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Labour underutilisation in Australia and inflation

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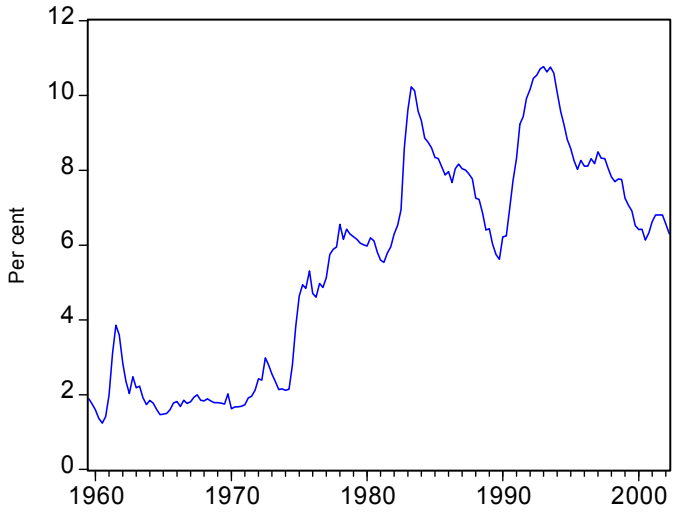
1 Introduction

The low point unemployment rate in Australia has ratcheted upwards over successive cycles in Australia since 1975 (see Figure 1). At issue is whether the picture indicated by the official unemployment rate is an accurate measure of the extent to which labour underutilisation exists in the Australian economy. Mitchell and Carlson (2001a) argue that the labour wastage evident in the upward trending unemployment rate is even worse when broader measures of labour underutilisation are considered. Given that economic policy should be concerned with attaining efficiency in resource usage, it is paramount that the extent of macro inefficiency (the Okun gaps) is accurately gauged. There is a sense in which the gravity of the problem posed by labour underutilisation and its attendant social costs is being overlooked by policy makers in almost all OECD economies. They now vigorously pursue active labour market programs that locate the source of the problem within the attitudes and motivations of the individual and/or in the institutional arrangements of the labour market and largely deny that systemic failure at the macroeconomic level is implicated.

Figure 1 Official unemployment rate, Australia, 1959 to 2002



Source: ABS TRYM model database.

The OECD (2001: 14) has recently praised Australia and concludes that in terms of labour market policies Australia "has been among the OECD countries complying best" with the OECD Jobs Strategy (OECD, 1994). The reality is that the Federal government in Australia has effectively abandoned the goal of full employment and instead appears satisfied with pursuing the diminished goal of full employability. The government no longer ensures that employment growth matches labour force growth but focuses, instead, on making individuals 'work ready', should there be jobs available. Yet there is strong evidence that the Australian economy has been demand constrained since 1975 and consistently fails to generate sufficient employment. There is also strong evidence to show that active labour market programs of the type praised by the OECD have been

largely ineffective in reducing unemployment and improving the outcomes of the most disadvantaged workers in the labour market (Mitchell and Carlson, 2001a; Mitchell, 2001a, Cowling and Mitchell, 2002).

In terms of measuring the extent of the underutilisation problem, Mitchell and Carlson (2001a: 60) claim that using hours instead of persons provides "an even more sophisticated and, arguably more precise, measure of labour underutilisation." The two hours-based measures, which are part of the CofFEE Labour Market Indicators (CLMI), published by the Centre of Full Employment and Equity (CofFEE), explicitly estimate the degree of underutilisation among the unemployed, the hidden unemployed, and the part-time workers who desire more hours of work. By decomposition they also provide a measure of underemployment among part-time workers. The comparison with the conventional unemployment measure leads to the conclusion that the degree of underutilisation is severely understated by the former. What are the implications of this claim? What economic hypotheses can they inform?

In this paper we explore several themes. First, we present revised estimates of the two hours-based measures of labour underutilisation in Australia developed Mitchell and Carlson (2001a), which explicitly account for hidden unemployment and underemployment. The revisions are due to improvements in our methodology in line with new developments in data collection in Australia. Second, we compare and contrast the properties of a range of labour underutilisation measures in terms of their cyclical properties and seek to determine whether asymmetry is present and if so which labour market groups it impacts on most. Third, a useful economic application of the underutilisation measures is to consider the role they might play in the inflation process given that in the context of the Phillips curve, excess labour supply is a key variable constraining wage and price changes. Accordingly, we test several hypotheses within a Phillips curve framework concerning the sources of inflationary pressure in Australia. Specifically, we test whether inflation is more sensitive to movements in the short-run underutilisation measures and also whether 'within-firm' underutilisation in the form of underemployment is an additional constraining influence on inflation.

The paper finds that broadening the measures of labour underutilisation beyond the official unemployment rate does provide extra insights into labour market behaviour. The comparison with the conventional unemployment measure leads to the conclusion that the degree of underutilisation is significantly understated by that measure. We also find that there is non-linearity behaviour in the measures driven by large negative demand shocks. It is also apparent that the costs of this asymmetry are more heavily borne by the more marginal workers in the labour market like the long-term unemployed and the hidden unemployed. In Section 8, we find that short-term unemployment provides a stronger discipline on inflation than the official unemployment rate and that underemployment plays an additional constraining role. Concluding comments follow.

2 Unemployment in the labour force framework

The labour force framework is the foundation for cross-country comparisons of labour market data. The framework is made operational through the International Labour Organization (ILO) and its International Conference of Labour Statisticians (ICLS).

These conferences and expert meetings develop the guidelines or norms for implementing the labour force framework and generating the national labour force data.

The rules contained within the labour force framework generally have the following features (see also ABS 2001a: 16):

- an activity principle, which is used to classify the population into one of the three basic categories in the labour force framework;
- a set of priority rules, which ensure that each person is classified into only one of the three basic categories in the labour force framework; and
- a short reference period to reflect the labour supply situation at a specified moment in time.

The system of priority rules are applied such that labour force activities take precedence over non-labour force activities and working or having a job (employment) takes precedence over looking for work (unemployment). Also, as with most statistical measurements of activity, employment in the informal sectors, or black-market economy, is outside the scope of activity measures.

Paid activities take precedence over unpaid activities such that for example 'persons who were keeping house' as used in Australia, on an unpaid basis are classified as not in the labour force while those who receive pay for this activity are in the labour force as employed. Similarly persons who undertake unpaid voluntary work are not in the labour force, even though their activities may be similar to those undertaken by the employed. The category of 'permanently unable to work' as used in Australia also means a classification as not in the labour force even though there is evidence to suggest that increasing 'disability' rates in some countries merely reflect an attempt to disguise the unemployment problem.

In terms of those out of the labour force, but marginally attached to it, the ILO (Hussmanns, *et al*., 1990) states that persons marginally attached to the labour force are those not economically active under the standard definitions of employment and unemployment, but who, following a change in *one of the standard definitions of employment or unemployment*, would be reclassified as economically active. (ABS, 2001a: 7.5) Thus for example, changes in criteria used to define availability for work (whether defined as this week, next week, in the next 4 weeks etc.) will change the numbers of people classified to each group. This also provides a great potential for volatility in series and thus there can be endless argument about the limits applied to define the core series.

3 Underutilisation and underemployment

Underutilisation is a general term describing the wastage of willing labour resources. It arises from a number of different reasons that can be subdivided into two broad functional categories: (a) a category involving unemployment or its near equivalent. In this group, we include the official unemployed under ILO criteria and those classified as being not in the labour force on search criteria (discouraged workers), availability criteria (other marginal workers), and more broad still, those who take disability and other pensions as an alternative to unemployment (forced pension recipients). These workers share the characteristic that they are jobless and desire work if there were available

vacancies. They are however separated by the statistician on other grounds; (b) a category that involves sub-optimal employment relations. Workers in this category satisfy the ILO criteria for being classified as employed but suffer "time related underemployment" (ABS, 2001a: 55) for example, full-time workers who are currently working less than 35 hours for economic reasons or part-time workers who prefer to work longer hours but are constrained by the demand-side. Sub-optimal employment can also arise from "inadequate employment situations" (ABS, 2001a: 55) where skills are wasted, income opportunities denied and/or where workers are forced to work longer than they desire.

In Figure 2, we summarise the main sources of labour underutilisation and trace them back to their labour force status.

3.1 Unemployed

According to ILO concepts, a person is unemployed if they are over a particular age, they do not have work, but they are currently available for work and actively seeking work. Unemployed people are generally defined to be those who have no work at all. Unemployment is therefore defined as the difference between the economically active population (civilian labour force) and employment. The unemployment rate refers to the number of unemployed persons as a percentage of the civilian labour force. The inference is that the economy is wasting resources and sacrificing income by not providing enough opportunities for the unemployed to be involved in productive activity.

As shown in Figure 2, there are, however, other avenues of labour resource wastage that are not captured by the unemployment rate as defined in this manner. The persons represented in these other avenues of resource wastage may be either in or out of the labour force.

