PERSISTENCE IN REGIONAL HIDDEN UNEMPLOYMENT DISPARITIES IN AUSTRALIA

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ABSTRACT: The purpose of this study is to investigate persistence in regional (state) hidden unemployment disparity in Australia. Quarterly time series data spanning the period 1978 through to 2003 were employed in the analyses. Empirical results indicate that cyclical sensitivity of hidden unemployment series is more pronounced in Tasmania and least pronounced in New South Wales. The hidden unemployment differentials appear to be more pronounced during periods following a recession than in a boom. Results also indicate that the levels of hidden unemployed were higher in the 1990s compared with the 1980s. Co-integration analyses indicate a lack of synchronicity of regional and national hidden unemployment series in Australia.

1. INTRODUCTION

Over the last three decades, persistently high unemployment has been one of the major economic and social problems in most OECD countries. The unemployment rates have varied widely across OECD countries and from one decade to another. This renewed interest among economists to provide explanations for this particularly inefficient phenomenon (see Bean, 1994, for a survey). Beginning in 1980, the interest shifted toward the definition and measurement of unemployment. In Australia, there has been growing research evidence to suggest that the official unemployment figures do not accurately reflect the true extent of joblessness (see, Mitchell, 2000; Wooden, 1996; Stricker and Sheehan, 1981; among others). Studies abroad have also expressed similar sentiments (see, Armstrong, 1999; Beatty and Fothergill, 1996; Green, 1995, among others). In these studies, it is argued that the official figures of unemployment underestimate the true extent of joblessness because they ignore the important components of inactivity.

Although industrialised countries experience protracted labour market problems, the labour market experience of Australia has been distinct. In a study of non-linearity in unemployment and demand-side policy, Mitchell (2002) found that the unemployment rates in Australia have been significantly higher than that of Japan with three strong upturns coinciding with demand failures, but lower than that of United Kingdom. Australia's unemployment rate was found to be slightly higher than that of United States. The result of Mitchell's study shows that, while Australia and United States experienced strong real output growth and falling unemployment over the last 8 years, Australia's unemployment rate had remained stuck at around 6 percent while the US achieved historically low unemployment rates. In recent times, though, Australia's unemployment rates have fallen below the 6 percent mark. Mitchell concludes that the key determinants of the level of unemployment in Australia

and the United States were real output and interest rate shocks, whereas petrol price shocks and sectoral shocks were the determining factors in Japan. For United Kingdom, there is a consensus that the high unemployment rates of the 1980s and 1990s were due not only to cyclical but also structural rigidities within the labour market (OECD, 1994).

Since the end of 1980, in an effort to offset the rise in unemployment, Australian governments have implemented a series of labour market policies, the most notable being the welfare reform launched in 1999 at the federal and state level. As Henman and Perry (2002) note, the central reason given by the government for the need for welfare reform was the increase in welfare dependency. Henman and Perry attribute the growth in welfare recipients in Australia to structural change, which involved transformations in the labour market and household composition. Other factors that have contributed to structural change in Australia's labour market were changes to registration with the Commonwealth Employment Service (Stromback, *et al*., 1998), structural mismatch (Chapman, 1997), and the decline in manufacturing sector following reductions in the degree of protection afforded this industry sector (Le and Miller, 2000).

The lag between structural reforms and its impact on the level of employment in labour market imposes a constraint on a government's ability to implement policies aimed at addressing the problem of unemployment (OECD, 1999). The OECD (1999) emphasises that the beneficial effects of reforms aimed at increasing work incentives in times of a recession or weak economic performance may actually not have its intended impact until economic conditions improve. The conventional wisdom is that cyclical swings in real economic activity may lead to cyclical unemployment and large-scale adjustments in the labour market, as popularised by Vroman (1977). This suggests the need to understand the impact of labour market reforms and economic conditions on the most vulnerable in society, the hidden unemployed. This is the motivating factor for undertaking this study.

Amstrong's (1999) review of recent developments in labour markets has revealed that regional differences in unemployment reflects the slow operation of equilibrating mechanisms, such as the response of migration to income and employment differentials, reaction of employment to regional wage rates and the response of regional wages to excess demand and supply variables. Armstrong and Taylor (1993) argue that the persistence of regional disparities is the net result of shocks and adjustment processes; regional disparities arise because regions respond in different ways to exogenous shocks and the adjustment mechanisms is not instantaneous because of economic and social barriers. Amstrong (1998) cites Marston (1995) to argue that if geographical areas are in equilibrium relationship with respect to one another, then the equilibrium unemployment rate in each area will be a function of the amenities and land endowment and infrastructure.

Since the seminal works of Thirlwall (1966) and Brechling (1967), a plethora of theoretical and empirical studies have emerged to attempt to answer the question of the cyclical responsiveness of regional unemployment to changes in

the national rate of unemployment (see Gordon (1985) for a review). Pehkonen and Tervo (1998) has found that the ratio of the unemployment rates between regions and the national average unemployment rate falls (rises) and the difference between them rises (falls) during recessions (booms).

