DISPARITIES IN MALE LABOUR FORCE PARTICIPATION RATES ACROSS STATES AND TERRITORIES IN AUSTRALIA: 1980-2002

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ABSTRACT: This paper examines differences in labour force participation rates across Australian states and territories over the period 1980 – 2002. It is found that divergence has been increasing, at least for males. Differences in participation rates over time and across states and territories appear to be explained by differences in the rate of labour force withdrawal following structural change (and especially by a move onto the Invalid or Disability Pension) and by differences in the age profile of the male population.

1. INTRODUCTION

Various authors have noted a tendency for real output per capita across Australian states and territories to diverge in recent years (Cashin (1995), Harris (1998), Neri (1998) and Dixon (2003)). In the most recent study Dixon (2003) looked at annual measures of real Gross State Product per capita for Australian states and territories over the period 1984/5 – 2000/1 and found that divergence has been increasing, at least since the early nineteen-nineties. In considering possible reasons for the regional dispersion of incomes Williamson (1965, p 40) conjectured that differences in the labour force participation rate might play an important role. Dixon (2003) found that differences in the participation rate (along with labour productivity differences) do play an important role in producing differences in real GSP per capita across states and territories in Australia.

The purpose of this paper is to look in more detail at the dispersion of participation rates across states and territories in Australia over the period 1980-2002 and also to see if some explanation can be found for observed differences in participation rates.

The structure of the paper is as follows: The next section looks at the evidence on the dispersion of participation rates for males, females and persons across states and territories. Once the data is disaggregated by gender it is seen that systematic divergence is a feature of the data for male participation rates and not female participation rates. In the third section of the paper an attempt is made to model differences in male participation rates across states and territories. The final section concludes.

2. THE EVIDENCE ON THE DISPERSION OF PARTICIPATION RATES OVER TIME

The labour force participation rate (this is usually abbreviated to 'the participation rate') is defined as the proportion of the civilian population aged 15

or over (*POP*) who are in the labour force (*LF*), that is who are either employed or unemployed.

It is convenient to begin by looking at the evidence on the dispersion of the (aggregate) participation rates for persons across the eight states and territories of Australia.

A common measure of dispersion is the cross-section variance (or standard deviation) of the logarithms of the variable of interest. The (weighted) variance of the regional[1] participation rates around their (weighted) mean (*WV*) is:

$$WV = \sum \frac{POP_R}{POP_N}\left(y_R - y_N\right)^2$$

where y_{Rt} is the state or territory participation rate in period t, y_N is the weighted average of all state and territory participation rates (ie the national value (y_N)) and POP_R/POP_N is the ratio of the population in the state or territory to the national population.[2]

Figure 1 shows how the weighted variance in the participation rate for persons has evolved over time for the eight regions.[3] To even out year to year volatility and to enable us to better see systematic movements in the series over time, a simple 3-period centred moving average has been computed for each of the series. We see that the degree of dispersion has 'stepped-up' over the period. The first marked rise occurred over the period 1983 or 1984 - 1986 and the second over the period 1991 - 1998. We also note that both the average level and rate of increase in the degree of dispersion was far greater in the second half of our sample period than in the first.

Two common alternative measures of dispersion are the cross-section variance of the logarithms and the cross-section coefficient of variation.

The weighted variance of the logarithms of the state and territory participation rates around the logarithms of their (weighted) mean (*WVL*) is:

$$WVL = \sum \frac{POP_S}{POP_N}\left(LOG\left(y_S\right) - LOG\left(y_N\right)\right)^2$$

while the weighted coefficient of variation (*WCV*) is:

$$WCV = \frac{\sqrt{\sum \frac{POP_{St}}{POP_{Nt}}\left(y_{St} - y_{Nt}\right)^2}}{y_{Nt}}$$

[1] In what follows the word "region" will be used where appropriate as shorthand for "state and territory".

[2] In what follows the word "population" will be used where appropriate as shorthand for "the civilian population aged 15 or over".

[3] Data for *LF* and *POP* are taken from the ABS Labour Force Statistics module of the DX database.