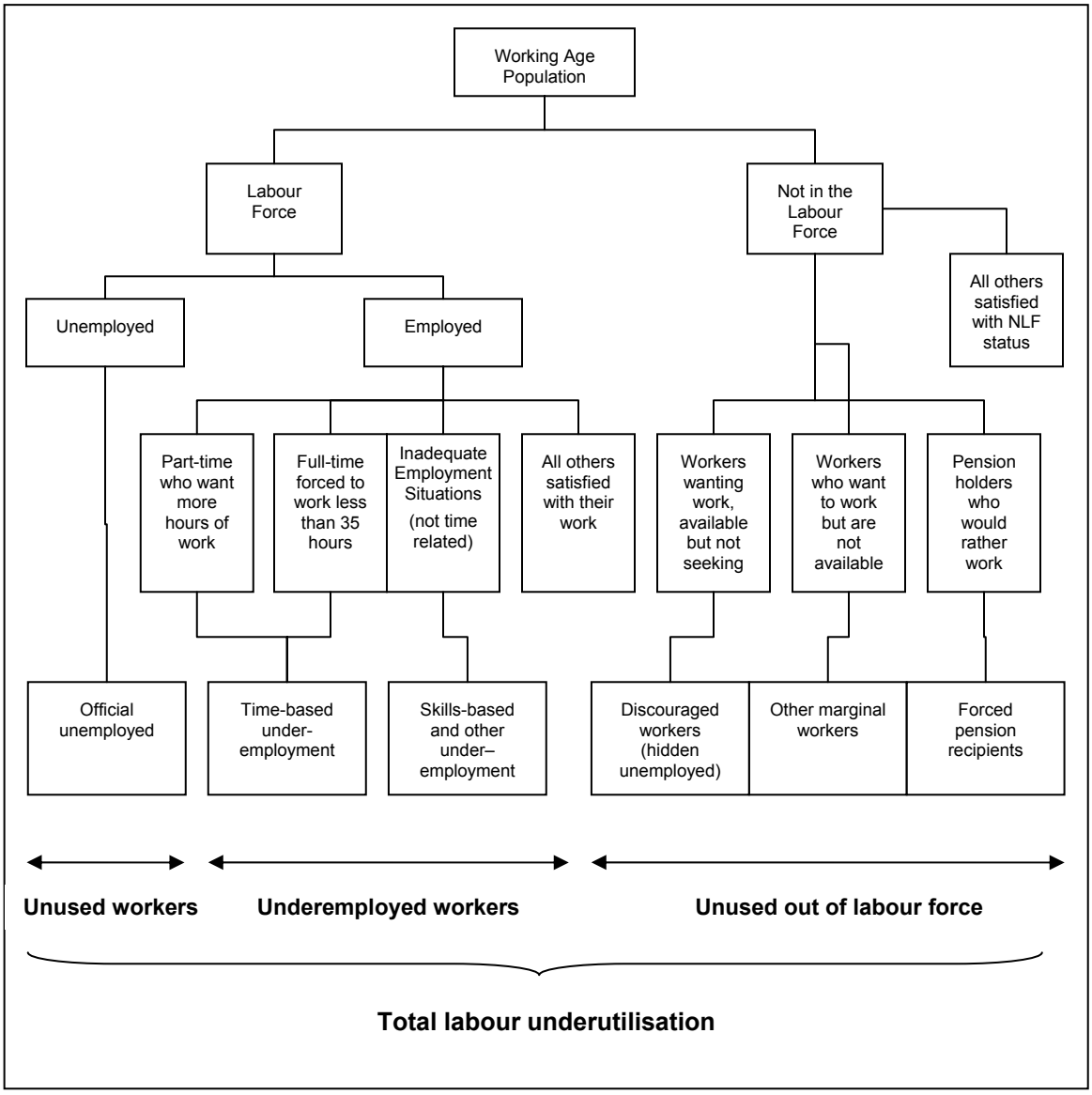
3.2 Time based and other types of underemployment

Underemployment may be time-related, referring to employed workers who are constrained by the demand side of the labour market to work fewer hours than they desire, or to workers in inadequate employment situations, including for example, skill mismatch. Clearly, if society invests resources in education, then the skills developed should be used appropriately. This latter is however, very difficult to quantify and in this paper we concentrate on the former. In conceptual terms, a part of an underemployed worker is employed and a part is unemployed, even though they are wholly classified among the employed.

Time-related underemployment is defined in terms of a willingness to work additional hours, an availability to work additional hours, and having worked less than a threshold relating to working time. In Australia, in line with the standard measurement of unemployment, persons *actively* seeking additional hours of work are distinguished from those who are not. Reflecting changing employment relationships and an increase in multiple job-holding, in Australia the questions collecting underemployment information have been recently revised to reflect a wider range of situations where people are seeking to work more hours. While the previous questions focused on people who were seeking *another* job which offered more hours, the redesigned questions are more inclusive of other situations, such as where people seek more hours with their current employer, or an extra job. This broadening is expected to result in a small increase in the number of

people classified as underemployed (ABS, 2001b). Two main series are identified: part-time workers wanting more hours of work; and full-time workers who worked less than 35 hours in the reference week for economic reasons (stood down or insufficient work).

Figure 2 The structure of labour underutilisation



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. In this regard, involuntary part-time workers share characteristics with the unemployed. If this form of underemployment is considered, the indicator would "move from an activity-based concept of the labor force … [as in the unemployment rate] … to a 'time lost' type of concept." (Sorrentino, 1995: 32).

3.3 Marginally attached workers and others outside the labour force

From a statistical consideration, discouraged workers (also called the hidden unemployed) are classified as being *not in the labour force*. The international guidelines (ILO 1982) suggest, however, that for persons not in the labour force, the relative strength of attachment to the labour market be measured. Thus persons marginally attached to the labour force are those not economically active under the standard definitions of employment and unemployment, but who, following a change in one of the standard definitions (of employment or unemployment), would be reclassified as economically active (see also Hussmans *et al*, 1990).

From the perspective of underutilised labour resources, the issue is whether those classified as being out of the labour force have characteristics similar to those who are classified as being in the labour force but unemployed. In Australia, marginally attached are those who want to work and are actively looking for work but not available to start work in the reference week, or those who are not actively looking for work but who are available to start work within four weeks.[2] Discouraged workers are a sub-group of the marginally attached. They want to work and are available for work (under the same terms as the unemployed) but believe that search activity is futile given the poor state of the labour market.[3] The discouraged (not in the labour force) worker is thus more like the unemployed (in the labour force) worker than they are, for example, like a retired person or a child in full-time education.

A fully employed economy requires labour utilisation to be maximised and this occurs when labour underutilisation and underemployment are minimised. In the next section we consider alternative measures of underutilisation and underemployment, followed by a discussion about the estimation of hidden unemployment in Section 5.

4 Alternative measures of underutilisation

The BLS developed six indicators to measure labour underutilisation (Bregger and Haugen, 1995). Comparable measures have been computed for Australia (Mitchell and Carlson 2001a) and these are shown in Table 1. They are not strictly comparable with the BLS measures because of some data variations.[4] We also created two measures for U6 – one which includes all part-time workers who preferred to work more hours and one which includes only those working part-time who preferred to work more hours *and* who looked for full-time work. This is consistent with international definitions of time-related underemployment which considers a willingness to work additional hours and an availability to work additional hours. Those who are actively seeking as opposed to those who are not are also distinguished (see also ABS, 2001a: 56).

The computed measures are reported in Table 2. Due to changes in ABS definitions we have only computed the U5 and U6 measures from 1986. Estimates from September 1986 were based on a revised labour force questionnaire introduced in April 1986. The estimate of employment was expanded resulting in a slight decrease in the estimate of persons not in the labour force (ABS, 1986a). New or amended concepts were also introduced in the September 1983 survey, causing a break in series (see ABS, 1986b). In particular, the availability to start work criteria was not applied to the definition of discouraged jobseekers in surveys prior to September 1983. So prior to this date, persons

were classified as discouraged jobseekers regardless of whether or not they were available to start work in the near future. Also persons not in the labour force aged 65 and over were added to the September 1983 survey of persons not in the labour force, and may therefore be classified as being discouraged jobseekers or as otherwise having marginal attachment to the labour force from this date. From 1987, this was modified to include only persons 65-69 in the *not in the labour force survey* estimates, although all persons over 65 continue to be included in the monthly Labour Force Survey estimates.[5] Persons belonging to two other groups were also added starting with the 1983 survey, as marginally attached (but not discouraged) workers: persons actively looking for work but who were unable to start in the survey week for reasons other than their own temporary illness or injury; persons who had been away from work without pay for four weeks or longer and had not been actively looking for work, of which those who wanted to work and were available to start work within four weeks are included as having marginal attachment to the labour force.