There is an ongoing debate about the way in which labour market reforms diverts people between different labour market outcomes; in particular between employment, unemployment and hidden unemployment. Studies of hidden unemployment try to estimate the size of those who are excluded from official measures of unemployment. As Armstrong (1999) notes, by incorporating hidden unemployment into measures of unemployment, the definition of unemployment moves away from the traditional definitions towards measures that accurately reflect the true extent of joblessness within an economy. This issue has attracted a phenomenal amount of interest over the years in both theoretical and empirical work. The interest in this issue is hardly surprising given the vital role typically ascribed to unemployment in policy debates. For Australia, the empirical evidence on the cyclical sensitivity of labour force participation rate and persistence of regional hidden unemployment disparity is non-existent.

This study aims to contribute to the existing literature on regional joblessness by investigating the persistence of hidden unemployment disparities in Australia. Not only will the study provide an insight into regional hidden unemployment but also create a means for measuring the broader measures of unemployment as opposed to the narrow measures of joblessness in Australia. This study uses quarterly time-series data to estimate hidden unemployment series in Australia. The persistence between regional and national hidden unemployment are examined in the context of an error-correction model (ECM) framework. The method used in this study provides an insight into hidden unemployment differentials and relativities, as well as sheds light on whether recessions have caused a shift in labour market structure at the regional level, and if yes, whether these changes are temporary or a permanent phenomenon in Australia.

The rest of the article is organised as follows. The next section discusses the method used in the analyses. The following section reports and discusses the empirical results. More specifically, we focus on cyclical sensitivity of labour force participation rate to labour market tightness and the persistence of regional hidden unemployment disparity in Australia. Finally, some concluding remarks follow.

2. THE MODEL

Over the last three decades, labour force participation rates in Australia have varied cyclically with the level of employment. Although it is possible to characterise the cyclical sensitivity and the rising trend in labour force participation, it is extremely difficult to empirically specify a model that represents labour force participation rate. Adapting the theoretical model of Mitchell (2000) and Agbola (2005), a modified labour force participation rate equation is specified as

$$LFPR_t = b_0 + b_1 ER_t + b_2 \log T + e_t \quad (1)$$

where LFPR is the ratio of the labour force to total civilian population aged 15 to 64 years; ER is the ratio of total employment to total civilian population aged 15 to 64 years; T is the a linear time-trend with T equal 100 in the first quarter of 1978 and rises by 1 every quarter; ε is a stochastic error term; t is a dating subscript and β's are parameters to be estimated.

The incorporation of the time trend variable in the labour force participation rate equation is aimed at capturing the impact of factors affecting the potential labour force when the economy is at full employment level. The β_1 coefficient measures the cyclical sensitivity or labour market tightness (Perry, 1971).

Following Perry (1971) and Mitchell (2000) in estimating hidden unemployment the employment rate coefficient β_1 in Equation (1) is used to adjust the difference between potential and actual employment levels for that year. That is, the difference between the potential and actual employment rate is multiplied by the cyclical sensitivity coefficient β_1 to obtain the marginal change in participation rate. The full employment-population rate is derived based on an assumed full unemployment-population rate of 5 percent. It should be noted, however, that the use of an assumed full unemployment-population rate of 4 percent yielded similar results. For a detailed discussion of the derivation of the full employment-population rate, see for example, Mitchell (2000), and recently Agbola (2005). The weighted difference between the actual and potential employment rate yields a measure termed the participation rate gap.

Mathematically, the participation rate gap is specified as:

$$PRGAP_t = b_1 (ER_t^{FN} - ER_t) \quad (2)$$

where PRGAP is the participation gap; ER^{FN} and ER are the employment-population ratio at full and actual employment levels, respectively, β_1 is the coefficient that measures the degree of cyclical sensitivity of labour force participation, and t is the dating subscript.

Hidden employment, *H*, is estimated as the product of participation gap and civilian population. Mathematically, this is expressed as:

$$H_t = PRGAP_t . (CIVPOP_t) \quad (3)$$

where CIVPOP is the civilian population.

The hidden unemployment rate is then derived as the ratio of the level of hidden unemployed to the total labour force. The hidden unemployment series for Australia was derived, following Martin (1997), as the weighted sum of hidden unemployment in each state. The weight used is the ratio of labour force in a given state to total labour force for Australia. Due to inconsistent results for Northern Territory and Australian Capital Territory, these territories have been excluded from the final analyses. Although this is the main limitation of the study, the excluded territories constitute less than 3 percent of the total labour force for Australia and hence the impact of their exclusion is argued to be minimal. The series employed in the analysis are seasonally adjusted quarterly data of labour force participation rate, employment rates and unemployment

rates for the six states of the Commonwealth. All the data employed in the analyses were obtained from the Australian Bureau of Statistics' *Labour Force* (Cat. No. 6203.0). Table 1 reports the summary statistics of hidden unemployment rates estimates for each state in Australia during the period 1978:1 to 2003:2.

