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**DISCUSSION PAPERS**

**THE EFFECTS OF UNEMPLOYMENT ON THE EARNINGS  
OF YOUNG AUSTRALIANS**

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## ABSTRACT

The high rates of youth unemployment experienced in a number of OECD economies has raised concerns about the effect of this on subsequent earnings. Using the Australian Youth Survey (AYS) a longitudinal survey of Australian youth, we estimate the effects of unemployment on subsequent hourly and weekly earnings. The estimates suggest that, when unobserved heterogeneity is taken into account, it is only long histories of unemployment which have a negative effect on hourly wages. On the other hand, even relatively small amounts of unemployment history are associated with weekly earnings losses. The effects of unemployment on weekly earnings is shown to be mostly due to shorter working hours, with only a small part being due to lower hourly wages. These findings are consistent with the fact that Australia has binding minimum wages which limit the extent to which hourly wages can be reduced and so the impact of unemployment on earnings occurs through shorter working hours. Evidence is presented that this loss of working hours is involuntary and can therefore be counted as a cost of unemployment.

## 1. Introduction

One of the most striking features of the job market since the 1990s is the scale of the problems which young people face. Although more young people are undertaking post-secondary education, unemployment rates remain high across most OECD countries (OECD 1996 and 1998). This has raised concerns about the impact of the experience of unemployment during the early phases of a person's working life, on their future labour market outcomes and the success of their entry into the labour market. One of the ways in which unemployment may impact upon future labour market outcomes is to reduce earnings in subsequent jobs, either by reducing hourly wages or by reducing the number of hours worked per week.

This paper presents estimates of the effect of unemployment on the subsequent hourly and weekly earnings of young Australians using the Australian Youth Survey (AYS), a longitudinal data set. A wage equation framework augmented with measures of unemployment experience is used and the effects of unobserved heterogeneity are eliminated using a fixed effects (FE) estimator. The effects of unemployment on earnings are decomposed into that due to a lower hourly wage rate and that due to shorter working hours.

While there are a number of papers which estimate the effects of unemployment on earnings (Gregory and Jukes 1997; Garcia and Stern 1989; and Ackum 1991), the estimates presented in this paper are the first of the effects of unemployment on working hours. Given the importance of working hours in determining earnings, understanding the effects of unemployment on hours of work is of considerable interest.

There are good reasons for thinking that the experience of unemployment may result in a lower number of hours worked in subsequent jobs, particularly in countries which have binding minimum wages such as Australia.

The estimates presented in this paper suggest that, when unobserved heterogeneity is taken into account, it is only long histories of unemployment that have a negative effect on the hourly wages of young Australians. This is consistent with estimates for Sweden (Ackum, 1991) and young British men (Gregory and Jukes, 1997). On the other hand, relatively small amounts of unemployment history are associated with lower weekly earnings due to their critical role with respect to hours worked.

Section 2 of the paper briefly discusses issues involved in estimating the relationship between unemployment and earnings. Section 3 develops the definition of the effects of unemployment on earnings used throughout the paper. Section 4 discusses the empirical framework and presents the estimates of the effects of unemployment on earnings. Section 5 considers the extent to which part-time employment is involuntary is explored, and Section 6 concludes.

## **2. Issues involved in estimating the effects of unemployment on earnings**

### **2.1 Theoretical literature**

A number of models of earnings determination suggest a link between the experience of unemployment and subsequent hourly wages and between unemployment and subsequent working hours. The impact of unemployment upon both these factors jointly determines the impact upon weekly earnings.

#### ***Hourly wages***

The experience of unemployment may reduce hourly wages in subsequent jobs through two mechanisms. First, the experience of unemployment may reduce a worker's potential productivity therefore leading to a lower hourly wage than would have been received in the absence of the experience of unemployment. Second, the experience of unemployment may lead to the worker lowering the reservation wage at which they will accept a job.

Within the human capital framework unemployment can reduce future wages only by decreasing productivity. This can occur through the loss of firm specific skills, depreciation of general human capital and through foregone skill development, which would have occurred, had the person remained employed. Depreciation of general human capital is generated by the experience of non-employment and not because of job loss in itself and therefore may increase with the duration of unemployment.<sup>1</sup> On the other hand, the loss of firm specific skills is caused by the event of unemployment and is not directly related to the duration of the spell of unemployment. Foregone skill development may be particularly significant for younger workers, given the human capital arguments that the majority of investment in skills development occurs early in a person's working life.

Within in the human capital framework, whether or not, any negative effects of unemployment on hourly wages disappear over time depends upon the extent to which productivity recovers to what it would have been in the absence of the experience of unemployment.

An alternative to the human capital framework is the screening hypothesis. If prospective employers have imperfect information about a potential employee's productivity they need a means of screening workers for unobserved differences in productivity. If having a history of unemployment is correlated with unobserved differences in productivity, then employers may use unemployment history as a signal of unobserved productivity differences (Gibbons and Katz (1991); Lockwood (1991); Blanchard and Diamond (1994); and Doiron (1995)).

Unfortunately, in the absence of direct information on the effects of unemployment on productivity, the human capital framework and the screening hypothesis are

observationally equivalent.

