ISSN 0819-2642
ISBN 0 7340 2638 2

THE UNIVERSITY OF MELBOURNE

DEPARTMENT OF ECONOMICS

RESEARCH PAPER NUMBER 980

JANUARY 2007

Unemployment Rate Dispersion within Australian Cities

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Abstract In this paper we examine differences in the unemployment rates across regions within the five largest metropolitan areas in Australia using pooled regression analysis. We find that the level of within-city dispersion is positively correlated with the city-wide unemployment rate and that dispersion tends to be higher for females than for males. The elasticity of Absolute Dispersion with respect to the unemployment rate is close to unity implying, as we find, that Relative Dispersion is not related to the state of the labour market. We argue that this reflects the fact that there is considerable persistence of relative rates across regions within each city over time.

Keywords Regional Unemployment Disparities Business Cycle Unemployment

JEL Codes E24 R11

INTRODUCTION

In this paper we examine patterns in the dispersion of unemployment rates across regions within the five largest metropolitan areas in Australia.[1] There area number of reasons why this is of interest. First, we aim to contribute to the growing literature on geographies of labour market inequality. As MARTIN and MORRISON (2003, p 3) have pointed out "the labour market has an intrinsically local or spatially constituted level of operation" and it follows that welfare and equity considerations (including a focus on unemployment) arise naturally as part of any study of the geography of labour markets. Second, there has been little exploration of Martin's ideas, first published in this journal (MARTIN, 1997) on the measurement of the dispersion in unemployment rates across regions. This is surprising since it is important for policy purposes that we uncover any empirical regularities there may be in the relationship between dispersion and the business cycle in particular. Finally, and in some ways most importantly, a key issue which we explore concerns the *elasticity* of Absolute Dispersion with respect to the (aggregate, or average) level of unemployment. We argue that this elasticity is itself of special interest.

As mentioned, the empirical work in this paper refers to unemployment within five large cities in Australia. The five cities (and their share of the national labour force) are: Sydney (21.5%), Melbourne (18.4%), Brisbane (9.2%), Perth (7.5%) and Adelaide (5.5%). Collectively these five cities make up just over 62% of the national labour force. Information on the size of the labour force and the unemployment rate is available for both males and females for a consistent set of regions within each of these cities over the period 1997:4 – 2005:3. The data is published by the Australian Bureau of Statistics and has its origin in a monthly survey of households (details of the survey and the definitions used are given in AUSTRALIAN BUREAU OF STATISTICS (2001)). The availability of this data allows us to study intra-city dispersion both over time and across cities, thus adding an additional spatial dimension to the study. Also, since time series data for each region within each city is available for males and females separately it is possible to look for patterns in gender differences in dispersion.

The paper is structured as follows. In the next section we examine two measures of the dispersion of unemployment rates drawing heavily upon MARTIN (1997) and then compare the levels of unemployment rate dispersion for males and females across the five cities. In the third section we formulate a number of hypotheses which might explain variations in unemployment rate dispersion and then test these hypotheses using pooled regression analysis. Amongst other things, it is found that the level of dispersion 'in absolute terms' is positively correlated with the unemployment rate and that the relationship between the two is such that the 'elasticity' of dispersion with respect to the unemployment rate is close to unity. This implies that there is a tendency for the level of dispersion relative to the average unemployment rate in all regions taken together to be invariant with respect to the average unemployment rate. We then formally test that hypothesis. The final section concludes.

MEASURING UNEMPLOYMENT RATE DISPERSION

Before we proceed to do any empirical work it is important to consider which measure of dispersion is the most appropriate. Two issues need discussion. First, in measuring dispersion what should be taken as the common reference point? Specifically, should we use the (unweighted) mean of the regional figures or the weighted mean as the point of reference, as 'the average'? If all regions were of a similar size the two would yield essentially the same results but in fact regions do vary greatly in size and so it is not only appropriate, but indeed necessary, to use as our measure of dispersion, the (weighted) deviations of regional rates from the average rate in all regions taken together. Second, should we use an 'absolute' or 'relative' measure of dispersion?[2] The essential difference between the two is that an absolute measure focuses on the arithmetic difference between the variables while a relative measure focuses on the ratio of the variables. Both are of interest, but we will follow most others who research in this area (eg THIRLWALL, 1966, p207; TAYLOR, 1991, p 75f and MARTIN, 1997, p 241) and use an absolute measure of dispersion as the starting point for our analysis.

