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The unemployed cannot find jobs that are not there!

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1. Introduction

The unemployed cannot find jobs that are not there! In economics we are taught that to minimise costs is a sign of an efficient production process and a necessary condition for profit maximisation. How quickly the adherents to this paradigm forget when they move into the macroeconomic sphere. At this level, the dominant economic orthodoxy has, since the mid-1970s, cajoled policy makers to follow policies that have deliberately and persistently deflated their economies under the false pretext that the role of policy is to ensure the economy is operating at the natural rate of unemployment. The famous statement attributed to Tobin that "it takes a lot of Harberger triangles to fill an Okun gap" has been ignored despite recent assessments that the costs of unemployment are huge (Mitchell and Watts, 1997; Watts and Mitchell, 2000; Harvey, 2000). There is now considerable evidence that rises in unemployment are highly persistent and cumulative and permanent costs are incurred if active policy does not seek to reduce it quickly (Mitchell, 1993, 2000). There is also mounting evidence against the dynamics implied by the NAIRU approach (Chang, 1997; Fair, 2000; Akerlof *et al*, 2000).

Modigliani, who introduced the term NAIRU to the economics profession (Modigliani and Papademos, 1975), has recently argued that (Modigliani, 2000: 3) that

> Unemployment is primarily due to *lack of aggregate demand*. This is mainly the outcome of erroneous macroeconomic policies… [the decisions of Central Banks] … inspired by an obsessive fear of inflation, … coupled with a benign neglect for unemployment … have resulted in systematically over tight monetary policy decisions, apparently based on an objectionable use of the so-called NAIRU approach. The contractive effects of these policies have been reinforced by common, very tight fiscal policies (emphasis in original)

In this paper we examine the evidence needed to support this statement from Modigliani, with special focus on the Australian experience. We also consider the NAIRU hypothesis and examine some of the key propositions that have to hold for the NAIRU approach to be a viable strategy. Our test results are not supportive of the NAIRU approach to economic management and confirm the evidence noted above. In general, we conclude that the last 25 years have been a period of lost opportunities for the Australian community. Misguided government policy has been largely responsible for the persistently high unemployment and the cumulative and permanent losses to social and economic well-being entailed. Until governments abandon the myopic NAIRU-styled attack on employment, unemployment will remain as the major problem facing us.

We conclude that it is time that the demand side of the economy was returned to its proper place. It is simply incredible to think that we can continue to deny the facts hinted at by Modigliani's statement quoted above. The empirical evidence is clear that the Australian economy has not provided enough jobs since the mid-1970s and the conduct of monetary and fiscal policy has contributed to the malaise. Central banks in OECD countries that have been waylaid by the "NAIRU-fight-inflation-first" dogma have forced the unemployed to engage in an involuntary fight against inflation and the fiscal authorities have further worsened the situation with complementary austerity. Public sector cutbacks have also exacerbated the situation. Once a target of monetary and fiscal policy, unemployment is now a policy instrument in the irrational fight against inflation.[2]

Section 2 introduces developments in the empirical NAIRU literature and examines some stylised facts that supply side adherents should consider. We examine the relationship between unfilled vacancies and unemployment and conclude that demand-deficiency has constrained the labour market since 1975. In this context, employment creation and the role of capital expenditure are examined. GDP gaps are computed and analysed. Section 3 develops a demand and supply framework for examining the factors that attributed to the rapid rise in unemployment in 1974 and the reasons that high unemployment has persisted since that time. Section 4 formally tests inflation models to see if they behave in a manner consistent with the NAIRU dynamics. We conclude that across several economies, the inflation dynamics are inconsistent with a constant NAIRU model. Section 5 brings the discussion together into a formal econometric model for Australia embodying a Phillips curve, an Okun relation, and a GDP gap equation. We test some of the key propositions in this paper relating to the primacy of demand in explaining unemployment. Concluding remarks follow.

2. Facts for the consideration of supply-siders

2.1 Introduction

The period of deficient demand has corresponded with a regime shift in macroeconomic policy making. Unemployment rates in almost all OECD economies rose and persisted at higher levels since the first OPEC shocks in the 1970s. Several studies like Layard, Nickell and Jackman (hereafter LNJ) (1991) and the OECD Jobs Study (1994) have argued that the persistently high unemployment is sourced in institutional arrangements in the labour market (wage setting mechanisms and trade unions) and government welfare policies (encouraging people to engage in inefficient search). We have argued that a major reason for the unemployment lies in demand shifts.

We argue that the principle reason for those shifts has been the unwillingness of policy makers to use fiscal and monetary policy in an appropriate manner. The rapid inflation of the mid-1970s left an indelible impression on policy makers, which became captive of the resurging 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. Consistent with this new ruling economic paradigm, the available policy instruments have narrowed with Governments reluctant to use taxation and spending to provide stimuli to their economies, and have instead placed an excessive reliance on tight monetary policy to control inflation. The upshot has been deflated economies with stifled economic activity. The experience of the OECD economies has been replicated, but with harsher consequences, in the nations that have been subjected to the disastrous IMF and World Bank structural adjustment programs. We refer to this period as the NAIRU Era.

There is also mounting evidence against the dynamics implied by the NAIRU approach (Chang, 1999; Fair, 2000; Akerlof *et al*, 2000). Evidence is presented later in this paper to confirm the asymmetry of unemployment responses to demand shocks (see also Akerlof *et al*, 2000). The unemployment rate rises quickly and sharply when demand contracts but persists and falls slowly when expansion occurs. Mitchell and Muysken (2001) trace the evolution of modern NAIRU models beginning with LNJ (1991) and conclude that each one is suffers from their own flaws or has been proven inadequate when confronted with the empirical evidence (see also Rowthorn, 1995; Arestis and Biefang-Frisancho Mariscal, 2000). The NAIRU literature began with the position that the NAIRU was constant and cyclically-invariant (LNJ, 1991) despite early challenges from the theories of hysteresis (Hargreaves-Heap, 1980, Mitchell, 1987a). From that position, governments deflated the economies and pushed unemployment up. It is easy to test whether the NAIRU, as originally conceived is constant. Split sample regression and appropriately imposed Chow breakpoint tests would be sufficient. Faced with mounting criticism, the NAIRU theorists progressively moved to a position where time variation in the steady-state was allowed but this variation is seemingly not driven by the state of demand - the so-called TV-NAIRUs estimated by Gordon, 1997, 1998; Weiner, 1993; and Tootall, 1994, among a host of researchers.

This intermediate phase has spawned a frenetic period of estimation using a range of technical methodologies including state space techniques (Kalman filter) (for example, Richardson *et al*, 2000); univariate extrapolation methods (filters and smoothers), and spline estimation (Staiger, Stock and Watson, 1997). Like the original concept, the attempts to model the time variation have been based on shaky theoretical grounds. The theory that generated the NAIRU in the first place provides no guidance about its evolution. Presumably, the evolution of unspecified structural factors have played a role, if we are to be faithful to the original (flawed) idea. In this theoretical void, econometricians have assumed that a smooth evolution is plausible but these slowly evolving NAIRUs bear little relation to actual economic factors. The extrapolation and smoothing approaches are particularly blighted here. Some authors have the temerity to merely run a smoothing filter through the actual series and assert that this captures the NAIRU.

Most of the research output confidently asserted that the NAIRU had changed over time but very few authors dared to publish the confidence intervals around their point estimates (Staiger, Stock and Watson, 1997 were exceptions). The evidence is illuminating. Staiger, Stock and Watson (1997: 46) who comment on their "state-of-the-art" estimation of NAIRU models and conclude that "these estimates are imprecise; the tightest of the 95 percent confidence intervals for 1994 is 4.8 to 6.6 percentage points. If one acknowledges that additional uncertainty surrounds model selection and that no one model is necessarily 'right', the sampling uncertainty is prudently considered greater than suggest by the best-fitting of these models." Staiger, Stock and Watson (1997: 39) find some of their models yield 95 percent confidence intervals of 2.9 percent to 8.3 percent. Chang (1997: 9) concludes, "The range of uncertainty about the location of the NAIRU is often too large to be useful."

A further problem is that the modern studies include a host of other variables, which can influence the inflation rate independently of the unemployment gap. In this case, the NAIRU hypothesis, if valid at all, loses policy relevance. But, unfortunately, the losses from a deflationary strategy are higher under these conditions and this reinforces the points made earlier. If the monetary authority responds to shifts in the Phillips curve independent of the unemployment rate with higher interest rates, the eventual losses from rising unemployment (and in a hysteretic world rising steady-state unemployment) will be larger. One might conjecture that the authorities should only react to endogenous factors (the unemployment gap). But then if it cannot measure that accurately and cannot decompose the different sources of inflation impulse, then this strategy will also fail. The safest strategy is to avoid the use of monetary policy in this way.

2.2 Non-NAIRU facts

Summarising the preceding discussion, we list the following stylised facts, which pose considerable challenges at both the both the theoretical and empirical levels for those who adhere to the NAIRU hypothesis:

1. Unemployment rates exhibit high degrees of persistence to shocks (see Campbell and Mankiw, 1987, 1989; Mitchell, 1993, 2001).
2. The dynamics of the unemployment rate exhibit sharp asymmetries over the business cycle (Akerlof, *et al*, 2000).

3. The models developed by LNJ (1991), which have motivated a large amount of NAIRU research, are misspecified because they exclude capital by artificially imposing a unity elasticity of substitution on the technology (Rowthorn, 1995; Arestis and Biefang-Frisancho Mariscal, 2000; Mitchell and Muysken, 2001).
4. Inflation dynamics do not seem to accord with those specified in the NAIRU hypothesis (Chang, 1997; Fair, 2000; Mitchell, 2000a).
5. Close relationships exist between employment and vacancies growth and the inverse of the unemployment rate, and between investment to GDP ratios and the unemployment rate across many countries. They are difficult to interpret as being driven from the supply-side (Mitchell, 1996; Ball, 1999; Modigliani, 2000).
6. High real interest rates seem to cause high unemployment (Ball, 1999).
7. The constant NAIRU has been abandoned and replaced by TV-NAIRUs, which have such large standard errors. The NAIRU-concept is now all but meaningless for policy analysis (Staiger, Stock and Watson, 1997; Chang, 1997).
8. Estimates of steady-state unemployment rates are cyclically-sensitive (hysteretic) and thus the previously eschewed use of fiscal and monetary policy to attenuate the rise in unemployment has no conceptual foundation (Mitchell, 1987a)
9. There is no clear correlation between changes in the inflation rate and the level of unemployment, such that inflation rises and falls at many different unemployment rates without system (Chang, 1997; Mitchell, 2000a).
10. The use of univariate filters (Hodrick-Prescott filters) with no economic content and Kalman Filters with little or no economic content has rendered the NAIRU concept relatively arbitrary. Kalman Filter estimates are extremely sensitive to underlying assumptions about the variance components in the measurement and state equations. Small signal to noise ratio changes can have major impacts on the measurement of the NAIRU (Gordon, 1997). Spline estimation (Staiger, Stock and Watson, 1997) is similarly arbitrary in the choice of knots and the order of the polynomials.