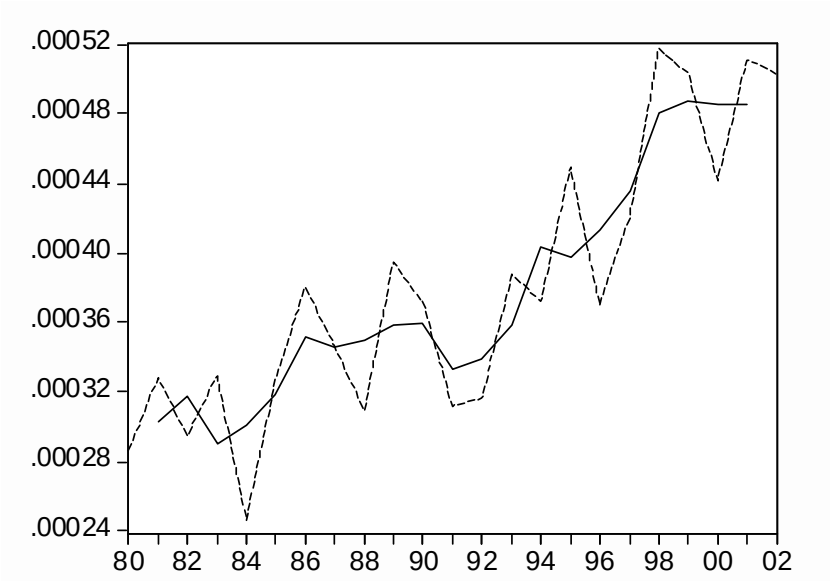

Figure 1. Weighted Variance of the Participation Rates for Persons (broken line) and a three period Moving Average of that Series (solid line), Australian States and Territories, 1980-2002.

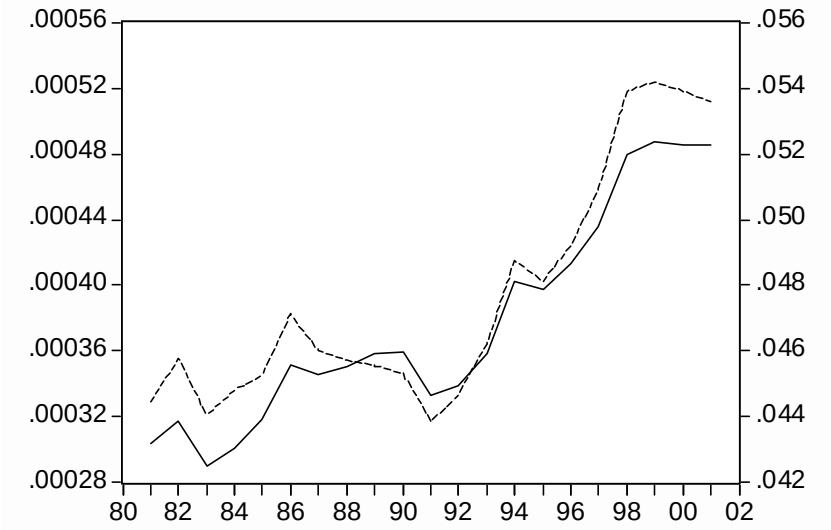

Figure 2. Three period Moving Averages of the Participation Rate of the Logarithm of the Participation Rate for Persons (solid line) and the Weighted Coefficient of Variation of the Participation Rates for Persons (broken line), Australian States and Territories, 1980-2002.

Figure 2 shows three period moving averages of the weighted variances of the logarithm of the participation rate for persons (solid line) and the weighted coefficient of variation of the participation rates for persons (broken line) for the eight Australian states and territories over the period 1980 – 2002. Again, we see that the degree of dispersion has 'stepped-up' over the period and that there appears to be a break in 1991 with both the average level and rate of increase in the degree of dispersion being far greater in the second half of the sample period than they were in the first half.

Clearly all three measures are indicating that the degree of dispersion in participation rates across states and territories has increased over the period and markedly so since 1991. While 1991 was a recession year we shall see later that there is another reason why this year might be associated with a break in any trends connected with the participation rate.

Before proceeding any further, an obvious question to ask at this point is whether this divergence in the data for persons reflects divergence in the participation rates for both males and females or if only one of these is solely or largely responsible for the trend we see in the series for persons.

Figures 3 and 4 show the time paths of the logarithms of the participation rates for males (Figure 3) and females (Figure 4) across the eight Australian states and territories (this is the top panel in each Figure) and for the six states alone (this is the bottom panel in each Figure).[4] For both males and females the participation rates are highest in the ACT, the NT and WA and lowest (at least in recent years) in NSW, SA and TAS.

It is obvious that there is no particular trend in the dispersion of female participation rates as the range from highest to lowest stays pretty much the same over the whole of the period. This is in marked contrast to the time series for males where the range at the end of the period is roughly twice that at the beginning.

Figure 5 shows the weighted variance of the participation rates for males (broken line) and a three period moving average of the weighted variance of the participation rates for males (solid line) for the eight Australian states and territories over the period 1980 – 2002. Clearly both these measures are highly correlated with the equivalent time series for persons, given in Figure 1. The correlation coefficient between the (weighted) variances of the participation rate for males and the (weighted) variances of the participation rate for persons is 0.90.[5]

[4] The figures show the (natural) logarithm of the data so as to more directly indicate the relative growth rates.