Table 1 Measures of labour underutilisation and underemployment for Australia

Measure	**Concepts defining the measure**
U1	Persons unemployed 13 weeks or longer, as a percent of the civilian labour force
U3	Total unemployed, as a percent of the civilian labour force (official unemployment rate)
U4	Total unemployed, plus discouraged workers, as a percent of the civilian labour force plus discouraged workers
U5	Total unemployed, plus discouraged workers, plus all other marginally attached workers, as a percent of the civilian labour force plus all marginally attached workers
U6a	Total unemployed, plus all marginally attached workers, plus total employed part time who preferred to work more hours, as a percent of the civilian labour force plus all marginally attached workers
U6b	Total unemployed, plus all marginally attached workers, plus total employed part time who preferred to work more hours and who looked for full-time work, as a percent of the civilian labour force plus all marginally attached workers

Source: Mitchell and Carlson (2001a)

The question is whether these extra indicators offer any meaningful additional information about labour underutilisation in the Australian economy.[6] The key points are: (a) all indicators move broadly together in a cyclical fashion with no marked disparities that could be attributed to orthogonal supply-side behavioural shifts; (b) U3 was 6.2 per cent in 1989 and 6.6 per cent in 1999, both years in which the cyclical low-point was achieved after several years of economic growth. Despite strong growth the trend in official unemployment is up; (c) U1, U4 and U5 display the same pattern of slight deterioration over the cycle. However, the broadest measures, U6a and U6b were significantly above their previous low-point levels. Underemployment clearly worsened over this period of employment growth as the part-time employment ratio increased from around 20 per cent to 27 per cent (ABS, 6203.0) and the hours offered increasingly fell

short of the preferences of the available labour force; (d) at the trough in the cycle, the underutilisation of those not in the labour force (discouraged and marginal workers) is around twice that of the official unemployed. At the peak this difference is slightly lower and concentrated among the marginal workers, indicating that cyclical participation swings are strong for those with a near attachment to the labour force; and (e) as the measure is broadened, the extent of underutilisation and underemployment grows dramatically. Indicator U6a, for example, suggests that around 15.4 per cent of willing labour resources in 2001 were wasted in some way.

Table 2 Underutilisation and underemployment measures, Australia, 1988-2002

Year	U1	U3	U4	U5	U6a	U6b
1988	4.1	7.2	8.2	14.9	17.4	16.0
1989	3.2	6.2	7.0	13.6	16.2	14.6
1990	3.6	6.9	8.0	14.5	17.4	15.7
1991	5.9	9.6	11.0	17.6	21.1	19.1
1992	7.4	10.8	12.3	18.8	23.0	20.7
1993	7.4	10.9	12.4	19.4	23.6	21.2
1994	6.5	9.7	10.8	17.1	21.3	19.0
1995	5.3	8.5	9.6	16.5	20.7	18.4
1996	5.1	8.5	9.7	16.6	20.8	18.5
1997	5.3	8.5	9.7	16.6	21.0	18.6
1998	4.9	8.0	9.1	16.3	20.6	18.2
1999	4.2	7.2	8.3	15.1	19.5	17.0
2000	3.6	6.6	7.6	13.9	18.3	15.7
2001		6.8	8.0	13.8 (a)	18.9	15.4
2002		6.7	7.9	13.6 (a)	18.8	15.1

Source: Mitchell and Carlson (2001b). Estimates for 2002 are to May although (a) denotes an estimate of the marginal workforce only. The estimate also affects the 2001 and 2002 results for U6a and U6b.
U1 = Persons unemployed 13 weeks or longer, as a percent of the civilian labour force
U3 = official unemployment rate
U4 = Total unemployed, plus discouraged workers, as a percent of the civilian labour force plus discouraged workers
U5 = Total unemployed, plus all marginally attached workers, as a percent of the civilian labour force plus marginally attached workers
U6a = U5 plus underemployed part-time (preferred to work more hours).
U6b = U5 + underemployed part-time (preferred to work more hours and looked for full-time work).

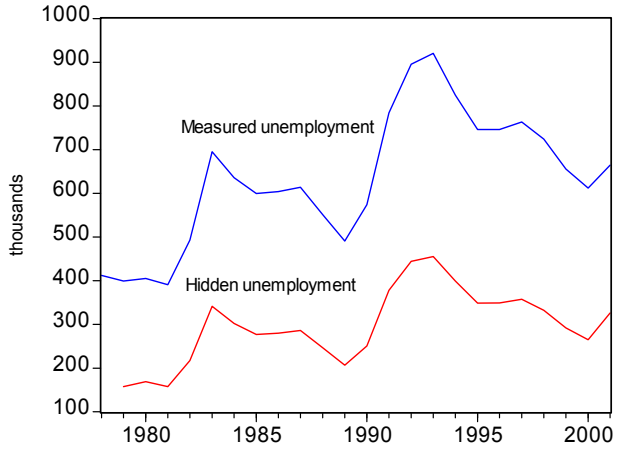
5 Hidden Unemployment

In terms of Figure 2, we noted that although workers were excluded from being counted as in the labour force because they had failed the active search test in the survey, they were in every other way equivalent to an officially unemployed worker. The CLMI estimates of hidden unemployment are derived from regression estimates of the cyclical sensitivity of age-gender labour force participation rates, which allow us to calculate the extra labour force participation that would be forthcoming if the economy was at some assumed 'full employment' level (see Mitchell, 2001b). By multiplying the working age population for each age-gender group by the respective estimated 'participation gap' one gets an estimate of the hidden unemployment (see Perry, 1971). The CLMI hidden

unemployment estimates are thus derived on a different basis as those available from the ABS and discussed above under U4. These estimates can also be converted into hours-based measures using the methodology explained in the Appendix.

In terms of the persons-based estimates, the course of hidden unemployment in Australia since 1978 is compared to the evolution of measured unemployment in Figure 3. The cyclical nature of hidden unemployment is clearly shown with local peaks coinciding with the two major downturns in economic activity over this period. The other disturbing point that emerges from the chart is that the recovery periods following the respective downturns ended with hidden unemployment remaining above its previous low. The patterns of the CLMI estimates are broadly similar to those implied by U4.

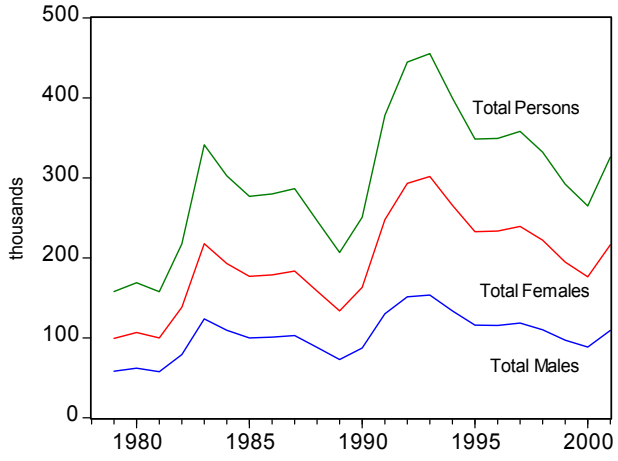
Figure 3 Measured and hidden unemployment, Australia, 1978-2001, thousands.



Source: ABS, The Labour Force, 6203.0 and author's own estimates.

Total estimated hidden unemployment for males and females are shown in Figure 4. Consistent with intuition, females are more prone to hidden unemployment probably because they still face more constraints on their time (combining work and home responsibilities), which means that women's' work remains, in part, instrumental.

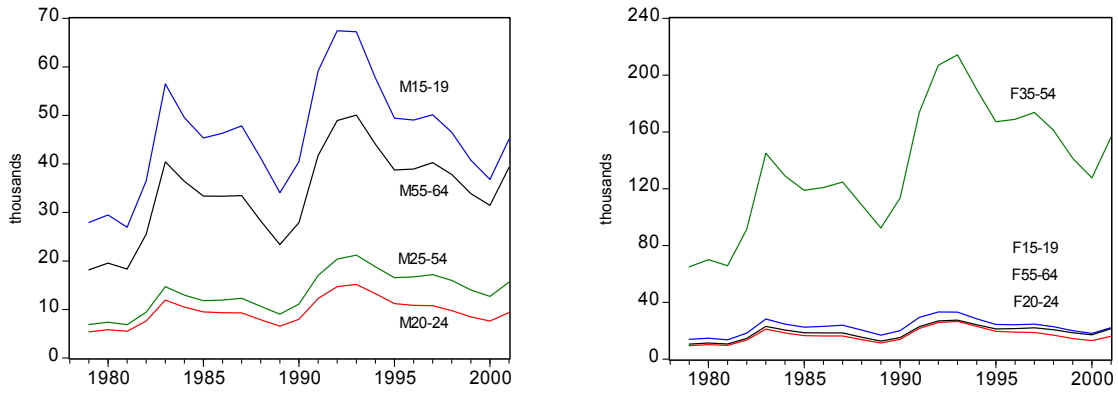
Figure 4 Hidden unemployment, Australia, totals, 1978-2001



Source: Mitchell (2001b).

Once we decompose the gender aggregates by age an interesting picture emerges. The estimates of hidden unemployment for males in 4 age categories: teenagers (15-19 years); 20-24 years; prime-age (25-54); and older workers (55-64) are shown in Figure 5(a). The aggregations were guided by similar behaviour within the disaggregated groups that comprise the categories shown. The evidence is clear that hidden unemployment for males is confined to the two age extremes: the teenagers and the older workers. The cyclical swings and implied asymmetries for these groups are also larger.

