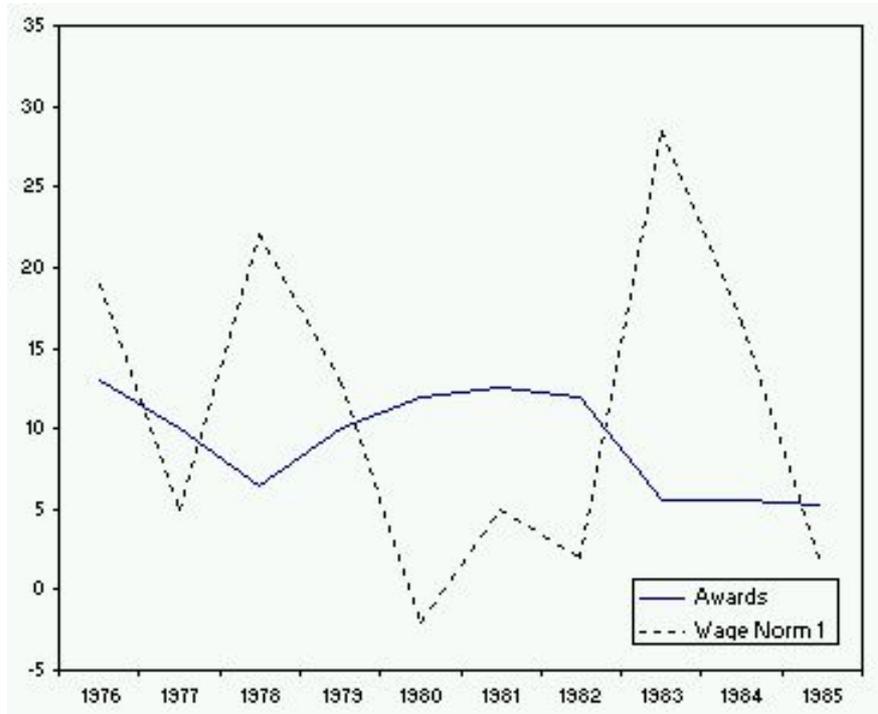


**Figure 5.2 Wage Growth under Norm-2 Guidelines compared to Actual Awards**
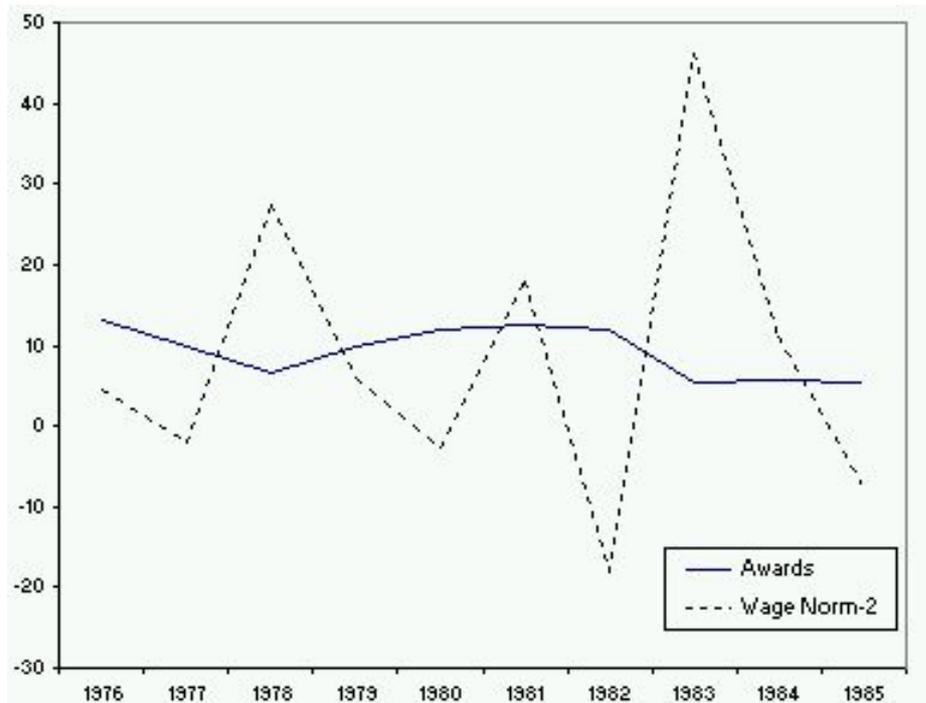
**Figure 5.3 Wage Growth under Norm-3 Guidelines compared to Actual Awards**
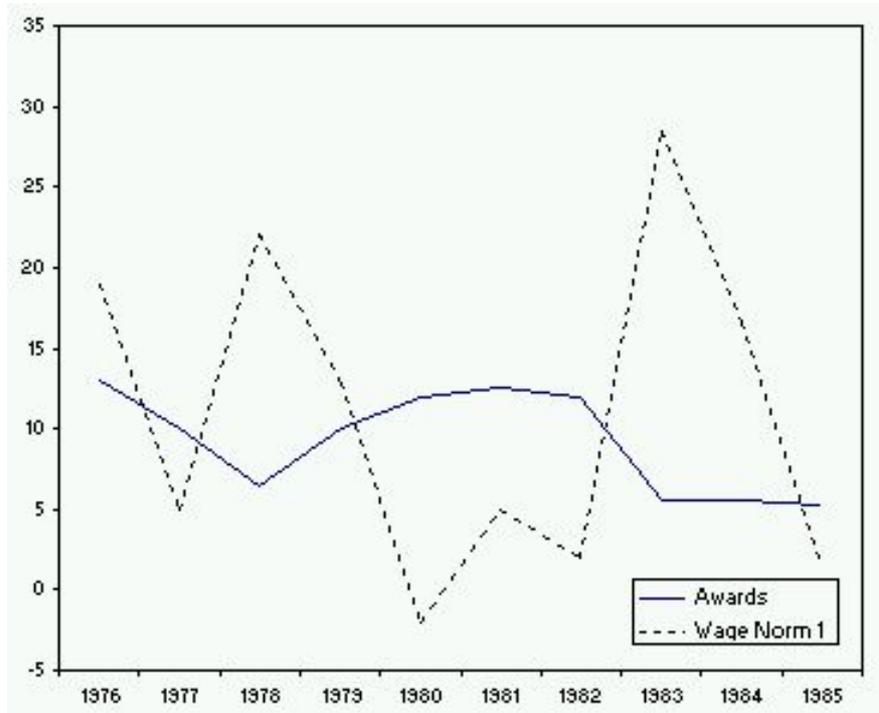


**Figure 5.4 Agricultural ULC under Norm-1 Guidelines compared to Actual ULC**
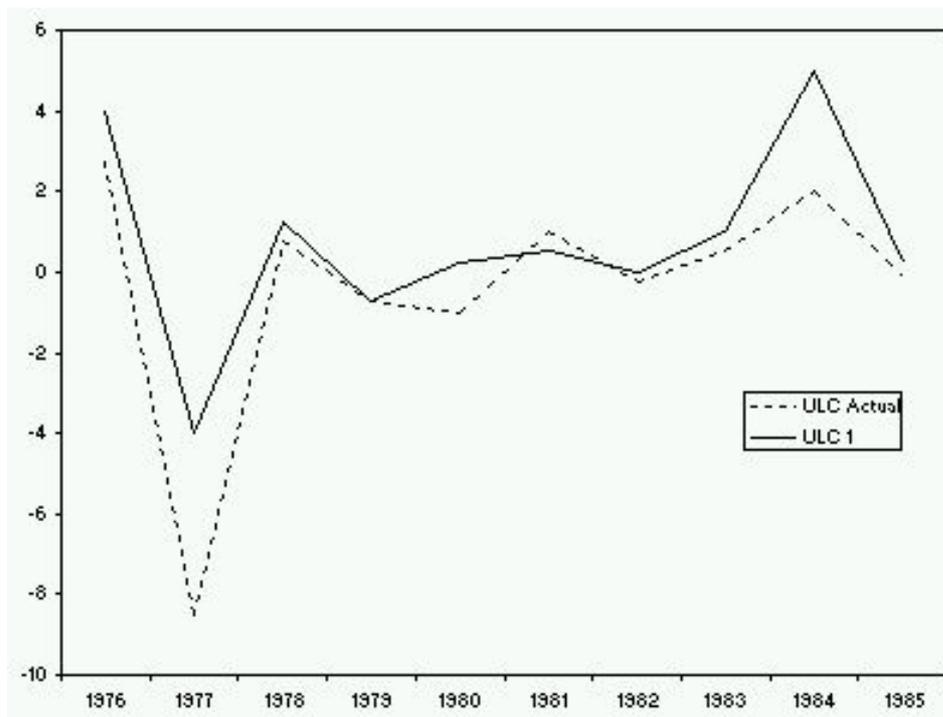
**Figure 5.5 Agricultural ULC under Norm-3 Guidelines compared to Actual ULC**
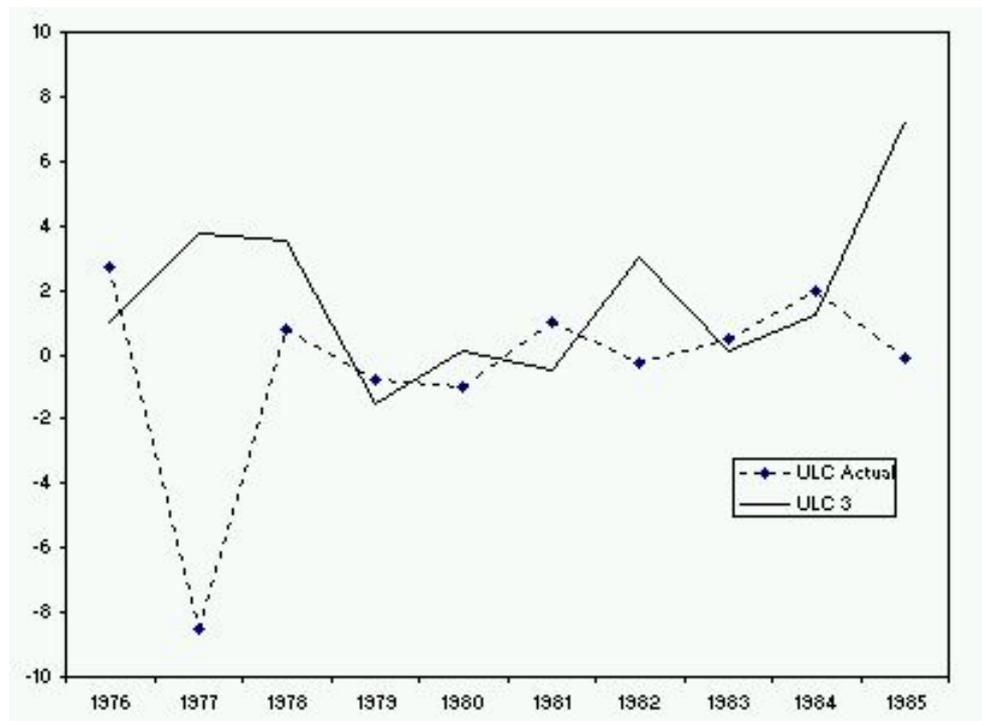
# Chapter 6　Testing for Unit Roots and Persistence in OECD Unemployment Rates

## 6.1　Introduction

There are two main alternative hypotheses about the relationship between the business cycle and the steady state in macroeconomics: the natural rate hypothesis (NRH) and the hysteresis hypothesis (HH). Each presents a distinct prescription for the design and conduct of aggregate economic policy.

The NRH, a central pillar of orthodox, market-clearing theory, distinguishes between the long-term secular trend and the short-term (transitory) fluctuations in the economy. At best, aggregate demand management can only stabilize the short-term variations, but in the NRH it is usually considered to inhibit the *natural* tendencies of an economy (if shocked) to equilibrate, and ultimately only influences nominal magnitudes (that is, causes inflation).

The HH relates to path-dependence in dynamic systems (Cross, 1986; Mitchell, 1987a; Franz, 1990; Watts and Mitchell, 1991). Franz (1990: 2) says that "The long-run solution of such a system does not only depend on the long-run values of the exogenous variables (as usually) … [that is, under NRH models] … but also on the initial condition of each state variable." Buiter (1987: 24) expresses path-dependence as, "Where you get to is determined by how you get there." Accordingly, expansionary demand policy can permanently reduce unemployment at the cost of some inflation, the price level acceleration is finite as the economy adjusts to a new lower steady-state unemployment rate.[1]

While the distinction between these hypotheses is clear in theory, on a practical basis the divide is somewhat blurred. The concept of unemployment persistence is important in this regard. In analytical terms, persistence is a special case of the NRH. An economy with strong persistence takes many periods to adjust back to equilibrium following a shock. So even if the NRH is a true model of the economy, persistence means that the effects of shocks have long memories and that short-term macroeconomic policy can be effective.

A further consideration is the apparent tension between the theoretical and the empirical literature on unit roots and hysteresis. Much of the theoretical work on uses the path dependence of the steady-state unemployment rate as a model of hysteresis (Blanchard and Summers, 1986, 1987; Franz, 1990). Nelson and Plosser (1982) found that the unemployment rate was the only time-series to reject the unit root hypothesis (see also Evans, 1989).

Perron (1989: 1363) did not "analyse the unemployment rate series since there is a general agreement that it is stationary." Perron (1988: 321) confirmed this belief and concluded for the United States that "the unemployment rate series … [is] ... stationary around a linear trend (albeit a zero trend.) ..." The problem is simple. Either the theoretical possibility of hysteresis in the unemployment rate is erroneous or there is a need for more comprehensive unit-root testing.[2]

Section 6.2 relates the distinction made by Nelson and Plosser (1982) between trend-stationary and difference-stationary processes to the NRH and the HH. The concept of persistence is shown to be a special case of the NRH. Interestingly, on a practical basis, this special case has the same policy implications as hysteresis. Section 6.3 provides historical evidence to motivate our analysis. Despite remaining at low average rates for many years, the aggregate unemployment rates for Australia and the United States of America (USA) generate test statistics, which do not reject the unit-root hypothesis. At the very least, the unemployment rates of these countries exhibit strong persistence. It appears that we cannot simply dismiss the post-1960s period as being a case of a mean shift. Section 6.4 presents some additional evidence on the degree of persistence in the OECD unemployment rates as a precursor to more formal testing. The measures clearly show that when shocked output gaps for all the OECD countries examined remain significant for many years. Section 6.5 outlines the unit-root testing framework. Section 6.6 presents and analyses the results of the formal unit-root tests. Section 6.7 examines the segmented trend approach and the modified test results based on this hypothesis. Concluding remarks follow.


## 6.2    Difference-stationary and Trend-stationary processes

Nelson and Plosser (1982) compare trend-stationary (TS) to difference-stationary (DS) processes. They say that macroeconomics commonly separates a non-stationary "secular or growth component" from a stationary "cyclical component" when decomposing real (and sometimes nominal) economic time-series. The transitory disturbances are due to monetary shocks. This representation is termed a TS process. Alternatively, integrated processes (DS) processes exhibit non-stationarity, which is stochastic and displays no automatic tendency to return to any deterministic trend. DS processes cannot provide long-term forecasts based on the mean of the series. Whereas the past history of the TS process does not influence its long-term value, the magnitude of a variable following a DS process is the sum of its past.

The linear model that nests both hypotheses (as alternatives) is

**Eqn 6-1** $\qquad y_t = \gamma + \beta t + u_t / (1 - \alpha L)$

where $L$ is the lag operator. Under the null of a unit root, $\alpha = 1$ and the implied value of $\beta$ is zero. The unit root hypothesis implying the joint hypothesis $\left(\beta, \alpha\right) = \left(0, 1\right)$ (see Nelson and Plosser, 1982: 144).

The NRH and the HH can be represented as TS and DS processes respectively. Franz (1990) says that in the context of "discrete time linear systems hysteresis is present when there are one or more unit roots in the characteristic equation of the state matrix." (see also Watts and Mitchell, 1991). The representation of hysteresis can take a number of forms. As an example, Franz (1990: Section 2) models the unemployment rate as a simple autoregressive process.

**Eqn 6-2** $\qquad u_t = d u_{t-1} - Z_t$

where $Z$ is an exogenous (aggregate demand) variable and $d$ is a parameter. Solving the steady-state value of $u_t$ gives:

**Eqn 6-3** $\qquad \overline{u} = \overline{Z} / (1 - d)$

which means that the equilibrium of $\overline{u}$ is a function solely of the equilibrium value of $Z$, if $d$ differs from unity. There is no path dependence in the equilibrium unemployment rate.

A non-unique, path-dependent equilibrium emerges if $d = 1$. In this case, the current value of $\overline{u}$ is a function of the starting value of $u$ and the accumulation of period values of $Z$. With $d = 1$ in Equation 6-2 and accumulating $u$ from some starting value $u_0$, we get

**Eqn 6-4** $\qquad u_t = u_0 + \sum Z_t$

Relating these insights to the TS-DS distinction from Nelson and Plosser (1982) is straightforward. We have equated the presence of a unit root in a time-series as being equivalent to hysteresis.

An integrated stochastic process $(u_t)$, like a random walk with fixed drift, is a DS process and is written as

**Eqn 6-5** $\qquad u_t = u_{t-1} + \beta + \varepsilon_t$

and can be expressed along the lines of Equation (6-4) as an accumulation process such that

**Eqn 6-6** $\qquad u_t = u_0 + \beta t + \sum \varepsilon_t$

A TS model in linear terms can be defined as a stochastic process which follows a secular trend such as

**Eqn 6-7** $\qquad u_t = \alpha + \beta t + \varepsilon_t$

where $t$ is a linear time trend and $\varepsilon_t$ is a stationary series with zero mean and variance $\sigma^2$. Once we eliminate the secular component of the series, $\left( \alpha + \beta t \right)$, the residuals sum to zero and are stationary $\left( \sum t \varepsilon_t = 0 \right)$.

While Equation 6-6 exhibits a linear trend as in Equation 6-7, the error term is not stationary and the variance $\left( \sigma^2 \right)$ increases with time. The DS process thus requires differencing before the residuals are stationary. This is the basis of the TS/DS distinction.

In terms of Equation 6-1, if $\alpha$ was a near unit root (say 0.95), then the resulting TS process would exhibit substantial persistence. An innovation to this type of model would not have permanent effects, but the process would still have a long memory. Thus persistence is a special case of the NRH. Although, persistence is clearly distinct from hysteresis in analytical terms, it is virtually equivalent in practical terms because a long memory process provides room for policy effectiveness.

## 6.3    A historical perspective

Figures 6-1 and 6-2 plot unemployment rate in Australia (1861-1984) and the USA (1890-1984), respectively. In each case the plots demonstrate highly autoregressive behaviour, with slow changes occurring to levels once established. A simple AR(1) regression for Australia yielded the following results for the log of the aggregate unemployment rate (t-statistics are in parentheses):

LUR = 0.13 + 0.9 LUR (-1)        $R^2 = 0.82$        s.e. = 0.3029
(23.38)

**Figure 6.1 Aggregate Unemployment Rate, Australia, 1861-1984**
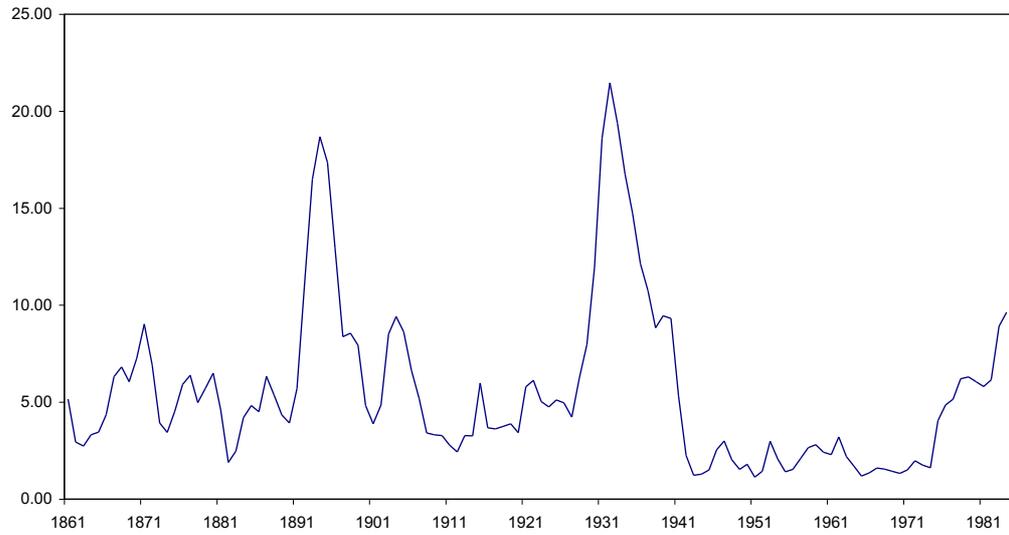


**Source:** Withers *et al*. (1985: 203-205, Series A).

**Figure 6.2 Aggregate Unemployment Rate, United States, 1900-1982**
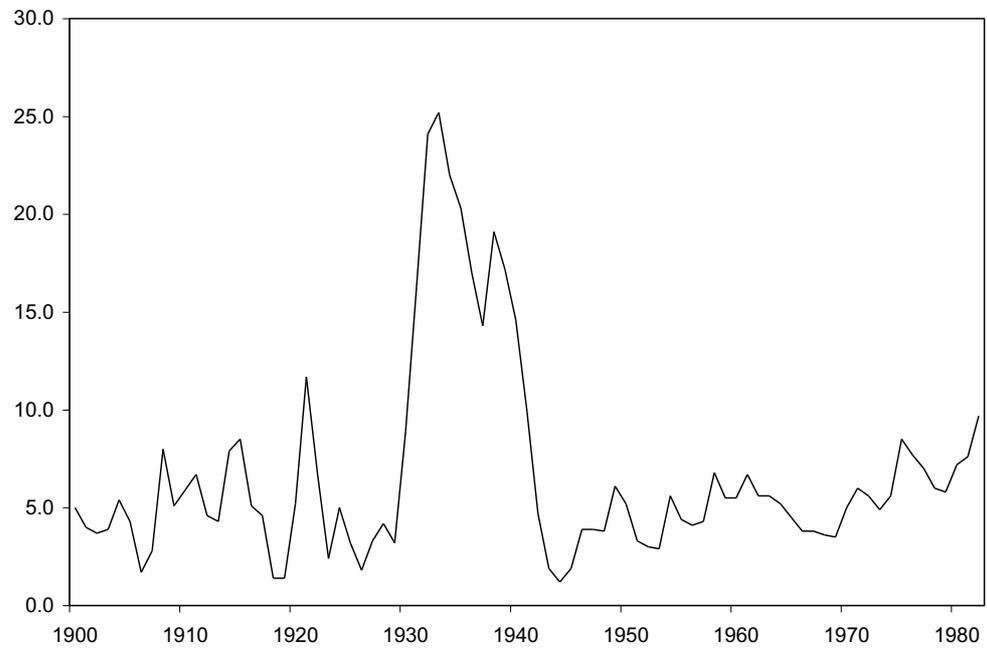


**Source:** Gordon (1985)

The results suggest substantial unemployment rate persistence. Blanchard and Summers (1986) conduct similar analyses for the United Kingdom (UK) and the USA and find comparable degrees of persistence for both countries, although the Australian unemployment rate is even slower to return to its mean value than the UK and USA unemployment rate which exhibit "at best a weak tendency to return to … [their] … mean"' (Blanchard and Summers, 1986: 21).

The unemployment rate in Australia, the UK and the US (among other Western economies) changes its level infrequently. There have been three notable rises in the level of the unemployment rate the 1890 recession, the 1929-39 period, and the recent post-1978 period. Each time the level has risen, the unemployment rate has only slowly reverted back to the previous lower level. Once the lower level is re-established it persists until some shock occurs. It is notable that each time the rate has risen and persisted at the higher rates, there has been a substantial aggregate demand failure.

It might be argued that another feature of this historical experience shown in our plots (a feature shared by other Western nations) is that for many years the rates fluctuated within a defined band and crossed some low mark several times. Taken together with the fact that in the last 20 years the rates have been on average much higher than previously, one might conclude that a simple mean shift has occurred without resorting to any unit-root explanations.

However, Table 6.1 reports standard unit-root tests on the Australian and the USA data. The augmented Dickey-Fuller statistics are well below the critical values. The null hypothesis of a driftless random walk with zero mean which is tested by ($\phi_2$) cannot be rejected (see Section 6.5 for an explanation of this and the $\phi_3$ test). The related driftless random-walk hypothesis ($\phi_3$) also cannot be rejected. Thus we cannot reject the hypothesis that the unemployment rates are unit-root processes. The first difference of the unemployment rates appears to be stationary, with its unit-root hypothesis being clearly rejected. Obviously more detailed testing is in order. We simply cannot dismiss the post-1960s period as being a case of a mean shift.

**Table 6.1 Annual historical unemployment rates – preliminary unit-root tests**

|  | ADF (k=4) | $\phi_2$ | $\phi_3$ |
|---|---|---|---|
| Australia, 1861-1984 |  |  |  |
| Level | -2.69 | 2.47 | 3.66 |
| First difference | -6.02 | 12.09 | 18.15 |
|  |  |  |  |
| USA, 1890-1984 |  |  |  |
| Level | -3.29 | 3.69 | 5.54 |
| First difference | -5.67 | 10.75 | 16.11 |

## 6.4    Autocorrelations and persistence

In this section, prior to the more formal unit root testing, we explore the persistence notion more thoroughly. The data is from the quarterly main economic indicators provided on disk from the OECD. Two seasonally adjusted unemployment rate series are available from this database; the unemployment rate as defined by each country and the OECD standardized unemployment rate. Where possible we use the former because it usually provides a longer time-series. In some cases, due to availability, the standardized unemployment rate is used. A full range of results for both sets of series is available on request. The results for each country are qualitatively similar using either series. The log of the relevant rate is used in every case.

Table 6.2 shows the sample autocorrelations for each country in level form. Without any significant exception, the unemployment rates display a high degree of autoregressivity at lag one (the highest is 0.98, the lowest is 0.90), then slowly decay as the lag increases, with limited individual variations around this pattern. The behaviour of the time series is very similar to the ACF of a random walk (see Nelson and Plosser, 1982: 147).

Table 3 reports the ACFs for the first difference for each country. With the exceptions of Italy and Japan, the first lag is significant for all countries. Although Finland and the United Kingdom display some variation, in general, the ACFs drop of rapidly at higher lags, which is consistent with stationarity. A linear filter $\left( \alpha + \beta t \right)$ was put through each series and the ACFs computed for the 'de-trended' residuals of each series are reported in Table 6.4. The resulting profiles are hardly consistent with stationarity.

To gauge how much persistence exists in the data, we estimated autoregressions for each country, testing down from a general specification to a parsimonious representation of the autoregressive component. The polynomials were solved for the steady-state unemployment rate in each country and an output gap, defined as the difference between the current and the equilibrium unemployment rate, was created by introducing a 3% negative shock. The time-paths back to equilibrium were computed and the results are shown in Table 6.5. All the non-reported calculations are available on request.

While the results do not discriminate between the nature of the shock, it is clear that considerable time elapses occur in all countries (except maybe Sweden) even before 1.5% of the output gap is eliminated (ceterus paribus). So even if we fail to formally establish the unit root hypothesis, in practical terms the policy implications are equivalent given the high degree of persistence evident in the data.

Convergence is slow relative to the actual frequency of shocks of this dimension experienced across the OECD block. Clearly, macroeconomic policy can be designed to minimize the costs of each shock (that is, reduce the output gaps) before the next shock impacts. A non-interventionist policy would see the impacts of previous shocks still 'substantially' in the system as the next shock arrives. Thus, the Okun losses would be magnified.

**Table 6.2 Sample Autocorrelations for LUR**

| Country | Period | Lag 1 | 2 | 3 | 4 | 5 | 6 |
|---------|--------|-------|-------|-------|-------|-------|-------|
| Australia | 66(3)-91(3) | 0.97 | 0.94 | 0.90 | 0.87 | 0.84 | 0.81 |
| Austria | 69(1)-91(1) | 0.98 | 0.94 | 0.91 | 0.88 | 0.85 | 0.82 |
| Belgium[a] | 70(1)-91(3) | 0.98 | 0.95 | 0.91 | 0.87 | 0.83 | 0.78 |
| Canada | 60(1)-91(3) | 0.98 | 0.95 | 0.91 | 0.87 | 0.83 | 0.80 |
| Denmark | 70(1)-91(2) | 0.96 | 0.89 | 0.84 | 0.77 | 0.71 | 0.66 |
| Finland | 60(1)-91(2) | 0.97 | 0.93 | 0.88 | 0.83 | 0.77 | 0.72 |
| France | 67(4)-91(2) | 0.98 | 0.96 | 0.94 | 0.92 | 0.90 | 0.87 |
| Germany | 62(1)-91(3) | 0.98 | 0.95 | 0.92 | 0.89 | 0.86 | 0.83 |
| Italy | 60(1)-91(2) | 0.98 | 0.96 | 0.93 | 0.91 | 0.88 | 0.85 |
| Japan | 60(1)-91(3) | 0.98 | 0.97 | 0.95 | 0.93 | 0.92 | 0.90 |
| Netherlands[a] | 70(1)-91(2) | 0.96 | 0.91 | 0.85 | 0.80 | 0.75 | 0.69 |
| Norway[a] | 70(1)-91(2) | 0.90 | 0.84 | 0.75 | 0.64 | 0.57 | 0.47 |
| Sweden[a] | 70(1)-91(3) | 0.93 | 0.84 | 0.73 | 0.61 | 0.51 | 0.41 |
| United Kingdom | 60(1)-91(3) | 0.98 | 0.96 | 0.94 | 0.91 | 0.88 | 0.85 |
| United States | 60(1)-91(3) | 0.97 | 0.92 | 0.85 | 0.78 | 0.72 | 0.66 |
| Random walk[b] | | 0.95 | 0.90 | 0.85 | 0.81 | 0.76 | 0.70 |

(a) OECD standardised unemployment rate.
(b) From Nelson and Plosser (1982: 147), Table 2.