[5] The equivalent correlation coefficient for females is 0.44.

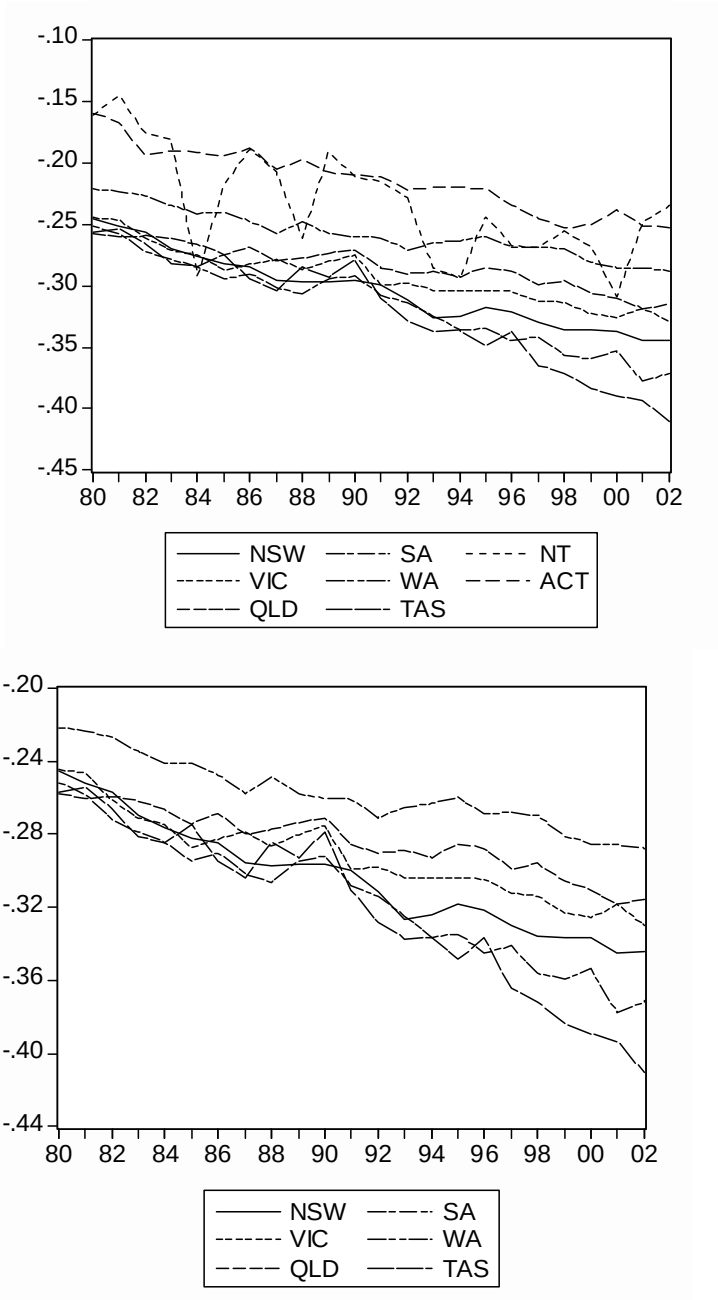

Figure 3. Logarithms of the Participation Rate for Males, 1980-2002.