Figure 5 Hidden unemployment by age-gender, Australia, 1978-2001, thousands.



(a) Males (b) Females

Note: the Female age groups F15-19, F20-24 and F55-64 are shown as they appear top to bottom.

Similarly, the estimates for females in the same age categories as males are shown in Figure 5(b). The prime-age females account for most of the estimated hidden unemployment for females. Mitchell (2001b) reports that this cohort accounts for around 48 per cent of all estimated hidden unemployment. The cyclical swings and implied asymmetries are also dramatic.

6 Hours-based measures of labour underutilisation

We have concluded that a wider coverage to reflect marginal workers and counts of underemployed part-timers provides a more comprehensive measure of labour underutilisation. However, though the broader measures discussed in the preceding sections provide additional useful information to the official unemployment rate, they are still limited by the fact that they are, variously, percentage relationships derived from ratios of persons. In this section we argue that a more precise measure of labour underutilisation can be constructed in terms of hours and we follow the methodology developed by Mitchell and Carlson (2001a) who computed two new hours-based measures of underutilisation (see Appendix). The measures are:

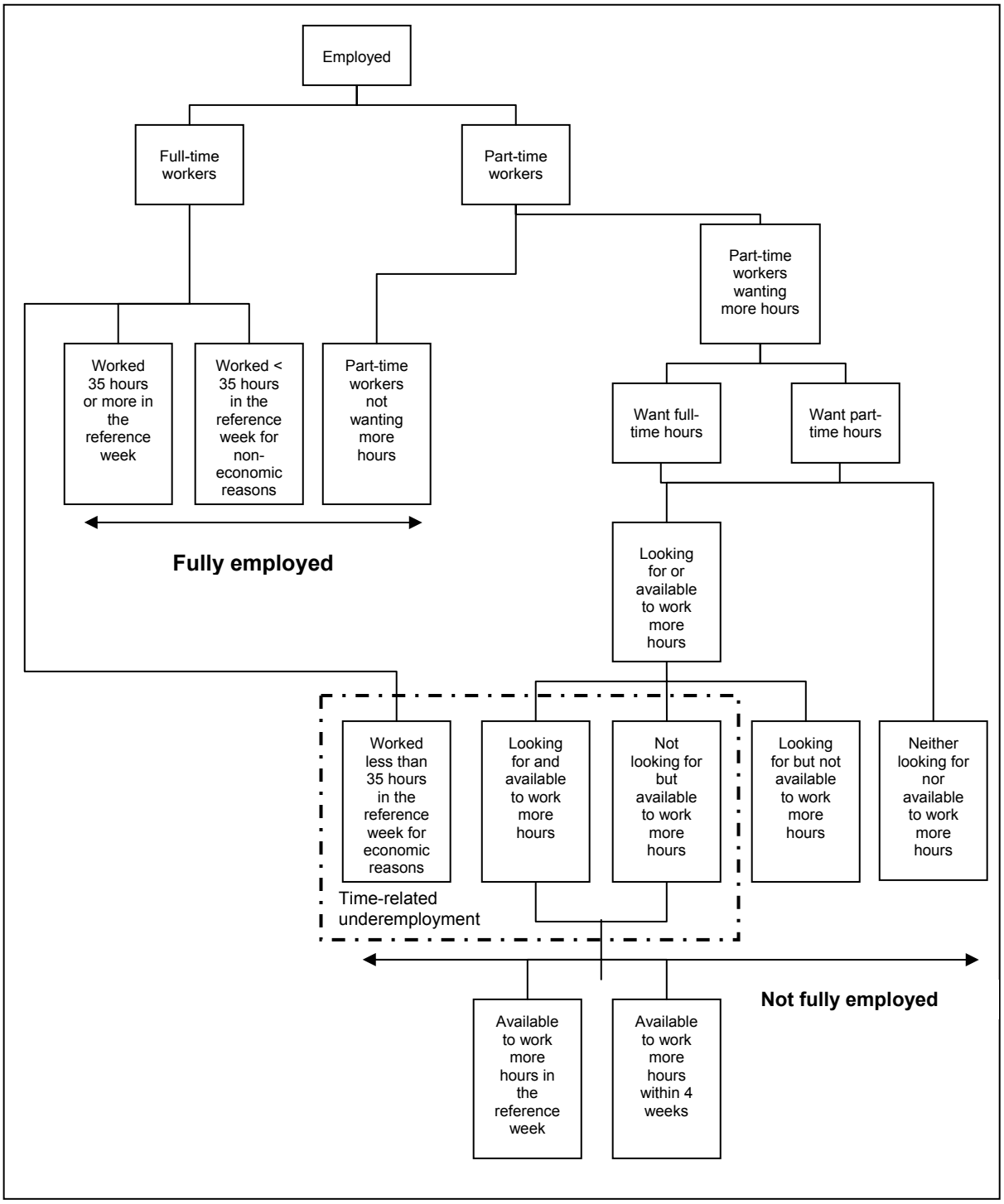
1. An hours-adjusted labour underutilisation rate (CU7) being a ratio of unutilised hours of work available (unemployed and underemployed part-time workers) to the total available (fully-utilised) labour force in hours (the numerator plus the full-time employed plus the part-time workers who are content with their working hours);

2. An hours-adjusted unemployment rate (CU8) including estimates of hidden unemployment from Section 5 (expressed in terms of a percentage ratio with hours on the numerator and denominator); and
3. A derivative measure of underemployment (UE) being the difference between CU7 and the official unemployment rate expressed in hours.

We reproduce the ABS conceptual framework for determining underemployment in Figure 6 as it guides the availability of data that we use to construct our own measures. The major difference between our current estimates of underemployment and those published in Mitchell and Carlson (2001a) relate to data availability on persons who worked less than 35 hours in the reference week for economic reasons. We now include them in the underemployment estimates. Initially we distinguish between part-time workers who do not want to work more hours and those who prefer more hours. The latter are then considered to be underemployed by varying degrees. The task is then to determine the distribution of the extra hours that are preferred.

The new indicators are compared with the official unemployment rate, U3 in Figure 7. Being hours-based measures, CU7 and CU8 distinguish between full-time and part-time employment, and take into account the fact that a substantial number of part-time workers (and in CU8 the hidden unemployed) are frustrated by their failure to gain full-time work or more part-time hours. CU8, the hours-based measure augmented by estimates of hidden unemployment is the most comprehensive measure of underutilisation and underemployment. It is clear that the both of the hours-adjusted unemployment rates (CU7 and CU8) are substantially higher than the official rate indicating that the extent of underutilisation (and underemployment) is large. The gap between U3 and CU7 has risen since 1980, which indicates that a proportion of jobs created have been part-time but with less than desired hours on offer. The frustration of workers with less than desired hours of work available is latent in the hidden unemployed as well. The gap between CU7 and CU8 reflects the magnitude of hidden unemployment and the hours-aspirations of the hidden unemployed. The underutilisation arising from cyclical sensitive participation effects is pronounced with the gap between the measures at its maximum during recession (3.6 percentage points at the 1982 and 4.4 percentage points in 1992). The gap narrows as the economy achieves higher levels of activity (2.1 percentage points at the 1989 cycle peak and 2.3 percentage points in 2000). In the June quarter 2002, the inclusion of hidden unemployment (counted in hours) adds 2.2 percentage points to U3. It has narrowed marginally since the recession in the early 1990s, which suggests that there are fewer persons classified as being not in the labour force that desire and are willing to work. Overall, the results are consistent with the conclusions reached using the U1-U6b indicators in Table 1. They all indicate substantial labour resource wastage in the Australian labour market.

Figure 6 ABS conceptual framework for underemployment

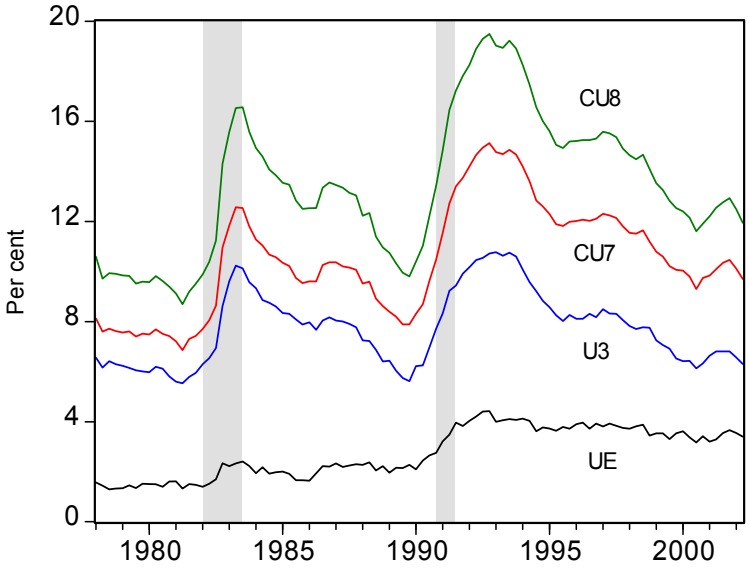


Source: ABS (2001a: Table 5.3, page 59).