**Table 6.3 Sample Autocorrelations for ΔLUR**

| Country | Period | Lag 1 | 2 | 3 | 4 | 5 | 6 |
|---------|--------|-------|------|-------|-------|-------|-------|
| Australia | 66(4)-91(3) | 0.35 | 0.15 | 0.15 | -0.09 | -0.20 | -0.30 |
| Austria | 69(2)-91(1) | 0.32 | -0.17 | -0.04 | 0.18 | 0.10 | 0.01 |
| Belgium[a] | 70(2)-91(3) | 0.55 | 0.49 | 0.36 | 0.26 | 0.11 | 0.07 |
| Canada | 60(2)-91(3) | 0.48 | 0.30 | 0.13 | -0.03 | -0.02 | -0.07 |
| Denmark | 70(2)-91(2) | 0.47 | 0.66 | 0.03 | 0.07 | -0.11 | -0.24 |
| Finland | 60(1)-91(2) | 0.30 | 0.22 | 0.30 | 0.03 | -0.09 | -0.07 |
| France | 68(1)-91(2) | 0.41 | 0.05 | -0.01 | -0.02 | -0.14 | -0.11 |
| Germany | 62(2)-91(3) | 0.61 | 0.32 | 0.18 | 0.02 | -0.01 | -0.10 |
| Italy | 60(2)-91(2) | -0.17 | 0.18 | 0.10 | -0.22 | 0.27 | -0.18 |
| Japan | 60(2)-91(3) | -0.11 | 0.00 | 0.15 | -0.06 | 0.01 | 0.15 |
| Netherlands [a] | 70(2)-91(3) | 0.36 | 0.26 | 0.19 | 0.24 | 0.01 | -0.06 |
| Norway[a] | 70(2)-91(3) | -0.21 | 0.13 | 0.16 | -0.29 | 0.11 | -0.01 |
| Sweden [a] | 70(2)-91(3) | 0.15 | 0.25 | 0.16 | 0.08 | 0.04 | 0.02 |
| United Kingdom | 60(2)-91(3) | 0.65 | 0.42 | 0.25 | 0.07 | 0.00 | -0.14 |
| United States | 60(2)-91(3) | 0.63 | 0.35 | 0.16 | -0.07 | -0.11 | -0.09 |
| Random walk[b] | | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

(a) OECD Standardised Unemployment Rate
(b) Time aggregated random walk from Nelson and Plosser (1982: 148), Table 3.

**Table 6.4 Sample Autocorrelations for De-trended LUR**

| Country | T | Lag 1 | 2 | 3 | 4 | 5 | 6 | ADF[b] |
|---------|---|-------|------|------|------|------|------|--------|
| Australia | 100 | 0.96 | 0.88 | 0.80 | 0.70 | 0.60 | 0.52 | -1.96 |
| Austria | 86 | 0.91 | 0.80 | 0.72 | 0.64 | 0.54 | 0.44 | -2.90 |
| Belgium[a] | 87 | 0.97 | 0.93 | 0.87 | 0.81 | 0.75 | 0.68 | -1.06 |
| Canada | 126 | 0.96 | 0.90 | 0.81 | 0.71 | 0.62 | 0.53 | -2.99 |
| Denmark | 86 | 0.95 | 0.85 | 0.75 | 0.65 | 0.54 | 0.45 | -2.12 |
| Finland | 126 | 0.95 | 0.86 | 0.76 | 0.63 | 0.49 | 0.37 | -3.92 |
| France | 95 | 0.94 | 0.85 | 0.75 | 0.65 | 0.57 | 0.49 | -1.00 |
| Germany | 118 | 0.95 | 0.85 | 0.73 | 0.60 | 0.48 | 0.35 | -2.55 |
| Italy | 126 | 0.84 | 0.74 | 0.61 | 0.44 | 0.33 | 0.18 | -3.88 |
| Japan | 126 | 0.91 | 0.83 | 0.76 | 0.68 | 0.62 | 0.54 | -1.99 |
| Netherlands [a] | 86 | 0.93 | 0.86 | 0.77 | 0.68 | 0.59 | 0.50 | -1.51 |
| Norway[a] | 86 | 0.82 | 0.71 | 0.56 | 0.35 | 0.25 | 0.10 | -2.46 |
| Sweden [a] | 87 | 0.93 | 0.84 | 0.73 | 0.61 | 0.51 | 0.41 | -2.66 |
| United Kingdom | 87 | 0.97 | 0.89 | 0.80 | 0.68 | 0.57 | 0.45 | -2.67 |
| United States | 87 | 0.97 | 0.90 | 0.82 | 0.72 | 0.62 | 0.53 | -2.42 |
| Random walk[c] | | 0.85 | 0.71 | 0.58 | 0.47 | 0.36 | 0.27 | |

(a) OECD Standardised Unemployment Rate.
(b) ADF regression included trend with four first-differences (k = 4).
(c) De-trended random walk - approximate expected sample autocorrelations based on Nelson and Kang (1981) from Nelson and Plosser (1982: 150), Table 3.1.

**Table 6.5 Persistence of output gaps following a 35% negative shock**

| Country | Half-life of shock (quarters) | Full-life of shock (quarters) |
|---|---|---|
| Australia | 33 | 179 |
| Austria | 33 | >200 |
| Belgium | 23 | >200 |
| Canada | 18 | 101 |
| Denmark | 13 | 76 |
| Finland | 19 | 100 |
| France | 42 | 70 |
| Germany | 17 | 72 |
| Italy | 98 | 125 |
| Japan | 44 | >200 |
| Netherlands | 16 | 183 |
| Norway | 28 | 91 |
| Sweden | 7 | 63 |
| United Kingdom | 29 | >200 |
| United States | 17 | >200 |

## 6.5 Testing for unit roots

Various autoregressive representations can be used as the basis for unit root testing. For example, Perron (1988) defines three regression equations, which indicate an ordering of relevant hypotheses.

**Eqn 6-8**
$$y_t = \hat{\alpha} y_{t-1} + \hat{u}_t$$

**Eqn 6-9**
$$y_t = \mu^* + \alpha^* y_{t-1} + u_t^*$$

**Eqn 6-10**
$$y_t = \tilde{\mu} + \tilde{\beta}\left(t - T/2\right) + \tilde{\alpha} y_{t-1} + \tilde{u}_t$$

Equation 6-8 is stationary if $|\hat{\alpha}| < 1$, whereas if $\hat{\alpha} = 1$, the process has a unit root and is non-stationary (see Dickey and Fuller, 1979: 427, Equation 1.1). Equation 6-9 allows for fixed drift, $\mu^*$ (Dickey and Fuller, 1979: 428, Equation 2.1). Equation 6-10 provides the framework for testing: Hypothesis A a driftless random walk $\left(\tilde{\mu}, \tilde{\beta}, \tilde{\alpha}\right) = \left(0, 0, 1\right)$, and Hypothesis B

$\left(\tilde{\mu}, \tilde{\beta}, \tilde{\alpha}\right) = \left(0, 0, 1\right)$ (Dickey and Fuller, 1981: 1057, Equation .3) against a general alternative.

There is some disagreement in the literature as to the order of hypothesis testing for Equations 6-8 to 6-10. Dickey *et. al.* (1986) believe that testing should begin with Equation 6-9. If Equation 6-9 is the valid model, such statistics would have higher power than statistics generated with Equations 6-8 or 6-10. Perron (1988) disagrees and recommends starting with Equation 6-10. This allows a

test of the unit-root hypothesis against the obvious alternative that the series is trend-stationary. Under this alternative, Equation 6-9 will not be able to distinguish a unit root from a trend-stationary process. We choose to use Perron's strategy, and initially test the unit root hypothesis directly against the trend-stationary alternative.

Dickey-Fuller tests based, for example, on Equation 6-10 assume error homogeneity. If the residual structure is correlated, we can either change the regression framework or modify the existing statistics. Dickey and Fuller (1981) and later, Said and Dickey (1984) employ the Augmented Dickey-Fuller (ADF) regression, where higher order first-differences of the variable are added to whiten the residuals.

The ADF regression format employed is

**Eqn 6-11** $$y_t = \mu + \beta t + \alpha_1 y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta y_{t-i} + e_t$$

To facilitate testing $y_{t-1}$ is subtracted from both sides and regressed as

**Eqn 6-12** $$\Delta y_t = \mu^* + \beta^* t + \alpha_1^* y_{t-1} + \sum_{i=1}^{k} \gamma_i^* \Delta y_{t-i} + e_t$$

where $\alpha_1^* = (\alpha_1 - 1)$. The test becomes the straightforward test of $\alpha_1^* = 0$.

Phillips (1987) took the second tack and developed a non-parametric approach to eliminate the dependence of the asymptotic distribution of his modified test statistics on the correlation structure of the residuals.[3]

In terms of Hypothesis A, the Dickey and Fuller (1981) $\Phi_2$-test is computed based on Equation 6-10, as is the Phillips and Perron's (1988) $Z(\Phi_2)$-statistic which is a modified version of the $\Phi_2$-statistic. In terms of Hypothesis B, the $\Phi_3$-test statistic (Dickey and Fuller, 1981) is computed based on Equation 10, along with the corresponding $Z(\Phi_3)$ due to Phillips and Perron (1988). We also calculate $\Phi_2^*$ and $\Phi_3^*$ based on the ADF regression. A range of ADF tests (for $k$ = 0-4), the $\tau_\tau$-test from Fuller (1976), the $Z(t)$ and the $Z(t_\alpha)$ tests from Phillips (1987) are also reported.

## 6.6    Test results

The results are reported in Tables 6.6 to 6.8 (and the appendix). Table 7 provides statistics for the unit-root null against the general alternative in Equation 6-10. The $\Phi^*$-statistics are based on the ADF regression (Equation 6-12), whereas the $\Phi$-statistics are from the Dickey-Fuller (DF) regression (Equation 10). The results vary due tot the impact of the residual structure on the residual sum of squares in Equation 10.

Using the $\Phi_2$-test of the joint hypothesis of a driftless random walk against the general alternative Equation 10, we can reject the null at the 5% level for Belgium, Italy, the Netherlands and Spain (with France at the margin). However, Table 6.6 reveals significant first-order (except Japan and Italy) and fourth-order (except Japan) serial correlation in the DF regression. In this case, the ADF regression is the preferable framework. Accordingly, the $\Phi_2^*$-tests suggests that we can only reject the null for Italy and Finland. The more restricted joint null of a random walk with fixed drift ($\Phi_3^*$-test) once again adds Finland to Italy as our two TS potentiates.

**Table 6.6 Unit Root Regressions – LUR (**Regression Model: $y_t = \hat{\mu} + \hat{\beta}t + \hat{\alpha}y_{t-1} + e_t$**)**

| Country | $T$ | $\hat{\mu}$ | $t(\hat{\mu})$ | $\hat{\beta}$ | $t(\hat{\beta})$ | $\hat{\alpha}$ | $t(\hat{\alpha})$ | $s(\hat{\alpha})$ | $\chi^2(4)$[b] |
|---|---|---|---|---|---|---|---|---|---|
| Australia | 100 | 0.03 | 1.14 | 0.001 | 1.05 | 0.961 | -1.359 | 0.080 | 18.69[c] |
| Austria | 88 | -0.06 | -2.10 | 0.001 | 3.16 | 0.909 | -2.791 | 0.071 | 19.14[c] |
| Belgium[a] | 86 | 0.08 | 4.34 | -0.001 | 2.73 | 1.006 | -0.461 | 0.047 | 21.14[c] |
| Canada | 126 | 0.05 | 1.52 | 0.000 | 1.97 | 0.963 | -1.741 | 0.053 | 32.36[c] |
| Denmark | 85 | 0.07 | 1.23 | 0.000 | 0.33 | 0.957 | -1.353 | 0.137 | 23.50[c] |
| Finland | 125 | 0.02 | 0.99 | 0.001 | 1.68 | 0.947 | -1.853 | 0.111 | 33.99[c] |
| France | 94 | 0.03 | 2.13 | 0.000 | 0.03 | 0.991 | -0.339 | 0.044 | 18.63[c] |
| Germany | 118 | 0.02 | 0.78 | 0.000 | 0.39 | 0.977 | -0.900 | 0.114 | 48.79[c] |
| Italy | 125 | 0.22 | 3.68 | 0.001 | 3.83 | 0.844 | -3.777 | 0.054 | 17.21 |
| Japan | 126 | 0.00 | 0.29 | 0.001 | 2.44 | 0.925 | -2.541 | 0.057 | 5.26 |
| Netherlands[a] | 85 | 0.13 | 4.31 | -0.001 | 1.86 | 0.993 | -0.341 | 0.075 | 6.03[c] |
| Norway[a] | 85 | -0.07 | 1.17 | 0.003 | 2.51 | 0.836 | -2.659 | 0.143 | 12.99[c] |
| Sweden[a] | 86 | 0.06 | 1.18 | 0.000 | 0.09 | 0.940 | -1.614 | 0.095 | 12.72[c] |
| UK | 126 | 0.02 | 1.47 | 0.000 | 1.09 | 0.973 | -1.262 | 0.072 | 57.91[c] |
| United States | 126 | 0.05 | 1.35 | 0.000 | 0.63 | 0.971 | -1.345 | 0.056 | 56.16[c] |

(a) OECD Standardised Unemployment Rate.

(b) $\chi^2(4)$ is a LM test for fourth-order serial correlation.

(c) Denotes $\chi^2(4)$ serial correlation statistic significant.

**Table 6.7 Dickey-Fuller Joint Hypothesis Tests – LUR[(c)]**

| Country | $T$ | $\tau_{\beta\xi}$[b] | $\Phi_2$[c] | $\Phi_3$[d] | $\Phi_2^*$ | $\Phi_3^*$ |
|---|---|---|---|---|---|---|
| Australia | 100 | -1.36 | 2.14 | 0.99 | 2.02 | 1.99 |
| Austria | 88 | -2.79 | 3.68 | 5.01 | 3.32 | 4.55 |
| Belgium[e] | 86 | -0.46 | 7.98 | 7.97 | 2.57 | 3.21 |
| Canada | 126 | -1.74 | 1.60 | 2.06 | 3.30 | 4.89 |
| Denmark | 85 | -1.35 | 2.19 | 1.72 | 1.82 | 2.37 |
| Finland | 125 | -1.85 | 1.62 | 1.78 | 5.53 | 7.69 |
| France | 94 | -0.34 | 3.79 | 0.74 | 2.17 | 1.05 |
| Germany | 118 | -0.90 | 1.87 | 0.97 | 2.49 | 3.30 |
| Italy | 125 | -3.78 | 5.33 | 7.49 | 5.62 | 7.73 |
| Japan | 126 | -2.54 | 2.31 | 3.38 | 1.49 | 1.98 |
| Netherlands[e] | 85 | -0.34 | 7.63 | 7.86 | 2.86 | 4.01 |
| Norway[e] | 85 | -2.66 | 2.80 | 3.79 | 2.60 | 3.13 |
| Sweden[e] | 86 | -1.61 | 1.00 | 1.30 | 2.75 | 4.12 |
| United Kingdom | 126 | -1.26 | 1.86 | 0.80 | 3.01 | 3.67 |
| United States | 126 | -1.34 | 0.67 | 0.90 | 2.02 | 3.03 |

(a) $\Phi_2$ and $\Phi_3$ are based on $y_t = \mu + \beta t + \alpha y_{t-1} + e_t$, whereas $\Phi_2^*$ and $\Phi_3^*$ are based on

$y_t = \mu + \beta t + \alpha y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta y_{t-i} + e_t$, with $k = 4$. The values of $T$ are based on the model

without higher-order terms.

(b) Critical values for $\tau_{\beta\xi}$ (see Fuller, 1976: 381, Table 8.5.2):

| T = | 80 | 100 | 120 |
|---|---|---|---|
| 5% level | -3.47 | -3.45 | -3.44 |

(c) Critical values for $\Phi_2$ and $\Phi_2^*$ (Dickey and Fuller, 1981: 1063, Table v):

| T = | 80 | 100 | 120 |
|---|---|---|---|
| 5% level | 5.03 | 4.88 | 4.86 |

(d) Critical values for $\Phi_3$ and $\Phi_3^*$ (Dickey and Fuller, 1981: 1063, Table vi):

| T = | 80 | 100 | 120 |
|---|---|---|---|
| 5% level | 6.59 | 6.49 | 6.47 |

(e) OECD Standardised Unemployment Rate.

**Table 6.8 Phillips-Perron Z Statistics - *LUR***

| | Truncation Lag | | | | | | | Truncation Lag | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 4 | 6 | 8 | 10 | 12 | 2 | 4 | 6 | 8 | 10 | 12 |
| | **Australia** | | | | | | **Austria** | | | | | |
| $Z(\hat{\alpha})$ | -3.93 | -3.93 | -3.93 | -3.93 | -3.93 | -3.93 | -8.05 | -8.05 | -8.05 | -8.05 | -8.05 | -8.05 |
| $Z(t\alpha)$ | -1.71 | -1.87 | -1.82 | -1.69 | -1.63 | -1.61 | -2.81 | -2.81 | -2.83 | -2.82 | -2.80 | -2.80 |
| $Z(\Phi_2)$ | 1.39 | 1.17 | 1.23 | 1.41 | 1.53 | 1.56 | 2.92 | 2.92 | 2.72 | 2.88 | 3.09 | 3.34 |
| $Z(\Phi_3)$ | 0.64 | 0.54 | 0.57 | 0.65 | 0.70 | 0.72 | 4.01 | 3.98 | 3.72 | 3.93 | 4.21 | 4.55 |
| | **Belgium[a]** | | | | | | **Canada** | | | | | |
| $Z(\hat{\alpha})$ | 0.54 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | -4.61 | -4.61 | -4.61 | -4.61 | -4.61 | -4.61 |
| $Z(t\alpha)$ | -0.68 | -0.78 | -0.80 | -0.78 | -0.75 | -0.74 | -2.07 | -2.20 | -2.24 | -2.25 | -2.27 | -2.27 |
| $Z(\Phi_2)$ | 4.51 | 3.57 | 3.43 | 3.55 | 3.77 | 3.93 | 0.90 | 0.75 | 0.72 | 0.71 | 0.69 | 0.69 |
| $Z(\Phi_3)$ | 4.33 | 3.43 | 3.29 | 3.41 | 3.62 | 3.77 | 1.16 | 0.97 | 0.92 | 0.92 | 0.89 | 0.89 |
| | **Denmark** | | | | | | **Finland** | | | | | |
| $Z(\hat{\alpha})$ | -3.61 | -3.61 | -3.61 | -3.61 | -3.61 | -3.61 | -6.68 | -6.68 | -6.68 | -6.68 | -6.68 | -6.68 |
| $Z(t\alpha)$ | -1.68 | -1.77 | -1.76 | -1.63 | -1.53 | -1.45 | -2.27 | -2.58 | -2.68 | -2.68 | -2.58 | -2.44 |
| $Z(\Phi_2)$ | 1.37 | 1.23 | 1.25 | 1.47 | 1.69 | 1.89 | 1.05 | 0.80 | 0.74 | 0.74 | 0.80 | 0.90 |
| $Z(\Phi_3)$ | 1.08 | 0.97 | 0.99 | 1.16 | 1.33 | 1.49 | 1.15 | 0.88 | 0.81 | 0.81 | 0.88 | 0.99 |
| | **France** | | | | | | **Germany** | | | | | |
| $Z(\hat{\alpha})$ | -0.89 | -0.89 | -0.89 | -0.89 | -0.89 | -0.89 | -2.71 | -2.71 | -2.71 | -2.71 | -2.71 | -2.71 |
| $Z(t\alpha)$ | -0.81 | -0.89 | -0.83 | -0.78 | -0.76 | -0.75 | -1.65 | -1.93 | -2.03 | -1.99 | -1.89 | -1.79 |
| $Z(\Phi_2)$ | 2.48 | 2.32 | 2.44 | 2.55 | 2.59 | 2.61 | 1.05 | 0.80 | 0.74 | 0.74 | 0.80 | 0.90 |
| $Z(\Phi_3)$ | 0.49 | 0.45 | 0.48 | 0.50 | 0.51 | 0.51 | 0.95 | 0.76 | 0.71 | 0.73 | 0.79 | 0.85 |
| | **Italy** | | | | | | **Japan** | | | | | |
| $Z(\hat{\alpha})$ | -19.5 | -19.5 | -19.5 | -19.5 | -19.5 | -19.5 | 9.46 | 9.46 | 9.46 | 9.46 | -9.46 | -9.4 |
| $Z(t\alpha)$ | -3.76 | -3.82 | -3.88 | -3.83 | -3.76 | -3.71 | -2.48 | -2.54 | -2.60 | -2.59 | -2.60 | -2.60 |
| $Z(\Phi_2)$ | 5.51 | 4.99 | 4.64 | 4.93 | 5.46 | 6.02 | 2.62 | 2.31 | 2.09 | 2.11 | 2.09 | 2.20 |
| $Z(\Phi_3)$ | 7.73 | 7.01 | 6.52 | 6.93 | 7.67 | 8.45 | 3.83 | 3.38 | 3.07 | 3.10 | 3.06 | 2.92 |
| | **Netherlands[a]** | | | | | | **Norway[a]** | | | | | |
| $Z(\hat{\alpha})$ | -0.60 | -0.61 | -0.61 | -0.61 | -0.61 | -0.61 | -13.9 | -13.9 | -13.9 | -13.9 | -13.9 | -13.9 |
| $Z(t\alpha)$ | -0.54 | -0.63 | -0.61 | -0.51 | -0.40 | -0.32 | -2.56 | -2.72 | -2.80 | -2.77 | -2.70 | -2.61 |
| $Z(\Phi_2)$ | 5.71 | 5.03 | 5.21 | 5.97 | 6.98 | 7.83 | 3.05 | 2.67 | 2.51 | 2.57 | 2.71 | 2.92 |
| $Z(\Phi_3)$ | 5.88 | 5.17 | 5.37 | 6.14 | 7.19 | 8.06 | 4.12 | 3.60 | 3.40 | 3.48 | 3.67 | 3.94 |
| | **Sweden[a]** | | | | | | **United Kingdom** | | | | | |
| $Z(\hat{\alpha})$ | -5.13 | -5.13 | -5.13 | -5.13 | -5.13 | -5.13 | -3.39 | -3.39 | -3.39 | -3.39 | -3.39 | -3.39 |
| $Z(t\alpha)$ | -1.85 | -2.06 | -2.17 | -2.23 | -2.24 | -2.22 | -1.87 | -2.15 | -2.25 | -2.23 | -2.15 | -2.05 |
| $Z(\Phi_2)$ | 0.74 | 0.59 | 0.53 | 0.50 | 0.50 | 0.51 | 0.89 | 0.68 | 0.62 | 0.63 | 0.67 | 0.65 |
| $Z(\Phi_3)$ | 0.96 | 0.77 | 0.69 | 0.65 | 0.64 | 0.66 | 0.38 | 0.29 | 0.27 | 0.27 | 0.29 | 0.32 |
| | **United States** | | | | | | | | | | | |
| $Z(\hat{\alpha})$ | -3.65 | -3.65 | -3.65 | -3.65 | -3.65 | -3.65 | | | | | | |
| $Z(t\alpha)$ | -1.91 | -2.12 | -2.16 | -2.15 | -2.10 | -2.05 | | | | | | |
| $Z(\Phi_2)$ | 0.33 | 0.27 | 0.26 | 0.26 | 0.27 | 0.29 | | | | | | |
| $Z(\Phi_3)$ | 0.44 | 0.36 | 0.35 | 0.35 | 0.36 | 0.39 | | | | | | |

(a) OECD standardised unemployment rate

Based on the $\Phi$ (and $\Phi^*$)-tests, the majority of OECD countries examined appear to have DS unemployment rates. The $\tau(b\xi)$-test from Fuller (1976) supports this conclusion and emphasises the distinct behaviour of Italy.

The alternative method of testing the unit root hypothesis when our regression framework is plagued by residual correlation is provided by the Phillips-Perron $Z$ tests. Table 6.8 reports the full range of $Z$ statistics for LUR and are of considerable interest. The $Z(\Phi\xi)$-tests confirm the conclusions based on the corresponding DF $\Phi$-tests for every country bar Finland. The $Z$ correction suggests that the null hypotheses for Finland cannot be rejected. The results are also invariant to the truncation lag chosen. The $Z(b\xi)$ test (critical values from Fuller (1976: 371, Table 8.5.1, third panel) indicates that we cannot reject the null in any case, although Italy is marginal at the 0.05 level. The $Z(cb\underline{g})$- tests confirm the results based on the $\tau(b\xi)$-test from Fuller (1976).

A complete range of DF and ADF tests is reported in the appendix. For Finland, we cannot reject the unit root hypothesis for values of $k \le 4$. While the other countries display some sensitivity to the value of $k$, overall, the unit root hypothesis remains the plausible working model. The ADF tests for the first-difference, DLUR reveal that in general, the unit root null is rejected.

Tentatively it is concluded that except for Italy, the unemployment rates of the remaining OECD countries behave consistently with integrated processes of order one and are hence non-stationary over the sample period examined. Finland's status is questionable. In terms of our theoretical introduction, this evidence is more consistent with the widespread presence of hysteresis across the OECD block, than it is with the universality of the NRH.

## 6.7　The segmented trend

Rappoport and Reichlin (1988) challenged the notion, which has become widely accepted since Nelson and Plosser published their U.S. findings in 1982, that macroeconomic time-series are difference stationary processes (Perron, 1989, also questioned this idea). Their principal conclusion is that "when the unit root hypothesis is tested against a segmented trend hypothesis, i.e., against the hypothesis that series are dominated by large infrequent shocks, it is rejected for some of the series analysed" (Reichlin, 1989: 231).

In this section, we introduce and test this hypothesis and gauge the results in Section 6.5 against it. We should add that this approach is *ad hoc*. No formal definition of a significant shock is advanced. Determination of the break points becomes an "eye-balling" exercise, which is rather unsatisfactory.

From Perron (1989) we consider three models: the "crash hypothesis" where under the null of a unit root the process is augmented by a dummy variable which takes the value of one only at the time of the shock, but undergoes a permanent intercept change following the break under the (segmented) TS alternative; the "changing growth" hypothesis which incorporates a shift in the intercept under the null, and a change in the slope of the trend function under the alternative; and the hybrid model which allows a shock in the level to accompany a permanent change in the growth rate.

To motivate testing Perron (1988: 1380) proposes three regressions corresponding to the three models described above. Each equation nests the null and corresponding alternative hypotheses.

**MODEL A:**

$$y_t = \hat{\mu}^A + \hat{\phi}^A DU_t + \hat{\beta}^A t + \hat{d}^A (TB)_t + \hat{\alpha}^A y_{t-1} + \sum_{i=1}^{k} \hat{c}_i \Delta t_{t-i} + \hat{e}_t$$

where $d(TB)_t = 1$ if $t = T_B$ and zero otherwise, $DU_t = 1$ if $t > T_B$ and zero otherwise, and $T_B$ is the break quarter.

**MODEL B:**

$$y_t = \hat{\mu}^B + \hat{\phi}^B DU_t + \hat{\beta}^B t + \hat{\gamma}^B DT_t^* + \hat{\alpha}^B y_{t-1} + \sum_{i=1}^{k} \hat{c}_i \Delta t_{t-i} + \hat{e}_t$$

where $DT_t^* = t - T_B$ if $t > T_B$ and zero otherwise

**MODEL C:**

$$y_t = \hat{\mu}^C + \hat{\phi}^C DU_t + \hat{\beta}^C t + \hat{\gamma}^C DT_t^* + \hat{d}^C \mathbf{(}TB_t \mathbf{g} \hat{\alpha}^C y_{t-1} + \sum_{i=1}^{k} \hat{c}_i \Delta t_{t-i} + \hat{e}_t$$

where $DT_t = t$ if $t > T_B$ and zero otherwise

From Perron (1988: 1380-1381)

> The null hypothesis of a unit root imposes the following restriction on the true parameters of each model: Model A, the "crash hypothesis": $\hat{\alpha}^A = 1, \hat{\beta}^A = 0, \hat{\phi}^A = 0$; Model B, the "breaking slope with no crash": $\hat{\alpha}^B = 1, \hat{\beta}^B = 0, \hat{\gamma}^B = 0$; and Model C, where both effects are allowed: $\hat{\alpha}^C = 1, \hat{\beta}^C = 0, \hat{\gamma}^C = 0$. Under the alternative hypothesis of a 'trend stationary' process, we expect $\hat{\alpha}^A, \hat{\alpha}^B, \hat{\alpha}^C < 1; \hat{\beta}^A, \hat{\beta}^B, \hat{\beta}^C \neq 0; \hat{\phi}^A, \hat{\phi}^C, \hat{\gamma}^B, \hat{\gamma}^C \neq 0$. Finally, under the alternative hypothesis, $d^A, d^C, \phi^B$ should be close to zero while under the null hypothesis they are expected to be significantly different from zero.

Perron (1989) suggests that we employ descriptive and graphical analysis to determine which of the three models should be used for any specific time-series. On this basis, the likely candidates for structural breaks are Australia (around 1974(3)), Canada (1981(4)), Japan (1974(4)), United States (1974(4)), United Kingdom (1974(1)), France (1974(3)), Germany (1973(3)) and Finland (1975(2)). Most of the possible breaks are clearly associated with OPEC oil shocks. The remaining countries in the study do not exhibit graphical evidence of major structural change in their unemployment rate series. This type of casual "shock assessment" exemplifies the ad hoc nature of this approach.

The value of $k$ is determined by significance tests (at the 10% level) on the lagged first differences. Too many lagged terms decrease the power but not the size of the test, whereas too few affect the size of the test. In fact, the results presented do not depend critically on the value of $k$ up to 8.

We test each model (A, B, and C) separately for each country. By choosing arbitrary break points and testing sequentially, the problem of pre-testing (data mining) is raised. According to Perron (1989: 1388), we need "a test for structural changes in the trend function occurring at unknown dates." Thus, care should be taken when interpreting the results of these regressions.

We began with the most general model (C), which nests both segmented trend hypotheses. Table 6.9 reports the results. The relevant test statistic is the $t$-ratio (in parentheses) corresponding to $\hat{\alpha}$ (critical values are from Perron, 1989: 1377, Table ViB). Taking note of $\lambda$ (the proportion of the sample prior to the hypothesised break), the unit root null cannot be rejected in all cases. For Australia and the USA there is evidence of a significant crash ($\hat{d} > 0$).