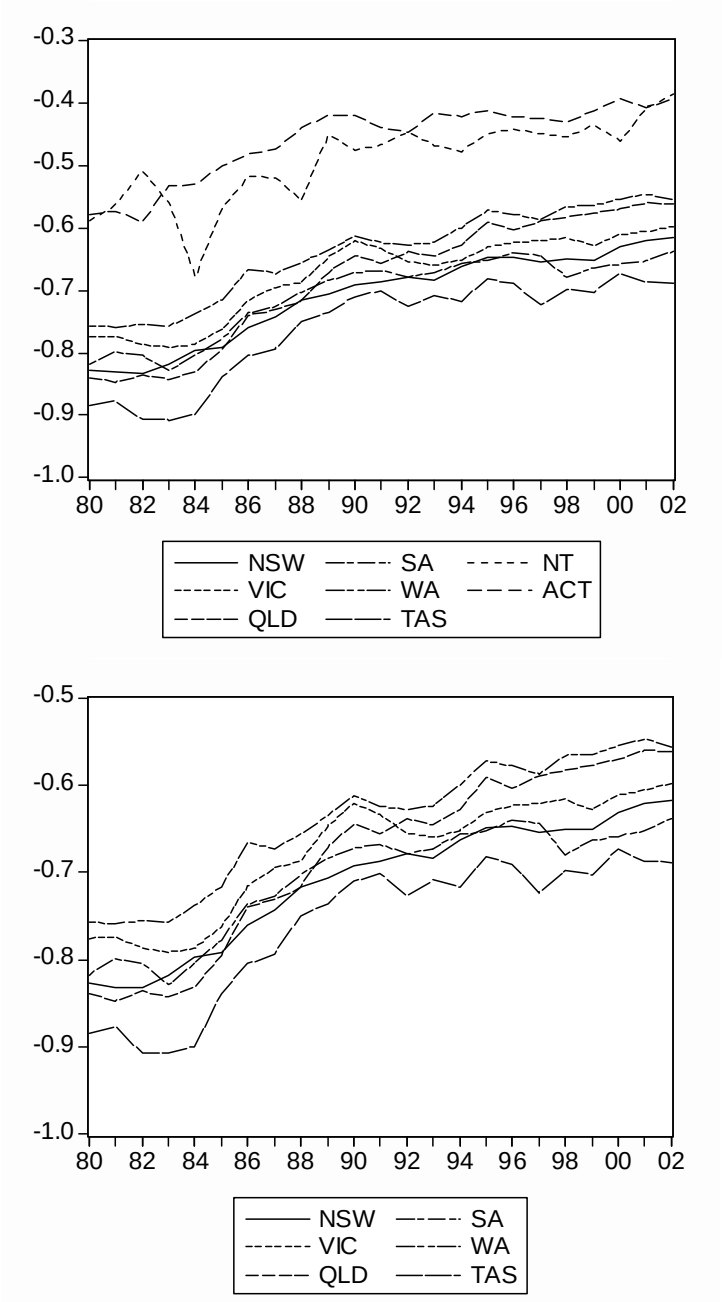

Figure 4. Logarithms of the Participation Rate for Females, 1980-2002.

Figure 5. Weighted Variance of the Participation Rates for Males (broken line) and a three period Moving Average of that Series (solid line), Australian States and Territories, 1980-2002.

Figure 6 shows three period moving averages of the (weighted) variances of the logarithm of the participation rate for males (solid line) and the weighted coefficient of variation of the participation rates (broken line) for the eight Australian states and territories over the period 1980 – 2002. Both measures are highly correlated with the equivalent time series for persons, given in Figure 2. The correlation coefficient between the (weighted) variances of the logarithm of the participation rate for males and the (weighted) variances of the logarithm of the participation rate for persons is 0.91.[6] The correlation coefficient between the (weighted) coefficient of variation of the participation rate for males and the (weighted) coefficient of variation of the participation rate for persons is 0.88.[7]

Interestingly, the time series for males, like that for persons, shows a marked and sustained increase in divergence over the periods 1983 or 1984 – 1986 and in the period after 1991.

In the next section of the paper a simple, but intuitively plausible, model of participation rate differences is set out and tested.

[6] The equivalent correlation coefficient for females is 0.17.
[7] The equivalent correlation coefficient for females is 0.05.

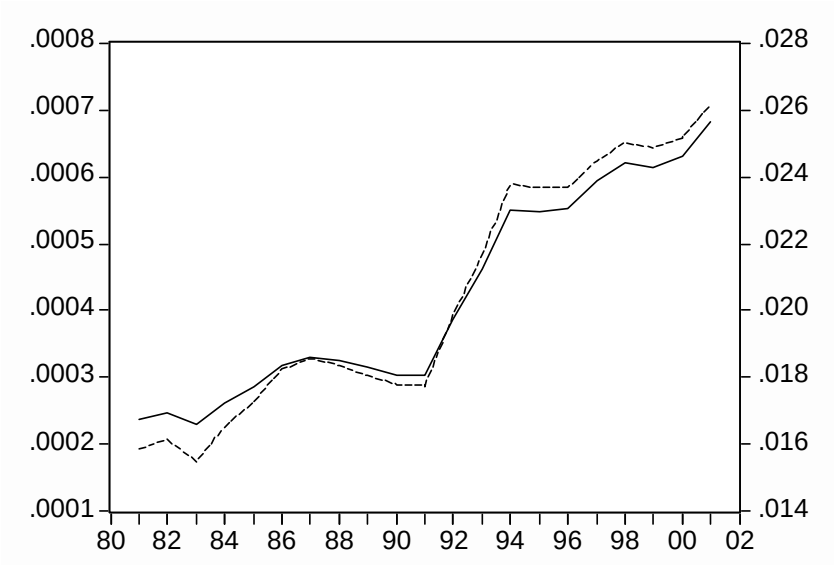

Figure 6. Three period Moving Averages of the (weighted) Variances of the Logarithm of Male Participation Rates (solid line) and the Weighted Coefficient of Variation of Male Participation Rates (broken line), Australian States and Territories, 1980-2002.