We now turn to the evidential analysis, which reinforce some of these stylised facts and to point the reader towards a demand-based explanation of the unemployment malaise.

2.2 Jobs have to exist before search can be effective

Over the last 25 years, as unemployment has risen and persisted at high levels, orthodox economists have concentrated on the supply side of the labour market, hypothesising that full employment now occurs at much higher unemployment rates than in the past. Piore (1979: 10) reminds us 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)

Table 1 shows the averages for the unemployment-unfilled vacancies ratio (UV) in Australia for the period of full employment up to the December 1973 peak, and then for the trough to peak periods 1974-1982, 1982-1990, and 1991-2000 shown in Appendix Table A1. Underlying these averages is the fact that not once since the December1974 trough has the UV ratio been below 2 and has averaged 11.1 unemployed persons per unfilled vacancy since June 1974.

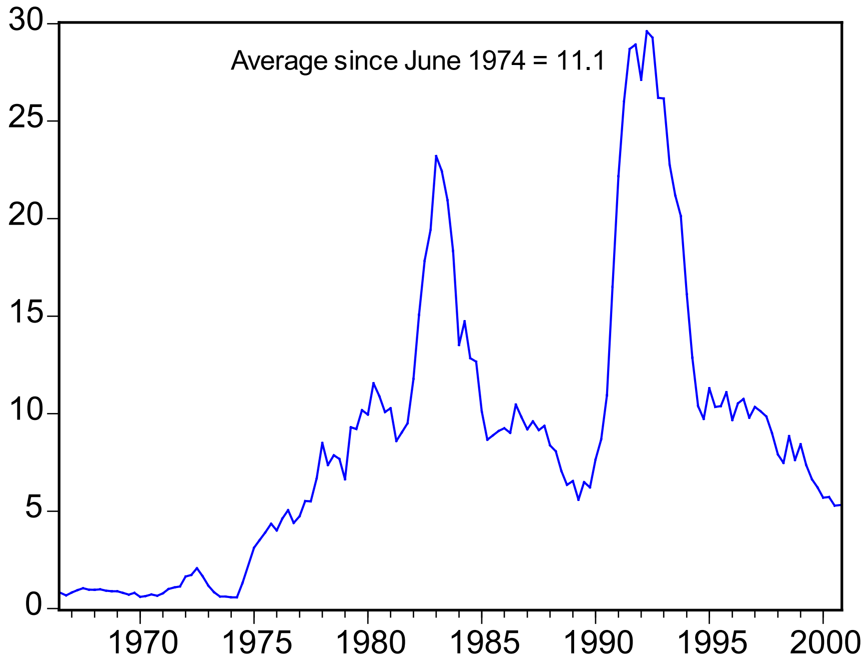
Table 1 UV ratio for the Australian business cycles, 1966-2000

Cyclical Phase	UV
September 1966 to December 1973	0.979
June 1974 to March 1982	6.811
June 1982 to December 90	11.491
June 1991 to September 2000	14.096

Source: ABS AUSSTATS, NIF current series data. The ratio is total unemployed (000s) to unfilled vacancies (000's).

Figure 1 plots the UV ratio for Australia from September 1966 to December 2000. Notwithstanding sectoral variations, at first blush, we are dealing with a heavily demand-constrained economy. We repeat the opening sentence: The unemployed cannot find jobs that are not there!

Figure 1 UV ratio for the Australia, 1966-2000

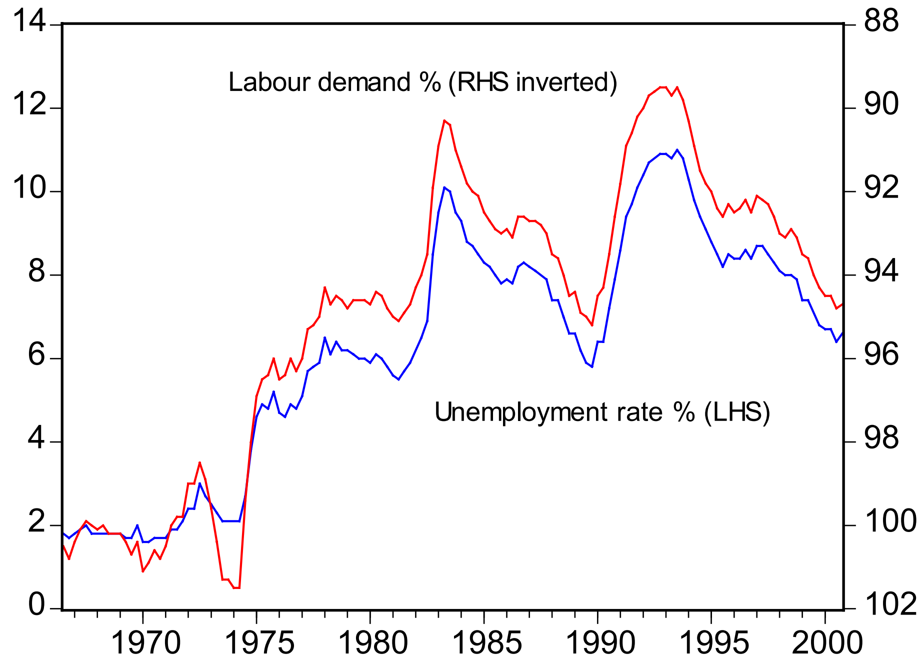


Source: see Table 1

Figure 2 shows the unemployment rate on the left hand scale plotted against the sum of employment and vacancies (as a percentage of the labour force) as a measure of labour demand on the right hand scale (inverted). The correspondence between the two series is striking and a major part of the variation in the unemployment rate appears to be associated with the evolution of demand. Modigliani (2000) has presented similar graphs for France, Germany, and the United Kingdom, which shows that as job availability declines the unemployment rate rises, with the concomitant outcomes that the search process lengthens as does the average duration of unemployment. Modigliani (2000: 5) concluded, "Everywhere unemployment has risen because of a large shrinkage in the number of positions needed to satisfy existing demand."

Part of this upward movement could be due to shifts in the unemployment-vacancy (UV) relationship, the so-called Beveridge curve. Much has been made of the shift in this relationship over time. Figure 3 plots the vacancies (thousands) against unemployment (thousands) for Australia from 1966 to 2000. The outward shifts are clearly shown.

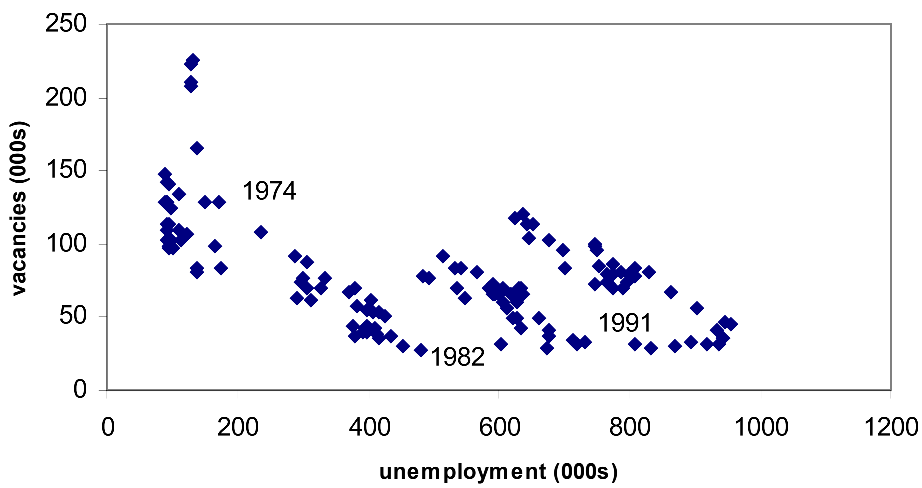
Figure 2 Labour demand and unemployment, Australia, 1966-2000



Source: see Table 1

LNJ (1991: 4, 38) argue that these shifts are due to a failure of the unemployed to seek work as effectively as before. They explain the outward shift in the European Beveridge curve by "a fall in the search effectiveness …among the unemployed" (1991: 38). LNJ (1991: 268) also claim that the UV shift has been due to "rise in long-term unemployment, which reduces search effectiveness…" What does this mean? LNJ (1991: 38) offer the following explanation: "Either the workers have become more choosey in taking jobs, or firms become more choosey in filling vacancies (owing for example to discrimination against the long-term unemployed or to employment protection legislation." They suggest that the first reason dominates. There is clearly an observational equivalence problem in attempting to test for this. Search time will lengthen when there are large cyclical downturns and the probability of gaining a job decreases. With UV ratios averaging 11.1 unemployed persons per vacancy over the last 26 years, it is a fallacy of composition to conclude that if all individuals reduced their reservation wage to the minimum (to maximise supply-side search effectiveness) that unemployment would significantly fall (given the small estimated real balance effects in most studies). Further, unless growth in labour requirements is symmetrical and labour force growth steady on both sides of the business cycle, the pool of unemployed can rise and remain persistently high (Mitchell, 2001). We examine this question in a later section. But it is impossible to directly test changes in the motivation of individuals independent of the hypothesis that the shifts are collateral damage of severe recessions. However, we can examine the impact of the rise in long-term unemployment.

Figure 3 Beveridge curve, Australia, 1966-2000



Source: AUSSTATS NIF Model database.

Prior to doing this, we should note that there have been three noticeable outward shifts in the Australian Beveridge curve shown in Figure 3. The shifts occurred in 1974, 1982, and in 1991. It is no surprise that these shifts are driven by cyclical downturns rather than any autonomous supply side shifts. Mitchell (1987a) has previously shown that structural imbalances (supply constraints) can be the result of cyclical variations and can be resolved, in part, by attenuating the amplitude of the downturns.

To examine the impact of recession on the UV relationship and test for the impact of rising long-term unemployment we ran the following regression. Note that due to limitations in the long-term unemployment data (starting March 1978) we have only been able to consider the last two recessions. We use the proportion of long-term unemployed to total unemployment (PLTU) as the "search effectiveness" variable. We also include two dummy variables: Recession_2 (zero until March 1983, unity thereafter) and Recession_3 (zero until March 1991, unity thereafter). They are included as intercept dummies and are allowed to interact with the unemployment rate to test for slope changes. The dependent variable is the log of the Vacancy Rate (LVR).