Using Model B (see Table 6.9), we can only reject the null for Finland, which confirms the results from the conventional unit root tests, reported earlier. If Model A is appropriate (that is, the trend function retained its slope but changed level as the alternative to the unit root hypothesis with a crash), our conclusions change somewhat. From Table 6.9, we now reject the null for Finland and

Japan. Thus, Japan provides the sole evidence in support of the claim that the non-rejection of the unit root hypothesis is largely due to misspecification of the original test regression.[4]

**Table 6.9 Segmented trend tests**

| Country | $T$ | $T_B$ | $\lambda$ | $\hat{\mu}$ | $\hat{\phi}$ | $\hat{\beta}$ | $\hat{\gamma}$ | $\hat{d}$ | $\hat{\alpha}$ | $s(\hat{e})$ | $\chi^2(4)$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Model A** | | | | | | | | | | | |
| Australia | 94 | 74(3) | 0.31 | 0.06 | 0.13 | 0.001 | | 0.23 | 0.86 | 0.06 | 22.93 |
| (k = 6) | | | | (2.45) | (3.47) | (1.48) | | (3.16) | (-3.36) | | |
| Australia | 100 | 74(4) | 0.32 | 0.08 | 0.14 | 0.001 | | -0.01 | 0.85 | 0.07 | 9.3 |
| (k = 6) | | | | (2.74) | (3.06) | (1.30) | | (0.14) | (-3.09) | | |
| France | 90 | 74(3) | 0.41 | 0.05 | 0.05 | 0 | | 0.06 | 0.94 | 0.04 | 24.8 |
| (k = 4) | | | | (2.63) | (2.31) | (0.70) | | (1.22) | (-1.82) | | |
| Finland | 121 | 75(2) | 0.41 | 0.07 | 0.08 | 0.001 | | 0.14 | 0.87 | 0.09 | 5.23 |
| (k = 4) | | | | (2.62) | (1.96) | (1.33) | | (1.40) | (-4.16) | | |
| Germany | 114 | 73(3) | 0.33 | -0.05 | 0.12 | 0.001 | | 0.01 | 0.89 | 0.04 | 2.35 |
| (k = 4) | | | | (1.93) | (3.23) | (2.09) | | (0.08) | (-3.96) | | |
| Japan | 122 | 74(1) | 0.32 | 0.03 | 0.11 | 0 | | -0.08 | 0.84 | 0.05 | 3.05 |
| (k = 4) | | | | (2.73) | (4.63) | (0.15) | | (1.24) | (-4.19) | | |
| U.K. | 122 | 74(1) | 0.35 | 0.03 | 0.06 | 0 | | -0.08 | 0.94 | 0.05 | 2.33 |
| (k = 4) | | | | (2.87) | (2.80) | (0.64) | | (1.38) | (-3.04) | | |
| U.S.A. | 120 | 74(4) | 0.11 | 0.11 | 0.02 | 0 | | 0.15 | 0.93 | 0.04 | 11.09 |
| (k = 4) | | | | (2.82) | (1.19) | (0.27) | | (3.55) | (-3.09) | | |
| **Model B** | | | | | | | | | | | |
| Australia | 96 | 74(3) | 0.31 | -0.06 | | 0.005 | -0.004 | | 0.9 | 0.07 | 3.79 |
| (k = 4) | | | | (0.47) | | (3.10) | (2.68) | | (-3.07) | | |
| Australia | 96 | 74(4) | 0.32 | -0.15 | | 0.005 | 0.004 | | 0.9 | 0.07 | 5.22 |
| (k = 6) | | | | (2.18) | | (3.00) | (2.58) | | (-2.98) | | |
| France | 88 | 74(3) | 0.41 | -0.06 | | 0.002 | -0.002 | | 1 | 0.04 | 1.51 |
| (k = 6) | | | | (1.13) | | (1.47) | (1.94) | | (-0.07) | | |
| Finland | 121 | 75(2) | 0.41 | 0.02 | | 0.002 | -0.001 | | 0.87 | 0.1 | 8.22 |
| (k = 4) | | | | (0.83) | | (2.57) | (0.99) | | (-4.02) | | |
| Germany | 114 | 73(3) | 0.33 | -0.08 | | 0.003 | -0.002 | | 0.94 | 0.09 | 6.48 |
| (k = 4) | | | | (2.02) | | (2.60) | (1.47) | | (-2.55) | | |
| Japan | 122 | 74(1) | 0.32 | -0.02 | | 0.001 | -0.001 | | 0.95 | 0.06 | 5.44 |
| (k = 4) | | | | (0.99 | | (2.35) | (1.60) | | (-1.29) | | |
| U.K. | 122 | 74(1) | 0.35 | 0.02 | | 0.001 | 0 | | 0.95 | 0.05 | 3.01 |
| (k = 4) | | | | (1.25) | | (1.70) | (0.17) | | (-2.64) | | |
| U.S.A. | 122 | 74(4) | 0.42 | 0.05 | | 0.001 | -0.001 | | 0.95 | 0.04 | 3.54 |
| (k = 4) | | | | (1.73) | | (2.40) | (1.85) | | (-2.27) | | |

**Table 6.9 (continued) Segmented trend tests**

| Country | $T$ | $T_B$ | $\lambda$ | $\hat{\mu}$ | $\hat{\phi}$ | $\hat{\beta}$ | $\hat{\gamma}$ | $\hat{d}$ | $\hat{\alpha}$ | $s(\hat{e})$ | $\chi^2(4)$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Model C** | | | | | | | | | | | |
| Australia | 94 | 74(3) | 0.31 | 0.02 | 0.22 | 0.003 | -0.002 | 0.22 | 0.86 | 0.06 | 23.26 |
| (k = 6) | | | | (0.23) | (2.24) | (1.43) | (1.00) | (3.04) | (-3.39) | | |
| Australia | 94 | 74(4) | 0.32 | -0.09 | 0.34 | 0.005 | -0.004 | 0.02 | 0.84 | 0.07 | 6.59 |
| (k = 6) | | | | (1.12) | (3.24) | (2.47) | (2.14) | (0.27) | (-3.31) | | |
| France | 89 | 74(3) | 0.41 | 0.04 | 0.10 | 0.000 | 0.000 | -0.06 | 0.95 | 0.03 | 14.47 |
| (k = 5) | | | | (0.69) | (1.48) | (0.04) | (0.30) | (1.50) | (-1.49) | | |
| Finland | 121 | 75(2) | 0.41 | 0.05 | 0.13 | 0.001 | -0.001 | 0.12 | 0.86 | 0.09 | 5.89 |
| (k = 4) | | | | (1.82) | (1.62) | (1.43) | (0.77) | (1.17) | (-4.13) | | |
| Germany | 114 | 73(3) | 0.33 | -0.05 | 0.11 | 0.001 | 0.000 | 0.01 | 0.89 | 0.08 | 2.39 |
| (k = 4) | | | | (1.16) | (1.82) | (1.06) | (0.21) | (0.08) | (-3.81) | | |
| Japan | 122 | 74(1) | 0.32 | 0.04 | 0.09 | 0.000 | 0.000 | -0.01 | 0.84 | 0.05 | 3.64 |
| (k = 4) | | | | (1.70) | (2.41) | (0.33) | (0.30) | (1.22) | (-3.16) | | |
| U.K. | 122 | 74(1) | 0.35 | 0.05 | 0.03 | 0.000 | 0.000 | -0.07 | 0.94 | 0.05 | 3.45 |
| (k = 4) | | | | (2.44) | (0.91) | (0.01) | (0.76) | (1.27) | (-3.13) | | |
| U.S.A. | 122 | 74(4) | 0.4 | 0.08 | 0.05 | 0.005 | -0.001 | 0.14 | 0.94 | 0.04 | 11.29 |
| (k = 4) | | | | (1.96) | (1.85) | (1.42) | (1.58) | (3.39) | (-2.71) | | |

## 6.8   Conclusion

We should be clear that our study does not provide a competitive comparison between the unit-root hypothesis and the alternative of stationary fluctuations around some deterministic (linear or breaking) trend. Even if we had rejected the unit-root null, we could not have concluded that the alternative could be accepted. Moreover, even if we had found some evidence in favour of the segmented trend hypotheses this would not have implied that the secular trend and the changes it undergoes is deterministic. Otherwise, forecasting would be certain.

Further, even if the segmented trend hypothesis had empirical credence, it would not negate the policy relevance of the HH. Pagan and Wickens (1989: 970), in relation to Perron's (1989) claim that the unit root hypothesis is more often rejected if one accounts for shifts in the mean of the series and changes in the trend function slopes, say "Perhaps this is not surprising as the unit root makes any shock persistent and dummy variables just do the same thing." This amounts to a refinement of the HH. Thus, while most policy shocks have transitory effects, a large shock can have permanent effects.

An important qualification to our work comes from Blough (1988), who points out that in small samples (especially frequently sampled data), trend-stationary processes are virtually observationally equivalent to DS processes with moving average errors (with roots close to minus one).

So while our study cannot reject the unit-root hypothesis in general, we admit that the tests have low power against near unit-root processes. Combining this knowledge with the evidence that at least the unemployment rates in the OECD countries examined are highly persistent, the results of the study provide further evidence for the mounting case that cyclical shocks can have long term effects on the unemployment rates in many OECD countries. The tests on the post-1960 sample thus are not inconsistent with the tentative findings for the data samples in Section 6.3, which started in the last century.

In terms of the practical implications, a definite short-term role for policy is suggested. Well designed policies aimed at reducing Okun losses following a negative aggregate shock can make permanent contributions to the social welfare of the communities in question. In a practical domain it becomes a moot point whether the roots are unit or near-unit.

An important point is that our results are not intended to explain the processes at work. We have taken the first step of measuring and providing a summary of important features of the time-series. The task ahead for labour economists is to analyse the behavioural forces at work in more theoretical terms.

# Appendix

### Table A1 Dickey-Fuller Unit Root Tests – LUR

| Country | $T^b$ | DF | Trend excluded ADF[c] | | | | DF | Trend included ADF[d] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $k=1$ | $k=2$ | $k=3$ | $k=4$ | | $k=1$ | $k=2$ | $k=3$ | $k=4$ |
| Australia | 100 | -0.93 | -1.28 | -1.18 | -1.1 | -1.17 | -1.36 | -2.04 | -2.15 | -2.5 | -1.96 |
| Austria | 88 | -0.15 | -0.69 | -0.19 | -0.42 | -0.56 | -2.79 | -2.79 | -2.37 | -2.57 | -2.9 |
| Belgium[a] | 86 | -2.7 | -2.09 | -3.36 | -2.45 | -2.46 | 0.46 | 0.5 | -1.54 | -1.23 | -1.06 |
| Canada | 126 | -0.46 | -1.27 | -1.45 | -1.35 | -1.15 | -1.74 | -2.85 | -3.3 | -3.24 | -2.99 |
| Denmark | 85 | -1.84 | -2.23 | -2.07 | -2.54 | -1.65 | -1.35 | -2.44 | -2.01 | -2.56 | -2.12 |
| Finland | 125 | -0.84 | -1.36 | -1.73 | -2.26 | -2.06 | -1.85 | -2.51 | -3.06 | -4.28 | -3.92 |
| France | 94 | -1.22 | -0.88 | -0.78 | -1.02 | -1.27 | -0.34 | -1.57 | -1.25 | -1.19 | -1.00 |
| Germany | 118 | -1.34 | -1.41 | -1.5 | -1.32 | -1.21 | -0.9 | -2.85 | -2.63 | -2.93 | -2.55 |
| Italy | 125 | -0.52 | -0.35 | -0.64 | -0.87 | -0.54 | -3.78 | -3.28 | -3.32 | -4.12 | -3.88 |
| Japan | 126 | -0.89 | -0.77 | -0.77 | -0.96 | -0.98 | -2.54 | -2.48 | -2.28 | -2.27 | -1.99 |
| Netherlands[a] | 85 | -3.54 | -3.5 | -3.46 | -3.03 | -2.84 | -0.34 | -1.16 | -1.46 | -1.32 | -1.51 |
| Norway[a] | 85 | -1.09 | -0.59 | -0.84 | -1.55 | -1.03 | -2.66 | -2.19 | -2.45 | -3.23 | -2.46 |
| Sweden[a] | 86 | -1.62 | -1.99 | -2.52 | -2.89 | -2.73 | -1.61 | -1.98 | -2.51 | -2.88 | -2.66 |
| U.K. | 126 | -0.65 | -1.36 | -1.31 | -1.44 | -1.39 | -1.26 | -2.91 | -3.13 | -3.09 | -2.67 |
| U.S.A. | 126 | -1.19 | -2.55 | -2.35 | -2.24 | -1.8 | -1.34 | -2.92 | -2.81 | -2.95 | -2.42 |

(a) OECD standardised unemployment rate

(b) The number of observation, $T$ is for the DF regression. To derive the value of $T$ for the ADF regression subtract $k$ from $T$.

(c) Regression model is: $y_t = \mu + \alpha y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta y_{t-1} + e_t$ .

(d) Regression model is: $y_t = \mu + \beta t + \alpha y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta y_{t-1} + e_t$

### Table A2 Dickey-Fuller Unit Root Tests – ΔLUR

| Country | $T^c$ | DF | Trend excluded ADF[c] | | | | DF | Trend included ADF[d] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $k=1$ | $k=2$ | $k=3$ | $k=4$ | | $k=1$ | $k=2$ | $k=3$ | $k=4$ |
| Australia | 99 | -6.89 | -5.35 | -4.18 | -4.68 | -4.87 | -6.87 | -5.33 | -4.14 | -4.67 | -4.91 |
| Austria | 87 | -6.64 | -7.43 | -4.84 | -3.72 | -3.49 | -6.66 | -7.50 | -4.90 | -3.79 | -3.54 |
| Belgium[a] | 85 | -4.93 | -3.64 | -2.91 | -2.87 | -3.16 | -5.53 | -4.78 | -3.66 | -3.74 | -4.44 |
| Canada | 125 | -6.67 | -5.24 | -4.93 | -5.02 | -4.26 | -6.72 | -5.32 | -5.01 | -5.09 | -4.34 |
| Denmark | 84 | -5.47 | -5.67 | -4.26 | -3.75 | -4.20 | -5.54 | -5.78 | -4.44 | -3.73 | -4.30 |
| Finland | 124 | -7.87 | -5.19 | -3.36 | -3.69 | -4.03 | -7.83 | -5.16 | -3.33 | -3.66 | -3.93 |
| France | 93 | -6.22 | -6.08 | -4.78 | -4.33 | -4.52 | -6.20 | -6.06 | -4.83 | -4.44 | -4.66 |
| Germany | 117 | -5.36 | -5.12 | -4.46 | -4.71 | -3.91 | -5.34 | -5.13 | -4.44 | -4.69 | -3.94 |
| Italy | 124 | -13.22 | -7.29 | -5.01 | -5.64 | -4.31 | -13.22 | -7.28 | -5.00 | -5.66 | -4.27 |
| Japan | 125 | -12.36 | -8.26 | -5.70 | -5.30 | -4.56 | -12.34 | -8.24 | -5.67 | -5.27 | -4.55 |
| Netherlands[a] | 84 | -6.03 | -4.16 | -3.36 | -2.60 | -2.94 | -7.23 | -5.38 | -4.45 | -3.57 | -4.25 |
| Norway[a] | 84 | -11.25 | -6.36 | -4.14 | -4.83 | -4.29 | -11.28 | -6.40 | -4.13 | -4.82 | -4.36 |
| Sweden[a] | 85 | -7.76 | -4.47 | -3.34 | -3.14 | -3.07 | -7.72 | -4.44 | -3.28 | -2.93 | -2.76 |
| U.K. | 125 | -5.14 | -4.49 | -4.27 | -4.57 | -4.09 | -5.13 | -4.46 | -4.26 | -4.58 | -4.09 |
| U.S.A. | 125 | -5.26 | -5.15 | -5.12 | -5.65 | -4.55 | -5.24 | -5.13 | -5.09 | -5.63 | -4.53 |

(a) OECD standardised unemployment rate

See explanatory notes in Table A1. The regressions noted are in first-differences.

**Notes:**

[1] A variety of empirical approaches have attempted to detect hysteresis in various countries. Hargreaves-Heap (1980), Mitchell (1987a), Coe and Gagliardi (1985), Coe (1988), Watts and Mitchell (1990) employed a Phillips curve framework with alternative specifications of the steady-state unemployment rate nested. Each study found some evidence of hysteresis. Moller (1990) explores human capital deterioration as a source of hysteresis. He uses a Beveridge curve framework to test whether in times of high unemployment the steady-state unemployment-vacancy relation bows out from the usual relation. Franz (1990) discusses other techniques, which have been used.

[2] We should be careful though. As Brunello (1990) observes, "since the unemployment rate is a bounded variable, it cannot in principle follow a pure unit-root process." However, the detection of a unit-root over an extended sample, say the post-war period, has significant implications for the conduct of economic policy, even though, over an infinite sample, the variance of the process may operate within finite bounds.

[3] The testing method involves the OLS estimation of an AR1 autoregression supplemented by a "correction factor based on the structure of the residuals from this regression" (Perron, 1988: 302)

[4] The ADF test, $k = 4$, for the residuals from the segmented trend regression for Japan was –4.16, indicating a rejection of the null that the residuals are non-stationary.

# Chapter 7      Arthur Okun's High Pressure Economy - its Relevance in the 1990s

## 7.1     Introduction

Given the vast economic changes that have occurred over the last 20 years, particularly within the labour market, this Chapter reassesses the notion of cyclical upgrading, popularised by Arthur Okun and others in the 1960s and early 1970s. The upgrading hypothesis and the related high-pressure economy model provided a coherent rationale for Keynesian policy positions. Okun (1983: 171) believed that

> unemployment was merely the tip of the iceberg that forms in a cold economy. The difference between unemployment rates of 5 percent and 4 percent extends far beyond the creation of jobs for 1 percent of the labor force. The submerged part of the iceberg includes (a) additional jobs for people who do not actively seek work in a slack labor market but nonetheless take jobs when they become available; (b) a longer workweek reflecting less part-time and more overtime employment; and (c) extra productivity - more output per man-hour - from fuller and more efficient use of labor and capital.

In a related study, Mitchell (1994a) examines the cyclical response of hour and productivity in the Australian economy. It was found that the long downward trend in average weekly hours worked has moderated since 1978. In terms of average weekly hours in February 1993 (35.8 hours), the lengthening of the average workweek as a result of a one per cent decline in the unemployment rate amounts to a 0.75 per cent increase.

A central plank of Okun's upgrading hypothesis is that a productivity bonus is provided to an economy undergoing increased real output growth (Black and Russell, 1969; Thurow and Taylor, 1966; Perry, 1971). Mitchell (1994a) finds mixed evidence for this proposition in the Australian economy. The tentative conclusion is that the behaviour of aggregate labour productivity changed during the mid to late 1970s. There has been a productivity slowdown. The exact reasons for this are unknown. There is some evidence, that despite a declining post-1970s trend, some short-term gains following an expansion are experienced. No evidence can be found, which indicates that recent behaviour is different to the 1983 recession and the upturn that followed.

In this Chapter, it is the labour market aspects of the upgrading hypothesis, which are studied. Specifically four major questions are investigated:

- How does the labour force participation rates of different age and gender groups behave over the economic cycle?
- For a given arbitrary full employment level, what is the potential employment levels for groups and the economy in total, and how are the employment gaps (defined as the difference between potential and actual employment) distributed across demographic groups?
- How is the total employment gap distributed across industries?
- To reconcile the demographic gaps and the industry gaps, how does the demographic composition of industry employment respond to changes in the total gap? What do the demographic gaps by industry look like?

In answering the questions posed, a rich data set is generated which allows us to estimate the participation of different demographic groups in the recovery from recession. It also allows us to juxtapose the likely outcomes with those expected in an 'Okun High Pressure' world.

Section 7.2 outlines Okun's upgrading hypothesis, which is compared to an alternative view of cyclical change in Section 7.3. Section 7.4 estimates the cyclical labour force participation effects as a precursor to calculating potential labour forces for each demographic group. Hidden unemployment estimates are also calculated once the potential labour forces are computed. Section 7.5 derives potential employment and employment gaps by age and gender. Section 7.6 estimates the cyclical responsiveness of employment for each industry and calculates the industry employment gaps. It is shown in Section 7.7 that the only way the demographic gaps can be reconciled with the industry employment gaps is through a cyclical shift in the demographic employment shares by industry, which is a major aspect of Okun's upgrading mechanism. Thus we estimate the cyclical sensitivity of the demographic employment shares. Concluding remarks follow.

## 7.2    Okun's upgrading hypothesis

A vast body of literature describes the manner in which the labour market adjusts to the business cycle (see Reder, 1955; Wallich, 1956; Wachter, 1970; Okun, 1973; Thurow, 1975; Vroman, 1978). The literature also ties in with some versions of segmented labour market theory. Together they provide the basis of a theory of cyclical upgrading, whereby disadvantaged groups in the economy achieve upward mobility as a result of higher economic activity.

Both Okun (1973) and Thurow (1975) base their theories on a dichotomy between good and bad jobs, arguing that this split is itself cyclically sensitive. When aggregate activity rises, the proportion of good jobs in total employment increases as the total rises. Vroman (1978: 195) concludes

> … even apart from its impact indirectly reducing unemployment and directly stimulating hours worked … aggressive aggregate demand policy can reduce the number of low wage workers and the incidence of poverty in the economy.

Okun's (1973) results are summarised as follows:

- The most cyclically sensitive industries had large employment gaps, were dominated by prime-age males, offered high-paying jobs, offered other remuneration characteristics (fringes) which encouraged long-term attachments between employers and employees, and displayed above-average output per person hour,
- In demographic terms, when the employment gap is closed in aggregate, prime-age males exit low-paying industries and take jobs in other higher paying sectors and their jobs are taken mainly by young people,
- In the advantaged industries, adult males gain large numbers of jobs but less than would occur if the demographic composition of industry employment remained unchanged following the gap closure. As a consequence, other demographic groups enter these 'good' jobs.
- The demographic composition of industry employment is cyclically sensitive. The total shift effects in 1970 are estimated to be of the same magnitude as the scale effects (the proportional increases in employment across demographic groups assuming constant shares). This indicates that a large number of labour market changes (the shifts) are generally of the ladder climbing type within demographic groups from low-pay to higher-pay industries.

Thurow (1975) reinforced this argument. When the economy is maintained at full employment, workers in low paying sectors (or occupations) also receive income boosts because employers, seeking to meet their strong labour demand, offer employment and training opportunities to the most disadvantaged in the population. If the economy falters, these groups are the most severely hit in terms of lost income opportunities (Mitchell, 1987b).

Vroman (1978) approached the upgrading hypothesis by focusing on cyclical changes in the earnings of low-wage workers. He found (1978: 192-193) in the US (during 3 periods covering 1964 to 1971) that

> … the pattern of cyclical real wage increases by type of job mobility is also clear-cut. People who do not change jobs on the average experience quite stable rates of real wage gain over different phases of the business cycle. Intra-industry movers have above-average wage gains

in cyclical expansions and below-average gains in contractions. Inter-industry movers, however, are the group whose real wage increases are most responsive to cyclical conditions ... On average, workers with the lowest wage levels have wage gains which are most sensitive to the business cycle. Wage gains for high-wage workers, conversely, are the least cyclically sensitive … There is a very large amount of job changing in the economy.

Upgrading also focuses on the mapping of different demographic groups into good and bad jobs. The groups who experience the greatest relative employment gains when economic activity is high are those who are stuck in the secondary labour market, typically, teenagers and women. While these groups are proportionately favoured by the employment growth, the industries with the largest relative employment growth are typically high-wage and high-productivity and employ mostly prime-age males. Expansion is therefore equated with ladder climbing whereby males in low-pay jobs (as a result of downgrading in the recession) climb into better jobs and make space for disadvantaged workers to resume employment in their usual sectors. In addition, favourable share effects in predominantly male industries provide better jobs for teenagers and women.

## 7.3    An alternative cyclical adjustment path

In the light of widespread evidence that many economies experienced a productivity slowdown during the 1970s, Thurow (1983) argues that it has been mainly due to changes in the occupational structure of the economy. These changes are characterised by a switch away from jobs that actually make things towards those that are essentially administrative and do not directly produce anything. He cites the fact that between 1978 and 1985, the number of blue-collar employees in the US fell by 1.9 million (6 per cent), while over the same period real business GDP rose by 16 per cent. Productivity for blue-collar workers seemed to be rising. An alternative explanation is that the slowdown may have been due to a slump in productivity in the goods-producing industries, and therefore a shift in the composition of output away from the good-producing sector is thus not necessarily the source of the problem.

Table 7.1 shows that for Australia, the share of employment of the *goods-producing aggregate* (Manufacturing, Construction and Transport) has fallen since 1978 (from 34 per cent of the total in 1978 to 26 per cent in 1992). Alternatively, the *services aggregate* (Wholesale and retail trade, Financial, property and business services, Community services and Recreation) rose from 49 per cent of total to 59 per cent of total over the same period. The major part of the rise coming from Community services (15 per cent to 19 per cent) and Recreation (6 per cent to 8 per cent), with Wholesale and retail trade almost constant in terms of its share in total. The other large service industry, Financial, property and business services rose from 8 per cent to 12 per cent of total employment.

**Table 7.1 Shares in Total Employment by Sector of Industry, 1976-1992**

| Year | Goods provision | Service provision | Selected service industries | | | |
|------|------|------|------|------|------|------|
| | | | WRT | Community services | Recreation | FPBS |
| 1978 | 34.0 | 49.0 | 20.0 | 15.0 | 6.0 | 8.0 |
| 1983 | 30.0 | 52.0 | 20.0 | 17.0 | 6.0 | 9.0 |
| 1988 | 29.0 | 57.0 | 21.0 | 18.0 | 7.0 | 11.0 |
| 1989 | 29.0 | 56.0 | 21.0 | 17.0 | 7.0 | 11.0 |
| 1990 | 28.0 | 58.0 | 21.0 | 18.0 | 7.0 | 12.0 |
| 1991 | 27.0 | 59.0 | 21.0 | 19.0 | 8.0 | 12.0 |
| 1992 | 26.0 | 59.0 | 21.0 | 19.0 | 8.0 | 12.0 |

**Source:** ABS, Labour Force, Australia, Cat. No. 6203.0
Goods provision is the aggregate, manufacturing, construction and transport. Service provision is the aggregate, Wholesale and retail trade, Financial, property and business services, Community services and Recreation.

Given marked shift in the composition of employment away from goods-producing industries, towards administrative, service and overhead industries, what patterns of productivity growth have the industries shown over the same period? Table 7.2 compares the employment growth and the productivity growth for the goods-producing sector and selected service sector industries. As a benchmark, the annual average growth in GDP divided by Employment for the All Industries for the period 1980-81 to 1991-92 was a meagre 0.97 per cent. For the market sector, over the same period, the average annual growth rate was slightly higher at 1.14, and for the non-farm, it was 1.0 per cent per annum.

The goods-producing aggregate (Manufacturing, Construction and Transport) exhibited a comparatively healthy 1.41 per cent average annual growth in productivity over the period 1978 to 1992. Manufacturing's average annual growth rate over the period 1980-81 to 1991-92 was a relatively strong 1.66 per cent, while Transport was 2.07 per cent per annum and Construction was -1.0 per cent per annum. While the goods-producing sector has shown above average productivity performance since the early 1980s, its annual average compound employment growth has been virtually zero.

The service industries shown in Table 7.2 have all shown very poor productivity growth, yet strong to very strong employment growth. A large redistribution in the employment to these industries, given that they account for nearly half the total employment, must definitely have contributed to the declining productivity performance and the reduced sensitivity of productivity growth to the closing of the employment gap.

**Table 7.2 Employment and Productivity Growth Rates by Sector, 1979 to 1992**

| Year | Goods Producers | | WRT | | Recreation | | FPBS | |
|---|---|---|---|---|---|---|---|---|
| | Δg | Δn | Δg | Δn | Δg | Δn | Δg | Δn |
| 1979 | 3.09 | 0.77 | 2.58 | 1.23 | -0.77 | 0.52 | 3.01 | 3.43 |
| 1980 | 2.08 | 1.28 | 0.74 | 2.93 | -0.47 | 4.36 | -0.14 | 5.03 |
| 1981 | 2.80 | 0.63 | 3.15 | -0.31 | 1.02 | 1.68 | -0.07 | 7.33 |
| 1982 | -0.27 | -1.84 | 1.68 | -0.49 | 0.86 | 1.48 | -1.12 | 3.64 |
| 1983 | -0.14 | -6.79 | -1.75 | -1.93 | 1.33 | -0.16 | 0.55 | -0.98 |
| 1984 | 5.79 | 1.10 | 4.03 | 2.48 | -1.76 | 4.55 | -2.55 | 7.37 |
| 1985 | 2.29 | 2.65 | 0.63 | 4.33 | -1.13 | 5.40 | 1.56 | 7.04 |
| 1986 | -1.75 | 1.39 | -7.69 | 5.24 | -2.13 | 4.03 | 0.90 | 6.79 |
| 1987 | 2.22 | 1.25 | 0.06 | 1.51 | -4.87 | 7.52 | 2.23 | 6.13 |
| 1988 | 1.76 | 3.52 | 1.02 | 5.75 | -2.27 | 6.43 | 0.94 | 6.03 |
| 1989 | 1.08 | 5.39 | -0.02 | 5.97 | -1.68 | 4.84 | -1.89 | 8.21 |
| 1990 | 0.33 | -1.99 | -4.30 | 1.91 | -3.49 | 3.66 | -1.47 | 4.16 |
| 1991 | -0.60 | -5.65 | -0.83 | -2.06 | -7.80 | 4.73 | -4.18 | -1.52 |
| 1992 | 1.02 | -2.48 | 4.38 | -0.43 | -1.80 | 2.95 | 0.29 | -0.28 |
| | | | | | | | | |
| Annual Average | 1.41 | -0.06 | 0.26 | 1.86 | -1.78 | 2.84 | -0.14 | 4.45 |

**Source:** ABS AUSSTATS
Productivity is real gross output divided by employment. Goods-producers are Manufacturing, Construction and Transport. Δg is the annual percentage change in productivity growth, and Δn is the annual percentage change in employment.

So it is the changing composition of total employment, with increasing numbers of workers being employed in sectors with low productivity levels and declining productivity growth rates, which has been more influential in explaining the productivity slump.