Where we are using the weighted average (ie the city-wide unemployment rate) as the reference point, the appropriate measure of absolute dispersion in each city in each period would be the Absolute Dispersion (*AD*) measure suggested in MARTIN (1997, p 250), that is:

$$AD_{ct} = \sum_{r} \left(L_{rt} / L_{ct} \right) \left| UR_{rt} - UR_{ct} \right| \tag{1}$$

where: t is a time subscript; L_r is the size of the labour force in region *r* of the city; L_c is the size of the labour force in all regions in the city taken together (ie it is the city-wide labour force); UR_r is the unemployment rate in each region of the city, and; UR_c is the unemployment rate in all regions taken together (the city-wide unemployment rate).

It can be shown that the *AD* measure has a very straightforward and intuitive interpretation. It measures the number of persons in all regions taken together who would have to change their labour market status in order for every region to have the (same) percentage unemployed as currently prevails in the city as a whole - where that number (the total number whose labour market status would have to change) is expressed as a proportion of the total labour force in the city.[3] Since *AD* is measured as a proportion of the total labour force it has the advantage that it can be directly compared to the (city-wide) unemployment rate thus facilitating an analysis of any policy or welfare trade-off between unemployment rate dispersion and unemployment rate level.[4]

MARTIN (1997) also discussed a second measure of dispersion which he calls Relative Dispersion (*RD*). This is defined as the ratio of *AD* to the aggregate unemployment rate (in our case the aggregate unemployment rate is the relevant city-wide unemployment rate). Dividing

(1) by UR_{ct} and rearranging gives an expression which shows that *RD* (unlike *AD*) focuses on the ratios rather than arithmetic differences:

$$RD_{ct} = \sum_{r} \left(L_{rt} / L_{ct} \right) \left| \left(UR_{rt} / UR_{ct} \right) - 1 \right| \qquad (2)$$

Given the interpretation that can be placed on the *AD* measure, the extent of Relative Dispersion is then a measure of labour force movements that would be needed to even out unemployment rates between regions – where that number is expressed as a proportion of the total number currently unemployed in the city. Notice, in passing, that if 'the elasticity' of *AD* with respect to the city's unemployment rate were unity then *RD* would not vary systematically with the unemployment rate (cet par).

Earlier we mentioned that the absolute measure of dispersion would act as the starting point for our analysis. Figure 1 shows a time series plot of the level of Absolute Dispersion (*AD*) for persons for each of the five cities for which we have time series data while Figure 2 shows the (weighted) average unemployment rate for each city over the same period. Taken together the Figures suggest that there is a some tendency for the level of absolute dispersion and the unemployment rate to move together over time. Table 1 shows mean values for the absolute dispersion of unemployment rates for males (*ADM*) and for females (*ADF*) and the mean city-wide unemployment rate for males (*URM*) and females (*URF*) separately for each city over the sample period. While the extent of dispersion differs across cities, it would appear that relatively high levels of dispersion for males tend to be accompanied by relatively high levels of dispersion for females, to take just one example, the average level of absolute dispersion for both males and females is almost twice as high in Sydney as it is in Perth.[5] It would also appear that there is a tendency for the dispersion of unemployment rates for females (*ADF)* to be greater than that for males (*ADM)*, especially in Brisbane.

[FIGURES 1 & 2 and TABLE 1 NEAR HERE]

In the next section we formulate a number of hypotheses which might explain variations in unemployment rate dispersion for males and females across time and across cities. These hypotheses are then tested using pooled regression analysis.

UNEMPLOYMENT RATE DISPERSION IN FIVE AUSTRALIAN CITIES

In relation to the variation in unemployment rate dispersion across time, two (obvious) hypotheses to be considered are: Is dispersion related in any systematic way to the level of the unemployment rate? If so, are the two positively or negatively related? Clearly an important question for both regional and national macroeconomic policy is whether we can only have low unemployment at the expense of greater dispersion. It also seems logical to test the hypothesis that the relationship between unemployment rate dispersion and level is such that the 'elasticity' of dispersion with respect to the unemployment rate is close to unity. This is an important question because, if this hypothesis could not be rejected, it would imply that Relative Dispersion will not vary with the state of the labour market and that there is considerable persistence in the relative levels of unemployment across regions. (It is because of a desire to explore this issue that our estimating equation will be cast in double-log form.)

