THE CONTRIBUTION OF INTERMITTENT
LABOUR FORCE PARTICIPATION TO
THE GENDER WAGE DIFFERENTIAL

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* I am grateful to Paul Miller for helpful comments. The data used in this paper are from the National Social Science Survey [Kelley, Cushing and Headey (1987)]. They are available publicly through the Social Science Data Archives at the Australian National University.

~~THE CONTRIBUTION OF INTERMITTENT LABOUR FORCE PARTICIPATION~~

TO THE GENDER WAGE DIFFERENTIAL

ABSTRACT

Despite equal pay decisions in 1969 and 1972, a gender wage differential of around 15 per cent exists in 1989. This paper uses actual experience data from the 1984 National Social Science Survey to provide an understanding of the role of intermittent labour force participation in the wage determination process in Australia. These results are the first of their kind in Australia, reflecting the inadequate nature of the data previously available. Differences in actual labour market experience between males and females are shown to account for approximately 40 per cent of the gender wage gap. The analyses also reveal that males receive higher returns for each additional year of schooling than females.

I INTRODUCTION

Despite equal pay decisions in 1969 and 1972, a gender wage differential of around 15 per cent exists in 1989. There are no major differences between the sexes in educational attainments, age, qualifications and locations which might account for a wage differential of this magnitude. However, males and females differ in one very important respect which may contribute to the explanation of males' wage advantage. The average female labour force participation rate is 56 per cent compared to 87 per cent for males. Consequently, the average male and female differ quite considerably in actual labour market experience, and the correct measurement of this characteristic is therefore likely to be crucial to the calculation of the wage differential.

The primary aim of this paper is to demonstrate the importance of time out of the labour market, reflected in lower actual labour market experience of females, to the size of the gender wage differential in Australia. The layout of the paper is as follows. Section II outlines the theoretical model of earnings determination proposed by Mincer and Polachek (1974) which takes account of time out of the labour market. Section III examines Australian studies of sex discrimination in wages. It is argued that these have a number of weaknesses which prevent strong conclusions being drawn concerning the extent of discrimination. The major problem is the use of the Mincer (1974) proxy for experience, which is computed as current age minus school leaving age. Unfortunately, this measure of potential experience is highly inaccurate for female workers. The importance of measuring the experience variable correctly is demonstrated in the empirical analyses presented in Section IV. Here data from the 1984 National Social Science Survey are utilised to provide the first estimates, using Australian data, of the human capital earnings function based on actual labour market experience. This enables the contribution of time out of the labour force to the gender wage gap to be more precisely determined. Section V presents a summary and conclusion.

II THE HUMAN CAPITAL EXPLANATION OF WAGES: AN OVERVIEW

Many economists who have examined the existence of a wage differential between males and females have based their research on Mincer's (1974) human capital model of earnings determination. This model stresses the impact of past investments in schooling and post-school training on current earnings capacity.

Human capital investments in the post-school period cannot, in general, be observed and hence Mincer suggested using years of experience in the labour market as an approximation. His estimating equation can be expressed as:

$$\ln Y_t = C_0 + r_s S + C_1 X - C_2 X^2 \quad [1]$$

where C_0 is primarily a function of earnings capacity before any secondary schooling, tertiary education or training takes place, C_1 and C_2 are functions of the rate of return to experience, the level of investment when work commences, and the rate of decline of the investment ratio with years of labour market activity, S denotes years of schooling and X represents years of labour market experience.

In the absence of specific measures of labour market experience, Mincer suggested estimating this variable from the individual's age and school leaving age, namely $X = \text{Age (A)} - \text{School Leaving Age (SLA)}$. This would be appropriate if no time was allocated to the labour market during schooling, and, once schooling was completed, all time was spent in the labour market.

It is evident that the assumption underlying the Mincer experience proxy will be difficult to justify in the case of female workers. This is illustrated by Figure 1 which shows the labour force participation rates of males, married women and single women by age in August 1987.

It can be seen that the labour force participation rate of prime age males is close to 100 per cent, implying that $X = A - \text{SLA}$ would be a reasonable measure of labour market experience for this group. Amongst prime age females, participation rates vary between 81.9 per cent and 56.9 per cent.

In other words, the Mincer proxy for experience is a very poor approximation

Figure 1

Labour Force Participation Rates by Age, Sex and Marital Status,

August 1987.

in the case of women. This is because it fails to account for any prolonged absences from the labour market due to other commitments.