These results suggest that Okun's upgrading hypothesis may have to be modified to take account of the changing composition of industry employment. The low productivity service sector is responsible for most of the growth in employment since the late 1970s. If two further related facts are added to the discussion, namely, (a) that these industries have higher part-time employment shares, and (b) larger female and teenage participation, then a less glamorous picture of upgrading emerges.

We should expect to see more jobs created in the service sector as the employment gap is closed. We should also expect teenagers and females to receive a significant number of these jobs. But whether we would want to construe this as a ladder-climbing shift is questionable. The new jobs are likely to be biased towards low-pay, fractional positions. Further the effect on aggregate productivity, as the composition of output and employment shifts further to these service industries is likely to be less than desirable.

## 7.4    Cyclical participation effects and hidden unemployment

From the viewpoint of upgrading, a cyclical rise in labour force participation (indicating that the discouraged worker effect is dominant) provides marginal workers with the chance to share in the benefits of the higher output and employment. Workers who enter the labour force only when the probability of gaining work increases are often termed - hidden *unemployed*. The literature indicates that it is teenagers and to lesser extent women who exhibit the largest swings.

In this section, we estimate the various demographic labour force participation responses over the business cycle and use these estimates to calculate potential labour force sizes for each demographic group. The potential labour force is based on an arbitrary aggregate unemployment rate. The estimates of potential labour forces allow us to provide estimates of the extent of hidden unemployment in Australia. The aggregate potential labour force also provides the basis upon which the aggregate employment gap is estimated. The first issue concerns the derivation of a 'full-employment' labour force, which will serve as a benchmark upon which comparisons with the actual cyclically sensitive labour force are based.

Trend extrapolation is a –popular method of deriving a benchmark labour force. An estimated trend is combined with an arbitrary full employment level of a variable designed to measure the cycle and the regression simulated to yield labour force estimates at full employment (for example, Simler and Tella, 1968; Gordon, 1971). Typically, linear trend functions are fitted and the simulated results are often unrealistic. Alternatively, some studies have chosen an arbitrary point in time as a full employment observation, and then simply projected a trend from that point to the end of the sample on the assumption that the long-term rate of GDP growth and its relationship to the labour market was stable over the sample period (for example, Stricker and Sheehan, 1981).

We use another approach first developed by Perry (1971). To calculate the potential labour forces, we begin with a set of age-gender regressions estimating labour force participation rates on cyclical and trend factors. The models seek adequate representations of the movements in terms of secular filters

and cyclical filters rather than presenting structural explanations for the complex behaviour. The models are inevitably approximations and black box by nature, but without them it is difficult to derive any estimates of potential labour forces.

The econometric model of labour force participation is

**Eqn 7-1**     $$(LFPR_i)_t = \alpha + \sum_{j=0}^{k} \beta_j NPOP_{t-j} + \phi TIME + \varepsilon_t$$

where $LFPR_i = (L_i / POP_i)$ and is the labour force participation rate of the ith age-gender group defined as the labour force divided by the total civilian population for that particular group; $NPOP$ is non-farm total employment divided by the civilian population between 15-64 years, TIME is a linear time trend, and $\varepsilon_t$ is a stochastic error term.

A general-to-specific methodology was employed to simplify the models. The lag length started with k=4 and was simplified according to a series of sequential restrictions. A separate regression was fitted for each age and gender group using quarterly, seasonally adjusted data. Testing for specific structural breaks was performed and no regression exhibited within-sample instability. In some instances dummy variables were used to capture some errant residual behaviour. The trend term was included to add precision to the cyclical coefficient on the NPOP variable(s). The potential labour forces for each age-gender group were calculated by adding an estimated participation gap to the actual seasonally adjusted labour force for each age-gender group.

The calculation of the participation gaps is based on

**Eqn 7-2**     $$PRGAP_i = \beta(NPOP^{FN} - NPOP_i)$$

where $PRGAP_i$ is the participation rate gap for the ith age-gender group, $NPOP^{FN}$ is the employment-population ratio at full employment, assuming some arbitrary benchmark unemployment rate as full employment, and $NPOP_i$ is the current employment-population ratio.

*PRGAP* thus measures the incremental variation in the relevant participation rate, which would occur if the economy moved from its current level of activity to the defined full employment level of activity. Potential participation rates are the sum of the current labour-force participation rate for the relevant group and the associated participation gap.

Once potential participation rates are calculated for each age-gender group, they are multiplied by the corresponding population aggregate to yield an estimate of the potential labour force for the relevant group and for the economy in total.

This method is arguably superior to the trend simulation method, especially in times when participation rates exhibit trend increases quite unlike previous periods. In that case, trend simulation would seriously underestimate or overestimate the potential labour force. Using a method that is more sourced in terms of the actual data variations; the gap approach is better able to accommodate the strong trend variations in the labour force participation rates over time.

Table 7.3 shows the male regressions. The labour force participation rates of teenage males and males above 55 year of age are sensitive in varying degrees to the business cycle. For prime-age males (25-54 years of age) there is virtually no participation rate responsiveness detected. All male participation rates show a downward secular movement over the sample period used. The results are in accord with the prevailing wisdom.

Table 7.4 shows the female regressions, which are in contrast to the male results. The participation rates for every female age group demonstrate cyclical sensitivity, with females aged between 35-54 and 60-64 showing the most responsiveness. Further, while there is a declining secular trend for teenage females, and women between 60-64, prime-age women have demonstrated a trend towards higher participation rates independent of the business cycle.

The process of deriving potential labour forces for each demographic group begins with the regression estimates reported in Tables 7.3 and 7.4. The participation gap for each group is derived by multiplying $\beta$ times the difference between the full-employment employment population ratio and the actual value of the employment population ratio. The full-employment population ratio was calculated to convert to a 94 per cent employment to labour force ratio. Potential participation rates are then defined as actual participation rates plus the gap. Total potential labour force is calculated as the potential participation rates times the respective population. In February 1993, it was equal to 8767.5 thousand. Hidden unemployment is then calculated as the current population for each cohort times the gap.

**Table 7.3 Male Labour Force Participation Rate Regressions**

| | 15-19* | 20-24 | 25-34 | 35-44 | 45-54 | 55-59 | 60-64* |
|---|---|---|---|---|---|---|---|
| Dependent Variable: LFPR<br>Sample: 1964(1)-1993(1) | | | | | | | |
| Constant | 31.31 | 85.58 | 96.15 | 95.17 | 95.48 | 57.89 | 43.66 |
| | (3.53) | (26.06) | (66.72) | (58.34) | (34.90) | (7.77) | (3.82) |
| Time | -0.14 | -0.05 | -0.04 | -0.04 | -0.07 | -0.12 | -0.29 |
| | (4.33) | (6.09) | (9.18) | (7.28) | (7.79) | (3.91) | (6.53) |
| NPOP | | 14.96 | 3.87 | 5.34 | 1.90 | 54.94 | |
| | | (2.52) | (1.50) | (1.84) | (0.39) | (4.27) | |
| NPOPMA | 71.38 | | | | | | 69.59 |
| | (4.65) | | | | | | (3.73) |
| D1 | 1.08 | | | | | | |
| | (2.34) | | | | | | |
| D5 | | | | 0.26 | | | |
| | | | | (2.48) | | | |
| D7 | | | | | -0.49 | | |
| | | | | | (3.98) | | |
| $R^2$ | 0.98 | 0.98 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| s.e. | 0.46 | 0.21 | 0.09 | 0.10 | 0.17 | 0.45 | 0.54 |
| Elasticity at means | 0.64 | 0.09 | 0.02 | 0.03 | 0.00 | 0.37 | 0.64 |
| rho | 0.99 | 0.95 | 0.97 | 0.97 | 0.97 | 0.99 | 0.99 |

* Sample was 1964(2)-1993(1) for 15-19 and 1966(3)-1993(1) for 60-64. All regressions were estimated using a first-order maximum likelihood correction for serial correlation (rho is the estimated serial correlation coefficient). NPOPMA is the two-quarter moving average of NPOP. D1 was zero prior to 1976(2) and unity after, D5 was zero prior to 1985(4) and unity after, and D7 was unity between 1983(4) and 1984(2) and zero otherwise. The figures in parentheses are *t*-statistics.

**Table 7.4 Female Labour Force Participation Rate Regressions**

| Dependent Variable: LFPR<br>Sample: 1964(1)-1993(1) | 15-19* | 20-24 | 25-34 | 35-44 | 45-54 | 55-59 | 60-64* |
|---|---|---|---|---|---|---|---|
| Constant | 39.88 | 34.62 | 6.99 | 0.16 | 4.21 | 6.75 | 7.50 |
|  | (5.13) | (6.42) | (1.24) | (0.03) | (0.75) | (0.92) | (1.10) |
| Time | -0.08 | -0.18 | -0.31 | -0.31 | 0.27 | -0.14 | -0.05 |
|  | (2.80) | (9.34) | (27.19) | (20.71) | (13.75) | (4.78) | (1.80) |
| NPOP | 44.44 | 38.67 |  |  |  | 24.98 | 20.83 |
|  | (3.27) | (4.07) |  |  |  | (1.95) | (1.80) |
| NPOPMA | 71.38 |  | 44.50 | 66.07 | 52.02 |  |  |
|  | (4.65) |  | (4.38) | (6.79) | (5.30) |  |  |
| $R^2$ | 0.97 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.96 |
| s.e. | 0.48 | 0.34 | 0.31 | 0.29 | 0.29 | 0.45 | 0.39 |
| Elasticity at means | 0.42 | 0.31 | 0.49 | 0.66 | 0.60 | 0.47 | 0.79 |
| rho | 0.97 | 0.98 | 0.95 | 0.97 | 0.99 | 0.98 | 0.98 |

\* Sample was 1964(2)-1993(1) for 15-19 and 1966(3)-1993(1) for 60-64.  All regressions were estimated using a first-order maximum likelihood correction for serial correlation (rho is the estimated serial correlation coefficient).  Figures in parentheses are *t*-statistics.

Table 7.5 shows the extent of hidden unemployment across age and gender groups at February 1993, while Table 7.6 shows the same aggregates for February 1983. In 1983, the aggregate unemployment rate was 9.6 per cent (seasonally adjusted) and was to rise for a further two quarters before beginning its slow decline as the employment expansion occurred throughout the 1980s. In February 1993, the aggregate unemployment rate was 11.1 per cent (seasonally adjusted). The striking characteristic about 1993 (compared to 1983) is that teenagers left the labour force in significant numbers and that males now comprise a higher percentage of both actual and hidden unemployment as both aggregates have worsened. Further, while the unemployment of older males rose relative to the actual rise in total unemployment, their hidden unemployment fell sharply. This may have reflected some modification to the downward trend in actual participation rates during the early 1980s.

In February 1993, there was approximately one hidden unemployed for every four officially recorded unemployed in excess of a 6 per cent unemployment rate (the benchmark). The increase in labour force participation would have been equivalent to an increase in employment of around 19 per cent.

**Table 7.5 Actual and Hidden Unemployment in Australia, (000's), February 1993**

| Age | Males | | Females | | Persons | | |
|---|---|---|---|---|---|---|---|
| | Actual | Hidden | Actual | Hidden | Actual | Hidden | Total |
| 15-19 | 96.1 | 33.9 | 83.8 | 15.9 | 179.9 | 49.8 | 229.7 |
| 20-24 | 115.2 | 6.1 | 78.0 | 15.5 | 193.2 | 21.6 | 214.8 |
| 25-34 | 155.2 | 3.1 | 88.9 | 35.4 | 244.1 | 38.5 | 282.6 |
| 35-44 | 104.0 | 7.5 | 68.9 | 49.7 | 173.0 | 57.2 | 230.2 |
| 45-54 | 64.9 | 1.1 | 42.0 | 28.9 | 107.0 | 30.0 | 137.0 |
| 55-59 | 31.0 | 11.8 | 5.9 | 5.2 | 37.0 | 17.0 | 54.0 |
| 60-64 | 27.8 | 14.1 | 1.5 | 4.4 | 29.2 | 18.5 | 47.7 |
| Total | 594.2 | 77.6 | 369.2 | 155.0 | 963.3 | 232.7 | 1196.0 |

The hidden estimates are based on a full employment unemployment rate of 6 per cent of the total potential labour force. All data are seasonally adjusted.

**Table 7.6 Actual and Hidden Unemployment in Australia, (000's), February 1983**

| Age | Males | | Females | | Persons | | |
|---|---|---|---|---|---|---|---|
| | Actual | Hidden | Actual | Hidden | Actual | Hidden | Total |
| 15-19 | 77.6 | 0.9 | 74.7 | 8.4 | 152.3 | 9.3 | 161.6 |
| 20-24 | 77.5 | -2.3 | 53.4 | 2.0 | 130.9 | -0.3 | 130.6 |
| 25-34 | 82.2 | 1.3 | 55.0 | 31.8 | 137.2 | 33.1 | 170.3 |
| 35-44 | 42.0 | 3.4 | 35.0 | 38.2 | 77.0 | 41.6 | 118.6 |
| 45-54 | 30.1 | 6.9 | 16.0 | 48.5 | 46.1 | 55.4 | 101.5 |
| 55-59 | 13.3 | 7.9 | 3.7 | 14.2 | 17.0 | 22.1 | 39.1 |
| 60-64 | 8.2 | 46.7 | 0.4 | 16.9 | 8.6 | 63.6 | 72.2 |
| Total | 330.9 | 64.8 | 238.2 | 160.0 | 569.1 | 224.8 | 793.9 |

The hidden estimates are based on a full employment unemployment rate of 6 per cent of the total potential labour force. All data are seasonally adjusted.

## 7.5　Potential employment and employment gaps by age and gender

The potential labour force estimates are used to calculate potential employment for each demographic group and in total. The total employment gap is defined as the difference between actual employment for any group and the potential employment.

The steps in this calculation are as follows:

- Potential total employment is defined as 94 per cent of potential total labour force using the 6 per cent unemployment rate as the full employment benchmark. In February 1993, the total potential labour force was 8,767.5 thousand and potential total employment was 8241.5 thousand.
- The total employment gap for February 1993 was 8241.5 minus 7643.4 (total seasonally adjusted employment), a gap of 598.1 thousand. This means that the 'full employment' unemployment (6 per cent of the total potential labour force) would have been 526,050.
- Distributing this unemployment across the age-gender groups allows us to calculate weights equal to the percentage of each age-gender group in total unemployment for February 1993, where total unemployment equals actual plus hidden unemployment. In this way, the cyclical response is incorporated in the distribution. Thus, the share of group $i$ in total 'full employment unemployment' is equal to the weight times the total unemployment.

To estimate total potential employment for each age-gender group, the distributed unemployment for each group was subtracted from its estimated potential labour force. The difference between actual employment for each group and the potential employment level is defined as the demographic employment gap. This gap represents the amount of employment shortfall as a result of the economy operating below the 6 per cent aggregate unemployment rate level of activity, which we are terming the full employment level.

Tables 7.7 and 7.8 compare the results of this analysis for February 1993 and February 1983, respectively. In February 1983, the national unemployment rate was 9.6 per cent in seasonally adjusted terms, whereas in February 1993 it was 11.1 per cent in seasonally adjusted terms. The labour market in 1993 was in worse shape than it was in February 1983. The overall employment gap in February 1993 was 598.1 thousand compared to only 368.3 thousand in February 1983. The potential employment level is around 23 per cent higher in 1993 due to the increased size of the labour force. Both potential employment aggregates are based on a 6 per cent full employment unemployment rate.

There have also been some changes in the demographic employment gaps over the decade. Teenage males are now much worse off as are the 55-59 year old males. Notably, males in the 45-54 year old group have shown little change since 1983, the slightly higher employment gap scaling up with the growth in actual and potential employment. Teenage females are actually better of in gap terms although their potential employment level has shrunk. The older females (55-64 year old) have improved their absolute position. Of interest is the deterioration in prime age females (25-54 year old). Two points are worth noting here. Actual prime-age female employment has risen dramatically since February 1983. At the same time, given the large labour force participation changes for this group, their potential employment level has risen by a greater proportion than actual employment. As a consequence, their employment gaps have increased.

It is apparent from the February 1993 results that there is enormous disproportionately between demographic employment gaps. The gaps (as percentages of actual employment) range from 25.9 per cent for teenage males to only 2.3 per cent for males 45-54 years. Prime-age males (25-54) accounted for around 41.9 per cent of total seasonally adjusted employment in February 1993 but only 25.7 per cent of the total employment gap. Females in total account for 56.2 per cent of the employment gap but only 42.3 per cent of the seasonally adjusted employment.

In terms of Table 7.7, we can see that this pattern has been somewhat modified even given the strong growth in secondary type workers. For example in February 1983, prime-age males accounted for 42.6 per cent of seasonally adjusted employment, but accounted for 20.8 per cent of the total employment gap. Secondary-type workers are characterised by relatively sensitive participation rates and also experience disproportionate rises in their unemployment rates as the business cycle turns down. As a result, they experience larger relative employment gaps. This result is certainly true for adult women.

**Table 7.7 Demographic Distribution of Employment Gap, February 1993**

| Demographic Group | Actual Employment | Potential Employment | Employment Gap | Gap as a % of Actual |
|---|---|---|---|---|
| | 000's | 000's | 000's | Per Cent |
| | | MALES | | |
| 15-19 | 266.5 | 335.6 | 69.1 | 25.9 |
| 20-24 | 541.8 | 589.2 | 47.4 | 8.7 |
| 25-34 | 1177.6 | 1256.3 | 78.7 | 6.7 |
| 35-44 | 1155.1 | 1209.6 | 54.5 | 4.7 |
| 45-54 | 876.9 | 897.5 | 20.6 | 2.3 |
| 55-59 | 240.5 | 267.5 | 27.0 | 11.2 |
| 60-64 | 149.5 | 168.6 | 19.1 | 12.8 |
| 15-64 | 4408.0 | 4724.3 | 261.9 | 5.9 |
| | | FEMALES | | |
| 15-19 | 275.4 | 314.5 | 39.1 | 14.2 |
| 20-24 | 469.7 | 513.7 | 44.0 | 9.4 |
| 25-34 | 843.8 | 915.2 | 71.4 | 8.5 |
| 35-44 | 859.6 | 945.9 | 86.3 | 10.0 |
| 45-54 | 607.8 | 638.8 | 31.0 | 5.1 |
| 55-59 | 127.7 | 133.9 | 6.2 | 4.9 |
| 60-64 | 51.4 | 55.4 | 4.0 | 7.8 |
| 15-64 | 3235.4 | 3517.4 | 336.2 | 10.4 |
| | | | | |
| Total Persons | 7643.4 | 8241.5 | 598.1 | 7.8 |

**Table 7.8 Demographic Distribution of Employment Gap, February 1983**

| Demographic Group | Actual Employment 000's | Potential Employment 000's | Employment Gap 000's | Gap as a % of Actual Per Cent |
|---|---|---|---|---|
| MALES | | | | |
| 15-19 | 332.9 | 369.2 | 36.3 | 10.9 |
| 20-24 | 523.4 | 558.1 | 34.7 | 6.6 |
| 25-34 | 1106.7 | 1145.3 | 38.6 | 3.5 |
| 35-44 | 912.9 | 933.9 | 21.1 | 2.3 |
| 45-54 | 668.6 | 685.7 | 17.1 | 2.6 |
| 55-59 | 281.5 | 291.4 | 9.9 | 3.5 |
| 60-64 | 138.9 | 164.3 | 25.4 | 18.3 |
| 15-64 | 3964.9 | 4147.9 | 183 | 4.6 |
| FEMALES | | | | |
| 15-19 | 292.3 | 331.8 | 38.5 | 13.1 |
| 20-24 | 413.8 | 439.4 | 26.6 | 6.2 |
| 25-34 | 620.8 | 660.9 | 40.1 | 6.5 |
| 35-44 | 540.4 | 574.3 | 33.9 | 6.3 |
| 45-54 | 345.6 | 375.5 | 29.9 | 8.6 |
| 55-59 | 101.2 | 109.5 | 8.3 | 8.2 |
| 60-64 | 36.5 | 44.5 | 8.0 | 22.0 |
| 15-64 | 2350.6 | 2535.9 | 185.3 | 7.9 |
| Total Persons | 6315.5 | 6683.8 | 368.3 | 5.8 |

## 7.6 Industry employment elasticities

In which industries would the extra jobs be generated should the economy close the employment gap? To calculate the employment gaps by industry, the following log-linear regression was estimated

**Eqn 7-3** $$N_{i,t} = \alpha_0 + \alpha_1 \text{TIME} + \sum \delta_i N_{i,t-j} + \beta N_t + \varepsilon_t$$

where TIME is a linear time trend included to distinguish cyclical forces from secular movements in the data, $N_{i,t}$ is the $i^{th}$ industry's employment at time $t$, and $N_t$ is total economy-wide employment at time $t$, $\varepsilon_t$ is a stochastic error term. To minimise the residual serial correlation, which may arise due to a misspecified dynamic structure, the residuals were modelled as autoregressive processes with log likelihood tests used in each case to determine the order of the autoregression of the residuals.

Table 7.9 shows the estimated employment elasticities for each industry. The $\beta$ estimates clearly indicate the divergent cyclical sensitivities of the sectoral employment levels to changes in total employment. Construction is the most cyclically sensitive industry (employment in construction increases by 1.84 per cent for every one per cent increase in aggregate employment). Other highly sensitive industries ($\beta > 1$) are Wholesale and retail trade and Finance, property, and business services. Electricity, gas and water and Public administration and Defence are counter-cyclical industries.

Converting the elasticity into a gap estimate is straightforward. First, the total gap is expressed as a percentage of actual total employment. This figure represents the percentage change in total actual employment that would be required to instantly eliminate the gap. In February 1993, total employment would have to be 7.825 per cent higher to close the gap of 598.1 thousand jobs. If employment was to suddenly grow by this amount, the aggregate unemployment rate (taking into account cyclical participation movements) would be equal to 6 per cent, the arbitrary full employment level of activity used in our analysis.[1]

Second, the gap for each industry is initially estimated by multiplying $\beta$ by 7.825 per cent by the current industry employment. For example, for manufacturing in February 1993, the gap calculation is 0.74282 times 0.07825 times 1100.5 thousand. This gives an initial gap of 64.0 thousand. Due to the stochastic nature of the estimating equations the estimated industry gaps do not fully exhaust the total gap of 598.1 thousand. The second round allocation involved distributing the residual across industries in accordance with each industry's gap as a percentage of the total first round gap distribution.

**Table 7.9 Estimating Employment Elasticities by Industry**

| Industry | Employment Elasticity $\beta$ |
|---|---|
| Agriculture | 0.64 |
| Mining | 0.58 |
| Manufacturing | 0.74 |
| Electricity, gas and water | -0.31 |
| Construction | 1.84 |
| Wholesale and retail trade | 1.29 |
| Transport and Storage | 0.12 |
| Communications | 0.26 |
| Financial, property and business services | 1.02 |
| Public administration and defence | -0.28 |
| Community services | 0.75 |
| Recreation and personal and other services | 0.35 |

Table 7.10 reports the results of the distribution of the aggregate employment gap and provides some broad industry characteristics. Wholesale and retail trade, Construction, Finance, property, and business services, Community services, and to a lesser extent Manufacturing, are the major components of the total gap, accounting for around 92 per cent of all the jobs which would be created if the economy moved to full employment. Wholesale and retail trade, Construction, and Community services account for around 65 per cent of the total gap. Although construction is a relatively small industry (6.7 per cent of total February 1993 employment) it is so cyclically sensitive that it accounts for 15 per cent of the total gap. For Community services, while it is only moderately cyclically sensitive ($\beta = 0.76$), it generates a relatively large employment gap (17.6 per cent of total gap), because it is a relatively large industry (19.2 per cent of total February 1993 employment).

**Table 7.10 Employment Gaps and Related Industry Characteristics, February 1993**

| Industry | Gap | | Actual Employment | |
|---|---|---|---|---|
| | 000's (s.a.) | % of Total Gap | 000's (s.a.) | % of Total |
| Agriculture | 24.7 | 4.1 | 406.5 | 5.3 |
| Mining | 4.7 | 0.8 | 85.9 | 11.2 |
| Manufacturing | 77.5 | 12.9 | 1100.5 | 14.4 |
| EGW | -2.6 | -0.5 | 100.9 | 1.3 |
| Construction | 90.0 | 15.0 | 515.7 | 6.7 |
| WRT | 195.5 | 32.6 | 1594/0 | 20.9 |
| Transport | 4.1 | 0.7 | 373.8 | 4.9 |
| Communication | 2.9 | 0.5 | 116.2 | 1.5 |
| FPBS | 85.3 | 14.2 | 877.8 | 11.5 |
| Public Admin. | -10.1 | -1.7 | 373.1 | 4.9 |
| Com. Services | 105.4 | 17.6 | 1466.9 | 19.l2 |
| Recreation | 20.8 | 3.5 | 626.9 | 8.2 |
| Total | 598.1 | 100.0 | 7643.4 | 100.0 |

Totals may not add up due to rounding.
Agriculture includes forestry, fishing and hunting, EGW is Electricity, gas and water, WRT is Wholesale and retail trade, FPBS is finance, property and business services, Public administration includes defence.

Table 7.10 presents the final employment gap allocation, whereas Table 7.11 orders the industries in terms of their elasticities and broadens the industry characteristics. We can summarise the results in the following manner:

- Prime-age males account for 41.5 per cent of All Industry employment. For the high elasticity industries, only construction with 63.6 per cent of its total employment being prime-age male is above the All Industry percentage of prime-age males. Both Wholesale and retail trade (35.2 per cent of total employment being prime-age male), and Financial, property and business services (39.5 per cent of total employment being prime-age males) are well below the All Industry prime-age male representation.

- The next most responsive industry, Community services (26.8 per cent of total employment being taken by prime-age males) is also noticeably below the All Industry prime-age male figure. Prime-age males do not dominate these industries.

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- If each industry filled its February 1993 employment gap with an unchanged demographic composition of industry employment, prime-age males would have got around 41.5 per cent of the extra jobs or 247.3 thousand. By comparison, according to our prior demographic estimates, prime-age males accounted for 25.7 per cent of the total employment gap. In contrast, teenagers account for 18.1 per cent of demographic employment gap would only get 7.0 per cent of the industry gap if demographic employment shares in each industry were unchanged.

- The fringe-benefits index was derived from a ratio of 'other labour costs' to earnings published by ABS, where the 'other labour costs' include superannuation, payroll tax, workers' compensation and fringe benefits tax. It is a proximate measure of the degree of long-term attachment between employers and employees. Labour market theory suggests that primary labour market jobs typically reward their incumbents with above-average earnings, which are supplemented by above-average fringes. In addition, employers must also pay higher fixed costs of hiring and firing and related employment costs in these areas. The benefit to them is that they gain a skilled and stable labour force. Put together, a motivation exists on both sides of the bargain to preserve the relationship. So the existence of above average fringe benefits may be accompanied by other primary labour market characteristics, whereas in an industry paying below-average fringes it is likely that primary labour markets are less well established.

  With the exception of Wholesale and retail trade, the high elasticity industries do pay above-average fringe benefits to earnings. In Construction however, it is higher worker's compensation payments and super payments, which account for most of the above-average result. This may be related to negotiated agreements with unions based on the transitory and dangerous nature of building projects, rather than being a sign of a primary labour market. For Financial, property and business services, above-average superannuation and fringe benefits tax payments tell the story. With Community services being placed in a lowly position on the index there is no unambiguous pattern among high employment gap industries with regards to high fringe to earnings ratios.

- The pattern is also unclear when it comes to the pay characteristics of the high employment gap industries. Wholesale and retail trade stands out as a clear exception among the high elasticity industries. Construction and Financial, property and business services both offer above-average weekly earnings to their workers. Of the mid-elasticity industries, Community services and Agriculture are among the lowest paying industries, whereas Mining is the highest and manufacturing is above average.

- Therefore, more jobs will go to industries whose average weekly earnings are below the All Industry average. However, it cannot be concluded from this that the newly created jobs will necessarily be low paying jobs (for further evidence showing that the newly created jobs are likely to be below average paying jobs, see Mitchell et al, 1995).

- Productivity (output per person hour) estimates are also shown for each industry. The top five elasticity industries have productivity performances, which are at best equal to the All Industry average. They are not high productivity industries. This is consistent with the previous results regarding fringes and average weekly earnings. It is also a rather different story to that found in the USA by Okun (1973) and Vroman (1978).
- The last column shows the full-time to total employment ratio for each industry. The All Industry average shows that 77.4 per cent of all employment is full-time. Construction is well above average, Financial, property and business services about average and Wholesale and retail trade is well below average.

**Table 7.11 Summary Characteristics of Industry Employment Gaps**

| Industry | β | Gap | Gap to total % | Prime-age male index | Prod'y index | Fringe benefits index | AWE Index | Full-time as a % of Total |
|---|---|---|---|---|---|---|---|---|
| High Elasticity Industries | | | | | | | | |
| Construction | 1.84 | 90.0 | 17.5 | 153.3 | 97.5 | 111.7 | 109.9 | 84.6 |
| WRT | 1.29 | 195.5 | 12.3 | 84.5 | 100.1 | 90.0 | 90.0 | 69.7 |
| FPBS | 1.02 | 85.3 | 9.7 | 95.2 | 94.9 | 112.5 | 113.9 | 78.3 |
| Medium Elasticity Industries | | | | | | | | |
| Com. Services | 0.76 | 105.4 | 7.2 | 64.6 | 98.3 | 67.5 | 67.5 | 70.9 |
| Manufacturing | 0.74 | 77.5 | 7.0 | 127.5 | 100.7 | 113.3 | 104.1 | 90.9 |
| Agriculture | 0.64 | 24.7 | 6.1 | 110.1 | 103.3 | | 76.1 | 76.8 |
| Mining | 0.58 | 4.7 | 5.5 | 183.4 | 119.8 | 123.3 | 177.4 | 97.0 |
| Low Elasticity Industries | | | | | | | | |
| Recreation | 0.35 | 20.8 | 3.3 | 67.9 | 90.6 | 60.1 | 70.1 | 57.1 |
| Communications | 0.26 | 2.9 | 2.5 | 145.3 | 120.5 | | 112.7 | 92.7 |
| Transport | 0.11 | 4.1 | 1.1 | 152.5 | 104.1 | 98.3 | 1221.3 | 89.0 |
| Negative Elasticity (counter-cyclical) Industries | | | | | | | | |
| Public Admin. | -0.28 | | | 170.4 | 104.1 | | 115.2 | 90.4 |
| EGW | -0.31 | | | 118.6 | 105.6 | 136.7 | 123.4 | 97.9 |
| All | | | | | | | | |

Prod'y = Productivity index with the observation at 1990-91 with All Industries set to 100.0 in that year.