Alternatively, the experience of unemployment may reduce hourly wages by leading individuals to lower the minimum hourly wage rate at which they will accept a job (the reservation wage). One class of models in which this may occur is search models. There are several reasons for thinking that reservation wages fall as the duration of unemployment increases. First, reservation wages may fall as the savings of the unemployed run out. Second, the experience of unemployment may decrease self-confidence and cause a downward revision of expectation leading to a lowering of the wage at which a person will accept a job.

### ***Working hours***

There are a number of reasons why individuals who have a history of unemployment may work a lower number of hours per week than they would have worked had they never been unemployed. These reasons can be divided into supply side and demand side factors. On the supply side, individuals with a history of unemployment may prefer to work fewer hours. In this case, any association between unemployment history and lower hours of work reflects individual preferences and cannot be interpreted as a wage loss.

On the demand side, employers may be prepared to only offer part-time jobs to individuals who have a history of unemployment. There are several possible explanations as to why employers may, on the basis of previous unemployment, restrict the range of hours associated with job offers. First, if having a history of unemployment makes employers uncertain as to the productivity of a potential employee and hiring and firing costs are lower for part-time than full-time workers, then employers may only be willing to employ people with a history of unemployment in jobs with lower hours.<sup>2</sup>

Second, if unemployment history reduces productivity (or sends a negative signal), then the range of job offers the job seeker has to choose from may be reduced. Given that an increasing number of new jobs being generated are part-time (Dawkins and Norris 1995), this means that individuals with a history of unemployment are more likely to be employed part-time.

Clearly, the different scenarios provide different interpretations of the data. If a worker would like to work more hours, but is unable to find a job with the desired number of hours because of their history of unemployment, the lower hours worked reflects a cost to the individual. If, on the other hand, individuals with a history of unemployment are working their desired number of hours, differences in hours worked cannot be interpreted as a loss.

## **2.2 Australian wage setting institutions**

The Australian system of wage determination has historically been highly centralised. Until very recently most workers in an industry or occupation had their minimum rates of pay set centrally by an industrial commission or tribunal. The system has been commonly referred to as a system of compulsory arbitration.

Under the system of compulsory arbitration, the majority of workers had their minimum rates of pay and other terms of work set out in an 'award' made by one of a range of arbitration and conciliation tribunals. Collectively, an award can be defined as a written statement of the terms and conditions of employment. Most awards relate to an industry, but some cover occupational groups.

Many award rates of pay and conditions, at both the Federal and State level, specify junior rates of pay. These junior rates of pay can cover workers aged 20 years and less, usually differ for each age in years and are set as proportions (typically rising according to age) of an adult award rate of pay (Daly *et. al.*, 1998). This institutional characteristic means that award wages will increase with age in the Australian youth labour market independent of an individual's experience and other factors related to productivity.

### 2.3 Existing studies

There are several papers which have estimated the impact of unemployment upon future hourly earnings. Stern (1989) and Gregory and Jukes (1997), using data on United Kingdom (UK) men, found that unemployment has a negative impact upon subsequent individual hourly earnings. However, the negative effects are smallest for young men. Ackum (1991) found that amongst Swedish youth, once unobserved heterogeneity was taken into account there was no impact upon subsequent hourly wages.

While there is an extensive theoretical and empirical literature dealing with the determinants of working hours, there appears to have been no research on the effect of unemployment upon working hours.

## 3. Defining the effects of unemployment on earnings

Before proceeding, careful attention needs to be paid to developing an appropriate definition of the effect of unemployment on earnings. This paper defines the effects of unemployment on earnings as the difference between what an individual with a given unemployment experience earns and what they would have earned had they never experienced unemployment. This definition allows for the earnings growth that would have occurred while the person was unemployed. It was first used in the program evaluation literature (LaLonde 1986) and has been used extensively in the job displacement literature (Jacobson, LaLonde and Sullivan, 1993). It has also been used by Ackum (1991) and Gregory and Jukes (1997) when estimating the effects of unemployment on earnings.

Since, what the individual would have earned had they never been unemployed is unknown, earnings losses are defined as the difference between what a person with a particular pattern of unemployment history earns and what an otherwise similar person with no history of unemployment is expected to earn.

The definition of earnings loss can be formalised as follows:

$$WL_{it} = E(W_{it} | X_{it}, D_{it}=1) - E(W_{it} | X_{it}, D_{it}=0) \quad (1)$$

where  $WL_{it}$  is the earnings loss (hourly or weekly) of individual  $i$  at time  $t$ . The first term on the right-hand side of equation 1 is the expected hourly or weekly earnings ( $W_{it}$ ) of individual  $i$  at time  $t$ , conditional upon their personal characteristics ( $X_{it}$ ) and having a particular experience of unemployment ( $D_{it}=1$ ).  $D_{it}$  is an indicator variable that takes the value of one if the individual has a particular history of unemployment and zero if they have never been unemployed. The vector of personal characteristics ( $X_{it}$ ) includes all the factors, with the exception of unemployment history, which are related to the hourly or weekly earnings an individual receives. The second term on the right-hand side of equation 1 is the expected wage of individual  $i$  at time  $t$ , conditional upon their personal characteristics and never having experienced unemployment ( $D_{it}=0$ ).