In addition, thanks to the availability of data for males and females separately, we are able to explore the relationship between male and female dispersion (inequality) once the state of the labour market (as proxied by the unemployment rate) and place (city) have been controlled for. Given the relative levels of the means for *ADF* and *ADM* reported in Table 1, we think it is reasonable to expect that there may be more (within city) variability in the female unemployment rate than in the male unemployment rate even after we control for the state of the labour market and the city. We are not aware of any research which has focused specifically on this question but we conjecture that any systematic difference in variability which does not reflect the state of the business cycle and which is not a characteristic of 'place', must reflect within-city variability in those 'personal' characteristics which tend to be associated with a high risk of becoming and/or remaining unemployed. Numerous studies of unemployment rates amongst various groups in the Australian population (for example BORLAND and KENNEDY (1998)) show that unemployment is concentrated disproportionately amongst particular groups including sole parents and the less educated (inter alia).[6] So, even putting to one side differences in the composition of industry located 'within' each area, spatial variations in the proportion of residents who are in one or both of these categories (or any other pre-disposing factor) will, cet par, be associated with variability in unemployment rates. We conjecture (but it is no more than a conjecture at this stage) that female unemployment rates are more variable than those for males for two reasons: First, because differences in the average level of education (and English language proficiency) across suburbs may be greater for females than they are for males (in part this is related to the tendency for recent immigrants different ethnic groups – and especially recent immigrants – to concentrate in particular suburbs); Second, for various reasons many more females than males face limitations on the distances they can commute and on their hours of work and time of day they can work. Given this, any unevenness in the distribution of households with couples with young children and/or in the distribution of single-parent households across different suburbs, will likely result in greater variability in female than in male unemployment rates across regions within a city.[7]

Finally, the inclusion of place (city) dummies may allow us to say something about the role of geography (or size). Empirical work shows that larger cities in Australia have less specialized industrial structures than smaller cities (BRADLEY and GANS, 1998) which would seem to suggest that, other things equal, we could expect unemployment rate dispersion to be lower in larger cities than in smaller cities.

Given the data available to us it is appropriate to use pooled regression to evaluate the effects of gender, the city-wide unemployment rate and 'place' upon the level of Absolute Dispersion. After we have done that we will examine Relative Dispersion.

Absolute Dispersion

The LHS variable in the pooled regression is annual averages of the observations on *AD* (or *RD*) for each city for each gender. (We use annual observations as here the dynamics of the relationship between *UR* and *AD* are less problematic than for quarterly data.[8]) As explanatory variables we include the relevant (gender and city specific) aggregate unemployment rate (*UR*), a gender dummy (*DG*) which was 1 if the observation was for females and then a series of city dummies (*ADEL*, *BRIS*, *MELB* and *PER*). To avoid the 'dummy variable trap' dummies for male gender and for Sydney were not included. Thus the intercept is to be interpreted as referring to the Absolute Dispersion for males in Sydney. Dummies for interaction between city and the unemployment rate and between gender and the unemployment rate were included but all except one proved to be insignificant and were dropped. The one interaction which was significant was that recording the interaction between gender and one of the cities, the city of Brisbane (the reader may recall that in Table 1 the discrepancy between the mean value of *ADF* and *ADM* was large for Brisbane).

The estimated model is thus of the form:

$$\begin{aligned} LAD_{\text{ijt}} = \alpha + \beta LUR_{ijt} + \phi DG_{jt} + \gamma_{\text{ADEL}} DADEL + \gamma_{\text{BRIS}} DBRIS + \gamma_{\text{MELB}} DMELB \\ + \gamma_{\text{PER}} DPER + \lambda \left(DG_{jt} \times DBRIS \right) + \varepsilon_{\text{ijt}} \end{aligned} \tag{3}$$

where *LAD* is the logarithm of the measure of Absolute Dispersion for gender *i* and city *j* in year *t*, *LUR* is the logarithm of the unemployment rate for each gender and city in each period, *DG* is a dummy variable for Gender (scored 1 if female and 0 if male), *DBRIS*, *DADEL*, *DMELB* and *DPER*, are city specific dummies (with Sydney not included to avoid the dummy variable trap) and ε_{ijt} is an error term. There are 70 observations in total. The results of estimating equation (3) are given in the first column of Table 2.[9]