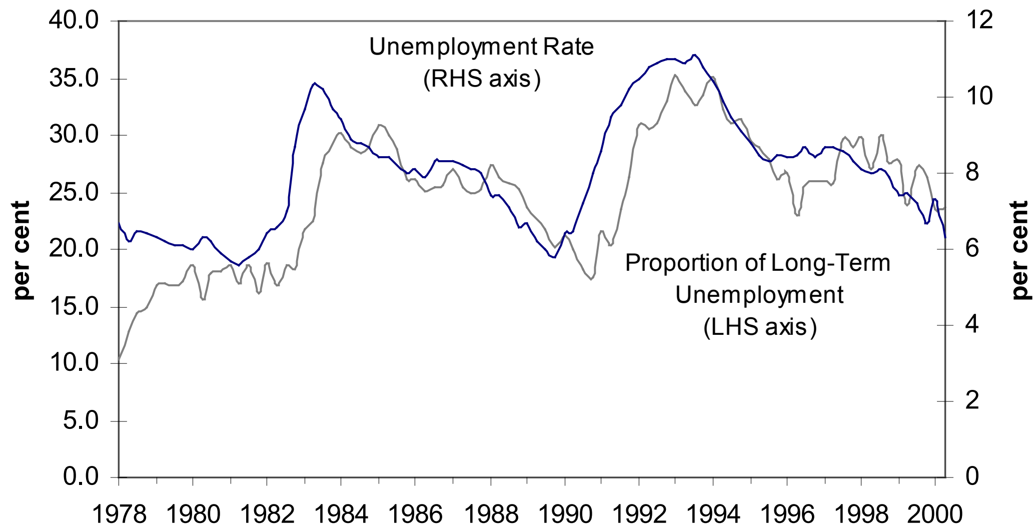
The results shown in Table 2 reveal that the UV relationship is displaced by the rise in PLTU but the two recessions dominate the outward shift. Both recessions appear to have worsened the trade-off between unfilled vacancies and unemployment.

Table 2 Beveridge curve regression, Australia, March 1978 to June 2000

Variable	Coefficient	t-Statistic
Constant	-3.67	(5.99)
LUR	-1.07	(3.23)
PLTU	0.03	(4.25)
RECESSION_2	1.31	(1.66)
RECESSION_3	2.45	(3.57)
RECESSION_2*LUR	-0.54	(1.31)
RECESSION_3*LUR	-1.11	(3.43)
R-squared	0.68	
S.E. as % of mean LVR	3.89	

Figure 4 shows that the relationship between long-term unemployment and the unemployment rate is very close. As unemployment rises (falls), the PLTU rises (falls) with a lag. Several studies have formally examined this relationship. Chapman *et al.* (1992), EPAC (1996), and Mitchell (2000b) have all found that a rising proportion of long-term unemployed (PLTU) is not a separate problem from that of the general rise in unemployment. This casts doubt on the supply-side policy emphasis that OECD governments have adopted over the last two decades. So while LNJ may claim search effectiveness declines and this contributes to rising unemployment rates, it is highly probable (as shown in Figure 2) that both are caused by insufficient demand. The policy response then is entirely different.

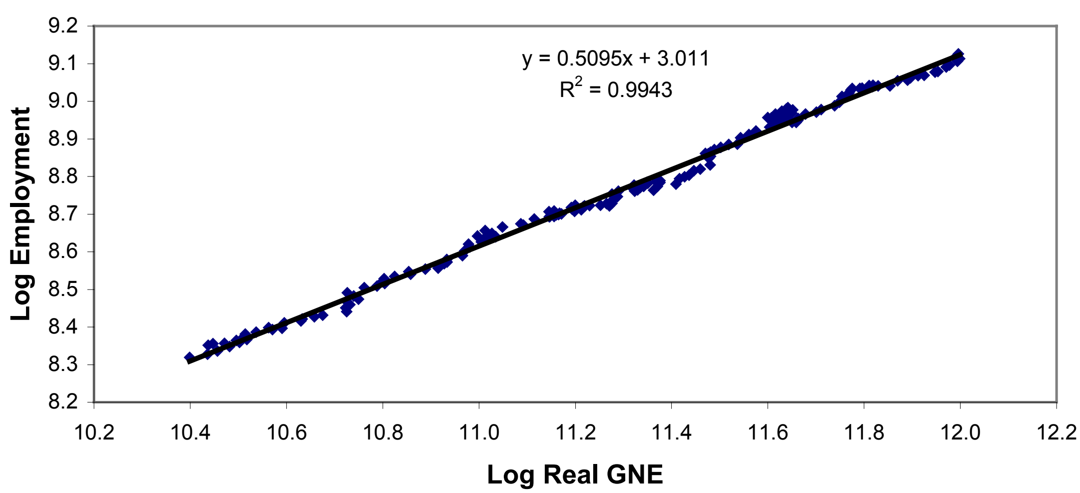
Figure 4 Long-term unemployment and the unemployment rate, Australia, 1978-2000



2.3 Employment determination

Modigliani (2000) argues that the level of aggregate demand rather than the labour force (supply) determines the level of employment. Figure 5 depicts a very close relationship between the log of total employment and the log of real final Gross National Expenditure.

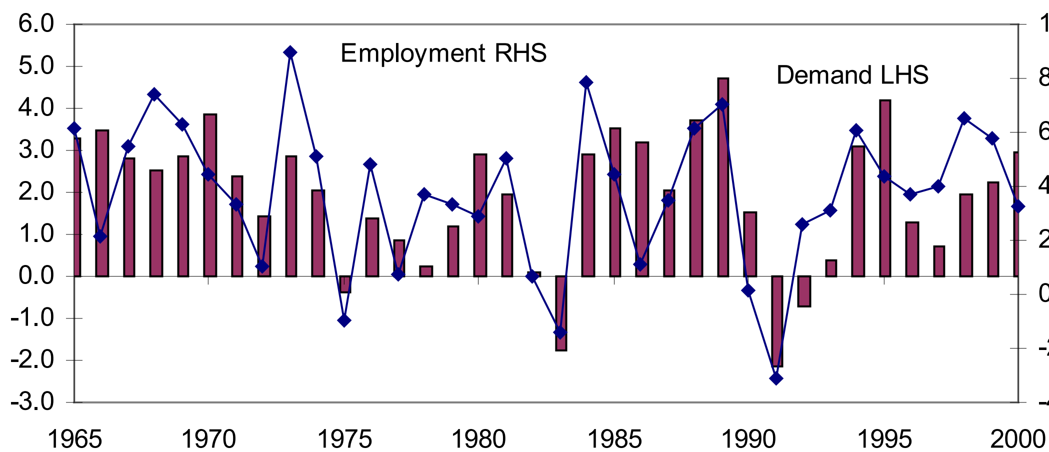
Figure 5 Employment Growth and Real Final Demand Growth, Australia, 1959-2000



Source: ABS AUSSTATS database. Employment is total farm and non-farm employment, real final demand is Gross National Expenditure at 1998/99 prices.

Figure 6 shows the annual percentage growth in real final demand (measured using Gross National Expenditure) and employment (total farm and non-farm) from 1965 to 2000 as a way of appreciating the correspondence between demand dynamics and employment dynamics. The major shifts in employment fortunes are closely related to similar directional shifts in real demand. Note that following the 1974 recession, which in relative terms was not as severe as the two later recessions (1982 and 1991), real demand growth was subdued. We have never recovered from the increase in unemployment that coincided with this period.

Figure 6 Annual percentage growth in demand and employment, Australia



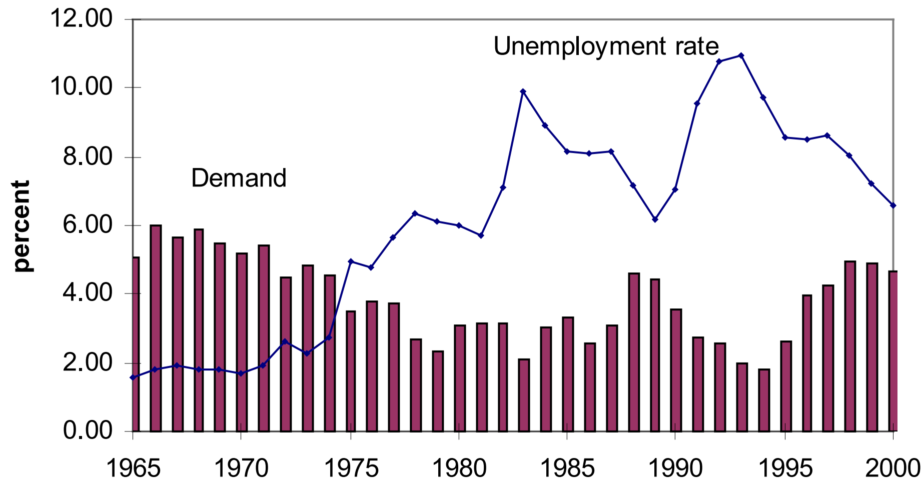
Source: ABS AUSSTATS database. Employment is annual percentage growth in total farm and non-farm employment, demand is the annual percentage growth in real final demand (Gross National Expenditure at 1998/99 prices).

Another way of viewing this relationship is from the unemployment side. Figure 7 shows the relationship between the growth in real demand (expressed as the 5-year moving average of the annual percentage changes in Gross National Expenditure) and the unemployment since 1960. We use the smoothed series to provide a better depiction of the downward trend in real demand over the period that unemployment began to become a problem.

The evidence leaves no doubt that the rise in unemployment was associated with a marked deficiency in aggregate demand. Had aggregate demand not fallen in the mid-

1970s and remained well below the 1960s levels for the next decade, the unemployment rate would not have risen significantly. Further, subsequent growth in employment (given the on-going labour supply growth) would have been able, as in previous recessions in the 1960s, to absorb those in the unemployment pool. The severity of the demand restraint meant that the unemployed pool rose far beyond what could be absorbed in any normal recovery.

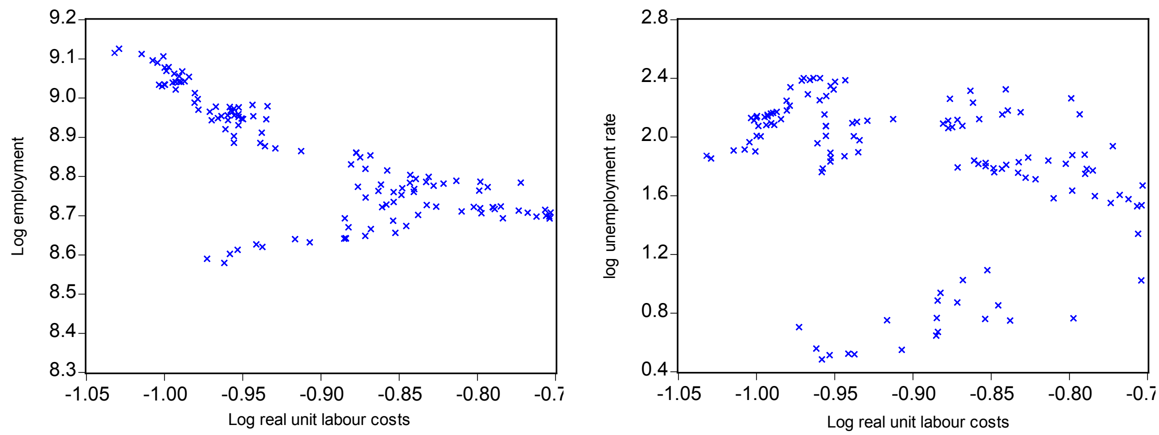
Figure 7 Real demand growth and the unemployment rate, Australia, 1960-2000



Source: ABS AUSSTATS database. Demand growth is the 5-year moving average of the annual percentage changes in real Gross National Expenditure at 1998/99 prices and the unemployment rate is the aggregate unemployment rate.