Table 1. Summary Statistics for Hidden Unemployment Rates Estimates Used in the Analyses.

Statistic	AUS	NSW	VIC	QLD	SA	WA	TAS
Mean	1.818	1.088	1.718	2.336	5.041	1.215	6.809
Maximum	4.542	2.923	5.212	4.329	9.392	3.319	12.121
Minimum	0.400	0.029	0.010	0.437	1.155	0.205	0.299
Std. Dev.	1.068	0.740	1.378	0.989	1.934	0.694	2.591
Observations	102	102	102	102	102	102	102

Notes. AUS denotes Australia in aggregate, NSW denotes New South Wales, VIC denotes Victoria, QLD denotes Queensland, SA denotes South Australia, WA denotes Western Australia, and TAS denotes Tasmania.

3. RESULTS AND DISCUSSION

3.1 Estimated Labour Force Participation Rates

The estimated labour force participation rates regressions are reported in Table 2. The estimated goodness-of-fit (R^2-adjusted) measure ranges from 0.87 for South Australia and Tasmania to 0.96 for Victoria. The high R^2-adjusted values indicate a good fit of the dataset. The estimated standard errors of the models are very small confirming the good fit of the model. The Durbin-Watson statistic ranges from 1.76 for New South Wales to 2.02 for Queensland and Tasmania. The results indicate no presence of autocorrelation. In terms of cyclical sensitivity of labour markets to changes in external stimuli, the β_1-coefficients which measure the response of labour force participation rate to labour market tightness are estimated to range between 0.31 for New South Wales and 0.64 for Tasmania. The results indicate that the labour force participation rate in Tasmania is the most sensitive, followed by South Australia, Victoria, Queensland, Western Australia and New South Wales, in that order. With the exception of South Australia and Tasmania, the coefficient of the time-trend variable, which captures the path of the labour force participation rate, is positive and statistically significant at a 1.0 percent level. Overall, the results suggest an upward secular movement in labour force participation rate across states in Australia during the study period.

Table 2. Regression Results for Estimated Labour Force Participation Rate Equations.

	Estimate			Diagnostics		
State	b_0	b_1	b_2	R^2-adj.	S.E.	D-W
NSW	40.902	0.310	0.019	0.92	0.28	1.76
	(15.89)	(6.432)	(5.286)			
VIC	35.012	0.433	0.0156	0.96	0.24	1.86
	(13.24)	(10.29)	(1.922)			
QLD	32.692	0.423	0.038	0.97	0.34	2.02
	(12.17)	(8.29)	(6.01)			
SA	27.398	0.604	-0.000	0.87	0.32	1.96
	(8.26)	(10.61)	(-0.06)			
WA	41.111	0.331	0.027	0.94	0.34	1.89
	(14.54)	(6.33)	(7.62)			
TAS	23.946	0.639	0.006	0.87	0.43	2.02
	(6.78)	(10.73)	(0.820)			

Notes. Values in parenthesis (.) are *t*-ratios. See also the notes in Table 1.

3.2 Regional Recorded and Adjusted Unemployment Rates

The recorded and adjusted unemployment rates in Australian states since the late 1970s are depicted in Figure 1. Examination of the panels in this Figure reveals a number of stylised facts.

First, although the adjusted unemployment series trend the recorded unemployment series, there is a great deal of diversity in the time path and magnitude of hidden unemployment rates (i.e. the difference between the recorded and adjusted unemployment series) across states. This is perhaps what would be expected in Australia which has a small number of relatively large state economies which arguably are externally oriented rather than fully integrated; and also a reflection perhaps of the differing economic structure of the Australian states. This finding is similar to those observed by Dixon *et al*. (2001), who also found that the levels and the time path of unemployment rates of Australian states and territories varied quite considerably. This is in contrast to observations by Martin (1997) for the United Kingdom. There the path of regional unemployment rates has followed a common overall temporal pattern.

Second, both the recorded and adjusted unemployment series appear to be countercyclical, i.e. they increase with recession episodes and decline with expansion episodes.

Third, Figure 1 shows that rises in the hidden unemployment rate have been more pronounced during the 1990 recession compared to that of the 1980, with Tasmania showing the highest secular rise in the level of hidden unemployed, followed by South Australia, Queensland, Victoria, Western Australia and New