## 4. Estimating the relationship between earnings and unemployment

### 4.1 Estimating model

As discussed, the effects of unemployment history upon hourly wages and weekly earnings are estimated using a wage equation framework augmented with measures of an individual's unemployment history. The model estimated is expressed formally in equation (2):

$$\ln W_{it} = \beta + \delta X_{it} + \theta Z_i + \phi UNEXP_{it} + \lambda UR_t + \pi REGION + \alpha_i + \varepsilon_{it} \quad (2)$$

where  $\ln W_{it}$  is the natural logarithm of real hourly wages or real weekly earnings,  $X_{it}$  is a vector of variables which measure individual characteristics that vary over time and across individuals and  $Z_i$  is a vector of time invariant individual characteristics. Individual's unemployment experience ( $UNEXP_{it}$ ) is measured by a set of variables measuring various dimensions of unemployment experience. The aggregate unemployment rate ( $UR_t$ ) is included to pick up the effects of the macro-economy on wages. The effects of geographic region of residence on earnings are controlled for using state of residence dummies ( $REGION_{it}$ ).  $\alpha_i$  represents an individual specific dummy variable that allows for the effects of any unobserved differences between individuals (unobserved heterogeneity) which are constant over time. These unobserved differences might include differences in innate ability, motivation or quality of secondary schooling.

If equation (1) is estimated using Ordinary Least Squares (OLS) the error term is  $(\alpha_i + \varepsilon_{it})$ . If there is correlation between the error term and unemployment history ( $UNEXP_{it}$ ) then the estimated effects of unemployment history on wage profiles will be biased. Under certain assumptions, this bias can be eliminated using a fixed effects (FE) specification. The FE estimator assumes that the unobserved heterogeneity is constant over time and can therefore be captured by differences in the constant term.<sup>3</sup> When using the FE estimator, the effect of time invariant characteristics ( $Z_i$ ) cannot be estimated as the impact of these variables is captured by the individual specific.

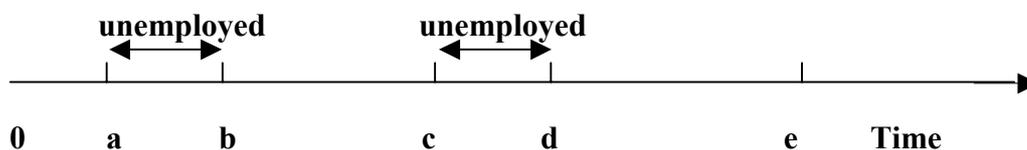
The OLS and FE estimates of the effects of unemployment on hourly and weekly earnings differ, indicating that the corresponding variables are correlated with the individual specific effects. This implies that the OLS estimates are biased by the correlation between the individual specific effects and the variables measuring unemployment experience.<sup>4</sup>

The discussion focuses on the FE estimates.<sup>5</sup>

Individual unemployment histories are measured in three dimensions: (i) the length of time since the most recent spell of unemployment ended ( $TIMING_{it}$ ); (ii) the duration of most recent spell of unemployment ( $RDUR_{it}$ ); and (iii) the cumulated duration of all other spells of unemployment ( $CDUR_{it}$ ).<sup>6</sup> The measures of individual unemployment histories exclude time spent not-in-the labour force and unemployment while the individual is in secondary education or full-time tertiary.

These measures of unemployment history can be explained with the aid of the following example. Figure 1 shows the time line of a hypothetical individual who has a history of unemployment. In this example, the individual was unemployed from time  $a$  to time  $b$  and then again from time  $c$  to time  $d$ . The individual was always employed when they were not unemployed (ie. from time 0 to time  $a$ , from time  $b$  to time  $c$  and from time  $d$  onwards). In terms of the measures of unemployment history, this individual's most recent spell of unemployment has duration of  $(d-c)$  and the cumulated duration of other spells of unemployment is of length  $(b-a)$ . If they are observed at time  $e$  then the length of time since the individual's most recent spell of unemployment ended timing is  $(e-d)$ .

**Figure 1. Time line of unemployment history**



These measures of unemployment history are "absolute" measures in that they represent actual lengths of time spent unemployed. An alternative would be to use relative measures of unemployment history (such as the proportion of time since leaving school spent unemployed). There are good reasons for thinking that wage losses from unemployment are related to the absolute length of time spent unemployed. For example, within the human capital model it is the duration of unemployment that is related to the depreciation of general human capital and not some relative measure of unemployment history.

The duration of the most recent spell of unemployment ( $RDUR_{it}$ ) is specified using dummy variables which indicated the number of quarters (3 months) the spell of

unemployment lasted for (one, two, three and four or more quarters). Similarly, the cumulated duration of other spells of unemployment ( $CDUR_{it}$ ) is also specified using a dummy variable specification (one, two, three, four and five or more quarters of unemployment). All the measures of unemployment history are set equal to zero for respondents with no experience of unemployment.

The separation of unemployment experience into the duration of the most recent spell of unemployment ( $RDUR_{it}$ ) and the cumulated duration of all other spells of unemployment ( $CDUR_{it}$ ) allows us to get some insight into the effects of multiple spells of unemployment. Individuals who have only one spell of unemployment have a cumulated duration of all other spells of unemployment of zero, whereas individuals who have more than one spell of unemployment will have a positive amount of cumulated duration of all other spells of unemployment.

The length of time since last unemployed is specified as the reciprocal of the number of weeks since the most recent spell of unemployment ended ( $TIMING_{it}$ ). This variable is set equal to zero for those with no history of unemployment, since a value of zero, implies that the time interval since the most recent spell of unemployment approaches infinity. The reciprocal of the number of weeks since the last spell of unemployment increases the shorter the length of time since the last spell of unemployment ended. The timing measure is entered into the regression model using a quadratic specification in order to allow a more flexible functional form.