The orthodox response may be that we are ignoring the role of labour costs in this analysis. The standard microeconomic explanation of unemployment imported erroneously to the macroeconomic level is that unemployment arises when the real wage is above the full employment labour productivity level. The basis of this claim is that firms maximise profits by hiring where the real wage is equal to the marginal product of labour. The classical neutrality assertion is invoked to make this outcome independent of the state of demand. Figure 8 examines the relationship between employment, unemployment and real unit labour costs in Australia since 1966. Real unit labour costs are the difference between the real wage and labour productivity. The figures suggest that there is no unique relationship between the variables. Certainly the correspondence between employment and unemployment and real demand examined earlier is not repeated.

Figure 8 Employment, unemployment and real unit costs in Australia, 1966-2000

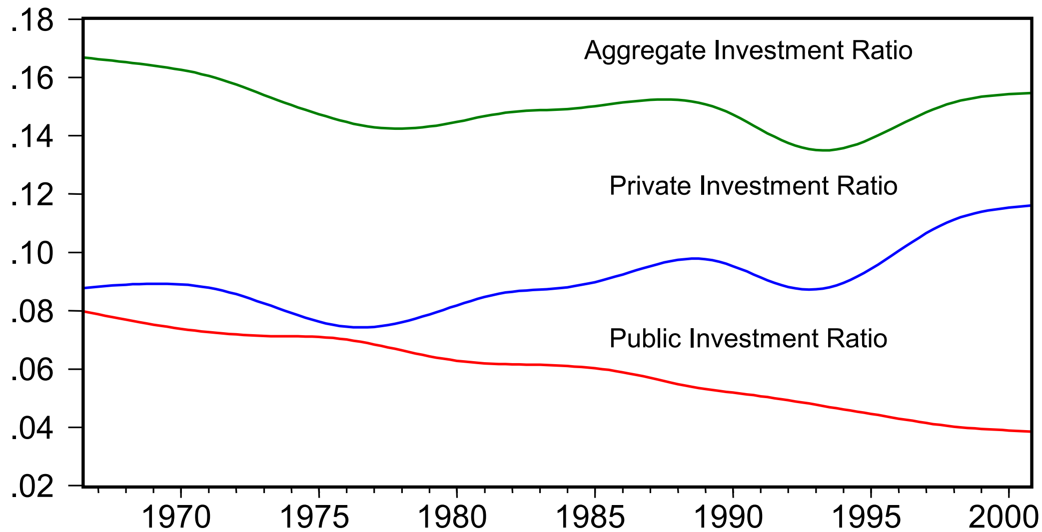


Source: AUSSTATS NIF Model database. Real unit labour costs are calculated as the ratio of real average weekly earnings (deflated by the GDP implicit deflator) to labour productivity measured in persons.

2.4 The role of capital expenditure

Investment expenditure, which adds to productive capacity, is a key component of aggregate demand. Fluctuations in the level of investment drive the business cycle. We should expect a close relationship between changes in the investment ratio (investment to GDP) and demand aggregates in the labour market, given the analysis presented above. Mitchell (1996) argued that the major determining factor accounting for the changes in the level of unemployment in the OECD has been movements in the investment ratio. Ball (1999) has also presented evidence supportive of this claim. Figure 9 shows the evolution of the smoothed private, public and aggregate investment ratios (investment to GDP smoothed using a Hodrick-Prescott filter) since 1965. The aggregate ratio started declining in the early 1970s and, despite rising in the recovery from the each recession since, it has failed to return to the levels associated with full employment in the 1960s. Of particular note is the continued decline in public capital expenditure since 1975. The transfer of resources to the private sector in several budgets as taxes and government spending fell has not seen the investment ratio for the private sector meet the gap left by the public decline. The decline in public capital expenditure as a share of GDP is symptomatic of the regime shift that occurred as the NAIRU-era began. We will examine this issue further on.

Figure 9 Public, Private and Aggregate smoothed investment ratios, Australia, 1965-2000



Source: ABS AUSSTATS database. Private investment excludes dwellings and inventory movements.

To examine the role of capital expenditure in influencing unemployment, we computed the full employment investment ratio (16.4 per cent) as the average of the investment ratio (total capital investment to GDP) for March 1970 to December 1971. The average unemployment rate over this period was 1.8 per cent. This relationship between investment and unemployment was stable during the 1960s notwithstanding cyclical episodes. We then computed a full capacity income (GDP^*) level based on a Harrodian natural rate of growth concept (see Davenport, 1982).

We define the rate of growth of capacity (X) to be the product of the ratio of gross investment (I) to capacity and the investment coefficient, $\alpha = \Delta X/I$, the ratio of change of capacity to investment:

$$\frac{\Delta X}{X} = \frac{I}{X} . \frac{\Delta X}{I}$$

We simulated capacity based on investment using the following relations:

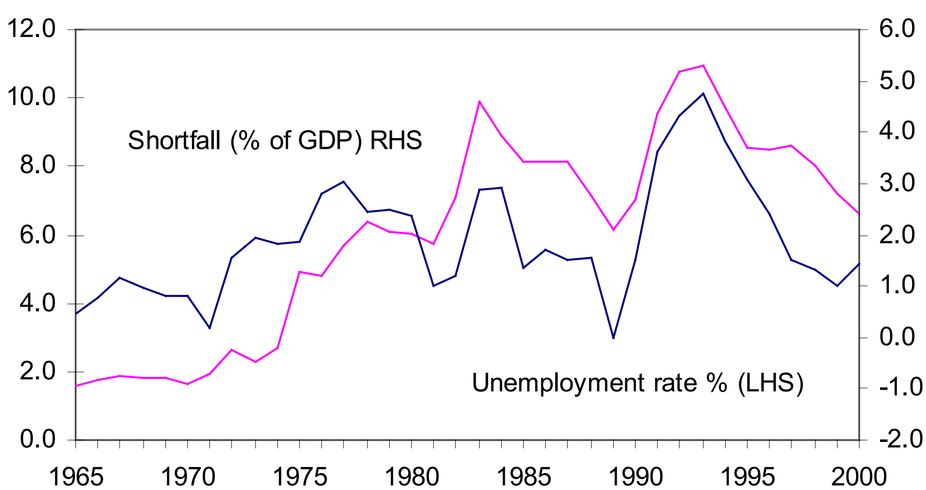
At peaks: $X_t = GDP_t$

Between peaks: $X_t = X_{t-1} + \alpha_i I_t$

So at peaks (see Appendix Table A1 for the timing of the peaks), capacity is equal to actual *GDP*. Between peaks, changes in capacity are a function of investment for that period weighted by the appropriate investment coefficient (α_i). We then derived a time series for the ratio of actual total investment to full capacity income (I/GDP^*). Finally, we subtracted this ratio (I/GDP^*) from the full employment investment ratio to compute the investment shortfall series. This measures for each period (in terms of percent of potential GDP) the extent to which I/GDP^* falls short of the full employment investment ratio and is a measure of demand deficiency.

Figure 10 shows that the relationship between the investment shortfall and the unemployment rate is striking. The crucial rise in unemployment in 1974 was preceded by a large jump in the investment shortfall.

Figure 10 Investment shortfall and unemployment rate, Australia, 1960-2000



Source: see text for description of derivation of investment shortfall

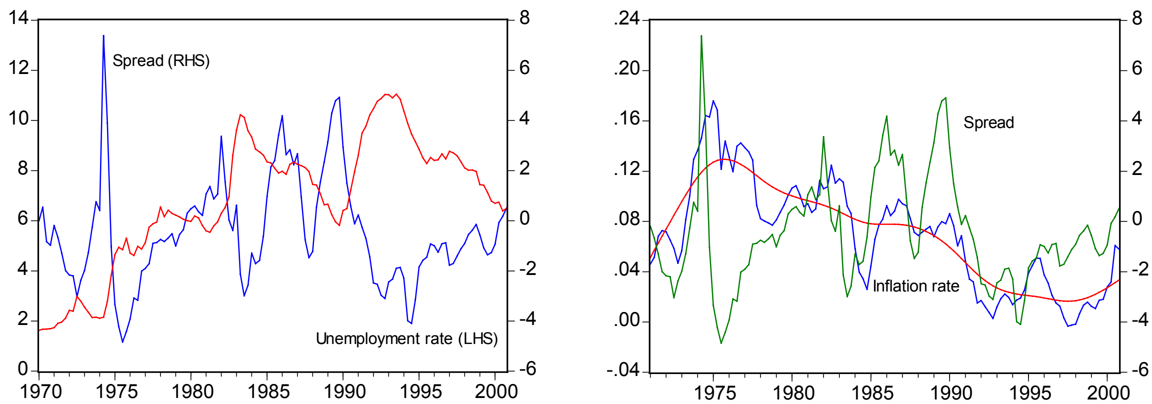
2.5 Monetary policy puzzles

Taking us through the Keynesian reasoning that investment affects aggregate demand, which in turn determines employment and unemployment, Modigliani (2000: 9) concludes, "We know from elementary economics that investments are affected by monetary policy (interest rates and credit availability). In fact as it is well known, this is the channel par excellence through which a Central Bank controls output and inflation. … Indeed, there is no economics fundamental that can lead anybody to hold the view that money can directly affect inflation up or down except through raising or curbing aggregate demand and thus the demand for labor, wages and prices."

In Australia, the Reserve Bank of Australia (RBA) was constituted to maintain full employment as one of its three policy goals (see Section 10 of the Reserve Bank Act 1959. Subsection 2). However, it too been significantly influenced by the NAIRU concept and conducts monetary policy in Australia to meet an openly published inflation target (RBA, 1996). They argue that, "Price stability is a crucial precondition for sustained growth in economic activity and employment (RBA, 1996: 2)." They also argue that "disciplined fiscal policy" has to complement their fight against inflation. The RBA says that the trade-off between inflation and unemployment is not a long-run concern because, following NAIRU logic, it simply doesn't exist (Edey, 1999).

Figure 11 provides a version of the history of monetary policy over the last 30 years in relation to the evolution of inflation and the unemployment rate. The measure of monetary policy shown is the spread between the Official 90-day bill rate and the 10-year Treasury bond rate. The spread summarises the shape of the yield curve. The basic principle linking the shape of the yield curve to the economy's prospects is explained as follows. The short end of the yield curve reflects the interest rate set by the Central Bank (Reserve Bank of Australia). The steepness of the yield curve then depends on the yield of the longer-term bonds, which are set by the market. But the short end of the curve is the primary determinant of its slope. In other words, the curve steepens mainly because the Reserve Bank is lowering the official cash rate, and it flattens mainly because the Reserve Bank is raising the official cash rate. The short-term bond rates are more sensitive to policy changes than the longer-term rates. The inflation measure is the annual inflation rate (CPI) and we have also plotted a smoothed inflation series using a Hodrick-Prescott filter to measure trend inflation.