[TABLE 2 NEAR HERE]

We find that the elasticity of *AD* with respect to the unemployment rate (β) is positive, indicating that it is possible to have both low unemployment and lower dispersion.[10] Secondly, the estimate of β is not significantly different from one (the p-value for the rejection of the null that β = 1 is 0.803, well above any conventionally accepted level at which we would be prepared to reject the null) and so we conclude that the elasticity of *AD* with respect to the unemployment rate may be regarded for all practical purposes as being equal to unity, implying that the ratio of *AD* to the unemployment rate - this is the value of *RD* - does not vary systematically with the state of the labour market. (We will return to this finding shortly when we discuss Relative Dispersion in more detail.)

The estimated coefficient on ϕ, this is the gender dummy, is (+) 0.104, indicating that there is a tendency for dispersion to be higher for females than for males, other things equal. There has been some considerable discussion in the econometrics literature of the most appropriate measure of the proportional change in the dependent variable that implied by the coefficient on as shift dummy when the dependent variable is in logarithms.[11] Suffice to say that for our specific application it must be the case that $AD_{DV=1} = AD_{DV=0}e^{\phi}$, where $AD_{DV=1}$ is the value of Absolute Dispersion in the regime where (cet par) the dummy is equal to 1 (cet par), $AD_{DV=0}$ is the value of Absolute Dispersion in the regime where (cet par) the dummy is equal to 0 and ϕ is the point estimate of the parameter on the dummy variable in the regression. So the proportional change in Absolute Dispersion as a result of the presence of the attribute signified by the dummy is simply equal to $e^{\phi} - 1$. With a point estimate of ϕ of 0.104 this yields an estimate of the size of the shift as being equivalent to an increase in the *AD* of 11.0%, given the unemployment rate and city.[12] In other words, the level of Absolute Dispersion for females tends to be a little over 10% higher than that for males, ceteris paribus.

As previously mentioned, the one interaction term which was significant (and thus was retained in the equation) was that recording the interaction between gender and one of the cities, the city of Brisbane. The coefficient on the interaction term is 0.523, indicating that Absolute Dispersion for females in Brisbane tends to be higher by 69% ($= e^{\lambda} - 1$), other things equal. The most likely explanation for this is to do with Brisbane's industrial structure. In particular, Brisbane does not have the same 'traditional' job opportunities for females who live in outer suburban areas that the other cites have. For example, the textiles, clothing & footwear and the finance & insurance industries (both industries which employ large numbers of females relative to males) are far less prominent in Brisbane than in the other cities, and especially Sydney, Melbourne and Adelaide.[13]

We also find that the city or 'place' dummies are relevant, with dispersion (unexpectedly) tending to be highest in the largest cities (Sydney and Melbourne) and lowest in the smallest cities (Brisbane, Adelaide and Perth), cet par.[14] One is tempted to respond to this by arguing that this is evidence that size brings with it external diseconomies which disrupt the functioning of the (intra-city) labour markets. However the interpretation of this finding is made problematic by the fact the ranking in size of the coefficients on the city dummies not only corresponds to the relative size of the cities but also to the division of the cities into the two for which we have a 'fine' regional classification (11 for Sydney and 9 for Melbourne) and the three for which we have a very 'coarse' regional classification (4 for Brisbane and Adelaide and 5 for Perth). It is quite likely then that the three smallest cities are showing up as having low dispersion, once we allow for other factors, because their regions (or, more correctly, the statistical boundaries of their regions) encompass more heterogeneity in population and industry/locality characteristics than do the regions (statistical boundaries) in Sydney and

Melbourne. For this reason we think it is best to see the city dummies as merely playing the role of control variables in the regression in this study and not to read too much into their relative magnitude.

Relative Dispersion.