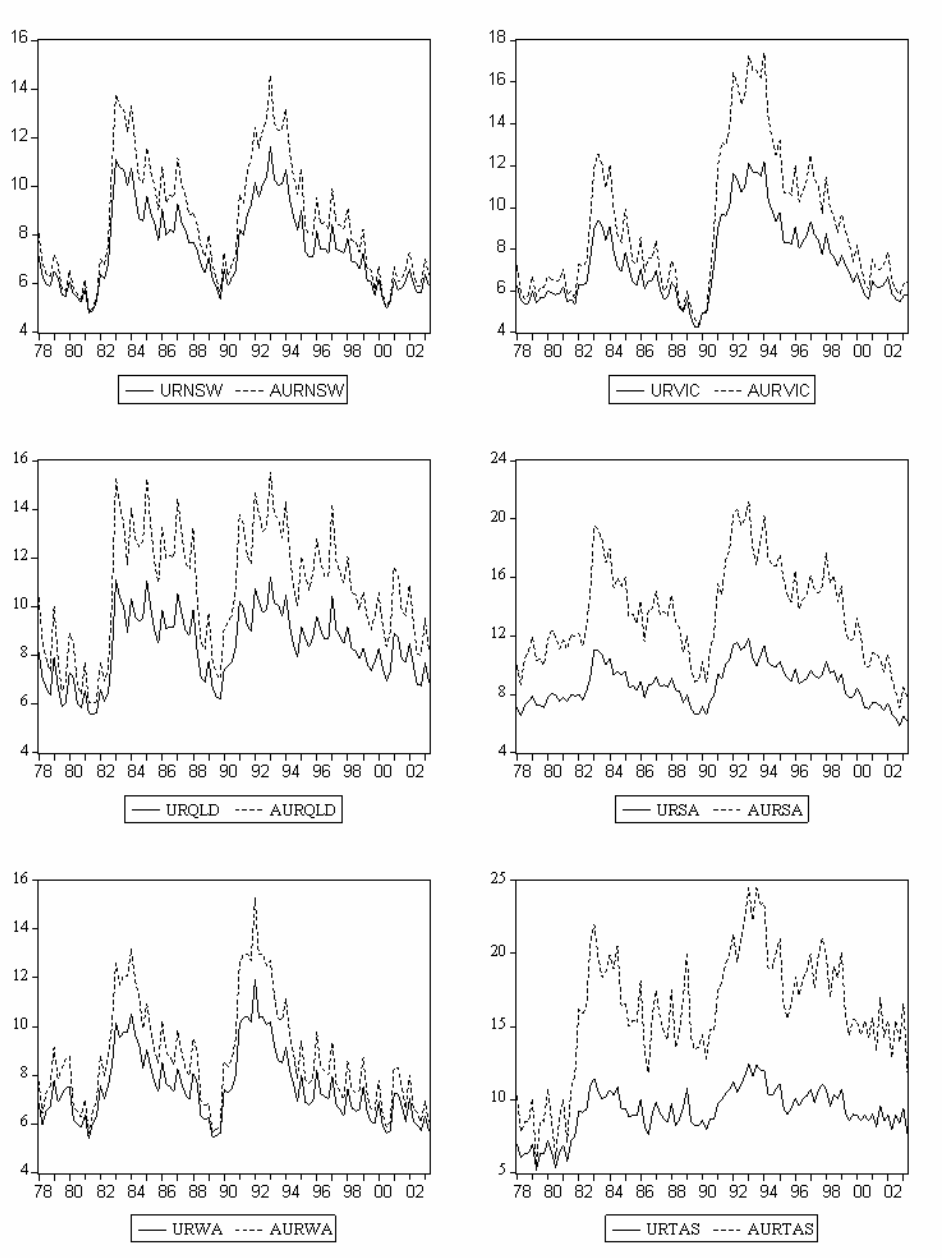

Figure 1. Regional Recorded (UR) and Adjusted (AUR) Unemployment Rates Across Australian States

South Wales, in that order. Table 3 highlights this further and indicates that the average hidden unemployment rate varies across Australian states, with New South Wales having the lowest average hidden unemployment rate (1.088 percent) and Tasmania having the highest hidden unemployment rate (6.809 percent) during the study period. The highest average hidden unemployment rate occurred in Tasmania in the third quarter of 1993, with an estimated rate of 12.12 percent. The lowest hidden unemployment rate occurred in Victoria in the fourth quarter of 1988, with an estimated rate of 0.03 percent. Tasmania experienced the highest variability in the hidden unemployment rate, estimated to be 2.591 percent, while Western Australia experienced the lowest variability in the hidden unemployment rate, estimated to be 0.694 percent. Notably, South Australia and Tasmania experienced huge swings following the early 1980 and 1990 recessions resulting in massive increase in the level of hidden unemployed during these times.

Table 3. Summary Statistics of Hidden Unemployment Differentials in Australian States.

Statistic	NSW	VIC	QLD	SA	WA	TAS
Mean	-0.730	-0.101	0.518	3.223	-0.603	4.991
Maximum	0.020	1.001	1.681	5.248	0.569	8.315
Minimum	-1.883	-1.006	-0.648	0.687	-2.333	-0.445
Std. Dev.	0.495	0.427	0.584	0.982	0.641	1.831
Observations	102	102	102	102	102	102

Notes. See Notes to Table 1.

Fourth, in general the late 1990s and the early part of 2002 show a decline in the hidden unemployment series. The exception is New South Wales which experienced a modest rise in both the recorded and adjusted unemployment rates in the early part of 2000. Despite the massive swings in the level of hidden unemployed in Tasmania in the 1980s and 1990s, it appears to have stabilised in the early part of 2000.