While U3, CU7 and CU8 show similar cyclical patterns with pronounced cyclical asymmetry and hysteresis, UE resembles a step function with the jumps coinciding with the major downturns over this period. The labour resource wastage rises in an economic downturn not only because unemployment rises but also because hours of work are

rationed and an increased number of workers are unable to work as many hours as they would prefer. The losses are compounded by the falling labour force participation rates captured by CU8. As the economy increases activity, more employed workers find full-time hours of work, the participation rate stabilises at a higher level, and the absolute number of unemployed falls. The indicators are clearly leading indicators for the peak in real GDP, although UE also led the other indicators into the recession of 1991 with CU8 then U3 rising in that order. This suggests that firms adjust working hours first and labour participation reacts to declining job offers before lay-offs and unemployment rises. Interestingly, in the 1991 downturn, the indicators keep rising long after the trough in real GDP with the asymmetries more apparent in the hours-based measures. More research is needed in this area.

Figure 7 The official unemployment rate and the hours-based indicators, 1978-2002



Source: ABS Labour Force, 6203.0 and CLMI (Mitchell and Carlson, 2001b). The shaded areas coincide with the peak and trough of real GDP growth in 1982:1 to 1983:3 and 1990:4 to 1991:3.

Table 3 summarises the basic statistics for the indicators in addition to the growth rates in real GDP, employment, the labour force and labour productivity measured in hours over the last four major Australian business cycles. The dating of the cycles is outlined in Mitchell (2001a) and is based on real GDP growth movements. The growth rates are related to unemployment via approximate accounting relationships (Okun relationships). Further, the aggregate unemployment is the sum of short-term and long-term unemployment; CU8 minus CU7 equals hidden unemployment; and underemployment (UE) equals CU7 minus an hours-based measure of the unemployment rate.

Over each successive cycle the low-point unemployment rate has increased indicating that hysteresis is present. More worrying is the behaviour of the broader indicators which have also ratcheted upwards over the cycle. In sum, after each cycle has created and destroyed jobs, the level of underutilisation that remains is higher than it was at the same point in the previous cycle.

Rule of thumb Okun arithmetic says that the growth in GDP should match the growth in the labour force and the growth in labour productivity in order for the unemployment rate to remain unchanged. The large rise in the unemployment rate over Cycle 2 is strongly connected to the insufficient real GDP growth over that period. When the GDP gap was the largest, employment growth was very modest and there was the greatest rise in the mean value of the unemployment rate between any two successive periods.

Table 3 Properties of CLMI and other relevant aggregates over successive cycles

Cycle		Person-based (%)			Hours-based (%)				Annual Growth Rates (%Δpa)			
		UR	STU	LTU	HU	UE	CU7	CU8	GDP	EMP	LF	LPH
Cycle 1 1966:3 1974:2	Mean	2.0							5.1	2.7	2.8	2.6
	Max	3.0										
	Min	1.6										
	CoV	16.4										
Cycle2 1974:3 1983:2	Mean	5.9							2.1	0.8	1.6	2.1
	Max	10.2										
	Min	2.8										
	CoV	23.3										
Cycle 3 1983:3 1991:3	Mean	7.8	5.8	2.0	3.0	2.3	10.1	13.0	3.5	2.4	2.4	1.1
	Max	10.1	7.3	2.8	4.0	4.0	13.4	17.2				
	Min	5.6	4.4	1.3	1.9	1.6	7.9	9.8				
	CoV	14.8	13.7	23.1	18.5	21.5	13.4	14.5				
Cycle 4 1991:4 2002:2	Mean	8.4	5.9	2.5	3.2	3.8	12.1	15.4	3.6	1.6	1.4	2.1
	Max	10.8	7.4	3.8	4.4	4.4	15.1	19.5				
	Min	6.1	4.6	1.4	2.2	3.2	9.3	11.6				
	CoV	17.4	13.6	28.8	21.0	7.9	14.2	15.6				

Source: ABS Ausstats, CLMI (Mitchell and Carlson, 2001a). CoV is the coefficient of variation expressed as a percentage. The cycles are defined as the periods from the preceding to the next trough in real GDP. UR is the official unemployment rate (U3); STU is the short-term unemployment rate defined as spells under 52 weeks; LTU is the long-term unemployment rate defined as spells over 52 weeks; HU is hours based hidden unemployment, UE is hours based underemployment; CU7 and CU8 are defined in the text; GDP is the annual growth in real GDP; EMP is the annual growth in employment; LF is the annual growth rate of the labour force; and LPH is the annual growth in labour productivity measured in hours.

In Table 3 we can see a mean shift in underemployment from 2.3 in Cycle 3 to 3.8 in Cycle 4. Yet, over Cycle 4, its coefficient of variation is relatively low (7.9 per cent), which lends support to the view that the 1990's consolidated the changes in working arrangements with an increasing proportion of part-time work arrangements. The other aspect that is worth noting is that underemployment is now becoming an increasing issue. Employment growth now produces increasingly fractionalised jobs that are frustrating an

increasing percentage of workers (although accurate estimates of underemployment are not available prior to 1978). Full-employment is an option that is now unavailable to an increasing number of workers, despite their preferences.