A number of methods have been used in the literature in an attempt to overcome the inaccuracies resulting from the use of the potential experience measure in female earnings equations. Three of these are:

(i) Partitioning the female sample and focusing on single women who have more continuous labour force participation [eg, Rosenweig and Morgan (1975)].

(ii) Using worker characteristics such as marital status as crude measures of time out of the labour force [eg, Fuchs (1971), Oaxaca (1973)].

(iii) Imputing actual experience measures, either by adhoc means or on the basis of behavioural models of labour force participation [eg, Chapman and Miller (1983)¹, Zabalza and Arrufat (1985)].

Each of these methods has major weaknesses. By focusing on single women, researchers are essentially avoiding rather than solving the problem of intermittent labour force participation. However, confronting the problem by using family characteristics as a measure of time out of the labour force is subject to the criticism that the prime indicator in this regard [marital status] is often a poor proxy for restricted work experience [Hill (1978)]. Finally, the use of predicted experience measures based on behavioural models of participation rates is deficient in that the models will neglect unobserved individual differences in commitment to the labour market, and observed characteristics typically explain a low fraction of the variation in participation rates. Thus the various adjustments proposed do not offer a satisfactory solution to the weakness inherent in the Mincer proxy (X). Therefore the use of actual experience data, where available, has much to

¹The formula Chapman and Miller (1983) use for adjusted experience is:
$$AE_{kni} = ER_{ji} + ER_{(j+1)i} + ER_{(j+2)i} + \dots + ER_{ni}$$
where AE_{kni} is a measure for accumulated experience of individual k of group i in year n, ER_{ji} is the employment rate of group i in the year in which the individual k was aged j.

recommend it.

Where actual experience data are available, the intermittent labour force participation of women should be explicitly incorporated into the human capital model. Modifications to the way in which the post-school investment function is parameterised will be required for two basic reasons. First, women who anticipate periods of time out of the labour market may invest less in training and education for career advancement. This results from the lower monetary returns they can expect on any cost outlay. Second, human capital may be subject to depreciation during time out of the labour force. In other words, the market value of skills may fall if they are not used for any significant length of time.

Mincer and Polachek (1974) suggest that the intermittent labour force participation of women may be accommodated for by dividing the post-school period into stages according to the degree of labour force involvement. Thus a general earnings function may be expressed as:

$$\ln Y_t = \ln E_0 + rS + r \sum_{i=1}^n \sum_{t=t_i}^{t_i+e_i-1} (k_i - b_{it}) \quad [2]$$

Where:

n = number of segments

t_i = beginning of i^{th} segment

e_i = length of the i^{th} segment

k_i = initial investment ratio in the i^{th} segment

b_i = the rate of decline of the investment ratio during the i^{th} segment.

Mincer and Polachek divided the post-school period into three segments. These segments were observed to be relatively short, and consequently the rate of net investment in a given segment was assumed constant. This allows equation [2] to be rewritten as:

$$\ln Y_t = \ln E_0 + rS + r(e_1 k_1 + e_2 k_2 + e_3 k_3) \quad [3]$$

Equation [3] may be expanded to allow for depreciation of human capital

as follows:

$$\ln Y_t = \ln E_0 + rS + (rk_1^* - \delta_1)e_1 + (rk_3^* - \delta_3)e_3 + (rk_h^* - \delta_h)h \quad [4]$$

δ_1 and δ_3 are the rates at which an individual's stock of human capital depreciates during the time periods e_1 and e_3 respectively, and δ_h is depreciation due to non-use of skills during periods of non-participation. k^* is the gross investment rate.²

The major elements of Mincer and Polachek's model can be illustrated using the following diagram from Goldin and Polachek (1987).

Figure 2

The Effects of Labour Force Intermittency on Earnings

O_1J is representative of an age-earnings profile for an individual with continuous labour force participation, typically or traditionally a male. It represents potential earnings capacity at each successive level of experience. Someone with intermittent labour force participation will have an age-earnings profile which displays significantly different characteristics to O_1J . $OABF$ is such a profile, identified by Goldin and Polachek as reflecting the labour market behaviour of an individual with commitments outside the labour market, such as a family.

² Depreciation of skills during time out the labour force (δ_h) may differ from the depreciation due to aging or strain (δ_1 and δ_3). Mincer and Polachek concluded that (δ_h) was the much more significant variable.

The time period h refers to home time, during which earnings are zero.

One explanation for this hinges on the argument that the probability and duration of withdrawal are greater for a woman who is more productive at home and who has invested less in human capital than other females. The individual is depicted as reentering the labour market at a wage equal to B , lower than the wage at which withdrawal occurred. The total loss in earnings attributable to intermittent labour force participation is BK , which is the difference between the reentry wage of a discontinuous participant and the wage of a continuous participant at the same point in time.