The vector of time varying individual characteristics include: age and age squared; actual employment experience measured in weeks ( $Exp$ ); tenure in current job and tenure squared measured in weeks ( $Tenure$ ,  $Tenure^2$ ); marital status ( $Married$ ); and having health problems that limit the amount or type of work that can be done ( $Health$ ). In principle, educational attainment varies over time. In practice however, there is very little variation in educational attainment and so educational attainment is treated as being a fixed characteristic.

The inclusion of age and actual employment experience differs from the conventional specification, which does not include age (Borland and Suen 1994; Preston 1997). Age is included in the specification to control for the age basis of minimum hourly wages in Australia. The short range of employment experience maximum 6 years means that a linear specification is a very close approximation to the relationship.

In addition, a dummy variable for being a full-time worker ( $Full-time$ ) is included in the estimates of the effects of unemployment upon hourly wages. Obviously this variable is not included in the estimates of weekly earnings. The effects of local labour market conditions are controlled for by dummy variables for state of residence (NSW, VIC, QLD, SA, WA, TAS, ACT, NT). Detailed information on the construction of the variables is presented in Table 1.

The empirical specification imposes a number of restrictions upon the ways in which unemployment history can affect wages. First, the returns to experience, tenure, and the effects of age, hours of work, being a member of a union, industry and occupation of employment are restricted to be the same regardless of unemployment history.<sup>7</sup> Second,

the slope of the re-employment wage profile, as measured by the coefficient on the timing variables, is restricted to be the same for all individuals with a history of unemployment.

**Table 1. Description of the variables**

<b>Variable</b>	<b>Description</b>
Wage	Natural logarithm of real hourly wage. Constructed by dividing individuals normal weekly earnings by normal hours worked per week. Respondents who refused to give earnings to the dollar or said they did not know (very small proportion of the sample) were asked which earnings category they fell into. For individuals who answered this question the midpoint of each income category is used. The highest income category is top coded at 1.5 times. The hourly wages are converted into 1989 dollars using the Consumer Price Index.
Earnings	Natural logarithm of real weekly wage. The weekly earnings are converted into 1989 dollars using the Consumer Price Index.
Age, Age <sup>2</sup>	Age and age squared measured in calendar years
Exp	Actual employment experience in weeks. Employment experience whilst attending secondary school or full-time tertiary education is excluded.
Tenure, Tenure <sup>2</sup>	Weeks of tenure in current job
Married	A dummy variable that takes the value of 1 if the respondent is married (includes defacto relationships)
Health	A dummy variable that takes the value of 1 if the individual has health problems that limit the amount or type of work they can do and 0 otherwise.
Full-time	A dummy variable that takes the value of 1 if the person usually worked more than 30 hours a week and 0 otherwise.
UR	Aggregate unemployment rate for the population 15 to 65 years of age
NSW, VIC, QLD, SA, WA, TAS, ACT, NT	Dummy variable controls for living in the states of New South Wales, Victoria, Queensland, Western Australia, Tasmania, Australian Capital Territory and the Northern Territory
1/Timing, (1/Timing) <sup>2</sup>	the reciprocal of the number of weeks since the most recent spell of unemployment ended. This variable is set equal to zero for those with no history of unemployment (implying that the time interval approaches infinity)
RDUR	A set of dummy variables indicating duration of most recent spell of unemployment quarters of unemployment history. Coded as a set of dummy variables indicating having 1 to 4 or more quarters of unemployment history. The omitted category is having no unemployment history. Excludes unemployment experience whilst in education.
CDUR	A set of dummy variables indicating cumulated duration of other spells of unemployment. Coded as a set of dummy variables indicating having 1 to 5 or more quarters of unemployment history. The omitted category is having no unemployment history. Excludes unemployment experience whilst in education.

## 4.2 Data

The effects of unemployment history on hourly earnings are estimated using the AYS, a longitudinal data set of individuals aged 16 to 24. The AYS began in 1989 with a sample of 5,350 individuals drawn from the Australian population aged 16 to 19 years. Since 1989 these individuals have been interviewed annually, with the obvious exception of those not able to be contacted. In addition, in each year from 1990 a new sample of 16-year-olds has been interviewed. By 1994, information on 11,767 individuals had been collected. The survey contains questions on a wide range of demographic, socioeconomic and labour market issues (for further details on the AYS see Miller (1995)). Of particular importance for this study is that complete labour force histories can be derived using employment and job search calendars contained in the AYS.<sup>8</sup>

The sample used in the wage regressions was selected using the following criteria. Observations where the individual was not employed at the time of the interview are excluded, as are observations that come from an individual in secondary education or full-time tertiary education at the time of the interview.<sup>9</sup> Descriptive statistics of the variables used in the econometric analysis are presented in Appendix Tables A1 and A2 for males and females respectively.

The AYS experiences significant sample attrition, with 40 per cent of the original 1989 sample, no longer present in the survey by 1994. If this sample attrition is not random (either in terms of observable or unobservable factors) then the representativeness of the sample may decrease over time and estimates of the relationship between unemployment and earnings may be biased.