Earlier, we noted that the ‘elasticity of Absolute Dispersion with respect to the city-wide unemployment rate’ is not significantly different from unity. This suggests that there is a tendency for Relative Dispersion (the ratio of Absolute Dispersion to the city-wide unemployment rate) to be invariant with respect to the size of the unemployment rate over our sample period. To formally test this hypothesis we again estimate a pooled regression but this time with (the logarithm of) Relative Dispersion as the dependent variable. The equation to be estimated is:

$$\begin{aligned} LRD_{\mathrm{ijt}} = \alpha + \beta LUR_{ijt} + \phi DG_{jt} + \gamma_{\mathrm{ADEL}} DADEL + \gamma_{\mathrm{BRIS}} DBRIS + \gamma_{\mathrm{MELB}} DMELB \\ + \gamma_{\mathrm{PER}} DPER + \lambda \left(DG_{jt} \times DBRIS \right) + \varepsilon_{\mathrm{ijt}} \end{aligned} \quad (4)$$

where *LRD* is the logarithm of the measure of Relative Dispersion for gender *i* in city *j* while all of the other variables are as defined for equation (3) above.

The results from estimating equation (4) are given in the last column of Table 2. With the exception of the coefficient on the unemployment rate the results are almost identical to those obtained from estimating equation (3) and so our discussion will focus on the findings in relation to the relationship between Relative Dispersion and the state of the labour market (as indicated by the city-wide unemployment rate).

[TABLE 3 NEAR HERE]

The coefficient (β) is not significantly different from zero (the p-value for the null that $\beta = 0$ is 0.784, well above any conventionally accepted level of significance) indicating, as expected, that there is no systematic relationship between Relative Dispersion and the city-wide unemployment rate, other things equal.

Martin's Relative Dispersion construct measures the number of people whose labour force status would have to change in order to even out unemployment rates between regions expressed as a proportion of the total number unemployed in all regions taken together (in other words, as a proportion of city-wide unemployment). It is this figure which appears to be invariant to the city-wide unemployment rate over the period. For this invariance to hold, it must be the case that there is considerable persistence of relative rates across regions within each city over time. Indeed, we are now able to turn the argument we have been following on its head and say that the reason why we so commonly observe that *AD* tends to rise and fall in proportion with the unemployment rate is because of the stability of relative levels of unemployment across regions and one would expect to find this 'unitary elasticity' of *AD* with respect to the (aggregate) unemployment rate wherever relative rate persistence is prevalent.

CONCLUSIONS

In this paper we examined differences in the unemployment rates across areas within the five largest metropolitan areas in Australia. We found that the 'absolute' level of dispersion varies in a systematic fashion with the state of the aggregate labour market. We investigated this relationship further by examining the elasticity of absolute dispersion with respect to the unemployment rate. We found that it was (approximately) unity with the result that the 'relative' level of dispersion was invariant with respect to the state of the aggregate labour market. We argued that this elasticity is itself of special interest to anyone studying the geography of labour markets. We also found that the level of within-city dispersion is higher for females than for males and that there are differences in dispersion across cites with the larger cities tending to exhibit more dispersion than the smaller cites.

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DATA APPENDIX

Data for the unemployment rates and labour force are taken from the ABS Labour Force Statistics module of the DX database. Data is available monthly for a consistent set of geographic areas for the period September 1997 - September 2005. However because of changes in the boundaries of regions it is not feasible to look at earlier periods.

The regions which make up the Major Statistical Region for each city are set out below.

Sydney (SYD): Eleven regions make up the Sydney MSR (Inner Sydney & Inner Western Sydney, Eastern Suburbs, St George-Sutherland, Canterbury-Bankstown, Fairfield-Liverpool & Outer South Western Sydney, Central Western Sydney, Outer Western Sydney & Blacktown, Hornsby-Ku-ring-gai & Baulkham Hills, Lower Northern Sydney, Northern Beaches and Gosford-Wyong).

Melbourne (MELB): Nine regions make up the Melbourne MSR (North Western Melbourne, Outer Western Melbourne, Inner Melbourne, North Eastern Melbourne, Inner Eastern Melbourne, Southern Melbourne, Outer Eastern Melbourne, South Eastern Melbourne and Mornington Peninsula).

Brisbane (BRIS): Four regions make up the Brisbane MSR (Brisbane City Inner Ring, Brisbane City Outer Ring, South & East and North & West).

Adelaide (ADEL): Four regions make up the Adelaide MSR (Northern Adelaide, Western Adelaide, Eastern Adelaide, Southern Adelaide).

Perth (PER): Five regions make up the Perth MSR (Central Metropolitan, East Metropolitan, North Metropolitan, South-West Metropolitan and South-East Metropolitan).

Table 1 Mean values of Absolute Dispersion for males and females, 1998-2004.