3. EXPLAINING DIFFERENCES IN THE MALE PARTICIPATION RATE

It is convenient to look at the periods 1980 – 1991 and 1992 – 2002 separately. The first row of Tables 1 and 2 show mean values of the participation rates for males in each region for the two periods. We notice that all of the participation rates are lower in the second period than in the first, this is consistent with what we know about trends in male labour force participation over this period. Looking across the regions we again note that participation rates are highest in the ACT, NT and WA and lowest in SA and TAS.

The obvious questions to ask at this point are why have we observed these levels and why have the levels have fallen between the two periods? We will approach the matter using multiple regression analysis.

Since we are measuring the participation rate as the labour force divided by the (civilian) population over the age of 15, and we know that participation rate for those aged 65 and over are very low[8] an obvious explanatory variable we should include is the proportion of the (male) 'population' who are aged 65 or more. Data for this variable (AGED) for each of our sub-periods is given in Tables 1 and 2. All of the proportions are higher in the second period than in the

[8] The mean participation rate for males in this age group over our sample period for Australia as a whole is 0.095.

first, consistent with what we know about population ageing over this period. Looking across the regions we note that proportion of males aged 65 and over in the population is lowest (indeed, very low) in the ACT and the NT and highest in TAS and SA. We would expect the regional participation rates to be negatively related to this variable.

Table 1. Means of the Variables for the period 1980-1991.

	NSW	**VIC**	**QLD**	**SA**	**WA**	**TAS**	**NT**	**ACT**	**AUS**
P Rate	0.756	0.760	0.764	0.751	0.784	0.754	0.816	0.824	0.762
AGED	0.121	0.118	0.120	0.128	0.105	0.125	0.034	0.061	0.117
AWE ($pw)	430	416	397	393	430	401	458	470	419
UR	0.074	0.061	0.078	0.084	0.074	0.087	0.065	0.054	0.072
DRPR	0.036	0.037	0.034	0.043	0.035	0.039	0.026	0.014	0.036

Table 2. Means of the Variables for the period 1992-2002

	NSW	**VIC**	**QLD**	**SA**	**WA**	**TAS**	**NT**	**ACT**	**AUS**
P Rate	0.719	0.732	0.742	0.707	0.761	0.695	0.768	0.789	0.730
AGED	0.142	0.140	0.132	0.156	0.120	0.148	0.047	0.090	0.137
AWE ($pw)	732	696	659	657	711	643	697	783	701
UR	0.079	0.086	0.089	0.098	0.077	0.111	0.064	0.068	0.084
DRPR	0.056	0.052	0.055	0.067	0.049	0.079	0.044	0.028	0.055

Economic theory would suggest that the participation rate is related (inter alia) to the expected return from being in the labour force relative to the return from being out of the labour force (eg engaged in homework). In the absence of data on all of the components that must make up real relative returns, the expected nominal average weekly earnings for males (EAWE) is used as a proxy, arrived at by multiplying the observed nominal weekly earnings (AWE) by the employment rate (that is, one minus the unemployment rate (UR)). Effectively it is assumed that there is little or no variability across states and territories in the missing variables such as relevant price levels, social security payments etc). An advantage of combining differences in average weekly earnings with differences in the unemployment rate into a single variable is that we use up only one degree of freedom instead of two. Data for nominal average weekly earnings for males (AWE) and the male unemployment rate (UR) for each of our sub-periods is given in Tables 1 and 2.[9] Nominal earnings are highest in the ACT and lowest in TAS and SA while the unemployment rate is

[9] Data for the average weekly (total) earnings ($'000) of all male employees in each region are taken from the ABS time series module in DX while data for the unemployment rate are taken from the ABS labour force statistics module in DX.

highest in SA and TAS and lowest in the ACT. We would expect the coefficient of the participation rate on EAWE to be positive.

The rapid growth since the early 90s in the number of males taking early retirement and especially the number on the Invalid or Disability Support Pension[10] (DPS) has been noted by many authors (Argyrous & Neale (2001, 2003), Bacon (1997), Cai & Gregory (2002-3), Debelle & Swann (1998), Fitzgerald (2001), McCormack (1997), O'Brien, (2001)). Indeed, it seems widely accepted that "[t]he disability support program has acted as an institutional mop for soaking up older males who have lost jobs" (Argyrous and Neale, 2003, p 21). It would also appear that males aged 55-64 were the group most severely affected by structural change in the economy in the recession period of the early 90s and that many males in this group moved to the DSP and/or early retirement (Argyrous & Neale, (2001, 2003); Borland (1995), Fahrer & Heath (1992) Gregory (1993, 2000), McCormack (1997), O'Brien (2001) and Rosenman &Warburton (1995)).[11] Importantly, from the point of view of this paper, all the evidence we have confirms that the move to DSP is largely a one-way flow in relation to the labour force as over 4/5 of those who exit the DSP do so because they are deceased or they have moved to the Age Pension or to some other form of income support (DFaCS, various years). Also, to the extent that the people moving onto DSP are older workers (Argyrous & Neale (2001, 2003), Cass et al (1988), Lim-Applegate (2004), O'Brien (2001)) this strengthens our argument that their move to income support can be regarded for our purposes as a permanent exit from the labour force.