The estimates of the relationship between unemployment and earnings do not appear to be biased by the sample attrition. Gray (1999) presents a detailed analysis of rates of sample attrition in the AYS and whether the attrition distorts the representativeness of the AYS in terms of a range of observable characteristics. Gray (1999) shows that the mean value of the hourly and weekly wages do not differ between the attritors and the non-attritors. It is also found that unobserved heterogeneity between attritors and non-attritors is not related to unobserved components of the level or rate of growth of wages. While attritors are more likely to have been unemployed than non-attritors when other personal characteristics are taken into account, having experienced unemployment is not associated with the probability of attriting from the sample.

## 4.3 The relationship between unemployment and hourly wages

Since the focus of this paper is on the effects of unemployment history on earnings we discuss only briefly the estimates of the other variables (see Gray (1999) for a comprehensive discussion of the estimates for the other variables). For both males and females, increases in age are estimated to increase hourly wages at a decreasing rate. Being married and having poor health are statistically insignificant. Being a full time worker is associated with lower hourly wages. This probably reflects the wage premia part-time workers receive in lieu of holiday pay or sick leave.

While the estimated coefficients on the variables measuring the length of the most recent spell of unemployment are negative, they are very small in size and statistically

insignificant. For both males and females, it is only very large amounts of unemployment experience that have a negative effect on hourly wages. For example, a cumulated duration of other spells of unemployment of five or more quarters is estimated to decrease the hourly wages of males by 11.5 percentage points.

These results imply that hourly wage losses are generated by repeated spells of unemployment which add up to a very large amount of unemployment history. The magnitude of wage losses for females are similar to those for males, but are generated by a slightly smaller amount of unemployment experience with four or more quarters of cumulated unemployment experience estimated to decrease hourly wages by 14.2 percentage points. The variables measuring the length of time since the most recent spell of unemployment ended (Timing and Timing<sup>2</sup>) are individually and jointly statistically insignificant for both males and females. This also implies that individuals with a experience of unemployment are not employed in jobs which have a lower rate of hourly wage growth than individuals who have never been unemployed.

**Table 2. FE estimates of the effects of unemployment history on hourly wages and weekly earnings**

	Hourly wages				Weekly earnings			
	Males		Females		Males		Females	
	Coef.	T-stat	Coef.	T-stat	Coef.	T-stat	Coef.	T-stat
Age	0.58216	10.60	0.61172	15.50	0.72063	8.53	0.72048	10.74
Age2	-0.0121	9.18	-0.0127	13.33	-0.01454	7.17	-0.0148	9.14
Exp (weeks)	0.00025	0.79	-0.00019	0.80	0.0018	3.71	0.00236	5.77
Tenure (weeks)	-0.00056	0.85	0.0004	0.97	0.00292	2.87	0.0018	2.55
Tenure2 (weeks)	0.00001	1.20	0	0.49	-0.00003	3.18	-0.00002	3.93
Married	-0.03151	1.40	0.01561	1.21	-0.02463	0.71	-0.03995	1.82
Health	0.01053	0.37	0.0069	0.34	0.02994	0.69	-0.03886	1.12
Full-time	-0.10455	5.35	-0.15424	12.85				
NSW	0.02438	0.37	0.09362	1.73	-0.00105	0.01	-0.0479	0.52
QLD	0.00295	0.04	0.04073	0.78	-0.05181	0.48	-0.01297	0.15
SA	0.19081	1.75	0.03647	0.51	-0.03016	0.18	-0.26182	2.16
WA	0.26016	1.94	0.13584	1.64	0.05134	0.25	-0.22988	1.63
TAS	0.13228	0.71	-0.12394	0.97	0.07991	0.28	-0.39845	1.83
ACT	0.14426	1.50	0.12842	1.35	-0.0378	0.26	0.03589	0.22
NT	0.18117	1.35	0.35239	3.93	-0.03609	0.18	0.1947	1.28
UR	-1.27135	2.59	-0.23374	0.69	-4.4009	5.86	-1.97192	3.41
Timing	-0.14506	0.97	0.05704	0.50	-0.56391	2.45	-0.34654	1.79
Timing <sup>2</sup>	0.10836	0.65	-0.06566	0.53	0.49011	1.91	0.13918	0.66
<b>Duration of most recent spell of unemployment (quarters)</b>								
1 quarter	-0.01603	0.65	-0.00642	0.43	-0.04394	1.17	-0.0383	1.52
2 quarters	-0.04413	1.39	-0.00753	0.35	-0.05149	1.05	-0.12847	3.52
3 quarters	-0.02593	0.58	-0.00897	0.31	-0.14183	2.07	-0.0657	1.33
4 quarters	-0.0032	0.04	-0.0514	1.22	-0.15819	1.42	-0.13049	1.81
<b>Cumulated duration of other spells of unemployment (quarters)</b>								
1 quarter	0.03856	1.64	-0.01277	0.83	0.01105	0.31	-0.03922	1.51
2 quarters	0.02904	0.85	-0.00599	0.28	-0.0396	0.75	-0.08958	2.44
3 quarters	-0.01334	0.32	-0.01514	0.54	-0.06665	1.04	-0.19556	4.11
4 quarters	0.02303	0.41	-0.15357	3.69	0.08967	1.04	-0.3757	5.31
5+ quarters	-0.12231	1.98	-0.13094	2.46	-0.28671	3.02	-0.40782	4.50
Constant	-4.45679	8.11	-4.92571	12.41	-2.48885	2.94	-2.67977	3.97

Number of obs	3386	4913	3386	4913
# Groups	1127	1495	1127	1495
R-sq within	0.2795	0.3841	0.2206	0.2290
F-test FE	F(1126,2232)~2.47	F(1494,3388)~2.33	F(1126,2231)~ 2.79	F(1494,3389)~3.55

Notes. The omitted region dummy is Victoria. For males and females, the F-test of the joint significance of the FE indicates that they are jointly significantly different than 0 at the 1 percent level, implying that individual FEs are present in the data (Baltagi (1995)). A Hausman specification test suggests that the random effects specification is inappropriate for the AYS data and that an FE specification is appropriate.