The wage differential between the intermittent female worker and the continuous male worker, (BK) , may be decomposed into two components. BD/BK is the explained proportion of the wage differential, being linked to different levels of training and rates of depreciation of capital stock. The residual component, DK/BK , is often taken as a measure of discrimination. These components of the wage gap can be quantified using the procedure devised by Oaxaca (1973) and Blinder (1973). This requires an earnings equation of the form outlined in equation [3] to be estimated for both males and females. Thus,

$$\ln Y_m = \sum_{i=1}^n \alpha_{im} Z_{if} \quad [5]$$

$$\ln Y_f = \sum_{i=1}^n \alpha_{if} Z_{if} \quad [6]$$

where Z is the set of explanatory variables such as schooling and experience, and m and f denote males and females respectively.

The percentage gender wage differential is determined by subtracting $\ln Y_f$ from $\ln Y_m$. Blinder and Oaxaca show that this can be decomposed into both an explained and an unexplained portion, as follows.³

³Other decompositions are possible. The method outlined in equations [7] and [8] treats the male wage structure as the non-discriminatory norm and seems to be the most popular in the Australian literature.

$$\sum_{i=1}^n (\bar{Z}_{im} - \bar{Z}_{if}) \alpha_{im} = \text{the explained portion.} \quad [7]$$

$$\sum_{i=1}^n (\alpha_{im} - \alpha_{if}) \bar{Z}_{if} = \text{the unexplained portion.} \quad [8]$$

Whilst this decomposition forms the basis of the majority of studies focusing on the gender wage difference in Australia, considerable care should be exercised when interpreting the residual as a measure of discrimination. In its most basic form, the human capital model of discrimination assumes that all differences in attributes are non-discriminatory. However, it has been suggested by Carline *et al.* (1985) that the presence of discrimination can be a significant deterrent to those women considering investment in education. Males and females generally face the same costs with regard to obtaining education. If women expect to encounter discrimination in the labour market, they will expect to receive a lower return to investment in human capital than males. Consequently, they may tend to demand less education than males. This is also known as the feedback effect and has been examined by Welch (1975). Other caveats are outlined in Rummery (1988).

III GENDER WAGE DISCRIMINATION: THE AUSTRALIAN EVIDENCE

This Section reviews six major studies of the gender wage differential in Australia. The major findings of each are presented in Table 1.

The raw wage gap varies across studies, ranging from 15.42 per cent to 46 per cent. This variability may be attributed to differences in the year in which the data set was collected,⁴ the definition of the sample, (whether all workers are included or only full-time workers) and finally, the choice of the dependent variable (whether it be income from all sources or wage and salary income).

In the earliest study available, Haig (1982) determined the weekly pay

⁴The time period covered is important because of the 1969 and 1972 Equal Pay decisions - see Jones (1983) for an overview.

Table 1

Australian Studies of Gender Wage Differences*

	Haig (1982)	Jones (1983)	Chapman and Miller (1983)	Gregory and Ho (1985)	Gregory, Daly and Ho (1986)	Chapman and Mulvey (1986)
Data Set	1973 Henderson Inquiry into Poverty. A.B.S.	1976 Australian Census.	1976 Australian Census.	1981 Australian Census.	1981 Australian Census.	ABS Supplementary Survey, number 4 1982
Dependent variable	Gross income from wages and salaries per week.	Annual income from all sources.	Hourly wage rates i.e. $\frac{\text{Weekly Income}}{\text{usual hours worked}}$	Weekly earnings of full-time workers.	Weekly earnings of full-time workers	Hourly wage rates i.e. $\frac{\text{weekly earnings}}{\text{weekly hours}}$
Rnw wage gap	1973 dollars \$49.10 per week or 46.0%	1976 dollars \$3056 per year or 34.8%	1976 dollars \$0.90 per hour or 21.7%	1981 dollars 23.3%	1981 dollars 20.7%	1982 dollars \$1.03 per hour or 15.4%
Adjusted wage gap	32.5%	21.4%	8.5%	n.r.	n.r.	11.8%
Independent variables	Education Experience Qualifications Marital Status Hours worked Area	Education Experience Qualifications Hours worked Socio economic status Sex composition of job	Education Experience (adjusted) Qualifications Occupation Industry	Education Experience Qualifications Marital Status Area	Education Experience Qualifications Marital Status Area Children	Education Experience Marital Status Area and Country of Birth Industry Union
Major findings	Earnings of single and married women are decreased by discrimination. Returns to schooling and experience are lower for females than for males.	Equal Pay legislation virtually eliminated explicit pay discrimination against women in Australia. Recognised ILFP, part time work and child rearing as lowering life-time earnings of women.	Males earn higher rates of return to schooling and experience than females. If women received same returns as males to endowments, wages unambiguously increase across sample of 20 industries.	Women receive lower rate of return to experience than males. Females in 'female' occupations earn lower rate of return to both education and experience than males in 'male' occupations. Married women with children earn less than married women with no children.	The discrimination of males and females across industries is important. Lower returns to endowments contribute to the explanation of the wage differential	There is a higher return to education than females. Females' returns to experience and job tenure higher than males'.
Experience variable	Mincer proxy, viz $J = A - SLA$	Mincer proxy, viz $J = A - SLA$	Mincer proxy, viz $J = A - SLA$ and adjusted by . The proportion of time since leaving school spent in labour market.	Mincer proxy, viz $J = A - SLA$	Mincer proxy, viz, $J = A - SLA$	Mincer proxy, viz $J = A - SLA$