The "DSP rate" is defined as the proportion of the male civilian population 15 and over who are in receipt of a Disability Support Pension. Figure 7 shows the (annual) DSP rate for males in Australia as a whole over the period 1980-2002.[12] Noteworthy is the marked rise in the DSP rate over the periods 1983-1987 and (especially) over the period 1991 – 1998. The total number of people on the scheme varied over the period with eligibility being tightened in 1980 and also in 1987 and then relaxed (markedly it would appear) in 1991 (Cai & Gregory (2002-3), Cass et al (1988)). It is my contention that these 'exogenous' policy changes can explain much of the timing of changes in direction and in the pace of change of the participation rates.

Figure 8 shows the logarithms of the disability support rate for males for the eight Australian states and territories over the period 1980 – 2002. Mean values of the DSP rate (DSPR) are given for the various states and territories in Tables 1 and 2. It is immediately evident that there are marked regional variations in the

[10] Prior to 1991 the DSP was known as the Invalid Pension. It is usual for males on the Invalid Pension or DSP to be transferred to the Age Pension upon turning 65.

[11] Fitzgerald (2001) has stressed the importance of early retirement, particularly by older males and that a high proportion of these early retirements have been involuntary (p 273). McCormack (1997, p 187) provides evidence of a jump in involuntary early retirement between 1989 and 1992. Of retired men surveyed in 1983 48.2% had retired at age 55-64 whereas 66.8 of retired men surveyed in 1992 had retired at age 55-64 (ABS (1994)).

[12] Data for Figures 7 and 8 are taken from Nichol (1988), DSS and DFaCS (Various Years).

DSP rate.[13] In particular, the proportion of the male population in receipt of an Invalid or Disability Support Pension was noticeably higher in the second period that it was in the first. We see also that the DSP rate is lowest in WA, NT and the ACT and highest in SA and TAS.

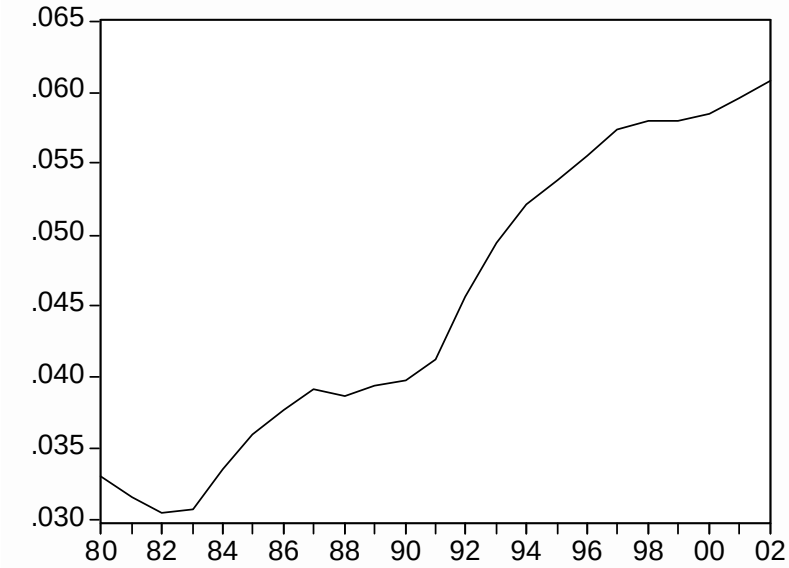

Figure 7. Proportion of Male Civilian Population over the age of 18 in Receipt of a Disability Support Pension, Australia 1980-2002.

Males taking up the DSP are almost certain to be moving out of the labour force and moving out permanently and so we would expect the participation rates to be negatively related to the DSP rates. However, it is important that the reader should note that, while it is of interest in its own right, this variable (the DSP rate) should really be seen as a proxy for the whole constellation of forces surrounding structural change and any consequential flows into early retirement, especially (but not solely) on the part of older male workers. In other words the DSP rate is being used here as an indicator of structural factors influencing withdrawal from the labour market.

Table 3 sets out the results of a number of cross-section regressions where data for the mean values of the variables on interest in the periods 1980-1991 and 1992-2002 are 'pooled', giving 16 observations on each variable to work with. The dependent variable in all of the regressions is the logarithm of the mean of the male participation rate in each state and territory in each of the two periods. Column (1) shows the results obtained when we use as explanatory variables the logarithms of the variables expected earnings (EAWE), the proportion of the

[13] A detailed discussion of these differences can be found in Bray (2001) and Morrow (2002).