A possible source of bias is that wages are observed only for individuals who were employed at the time of the annual interview. We have not attempted to test and correct for this type of sample selection for two reasons. First, the FE specification controls for unobserved heterogeneity which is constant over time and should reduce, if not eliminate any biases. Second, the Heckman correction term in the cross-sectional case has no effect upon the coefficient estimates and the Heckman correction term was statistically insignificant (Gray 1999).

#### 4.4 The relationship between unemployment and weekly earnings

Since weekly earnings are determined jointly by the number of hours worked and the hourly wage rate, any effect from unemployment on subsequent weekly earnings will be the combined result of these factors. As with the discussion of the effects of unemployment on hourly wages, the discussion in this section focuses on the variables measuring unemployment experience (see Gray (1999) for a comprehensive discussion of the estimates for the other variables).

For both males and females, increases in age are estimated to increase weekly earnings at a decreasing rate. Increases in experience are estimated to increase weekly earnings. Increases in tenure are also estimated to increase weekly earnings at a decreasing rate. Marital and health status were found to have no statistically significant effect upon weekly earnings

The estimates suggest that unemployment experience can have a substantial negative effect upon the earnings for males and females. Weekly wage losses are associated with the most recent spell of unemployment and with the cumulated duration of other spells of unemployment. The estimated wage losses increase with the duration of unemployment experience and are very substantial for large amounts of unemployment experience. The effects of the cumulated duration of other spells of unemployment are larger than the effects of the most recent spell of unemployment. This implies that multiple spells of unemployment experience are particularly damaging in terms of weekly earnings. The coefficients on the timing variables are jointly statistically significant and imply weekly earnings losses decrease with continuing employment.

One possible reason for the negative effect of unemployment history on weekly earnings is the loss of union, industry or occupation wage premium. The estimated wage losses did not change significantly when trade union membership was controlled for, suggesting that the wage losses are not a result of the loss of union wage premium. Controlling the industry and occupation of employment leads to reductions in the estimated wage losses,

but the reductions are relatively small (Gray (1999)).

#### **4.5 Decomposition of earnings losses into hourly wage rate and number of hours worked effects**

This section presents a decomposition of the effects of unemployment on weekly earnings into those due to a lower hourly wage rate and those due to a lower number of hours of worked. This is possible because the only factor determining the difference between hourly and weekly earnings is the number of hours worked per week. The hourly wage loss is given directly from the hourly wage regression. The wage loss due to the loss of hours is calculated as the difference between the total wage loss (estimated from the weekly earnings regression) and the hourly wage losses.

For this decomposition to be valid the hourly wage rate and the number of hours worked must be independent. The estimates of the determinants of hourly wages demonstrate that working more than 30 hours per week (full-time employment) is negatively related to hourly wages. There are a number of reasons for the negative relationship between hourly wages and working hours. Vella (1993) argues that the negative relationship between weekly hours worked and the gross hourly wage rate is due to employers and employees avoiding taxation by substituting wages with non-taxable, non-wage benefits as the total weekly wage increases.

The inclusion of a control for working hours in the hourly wage regression model should reduce the effects of this correlation. Any correlation between the number of hours worked and the hourly wage rate probably leads this decomposition to understate the proportion of wages losses due to lower number of hours of work, since part-time workers, *ceteris paribus*, receive a higher hourly rate of pay.

Table 3 presents the results of decomposing the weekly earnings losses into the part due to a lower hourly rate of pay and the part due to a decrease in the number of hours worked. The wage losses for the following patterns of unemployment history are presented: most recent spell of unemployment lasted for one, two, three and four or more quarters and no other unemployment experience (ie individual has experienced one spell of unemployment); duration of most recent spell two quarters and three quarters of cumulated other unemployment spells; and duration of most recent spell four or more quarters and five or more quarters of cumulated other unemployment spells. For each pattern of unemployment history it is assumed that the length of time since the most recent spell of unemployment ended is four weeks.

As an example for the interpretation of Table 3, consider females who have a most recent spell of unemployment which lasted four or more quarters and have five or more quarters of other unemployment experience. The estimated total wage loss is 53.5 percentage points, of which 20.2 percentage points is due to lower hourly wages and 33.3 percentage points is due to working fewer hours per week. For males with an identical unemployment history the total wage loss is 50.6 percentage points, of which hourly wage losses account for 14.8 percentage points and 35.8 percentage points is due to fewer hours being worked.

It is clear that the negative effects of unemployment history on the hourly wage rate are very small unless the person has experienced a lot of unemployment. On the other hand, even relatively short histories of unemployment are associated with substantially lower working hours and weekly earnings.