What type of jobs might we expect to be created? There is no sure way of knowing nor estimating the type of jobs, which might be created. But as an exercise, suppose the new jobs created were split between full-time and part-time jobs in proportion to the distribution that prevailed in February 1993? Table 7.12 shows the results of this calculation. In terms of total employment in February 1993 and the extra gap employment which would be generated, full-time employment would represent 76 per cent of the new total, a fall of 1.4 per cent. This 1.4 per cent change in the mix (at full employment, other things equal), means that around 115.4 thousand jobs would change status from full-time to part-time.

**Table 7.12 Hypothetical Breakdown between Full-time and Part-time Employment as Gap closes**
**February 1993**

| Industry | Full-time | Part-time | Total |
|---|---|---|---|
| Construction | 76.1 | 13.9 | 90.0 |
| WRT | 136.3 | 59.2 | 195.5 |
| FPBS | 66.8 | 18.5 | 85.3 |
| Com. Services | 74.7 | 30.7 | 105.4 |
| Manufacturing | 70.4 | 7.1 | 77.5 |
| Agriculture | 19.0 | 5.7 | 24.7 |
| Mining | 4.6 | 0.1 | 4.7 |
| Recreation | 11.9 | 8.9 | 20.8 |
| Communications | 2.7 | 0.2 | 2.9 |
| Transport | 3.6 | 0.5 | 4.1 |
| Public Admin. | -9.1 | -1.0 | -10.1 |
| EGW | -2.5 | -0.1 | -2.6 |
| | | | |
| Total | 454.5 | 143.6 | 598.1 |

The results taken together do not accord with the earlier American work by Okun (1973) and Vroman (1978) among others. While we cannot be sure about the type of jobs that would be created having only examined broad industry characteristics, it would seem that the substantial upgrading effects (higher wages, higher productivity, more primary labour market jobs) found in the earlier studies are not found in this work. The bulk of the extra employment would go to, at best, average productivity industries, paying below average weekly wages with no clear superiority in fringe benefits. Further, the jobs would be likely to increase the ratio of part-time to total employment, other things being equal.

## 7.7   Estimating the cyclical sensitivity of demographic employment shares

Table 7.13 compares and contrasts the demographic gap calculations shown in Table 7.7 with the industry gap estimates shown in Table 7.10. The industry gaps are distributed across the demographic groups shown in accordance with their current share of industry employment. According to the demographic gaps there are too many teenage boys and girls, and not enough prime-age males to fill the relevant industry gaps, if the demographic composition of industry employment was to remain unchanged. The other demographic groups are less disparate. The implication is that the demographic composition of industry employment must vary with the level of economic activity. This sensitivity is an essential part of the upgrading story. While the other aspects of the upgrading hypothesis do not seem clear cut in the present study, it remains to be seen whether upgrading opportunities for women (and other less advantaged groups in the labour market) arise from changes in the demographic composition of industry employment.

**Table 7.13 Comparison between demographic and industry employment gaps, February 1993**

| Demographic Cohort | Demographic Gaps (per cent of total) | Industry Gaps (per cent of total) |
|---|---|---|
| Teenage Boys | 11.6 | 3.5 |
| Prime-age Males | 25.7 | 42.0 |
| 55-64 Males | 7.7 | 5.1 |
| Teenage Girls | 6.5 | 3.6 |
| Prime-age Females | 31.5 | 30.2 |
| 55-64 Females | 1.7 | 2.3 |

Industry Gaps are calculated assuming the composition of industry employment by demographic groups is unchanged.

To reconcile the two we need to investigate within each industry, which demographic groups would gain the extra jobs if the total employment gap was closed? A reconciliation of the estimated industry and demographic gaps requires a change in employment shares.

To estimate the cyclical responsiveness of demographic employment shares unpublished ABS data for employment by industry by age and gender was used. To simplify the analysis, four broad age groups were used for each gender: 15-19, 20-24, 25-54 - termed 'prime-age', and 55-64 years. For two

industries (Mining and Electricity, gas and water), the latter group was aggregated into the prime-age category for females only, to overcome thinness of data in the older groups. All data was seasonally adjusted.

The following regression framework was estimated as the basis of our calculations

**Eqn 7-4:** $$\left( N_{ij} / N_i \right)_t = \alpha_0 + \alpha_1 \text{TIME} + \alpha_2 \left( GAP / N \right)_t + \varepsilon_t$$

where $N_{ij}$ is the employment of the j$^{\text{th}}$ group in industry $i$, $N_i$ is total employment in industry $i$, TIME is a linear time trend intended to decompose sectoral factors and cyclical factors, and ($GAP/N$) is the Total All Industry employment gap to total employment. Ratio

A separate demographic employment share equation was thus estimated for each. In practice, the sum of total industry employment is equal to the sum of the employment of each of the demographic groups. To ensure that the sum of demographic employment share shifts in each industry summed to zero, the six equations were constrained so that $\Sigma \alpha_2 = 0$. The system of eight equations in each industry were estimated as Seemingly Unrelated Regressions in an unrestricted form. The system was re-estimated with the appropriate cross-equation restriction being imposed. The relevant test of the validity of the restriction never rejected the null that the unrestricted system and the restricted system were statistically equivalent.

The coefficient $\alpha_2$ measures the cyclical sensitivity of a specific demographic industry employment share. If the value of $\alpha_2 > 0$, then the demographic employment share in that industry decreases when the employment gap decreases and the share of that group in that industry's employment is maximised when the gap is maximised. These demographic groups experience their largest employment share when the economy is at its lowest ebb. If $\alpha_2 = 0$, the demographic employment share in question is not cyclically sensitive. Accordingly, the number of jobs they receive in an expansion is in proportion to their current share in total industry employment. If $\alpha_2 < 0$, the employment share of that demographic group in that particular industry increases when the employment gap decreases. These groups benefit from increasing employment share as the economy increases its level of economic activity.

Table 7.14 reports the estimates of $\alpha_2$ for each demographic group by industry. Excluding Electricity, gas and water and Public administration and defence, it is clear that teenage boys benefit from

increasing employment share in all industries whereas teenage girls gain share in all but mining. Prime-age males lose share in all industries whereas prime-age females gain in all but agriculture, communications, and financial, property and business services. The 20-24 group and the 55-64 group in both genders experienced a mixed bag.

**Table 7.14 Coefficients measuring cyclical sensitivity of demographic employment shares**

| Industry | Males | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|
| | 15-19 | 20-24 | Prime Age | 55-64 | 15-19 | 20-24 | Prime Age | 55-64 |
| Agriculture | -0.103 | 0.019 | 0.140 | 0.072 | -0.064 | -0.048 | 0.041 | -0.049 |
| Mining | -0.072 | -0.242 | 0.044 | -0.027 | 0.038 | 0.009 | -0.145 | *** |
| Manufacturing | -0.129 | 0.109 | 0.116 | -0.076 | -0.035 | 0.098 | -0.072 | -0.011 |
| EGW | 0.126 | 0.005 | -0.080 | 0.126 | -0.030 | 0.084 | 0.016 | *** |
| Construction | -0.235 | 0.009 | 0.134 | 0.140 | -0.021 | -0.011 | -0.034 | 0.019 |
| WRT | -0.145 | 0.052 | 0.203 | -0.023 | -0.042 | 0.071 | -0.099 | -0.016 |
| Transport | -0.121 | 0.041 | 0.246 | 0.086 | -0.065 | 0.021 | -0.207 | -0.001 |
| Communication | -0.062 | -0.086 | 0.139 | 0.125 | -0.084 | -0.069 | 0.031 | 0.005 |
| FPBS | -0.092 | -0.068 | 0.289 | -0.055 | -0.202 | 0.044 | 0.047 | 0.036 |
| Public Administration | 0.010 | 0.075 | 0.250 | -0.030 | -0.032 | 0.041 | -0.296 | -0.025 |
| Community Services | -0.019 | -0.013 | 0.087 | 0.031 | -0.041 | 0.040 | -0.119 | 0.035 |
| Recreation | -0.590 | -0.031 | 0.185 | 0.017 | -0.128 | 0.056 | -0.124 | 0.021 |

*** Female prime-age for Mining and Electricity, Gas and Water includes 55-64 years olds.
EGW is Electricity, gas and water, WRT is Wholesale and retail trade, FPBS is Financial, personal and business services.

Table 7.15 shows the distribution of the industry employment gaps across the major ASIC industry divisions. The Table reports three figures for each demographic group (males 15-19, males 20-24, males 25-54 or the prime age category, males 55-65, females 15-19, 20-24, 25-54, and 55-64). The first row in each industry denoted (a) measures the 'share' or 'scale' effect which would result if each industry closed its February 1993 employment gap and allocated the extra jobs across these groups in accordance with their February 1993 employment to industry employment share. So, for example, prime-age males employed in manufacturing accounted for 52.9 per cent of total manufacturing employment and would have received 41 thousand of the 77.5 thousand jobs created if the manufacturing employment gap was eliminated.

**Table 7.15 Demographic Allocation of Employment Gaps by Industry, February 1993**

| Sector | Gap 000s | | Males 15-19 | Males 20-24 | Males 25-54 | Males 55-64 | Females 15-19 | Females 20-24 | Females 25-54 | Females 55-64 |
|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | 24.7 | (a) | 1.2 | 1.8 | 11.3 | 2.8 | 0.3 | 0.5 | 5.8 | 1.0 |
| | | (b) | 3.0 | -0.3 | -4.1 | -2.1 | 1.9 | 1.4 | -1.2 | 1.4 |
| | | (c) | 4.2 | 1.5 | 7.2 | 0.7 | 2.2 | 1.9 | 4.6 | 2.4 |
| Mining | 4.7 | (a) | 0.3 | 0.3 | 3.6 | 0.2 | 0.0 | 0.1 | 0.1 | |
| | | (b) | 0.5 | 1.6 | -3.0 | 0.2 | -0.3 | -0.1 | 1.0 | |
| | | (c) | 0.8 | 1.9 | 0.6 | 0.4 | -0.3 | 0.0 | 1.1 | |
| Manufacturing | 77.5 | (a) | 3.0 | 7.4 | 41.0 | 4.8 | 1.0 | 2.9 | 16.6 | 1.0 |
| | | (b) | 11.1 | -9.4 | -10.0 | 6.5 | 3.0 | -8.3 | 6.2 | 1.0 |
| | | (c) | 14.1 | -2.0 | 31.0 | 11.3 | 4.0 | -5.4 | 22.8 | 2.0 |
| EGW | -2.6 | (a) | -0.2 | -0.3 | -1.8 | -0.2 | 0.0 | -0.1 | -0.1 | |
| | | (b) | -1.0 | 0.0 | 0.6 | 0.9 | 0.2 | -0.7 | -0.1 | |
| | | (c) | -1.2 | -0.3 | -1.2 | 0.7 | 0.2 | -0.8 | -0.2 | |
| Construction | 90.0 | (a) | 4.3 | 10.0 | 57.2 | 6.5 | 0.4 | 0.7 | 10.0 | 0.9 |
| | | (b) | 9.5 | -0.4 | -5.4 | -5.6 | 0.9 | 0.5 | 1.4 | -0.8 |
| | | (c) | 13.8 | 9.6 | 51.8 | 0.9 | 1.3 | 1.2 | 11.4 | 0.1 |
| WRT | 195.5 | (a) | 13.9 | 15.9 | 68.9 | 8.0 | 18.9 | 13.7 | 52.5 | 3.8 |
| | | (b) | 18.0 | -6.4 | -25.2 | 2.8 | 5.2 | -8.7 | 12.2 | 2.0 |
| | | (c) | 31.9 | 9.5 | 43.7 | 10.8 | 24.1 | 5.0 | 64.7 | 5.8 |
| Transport | 4.1 | (a) | 0.1 | 0.3 | 2.6 | 0.3 | 0.0 | 0.2 | 0.6 | 0.1 |
| | | (b) | 3.5 | -1.2 | -7.0 | -2.5 | 1.9 | 0.6 | 6.0 | 0.0 |
| | | (c) | 3.6 | -0.9 | -4.5 | -2.2 | 1.9 | 0.8 | 6.6 | 0.1 |
| Communication | 2.9 | (a) | 0.0 | 0.1 | 1.7 | 0.1 | 0.0 | 0.1 | 0.7 | 0.1 |
| | | (b) | 0.6 | 0.8 | -1.3 | -1.1 | 0.8 | 0.6 | -0.3 | 0.0 |
| | | (c) | 0.6 | 0.9 | 0.4 | -1.0 | 0.8 | 0.7 | 0.4 | 0.1 |
| FPBS | 85.3 | (a) | 1.0 | 5.1 | 33.7 | 3.7 | 1.6 | 8.4 | 29.8 | 1.8 |
| | | (b) | 6.3 | 4.6 | -19.6 | 3.7 | 13.8 | -3.0 | -3.2 | -2.5 |
| | | (c) | 7.3 | 9.7 | 14.1 | 7.4 | 15.4 | 5.4 | 26.6 | -0.7 |
| Public Admin | -10.1 | (a) | -0.1 | -0.5 | -5.0 | -0.6 | -0.1 | -0.5 | -3.2 | -0.2 |
| | | (b) | -0.3 | -2.2 | -7.2 | 0.7 | 0.9 | -1.2 | 8.5 | 0.7 |
| | | (c) | -0.4 | -2.7 | -12.2 | 0.1 | 0.8 | -1.7 | 5.3 | 0.5 |
| Community Services | 105.4 | (a) | 0.6 | 2.9 | 28.2 | 3.7 | 1.4 | 7.0 | 56.7 | 4.7 |
| | | (b) | 2.2 | 1.5 | -10.0 | -3.6 | 4.7 | -4.6 | 13.8 | -4.0 |
| | | (c) | 2.8 | 4.4 | 18.2 | 0.1 | 6.1 | 2.4 | 70.5 | 0.7 |
| Recreation and personal services | 20.8 | (a) | 1.0 | 1.7 | 5.9 | 0.7 | 1.4 | 2.5 | 7.2 | 0.6 |
| | | (b) | 2.9 | -1.5 | -9.0 | -0.8 | 5.8 | -2.7 | 6.0 | -1.0 |
| | | (c) | 3.9 | 0.2 | -3.1 | -0.1 | 7.2 | -0.2 | 13.2 | -0.4 |

Row (b) depicts the 'shift' effect or the upgrading movements that occur when the economy operates at higher levels of activity. It reveals that not only does a stronger economy create more jobs but also changes the composition of employment in favour of the least advantaged groups in the labour force. Row (b) is calculated by multiplying the $\alpha_2$ coefficient for the relevant demographic industry pair by total employment in that industry in February 1993 times the negative of the employment gap for February 1993. For example, for prime-age males in Community services, the $\alpha_2$ coefficient (from

Table 7.14) is 0.087074 times 1,465.6 thousand (seasonally adjusted employment in February 1993) times -0.0782547 (the total economy employment gap in February 1993) which gives -10.0 thousand. This tells us that although prime-age males would have received 28.2 thousand of the extra 105.4 thousand jobs created in Community Services in fact, as a result of them losing share, this figure is reduced by 10 thousand jobs. Row (c) is the net gain in employment per industry for each demographic group. So while prime-age males in Community services would still gain 18.2 thousand extra jobs as the employment gap in that industry closed, they also lose some of their share (equivalent to 10 thousand jobs) to other demographic groups. The groups that benefit in this case are males under 25 years, teenage females, and significantly, prime-age females.

Table 7.16 summarises the gross shift and share effects. We see there is considerable cyclical sensitivity in the demographic employment shares across industries. All groups share in the 598.1 thousand-job expansion. Teenage males (total shift effect of 56.3 thousand), teenage females (38.8 thousand) and prime-age females (50.3 thousand) are the demographic groups which gain relatively greater employment opportunities. The other groups all lose shares, with prime-age males being the worst hit with a share loss equivalent to 101.3 thousand jobs.

Apart from the counter-cyclical industries (Electricity, gas and water and Public administration and defence), prime-age males leave recreation and transport, both low elasticity industries. While Recreation is a low pay, low fringe and low productivity industry, with a relatively high proportion of part-time jobs (compared to the All Industry average), Transport is virtually the opposite. However, the actual employment gap in Transport is very small and so the traditional upgrading (from low pay et al. to high pay *et al*.) opportunities which would go to teenagers and prime-age females are trivial in this case. Prime-age males gain substantial numbers of jobs in manufacturing (31 thousand or 40 per cent of total), construction (51.8 thousand or 57.6 per cent of total), and Financial, property and business services (14.1 thousand or 16.5 per cent of total) but still lose share to other demographic groups.

These three industries all display above-average earnings and fringes, but are below-average in terms of productivity. The demographic groups who gain share in these industries are: teenage males (Manufacturing, Financial, property and business services, and strongly, in Construction); teenage females (Manufacturing, to a lesser extent in Construction, and strongly in Financial, property and business services); prime-age females (Manufacturing and to a lesser extent in Construction); older males (strongly in Manufacturing, less so in Financial, property and business services), and older females (some gains in Manufacturing).

**Table 7.16 Summary Shift and Share effects for Demographic Employment by Industry (000's)**

| Effect | Males | | | | Females | | | |
|--------|-------|-------|--------------|-------|-------|-------|--------------|-------|
|        | 15-19 | 20-24 | Prime Age | 55-64 | 15-19 | 20-24 | Prime Age | 55-64 |
| Share  | 25.1  | 44.7  | 247.3        | 30.0  | 24.9  | 35.5  | 176.7        | 13.8  |
| Shift  | 56.3  | -12.9 | -101.3       | -0.9  | 38.8  | -27.4 | 50.3         | -3.2  |
| Total  | 81.4  | 31.8  | 146.0        | 29.1  | 63.7  | 8.1   | 227.9        | 10.6  |

Female Prime-age includes 55-64 year olds from Mining and Electricity, gas and water.
Female 55-64 excludes Mining and Electricity, gas and water.

The gains resemble the traditional upgrading movements from low pay industries to higher paying industries. In this case, teenagers are the big winners. Prime-age females gain most in Wholesale and retail trade (64.7 thousand or 33.1 per cent of total), Community services (70.5 thousand or 66.9 per cent of total, and Recreation (13.2 thousand or 631.5 per cent of total). Notably, these industries are characterised by low pay and fringes, average-to-low productivity, and relatively high proportions of part-time work. Teenage males and females also gain in these industries but do better than prime-age females in the higher paying industries noted above.

## 7.8    Conclusion

The results have shown that the upgrading thesis has to be questioned. It would appear that recovery would be accompanied by the creation of a preponderance of low productivity, low paid jobs. The projections accord with the explanation for the slowdown in productivity since the mid-1970s based on increasing shares in output of low productivity service industries. With more jobs projected to be created in the service sector than the goods producing sector this trend towards lower productivity growth is likely to continue.

The principle source of upgrading comes from the changing demographic composition of industry employment. It is estimated that in many industries, the employment shares of prime-age women and teenagers increase as the total employment gap is closed. In other words, these groups gain a larger share of the extra jobs than their current share in industry employment would predict. Prime-age males lose shares in most industries. Substantial improvements are projected for teenagers who gain the most in higher paying industries, while some improvements for prime-age females are estimated. The share increases for prime-age women, however, are mostly in the service sector.

The results also suggest that the ratio of part-time to full-time employment will increase as the aggregate employment gap is closed. In other words, more low-paying, low-productivity and fractional jobs for women are predicted to be created. There appears to be a long term increase in the incidence of female part-time employment across industries and occupations, which has been accompanied by an increase in the percentages of both part-time males and females who are seeking more hours of work. It has been documented that part-time employment tends to be insecure and disadvantaged, although there has been some progress in improving the conditions of part-time employment, through enterprise bargains.

**Notes:**

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[1] The choice of a 6 per cent unemployment rate to represent full employment was entirely arbitrary. We think it is an overestimate of the actual full employment unemployment rate (see Mitchell, 1987b), but we have used it to avoid any unnecessary criticisms that our results are due to an artificially low assumed full employment unemployment rate.

# Chapter 8    Modelling the impact of the ACCORD on wage inflation in Australia

## 8.1    Introduction

In 1972, Australia's inflation rate was 6.2 per cent, but following the first OPEC oil shock in 1974, aided by some large wage increases, the inflation rate reached 17 per cent in 1975. By the end of the 1970s, despite a period of subdued activity and rising unemployment, the inflation rate was still high in relation to our trading partners at 9.2 per cent. The wage increases that followed the breakdown of the period of wage indexation in the early 1980s pushed the inflation rate, once again above 10.4 per cent, and provided the background to the introduction of the Accord in 1983. At that time, the unemployment rate and the inflation rate were at around 10 per cent due to the sluggish economy.

The Accord period in Australia was associated with strong employment and GDP growth from 1983-84 to 1989-90 (with the help of an expansionist Labour Government), negative growth during the recession, and then a strengthening recovery after 1993-94. For the period 1984-85 to 1994-95, Australia's total employment growth per annum averaged 2.19 per cent, while the corresponding growth per annum for the OECD countries in total was 1.05 per cent. For the 1984-85 to 1989-90 period of expansion, the Australian figure was 3.43 per cent compared to 1.65 per cent for the OECD. Over the recession of 1990-91 to 1994-95, Australia's employment growth was 0.70 per cent per annum compared to the OECD outcome of 0.33 per cent per annum.

Mitchell (1987a) found that there were constraining effects on wages growth in Australia as a result of imposing wage fixing guidelines. Watts and Mitchell (1990) updated and extended this study to estimate the effects of the first three stages of the Accord (up until the third quarter of 1988). Watts and Mitchell found (1990: 160)

> that the different eras of wage-fixing guidelines can be statistically differentiated and are robust across different specifications. Except for the third and fourth phases of the guidelines…which signalled the end of centralised wage fixation in 1981, incomes policy successfully imposed a negative trend on the growth of real earnings…

Watts and Mitchell, (1990: 161) also found no evidence of the

> existence of a conventional Phillips Curve relating inflation to unemployment…. the annual growth of real weekly earnings is largely independent of conventional excess demand proxies and is strongly influenced by the prevailing institutional arrangements for wage fixing.

Chapman and Gruen (1990) compare all the empirical work to that time which estimated the impacts of the Accord on wage inflation. They concluded that on balance the Accord had reduced the growth of nominal wage inflation.

With the Accord now history, this Chapter updates the econometric modelling to assess the extent to which it influenced the path of wage and price inflation. A model is estimated to test for cointegration as the first stage in modelling an error-correction representation of the wage-setting dynamics. This is an advance on the work of Watts and Mitchell (1990) and Mitchell (1987a) in that the modelling explicitly considers the possibility of integrated data.

In Australian wage setting, the period 1968(3) to 1996(1) has been dominated by incomes policy with several distinct phases of wage fixation. Table 8.1 describes the phases and the specification of the econometric variables.

It is also useful to compare the relationship between price inflation and unemployment in Australia (Figure 8.1) with the relationship between wage inflation and unemployment over the same period (Figure 8.2). All data are described in Appendix 8B. There are two periods of instability evident in both Figures: the mid-1970s following the first OPEC oil shock and again in the early 1980s. An additional feature, which emerges (comparing Figures 8.1 and 8.2), is that the instability in the mid-1970s implicated both wage and price inflation. However, although there was some large wage rises in the early 1980s, the wage inflation quickly diminished around the time the Accord was initiated, but the surge in price inflation persisted for two more years. This behaviour supports the hypothesis that significant wage moderation accompanied the introduction of the Accord.

**Table 8.1 Wage Setting Phases in Australia, 1968 Q3 to 1996 Q1**

| Wage setting regime | Model Variable | Impact Dates |
|---|---|---|
| Decentralised Collective Bargaining | No variable | 1968 Q3 to 1975 Q1 |
| Full Indexation | IP1 | 1975 Q2 to 1976 Q2 |
| Plateau Indexation | IP2 | 1976 Q3 to 1978 Q2 |
| Partial Indexation | IP3 | 1978 Q3 to 1979 Q3 |
| Partial Indexation | IP4 | 1979 Q4 to 1981 Q2 |
| Decentralised Collective Bargaining | No variable | 1981 Q3 to 1982 Q4 |
| Wages Pause | Wage Pause | 1983 Q1 to 1983 Q2 |
| **Accord** | | |
| Full Indexation | Mark I | 1983 Q3 to 1985 Q1 |
| Partial Indexation | Mark II | 1985 Q2 to 1987 Q1 |
| Restructuring and Efficiency Principle | Mark III | 1987 Q2 to 1988 Q3 |
| Structural Efficiency Principle | Mark IV | 1988 Q4 to 1989 Q1 |
| Structural Efficiency Principle | Mark V | 1989 Q2 to 1990 Q1 |
| Structural Efficiency | Mark VI | 1990 Q2 to 1993 Q2 |
| Enterprise Bargaining and Safety Net | Mark VII | 1993 Q2 to 1995 Q3 |
| Enterprise Bargaining and Safety Net | Mark VIII | 1995 Q4 to 1996 Q2 |

## 8.2    Time series properties of the data

The data is quarterly and is filtered for deterministic seasonality. All analysis is in terms of the logarithm. Appendix 8B describes the data. Table 8.2 displays the sample autocorrelations for all the data in levels, seasonal differences, and the first-difference of the seasonal difference. The autocorrelations are a preliminary guide to assist our interpretation of the more formal unit root tests.

There is considerable variation in the sample correlations shown. The price variables (LAWE and LP) reveal similar patterns, with the level of each showing very pronounced inertia. The ACF of a random walk exhibits behaviour similar to this (see Nelson and Plosser, 1982: 147). The seasonal difference for both variables also decay slowly and it is not until this difference is first-differenced do the lags drop off rapidly and resemble a stationary series. All the levels of the other variables appear to be non-stationarity. However, it seems that seasonal differencing results in ACFs, which decay fairly quickly.

We now turn to more formal analysis using unit root testing (Appendix 8B outlines the testing framework). To capture the successive wage and price adjustment patterns of the Australian wage setting system, four-quarter log changes are preferred *a priori* (see Mitchell, 1987a; Watts and Mitchell, 1990). This raises the issue of seasonal integration. We test whether there are seasonal roots in the time series using the Dickey-Hasza-Fuller (1984) – DHF test and the critical values available in their Table 7. If we cannot reject the hypothesis of seasonal integration we then whether the seasonal difference (for example, $\Delta_4 w = w_t - w_{t-4}$) is stationary, that is, that the levels are $SI_4$ (0, 1). If that hypothesis is rejected, we proceed to test whether the first-difference of the seasonal difference (defined as $\Delta\Delta_4 w = [w_t - w_{t-4}] - [w_{t-1} - w_{t-5}]$) is stationary, that is, that the levels are $SI_4(0, 1)$. The last two tests employ the standard Augmented Dickey-Fuller test.

**Table 8.2 Sample Autocorrelation Functions, 1966(3)-1996(1)[+]**

| Series | Lag | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| LAWE | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Δ4LAWE | 0.91 | 0.80 | 0.67 | 0.58 | 0.56 | 0.52 | 0.48 | 0.40 | 0.34 | 0.28 |
| ΔΔ4LAWE | 0.11 | 0.08 | -0.16 | -0.43 | 0.09 | 0.02 | 0.17 | -0.07 | -0.01 | -0.16 |
| LP | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Δ4LP | 0.96 | 0.90 | 0.83 | 0.73 | 0.66 | 0.59 | 0.52 | 0.47 | 0.43 | 0.39 |
| ΔΔ4LP | 0.21 | 0.15 | 0.27 | -0.29 | -0.11 | -0.03 | -0.22 | -0.08 | -0.05 | -0.03 |
| LGUT | 0.84 | 0.73 | 0.62 | 0.49 | 0.33 | 0.21 | 0.08 | -0.01 | -0.10 | -0.12 |
| Δ4LGUT | 0.69 | 0.49 | 0.30 | -0.05 | -0.10 | -0.19 | -0.30 | 0.30 | -0.30 | -0.27 |
| LUR | 0.99 | 0.98 | 0.96 | 0.94 | 0.92 | 0.91 | 0.89 | 0.88 | 0.87 | 0.87 |
| Δ4LUR | 0.85 | 0.61 | 0.30 | -0.03 | -0.22 | -0.32 | -0.32 | -0.21 | -0.07 | 0.03 |
| ΔΔ4LUR | 0.28 | 0.26 | 0.09 | -0.49 | -0.32 | -0.31 | -0.34 | -0.07 | 0.12 | 0.08 |
| LPROD | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.98 | 0.98 | 0.98 | 0.97 |
| Δ4LPROD | 0.59 | 0.39 | 0.22 | 0.01 | 0.11 | 0.15 | 0.07 | -0.01 | -0.09 | -0.18 |
| ΔΔ4LPROD | -0.24 | -0.06 | 0.05 | -0.37 | 0.06 | 0.15 | 0.00 | 0.00 | 0.00 | -0.25 |

+ The sample is for the level and is appropriately shortened to take into account the differencing.

Table 8.3 reports the test statistics. The hypothesis that the series in levels are $SI_4$ (0, 0) is rejected in all cases, except there is conflicting evidence relating to LP. On balance, LP is assumed to be non-stationary. The critical value for the DHF test for 80 observations is -4.11 at the 5 per cent level. Further testing suggests that we reject the $SI_4$ (0, 1) hypothesis for LAWE and LP but accept it for LGUT, LUR and LPROD. After first-differencing the annual difference, we can then accept the hypothesis that the levels of LAWE and LP are $SI_4$ (1, 1).

This means that a cointegration relationship can be explored between $\Delta_4$LAWE, $\Delta_4$LP, LGUT, LPROD and LUR. This is interesting because it means that the cointegration regression will be estimating an equilibrium or steady-state wage inflation model rather than the level of average weekly earnings.