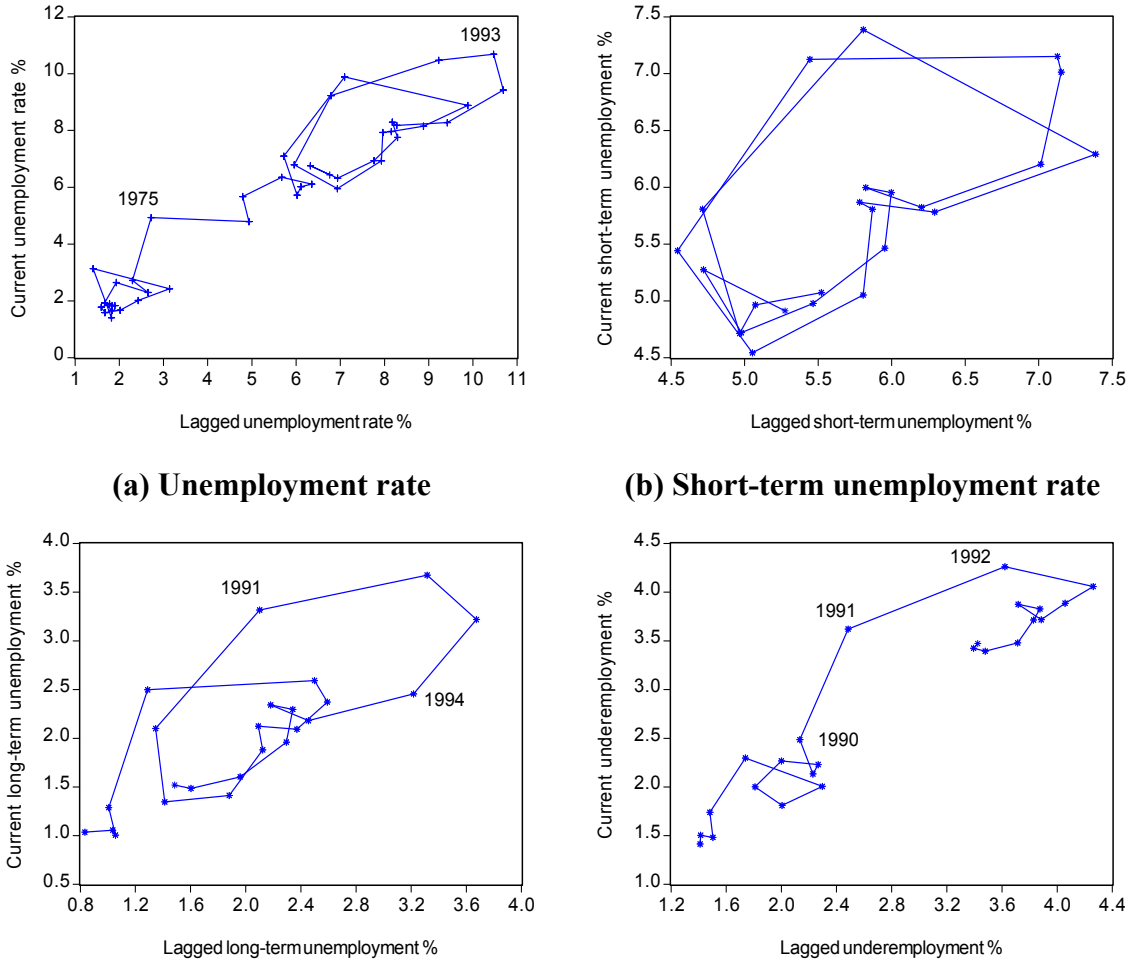
7 Non linear cyclical behaviour

7.1 Phase diagram analysis

Phase diagrams which plot current values of a time series on the *y*-axis against the lagged value of the same series on the *x*-axis are a useful exploratory tool (see Mitchell, 2001a, 2002; Ormerod, 1994). First, they indicate the presence of cycles in the data. Second, they indicate the presence of "attractor points … [as the] … centre of the ellipses traced out" in the plot (Ormerod, 1994: 154). Third, the size of an ellipse indicates the magnitude of the cycle. Fourth, the persistence of an attractor can be determined by examining the extent to which it disciplines the cyclical observations following a shock. Weak attractors are dominated by the shock and the relationship shifts until a new attractor point asserts itself. Mitchell (2002) shows that the unemployment attractor in Australia shifted in the 1974-76 period and the two subsequent recessions have oscillated around this higher point with varying cyclical magnitude. The economy also takes several years to recover from a large negative shock even when the attractor remains constant. For the vacancy rate the 1974-75 disturbances in the unemployment rate attractor in Australia also promoted a shift in the attractor, although in this case the movement was downwards. These shifts confound supply-side analysis which interprets the unemployment shift (see Figure 9(a)) as a decline in labour market efficiency, whereas the inward shift in the vacancy relationship using the same logic would be interpreted as increasing matching efficiency. Clearly, both states cannot hold. A consistent interpretation is that the Australian economy has been demand constrained since the mid-1970s. The rapid rise in unemployment in 1974 was so large that subsequent (lower) real GDP growth with on-going labour force and productivity growth could not reverse the stockpile of unemployed (Mitchell, 2001a). Whatever endogenous supply effects that may have occurred in skill atrophy and work attitudes were not causal but reactive.

Phase diagrams for the unemployment durations and underemployment are produced in Figure 9 from 1978 to 2002 (with the unemployment rate for 1960-2002 also shown in 9(a)). It would be reasonable to assume that a longer series for short-term unemployment than is available would follow the non-linear pattern of the aggregate rate given that duration was not an issue in the 1960s and 1970s. The 1982 and 1991 recessions produced similar cycles for the STUR but the duration effects are clear in the second recession for the LTUR. The interesting insight is gained from 9(d) which shows that the attractor for underemployment shifted in the 1991 recession and a new higher level has been established. These results are consistent with the view that the Australian economy has shifted some of the manifestations of demand deficiency from unemployment into underemployment. They also emphasise why it is essential to compute broader measures of underutilisation to enable these shifts to be shown. There is also strong evidence that the non-linearity episodes are prompted by large negative demand shocks (see Mitchell, 2002 for further econometric analysis).

Figure 9 Phase relationships for underutilisation measures



(a) Unemployment rate **(b) Short-term unemployment rate**

(c) Long-term unemployment rate **(d) Under-employment**

Source: see Table 3. The sample for the unemployment rate is from 1960 to 2002, whereas for the other time series it is from 1978 to 2002.

7.2 Exploring the non-linearity further

If we view the shifts in attractor points in the phase diagrams as endogenous events then they depict non-linear time series behaviour. In this section, we use the Current Depth of Recession (CDR) approach (Beaudry and Koop, 1993) to test the asymmetry in the response of the underutilisation measures to negative and positive shocks, specifically, that negative shocks impact more strongly than positive shocks (see Mitchell, 2002 for further discussion). We follow Parker and Rothman (1998) who construct the CDR variable for the unemployment rate as:

$$CDR_t = \min\left\{U_{t-s}\right\}_{s=0,..,5} - U_t$$

The difference between this approach and the Beaudry and Koop (1993) construction reflects the fact that the unemployment rate is a cyclical variable with no evidence of a strong trend. Accordingly, we define the minimum as the lowest value for the last 6

quarters (a local minimum). CDR is then the difference between this value and the actual unemployment rate. The lag for the minimum is experimental and our results are not significantly different when using 8, 10 and 12 lags. When the unemployment is above this local minimum, the CDR variable is negative and measures the depth of recession. We construct similar variables for the other measures of underutilisation examined.

The CDR impact is tested as an added variable to a linear autoregressive model (see Parker and Rothman, 1998). Full comparisons between the CDR model and a linear AR model for unemployment are presented in Mitchell (2002). In this paper, we present the results of the CDR regression and draw out the implications. The preferred equations for the five measures of underutilisation, the official unemployment rate (UR), the short-term unemployment rate (STUR), the long-term unemployment rate (LTUR), hidden unemployment (HU) and underemployment (UE) are presented in Table 4. In each case, the lag order was determined by reference to AIC and the CDR model provides a reduction in residual variance compared to the tested-down linear AR model. The results confirm the presence of the asymmetric CDR effect of varying degrees of magnitude for all measures. The significant negative CDR coefficient indicates that the measure increases quickly in recessions, but declines relatively more slowly during expansions. The coefficient magnitude measures the strength of asymmetry. The impact of the shock also depends on the current state of the labour market. A depressed labour market that is confronted with restrictive macroeconomic policy will be driven deeper into sustained underutilisation. Finally, the cyclical non-linearity has greater adverse consequences for the marginal labour force workers (long-term unemployed and hidden unemployed).

Table 4 CDR regression results for underutilisation indicators, Australia

	UR	STUR	LTUR	HU	UE
Sample	1961:1 to 2002:2	1979:3 to 2002:2	1979:3 to 2002:2	1979:3 to 2002:2	1979:3 to 2002:
Constant	0.001	0.007	0.001	0.223	0.092
	(1.68)	(3.22)	(3.42)	(3.23)	(1.46)
LDV(-1)	0.98	0.86	0.90	0.91	0.73
	(102.2)	(21.2)	(42.9)	(37.9)	(5.80)
LDV(-2)					0.24
					(1.94)
CDR(-1)	-0.118	-0.187	-0.234	-0.217	-0.147
	(3.80)	(3.65)	(6.82)	(6.21)	(2.08)
R^2	0.99	0.89	0.97	0.96	0.96
s.e./mean	5.96%	4.72%	6.03%	4.81%	6.83%

t-statistics in parentheses, s.e./mean is the standard error of the regression as a percentage of the mean of the dependent variable.

8 Labour underutilisation and the inflation process

A useful economic application of the underutilisation measures is to consider the role they might play in the inflation process given that in the context of the Phillips curve,

excess labour supply is a key variable constraining wage and price changes. In this context, there are several interesting testable hypotheses that link the measures to the inflation process. First, the standard Phillips curve model predicts a significant negative coefficient on the official unemployment rate (a proxy for excess demand) and nominal homogeneity (to derive a unique NAIRU). Given homogeneity of labour is assumed, we might expect the broader measures of underutilisation to have a stronger negative effect on inflation if this model was meaningful. Second, the hysteresis model suggests that state dependence is positively related to unemployment duration and at some point the long-term unemployed cease to exert any threat to those currently employed. Consequently, they do not discipline the wage demands of those in work and do not influence inflation. The hidden unemployed are even more distant from the wage setting process. So we might expect that the short-term unemployment is a better excess demand proxy in the inflation adjustment function. If the long term unemployed do not place pressure on inflation, then, at best only a unique level of short-term unemployment consistent with stable inflation may exist. The uniqueness of this level depends on other aspects of the inflationary process, in particular whether the estimated models are nominally homogenous and whether hysteresis is present in the short-term unemployment rate or not (see Fair, 2000; Mitchell, 2001a). Third, while the short-term unemployed may be proximate enough to the wage setting process to influence price movements, our indicators show that there is another significant and even more proximate source of surplus labour available to employees to condition wage bargaining – the underemployed. This pool of hours can be clearly redistributed among a smaller pool of persons in a relatively costless fashion if employers wish. It is thus reasonable to hypothesise that the underemployed pose a viable threat to those in full-time work who might be better placed to set the wage norms in the economy. The argument that wage determination is dominated by 'insiders' (the employed) who set up barriers to isolate themselves from the threat of unemployment is echoed in earlier Australian work that found 'within-firm' excess demand variables (like the rate of capacity utilisation or rate of overtime) to be more significant in disciplining the wage determination process (see Watts and Mitchell, 1990). It is plausible that while the short-term unemployed may still pose a more latent threat than the long-term unemployed, the underemployed are also likely to be considered an effective surplus labour pool. In that case we might expect downward pressure on price inflation to emerge from both sources of excess labour.

This raises an interesting parallel to another aspect of the hysteresis hypothesis. Ball (1999: 230) argues that "hysteresis is reversible: a demand expansion can reduce the NAIRU" because "they … [employers] … would rather pay the training costs than leave the jobs vacant." A similar observation underpins the hysteresis models in Mitchell (1987, 1993). In a high pressure economy, firms lower hiring standards and address the skill deficiencies of the long-term unemployment by offering on-the-job training. Mitchell and Muysken (2002a) demonstrate using gross flows data that when employers access both the short-term and long-term unemployed pools in an expansion yet the long-term unemployed do not exert much influence on the inflation process. They argue that the labour market is structured in a way that increasing low-skill, low-pay fractional (part-time) jobs are being created which overcome the re-employment barriers facing the long-term unemployed. The 'primary' and 'secondary' jobs are functionally related (the secondary jobs allow firms to make adjustments to demand fluctuations, for example,

without disturbing the employment structure of the primary labour market. Thus when employment growth is strong enough both pools of unemployed find employment opportunities. So while the long-term unemployed do have employment opportunities in an expansion they are in jobs that do not set the wage norms. However, once they become re-attached to the employed labour force, they may influence wage setting via underemployment, given that they will often only have part-time jobs available to them. As part-timers with some in-house training they become an entirely different proposition than when they were facing skill atrophy and motivation loss after more than 12 months without work.