Figure 11 Monetary policy, inflation and unemployment, Australia, 1970-2000

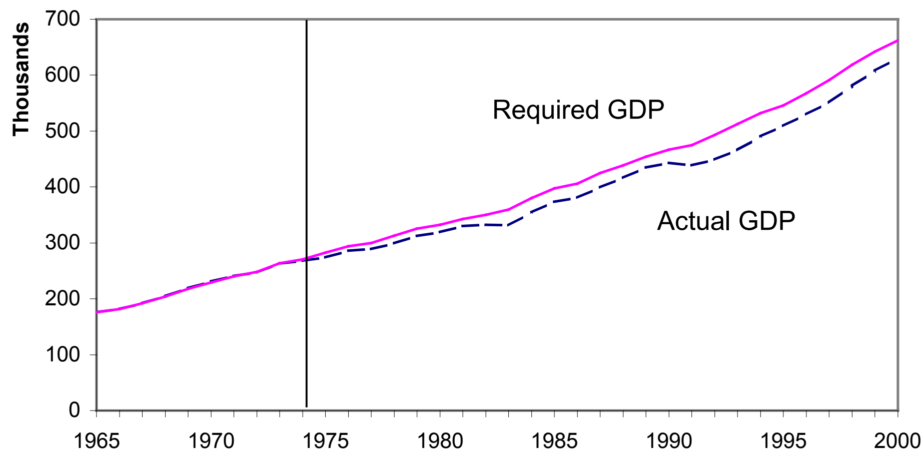


The left-hand panel in Figure 11 shows that the sharp rises in the unemployment rate corresponding to the last 3 recessions were preceded by sharp tightening in the monetary policy measure. It is puzzling why the spread was so high during the period following the 1974 crises when the stock of unemployment was building. From the right-hand panel the 1980s and late 1990s stand out as worrying examples of mistaken monetary policy. With trend inflation falling throughout the decade and the unemployment rate still above acceptable levels, why did the RBA hold the spread at such high levels for so long in the 1980s? Further, with inflation well under control in the late 1990s, why did the RBA successively push short rates higher? The manifestation of this behaviour is now being revealed with the December quarter National Accounts showing that GDP growth had become negative. In conclusion, the past 25 years in Australia provide plenty of evidence that the RBA has acted exactly in accordance with Modigliani's assessment noted above.

2.6 Demand constraints = GDP Gaps

To help account for the rise in unemployment in Australia it is useful to compute the evolution of the GDP gap. For the unemployment rate to remain constant, real GDP growth has to be equal to the sum of labour force and labour productivity growth, *other things equal*. In the midst of on-going debates about labour market deregulation, minimum wages and taxation reform, the most salient, empirically robust fact that has pervaded the last two decades is that the actual GDP growth rate has rarely reached this required rate. Figure 12 is derived from annual analysis of GDP gap components.

Figure 12 GDP and Required GDP, Australia, 1965-2000



Source: ABS AUSSTATS Labour Force and National Accounts data

The results are clear. Prior to 1974, the growth rate of GDP was sufficient to match the required growth rate set by the growth of the labour force and labour productivity. After that point, GDP growth was never sufficient and unemployment rises and falls reflected the history of that deficiency.

To examine this divergence between GDP and Required GDP more closely, we tested for breaking trends in GDP growth, Labour Force growth and Labour Productivity growth. In each case, we regressed the log of the variable against a constant and a linear time trend (to estimate percentage growth rates), and then tested the addition of an intercept and slope dummies for breaks following the major recessions. The dummy variables were then allowed to interact with the trend or measure intercept shifts. The results are shown in Table 3 and clearly indicate that the recessions displaced the growth rate both in intercept and trend slope. The impact of the 1974 recession is quite distinct from the later recessions. The GDP growth rate almost halved in the period between the 1974 recession and the 1983 recession. The growth rates of labour productivity and the labour force also slowed but not by the same amount as the output growth rate. It is hard to interpret the rising unemployment that accompanied this period as being anything other than a deficient demand episode.

Table 3 Segmented trend growth regressions, GDP, LP, and LF

Variable	Log GDP	Log LP	Log LF
Constant	10.38	8.98	8.33
RECESSION_1	0.32	0.12	0.17
	(14.9)	(6.1)	(19.0)
RECESSION_2	-0.29	0.18	-0.27
	(7.2)	(4.8)	(16.2)
RECESSION_3	-0.17	-0.44	0.35
	(3.5)	(9.9)	(17.8)
Time Trend	0.0128	0.0061	0.0067
	(106.0)	(54.4)	(136.6)
RECESSION_1*@TREND	-0.0059	-0.0022	-0.0028
	(19.9)	(7.8)	(23.5)
RECESSION_2*@TREND	0.0029	-0.0018	0.0027
	(7.1)	(4.6)	(16.1)
RECESSION_3*@TREND	0.0007	0.0035	-0.0030
	(1.9)	(9.7)	(18.7)
R-squared	0.999	0.995	0.999
S.E. % of Mean Dependent Variable	0.144	0.160	0.075
Annual Growth before June 1974	5.13	2.44	2.70
Annual Growth June 1974-March 1982	2.76	1.58	1.56
Annual Growth June 1983-March 1991	3.92	0.87	2.65
Annual Growth after June 1991	4.21	2.26	1.46

Notes: Log GDP is the log of Gross Domestic Product, Log LP is the log of labour productivity measured in persons, Log LF is the log of the total labour force. Recession_1 is zero prior to June 1974 (see Table A1), and 1 after, Recession2 and Recession3 are as previously defined.

What factors best account for the GDP gap? If the OECD Jobs Study (1994) model was convincing we should expect a host of supply side variables and others reflecting government regulations and transfer payments to be prominent. Alternatively, a Post-Keynesian explanation would focus on the role of private sector investment and government spending in determining the GDP gap. We have already seen in the previous discussion that the evolution of Australia's unemployment rate (the result of the GDP gap) is strongly associated with the evolution of the investment ratio (for both private and public sectors). The investment shortfall shown in Figure 10 and the unemployment rate are closely associated. One might be tempted to assert that the major determining factor accounting for the changes in the level of unemployment has been movements in the investment ratio.

To examine this further a simple dynamic regression modelling the GDP gap was run. The GDP gap was computed using the methodology outlined above and expressed in percentage form. We regressed the gap (as the dependent variable) on a range of variables, which capture various supply side, and/or demand side theories contained in the literature. We chose to represent the demand side by the measure of monetary policy (SPREAD) and the shortfall in investment spending (SHORTFALL) discussed above. We include this term to capture the effects of tight monetary policy on the GDP gap. A range of supply side variables (including real wage costs measures and government benefits) was tried. None of the supply side variables were significant.

Table 4 GDP Gap Regressions, Australia, 1960:4 to 2000:4

Regressor	Coefficient	*t*-Statistic
Constant	-0.00	-0.47
SPREAD(-4)	0.001	4.45
SHORTFALL	0.002	4.12
YGAP (-1)	0.93	53.1
D753	-0.01	2.59
D824	0.02	3.99
R-squared	0.97	
S.E. of regression	0.005	
Mean dependent variable	0.033	

Notes: D753 is unity in 1975:3 and zero otherwise. D824 is unity in 1982:4 and zero otherwise. *t*-statistics in parentheses.

The tested-down regression is reported in Table 4 for the estimation period (1960:4 to 2000:4). The diagnostics for the regression were sound. The regression forecasted satisfactorily out-of-sample over the 8 quarters. The results confirm that the shortfall in investment as a percentage of GDP was a key determinant of the GDP gap over the period examined. In addition, the era of tight monetary policy aimed at curbing inflation was also instrumental in maintaining the GDP gap.

2.7 Can the private sector provide enough jobs?

Mitchell (2000c) argues that in the fifty years since the end of World War II, most OECD economies have gone from a situation where the respective governments ensured there were enough jobs to maintain full employment to a state where the same governments use unemployment to control inflation. A major aspect of this move has been the changes that have occurred in public sector employment. Many economies have undergone substantial restructuring of their public sectors with significant employment losses being endured. Table 5 shows that in Australia, the labour force has grown at an average compound rate of 1.87 per cent per annum since 1970. Over the same period, private employment has averaged 1.91 per cent per annum, whereas public employment has averaged a rate of growth of 0.64 per cent per annum (driven heavily by the growth in the 1970-75 period). Since 1990, the public sector has declined in absolute employment every year with a rapid –2.03 per cent per annum average decline since 1995.

With private sector employment growing more or less commensurately with the labour force, the withdrawal of public sector employment has contributed significantly to the persistently high unemployment that Australia has experienced. If the governments expected the private sector to provide commensurately more jobs as public sector employment was cut, then they were wrong. The magnitude of private employment growth necessary to compensate for the public sector losses has been historically unattainable on any sustained basis. By failing to expand public employment, at least in line with labour force growth, the governments have allowed unemployment to persist at high levels. In this context, we say that at any point in time the government chooses the level of unemployment.

Table 5 Growth rates in labour market aggregates, Australia, 1970-1999

	Public		Private		Total Employment		Labour Force		UGAP
	Growth	Change	Growth	Change	Growth	Change	Growth	Change	Change
1970-1999	0.6	245.5	1.9	3100.2	1.7	3345.8	1.9	3934.3	518.5
1970-1975	3.8	249.9	1.1	239.1	1.7	489.1	2.4	704.3	202.7
1975-1980	2.3	117.7	1.0	248.6	1.2	366.2	1.6	466.0	91.5
1980-1985	1.6	133.6	1.5	295.9	1.5	429.5	1.8	625.7	185.1
1985-1990	0.3	28.9	4.1	1112.5	3.2	1141.5	2.9	1131.8	-29.8
1990-1995	-1.9	-160.9	1.7	550.0	1.0	389.0	1.3	566.0	166.9
1995-1999	-2.0	-123.7	2.4	654.1	1.6	530.5	1.2	440.5	-97.8

Notes: Growth rates are annual average compound rates for the periods shown. UGAP is unemployment minus 2 per cent of the Labour Force to capture frictional unemployment. For a full account of this data and OECD comparisons see Mitchell (2000c).

Can the private sector provide enough jobs to generate full employment? Even when private sector employment achieved annual growth rates of 4.1 per cent (1995-1990), unemployment only declined by 29.8 thousand. It is highly unlikely that the private sector could create enough jobs, given the current private employment to total employment ratio, to allow the Australian economy to reach full employment. However, the issue is not just one of quantity of employment.

2.8 A job is not a job

Labour utilisation is maximised if labour underutilisation and underemployment are minimised. The operational difference between being classified under the ILO guidelines as employed and unemployed is only one hour of paid employment or self-employment. An economy with many part-time workers who desire but cannot find full-time work is arguably less efficient than an economy with labour preferences for work hours satisfied. Mitchell and Carlson (2000) compute a range of measures, which broaden the official unemployment rate, to provide a better indication of the extent to which existing and potential labour resources are being under-utilised. They argue that the new measures give a more accurate indication of the degree of labour market tightness. Essentially, the concepts shown are incremental with U4 adding the hidden unemployed to the official rate U3, U5 adding all other marginal workers to U4, and U6 adding an estimate of the workers who are working part-time but desire more hours (see Mitchell and Carlson, 2000, Table 6 for full definitions). Mitchell and Carlson (2000) also compute these measures in terms of hours rather than persons. Using 1999 as the example, the official unemployment rate indicates that 7.2 per cent of the willing labour force is underutilised. Adding the hidden unemployed gives an underutilisation rate of 8.3 per cent. Adding other marginal workers takes the rate to 15.2 per cent. Once the incidence of constrained part-time workers is added, the rate of underutilisation exceeds 20.5 per cent.