'population' who are aged 65 or over (AGED) and the proportion of the 'population' in receipt of a disability support pension (DSPR) together with a constant.[14]

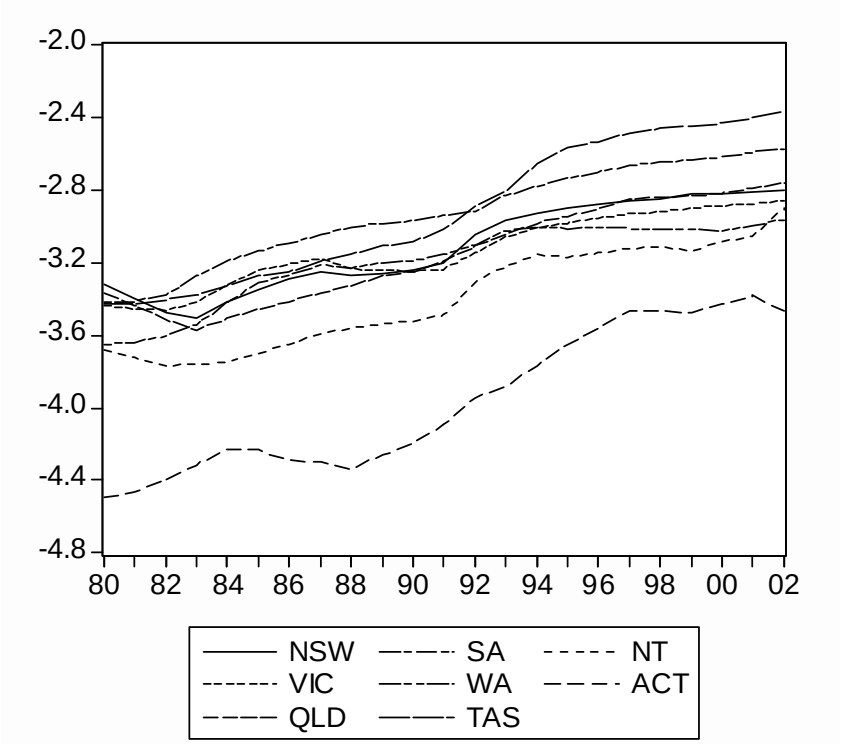

Figure 8. Logarithms of Disability Support Rate for Males, Australian States and Territories 1980-2002.

The expected earnings variable is wrongly signed and statistically insignificant. The other variables are statistically significant and have the expected signs. Column (2) reports the results of repeating the 'pooled' cross-section regression with the expected earnings variable excluded from the equation. The results are very reasonable and the equation has relatively high explanatory power for a cross-section equation.

Since data is being pooled it is appropriate to experiment with dummies to test for the effects of the time period (1980-1991 as against 1992-2000) and state or territory. In none of the regressions was there any detectable 'period' effect, in other words there was no evidence of any effect of the passage of time which was not captured by differences over time in one or more of the other explanatory variables. Experimentation with state or territory dummies

[14] All of the raw data used in the regressions are given in Tables 1 and 2.

suggested that there was a role for only one 'region-effects dummy' and that was for Western Australia.[15] Columns (3) and (4) of Table 3 show the results of repeating both regressions mentioned earlier but with a dummy variable added to denote whether or not the observation was for WA.

Table 3. Results of Cross-section Regressions for the Mean Level of the Participation Rate (yr) in each Period (p-values in parentheses).

Explanatory Variable	(1)	(2)	(3)	(4)
Constant	-0.592	-0.614	-0.585	-0.620
	(0.001)	(0.000)	(0.000)	(0.000)
EAWE	-0.003		-0.005	
	(0.852)		(0.682)	
DSPR	-0.080	-0.081	-0.079	-0.081
	(0.000)	(0.000)	(0.000)	(0.000)
AGED	-0.033	-0.033	-0.036	-0.035
	(0.014)	(0.010)	(0.001)	(0.001)
Dummy for WA			0.029	0.029
			(0.005)	(0.003)
Adjusted R^2	0.895	0.903	0.946	0.950