3.3 Regional Hidden Unemployment Dispersion: Differentials and Relativities

To investigate hidden unemployment dispersion within regions, this study employs two measures. The first, hidden unemployment differentials, is measured as the regional percentage point differential about the national hidden unemployment rate, $hu_r - hu_n$, and the second, hidden unemployment relativity, is measured as the ratio of regional hidden unemployment rate to the national average hidden unemployment rate, hu_r/hu_n. Figure 2 plots the regional hidden unemployment differentials across Australian states.

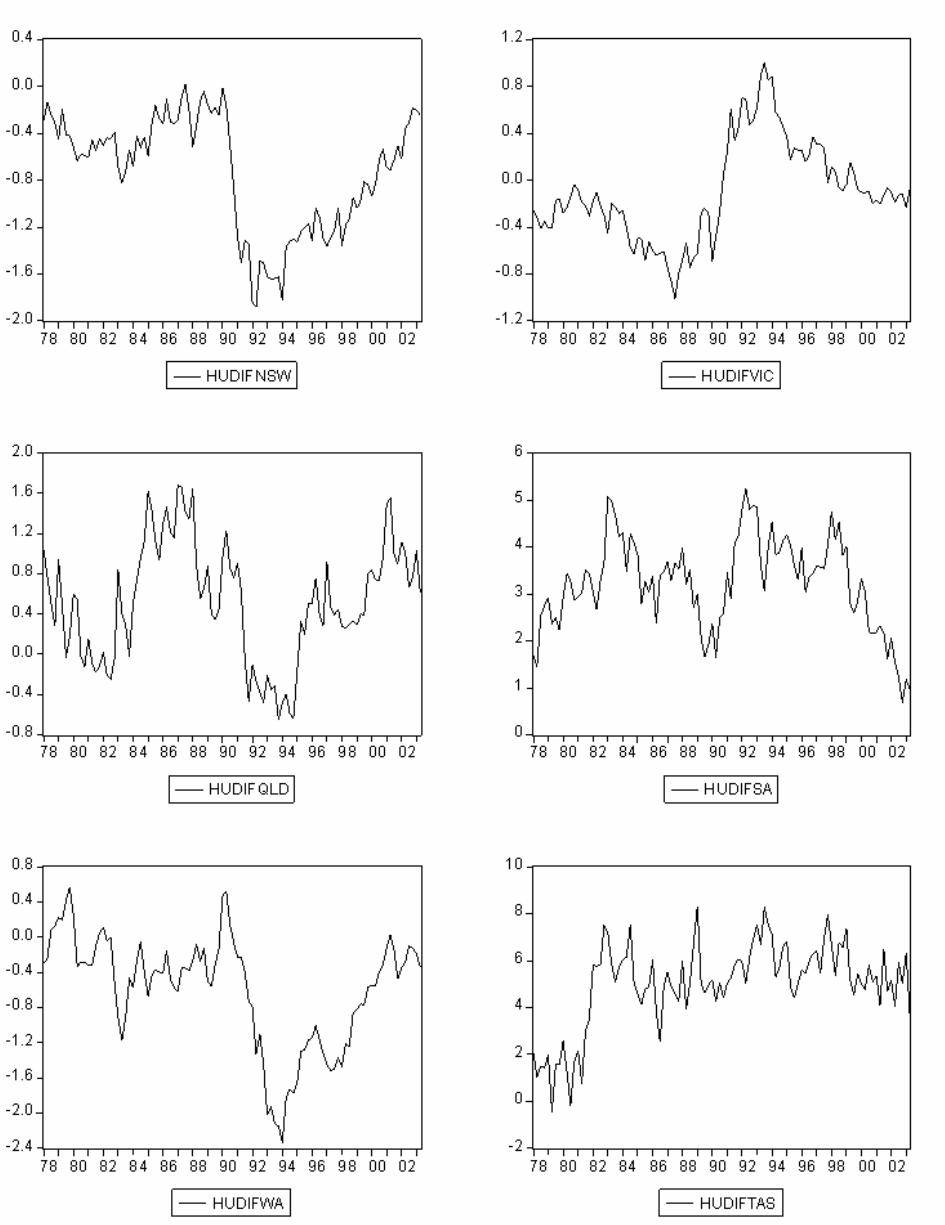

Figure 2. Regional Hidden Unemployment Differentials, 1978-2003: Regional Rate minus National Rate (hu_{rt}-hu_{nt})

A salient feature revealed in Figure 2 is that, with the exception of Queensland, which seems to withstand the economic shocks during the 1980 and 1990 recessions, the regional hidden unemployment differentials appear to have widened during the recession of the early 1980s, and narrowed thereafter, then widened again during the early 1990 recession, and again narrowed in the mid to late 1990s. Overall, the hidden unemployment differentials appear to have narrowed in the early part of 2000. Another salient feature of the regional hidden unemployment rate differential revealed in Figure 2 is that Victoria, Queensland and Western Australia appear to exhibit pro-cyclical movements. Overall, with the exception of Western Australia, the regional hidden unemployment differentials appear to be narrowing across states, as expected, a consequence of the decline in Australia's unemployment rate.