Most importantly, while the aggregate unemployment rate in Australia has returned to levels that existed in the late 1980s (after a severe recession in the early 1990s), the level of underemployment and the impact of marginal attachment have risen over that time. This represents a much bleaker picture of the labour market than demonstrated by the aggregate unemployment rate. While private sector employment growth has more or less matched labour force growth, there has been a dramatic rise in the ratio of part-time employment. This may reflect the changing preferences of the workforce for casual arrangements. But ABS data shows that since 1978, the percentage of part-time workers who wanted to work more hours had doubled (now at around 29 per cent). Australia is now creating an increasing number of part-time jobs, inconsistent with the preferences of a rising number of the labour force for more work. A job is not a job.

2.9 Concluding remarks

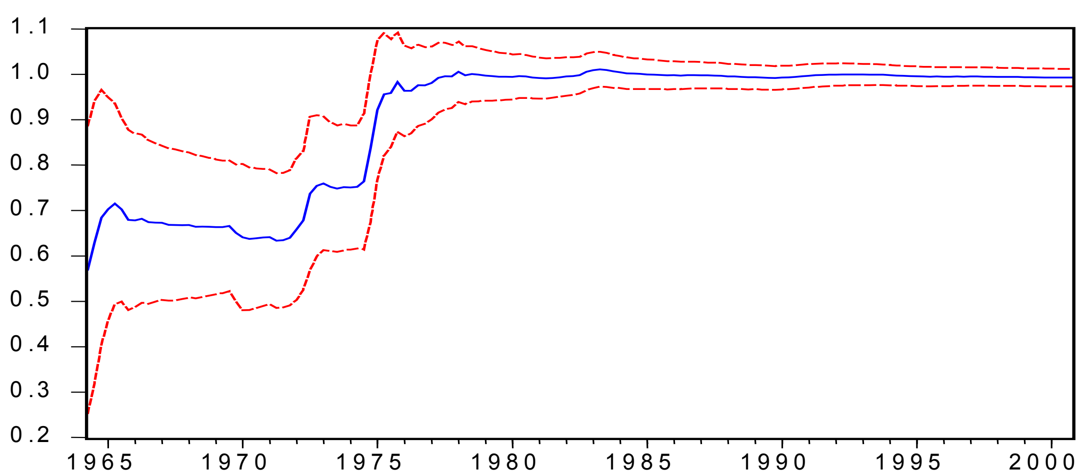
We have demonstrated that employment and unemployment outcomes are both driven by aggregate demand. There is strong evidence to support this contention. Despite all the labour market and related supply-side reforms that have been introduced in Australia over the last 15 years, the unemployment rate persists at high levels due to demand deficiency. This deficiency reflects several factors: (a) declines in the investment ratio, (b) declines in public sector employment. Both have been exacerbated by deflationary macroeconomic policy since 1975, which has ensured that the persistently high unemployment was inevitable. In the next section, we seek to specifically decompose the aggregates that have impacted on the unemployment outcomes.

3 Accounting for the unemployment increase in Australia?

In the previous section, we argued that unemployment increases have been the result of deficient demand over the last 25 years. But supply factors have also been at work. It is instructive to decompose the labour demand and labour supply into their separate influences. Mitchell (2001) examined the persistence of the unemployment rate across 18 OECD economies. The general conclusion is that all the countries examined exhibited significant degrees of persistence to negative shocks. In Australia, there was a major change in the degree of persistence occurring in 1974.

Figure 13 is taken from Mitchell (2001: Figure 3) and shows the changing estimates of the AR(1) parameter in the recursive least squares regression of log unemployment rate on one lag and a constant for the sample of 1962:1 to 2000:4. It shows that the degree of persistence (reflected in the value of the AR(1) coefficient shifted dramatically upwards during the 1974 recession.

Figure 13 Recursive estimates of the AR(1) parameter for unemployment, Australia



Source: Recursive least squares regression of log unemployment rate on one lag and a constant. The plotted coefficient is the estimated AR(1) parameter for 1962:1 to 2000:4.

The conclusion is that the 1974 recession was different to those that had occurred in the 1960s and also different to the two major downturns that followed it (1983 and 1991). This argument can be presented in terms of labour demand and supply decompositions by focusing on the relative recovery phases following the last four recessions. What factors were different in the 1974 recovery that saw unemployment rise so significantly?

3.1 Labour supply decomposition

The supply side of the labour market can be expressed in terms of the following identity:

$$E \equiv WAP * \left(LF / WAP\right) * (E / LF)$$

where E = employed persons, WAP is the working age population, and LF is the labour force (employed + unemployed). So LF/WAP is the labour force participation rate and E/LF is the employment rate. The relationship can then be expressed in growth rates where the growth of persons employed (e) is approximately equal to the sum of the growth in working age population (p), labour force participation (pr) and the employment rate (er).

$$e \approx p + pr + er$$

Table 6 shows the components of employment growth on the supply side of the labour market, which capture demographic and employment behaviour (see Werner, 1999). The four recoveries shown exhibit strikingly different behaviour. In 1966-68 recovery, employment growth was strong although the robust growth in working age population meant the employment rate did not change at all (unemployment did not rise significantly during this period). Labour force participation grew by 1.30 per cent over the 8 quarters. In stark contrast, the 1974 recovery failed to generate substantial employment growth and with a reasonably strong growth in working age population (attenuated somewhat by the fall in participation), the employment rate plummeted. Table 7 shows how this translated into the rise in unemployment. The 1983 recovery is notable because it was the only one of the four where employment growth outstripped the growth in the labour force (combination of working age population growth and the participation rate). As a consequence, this recovery quickly began to reduce the unemployment that had risen sharply. While the 1991 recovery was associated with negative employment growth (and a declining employment rate), labour force growth was very small and so the resulting rise in unemployment from this source was less than it may have been had labour force growth been of the same magnitude as in earlier recoveries.

Table 6 Components of employment growth on supply side over 8 quarters from trough

	%Δ EMP	%Δ WAP	%Δ LFPR	%Δ EMPR
From June 1966	5.75	4.40	1.30	0.00
From June 1974	0.88	3.58	-0.12	-2.49
From June 1983	6.04	3.65	0.23	2.07
From June 1991	-0.71	2.52	-1.55	-1.62

Source: Percentage changes between the recession trough and the trough plus 8 quarters. The numbers do not add exactly to meet the relevant identity constraints. EMP is total employment, WAP is the working age population, LFPR is the labour force participation rate, and EMPR is the employment rate (employment as a percentage of the labour force).

Table 7 converts the decompositions by percentage changes into actual persons.

Table 7 Supply side contributions to change in unemployment

	Change in EMP (000s)	Change in LF (000s)	Contribution to Change in UN (000s)
From June 1966	280	281	1
From June 1974	53	211	158
From June 1983	385	273	-112
From June 1991	-55	79	134

Source: Absolute changes between the recession trough and the trough plus 8 quarters. EMP is total employment, LF is the labour force, and UN is aggregate unemployment (LF-EMP).

In conclusion, the supply side analysis makes it clear how different the 1974 period was in relation to the other recoveries. The economy at that time failed to generate the strong employment growth evident in the 8-quarter period from June 1966 and June 1983. At the same time, labour force growth was on trend adding some 211 thousand workers over the recovery. It would be wrong to conclude that the problem was the growth in the labour force. The real problem was the failure of the economy to generate an employment growth rate commensurate with the previous recession.

3.2 Labour demand decomposition

Similarly, the demand side can be decomposed by the following identity, which links gross domestic product (GDP) to persons employed times average annual working hours per person employment (*AWT*) times labour productivity per hour worked (*LP*).

$$Y \equiv E * AWT * LP$$

In growth rates, output growth (*y*) is approximately equal to the growth of persons employed (e) plus total hours worked per person (*h*) plus labour productivity growth (*g*):

$$y = e + h + g$$

Table 8 shows the components of employment growth on the demand side of the labour market, which captures economic growth factors. There are two notable features shown in this table. When GDP growth is strong, employment growth is strong. The behaviour of labour hours productivity (and labour force growth) in the 1974 recovery goes a long way to explaining why unemployment rose so quickly and failed to return to previous levels. Even with assistance from sharp declines in average weekly hours worked, the GDP growth rate was not sufficient to match the job losses implied by the productivity growth. The economy was only able to generate a net increase in employment of 53 thousand over the two year recovery period. With labour force growth only showing modest declines, no ground was made in reducing the large stocks of the unemployed. Once the economy resumed more normal aggregate relationships, the stock of unemployment was trapped in this historical episode. The last thing that was required in this period was a move to tighter monetary and fiscal policy. Unfortunately, that is exactly what happened. The 25 year period of persistently high unemployment had begun.

Table 8 Growth in demand aggregates over 8 quarters from trough

	%ΔGDP	%Δ EMP	%ΔATW	%ΔLP
From June 1966	12.63	5.75	-1.51	8.14
From June 1974	8.22	0.88	-4.19	11.96
From June 1983	15.04	6.04	2.28	6.08
From June 1991	6.40	-0.71	0.28	6.86

Source: Percentage changes between the recession trough and the trough plus 8 quarters. The numbers do not add exactly to meet the relevant identity constraints. EMP is total employment, GDP is gross domestic product, ATW is annual total hours worked per person, and LP is labour productivity in hours.

In the last two recoveries shown, average hours worked grew in contrast to the earlier experience. This makes it more difficult to reduce unemployment and the GDP growth in 1992 was not able to offset productivity growth plus the modest hours effect. As a consequence, employment fell over the first 8 quarters from the trough. The problem was lack of jobs being created. The growth phase leading out of the 1983 trough was quite different to this (and in many ways similar to the 1960s behaviour). In that recovery, strong GDP growth outstripped the strong labour force and labour productivity growth to generate an increasing employment rate. Little wonder the unemployment rate began to fall in this period. The early recovery in 1991-1993 is also different to the 1974 recovery because although the employment rate and total employment fell, labour productivity growth was not as strong. The secret to the rapid rise in unemployment in 1974 lies in the combination of rapid productivity growth and a failure to generate enough jobs. Labour supply issues do not appear implicated. It may be argued that abnormally high wage share movements led to a neoclassical-type factor substitution with the low employment growth and increased labour productivity growth as the outcome. However, over the period concerned, it is difficult to detect substantial changes increases in the aggregate capital to labour ratio. The research question not tackled in this paper is to explain this abnormal conjunction of events – the slow demand combined with the strong productivity growth.

In the same way that we decomposed the contribution to persons employed on the supply side, Table 9 reports the results of the demand side decomposition into a GDP effect, an Hours effect, and a Labour Productivity effect.