## 5. The extent to which part-time employment is involuntary

While we have shown that effect of previous unemployment on weekly earnings is mostly due to a lower number of hours worked per week it is not possible to conclude from these results whether the lower hours of work is voluntary or involuntary. In this section, evidence is presented on the extent to which part-time employees with differing amounts of unemployment experience would prefer to work full-time. If people working part-time would prefer to work full-time this is *prima facie* evidence that they are hours constrained and the effects of unemployment on hours of work can indeed be interpreted as a cost.

**Table 3. Predicted wage losses**

	Males			Female		
	Rate	Hours	Weekly	Rate	Hours	Weekly
	Per cent					
1 quarter	-4.5	-10.8	-15.3	0.4	-11.9	-11.6
2 quarters	-7.3	-8.8	-16.1	0.3	-20.1	-19.8
3 quarters	-5.5	-18.7	-24.3	0.1	-14.3	-14.2
4 quarters	-3.3	-22.4	-25.7	-4.0	-16.0	-20.0
2 quarters, 3 quarters	-8.6	-13.9	-22.5	-1.2	-36.4	-37.6
4+ quarters, 5+ quarters	-14.8	-35.8	-50.6	-20.2	-33.3	-53.5

Notes. In all cases it is assumed that the length of time since the most recent spell of unemployment ended is four weeks. The percentage effect of each dummy variable on earnings is given by  $((e^{\beta} - 1) \times 100)$ .

**Table 4. Preference for full-time work for those working less than 30 hours a week, by the percentage of time spent unemployed**

	Mean	Standard deviation	Number of observations
	per cent		
<b>Males</b>			
No unemployment	45.1	0.4985	286
0.01% to 25%	46.5	0.4995	310
26% to 50%	56.9	0.4967	167
51% to 75%	72.5	0.4500	69
76% to 99%	74.7	0.4378	75
<b>Females</b>			
No unemployment	43.7	0.4966	455
0.01% to 25%	43.9	0.4968	510
26% to 50%	54.9	0.4985	299
51% to 75%	57.9	0.4956	140
76% to 99%	57.7	0.4963	111

Note. The question "Would you rather be working full time - that is, 30 hours a week or more - or part-time?" is asked of individuals who were employed for less than 30 hours a week at the time of the interview. On the basis of this question preference for part-time employment is derived.

Table 4 shows the proportion of individuals employed part-time who would prefer to work full-time, cross-tabulated by the percentage of time in the labour market which has been spent unemployed. For example of the males employed part-time and with no history of unemployment, 45.1 percent said they would rather be working full-time as opposed to part-time. By contrast, of the males who were also employed part-time, but had been unemployed for between 51 percent and 75 percent of the time they had been in the labour force, nearly 73 percent expressed a preference for full-time employment, more than 30 percentage points higher than amongst males with no history of unemployment.

For males and females employed part-time, the proportion preferring to work full-time increases as the percentage of time they have spent unemployed increases. This can be interpreted as meaning that individuals who have a history of unemployment are more likely to face an hours constraint than individuals with no history of unemployment.

The high proportion of the part-time employed who wish to work more hours is suggestive of significant under-employment in youth labour markets, especially when it is considered that these figures exclude individuals who were in secondary education or full-time tertiary education.

## 6. Conclusions

The effects of unemployment history on hourly wages and weekly earnings have been estimated using a wage equation framework augmented with measures of individual unemployment history. Within this framework the effects of unobserved heterogeneity, which may bias the estimates, are controlled for using a fixed effects estimator.

The main findings are the following. Amongst young Australian males and females, when unobserved heterogeneity is taken into account, it is only after experiencing very large amounts of unemployment history that there are negative effects of unemployment history on hourly wages. However, unemployment history is associated with statistically significant weekly earnings losses and for large amounts of unemployment history weekly earnings losses are very substantial.

The estimated weekly earnings losses, in percentage terms, are much larger than the hourly wage losses and are generated by much smaller amounts of unemployment history. This suggests that the effects of unemployment history on weekly earnings are predominantly generated by a lower number of hours worked rather a lower hourly wage rate. There does appear to be some recovery in weekly earnings with continuing re-employment, although there is no evidence of recovery in hourly wages. This means that the recovery in weekly earnings is due to an increase in the number of hours worked. This is consistent with the findings of Gaston and Timcke (1999) that there is a significant degree of movement from part-time employment to full-time employment amongst young Australians.

The evidence presented suggests that the lower number of hours worked is not the result of differences in preferences, but is an involuntary loss of hours. Consequently, this reduction can be interpreted as an earnings loss. Further, the estimated weekly earnings losses become larger as the cumulated duration of unemployment history increases.

Other research has found that the experience of unemployment increases the probability of experiencing repeated unemployment amongst young Australians (Junankar and Wood, 1992; and Knights, Harris and Loundes 2000). One hypothesis that is consistent with these findings is that the experience of unemployment lowers productivity, or employers' expectation of productivity. However, as historical institutional arrangements in the Australian labour market limit the extent to which an individual can lower the hourly rate of pay for which they will work, the effects of unemployment on future labour market outcomes occurs through a lower number of hours worked combined with an increased rate of joblessness. These findings imply that the costs of unemployment continue after reemployment and suggest that current measures of the costs of unemployment may understate the true cost.