This discussion leads to two major hypotheses:

1. That the short-term unemployment rate (STUR) constrains the annual inflation rate more than the overall unemployment rate (UR)? By implication we expect the long-term unemployment rate (LTUR) to be a statistically insignificant influence on the annual inflation rate.
2. That the degree of underemployment (UE) exerts a separate negative impact on the inflation process.

Following Mitchell (2001a), we use a general autoregressive-distributed lag Phillips curve representation like:

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

where $\dot{p}_t$ is the rate of inflation, u is the unemployment rate, z is a cost shock variables (like import price inflation, capital costs), and the ε is a white-noise error term.

The parameterisations of the excess demand variable that we consider are all assumed to be $I(0)$ variables given they are bounded and are:

(a) The official unemployment rate (*UR*). In each case (following Gruen *et al*, 1999) we tried four-quarter moving average representations of the underutilisation variable to match it with the annualised change in the dependent variable. The high persistence in the underutilisation series means the results are very similar and are not reported;

(b) The level of the short-term unemployment rate (*STUR*) defined by ABS as those unemployment for less 52 weeks as a percentage of the total labour force;

(c) The level of the underemployment (*UE*) computed from the CLMI as explained above; and

(d) The difference between the levels and the filtered trend derived using a Hodrick-Prescott filter The variables created are *UR Gap* and *STUR Gap*. This construct is now commonly used and has been referred to in papers by the OECD and others as a test of the TV-NAIRU hypothesis (Boone, 2000; see also Mitchell, 2001a for more detail). We examine the validity of this inference below.

Within a similar framework to Equation (1), Fair (2000), Mitchell (2001a), and Mitchell and Muysken (2002a, 2002b) find evidence that the estimated Phillips curve does not exhibit dynamics consistent with a constant NAIRU. They use a simple homogeneity test based on the lagged inflation term(s). Connolly (2001) has suggested that if the

dependent variable is specified in an annual change form, the inclusion of lagged dependent variable biases this test towards accepting the null (of homogeneity). In practical terms, this argument may only matter if the test result is close. Mitchell (2001a) and Connolly (2001) have both found that the NAIRU dynamics in Australia are clearly absent.

We initially develop a Phillips curve model for Australia using 4 lags on the annualised inflation terms (*D4LP*) and import prices (*D4LPM*), the level of the unemployment rate, a dummy variable, *DGST* (defined as 1 in 2000:3 and zero otherwise) to take into account the introduction of the Goods and Services Tax system in Australia in July 2000. We also test other influences that have been mentioned in the literature, by including variables to capture the cost of capital, interest spread, and payroll taxes and the like (Phelps, 1994, Modigliani, 2000). The other variables were not significant in the final tested-down specification. Using standard unit root tests (ADF and KPSS) we find that the inflation and import price inflation series are $I(1)$ and that they co-integrate, meaning that we can use them in a regression with stationary variables like the underutilisation measures. To some extent, our analysis ignores any broader interaction between cointegration and the related error correction dynamics. The statistical validity of the exercise is to be judged by the diagnostic performance of the models. Sequential testing down from the general equation using different measures of the underutilisation variable yielded the results shown in Table 5. In each case, the dynamics were so close and the coefficient estimates for the other variables were highly stable that a common specification is employed to aid comparison. In general, the diagnostics of all equations were satisfactory apart from some evidence of fourth-order serial correlation, which could reflect the four-quarter change specification. An AR(4) correction did not alter the estimates significantly in any equation. The results reported are the uncorrected estimates.

Equation (5.1) in Table 5 describes a typical Phillips curve using the aggregate unemployment rate (*UR*). The unemployment rate exerts a negative influence on the rate of inflation (-0.165). The added effect of the underemployment variable (*UE*) is depicted in Equation (5.2). It is statistically significant which indicates that it exerts negative influence on annual inflation with the negative impact of the *UR* being reduced. In Equation (5.3), the degree of negative pressure on inflation exerted by the highly significant *STUR* is -0.353, substantially above that estimated for *UR*. When UE is added it is statistically significant and attenuates the negative impact of *STUR* (Equation 5.4).

Equations 5.5 to 5.8 utilise the gap specification for the excess demand variable. Mitchell (2002) argues that the NAIRU concept remains on shaky theoretical grounds. The original theory underpinning the NAIRU provides no guidance about its evolution although, unspecified structural factors should be involved to remain faithful to that theory. In this theoretical void, econometricians use techniques that allow for a smooth evolution although there is no particular correspondence with any actual economic factors. Some authors assert that a Hodrick-Prescott filter through the actual series captures the TV-NAIRU (for example Boone, 2000 among many). Of-course, the Hodrick-Prescott filter merely tracks the underlying trend of the unemployment and follows it down just as surely as it follows it up. The unemployment rate is highly cyclical and the TV-NAIRU proponents are silent on this apparent anomaly – why do the alleged structural factors cycle with the actual rate?

Table 5 Phillips curve regressions, Australia, 1978:1 to 2002:2

	Eq 5.1	Eq 5.2	Eq 5.3	Eq 5.4	Eq 5.5	Eq 5.6	Eq 5.7	Eq 5.8
C	0.02	0.03	0.02	0.03	0.00	0.01	0.00	0.02
	(4.22)	(4.1)	(3.69)	(4.37)	(1.34)	(2.24)	(2.20)	(3.03)
ΔLP(-1)	0.88	0.79	0.90	0.82	0.91	0.83	0.89	0.80
	(29.8)	(18.2)	(33.4)	(18.2)	(35.4)	(19.1)	(31.9)	(19.1)
UR	-0.165	-0.099						
	(3.89)	(1.45)						
STUR			-0.353	-0.233				
			(3.55)	(2.10)				
UR Gap							-0.489	-0.322
							(4.27)	(3.21)
STUR Gap					-0.637	-0.504		
					(4.60)	(3.33)		
UE		-0.004		-0.003		-0.003		-0.004
		(2.56)		(2.23)		(1.98)		(2.67)
ΔLPM	0.04	0.04	0.05	0.05	0.06	0.05	0.05	0.05
	(2.90)	(3.46)	(4.36)	(3.65)	(4.84)	(4.12)	(3.91)	(4.15)
ΔGST	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	(2.18)	(2.74)	(2.46)	(2.67)	(2.73)	(2.84)	(2.01)	(2.78)
R^2	0.941	0.947	0.945	0.948	0.949	0.9518	0.942	0.9515
SE %	15.1	14.5	14.7	14.4	14.1	13.9	14.9	13.9
SC(1)	0.108	0.063	0.321	0.132	0.807	0.455	0.381	0.247
SC(2)	0.106	0.015	0.199	0.045	0.707	0.347	0.365	0.147
SC(4)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ARCH	0.469	0.960	0.729	0.987	0.877	0.591	0.069	0.778
RESET	0.110	0.784	0.875	0.757	0.852	0.792	0.445	0.682
NAIRU	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ADF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: SC(n) is the Breusch-Godfrey Serial Correlation LM(n) test, ARCH is a 1th order test for Autoregressive conditional heteroscedasticity, RESET is the Ramsey RESET test with 2 added terms, NAIRU is the Wald Test for homogeneity and ADF is a unit root test on the residuals from the regression. All these tests are reported as prob values. SE% is the standard error as a percentage of the mean of the dependent variable and *t*-statistics are in parentheses.

Equations (5.5) and (5.6) compare *STUR Gap* with and without the *UE* variable. The results suggest that: (a) underemployment plays a significant constraining influence on inflation independent of the unemployment; (b) STUR Gap is highly significant and a 1 per cent deviation above the filtered value leads to a 0.5 per cent slowdown in the annual inflation rate; and (c) the specification is improved on Equations (5.1) to (5.4). In Equation (5.7) and (5.6) we make a similar comparison using the *UR Gap* variable. The preferred equation of the two includes *UE*. The constraining influence of the UR Gap variable is also smaller (in that it includes *LTU*). There is a minor preference for Equation (5.6) over Equation (5.8).

The different values of the coefficients on the *STUR* and *UR* variables suggest the following dynamics are plausible. A downturn increases short-term unemployment

sharply, which reduces inflation because the inflow into short-term unemployment is comprised of those currently employed and active in wage bargaining processes. In a prolonged downturn, average duration of unemployment rises and the pressure exerted on the wage setting system by unemployment overall falls. This requires higher levels of short-term unemployment being created to reach low inflation targets with the consequence of increasing proportions of long-term unemployment being created. In addition, as real GDP growth moderates and falls, underemployment also increases placing further constraint on price inflation. The results taken together provide support for the hypotheses (1) to (2) outlined above.