**Figure 8.1**

**Australia Phillips Curve - Unemployment rate and Inflation 1970-1995**



**Figure 8.2**

**Australia Phillips Curve - Unemployment rate and Annual Percentage Change in Average Weekly Earnings 1970-1995**
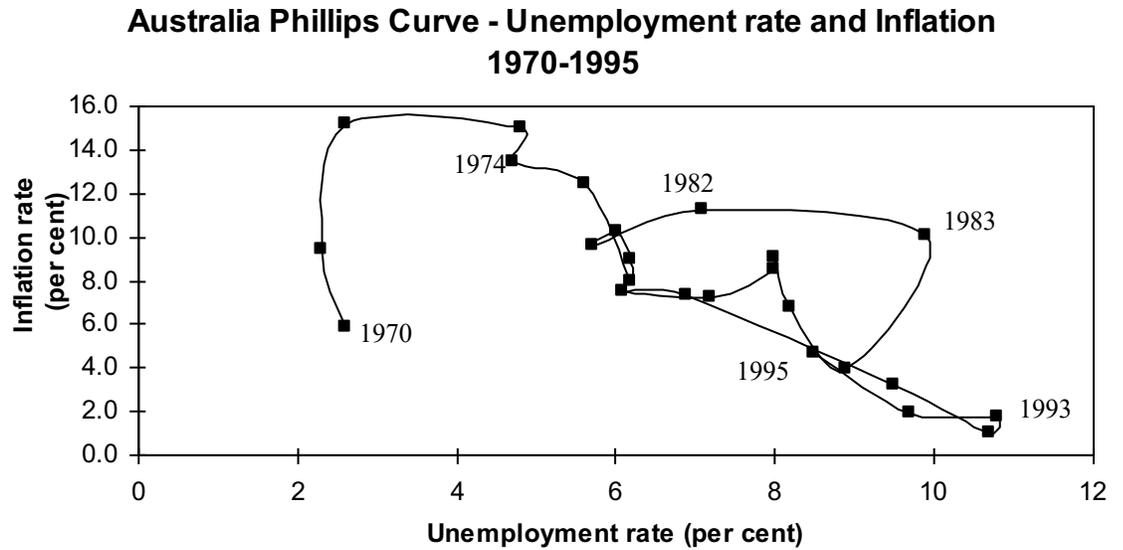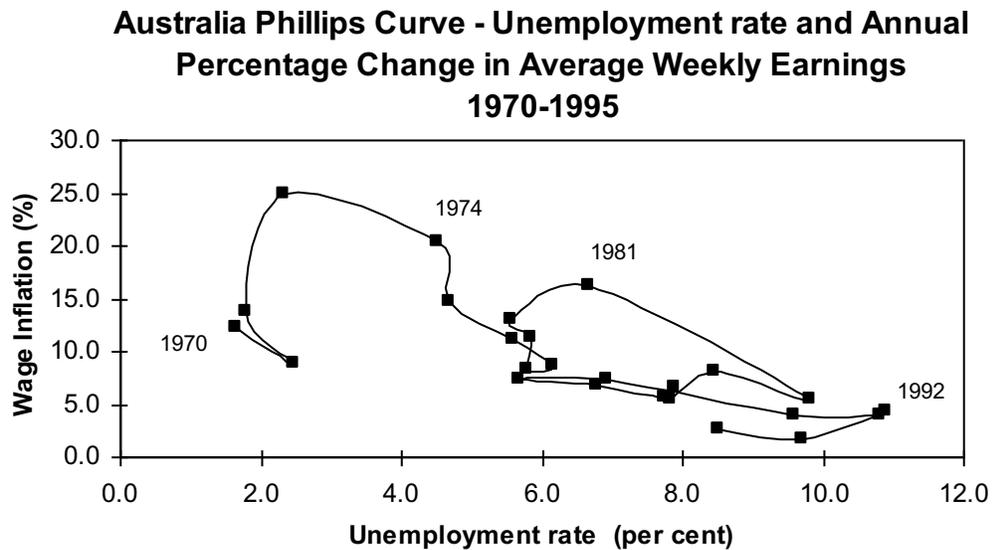
**Table 8.3 Unit Root Statistics**

| Variable | T[a] | DHF[b] | ADFSI[c] | ADF[d] no constant or trend | k | ADF[d] with constant and trend | k | ADF[d] with constant | Result |
|---|---|---|---|---|---|---|---|---|---|
| LAWE | 111 | 0.35 | 1.513 | | 5 | -0.65 | 5 | -2.41 | |
| D4LAWE | | | | -1.954 | 5 | -2.94 | 5 | -1.93 | |
| DD4LAWE | | | | -5.09 | 4 | -5.06 | 4 | -5.07 | ** |
| LP | 108 | -5.76 | -2.47 | | 4 | -1.07 | 4 | -2.07 | |
| D4LP | | | | -0.77 | 4 | -2.36 | 4 | -1.72 | |
| DD4LP | | | | -5.16 | 3 | -5.98 | 3 | -5.86 | ** |
| LGUT | 108 | -3.87 | -1.91 | | 4 | -3.14 | 0 | -2.85 | |
| D4LGUT | | | | -4.11 | 4 | -4.13 | 4 | -4.10 | ** |
| DD4LGUT | | | | -6.36 | | | | | |
| LUR | 108 | 0.92 | 1.46 | | 2 | -2.27 | 2 | -1.97 | |
| D4LUR | | | | -3.23 | 4 | -3.69 | 4 | -3.49 | ** |
| DD4LUR | | | | -7.70 | | | | | |
| LPROD | 108 | -3.48 | -3.37 | | 1 | -1.32 | 1 | -1.96 | |
| D4LPROD | | | | -2.23 | 4 | -3.63 | 4 | -3.17 | ** |
| DD4LPROD | | | | -7.71 | | | | | |

(a) sample is 1969(2)-1996(1) for all variables.
(b) DHF is the Dickey-Hasza-Fuller (1984) test outlined in Appendix B.
(c) ADFSI is the Augmented Dickey-Fuller Seasonal Integration test outlined in Appendix B.
(d) ADF is the Augmented Dickey-Fuller test.

** indicates stationary

## 8.3 The model

Given that that LAWE and LP were found to be $SI_4(1, 1)$ and the activity variables and productivity were $SI_4(0, 1)$, the cointegration regression, following Engle-Granger (1987),[i] is specified as

**Eqn 8-1**
$$\Delta_4 LAWE_t = \beta_0 + \beta_1 \Delta_4 LP_t + \sum_{j=0}^{m} \beta_{2j} LZ_{j_t} + \sum_{j=1}^{13} \rho_j IP_j + \varepsilon_{1t}$$

where $\Delta_4 LAWE$ is the seasonal-difference of the log of average weekly earnings, $\Delta_4 LP$ is the seasonal-difference of the log of the consumer price index, $LZ_j$ is the log of the $j$th variable which may impact on wage inflation (including LGUT - the log of capacity utilisation and LPROD - the log of non-farm GDP per hour worked by non-farm wage and salary earners), $IP_j$ is the $j$th dummy variable designed to capture the periods of incomes policy in Australia.

The dynamic error correction model that corresponds to the cointegration model is specified as:

**Eqn 8-2**

$$\Delta\Delta_4 LAWE = \beta_0 + \sum_{j=1}^{k} \beta_{1j} \Delta\Delta_4 LAWE_{t-j} + \sum_{j=0}^{k} \beta_{2j} \Delta\Delta_4 LP_{t-j} + \sum_{j=0}^{k} \beta_{3j} \Delta_4 LZ_{t-j}$$
$$+ \sum_{j=1}^{13} \rho_j IP_j + \delta ECM_{t-1} + \varepsilon_{2t}$$

where $\Delta\Delta_4 LAWE$ is the first-difference of the four-quarter change in average weekly earnings, $\Delta\Delta_4 LP$ is the corresponding change in the consumer price index, and $ECM$ is the error-correction term derived from the residuals of the cointegrating regression and $\delta$ is the adjustment parameter. All other variables and changes are self-explanatory.

## 8.4 Cointegration tests

Several variables were considered as possible candidates for the vector $Z$ - the unemployment rate, the vacancy rate, and the rate of overtime, in addition to productivity and capacity utilisation (Mitchell, 1987a; and Watts and Mitchell, 1990a). Significantly, no cointegrating relationship could be found between the wage and price inflation variables and the log of the unemployment rate, even when other

variables were added. Table 8.4 presents the final estimates with D4LAWE as the normalising variable.

**Table 8.4 Cointegration Regression Estimates, 1967 Q3 to 1996 Q1**

| Variable | Parameter Estimate | $t$-statistic |
|---|---|---|
| Constant | 0.327 | 2.08 |
| D4LP | 0.857 | 8.60 |
| IP1 | -0.015 | 1.21 |
| IP2 | -0.043 | 4.08 |
| IP3 | -0.057 | 4.34 |
| IP4 | -0.035 | 2.92 |
| Wage Pause | -0.053 | 2.55 |
| Mark 1 | -0.048 | 3.16 |
| Mark 2 | -0.082 | 5.71 |
| Mark 3 | -0.080 | 4.99 |
| Mark 4 | -0.065 | 2.97 |
| Mark 5 | -0.082 | 4.67 |
| Mark 6 | -0.048 | 2.89 |
| Mark 7 | -0.081 | 3.92 |
| Mark 8 | -0.087 | 3.88 |
| LGUT | 0.372 | 2.24 |
| LPROD | 0.070 | 1.73 |
| TD1 | 0.067 | 2.72 |

$R^2 = 0.82$
s.e. = 0.02
DW = 0.99

Table 8.5 shows the results of the ADF tests on the residuals of this equation and confirms that they are stationary at the 1 per cent level of significance. The results were unaffected when the trend and constant were deleted from the auxiliary regression.

The estimates from the cointegrating regression are biased but super consistent. The extent of the small-sample bias is related to $(1 - R^2)$ of the cointegrating regression, which suggests that in our case the bias is not large (Banerjee *et al*., 1986). However, following Engle and Yoo (1989), we know that that the distribution of the estimators of the cointegrating vector are usually non-normal and this prevents inferences being drawn about the significance of the parameters. We can correct the parameter estimates in the cointegrating vector to allow inference by using information from the dynamic error-correction model implied by the cointegrating regression. This will allow us to satisfy our objective to determine whether the introduction of incomes policies in Australia moderated wage inflation and to test whether there is a difference in the impact of the various regimes specified.

**Table 8.5 ADF Tests on Cointegration Residuals**

| Lag in Augmented Dickey-Fuller Regression | *t*-statistic in ADF |
|:---:|:---:|
| 5 | 4.2612 |
| 4 | 4.7392 |
| 3 | 6.4652 |
| 2 | 6.9216 |
| 1 | 6.3908 |
| 0 | 5.8484 |

Critical values: 1 per cent = -4.044
A constant and trend were included.

## 8.5 Dynamic error correction model

A general-to-specific modelling approach was employed. In the general model, *k* was set at 4 for all variables. The initial model was estimated over the period 1969(1) to 1996(1) and satisfied the requirement that the residuals were white noise. The general model therefore serves as an appropriate benchmark for further simplification.[ii]

The first simplification took the form of 24 zero restrictions. Testing the reduction restrictions yielded an $F(24, 74) = 0.823$, making the simplification valid. The model now looked like

**Eqn 8-3**

$$\Delta\Delta_4 LAWE_t = \alpha_1 + \alpha_2\Delta\Delta_4 LAWE_{t-2} + \alpha_3\Delta\Delta_4 LAWE_{t-4} + \alpha_4\Delta\Delta_4 LP_t$$
$$+\alpha_5\Delta_4 LGUT_t + \alpha_6\Delta_4 LGUT_{t-1} + \alpha_7\Delta_4 LPROD_{t-4}$$
$$+\alpha_8 IP2 + \alpha_9 WagePause + \alpha_{10} TD1 + \delta ECM_{t-1} + u_t$$

Estimates from this model then suggested the following restrictions that would allow further simplification in accord with economic sense

**Eqn 8-4(a)** $\qquad \alpha_2 = -\alpha_3$

**Eqn 8-4(b)** $\qquad \alpha_5 = -\alpha_6$

**Eqn 8-4(c)** $\qquad \alpha_7 = 0$

The restrictions were imposed and accepted $F(27, 74) = 0.766$ (in comparison with the general model).

The final restricted form for the period 1969(1) to 1996(1) with absolute $t$ statistics in parentheses is:

$$\Delta\Delta_4 LAWE = 0.00 + 0.288\Delta_2\Delta\Delta_4 LAW(-2) + 0.355\Delta\Delta_4 LP + 0.227\Delta\Delta_4 LGUT$$

$$(0.56) \quad (6.65) \quad (2.99) \quad (3.07)$$

$$- 0.491 ECM(-1) - 0.011 IP2 - 0.039 \text{Wage Pause}$$

$$(8.59) \quad (2.25) \quad (4.33)$$

$$+ 0.073 TD1$$

$$(5.74)$$

$R^2 = 0.66$ \qquad s.e. $= 0.012$ \qquad RSS $= 0.016$

Test for first to fifth-order serial correlation: $F(5, 96) = 1.89$
Test for fourth-order ARCH: $F(4, 93) = 0.81$
Test for Normality: $\chi^2(2) = 1.51$
RESET: $F(1,100) = 1.65$
Predictive Failure: $F(4, 97) = 0.79$
Predictive Failure: $F(8, 93) = 0.71$

The dynamic model contains a strong error-correction component. All the signs are meaningful and the magnitudes of the parameters are plausible. Diagnostically, the equation performs very well, exhibiting no problems of serial correlation, heteroscedasticity, or functional form misspecification. Two predictive failure tests were performed (4 forecast periods, and 8 forecast periods) and the Chow $F$ statistics indicate no instability.

We might be concerned about the independence (or in fact, lack of correlation) of the regressors, $\Delta\Delta_4 LP$ and $\Delta\Delta_4 LGUT$ and the disturbance term in the dynamic model. A Hausman-Wu test was performed for each (using two lags of each as instruments in the relevant auxiliary regression) and the LM test statistic was insignificant [$F(2, 99) = 0.069$] indicating that we can consider $\Delta\Delta_4 LP$ and $\Delta\Delta_4 LGUT$ to be weakly exogenous.

In choosing AWE as the measure of earnings it is acknowledged in Appendix 8A that a more appropriate measure of unit labour cost would be average hourly earnings (AHE) which is the ratio of AWE to average weekly hours. Its use raises the possibility, however, that variation in the pressure variable might influence AHE, not directly through moderating wage demands but indirectly due to inertia of AWE in response to quantity adjustments by firms (that is, variations in hours worked). Accordingly, an added variable test was performed by adding $\Delta\Delta_4 AWH$. The insignificant $t$-statistic

confirms the predominance of quantity adjustments over price adjustments (see Okun, 1981; Watts and Mitchell, 1990a).

In summary, the dynamic model shows that the fluctuations in wage inflation around the conditional steady-state wage inflation rate are heavily conditioned by the error-correction mechanism. The incomes policy variables do not, in general, impact on the quarterly variation in the annual wage inflation rate. Their role seems confined to the annual change in wage inflation.

## 8.6 Correcting the first stage estimates

We follow the method set out by Engle and Yoo (1989) to correct the parameter estimates from the first stage cointegration regression. While the method was proposed for an unrestricted multivariate system, it can be applied to advantage in the case of a single cointegrating vector. The third step follows the estimation of the dynamic error-correction model.

The final second-stage model is:

**Eqn 8-5**
$$\Delta\Delta_4 LAWE_t = \alpha_1 + \alpha_2 \Delta_2 \Delta\Delta_4 LAWE_{t-2} + \alpha_3 \Delta\Delta_4 LP_t + \alpha_4 \Delta\Delta_4 LGUT_t$$
$$+ \alpha_5 IP2 + \alpha_6 WagePause + \alpha_7 TD1 + \delta ECM_{t-1} + e_{2t}$$

We form an auxiliary regression by multiplying all the conditioning variables in the first-stage cointegrating regression ($X_t$) by $-\delta$ and regress them on the residuals from the second-stage model, $e_{2t}$. The coefficients from the auxiliary regression are the corrections to the parameter estimates and the standard errors are the appropriate standard errors for inference. This allows us to test whether the income policy parameters are significantly negative.

The corrected parameter estimates are calculated by adding the original parameters on the conditioning variables to the parameters on the new variables ($-\delta X_t$) in the third-stage regression. The correct $t$-statistics are calculated from the standard errors in the third-stage regression in relation to the corrected parameter estimates. Table 8.6 reports the results and provides the corrected t-statistics.

The incomes policy variables are all highly significant and negative. In general, the Accord period exerted a much stronger downward influence on annual wages growth than the earlier period of incomes policy. The different phases are all robustly defined.

**Table 8.6 Corrected parameter estimates and *t* statistics**

| Variable | First Stage Parameter Estimates | Third Stage Parameter Estimates | Corrected Parameter Estimates | Third Stage Standard Errors | Corrected t-statistics |
|---|---|---|---|---|---|
| Constant | 0.327460 | 0.0952260 | 0.422686 | 0.100260 | 4.22 |
| D4LP | 0.857440 | -0.1365500 | 0.720890 | 0.113900 | 6.33 |
| IP1 | -0.146940 | -0.0047944 | -0.151734 | 0.013696 | 11.08 |
| IP2 | -0.042676 | -0.0003441 | -0.043020 | 0.011763 | 3.66 |
| IP3 | -0.056640 | -0.0130700 | -0.069710 | 0.014816 | 4.71 |
| IP4 | -0.035049 | -0.0006863 | -0.035735 | 0.013824 | 2.59 |
| Wage | -0.053124 | 0.0031676 | -0.049956 | 0.023475 | 2.13 |
| Pause | | | | | |
| Mark 1 | -0.048461 | -0.0170090 | -0.065470 | 0.017428 | 3.76 |
| Mark 2 | -0.082058 | -0.0147690 | -0.096827 | 0.016868 | 5.74 |
| Mark 3 | -0.080008 | -0.0181640 | -0.098172 | 0.019141 | 5.13 |
| Mark 4 | -0.065382 | 0.0050966 | -0.060285 | 0.026117 | 2.31 |
| Mark 5 | -0.082330 | -0.0280450 | -0.110375 | 0.021587 | 5.11 |
| Mark 6 | -0.048417 | -0.0219930 | -0.070410 | 0.019420 | 3.63 |
| Mark 7 | -0.080763 | -0.0353560 | -0.116119 | 0.024775 | 4.69 |
| Mark 8 | -0.087459 | -0.1729900 | -0.260449 | 0.027114 | 9.61 |
| LGUT | 0.371730 | 0.1664800 | 0.538210 | 0.209430 | 2.57 |
| LPROD | 0.070117 | 0.0472690 | 0.117386 | 0.053030 | 2.21 |
| TD1 | 0.067293 | 0.0072768 | 0.074570 | 0.027804 | 2.68 |

## 8.7    Conclusion

The experience for Australia is that incomes policy exert a strong moderating influence on the annual wages growth and insofar as this pushes against inflation, it provides more "room" for governments to stimulate their economies. The only thing stopping governments is the will to do it.

But the way ahead is not so simple. One can no longer assume that a solution to the inflation constraint and a revival of social democratic budgetary ideals will allow sustainable low levels of unemployment to be achieved. A new set of constraints has become apparent in the last few decades although it is out of the realm of orthodox economic analysis.

A strong case can be made to support the argument that environmental constraints are now so relevant that the global economy cannot support levels of aggregate demand sufficient to fully employ the available workforces. This is the challenge that governments will have to face.

The solution appears however to lie in the role of the government as an employer. The capitalist system has cast aside the long-term unemployed and rendered then "valueless" in terms of their contribution to production. The social costs of this are enormous and threatening. The role of the government given the environmental constraint has to lie in getting "value" out of the long-term unemployed via government employment schemes that will be in harmony with the natural environment.

This will require considerable re-orientation of the way we think about employment and government. Unfortunately, we are some way from that change.

## Appendix 8A - Data Description and Discussion

Data is drawn from two main sources. The DX Data base (principally the ABS NIF-10 Databank) and the OECD Main Economic Indicators and country-specific data sources.

In terms of the regression model:

- LAWE is thelog of average weekly earnings of non-farm wage and salary earners.
- LP is the log of consumer price index weighted average of 8 capital cities.
- LGUT is the log of capacity utilisation.
- LPROD is the log of real non-farm gross domestic product per unit of hours worked by non-farm wage and salary earners.

The choice of average weekly earnings as the dependent variable is discussed in Mitchell (1987a) and Watts and Mitchell (1990a). To focus on unit labour costs and hence the price level, it would be natural to use the growth in earnings per hour as the dependent variable. This would overcome the problem noted by Gregory (1986: 73) of spurious correlation between average weekly earnings and labour utilisation rates within the firm.

Using average weekly earnings however, overcomes several difficulties that are encountered when the earnings per hour variable is used. Notable among these is that the dependent variable then becomes a ratio of two variables, each of which may be positively correlated with the excess demand pressures. As a result, the sign of the pressure variable in an hourly earnings equation is ambiguous. The homogeneity of earnings with respect to hours worked is a separate issue, not without interest, as it allows insights into the relative price and quantity adjustments that firms might employ as economic activity changes, the possible direct and indirect influences of variations in activity on inflation need to be more explicitly estimated. For these reasons, the quantity/price trade-offs are estimated by including average weekly hours as an added variable in the model.

The chosen form for the dependent variable, $\Delta_4 x_t = x_t - x_{t-4}$ is also discussed in Mitchell (1987a) and Watts and Mitchell (1990a). The form is preferred *a priori* because this pattern more adequately captures the successive wage and price adjustment patterns of the Australian wage setting system. The claim that this form introduces serial correlation is an econometric issue and should not necessarily guide the appropriate specification prior to testing. The model should attempt to capture the known characteristics of the data generating process.

The use of the $\Delta_4 x_t$ raises interesting issues for unit root testing and cointegration modelling. Given that the variance for a fourth difference is larger than the variance for the first difference, the Dickey-Fuller procedure has to be modified to test for unit roots in this case. The literature on seasonal and non-seasonal unit roots is relevant here (see Dickey, Hasza, Fuller, 1984; Hylleberg *et al*, 1990).

## Appendix 8B - Testing the Orders of Integration

The preferred specification of the wage adjustment and price adjustment models takes the form of annual changes using quarterly data. The Dickey-Hasza-Fuller (1984) Testing Models:

To test   H₀:      $x_t \sim SI(0, 1)$ against

H₁:      $x_t \sim SI(0, 0)$

We test for significant negativity in δ in the following model:

$$\Delta_4 x_t = \delta z_{t-4} + \sum_{i=1}^{k} \alpha_i \Delta_4 x_{t-i} + \varepsilon_t$$

where $z_t = x_t - \sum_{i=1}^{k} \phi_i x_{t-i}$, and $\phi_i$ is the iᵗʰ coefficient in a regression of $\Delta_4 x_t$ on its $k$ lagged values.

An alternative approximate test is to use an Augmented Dickey-Fuller model like:

$$\Delta_4 x_t = \delta x_{t-4} + \sum_{i=1}^{k} \alpha_i \Delta_4 x_{t-i} + \varepsilon_t$$

and test for significant negativity in δ.

To test   H₀:      $x_t \sim SI(1, 1)$ against

H₁:      $x_t \sim SI(0, 1)$

We test for significant negativity in δ in the following model using an ADF criterion:

$$\Delta\Delta_4 x_t = \delta \Delta z_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta\Delta_4 x_{t-i} + \varepsilon_t$$

If stationarity is not found at this stage, the next step is to test:

H$_\text{o}$:     $x_\text{t} \sim SI(2, 1)$ against

H$_1$:     $x_\text{t} \sim SI(1, 1)$

The ADF model then becomes:

$$\Delta\Delta\Delta_4 x_t = \delta\Delta\Delta z_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta\Delta_4 x_{t-i} + \varepsilon_t$$

## Appendix 8C - Brief History of the Accord

**1983-84**        **Mark 1**

Two decisions in 1983 - 4.3 per cent and 4.4. per cent.
Two decisions in 1984 - Deferred then 2.6 per cent.

Agreement between ALP and ACTU and then formally between the Labour government and the ACTU. Business was not a party to the agreement. Basic commitment was to the maintenance of real wages over time and the introduction of the social wage concept (embodying taxation, public spending, wages, prices and working conditions).

Econometric Impact:      1983 Q3 to 1985 Q1

**1985-1987**        **Mark 2**

Two decisions in 1985 - 3.8 per cent and 2.3 per cent.

With a large negative terms of trade shock, pressure mounted to isolate the resulting exchange rate fall from the wage and price system. Partial wage indexation resulted. The ACTU agreed to accept a 2 per cent discount on the CPI outcome in return for tax cuts and superannuation gains. This signalled the start of the tax-wage trade-off period where the public sector effectively ran a crude industry policy protecting higher cost firms from wage rises and using public spending recipients as the source of subsidy.

Econometric Impact:      1985 Q2 to 1987 Q1

**1987-1988**        **Mark 3**

Decisions - $10 p.w. (1st Tier) and 4.0 per cent (2nd Tier)

With the full impact of the terms of trade deterioration now known to be well in excess of the original discounting, indexation was effectively abandoned in return for a two-tier system under *Restructuring and Efficiency Wage Principle*. The first tier was a flat rate $10 per week increase in March 1987, leaving room in the second tier for a 4 per cent rise if restrictive work practices were abandoned. This was the beginning of the move to productivity-based pay rises, although there was little real

productivity bargaining in the second tier negotiations, which tended to emphasise raw cost cutting. Not all workers could gain second tier rises.

Econometric Impact:     1987 Q2 to 1998 Q3

**1988-89**                      **Mark 4**

Decisions - 3.0 per cent and $10 p.w.

The August 1988 NWC ushered in the *Structural Efficiency Principle* and was a variant of the two-tier system and allowed all workers a 3 per cent rise from September 1988, as long as workers agreed to a award review process. The second-tier was available in March 1989 amounting to $10 per week as long as structural efficiency (real productivity) improvements were made. Structural efficiency was focused at the industry level (whereas under Mark I the productivity distribution was to be at the national level). It was also moving away from "cost cutting" to genuine productivity gains.

Econometric Impact:     1988 Q4 to 1989 Q1

**1989-1990**                    **Mark 5**

Decisions - $20-$30 (in two instalments)

The Mark V agreement continued the Structural Efficiency Principle established in Mark IV. The August 1989 NWC reflected the increased call for even more flexibility in the wages system. The wage increases could only be paid if there had been progress in the award restructuring process brought in under Mark IV. Many workers had not gained second tier increases under Mark III nor Mark IV. In the May 1989 Treasurer's Statement, the Government indicated that tax cuts would be delivered and this took some pressure of the union wage push. Unions had to agree to continue no claims outside the guidelines.

Econometric Impact:     1989 Q2 to 1990 Q1

**1990-1993**                      **Mark 6**

Decision - 2.5 per cent.

After seven years of real wage cuts, the ACTU started pushing for a Phillips curve model of wage setting focusing on price expectations rather than indexation in retrospect. However, the onset of the worst recession since the 1930s tempered any union aggression. The IRC in fact rejected the agreement made between the government and the unions and instead imposed a selective and conditional 2. 5 per cent increase.

Econometric Impact:       1990 Q2 to 1993 Q1

**1993-1995**                      **Mark 7**

Decisions - Safety Net Adjustment in 1993 of $8 and another in 1994 of $24 in three instalments.

Enterprise Bargaining Principle established to replace the close supervision by the Arbitration Commission. There was no wage limit established.

Econometric Impact:       1993 Q2 to 1995 Q3

**1995-96**                       **Mark 8**

The election caught up with Mark 8 and in effect it is a continuation of Enterprise Bargaining Principle with the Safety Net intact.

Econometric Impact:       1995 Q4 to 1996 Q2

**Notes:**

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[i] Johansen (1988) ML procedure was employed given the possibility that wage inflation and price inflation would form a system with more than one cointegrating relation. The results could not reject the hypothesis that there were two cointegrating vectors, using the maximal eigenvalue test. However, one of the vectors made no economic sense and so it was concluded that one distinct vector exists.
[ii] The $F(5, 69)$ test for first to fifth order autocorrelation was 1.48, the $F(4, 66)$ for fourth-order ARCH was 0.28, the Normality $Chi^2 (2)$ was 0.65, and the RESET $F(1,73)$ was 0.57.

# Chapter 9          The Buffer Stock Employment Model and

## the NAIRU: The Path to Full Employment

## 9.1      Introduction

Governments redistribute resources from private households to the public sector to advance a variety of collective actions. The desirable size of the government (and the amount of resources redistributed) is a political choice, rather than an economic issue. The question for economists is how government goes about its role once its scale is accepted. In this Chapter, we examine this role as it relates to unemployment. High and persistent unemployment has pervaded almost every OECD country since the mid-1970s. We argue that unemployment arises because the budget deficit is too small relative to the desires of the private sector to meet its tax obligations and to save and to hold money for transactions purposes.

Mass unemployment is a macroeconomic phenomenon and can never be a "real wage" problem. William Vickrey [1996] argued that

> the 'deficit' is not an economic sin but an economic necessity. Its most important function is to be the means whereby purchasing power not spent on consumption, nor recycled into income by the private creation of net capital, is recycled into purchasing power by government borrowing and spending. Purchasing power not so recycled becomes non-purchase, non-sales, non-production, and unemployment.

The rapid inflation of the mid-1970s left an indelible impression on policy-makers who became captives of the resurgent new labor economics and its macroeconomic counterpart, monetarism. The goal of low inflation replaced other policy targets, including low unemployment. This has resulted in GDP growth in OECD countries, which has generally been below that necessary to absorb the growth in the labor force in combination with rising labor productivity.[1] The proximate cause of high unemployment has thus been the excessively restrictive fiscal and monetary policy stances by OECD governments driven by what we might call "backward" thinking (Mitchell 1996; 1998b).

Backward reasoning reflects a fundamental misunderstanding of the way fiat currency operates. It begins with the fallacious analogy that government spending, taxation, and debt issue is equivalent to the spending and financing decisions of the household. Accordingly, governments are supposed to seek financing prior to spending. The analogy has led orthodox economists to advocate balanced

budgets to avoid higher tax rates and interest rates. But the underlying cause is that the reemerging free market ideology has convinced us wrongly that government involvement in the economy imposes costs on us, and we have thus supported governments that have significantly reduced their fiscal involvement in economic activity.