Table 4 reports the summary statistics of hidden unemployment differentials in Australian states. Table 4 indicates that temporal variability in hidden unemployment relativities is most pronounced in Tasmania, followed by South Australia, Queensland, Western Australia, Victoria and New South Wales, in that order.

Table 4. Summary Statistics of Hidden Unemployment Relativities in Australian States.

Statistic	NSW	VIC	QLD	SA	WA	TAS
Mean	0.575	0.835	1.452	3.209	0.729	4.495
Maximum	1.015	1.260	3.187	6.746	1.926	13.434
Minimum	0.045	0.014	0.709	1.799	0.274	0.402
Std. Dev.	0.213	0.278	0.500	1.058	0.314	2.338
Observations	102	102	102	102	102	102

Notes. See Notes to Table 1.

Figure 3 depicts the regional hidden unemployment relativities. Figure 3 shows that, overall, the regional hidden unemployment relativities tended to narrow during the 1980s and 1990s recessions and widen during economic boom and recoveries. The exception is South Australia, which showed a marked increase in relative hidden unemployment rate during the 1980 recession, but it narrowed during the 1990 recession. These findings are generally consistent with those of Martin (1997) for the United Kingdom, who found that unemployment rate relativities narrow during recessions and widens during economic boom and recoveries.

3.4 Regional Hidden Unemployment Persistence

We now turn to the question of persistence of hidden unemployment disparities in Australian states. The questions of great importance are the following: Is there a long run relationship between regional and national hidden