	SYD	MELB	BRIS	ADEL	PER
ADF	1.68	1.58	1.28	1.52	0.91
ADM	1.63	1.45	0.93	1.53	0.87
URF	5.0	6.2	7.1	6.9	5.9
URM	5.1	6.2	7.0	8.1	6.6

Table 2 Estimates of Equations (3) and (3)

	AD Equation	*RD equation*
α	-1.095	-1.087
	(0.321)	(0.323)
β	0.952	-0.053
	(0.191)	(0.192)
ϕ	0.104	0.102
	(0.054)	(0.054)
γ_{ADEL}	-0.456	-0.453
	(0.104)	(0.104)
γ_{BRIS}	-1.181	-1.180
	(0.107)	(0.109)
γ_{MELB}	-0.277	-0.275
	(0.083)	(0.083)
γ_{PER}	-0.820	-0.817
	(0.083)	(0.084)
λ_{BRIS}	0.523	0.519
	(0,054)	(0.118)
R^2	0.766	0.806

The figures in brackets under the coefficient estimates are estimated standard errors.

Figure 1 Absolute Dispersion by city, Persons: 1998-2004.

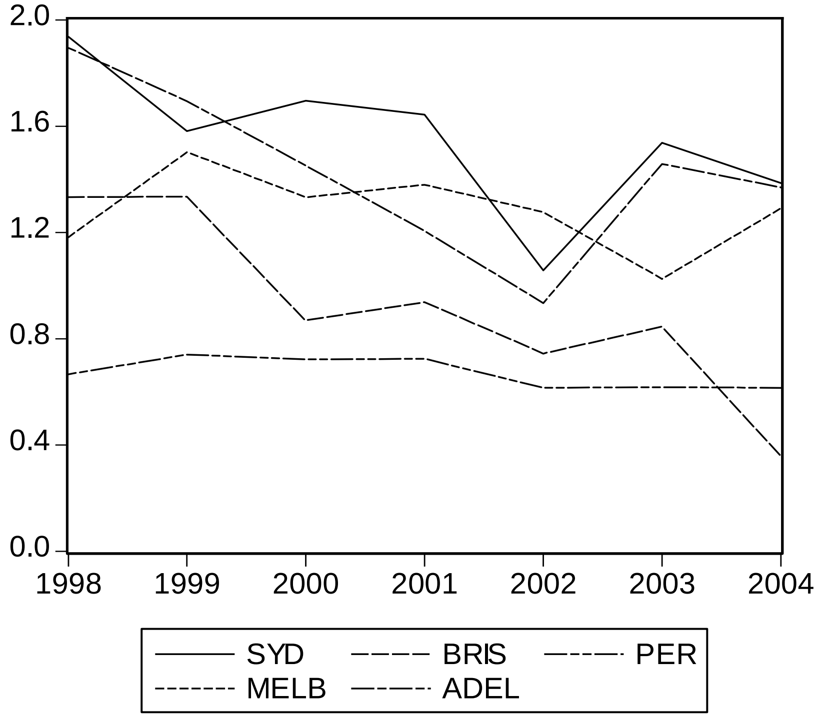
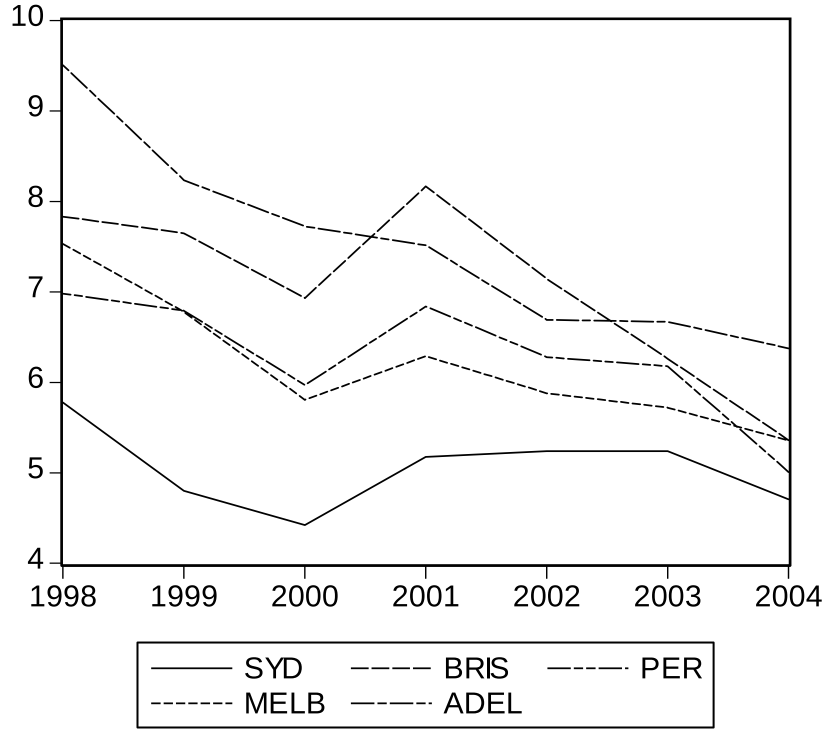