The economies that avoided the plunge into high unemployment maintained a "sector of the economy which effectively functions as an employer of the last resort, which absorbs the shocks which occur from time to time..." (Ormerod, 1994: 203). In this Chapter, we characterize this absorption function in terms of the Buffer Stock Employment (BSE) model. we will briefly outline the BSE approach and compare and contrast the inflation control mechanisms of the BSE model with those in an economy subject to a NAIRU.[2] we provide a more complete treatment of the financial implications of the BSE model elsewhere (Mitchell, 1998b).

We demonstrate three ways in which government can maintain price stability. First, it can adopt the NAIRU approach by suppressing the budget deficit and generating unemployment. Second, it can conduct a BSE policy whereby the public sector absorbs all the current idle workers into paid employment at a base level wage that it sets and maintains. We will show that the relevant price stability concept can be called the NAIBER.[3] The change in the buffer employment ratio (BER)[4] disciplines the wage-price pressures in the private sector by asserting the buffer stock wage as the numeraire. A third approach is a special case of the BSE policy. The government may not wish to let the market drive the BER high enough to equal the NAIBER and can intervene using an income policy to maintain a lower than otherwise BER while still maintaining price stability. No rational government, which understood how its own currency works and the role of the budget deficit, would choose the NAIRU approach. The costs from lost output and social alienation are enormous.[5]

The BSE model can thus be justified on two separate grounds: First, it is appealing from social welfare considerations; and, second, it is the only rational strategy for a government that supplies a fiat currency and wishes to maximize macro benefits and retain price stability. We can also outline a third justification in terms of environmental sustainability (Mitchell, 1999e), although we do not address this issue here.

## 9.2    The Buffer Stock Employment model

The BSE policy first proposed by Mitchell (1996) and involves the government continuously absorbing into employment workers displaced from the private sector. The "buffer stock" employees would be paid the minimum wage, which defines a wage floor for the economy. Government employment and spending automatically increases (decreases) as jobs are lost (gained) in the private sector.

The BSE model allows currently idle workers to contribute in many socially useful activities including urban renewal projects and other environmental and construction schemes (reforestation, sand dune stabilization, river valley erosion control, and the like), personal assistance to pensioners, and assistance in community sports schemes.

While the existence of the buffer stock would reinforce the automatic stabilization built into the fiscal system, it remains a fluctuating work force. The design of the jobs and functions would have to reflect this. Projects or functions requiring critical mass might face difficulties as the private sector expanded, and it would not be sensible to use only buffer stock employees in functions considered essential.

What would this cost? Three recent studies estimate the costs of such schemes in the United Kingdom, the United States, and Australia, respectively [Gordon, 1997 for the United States; Kitson *et al*., 1997 for the UK; and Mitchell and Watts, 1997 for Australia]. All three studies produced estimates that lie in the range of 0.06 percent (United States) to 3.5 percent (Australia) of current GDP. The costs are overstated because they ignore the multiplier effects from the rising incomes of buffer stock workers. More detailed cost analysis can be found in the above references. The conclusion from all studies is that the BSE proposal is a very cheap option compared to the Okun gap losses that are incurred daily due to unemployment. High unemployment also places increased costs on the health system and is associated with increased family breakdown and higher crime rates.[6]

## 9.3    Inflation and the NAIRU

In this section, we examine the argument that the BSE would violate the NAIRU constraint and generate inflation. The expectations-augmented Phillips curve became the centerpiece of the resurgence of orthodox thinking in the late 1960s as rising inflation rates challenged the credibility of the demand-oriented Keynesian macroeconomics. The conventional notion of an inflation-unemployment trade-off that had driven the conduct of fiscal and monetary policy since the end of World War II was abandoned in favor of a natural rate of unemployment (NRU) that was considered to be insensitive to aggregate policy. The quest for balanced budgets and deregulation replaced fiscal activism. The NAIRU became the target for governments obsessed with inflation.[7]

The OECD experience of the 1990s shows that persistently high unemployment eventually delivers low inflation -- the Phillips curve is alive and well (Mitchell 1996).[8] Orthodox theory, in denying the existence of involuntary unemployment, had to adopt an esoteric explanation for the observed Phillips curve behavior. Adherents of the natural-rate hypothesis claimed that when a government stimulus pushes the inflation rate up, workers confuse the rise in nominal wages with

a rise in real wages and increase their supply. The rise in labor supply lasts until the workers learn the truth and withdraw their labor, and ultimately the economy settles at the competitive equilibrium position -- the NAIRU. Attempting to maintain unemployment below the NAIRU results in accelerating inflation. The most damning piece of evidence against these supply-side explanations of unemployment is that quits are procyclical -- exactly the opposite hypothesized in the natural-rate story.[9]

Drawing from the competing claims literature, a NAIRU relationship can be established without the orthodox theory (Mitchell, 1987a). Accordingly, inflation results from incompatible distributional claims on available real income, and unemployment acts to discipline the aspirations of labor so that they are compatible with the profit expectations of capital (Kalecki, 1971). The depressed product market demand also reduces the ability of firms to pass on prices. The temporary inflation stability defines what I have termed a macroequilibrium unemployment rate (MRU) (Mitchell, 1987a).[10] Adding hysteresis, where the MRU is functionally related to the actual unemployment, defines a long-term trade-off between inflation and unemployment [Hargreaves Heap, 1980; Mitchell, 1987a).[11]

## 9.4    Inflation and the BSE

If the government pays market prices for everything in a NAIRU world, then it is forced to use unemployment to maintain price stability. How would the introduction of the BSE policy change this? Suppose we characterize an economy with two labor markets: A (primary) and B (secondary) broadly corresponding to the dual labor market depictions. Wage setting in A is contractual and responds in an inverse and lagged fashion to relative wage growth (A/B) and to the Wait unemployment level (displaced Sector A workers who think they will be reemployed soon in Sector A).

A government stimulus to this economy increases output and employment in both sectors immediately. Wages are relatively flexible upwards in Sector B and respond immediately. The compression of the A/B relativity stimulates wage growth in Sector A after a time. Wait unemployment falls due to the rising employment in A but also rises due to the increased probability of getting a job in A. The net effect is unclear. The total unemployment rate falls after participation effects are absorbed.

The wage growth in both sectors may force firms to increase prices, although this will be attenuated somewhat by rising productivity as utilization increases. A combination of wage-wage, and wage-price mechanisms in a soft product market can then drive inflation. This is a Phillips curve world. To stop inflation, the government has to repress demand. The higher unemployment

brings the real income expectations of workers and firms into line with the available real income and the inflation stabilizes - a typical NAIRU story.

Introducing the BSE policy into the depressed economy effectively makes Sector B the BSE sector because its wage levels are fixed by the government in accordance with its desire to set the value for its fiat money. This sets a floor in the economy's cost structure for given productivity levels. The dynamics of the economy change significantly. The elimination of all but wait unemployment in Sector A and frictional unemployment does not distort the relative wage structure so that the wage-wage pressures that were prominent previously are now reduced.

But the rising demand softens the product market, and demand for labor rises in Sector A. There are no new problems faced by employers who wish to hire labor to meet the higher sales levels. They must pay the going rate, which is still preferable to appropriately skilled workers, than the BSE wage level. The rising demand per se does not invoke inflationary pressures as firms increase capacity utilization to meet the higher sales volumes.

What about the behaviour of workers in Sector A? Wendell Gordon (1997: 833) said, "If there is a job guarantee program, the employees can simply quit an obnoxious employer with assurance that they can find alternative employment." With the BSE policy, wage bargaining is freed from the general threat of unemployment. However, it is unclear whether this freedom will lead to higher wage demands than otherwise.

In professional occupational markets, it is likely that some wait unemployment will remain. Skilled workers who are laid off are likely to receive payouts that forestall their need to get immediate work. They have a disincentive to immediately take a BSE job, which is a low-wage and possibly stigmatized option. Wait unemployment disciplines wage demands in Sector A. However, the demand pressures may eventually exhaust this stock, and wage-price pressures may develop.

Further, buffer stock employees are more attractive than when they were unemployed, not the least because they will have basic work skills, like punctuality, intact. This reduces the hiring costs for firms in tight labor markets who previously would have lowered their hiring standards and provided on-the-job training. They can thus pay higher wages to attract workers or accept the lower costs that would ease the wage-price pressures. The BSE policy thus reduces the "hysteretic inertia" embodied in the long-term unemployed and allows for a smoother private sector expansion because growth bottlenecks are reduced.

Exchange rate changes may induce cost pressures. With flexible exchange rates, the demand stimulus would increase the price of foreign exchange, which under usual conditions increases the competitiveness of the economy while also adding to the domestic price level. Vickrey (1996)

said, "The danger of world speculative gyrations under freely floating conditions would be greatly diminished under a well-established full-employment policy, especially if combined with a third dimension of direct control over the overall domestic price level." The direct control to allow the depreciation to be insulated from the wage-price system could be an income policy.

## 9.5    Inflation control -- the NAIBER

The BSE wage provides a floor that prevents serious deflation from occurring and defines the private sector wage structure. However, if the private labor market is tight, the non-buffer stock wage will rise relative to the BSE wage and the buffer stock pool drains. The smaller this pool, the less influence the BSE wage has on wage patterning. Unless the government stifles demand, the economy will then enter an inflationary episode, depending on the behavior of labor and capital in the bargaining environment.

In the face of wage-price pressures, the BSE approach maintains inflation control in much the same way as monetarism -- by choking aggregate demand and inducing slack in the non-buffer stock sector. If a shrinking BSE pool is not answered with demand reducing measures, other prices will rise relative to the BSE wage and old fashioned inflation can follow. The slack does not reveal itself as unemployment, and in that sense the BSE policy may be referred to as a "loose" full employment.

The BSE policy generates inflation stability because the suppression of non-buffer sector output asserts the numeraire price -- the BSE wage. This leads to the definition of a new concept, the Non-Accelerating Inflation Buffer Employment Ratio (NAIBER), which, in the buffer stock economy, replaces the NAIRU/MRU as an inflation control mechanism. The Buffer Employment Ratio (BER) is the ratio of buffer stock employment to total employment.

As the BER rises, due to an increase in interest rates and/or a fiscal tightening, resources are transferred from the inflating non-buffer stock sector into the buffer stock sector at a price set by the government; this price provides the inflation discipline. The disciplinary role of the NAIRU, which forces the inflation adjustment onto the unemployed, is replaced by the compositional shift in sectoral employment, with the major costs of unemployment being avoided. That is a major advantage of the BSE approach.

The NAIBER also relates the private sector employment rate to the inflation rate. In the switch from a NAIRU regime to a NAIBER model, the initial BER would be an understatement of the medium-term, steady state BER. As the government absorbed the unemployment into buffer stock employment the demand levels that were delivered via the NAIRU would rise and disturb the

distributional peace. The government would then have to exert pressure on the private sector and be prepared to absorb increased numbers into the buffer stock pool.

However, relying on the NAIBER may introduce other costs. For example, the rising BER will lower overall productivity growth, as resources are transferred out of the higher productivity, non-buffer sector. While this will not have direct implications for competitiveness in the export sector, it is possible that productivity growth in the non-buffer stock sector itself will also fall as scale declines (Kaldor, 1978).

The BSE economy thus has some new policy choices to make. Minimizing the BER may improve productivity growth but leaves the economy open to inflation. By maximizing the BER, it controls inflation, but may reduce productivity growth overall and introduce trade problems.[12]

The alternative is to separate the BER from the inflation control via an income policy (Mitchell and Watts, 1997). With the BSE economy, the government sets a wage floor and thus the price that it is willing to pay to transfer resources from the non-buffer stock sector to the buffer stock sector. An income policy using this numeraire as the basis for wage adjustment would allow the economy to achieve both full employment and price stability with a lower BER. The design of such a policy is not considered here.


## 9.6 Conclusion

Unemployment arises because the budget deficit is too low. It is always a macroeconomic problem. The Buffer Stock Employment model is the only logical way of providing jobs for everyone with guaranteed price stability. Whether it is accompanied by an income policy is a matter of refinement rather than substance.

**Notes:**

[11] Mitchell (1996) provides extensive analysis and data to support this contention.

[2] NAIRU refers to the Non-Accelerating Inflation Rate of Unemployment and is used in this paper to characterize the approach to inflation control advocated by monetarists, whereby a stock of unemployment is required to discipline the wage-price process.

[3] NAIBER refers to the Non-Accelerating Inflation Buffer Employment Share and is the ratio of buffer stock employment to total employment that is required to stabilize inflation.

[4] The Buffer Employment Ratio (BER) is the ratio of buffer stock employment to total employment and rises (falls) as the private sector contracts (expands).

[5] Mitchell and Watts (1997) indicate that the daily losses from unemployment in Australia are around $156 million or $3100 per capita per annum. This is more than twice the alleged microeconomic inefficiencies estimated in the 1991-92 Annual Report of the Australian Industry Commission.

[6] Gordon (1997: 831) concludes that

> beyond this, there is an important sense in which the job guarantee program would not cost anything. The goods or services produced by the labor of the beneficiary of the job guarantee increase the gross national product and the national welfare by as much as the worker is paid as reliably as does any 'free market' labor. The laborer is 'earning' the wage or salary received. Also, and importantly, the worker under the job guarantee program has a job of which the worker can be as proud as are other citizens with their jobs.

[7] There is a distinction between the NAIRU and the natural rate of unemployment (NRU). The NAIRU is the NRU with some structural impediments in the economy added. The mechanics of the inflation process are the same, however.

[8] The NRU-NAIRU concept arose from a misunderstanding of what the trade-off between inflation and unemployment really means and a failure to appreciate the way in which fiat money works in the economy. The coincidence of high inflation and high unemployment in the 1970s -- the period of stagflation -- appeared to be contrary to orthodox Keynesianism. Blinder (1987: 39) said "So when high inflation and high unemployment occurred together in the 1970s, many observers wrongly declared the Phillips curve dead and conventional macroeconomic analysis bankrupt."

[9] Thurow (1983: 186-87) rejected this approach and asked, "Can you honestly think that WWII presented a case of misinformation that produced low unemployment? No. But when governments tighten fiscal and monetary policies, unemployment also seems to rise as predicted."

[10] While the MRU defines a (transitory) steady state relationship between unemployment and inflation, it has no connotations of voluntary maximizing individual behavior or market clearing that underpins most orthodox versions of the NAIRU concept.

[11] In a hysteretic economy aggregate demand influences the long-term steady-state unemployment rate, and activism can permanently reduce the unemployment rate. The dynamics of this interaction are examined in Mitchell (1987a).

[12] Mitchell (1999e) also shows that the BER is positively related to an environmentally favorable mix of goods.

# Chapter 10          The Buffer Stock Employment model in a small open economy

## 10.1.  Introduction

High and persistent unemployment has pervaded almost every OECD country since the mid-1970s. Mass unemployment arises because the budget deficit is too small relative to the desires of the private sector to meet its tax obligations, to save and to hold money for transactions purposes. Unemployment is thus a macroeconomic phenomenon and can never be a "real wage" problem The solution to this problem is for government to use deficit spending to introduce a Buffer Stock Employment (BSE) policy (Mitchell 1996, 1998a).[1]

The BSE approach to full employment is counter the current policy direction of governments in the OECD economies. The rising unemployment began with the rapid inflation of the mid-1970s. The inflation left an indelible impression on policy-makers who became captives of the resurgent new labor economics and its macroeconomic counterpart, monetarism. The goal of low inflation led to excessively restrictive fiscal and monetary policy stances by OECD governments driven by what we might call "backward" thinking (Mitchell 1996, 1998a). This has led to GDP growth in OECD countries being generally below that necessary to absorb the growth in the labor force in combination with rising labor productivity.[2]

Backward reasoning reflects a fundamental misunderstanding of the way fiat currency operates. It begins with the fallacious analogy that government spending, taxation, and debt issue is equivalent to the spending and financing decisions of the household. Accordingly, governments are supposed to seek financing prior to spending. The analogy has led orthodox economists to advocate balanced budgets to avoid higher tax rates and interest rates. The reemerging free market ideology has convinced us wrongly that government involvement in the economy imposes costs on us, and we have thus supported governments that have significantly reduced their fiscal involvement in economic activity.

The economies that avoided the plunge into high unemployment maintained a "sector of the economy which effectively functions as an employer of the last resort, which absorbs the shocks which occur from time to time..." (Ormerod, 1994: 203). The BSE policy fulfills this absorption function. While the BSE approach will cure unemployment it also delivers price stability (Mitchell, 1998a; Mosler, 1998; Wray, 1998)

In this Chapter, we consider some of the financial implications of the BSE model in the context of a small open economy. In addition to the normal arguments that monetarists and others use to justify their case against fiscal activism (crowding out, inefficient resource usage), it is often argued that increased globalisation imposes further restrictions on the ability of governments to pursue independent fiscal and monetary policy. In Australia's case, it is alleged that budget deficits only result in growing current account deficits and rising debt levels. Reacting to this, it is alleged that external funds managers can enforce higher interest rates and thus even lower growth and higher unemployment in the domestic economy.

There are several testable hypotheses included in the monetarist case, which are rarely confronted with empirical scrutiny.

- Is there evidence of a relationship between budget deficits and short-term and long-term interest rates? If there is no discernable statistical relationship found it is difficult to argue against fiscal activism based on financial crowding out arguments.

- Is there evidence of a relationship between long-term interest rates across countries in globalised financial markets? If there is no relationship detected then the view that financial traders in the large markets like Japan and the United States can render domestic monetary policy ineffective is problematic.

- Is there any evidence that the relationship between domestic long-term and short-term interest rates is unstable? Stability implies that the cash rate, which is set as a policy instrument, and the longer-term interest rates, which are influenced by market considerations, move together in a proportional manner over the long-run and that therefore the determinant is the officially controlled cash rate.

- Is there any evidence to support the twin-deficits hypothesis that imposes causality from the fiscal deficit changes to changes in the current account deficit? A lack of such a direct relationship also provides further support for the use of budget deficits under the BSE policy.

It is found that none of the principal claims used against fiscal activism are empirically sustainable. The evidence is supportive of the conceptual basis of monetary theory that underpins the BSE model (Mitchell, 1996; Mosler, 1997, Wray, 1998; Bell, 1998, Mitchell and Mosler, 1999).

The Chapter is set out as follows. Section 10.2 discusses the role of the budget deficit and explains why we should not be concerned about its size. Section 10.3 conducts a range of econometric tests, which establish that the monetarist case against budget deficits is not empirically founded. Accordingly it is argued that the budget deficit implications of introducing the BSE policy should be disregarded. Concluding remarks are provided.

## 10.2   The BSE and the Budget Deficit

The critics of the BSE approach point to financial constraints they allege would arise from the higher budget deficits. The willingness of government to allow the budget deficit to increase and decrease as is necessary to maintain full employment is essential to the viability of the BSE policy. In this section, it is argued that the rising budget deficits that are likely to accompany the introduction of the BSE policy are not a cost and should be ignored. In a BSE world the size of the budget deficit necessary to maintain the policy is irrelevant. One of the most damaging analogies in economics is the supposed equivalence between the household budget and the government budget. This immediately leads to what we might call "backward" reasoning. For example, Barro (1993: 367) says "we can think of the government's saving and dissaving just as we thought of households' saving and dissaving."

The analogy is flawed at the most fundamental level. The household must work out the financing before it can spend. Whatever sources are available, the household cannot spend first. Moreover, by definition a household must spend to survive. The government is totally the opposite. It spends first and does not have to worry about financing. The important difference is that the government spending is desired by the private sector because it brings with it the resources (fiat money) which the private sector requires to fulfill its legal taxation obligations. The household cannot impose any such obligations. The government has to spend to provide the money to the private sector to pay its taxes, to allow the private sector to save, and to maintain transaction balances. Taxation is the method by which the government transfers real resources from the private to the public sector. A budget deficit is necessary if people want to save.

The logic according to those who draw the household analogy follows like this. Debt would have to be issued to finance the deficit. Accordingly, bond sales finance government, which will accumulate as debt. Like a household, the rising debt cannot be sustained indefinitely and so spending must be curbed and brought in line with the financial reality. In the meantime, the demands that the debt places on available savings pushes interest rates up and crowds out "more efficient" sources of private spending.

The backward logicians divide into two camps. The orthodox Monetarists who eschew government debt and advocate balanced budgets. Their wrong-minded logic has imposed extremely high macroeconomic costs in terms of lost growth and high unemployment on the western economies since the mid-1970s. The other camp is the group, which includes some Post Keynesians, who while comfortable with using deficit spending to increase economic activity, couch their recommendations in conservative logic bounded by appropriate movements in the debt to GDP ratio. Accordingly, as long as the ratio is stable there is no problem.

For example, The Bank of International Settlements (1994) analysed the level of deficit that would be sustainable in terms of a stable government debt to GDP ratio (hereafter the debt ratio). They concluded that a deficit is sustainable as long as the debt ratio does not increase permanently. A framework for analysing the relation between deficits and the debt ratio is provided by Bispham (1988) and Glyn (1997). Glyn (1997: 226), an advocate of expansionary fiscal policy to reduce unemployment, points out that this literally means the higher is the debt ratio the higher sustainable deficit as long as the real interest rate is below the GDP growth rate. He also argues that "financial markets, the ultimate arbiters of such matters, may look simply at the size of the deficit." The BIS (1995: 88) concur that "it is difficult to persuade markets that low inflation is sustainable in the presence of large budget deficits." Glyn (1997: 227) concludes that

> Given the experience of the past twenty years it would be difficult to convince that increased deficits at the beginning of the expansionary programme would be rapidly scaled down as the private sector took up the main thrust of expansion. There seems little alternative to financing through taxation most of an expansionary programme.

Further, Glyn (1997: 224) says "it is misleading to treat them (interest rates) as entirely exogenous. It is likely that beyond a certain level, a higher deficit will lead financial markets to exact a higher real-interest rate."

The two camps however fail to understand the relationship between fiat currency, public debt and taxation in a monetary capitalist economy, a topic, which is examined by Mitchell (1998b), Mosler (1997). Wray (1998), and Bell (1998). They show the priority of spending and argue that debt issue is not essential for governments to spend beyond tax revenue. Mosler (1997) shows that bond issues are essential only to support the cash rates set by the Central Bank. Deficit spending without Treasury bond sales would generate excess reserves in the banking system, so that government debt helps to maintain a positive overnight interest rate for private banks. The idea of crowding out in this environment is as meaningless as debates about the term maturity of the debt. Deficits add to the net disposable income of households in the economy and the income provides markets for private production. An endogenous credit economy then serves to provide the deposits necessary to make payments, which facilitate production. The higher demand stimulates investment that creates capacity as a legacy to the future. The higher is current demand, the higher is productive capacity in the future. Spending brings forth its own savings. Savings are not required to exist as a prior pool for spending to occur.

William Vickrey (1996: 10) argued that

> the 'deficit' is not an economic sin but an economic necessity. Its most important function is to be the means whereby purchasing power not spent on consumption, nor recycled into income by the private creation of net capital, is recycled into purchasing power by government borrowing and spending. Purchasing power not so recycled becomes non-purchase, non-sales, non-production, and unemployment.

In an endogenous money world, there can be no crowding out unless the monetary authority stops lending.

The recent Asian financial troubles and IMF intervention have once again given credence to the view that increasing levels of debt will eventually lead to lenders refusing to take up further public borrowing. Usually this is cast in terms of countries with low levels of capital that have major private debt denominated in a foreign currency which is used to finance imports. Crises occur when the export revenue, which services the debt, falls for one reason or another. But none of these countries would have any trouble issuing debt in its own currency.[3]

The point is clear. When fiat money is used, government spending increases reserves in the banking system. Taxation and borrowing drain the reserves. This gives the clue to the function of borrowing. A deficit generates a net build up in reserves in the banking system. The spending occurs and the private firms and individuals that sell goods and services to the government deposit the proceeds in the commercial banks, which build up reserves. Unless those reserves are drained from the system, they will earn the official discount rate. The role of the government bond issues is to give these returns a way to earn a return in excess of the discount rate.

To fine-tune this point further, the spending would still have occurred if there were no bond issues. The excess reserves would be held somewhere in the banking system earning zero return. If the Treasury offers too few or too many bonds relative to the holders of reserve balances at the Central Bank, the Central Banks "offsets" those operations to balance the system. In any case, the 'money' is in one account or another at the Central Bank. We then ask the question - why should government care if the holders of the excess balances chose the one that doesn't pay interest as opposed to the ones that do (buying bonds)? The answer is simple - they would be indifferent.

## 10.3  Interest rates, budget deficits and Current Account performance

The BSE policy requires that the government have the ability to implement a largely independent monetary and fiscal policy. In this section we examine the effects of budget deficits on interest rates and current account performance and also seek to establish causality within the term structure of interest rates.

As noted above Glyn (1997: 26-227), an advocate of fiscal activism, believes that taxation should be used to "finance" the necessary spending. His contention is based on his acceptance of the notion that international financial markets will react to higher budget deficits and "exact a higher real-interest rate" (Glyn, 1997: 224)

This contention forms a set of empirically testable hypotheses outlined in the introduction. We examine each in turn in this section. The following ideas are examined:

- Is there evidence of a relationship between budget deficits and short-term and long-term interest rates? If there is no discernable statistical relationship found it is difficult to argue against fiscal activism based on financial crowding out arguments.

- Is there evidence of a relationship between long-term interest rates across countries in globalised financial markets? If there is no relationship detected then the view that financial traders in the large markets like Japan and the United States can render domestic monetary policy ineffective is problematic.

- Is there any evidence that the relationship between domestic long-term and short-term interest rates is unstable? Stability implies that the cash rate, which is set as a policy instrument, and the longer-term interest rates, which are influenced by market considerations, move together in a proportional manner over the long-run.

- Is there any evidence to support the twin-deficits hypothesis that imposes causality from the fiscal deficit changes to changes in the current account deficit? A lack of such a direct relationship also provides further support for the use of budget deficits under the BSE policy.

### 10.3.1 Crowding Out

The crowding out notions of monetarism which was anticipated by Keynes (1937) are well known. Whenever there is an exogenous planned rise in demand there is a concomitant rise in demand for money to meet the extra contractual commitments. If the banking system does not meet the demand for credit the rate of interest will rise before any additional output is sold. Accordingly, a budget deficit which "draws" on scarce savings via debt issue will push interest rates up in the domestic markets.

However, if the extra wage bill that the Government requires for BSE workers are paid out of deposit-balances held by the Treasury at the Central Bank then there are no short-term interest rate effects. The demand for credit is not independent of the level of real activity, irrespective of whether this is a demand for loans from private entrepreneurs from the commercial banks, or whether it is a demand by the Treasury for balances at the Central Bank. Either route to increased money are consistent with an overdraft system which Keynes certainly approved of (Keynes, 1937). Thus, in a credit money economy we should expect to find no relationship between changes interest rates and the changes in the budget deficit.

Table 10.1 presents evidence from Australian financial markets which strongly rejects the null hypothesis that there is a *statistical causation* flowing from changes in the budget deficit to

changes in long- and short-term interest rates. Granger causality tests were conducted which
formulate the problem in the following way:

> $x$ is a *Granger cause of* $y$  (denoted as $x \rightarrow y$ ), if present $y$ can be predicted with better
> accuracy by using *past* values of $x$ rather than by not doing so, other information being
> identical. (Granger, 1969).

In other words, in a general Autoregressive-Distributed lag model, the rejection of Granger
causality amounts to the acceptance of the restriction that all the coefficients of the distributed lag
(starting at lag one) are zero. The testing model regressed the change in the interest rate measure
on lagged changes of the interest rate measure and lagged changes of the budget deficit to GDP
ratio.[4]

**Table 10.1 The relationship between changes in the budget deficit and real interest rates in**
**Australia**

| Interest Rate Change | Lag | Sample Period | Test Statistic |
|---|---|---|---|
| Cash Rate 11.00 am. | 4 | 1980 (2) to 1997 (3) | $F(4,61) = 0.90068$ |
|  | 8 | 1981 (2) to 1997 (3) | $F(8,49) = 0.74283$ |
|  | 12 | 1982 (2) to 1997 (3) | $F(12,37) = 0.4068$ |
| 3 Month Treasury Bill Rate | 4 | 1979 (4) to 1997 (3) | $F(4,63) = 1.0074$ |
|  | 8 | 1980 (4) to 1997 (3) | $F(8,51) = 0.55517$ |
|  | 12 | 1981 (4) to 1997 (3) | $F(12,39) = 0.49747$ |
| 90-day Bank-accepted Bill Rate | 4 | 1979 (4) to 1997 (3) | $F(8,63) = 1.52741$ |
|  | 8 | 1980 (4) to 1997 (3) | $F(8,51) = 0.54597$ |
|  | 12 | 1981 (4) to 1997 (3) | $F(12,39) = 0.38844$ |
| Federal Government 10 Year | 4 | 1979(4) to 1997 (3) | $F(4,63) = 0.62536$ |
| Bond Yield | 8 | 1980 (4) to 1997 (3) | $F(8,51) = 0.56285$ |
|  | 12 | 1981 (4) to 1997 (3) | $F(12,39) = 0.5763$ |

**Source:** Datastream
Quarterly interest rate changes: Cash Rate 11 a.m., 3-month Treasury Bill Rate, 90-day Bank-
accepted Bill Rate, and 10-year Commonwealth Government Bond Yield.
The nominal rates were converted to real rates using a smoothed moving-average of the inflation
rate.

For every lag tested, no relationship between changes in the Deficit/GDP ratio and the changes in
the real interest rates could be detected. The evolution of real interest rates appears to be
independent of the changes in the relative size of the deficit. This is consistent with evidence from
Nevile (1997: 99-103) who concludes that "It is flying in the face of the facts to argue that in

Australia larger deficits cause higher interest rates." Nevile (1977) studied nominal interest rate causality but argues that price expectations do not change quickly enough for there to be causality between the real interest rate and the budget deficit if it wasn't present in the nominal rates of interest.

### 10.3.2 Long-term interest rate convergence

While the measurement of real long-term interest rates is open to question there appeared to be a convergence among real long term interest rates in the major economies during the mid-1990s despite what appeared to be different domestic situations in each country. Real long-term interest rates in Europe and Japan seemed to rise in response to American monetary conditions. Christiansen and Pigott (1997: 5) argue that if "long-term interest rates were responding more to external factors than domestic economic conditions and, if so, might be less free, even under floating exchange rates, to vary independently across the major regions than earlier believed."