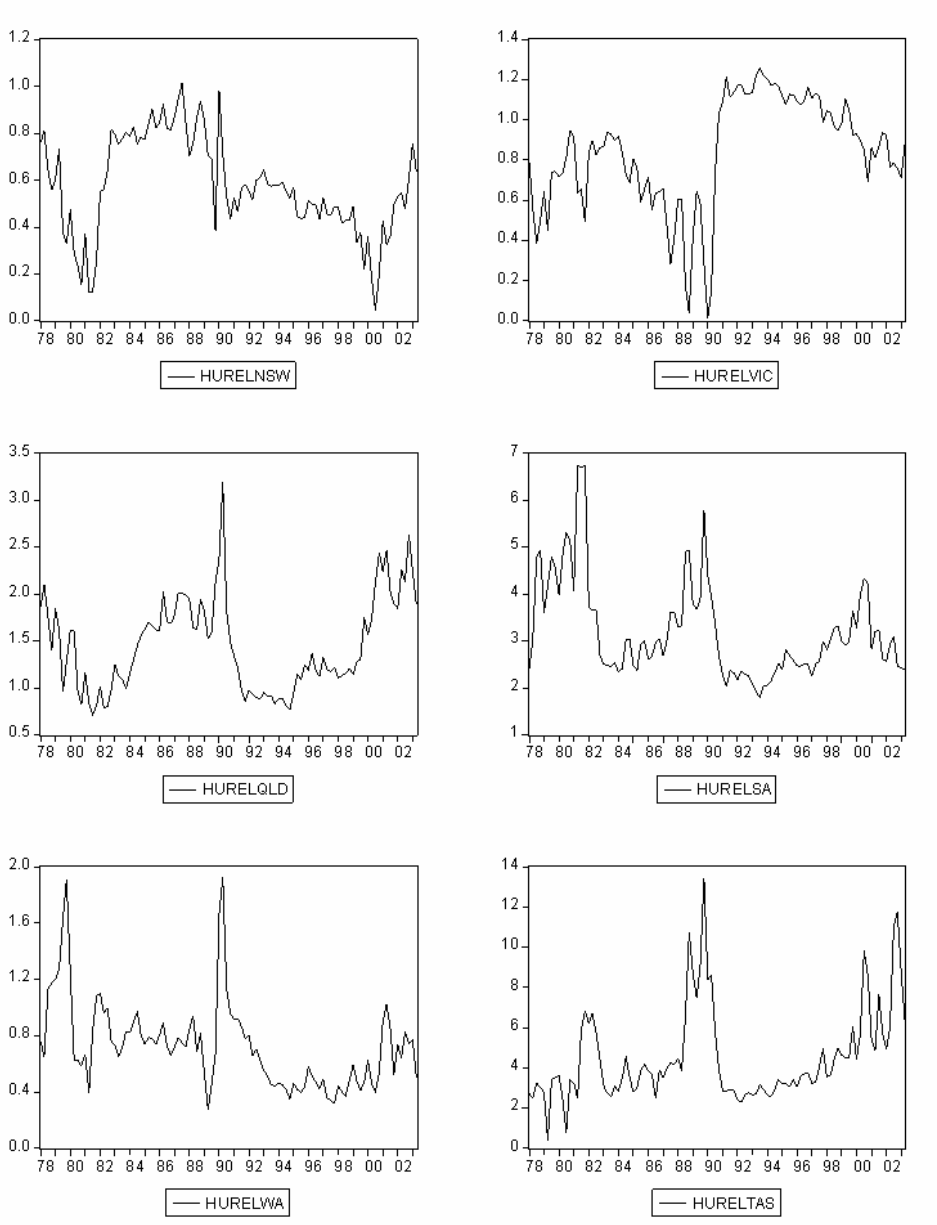

Figure 3. Regional Hidden Unemployment Relativities, 1978-2003: Regional Rate/National Rate (hu_{rt}/hu_{nt})

unemployment rates? Whether a shock to the regional hidden unemployment structure is dissipated very quickly? To answer these questions we start by paraphrasing Martin (1997, p.241), that "…if the labour market is in equilibrium there is some stable absolute differential as well as a stable relativity between each region and the national average hidden unemployment rate". Following Martin (1997), the relationship between the regional and national average hidden unemployment rate is expressed as

$$hu_{rt} = a_r + b_r\, hu_{nt} + e_{rt} \qquad (4)$$

where hu_{rt} and hu_{nt} denote the regional and national hidden unemployment rates, respectively.

The time-series econometric literature provides a useful tool for analysing the persistence of regional hidden unemployment in Australia. If the regional and national hidden unemployment series are integrated processes of the same order, say $I(d)$, and if the error term in the estimated regression of Equation (4) is stationary, then the regional and national average hidden unemployment rates are said to be co-integrated. The implication is that the relationship between the variables can be estimated in levels. Arguably, when a group of variables are found to be non-stationary but co-integrated then a useful specification for their dynamic interaction is an error-correction (ECM) model (Engel and Granger, 1987). From (4), the ECM can be specified, following the parametisation of Martin (1997), as

$$\Delta hu_{rt} = c_{r0} + c_{r1}\,\Delta hu_{nt} - l\, e_{rt-1} + n_{rt} \qquad (5)$$

which can also be expressed as

$$\Delta hu_{rt} = c_{r0} + c_{r1}\,\Delta hu_{nt} - l\,[hu_{rt-1} - (a_r + b_r\, hu_{nt-1})] + n_{rt} \qquad (6)$$

where Δ denotes the first difference, that is $\Delta hu_{rt} = hu_{rt} - hu_{rt-1}$, and v_{rt} is the error term, and the other variables are as defined above.

The error correction term e_{rt-1} in equation (5) captures the adjustment of the regional and national hidden unemployment series toward their long-run steady state relationship, and the parameter l measures the proportion of the disequilibrium between hu_{rt} and hu_{nt} in one period is corrected in the next period (see, Martin 1997). It is important to emphasise that the estimated parameters in Equation (4) not only capture the persistent difference in the pressure of demand in a region relative to the nation, but also the supply-side and institutional differences. The error terms in Equation (5) also capture the extent to which a regional labour market is away from its underlying steady state relationship with the national labour market (see, Martin, 1997, for a discussion).

It is important to note that there is controversy about whether one can use the error correction modelling for analysing persistence. Smyth (2003) cites Brunello (1990, p. 485) to argue that 'unemployment is a bounded variable [within the interval 0, 100], it cannot in principle follow a pure unit root process'. However, as Dixon and Shepherd (2001, p. 256) argue:

> *While it may be true that the unemployment series are stationary in the probability limit [here] we are dealing not only with a finite realization of the process, but also a sample period that is 'very short'. In these circumstances, it is quite possible that the series may wander significantly within the*

interval, exhibiting characteristics that are, for all practical purposes, indistinguishable from an unrestricted random walk.

These arguments are true for hidden unemployment rates, which are also bounded [0, 100]. However, following from the argument from above, this study follows the existing literature on hysteresis and ignores the issue of boundness in the study of hidden unemployment persistence in Australia states. For further discussion see Martin (1997) and Smyth (2003).

Table 5 presents the estimated co-integrating regression results. All the estimated coefficients of the national average hidden unemployment variable are statistically significant at a 1.0 percent level and range between 0.633 for New South Wales and 1.93 for Tasmania. The goodness-of-fit (R^2-adjusted) measure is high, ranging from 0.66 for both Western Australia and Tasmania to 0.94 for Victoria.