The estimated coefficients on the shift dummy for WA is positive with a point estimate of 0.029. There has been some considerable discussion in the econometrics literature of the most appropriate measure of the proportional change in a dependent variable that implied by the coefficient on as shift dummy when the dependent variable is in logarithms.[16] Suffice to say that for our specific application it must be the case that $y_{WA,DV=1} = y_{WA,DV=0}e^{\gamma}$, where $y_{WA,DV=1}$ is the value of the WA participation rate in the regime where the dummy is equal to 1 (cet par), $y_{WA,DV=0}$ is the value of the WA participation rate in the regime where the dummy is equal to 0 (cet par) and γ is the point estimate of the parameter on the dummy variable. So the proportional change in the dependent variable (y_{WA}) as a result of the shift is simply equal to $e^{\gamma} - 1$. With a point estimate of γ of 0.029 – a 'small' number – this yields an estimate of the size of the shift as being equivalent to an increase in the participation rate for WA of 2.9 percent, given the magnitude of the other variables. So that instead of the observed mean value of the participation rate for males in WA over the period 1992 - 2002 (say) of 0.761 we would, but for the 'state effect', have seen a participation rate (cet par) of only 0.739. This represents a not insignificant difference in the participation rate of (slightly over) two percentage points.

[15] Interestingly a QLD dummy was not significant.
[16] See Derrick (1984) for a summary of the arguments.

From all of this it is concluded that differences in participation rates over time as well as across states and territories can be explained by differences in the rate of labour force withdrawal involving a move onto the Invalid or Disability Pension (again this is taken to be a proxy for 'structural change') and by differences in the age profile of the male population. It would appear that differences in expected earnings play no role. It would also appear that there is a positive 'state effect' associated with WA and that this is not a trivial amount. This finding is interpreted to mean that, while the model without the state dummy has high explanatory power, there is an excluded variable which for WA has an unusually high (or low) score and which, if it was included, would be significant and would render the WA dummy insignificant.

These findings link up with the earlier findings of increasing divergence in male participation rates as the regression results suggest that we should look to see if there has been any tendency for divergence over time in the proportion of the population who are aged 65 or over (AGED) and/or the proportion of the population in receipt of a disability support pension (DSPR). Figure 9 shows a time series for the weighted variance of DSPR for the eight Australian states and territories over the period 1980 – 2002 while Figure 10 shows a time series for the weighted variance of AGED for the eight Australian states and territories over the period 1980 – 2002. The behavior of both series is consistent with the evolution of the time series for the dispersion of male participation rates as depicted in Figures 5 and 6 although the effect of (differential) population ageing is becoming more muted over time.

Figure 9. Weighted Variance of Male Disability Pension Rates, Australian States and Territories, 1980-2002

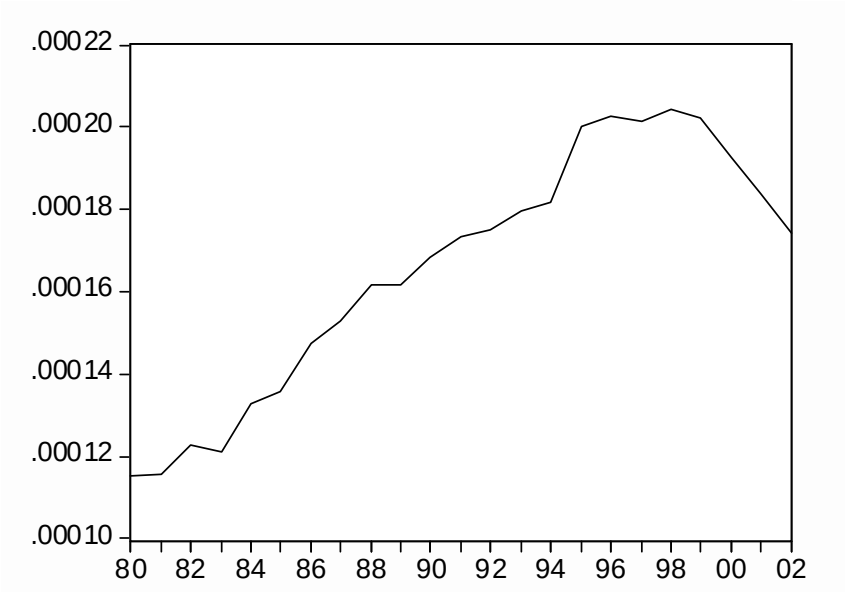

Figure 10. (Weighted) Variances of the Ratio of Male Population aged 65 and over to the Total Male Population aged 15 or more, 1980-2002.

4. CONCLUSION

It would appear that the increasing divergence in real Gross State Product per capita for Australian states and territories in the last decade or so (see Dixon (2003)) can be explained, in part, by diverging male labour force participation rates. Differences in participation rates over time and across states and territories appear to be explained by differences in the rate of labour force withdrawal following structural change (and especially by a move onto the Invalid or Disability Pension) and by differences in the age profile of the male population. However, although the basic model makes sense and has high explanatory power, the finding that there is a (positive) 'state-effect' associated with WA indicates that at least one relevant explanatory variable has been excluded.

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