Figure 2 Unemployment Rate by City, Persons: 1998-2004.



NOTES

* I am grateful to Nisvan Erkal for helpful comments on an earlier draft.

[1] Ours is not the first study of the time series characteristics of unemployment rate dispersion by geographic area for Australia. Examples of previous studies include: ANDREWS and KARMEL (1993), who looked at SLAs and LGAs in Australia over the period 1984-1991 using the conventional standard deviation as the measure of dispersion; STUBBIN and HART (1991), who looked at ABS labour force regions in Australia and in the different States over the period 1984-1990 using standard deviations and also coefficients of variation as the measure of dispersion, and; BORLAND and KENNEDY (1998), who looked at unemployment rate dispersion across DEETYA local labour markets within the state of Victoria over the period 1984-1997, using both the coefficient of variation and the Gini coefficient to measure dispersion.

[2] This is akin to wondering if we should use the standard deviation or instead use the coefficient of variation as the indicator of dispersion.

[3] MARTIN (1997, p 240) describes AD as: "the number of new jobs or labour force movements that would be needed to even out unemployment rates between regions". An arithmetic proof may be found in DIXON, SHEPHERD AND THOMSON (2001, p 94).

[4] It also means that the *AD* measure could play a role as a measure of structural or frictional unemployment or 'mis-match unemployment' in econometric models of city-wide unemployment levels.

[5] STUBBIN and HART (1991, p 259) in their study of unemployment rate differences across regions within metropolitan areas in Australia for the June Quarter of 1990 noted that "there is considerable variation in unemployment rates within capital cities, especially Sydney".

[6] There are many other factors which are relevant to a persons risk of being unemployed – we have chosen those which we feel may bear disproportionately on females.

[7] LILLYDAHL and SINGELL (1985) in their study of male and female labour market experience in five US cities found a tendency for female (and teenage) unemployment rates to rise with distance from the CBD which they attributed to self-imposed job location and work hour limitations.

[8] However, the results for annual observations are essentially the same as those obtained when quarterly data is used.

[9] EViews 5.1 is the package utilized. As mentioned in the text, numerous interaction terms involving gender and place were experimented with but all except one proved to be insignificant and are not included in the final equation.

[10] Previous studies dealing with this issue for Australia are now rather dated but both suggest that the two are positively related. STUBBIN and HART (1991, p 259ff) in their study of unemployment rate differences (measured by the weighted standard deviation) across 63 (metropolitan and non-metropolitan) Australian Statistical Regions using data for persons over the period 1984 – 1990 argue that dispersion and level were positively related over the period. ANDREWS and KARMEL (1993, p 49) look at unemployment rate differences (measured by the un-weighted standard deviation) across 890 (metropolitan and non-metropolitan) LGAs in Australia using data for persons over the period 1984 – 1991 and argue that dispersion and level were positively related over the period.

[11] See for example HALVORSEN and PALMQUIST (1980), KENNEDY (1981) and DERRICK (1984).

[12] Now, it could be (and often is) argued, when the coefficient on the dummy is small, that $e^{\phi} - 1 \approx (1+\phi) - 1$, so the proportional change in the dependent variable as a result of the shift

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would be given by ϕ. Following this approach we would conclude that the size of the shift was equivalent to an increase in *AD* of 10.4% rather than 11.0%.

[13] I am grateful to Christine Smith for this explanation. I explore unemployment dispersion in Brisbane in more detail in DIXON (2006).

[14] The reader should note that the Brisbane dummy appears twice and the net effect is to place Brisbane in a similar category to Adelaide and Perth.