An additional finding is that a long-term trade-off between unemployment and inflation is implied in all regressions. The NAIRU dynamics test statistic shown in Table 5 allows us to easily reject the null that the sum of the coefficients on the lagged inflation terms is unity in all regressions. In that sense, we would reject the constant NAIRU hypothesis.[7] So even though the short-term unemployment rate is relatively more effective in controlling inflation, there is no convergence to a constant equilibrium rate of short-term unemployment after an employment shock. The transitory equilibrium short-term unemployment rate is contingent on the evolution of employment growth and demand in general. The results indicate that a deflationary strategy using demand repression (tight monetary and fiscal policy) will be costly in terms of unemployment.

9 Conclusion

In this paper we computed a range of measures of underutilisation for Australia, including underemployment using BLS concepts and concluded that they provide a richer picture of the state of the labour market than would have been gained if we relied on the unemployment rate as our sole measure. 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.

However, the persons-based indicators do not tell us anything about the foregone working hours associated with the labour underutilisation. In that regard, we outlined and discussed the two major hours-based indicators of labour market utilisation, which are the basis of the CLMI database. We argued that they provide a more accurate guide to the state of resource usage than the conventional unemployment rate. The two measures CU7 and CU8 are defined in terms of hours lost by underemployment and hidden unemployment, respectively.

The indicators taken together show that the Australian economy has failed to generate enough jobs and enough hours of work over the last 25 years or so and now wastes over 12 per cent of its available labour resources. If we include marginal workers other than the discouraged, then the wastage is significantly higher.

In terms of economic policy, the bevy of active labour market programs have not arrested the upward trend in labour underutilisation and should be reduced in priority in favour of public job creation and other demand stimulus programs.

Appendix

Derivation of Hours-adjusted unemployment rates

There are two hours-adjusted measures of the unemployment rate presented in this paper:

1. Hours-adjusted unemployment rate (CU7) which estimates the impact of underemployment of part-time workers, who want to work more hours than they are currently working;
2. Hours-adjusted unemployment rate with hidden unemployment (CU8), which is equal to CU7 plus an estimate (in hours) of the unused resources currently not counted in the labour force but still willing to work – the so-called hidden unemployed. The hidden unemployment estimates are explained in Mitchell (2001b); and
3. A derivative measure of underemployment (UE) is then possible by decomposing CU7 into its separate components.

Hours-adjusted labour underutilisation rate

The formula for the hours-adjusted labour underutilisation rate (CU7) is given as:

$$(1) \qquad \text{CU7} = \frac{PTE_{UH} + UN_{FT} + UN_{PT} + E_{FT<35}}{FTE + PTE_{H} + PTE_{UH} + UN_{FT} + UN_{PT} + E_{FT<35}}$$

where UN_{FT} is the number of unemployed who want full-time work multiplied by the average full-time working hours, UN_{PT} is the number of unemployed workers who want part-time work multiplied by average part-time working hours, PTE_{UH} is the number of part-time workers who want to work full-time expressed in hours as explained below, PTE_{H} is the number of part-time workers who do not want to work more hours multiplied by the hours they are currently working, FTE is total full-time workers multiplied by the average full-time working hours, and $E_{FT<35}$ is the total full-time workers who are forced to work less than 35 hours per week for economic reasons. The numerator and denominator of CU7 are in hours and the ratio is a percentage.

Computing PTE_{UH} and PTE_{H}

The part-time workers are divided into those who want more hours and those who don't wish to work more hours. The part-time workers who are content are divided by the ABS into 4 hours-bands: 0 hours per week, 1-15 hours per week, 16-29 hours per week, and 30-34 hours per week. Average hours per week for each hours-band are also published. The total part-time hours in this category then equals the number of workers in each category multiplied by the relevant average hours. For the workers in the 0 hours per week band, we treated them as if they were in the 1-15 hours-band. The latter assumption provides some downward bias in the measure. The sum of these individual products is the total hours of part-time workers who are content with the number of hours they are working. These part-time workers are therefore not construed as being underemployed.

The part-time workers who want more hours are divided into two groups: those who want to work full-time and those who did not look for full-time work. The ABS also publishes

the numbers of these workers in the hours bands denoted above. For the part-time workers who wanted more hours but did not look for full-time work, we assumed they wanted to be in the next higher hours-band than they were currently working in. Underemployment then is the number of workers in this group expressed in each hours band times the average hours of the part-time workers (who are content) in the next higher hours band minus the actual hours they are currently working. The individual products are summed. The workers in the 0 hours band are treated as before. This generates the first component of underemployed part-time work in hours. The underemployment of the part-time workers who want to work full-time is the number of workers in each hours-band times the average weekly full-time hours minus the hours they are actually working. The individual products are summed. The workers in the 0 hours band are treated as before. This generates the second component of underemployed part-time work in hours. Total underemployment is the sum of these components.

Computing $UN_{FT} + UN_{PT}$

The actual unemployed are divided into those who want full-time work and those who do not. The underutilised hours for those who want full-time work equals the total persons in this category times the average weekly full-time hours. For those currently unemployed who want part-time work, their underutilised hours are computed by multiplying the number of unemployed in this category by average part-time hours worked. This gives total unemployment in hours

Computing FTE

This is the number of full-time workers times the average full-time working hours.

Computing $E_{FT<35}$

The ABS publishes data for full-time employed persons who worked less than 35 hours by reason worked less than 35 hours and hours worked. The numbers of workers in relation to the actual hours worked are published in hour bands of 0, 1-15, 16-29, and 30-34. The reasons given for working less than 35 hours can be broken down into economic (working less than 35 hours because of 'Bad weather, plant breakdown' or 'Stood down, on short time, insufficient work') and non-economic. The 'hours gap' was then computed by multiplying the number of workers in each band who were constrained by economic reasons by 35 hours and subtracting the actual hours that they had actually worked.

Hours-adjusted unemployment rate with hidden unemployment

The formula for the hours-adjusted unemployment rate (CU8) is given as:

$$\text{(2)} \qquad \text{CU8} = \frac{PTE_{UH} + UN_{FT} + UN_{PT} + E_{FT<35} + HU_{FT} + HU_{PT}}{FTE + PTE_{H} + PTE_{UH} + UN_{FT} + UN_{PT} + E_{FT<35} + HU_{FT} + HU_{PT}}$$

where the additional terms are HU_{FT} the estimated discouraged workers who want to work full-time times the average full-time working hours, and HU_{PT} is the estimated number of discouraged workers who want to work part-time times the average part-time working hours. We used the proportions that apply to the official unemployed to allocate the estimated hidden unemployed between the two categories.

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Notes

[1] The authors are Professor of Economics and Director of the Centre of Full Employment and Equity, The University of Newcastle; and Senior Researcher, Centre of Full Employment and Equity, The University of Newcastle, respectively.

[2] According to the ABS (2001b: 74) " this definition is consistent with that suggested by the international guidelines, and involves relaxing the criteria used to determine unemployment in the Labour Force Survey as follows: (a) persons meeting the criteria wanting to work, actively looking for work, not available to start work would have been classified as unemployed if the unemployment criterion 'currently available for work' had been waived; (b)persons meeting the set of criteria wanting to work, not actively looking for work, available to start within four weeks, would have been classified as unemployed if the unemployment criterion 'active job search' had been waived and the criterion 'currently available for work' had been relaxed to include the next four weeks. The circumstances which would permit people to start a job are likely to differ between people in the labour force and those not in the labour force. Accordingly, a reference period of four weeks for the availability criterion is adopted rather than current availability, as for the unemployed. The strict definitions vary between countries. Concerning availability, in Australia persons must be available in the next four weeks; in the US they must be available for work in the same week.

[3] In Australia persons are classified as discouraged jobseekers if they want to work, are available for work in the next four weeks but are not actively looking for work (have not looked in the last 4 weeks) for one of the following reasons: considered too young or too old by employers; lacked necessary training, skills or experience; difficulties with language or ethnic background; no jobs in locality or line of work; or believe there are "no jobs at all". (ABS, 2001a).

[4] See Mitchell and Carlson, 2001a for a full explanation of the differences between these and the BLS measures.

[5] The difference between the estimates appearing in the ABS publication 6220.0 Persons Not in the Labour Force and the publication 6203.0 Labour Force, Australia are "chiefly the result of excluding persons aged 70 years and over from estimates appearing in th[e] supplementary survey publication [6220.0]. This is in line with the scope of this supplementary survey. [In 1999] Over one-quarter (32%) of the civilian population aged 15 years and over who were not in the labour force were excluded from answering questions from this supplementary survey because they were aged 70 years and over." (ABS, 1999: 34) It should also be noted that the Not in the Labour Force survey "excludes persons in institutions (e.g. boarding schools, hospitals, prisons, retirement homes, homes for the handicapped), which are included in estimates of persons not in the labour force contained in Labour Force, Australia." (ABS, 1999: 34).

[6] See Mitchell and Carlson (2001a) for a full discussion.

[7] Mitchell (2001a) tested for NAIRU dynamics in similarly derived Phillips curve models for Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States. There was 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.