## Appendix A. Statistical characteristics of the data

**Table A1. Statistical characteristics of the AYS data set, males**

Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
Wage (\$/hr)	9.789	4.59	ESB migrant	0.049	0.2152
Weekly wage (\$/wk)	342.35	185.50	NSW	0.308	0.4618
Weekly hours	38.52	342.35	QLD	0.217	0.4121
Age	19.96	1.982	SA	0.085	0.2791
Experience (weeks)	51.52	31.7	WA	0.096	0.2943
Tenure (weeks)	34.49	23.8	TAS	0.033	0.1791
Tenure2 (weeks)	1757	2536	ACT	0.019	0.1376
Married	0.1	0.2994	NT	0.005	0.0736
Health	0.066	0.2475	UR	0.094	0.017
Union	0.334	0.4717	Timing (weeks)	41.01	57.4572
Full-time	0.871	0.3351	Duration most recent spell of unemployment		
Year 9	0.041	0.1978	1 quarter	0.413	0.4924
Year 10	0.155	0.3617	2 quarters	0.121	0.3262
Year 11	0.107	0.3093	3 quarters	0.051	0.2192
Year 12	0.293	0.4553	4 quarters or more	0.019	0.1367
Degree	0.049	0.2164	Cumulated duration of other spells of unemployment		
Diploma	0.033	0.1777	1 quarter	0.171	0.3764
Trade	0.096	0.2943	2 quarters	0.066	0.2485
Certificate	0.127	0.3327	3 quarters	0.036	0.1874
Other qual	0.1	0.2998	4 quarters	0.015	0.1214
NESB migrant	0.048	0.2141	5 quarters or more	0.019	0.1367
Number of individuals	1127				
Number of observations	3386				

Note. Statistical characteristics are for the sample that is employed and has valid wage observations.

**Table A2. Statistical characteristics of the AYS data set, females**

Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
Wage (\$/hr)	9.069	3.92	ESB migrant	0.039	0.1944
Weekly wage (\$/wk)	283.71	123.56	NSW	0.289	0.4534
Weekly hours	34.64	10.48	QLD	0.204	0.4028
Age	19.79	19.79	SA	0.112	0.315
Experience (weeks)	50.99	30.7113	WA	0.11	0.3128
Tenure (weeks)	36.18	23.9	TAS	0.037	0.189
Tenure2 (weeks)	1879	3028	ACT	0.015	0.1199
Married	0.184	0.3872	NT	0.013	0.1114
Health	0.059	0.2356	UR	0.093	0.0172
Union	0.301	0.4588	Timing (weeks)	36.79	54.2844
Full-time	0.796	0.4031	Duration most recent spell of unemployment		
Year 9	0.019	0.1367	1 quarter	0.413	0.4924
Year 10	0.103	0.3037	2 quarters	0.098	0.2975
Year 11	0.107	0.3087	3 quarters	0.038	0.1915
Year 12	0.291	0.4541	4 quarters or more	0.016	0.1263
Degree	0.061	0.2394	Cumulated duration of other spells of unemployment		
Diploma	0.09	0.2865	1 quarter	0.154	0.3612
Trade	0.016	0.1255	2 quarters	0.061	0.2398
Certificate	0.228	0.4196	3 quarters	0.032	0.1756
Other qual	0.086	0.2797	4 quarters	0.014	0.1183
NESB migrant	0.036	0.1865	5 quarters or more	0.008	0.0886
Number of individuals	1495				
Number of observations	4913				

Note. As for Table A1.

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- 1 **The depreciation of general human capital might include a negative impact upon mental health which lessens productivity.**
  - 2 **Reasons as to why it is cheaper to sack an employee who is a part-time casual than an employee who is full-time permanent include: no redundancy payments severance pay; less problems with unions; and less friction within the workplace (see Simpson, Dawkins and Madden 1997).**
  - 3 **The fixed effect estimator assumes that the unobserved heterogeneity is constant over time and can therefore be captured by differences in the constant term. In principle this can be implemented by including a dummy variable for each individual in the sample. However, in practice, since the inclusion of a dummy variable for each individual, results in a very large number of parameters being estimated, the data is transformed by taking deviations from individual specific means and then running OLS on the transformed data. Corrections to the standard errors are made to account for the fact that the individual specific means are estimated (Greene 1997).**
  - 4 **Another possible reason for the a difference between the OLS and FE estimates is measurement error on the explanatory variables, the effects of which can be greatly exacerbated by standard FE estimation, especially if the explanatory variables are correlated across time (Johnston and DiNardo, 1997).**
  - 5 The OLS results are available from the author on request.
  - 6 **The discussion of the theoretical literature indicated that the effect of unemployment history on wages is likely to be related to whether the spell of unemployment history resulted from a voluntary quit or whether it resulted from an involuntary separation.**

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Unfortunately the AYS data set does not allow the reason for each spell of unemployment to be determined.

- 7 In principle it is possible to estimate a specification which allowed the coefficient on the observable characteristics to vary with unemployment history. In practice this was not possible in the AYS because there is not enough data degrees of freedom.
- 8 Complete labour force histories cannot be constructed for respondents who experience temporary sample attrition or had a significant amount of labour force experience prior to the first interview. The proportion of the sample that has incomplete labour force histories is very small and the results are unlikely to be biased by this. Individuals with a substantial amount of pre-survey employment experience are excluded from the analysis.
- 9 Individuals who were employed at the interview but refused to say, or did not know what their usual weekly earnings or usual weekly hours are excluded. Only a very small number of individuals had missing information on weekly earnings or hours worked.