To investigate whether the regional and national average hidden unemployment rates are co-integrated, we examine the estimated Durbin-Watson statistics reported in Table 5. The null hypothesis is that the error terms from the estimated co-integrating regressions is non-stationary, indicating that the regional and national hidden unemployment are not co-integrated, against the alternative hypothesis that the errors are correlated thereby suggesting the presence of co-integrated long-run equilibrium relationship. Using critical values of Co-integration Regression Durbin-Watson (CRDW) statistic (Gujarati, 1993), the null hypotheses are rejected at a 5 percent level for Queensland, South Australia and Tasmania, but we fail to reject the null hypotheses for New South Wales, Victoria and Western Australia. These results are important because they indicate that hidden unemployment series in Queensland, South Australia and Tasmania are co-integrated with the national series, suggesting a stable relationship between hidden unemployment rates within these states and the national rate. For New South Wales, Victoria and Western Australia, the results indicate that the hidden unemployment series within these states are not co-integrated with the national series. The results indicate that the hidden unemployment structure in New South Wales, Victoria and Western Australia are determined primarily by forces within these economies, while those in Queensland, South Australia and Tasmania are determined largely by forces outside rather than within these economies.

Table 5 also reports the estimated b_1-coefficients which measure the impact of demand and supply–side and institutional factors on hidden unemployment within a state. This is estimated to range between 0.63 for New South Wales and 1.97 for Tasmania. Tracing the relationship between the state hidden unemployment series and national series, the results appear mixed. The lack of unison of the relationship between state and national hidden unemployment series provides further empirical evidence to support the argument of the lack of synchronicity between these series. The results also suggest that the uniqueness of persistence of state hidden unemployment series does not only reflect the spatial imbalances in demand arising from structural and institutional differences induced largely by federal labour reforms, but also labour market characteristics within each state. For example, the fact that the slope of the b_1 coefficient in the

cointegrated regression for Victoria is higher than that for Queensland and South Australia suggests that the cyclical variability of state hidden unemployment may be due the changes in industrial structure experienced in the early to late 1980s following the neo-liberal economic policies of the time (see, Tonts, 1999; Dixon *et al*., 2001, for a discussion). In particular, these policy and institutional reforms have had region-specific impacts, and this is particularly evident in the case of Victoria where the most affected industry, the textile, clothing and footwear, was highly concentrated (see Dixon *et al*., 2001).

Table 5. Regional Hidden Unemployment in Australia: A Co-Integration Analysis.

State	Co-integrating regression					Error correction parameter (λ)
	B_0	b_1	R^2	S.E.	D-W	
NSW	-0.063	0.633	0.83	0.30	0.17	-0.08
	(-1.050)	(22.38)				[13]
VIC	-0.561	1.253	0.94	0.33	0.23	-0.08
	(-8.62)	(40.55)				[13]
QLD	0.919	0.779	0.71	0.54	0.45	-0.13
	(8.72)	(15.57)				[8]
SA	1.930	0.717	0.90	0.62	0.49	-0.24
	(15.80)	(29.75)				[4]
WA	0.250	0.531	0.66	0.40	0.29	-0.17
	(3.16)	(14.17)				[8]
TAS	3.222	1.973	0.66	1.52	0.59	-0.30
	(10.83)	(13.96)				[3]

Notes. Critical values for D-Ware d=0.511 (1 percent), d=0.386 (5 percent) and d=0.322 (10 percent). Values in parenthesis (.) are t-ratios. Values in brackets [ ] denote number of quarters it takes to fully adjust towards long run equilibrium level. See also notes to Table 1.

Table 5 reports the estimated regional hidden unemployment error correction parameter, λ_r, which measures the proportion of the disequilibrium between hidden unemployment series of a state, hu_r, and the national series, hu_n, in one period. This estimate ranges between –0.30 for Tasmania and –0.08 for New South Wales and Victoria. The results indicate that between 8.0 percent and 30.0 percent of any disequilibrium between regional and national hidden unemployment series is eliminated in the first year. The implication is that it takes about nearly a year to three years for shocks to the state labour markets to completely dissipate. In particular, it takes nearly a year in Tasmania, a year in South Australia, nearly two years in Western Australia, two years in Queensland and a little over three years in both New South Wales and Victoria, for a labour market shock to fully dissipate.

4. CONCLUSION

The purpose of this article is to examine persistence in regional hidden unemployment disparity in Australia using time-series data spanning the period 1978:1 through to 2003:2. The findings of the empirical analyses can be summarised into three main points. First, the estimated labour force participation rate equations reveals that cyclical sensitivity of labour force participation rate to labour market tightness is most pronounced in Tasmania and least pronounced in New South Wales. Second, the co-integration results indicate that there is no relationship between hidden unemployment rates in New South Wales, Victoria and Western Australia and the national average hidden unemployment rate. The results indicate that hidden unemployment rates in Queensland, South Australia and Tasmania are co-integrated with the national average hidden unemployment rate. Finally, the results indicate that there are differences in the degree of persistence in hidden unemployment to exogenous shocks affecting labour markets in Australian states. Clearly, the non-synchronicity of persistence of hidden unemployment rates suggests the differences that exist in the way economic and institutional factors, such as structural rigidities in labour markets, decline in manufacturing sector, transformation in household consumption, and structural mismatch are impacting on the level of hidden unemployment within Australian states. Future research would attempt to explore the extent to which these factors are determining the level of hidden unemployment disparity in Australia.

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