The following equation was used to generate the (approximate) decomposition.

$$\Delta N \simeq \left(\frac{\Delta Y}{Y}\right) N_0 + \left(\frac{\Delta P}{P}\right) N_0 + \left(\frac{\Delta H}{H}\right) N_0$$

where ΔN is the total change in employment, ΔY is the change in *GDP*, *H* is the average quarterly hours worked, and *P* is the measure of labour productivity in hours. The subscript refers to the base period.

Table 9 Demand side accounting for changes in employment, thousands.

	GDP Effect	Productivity Effect	Hours Effect	Net Employment
From June 1966	615.2	-396.6	73.6	280.0
From June 1974	496.3	-722.7	253.0	53.0
From June 1983	959.7	-387.8	-145.4	385.0
From June 1991	496.4	-532.1	-21.7	-55.0

Source: The base period is the recession trough and the trough plus 8 quarters is the current period. Note the interactive effects between GDP, Hours, and Labour Productivity are assumed to be equal to zero and thus numbers in columns 2 to 4 do not add to column 5.

Table 9 can be interpreted with Table 7 to approximately account for the rise in unemployment in the 1974 period. GDP growth and declines in Average Hours Worked added some 752 thousand jobs, which were almost obliterated by the relatively high labour productivity growth. The economy only generated a 53 thousand net employment increase over the 8 quarters. The situation would have been worse had not average weekly hours fell by some 2 hours to just over 36 hours.

In conclusion, we believe that the evidence suggests that the rapid rise in unemployment in the 1974 recession was a combination of deficient economic growth and rapid growth in labour productivity. The economy failed to generate sufficient employment given the trend rate of growth in the labour force and the rise in unemployment was exacerbated by the declining requirements for labour as labour productivity rose. Subsequent growth proportions were incapable of mopping up the huge stock of unemployment that occurred in this short period.

4. Testing for NAIRU dynamics

4.1 Introduction

There are various methods across a plethora of studies that have examined the elusive NAIRU. We do not survey them here (see Mitchell and Muysken, 2001). It is now fashionable to study the topic within the LNJ wage-price bargaining framework initially developed by Carlin and Soskice (1990). Whatever approach is taken, and the choice of approach is not uncontroversial, the dynamics of the NAIRU have to reveal themselves in a price inflation Phillips curve model with unemployment rate on the right-hand side. Otherwise, one has to show that an indirect but reliable relationship between a series of variables links a policy-targetted unemployment rate with inflation.

The most obvious starting point is to estimate a Phillips curve and to test whether the dynamics required by the NAIRU hypothesis are present (Fair, 2000). The model we use is a general autoregressive-distributed lag Phillips curve representation like:

$$\dot{p}_t = \alpha + \sum_{i=1}^{n} \delta_i \dot{p}_{t-i} + \sum_{i=0}^{m} \beta_i u_{t-i} + \sum_{i=0}^{q} \gamma_i z_{t-i} + \varepsilon_t$$

where $\dot{p}_t$ is the rate of inflation at time *t*, *u* is the unemployment rate, *z* is a cost shock variable, and the ε is a white-noise error term. If the δ coefficients sum to unity, the model gives a constant NAIRU of $-\alpha \big/ \sum_{i=0}^{m} \beta_i$. At this unemployment rate, the inflation rate will only exhibit short-run changes due to cost (changes in *z*) and/or random shocks (changes in ε).

Fair (2000) tests for NAIRU dynamics in the United States unemployment rate. He begins with a simple inflation model where the current inflation rate (difference in log of the price level) is a function of the lagged inflation rate, the price of imports and the gap between the unemployment rate and the NAIRU. He then expresses this model in terms of the price level and shows there are two related restrictions imposed by NAIRU dynamics. The model becomes $p_t = 2p_{t-1} - p_{t-2} + \beta\left(u_t - u_t^*\right) + \gamma s_t + \varepsilon_t$, which requires the lagged coefficients on the lagged price level terms sum to 1 and that the each price level has the previous price level subtracted from it before entering the equation (Fair, 2000: 64). Fair (2000: 70) generally rejects "the dynamics implied by the NAIRU specification…" and concludes (2000: 70) that "this changes the way one thinks about the relationship between inflation and unemployment. One should not think that there is some unemployment rate below which the price level forever accelerates and above it forever decelerates."

While Fair (2000) is interested in specification issues beyond the testing of the NAIRU dynamics, we consider here only one of the two restrictions he identifies - the requirement that the coefficients on the lagged price variables sum to one. If this restriction fails then the validity of the other restriction (the form in which the level variables enter the model) is moot.

4.2 NAIRU dynamics in Australia

We initially develop a Phillips curve model for Australia using the general specification noted in Section 4.1. We began with 4 lags on the inflation terms and import prices and included the level of the unemployment rate and the first difference of the unemployment rate (lagged once) to avoid problems of singularity with the level. We used Two Stage Least Squares to overcome any endogeneity with the contemporaneous rate of unemployment on the right hand side. Sequential testing down from the general equation with all restrictions tested yielded the following regression for 1970:4 to 2000:4.

The results show that the level of unemployment exerts a negative influence on the rate of inflation with a trade-off parameter of –0.006. The question is whether there is a trade-off in the long-term implied by this regression. There are two sources of trade-off information in the specification: (a) the NAIRU dynamics test noted above, and (b) the presence of the differenced unemployment rate term. In the case of the test for NAIRU dynamics the test statistic shown in Table 10 allows us to easily reject the null that the sum of the coefficients on the lagged inflation terms is unity. In that sense, we would reject the constant NAIRU hypothesis. Reinforcing this is the highly significant coefficient for the lagged first-difference of the unemployment rate. This can be interpreted as consistent with a hysteretic vision of the inflationary dynamics in Australia. The results support previous findings of hysteretic dynamics by this author (Mitchell, 1987a). So the evidence presented here suggests that there is a long-run trade-off between inflation and unemployment in Australia. The results indicate that a deflationary strategy using demand repression (tight monetary and fiscal policy) will be costly in terms of unemployment.

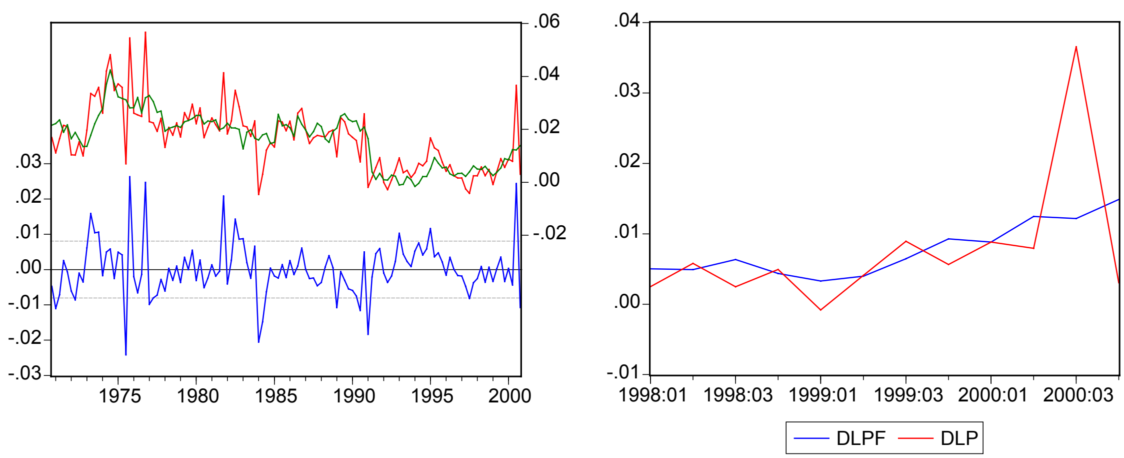
Table 10 Australian Phillips Curve regression with DLP as dependent variable

Variable		Coefficient	t-Statistic
Constant	C(1)	0.014	3.78
DLP(-2)	C(2)	0.192	2.19
DLP(-3)	C(3)	0.223	2.62
DLP(-4)	C(4)	0.273	3.26
LUR	C(5)	-0.006	3.36
DLUR(-1)	C(6)	-0.025	2.20
DLPM	C(7)	0.076	3.34
DLPM(-1)	C(8)	0.048	2.03
R-squared	0.615		
S.E. of regression	0.007		
SC LM(4)	2.11		
ARCH (4)	8.15		
RESET(2) F	0.75		
Normality	42.1		
NAIRU Restriction: c(2) + c(3) + c(4) = 1			
F-statistic	15.198		
Probability	0.0001		

Instrument list: Constant, DLP(-1 TO -4) LUR(-1TO -5) DLUR(-1) DLPM(TO -4). SC LM(4) is a Breusch-Godfrey Serial Correlation 4th order LM Test, ARCH(4) is a 4th order test for Autoregressive conditional heteroscedasticity, RESET(2) is the Ramsey RESET test with 2 added terms, Normality is the Jarque-Bera test. Shaded cells indicate a significant test statistic. *t*-statistics are in parentheses.

Import price changes are also statistically significant positive influences on the inflation rate with a one percent change in import prices generating a 0.124 percent impulse to local price inflation. The diagnostics are generally satisfactory. Figure 14 shows the actual, fitted and residuals and although some disturbances are relatively large around each recession. We tested for breaks in the relationship at these points without success. The model is stable within-sample. We also tested its out-of-sample forecasting performance by re-estimating the model to 1997:4 and then dynamically forecasting to 8 quarters out. The results are also shown in Figure 14. The presence of the GST introduction is clear but despite that the model forecasts well. Overall, the model is satisfactory.

Figure 14 Actual, fitted, residuals and forecasts for Inflation model



(a) Actual, fitted and residuals – full sample

(b) dynamic forecast 1998:1 to 2000:4

4.3 NAIRU dynamics in other OECD economies

We now test for NAIRU dynamics in Phillips curve models for Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States. The data is from the OECD semi-annual Economic Outlook database and the variables chosen were the Private Consumption deflator (as measures of the price level), the local currency import price index of goods and services (as the measure of the external supply shock), and the unemployment rate. All variables are in logs. The inflation measure is the difference between the log p and its first lag. We followed a similar testing methodology to that outlined in Section 4.2. We also included the change in the unemployment rate, which has been used by some to test for hysteretic effects (see Gordon, 1997).