The issue bears on the ability of a sovereign government to implement policy, which is likely to be suspected by global financial markets. Christiansen and Pigott (1997) investigate the extent to which external factors constrain the freedom of long-term interest rates to vary with domestic fundamentals and the extent to which globalisation has reduced the ability of monetary authorities to influence long-term interest rates.

With flexible exchange rates we expect that domestic long-term real interest rates will reflect domestic economic conditions. The budget deficit is usually included because it is seen as a major factor determining domestic saving. However, this reflects a view of saving as a finite pool, which can be made available either to finance the budget deficit or to finance private spending. We have argued that spending creates its own saving and within the BSE policy framework no such influence is expected. In the previous section, we failed to find evidence to support a relationship between the budget deficit and long-term interest rates.

What factors might lead to international conditions dominating domestic influences on a country's long-term interest rates? First, when portfolio diversification is possible, risk premia may be determined by conditions in world markets. The argument is that large financial traders can impose their view on a nation's interest rates. If, for example, it is thought that inflation is rising a higher risk premium will be imposed. There is very little evidence in the literature to support this view. Further, the antagonism towards large budget deficits is usually in terms of higher expected inflation rates. Under the BSE model, any relation between budget deficit and expected inflation is negated by broken by the influence of the NAIBER. Second, the work by Summers (1986) on noise trading could provide the linkage. Expectations rather than economic fundamentals drive speculation. Traders who are unable to determine exact equilibrium information will use price information derived from large bond markets (such as the US bond market) to guide their trading

behaviour. However, it is hard to argue that these effects which are likely to impact on short-term rates will be influential on long-term rates.

There is thus a time dimension to the degree to which long-term interest rates may converge between countries. It is useful to distinguish between relationships in the:

- very-near term (daily or weekly)
- medium and longer term.

**Relationships between daily US long-term rates and daily Australian long-term rates**

Initially we test the relationship between the daily US long-term nominal bond rate and the daily Australian nominal long-term bond rate. Table 10.2 provides evidence from Granger-causality tests relating the US nominal long-term interest rate to Australian nominal long-term rates. The tests for Granger-causality were performed on daily changes of using 5, 10, and 20 lags. In other words we are assuming that the US rates affect Australian rates on the following day.

**Table 10.2 Tests of causality among daily changes in long-term interest rates,
January 1993 to March 1998**

| Change in Australian Rates | Lag | $F$-statistic |
|---|---|---|
| Adding Change in USA Rates | 7 | $F(7,1325) = 80.658$ ** |
|  | 10 | $F(10,1316) = 56.755$ ** |
|  | 20 | $F(20,1286) = 28.267$ ** |
| **Change in USA Rates** |  |  |
| Adding Change in Australian Rates | 7 | $F(7,1325) = 2.3614$ * |
|  | 10 | $F(10,1316) = 1.972$ * |
|  | 20 | $F(20,1286) = 1.3717$ |

**Source:** Datastream for the period January 29 1993 to March 31 1998.
 Changes in the nominal US Treasury benchmark 10-year bond and changes in the Australian 10-year bond yield (middle rate)

We conclude that changes in the United States long-term bond market is statistically significant as a predictor of changes in the Australian long-term bond market over extremely short periods. The bi-lateral causality is also confirmed with Australian changes helping predict US changes the following day (Remolona, 1991).

Another significant consideration is the magnitude of the response of the rate change in Australia to a change in a large market. The causality merely indicates that the spillover effects between markets occur. To estimate the responsiveness the daily change in Australian nominal long-term

interest rates was regressed on the daily change in nominal long-term interest rates a simple regression with a lagged dependent variable added was run over the full sample.

The result below is the steady-state solution and the $R^2$ refers to the coefficient of determination in the dynamic model and the Partial $R^2$ refers to the partial effect of the addition of $\Delta US$ to the dynamic model.

$$\Delta AUS = -0.002 + 0.165\Delta US$$
$$R^2 = 0.028 \qquad \text{Partial } R^2 = 0.013$$

The conclusion is that only a minute fraction of daily changes in the Australian nominal long-term interest rates are attributable to daily changes in the United States nominal long-term interest rates.

**Relationships between monthly real US long-term rates and monthly real Australian long-term rates**

Table 10.3 provides evidence from Granger-causality tests relating the monthly foreign real long-term interest rate to monthly Australian real long-term rates. The tests for Granger-causality were performed on monthly changes of real long-term interest rates using 36, 24, 12, 6 and 1 lags. To examine the hypothesis that globalisation has changed the way long-term interest rates are determined in a domestic economy the tests were performed over the entire sample and then for the post-1984 period when Australia essentially experienced financial deregulation and opened it financial markets. If the hypothesis that large markets dominate smaller markets like Australia, even under flexible exchange rates, is valid, then we would expect the foreign rates to Granger-cause Australian rates for both samples.

The results show clearly that while there is some influence from American and Japanese rates for the entire sample (part of which spans a fixed exchange rate period), there is no causality detected in the post-1984 sample. In other words, the move to flexible exchange rates has been associated with a period where changes in monthly foreign long-term interest rates have had no influence on changes in monthly domestic rates. Similar results were found by testing for the influence of other monthly OECD real long-term rates.

These results are consistent with those found in the literature. There is little evidence to support the proposition that there has been a decrease in the sensitivity of long-term rates to domestic short-term rates with the rising incidence of globalisation (see Kasman and Rodrigues, 1991; Christiansen and Pigott, 1997).

**Table 10.3 Relationship between Australian real long-term interest rates and those of other Countries**

| Country | Lag | Sample Period | Test Statistic for adding the Distributed lag |
|---|---|---|---|
| **FULL SAMPLE:** | | | |
| United States | 1 | 1969(2)-1997(7) | F(1,332) = 1.9595 |
| | 6 | 1970(2)-1997(7) | F(6,317) = 1.2358 |
| | 12 | 1970(8)-1997(7) | F(12,299) = 1.1161 |
| | 24 | 1971(8)-1997(7) | F(24,263) = 1.6139 * + |
| | 36 | 1972(8)-1997(7) | F(36,227) = 1.5035 * + |
| Japan | 1 | 1971(3)-1997 (7) | F(1,314) = 7.0949 ** |
| | 6 | 1971(8)-1997(7) | F(6,299) = 2.5883 * |
| | 12 | 1974(2)-1997(7) | F(12,281) = 1.5385 |
| | 24 | 1973(2)-1997(7) | F(24,245) = 1.4956 |
| | 36 | 1974(2)-1997(7) | F(36,209) = 1.3458 |
| United Kingdom | 12 | 1970(8)-1997(7) | F(12,299) = 0.61168 |
| | 24 | 1971(8)-1997(7) | F(24,263) = 0.55368 |
| | 36 | 1972(8)-1997(7) | F(36,227) = 0.79009 |
| **GLOBALISATION PERIOD:** | | | |
| United States | 1 | 1984 (1)-1997(7) | F(1,160) = 2.4689 |
| | 6 | 1984 (1)-1997(7) | F(6,150) = 1.1229 |
| | 12 | 1984(1)-1997(7) | F(12,138) = 1.2414 |
| Japan | 1 | 1984(1)-1997(7) | F(1,160) = 3.784 |
| | 6 | 1984(1)-1997(7) | F(6,150) = 2.0498 |
| | 12 | 1984(1)-1997(7) | F(12,138) = 1.319 |

**Source:** OECD Main Economic Indicators, monthly long-term interest rates. Real interest rates were calculated using a smoothed annualized inflation rate.
+ Causality was also detected flowing from changes in Australian long-term interest rates to changes in the USA long-term interest rates. No such causality could be detected flowing from Australia to Japan.
* Denotes the 5 per cent level of significance.

### 10.3.3 Testing the Stationarity of the Yield Gap

It appears that the long-term interest rates in the large markets do not "cause" enduring movements in the long-term rates in Australia. Indeed, the evidence appears to support the idea that globalisation has led to more independence of long-term rates between Australia and the rest of the world after the move to freely determined exchange rates. The only causal relations detected appear to be during the period of fixed or heavily managed exchange rates. There is also some evidence of very small near-term effects.

Given that there is very little evidence to support the notion that globalisation has led to Australia's long-term interest rate being dominated by the US rates or other external long-term rates, it is important to focus on the relationship between the short-term rates and the long-term rates within Australia. There are two issues of interest. First, do long-term interest rates drive short-term interest rates or vice-versa? Second, if monetary authorities are able to set the cash rate and if the medium and long-term rates exhibit a stable relationship over the long run then the monetary authorities retain the ability to influence movements in long-term interest rates in their own financial markets and achieve their policy targets.

Table 10.4 provides evidence of causality between the components of the Australian term structure. The tests seek to determine if there is any evidence to support the notion that the changes in the cash rate are caused by changes in other rates. The results indicate that causality can be detected in both directions for each of the pairs tested and are thus not supportive of any primary determinacy.

Given that bi-directional causality cannot be eliminated, it is important to examine the notion that monetary authorities can set the cash rate within a stable term structure. This contention is examined by testing whether the yield gaps between the cash rate and various other rates in the term structure are stable. A series of unit root tests were conducted for this purpose. We would reject the notion that the yield gap is stable if we detected a unit root in the series.

For Australia, the results shown in Table 10.5 clearly support the notion that the yield gap is stationary over a range of time periods. The tests reject the null that the yield gap is a unit root process. In other words, the evidence is consistent with the statement that the difference between domestic long-term interest rates and short-term rates is stable over time. This is also consistent with the view that Australian monetary authorities are able to pursue their policy objectives and are not at the behest of global funds managers as if often alleged by antagonists of the use of activist deficit-based government policy.

Christiansen and Pigott (1997: 14) perform similar tests for the United States, Japan, Germany, France, Italy, the United Kingdom and Canada and conclude that

> the evidence does not suggest that the effects of globalisation have been so great as to prevent monetary authorities from being able to achieve their fundamental objectives…. Most of the studies cited earlier suggest that domestic short-term interest rates have a greater impact on long-term interest rates than do US interest rates, at least for European countries. … Indeed, for most countries, the gap between domestic long-term interest rates and short-term rates is stable in the long run. This indicates that long-term interest rates are ultimately linked to short-term interest rates. Through their influence on the supply of liquidity to markets, authorities remain capable of controlling the evolution of short-term interest rates over these horizons.

Other studies reach similar conclusions (see Radecki and Reinhart, 1989; Kasman and Rodrigues, 1991).

To further examine the stability of the term structure, cointegration tests were performed using the Engle-Granger (1987) approach.[5] The cointegration equations confirmed the evidence shown in Table 10.6. The pairwise relationships between the cash rate and the medium and long-term rates are cointegrated, which indicates that there are no systematic departures over a long period between the rates of interest.

The finding of pairwise cointegration means that the term structure defined in terms of the rates we are using in this study is also cointegrated and the following cointegrating regression establishes the long-term stability of the term structure over the period 1979(1) to 1997(2):

CASHRATE =      + 1.049       - 0.1929 TB3M     + 1.248 BILL90    - 0.1819 TB10Y

$\qquad\qquad\qquad$ (0.419)        (0.102)            (0.108)            (0.069)

$R^2 = 0.97$

ADF = -4.3640 **

(*t*-statistics in parentheses)

Additional evidence was adduced from a series of error correction models of the form

**Eqn 10.1** $\qquad \Delta r_{st} = \alpha_1 + \alpha_2 \Delta r_{Lt} + \gamma (r_{st} - r_{Lt})_{t-1} + \varepsilon_t$

The model is consistent with theories of the term structure of interest rates, which imply a long-run relationship between long and short-term rates. If the gap between the long- and short-term rates is large relative to the long-run (equilibrium) relationship, then the yield gap has to close by some amount each period. The models do not tell us exactly how the gap is closed. But the models strongly support the notion that there is a long-run relationship between the short-term and long-term rates and that the short-run dynamics in the short-term rate is influenced by deviations from the long-run relationship. In each case, the error-correction term, $\gamma$, is strongly defined and of the correct sign. The speed of adjustment varies between 0.20 to 0.73. Results are available from the author.

**Table 10.4 Causality within the Australian Term Structure**

| Test | Lag | Sample Period | Test Statistic for adding the Distributed lag |
|---|---|---|---|
| Cash rates on 3-month Treasury Bills | 12 | 1982 (2) to 1997 (3) | $F(12,37) = 5.394$ ** |
| | 8 | 1981 (2) to 1997 (3) | $F(8,49) = 3.2831$ ** |
| | 4 | 1980 (2) to 1997 (3) | $F(4,61) = 4.0947$ ** |
| 3-month Treasury Bills on Cash rates | 12 | 1982 (2) to 1997 (3) | $F(12,37) = 2.4243$ * |
| | 8 | 1981 (2) to 1997 (3) | $F(8,49) = 1.8358$ |
| | 4 | 1980 (2) to 1997 (3) | $F(4,61) = 1.8719$ |
| Cash rates on 90-day Bank-accepted Bill Rate | 12 | 1982 (2) to 1997 (3) | $F(12,37) = 7.9528$ ** |
| | 8 | 1981 (2) to 1997 (3) | $F(8,49) = 8.1097$ ** |
| | 4 | 1980 (2) to 1997 (3) | $F(4,61) = 9.4402$ ** |
| 90-day Bank-accepted Bill Rate on Cash rates | 12 | 1982 (2) to 1997 (3) | $F(12,37) = 2.9441$ ** |
| | 8 | 1981 (2) to 1997 (3) | $F(8,49) = 2.839$ * |
| | 4 | 1980 (2) to 1997 (3) | $F(4,61) = 4.6364$ ** |
| Cash rates on 10-year Treasury Bonds | 12 | 1982 (2) to 1997 (3) | $F(12,37) = 2.0358$ * |
| | 8 | 1981 (2) to 1997 (3) | $F(8,49) = 2.2491$ * |
| | 4 | 1980 (2) to 1997 (3) | $F(4,61) = 2.1809$ |
| 10-year Treasury Bonds on Cash rates | 12 | 1982 (2) to 1997 (3) | $F(12,37) = 2.0394$ * |
| | 8 | 1981 (2) to 1997 (3) | $F(8,49) = 1.438$ |
| | 4 | 1980 (2) to 1997 (3) | $F(4,61) = 1.497$ |

**Source:** Datastream
Quarterly interest rate changes: Cash Rate 11 a.m., 3-month Treasury Bill Rate, 90-day Bank-accepted Bill Rate, and 10-year Commonwealth Government Bond Yield.
The nominal rates were converted to real rates using a smoothed moving-average of the inflation rate.

**Table 10.5 Testing the relationship between short-term and long-term interest rates in**

**Australia**

| Yield Gap | 1980(3)-1997(3) | 1984(1)-1997(3) | 1990(1)-1997(3) |
|---|---|---|---|
| Cash rate – 3-month Treasury Bills | -6.0912** | -5.0143** | -2.6924** |
| Cash rate – 90-day Bills | -4.8933** | -3.9441** | -2.6162 * |
| Cash rate – 10-year Treasury Bonds | -2.8827** | -2.1521 * | -2.4720 * |

**Source:** Datastream.
CASHRATE is the 11.00 am cash rate, TB3M is the 3-monthly Treasury Bill rate, BILL90 is the 90-day commercial bill rate, and TB10Y is the 10-year Treasury Bond rate.
There was no constant and trend included in the final augmented Dickey-Fuller tests after starting with 5 lags with a trend and constant. All lags generated test statistics that reject the unit root null.
* denotes significance at the 5 per cent level and ** denotes significance at the 1 per cent level.

**Table 10.6 Cointegration Tests, 1979(1)-1997(3), normalised on the Cash Rate.**

| Variable | Coefficient | *t*-value | ADF | CRDW |
|---|---|---|---|---|
| TB3M | 0.99168 | 22.583 | -6.7092** | 1.64 |
| BILL90 | 0.97421 | 45.607 | -4.7402** | 1.17 |
| TB10Y | 1.4063 | 14.556 | -3.2832* | 0.55 |

ADF is the Augmented Dickey-Fuller test and the CRDW is the Cointegrating Durbin Watson Test. Both yielded significant results.
* denotes statistical significance at the one per cent level.
** denotes statistical significance at the one per cent level.

### 10.3.4  The Twin Deficits hypothesis

The Twin Deficits Hypothesis (TDH) was used by monetarists to justify restrictive fiscal policy stances in the OECD economies during the 1980s and 1990s. The hypothesis is based on sectoral flow relationships, which hold in an accounting sense in the national accounts. The TDH, however, imputes a strict causality where the private sector savings and investment gap is zero or stable, and changes in the budget deficit translate directly into current account deficit. Noting that in these circumstances the current account deficit represents a nation "spending more than it is earning", the budget deficits are then considered to "cause" a rising external debt. Accordingly, the risk of foreign financial market retribution via downgrading by international ratings agencies and the like is related to rising budget deficits. The cure for a chronic current account deficit then is logically to be found in increased domestic savings emanating from budget surpluses.

The problem is that the causality is not guaranteed. The evidence in Australia is that the private savings gap is not stable (Argy, 1992). Further, the current account position at any point in time can be driven by international factors like imperfect competition, barriers to entry, economies of scale and general conditions of world trade. All these factors may constrain export revenue. A world recession may cause a trading economy with automatic stabilisers to experience a current account deficit, which then drives a rising budget deficit. Further, a rising budget deficit can increase domestic income and reduce the private savings gap.

Table 10.7 shows that the tests fail to support any notion of causality between changes in the Current Account deficit and changes in the Budget Deficit. Neither direction of causality was detected.

**Table 10.7 Twin Deficits Causality**

|  | Lag | Sample Period | Test Statistic |
|---|---|---|---|
| Does Budget Deficit Granger-cause the Current Account Deficit? | 12 | 1981(4)-1997(2) | $F_{(12,38)} = 0.5614$ |
|  | 8 | 1980(4)-1997(2) | $F_{(8,50)} = 0.41082$ |
|  | 4 | 1979(4)-1997(2) | $F_{(4,62)} = 0.80449$ |
| Does Current Account Granger-cause the Budget Deficit Deficit? | 12 | 1981(4)-1997(2) | $F_{(12,38)} = 1.0185$ |
|  | 8 | 1980(4)-1997(2) | $F_{(8,50)} = 1.2217$ |
|  | 4 | 1979(4)-1997(2) | $F_{(4,62)} = 2.0031$ |

**Source:** ABS, AUSSTATS.
The Budget Deficit is expressed as a percentage of GDP as is the Current Account Deficit. The data is quarterly and the Granger-causality testing regression used the change in each variable.

## 10.4  Future directions

Leading proponents of Post Keynesian economic theory develop the open economy model in terms of fixed exchange rate regimes (see Davidson, 1994). The BSE approach to full employment and price stability requires a flexible exchange rate system to allow monetary authorities the scope to pursue independent policies. Under fixed exchange rates, globalisation of financial markets lead to a convergence of both short-term and long-term interest rates across countries within the exchange rate bloc. The rates also tend to move together and are thus determined by shared conditions. Individual economies cannot run independent monetary policy. The BSE approach thus challenges not only the monetarist orthodoxy but also the Post Keynesian orthodoxy.

Post Keynesian orthodoxy is also somewhat ambivalent to the role of the budget deficit. Glyn's (1997) idea that taxation should finance spending to avoid issuing debt is an example of the Post Keynesians who are worried about the endogeneity of the deficit. The BSE policy requires that the deficit is endogenous and not a policy target in itself. A reading of Keynes (1940) suggests that the BSE approach to full employment, while ostensibly "Keynesian" is in fact not derived from the ideas that he had on functional finance. For example, Keynes (1940: 23) "The last row of figures leaves us with the incomes out of which the increased war expenditure has to be met either by additional taxes or by borrowing, after allowing for what can be provided out of existing capital." Keynes (1919) was also negative about the use of budget deficits to finance reconstruction.

Further work is required to resolve this conflict. The development of a coherent approach to full employment will always be hampered if economists constrain activity by making the budget deficit a target variable, either in absolute terms (the Balanced Budget School) or in relative terms (stable deficit to GDP School). Neither view is consistent with the dynamics of a government which issues fiat currency.

## 10.5 Conclusion

Unemployment arises because the budget deficit is too low in relation to private saving and the desire to hold money. It is always a macroeconomic problem. Australia's persistently high unemployment rate is largely the outcome of demand deficiency brought on by successive governments who have failed to understand the implications and logic of their own monetary position. The Buffer Stock Employment model is the only logical way of providing jobs for everyone with guaranteed price stability. Whether it is accompanied by an income policy is a matter of refinement rather than substance.

Once we understand the role of public spending and why there is no financing imperative for the government then it is possible to see why there is no requirement to balance the budget position of the government.

The evidence presented in this paper suggests that the major financial objections raised to fiscal activism do not hold. Under flexible exchange rates, there appears to be no enduring constraints against a government running an independent monetary policy.

**Notes:**

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[1] (Mitchell (1996, 1998a), Mitchell and Watts (1997), Mitchell and Burgess (1998a, 1998b) outline a case for the introduction of a full employment policy based on the buffer stock employment (BSE) model developed by Mitchell (1998a). Mitchell and Burgess (1998b) place the BSE approach within the context of human rights and argue that the government has to be responsible for the maintenance of rights in this regard.

[2] Mitchell (1996) provides extensive analysis and data to support this contention.

[3] Vickrey (1996: 11) says

> In the case at hand the debt is intended to supply a domestic demand for assets denominated in the domestic currency, and in the absence of a norm such as a gold clause, there can be no question of the ability of the government to make payments when due, albeit possibly in a currency devalued by inflation. Nor can there be any question of balking by domestic lenders as long as the debt is limited to that needed to fill a gap created by an excess of private asset demand over private asset supply.

[4] It should be noted that statistical causality does not necessarily coincide with the usual notion of cause and effect. At the very least, however, it indicates a time series correlation. It would be surprising to find a structural relationship between two variables (in a more complex model) if Granger-causality was absent.

[5] The Maximum Likelihood method of Johansen (1988) was also used with no significant differences in outcome.

# Chapter 11                                        Conclusion

The collection of essays in this thesis concentrates on the theme of inflation and unemployment – the twin macroeconomic evils. The fundamental tenet, which binds the essays together, is the central role that the government should play in creating conditions for full employment. Many of the essays contrast the Monetarist position against active government intervention to the Keynesian and Post-Keynesian advocacy of public sector involvement in the economy. The Chapters mix conceptual argument with econometric and statistical analysis. The aim is always to create information conducive to the development of policies, which will reduce unemployment and maintain stable inflation rates.

The essays coincide with some of the work that I have published since beginning my academic career in the mid-1980s. The chapters are only a small part of the published work to date. I thought about the selection carefully. I could have selected a different array, which may have concentrated the work, say in the area of hysteresis, or on the BSE. I decided to use the chronological presentation to demonstrate the development in my research program and skills. In that sense, the earlier work is now flawed, in my view. However, the underlying theoretical views developed and empirical results established in the earlier work have not been negated by the more recent and more sophisticated empirical work.

Unemployment rates in almost all OECD economies have risen and persisted at higher levels since the first OPEC shocks in the 1970s. I maintain that the principle reason that OECD countries have experienced more than two decades of high unemployment lies in an unwillingness of policy makers to use fiscal and monetary policy in an appropriate manner (Mitchell, 1996, 1999a, 1999b). The rapid inflation of the mid-1970s left an indelible impression on policy makers who became captive of the emergent "new labour economics" and its macroeconomic counterpart, Monetarism. The goal of low inflation replaced other policy targets, including low unemployment. The result has been that GDP growth in OECD countries has generally being below that required to absorb the labour force growth and the growth in labour productivity.

In modern parlance, when there is mass unemployment you know one thing before anything - that the budget deficit is not large enough. The orthodox viewpoint, however, does not agree with this conclusion. A number of factors are listed to explain why we should see the rise and persistence of unemployment as a supply-side phenomenon:

a) Excessive unemployment and other social security benefits distort the choice between labour and leisure - this might be called the search argument.

b) Excessive minimum wage rates and hiring and firing cost promoted by trade unions and government.

c) Mismatch between the skills of the unemployed workers and the jobs on offer.

d) Excessive real wage levels

There are substantial theoretical and empirical problems with this interpretation of unemployment (Thurow, 1983; Mitchell, 1996, 1999a, 1999b). At best, it can help to explain frictional unemployment. It has a major problem accounting for the business cycle. Even the relatively recent real business cycle theories strain credibility by explaining the business cycle in terms of random supply shocks or temporary misinformation.

My overriding view is that unemployment arises because the budget deficit is too small relative to the desires of the private sector to meet its tax obligations and to save and to hold money for transactions purposes. If the private sector's desired net savings exceed actual net savings of the local currency and there is a constant desire to net save, unemployment can only be reduced by increasing the government's budget deficit. To argue that microeconomic changes, like labour market deregulation, will reduce unemployment, requires one to show that such changes will change the government's budget deficit in the appropriate direction or reduces the private sector's desire to net save. The linkages required to establish this proposition are rather obtuse. The essays in this collection have all sought to explore this viewpoint and to develop policies, which can eliminate involuntary unemployment.

I assess that I am now around the mid-point of my research career. I have performed a substantial amount of empirical testing to date and have never been able to find evidence to support the Monetarist position. I have also shifted in my own viewpoints over the time covered by the essays. The last two chapters suggest that I have moved substantially from a position of using expansionary fiscal and monetary policy to stimulate the closure of GDP gaps. The basic Keynesian position of using aggregate demand stimulus to reduce unemployment is too crude and I now reject it. I am now concerned with the composition of the expansion with a view to environmentally sustainable resource practice (Mitchell, 1999e).

The last two chapters on the Buffer Stock Employment model reflect my current and on-going research program. In a sense, I started out a cautious Post Keynesian, of the type that I criticise in chapters 9 and 10. I thought that there was a Phillips curve that would have to be attenuated with incomes policy, a very orthodox Post Keynesian view. I have always supported public sector job creation as the path to full employment. But it is true that I considered this in the context of increasing taxation. It took some time to draw the threads of my monetary thoughts (Mitchell, 1996, 1998b, 1999a, 1999c) together with my bias towards job creation labour market programs.

The result led me to recall some ideas I had when I was a fourth-year student at the University of Melbourne. The Buffer Stock Employment model is the result and has spawned an active research program including strong collaboration with some economists from the United States and elsewhere.

The comparison that I am now seeking to develop is between an economy that uses a NAIRU to stabilise prices and an economy that uses the BSE to stabilise prices. The only substantial goal that the former approach achieves is a low inflation rate. The costs of the strategy in terms of foregone output and the social and personal costs are large (Mitchell and Watts, 1997; Mitchell and Burgess, 1998a). An economy disciplined by a NAIRU has a problem in renewed growth because the underlying mechanisms, which drove the inflationary spiral, reappear. In contrast, a BSE economy maintains full employment and price stability by shifting labour resources between sectors in the economy. Further, the idle resources under a NAIRU strategy are available as BSE workers to fulfill a number of community needs not normally provided by the profit-seeking private sector. In this way, I tie in the goal of full employment with the need to maintain social equity and environmental good practice.

The BSE policy is criticised by the orthodox economists on philosophical grounds (distaste for government involvement in the market) and financial grounds (the belief that budget deficits are dangerous and lead to inevitable inflationary spirals). The conceptual and empirical work to date suggests that the orthodox Monetarist viewpoint is not sustainable. This is no surprise and merely supports the long-standing criticism of the relevance of Monetarist thinking. However, the BSE policy is also criticised by Post Keynesians. There are arguments about the financial implications of the approach, the implications for the exchange rate in a small open economy like Australia, the implications for inflation, the types of jobs, and philosophical issues like the coercion of the unemployed and the provision of low wage employment.

The work has put me outside the normal parameters that the economics profession uses to define debate. Some critics have dismissed it as being beyond political reality and therefore a waste of effort. I disagree with this approach to defining "useful" research programs. Academic research has a plethora of aims. One aim that I identify is to provide tension to the current debates if there are unsatisfactory outcomes being delivered. In this sense, the development of the BSE model is designed to be a benchmark against which the prevailing (failed) ideas must be judged. The model does require a paradigmatic change in the way we typically consider finance and money. A great deal of work is being done within our research program to explicate these underpinnings (for example, Mosler, 1997; Wray, 1998; Bell, 1998; Mitchell, 1998b, 1999a). Formal models of the monetary sector are now being written and will be published in the near future.

The work ahead will also investigate the external implications for a small open economy. Chapter 10 provides some empirical evidence that is supportive of the BSE approach. The on-going

research work is aimed at explaining what happens to the exchange rate and the implications for the current account when a BSE policy is introduced. Mitchell and Mosler (1999) is the first formal expression of this work. The issue concerns the likelihood of the exchange rate depreciating and introducing inflationary impulses, which would necessitate rises in the BER. The work we are developing suggests that the exchange rate is likely to depreciate with an initial deterioration in the current account. However, over time, the benefits to firms of a skilled labour force and the high demand negate the transition effects.

A further arm of our research will consider the philosophical issues of coercion and responsibility. John Burgess and myself have already linked the BSE with the maintenance of human rights, where employment is considered a human right (Mitchell and Burgess, 1999b). The argument arises that the BSE forces people to work in low paid jobs. My own conception of the policy is that it is a reciprocating relationship. The public sector does have a responsibility to maintain enough work for all. But equally, each person has the responsibility to contribute to the society through work. Should a person be required to work in a BSE job to gain income guarantees (assuming they are able to work)? This issue is part of our on-going debate and is important. The discussion is leading us in the direction of defining new forms of work and in this sense the BSE policy may become a vehicle for liberating the labour force from the gainful work framework.

The issue concerning the appropriate wage rates for BSE workers is crucial. The simple model presented in this collection assumes a wage that lies below the private sector wage structure. That is an assumption that is used to clearly show the role of the NAIBER. But, the BSE policy could be used as an industry policy, in the sense, that low productivity firms could be driven out if the BSE wage was set above the private wage in these high cost firms. Work is being done to develop this part of the argument.

Martin Watts and myself are also updating the analysis in Chapter 7 using more sophisticated shift-share analysis and also comparing the Australian economy to the United States. This is a precursor to work that Martin Watts, John Burgess and myself are doing on explaining the differences in unemployment rates in the OECD economies.

In closing, the essays in this collection point consistently in the same direction – to generate an understanding of the relationship between unemployment and inflation with the aim of reducing the unemployment without endangering goals of price stability. The theme will continue to dominate my research activities.

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