Table 11 Testing for NAIRU dynamics in selected OECD economies

	Canada	France	Germany	Italy	Japan	UK	USA
Constant	0.008	0.005	0.009	0.008	0.016	0.007	0.011
	(2.10)	(1.75)	(6.51)	(1.96)	(5.99)	(3.06)	(4.99)
Lagged Inflation							
(-1)	0.758	0.902	0.529	0.801	0.512	0.650	0.497
	(16.71)	(23.00)	(7.19)	(21.06)	(9.01)	(12.13)	(9.26)
(-3)			0.351				0.385
			(4.01)				7.411
(-4)			-0.255			0.169	
			(3.22)			(3.77)	
UR Level							
Current		-0.001	-0.003		-0.013	-0.003	-0.006
		(1.19)	(4.92)		(5.19)	(2.15)	(4.32)
(-1)	-0.002			-0.002			
	(1.28)			(1.14)			
UR Change						-0.014	-0.012
						(1.88)	(3.19)
Import Prices	0.140		0.084	0.121	0.063	0.058	0.125
	(5.43)		(6.17)	(6.86)	(3.41)	(2.60)	(14.33)
Sample Starts	1962:1	1965:1	1968:2	1961:1	1961:1	1962:2	1962:1
R-squared	0.89	0.91	0.89	0.93	0.88	0.94	0.97
S.E. of regression	0.886	0.006	0.003	0.007	0.007	0.006	0.002
SC LM(4)	10.86	7.09	3.62	1.36	11.27	1.82	2.55
ARCH (4)	3.64	3.66	4.37	7.41	27.64	1.23	3.99
RESET(2) F	3.10	0.55	2.57	0.28	0.50	0.07	0.02
Normality	0.65	9.72	1.64	1.11	14.06	2.78	0.51
NAIRU Test							
F-statistic	28.59	6.28	51.14	27.53	74.07	12.69	11.19
Probability	0.000	0.015	0.000	0.000	0.000	0.001	0.001

Notes: The dependent variable was the first difference in the log of the final consumption deflator. UR is the unemployment rate and import prices are the first difference in the log of the import price index. Shaded cells indicate a significant test statistic. Various dummy variables were added where significant outliers were detected. Details available on request. *t*-statistics are in parentheses.

The results for Canada, France, Germany, Italy, Japan, United Kingdom, and the United States are shown in Table 11. To avoid singularity different combinations of the level and change term for the unemployment rate were tried. The final equations are valid simplifications of the general models. The level of the unemployment rate was left in all regressions despite it not being statistically significant in the cases of Canada, France and Italy.

While the models themselves are of interest, the purpose of the exercise was to test the NAIRU dynamics constraint. The final results are reported in the final row of the Table. In no cases, was the restriction accepted and the conclusion is clear. There is no evidence of a constant NAIRU operating in these countries. In each case, there is evidence of a non-vertical long-run Phillips curve although for Canada, France, and Italy, the findings are weak. Further, in the case of the United Kingdom and the United States, the change of unemployment is statistically significant indicating that hysteretic forces are present.

5. A small macroeconomic model for Australia

In this section, we aim to develop a small macroeconomic system designed to test the key linkages outlined in this paper to date. The model is part of the development of a benchmark model for a larger more sophisticated model of the Australian economy that the Centre of Full Employment and Equity is undertaking called CofFEE-1. In this exercise we seek to establish basic specifications, which satisfy statistical requirements and capture the essence of the story being told. Specifically, we estimate the following system of equations, which link a Phillips curve, an unemployment dynamics (Okun) relation and an GDP gap equation. The specification is as follows:

Phillips Curve: $$\dot{P}_t = \alpha_1 + \sum_{i=1}^{m} \beta_i \dot{P}_{t-1} + \sum_{i=0}^{m} \delta_{1i} UR_{t-i} + \sum_{j=1}^{m} \delta_{2j} \Delta UR_{t-j} + \sum_{i=0}^{m} \gamma_i \dot{P}M_{t-1} + e_{1t}$$

Unemployment: $$\Delta UR_t = \alpha_2 + \sum_{j=1}^{m} \Delta UR_{t-j} + \sum_{i=0}^{m} \theta_i \Delta Y_{t-i} + e_{2t}$$

GDP Gap $$YGAP_t = \alpha_3 + \sum_{i=1}^{m} \varphi_i YGAP_{t-i} + \sum_{i=0}^{m} \rho_i \Delta\left(I/Y\right)_{t-i} + \sum_{i=0}^{m} \eta_i MP_{t-i} + e_{3t}$$

where *Y* is *GDP*, *P* is the price level (a dot indicates the inflation rate), *PM* is the import price index, *UR* is the unemployment rate, (*I*/*Y*) is the investment ratio, *MP* is the SPREAD, and Δ is the first-difference operator. The model is deliberately general and amenable to sequential testing of the dynamics. The model is not simultaneous but to overcome the problem of contemporaneous correlation across the residuals, we estimated the tested down equations using Full Information Maximum Likelihood (FIML) and Seemingly Unrelated Regression Estimation (SURE), both of which take into account cross correlation among the residuals. The results for the FIML estimation are presented in Table 12 for the tested down model. The SURE results were similar. In both cases the model is stable and solves quickly. Diagnostic performance is satisfactory for an experimental model.

Focusing on the FIML results in Table 12, the equations are consistent with a demand side interpretation of the dynamics of unemployment. The Phillips curve is defined and the NAIRU dynamics are rejected as discussed below. There is weak evidence for the change in unemployment to influence the path of inflation. The implied long-run Phillips Curve trade-off is estimated as –0.017. In terms of the unemployment equation, the lagged change in output is a significant determinant on the evolution of unemployment although the persistence in the unemployment rate is the dominant source. An increase in the rate of GDP growth will, however, reduce the unemployment rate. The estimated elasticities appear to be on the high side. There is evidence of asymmetry in the reaction of the unemployment rate to the cycle as shown by the GDPDECLINE dummy, which takes the value of unity in periods where GDP growth is negative. The GDP gap equation repeats the earlier results that capital investment shortfalls and tight monetary policy reduces capacity utilisation.

Table 13 reports the results of the tests for NAIRU dynamics (outlined in Section 4.3) using both the SURE model and the FIML model. In both cases, we categorically reject the null that the sum of coefficients, C(2)+C(3) = 1 in the Phillips curve. The results are consistent with those published for the USA by Fair (2000). The dynamics in the Australian inflation process do not accord with a constant NAIRU. In a future paper we will examine in more detail the viability of the TV-NAIRU in the Australian context.

Table 12 Maximum Likelihood Estimates, 1970:3 2000:4, 122 observations

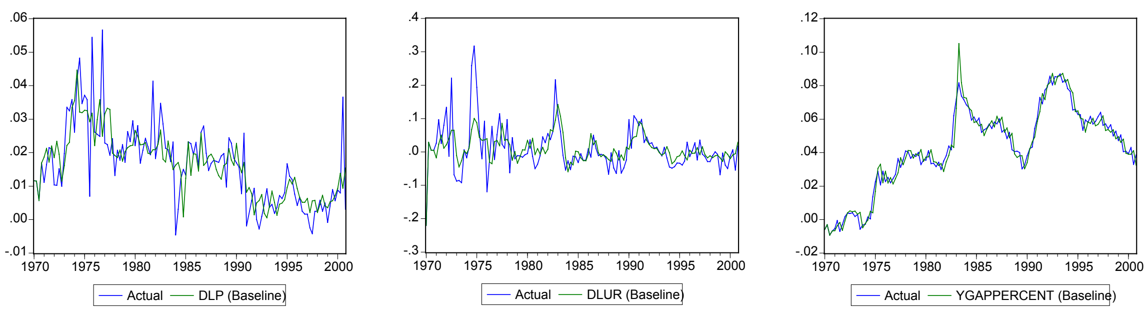
Phillips Curve					
Variable		*Coefficient*	*Std. Error*	*z-Statistic*	*Probability*
Constant	C(1)	0.014	0.0048	2.90	0.0038
DLP(-2)	C(2)	0.327	0.1109	2.95	0.0032
DLP(-3)	C(3)	0.361	0.0959	3.76	0.0002
LUR	C(4)	-0.005	0.0021	2.50	0.0125
DLUR(-1)	C(5)	-0.022	0.0165	1.36	0.1748
DLPM	C(6)	0.079	0.0384	2.06	0.0399
R-squared	0.56	Std Error	0.008		
Unemployment Equation					
Variable		*Coefficient*	*Std. Error*	*z-Statistic*	*Probability*
Constant	C(7)	0.022	0.0086	2.55	0.0109
DLUR(-1)	C(8)	0.234	0.0626	3.74	0.0002
DLY(-1)	C(9)	-1.040	0.4140	2.51	0.0120
DLY(-2)	C(10)	-1.432	0.3885	3.69	0.0002
GDPDECLINE	C(11)	0.040	0.0124	3.20	0.0014
R-squared	0.35	Std Error	0.056		
GDP Gap Equation					
Variable		*Coefficient*	*Std. Error*	*z-Statistic*	*Probability*
Constant	C(13)	0.000	0.0013	0.06	0.9508
YGAP(-1)	C(14)	0.932	0.0278	33.5	0.0000
Shortfall	C(15)	0.002	0.0006	3.18	0.0015
Spread*-4)	C(16)	0.001	0.0003	3.35	0.0008
R-squared	0.96	Std Error	0.005		

Table 14 reports the actual and baseline forecasts for the three equations in the model using the FIML estimates. Given the model's development status the tracking between baseline and actual is reasonably good. We also experimented with some scenarios where we held the rate of GDP Growth at trend and altered monetary policy settings with predictable results. Unemployment is significantly lower, and inflation does not accelerate.

Table 13 Wald tests for NAIRU dynamics in Australian inflation process

	SURE		FIML	
Null Hypothesis	χ^2 Test statistic	Probability	χ^2 Test statistic	Probability
C(2)+C(3)=1	17.27018	0.000032	13.87007	0.000196

Table 14 Actual and Baseline Forecasts for FIML Estimation



(a) Inflation Model (b) Unemployment Model (c) GDP Gap Model

6. Conclusion

This paper has examined a large amount of data to test the plausibility of the demand side explanations for unemployment outlined in the introduction. It is difficult to reject the notion that the rise and persistence in unemployment in several countries examined is not due to deficient demand brought about by fluctuating investment and inappropriately tight fiscal and monetary policies. The chase for the NAIRU has exacted a significant and permanent toll on economies around the world.

Appendix A

Table A1 Dating Australian Business Cycles.

Business Cycle Reference Dates		Duration in Quarters			
		Contraction	Expansion	Cycle	
Trough	Peak	Trough from Previous Peak	Trough to Peak	Trough from Previous Trough	Peak from Previous Peak
na	June 1960				
September 1961	March 1963	3	5	na	9
June 1963	December 1965	1	10	7	11
June 1966	December 1973	2	30	12	32
June 1974	March 1982	2	31	32	33
June 1983	December 1990	5	30	36	35
June 1991	September 2000	2	37	30	39

Source: ABS AUSSTATS National Accounts. The methodology is described in the text. na indicates that the data was not available to compute the starting point of the cycle that concluded in June 1960

Table A2 Correspondence between GDP and Employment Peaks and Troughs

GDP Trough	GDP Peak	Employment Trough	Employment Peak
na	June 1960	na	December 1960 (q)
September 1961	March 1963	March 1961 (q)	*
June 1963	December 1965	*	*
June 1966	December 1973	*	June 1974 (q)
June 1974	March 1982	March 1975 (q)	January 1982
June 1983	December 1990	April 1983	July 1990
June 1991	September 2000	July 1991	August 2000

Source: Table A1. The employment peak/troughs from January 1982 were based on monthly labour force data (ABS, The Labour Force, Australia, 6203.0) while those preceding this data were based on the quarterly version of this survey (denoted (q)). * refers to the no intervening peaks or troughs of merit.

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[2] Irrational in the sense that it is clearly not a cost-minimising macroeconomic policy strategy.