= wage gap adjusted for differences in endowments of males and females, and provides a measure of discrimination.
n.r. = not reported.

* = wage gaps computed using male wages as a base.

differential in 1973 to be \$49.10 (in 1973 dollars), or 46 per cent.⁵ \$14.40, or 0.29, of the total wage gap of \$49.10 is associated with the different endowments of males and females, while \$34.70, or 0.71, of the wage gap could not be explained in this manner and may be attributed to discrimination.

Subsequent studies indicate that the gender wage gap has closed considerably. For example, the study by Jones (1983), using the 1976 Census, found a wage gap of approximately 35 per cent for a sample of all workers, representing a decline of 11.17 percentage points compared with Haig's 1973 data. This decline coincides with the implementation of equal pay, thus some of the decrease may be attributed to this factor.

Using the standard decomposition technique Jones (1983) showed that about two-fifths, or 14 percentage points of the total 35 per cent wage differential, is attributed to differences in worker characteristics. Of particular importance in this regard were differences in hours worked, potential labour market experience, and occupational crowding. The remaining three-fifths, or 21.4 percentage points of the total 35 per cent, was attributed to a residual, including discrimination, omitted but relevant productivity-related worker characteristics and undetected effects.

Another study which used the 1976 Census was that by Chapman and Miller (1983). Chapman and Miller restricted their sample to wage and salary earners who work 30-40 hours per week. The distinguishing feature of their analysis is the use of an adjusted experience measure. This involves adjusting potential labour market experience by α , the proportion of time since leaving school spent in the labour market (see footnote 1 for details). Table 2 shows that the use of α makes a marked difference to the measure of the experience variable.

⁵It is important to note that Haig's data were collected prior to the implementation of the equal pay for work of equal value decision of 1972.

Table 2

Unadjusted and Adjusted Labour Market Experience

Unadjusted Experience (Yrs)	Adjusted Experience	
	Males	Females
5	4.49	3.36
10	9.34	5.57
20	18.93	8.60
25	23.77	10.10

Source: Chapman and Miller (1983) p.235

This adjustment has an important effect on the regression analysis. For example, while the unadjusted wage gap of 21.69 per cent for this sample was similar to that reported by Jones, Chapman and Miller suggest that 0.39 or 8.46 percentage points is due to discrimination and 0.61 or 13.23 percentage points is due to endowments.

The fourth set of studies summarised in Table 1 is the analyses of the 1981 Census data by Gregory and Ho (1985) and Gregory, Daly and Ho (1986). Both studies calculate a raw wage gap of around 23 per cent. As the studies by Gregory and his associates assume that the Australian pay structure can provide the non-discriminatory norm in international comparisons, no breakdown of the wage gap, as in other Australian studies, is provided. The main findings from the regression analysis of the 1981 Census are consistent with those of other studies and will not be discussed in detail. One result which should be noted, however, is that married women with children under the age of 18 earn less than married women with no children in this age group. As this variable may be viewed as a proxy for time out of the labour market, it reinforces the argument that this is an important aspect of the female wage structure.

The final study is that by Chapman and Mulvey (1986), who, using 1982 data, estimate the wage gap at 15.42 per cent. Their wage decomposition shows that around 0.23 or 3.6 percentage points of the differential is attributed to differences in endowments, whilst 0.77 or 11.8 percentage points is associated with discrimination. While consistent with Jones' study, these results

contrast with those provided by Chapman and Miller. Accordingly, a strong conclusion from this literature review is that the treatment of experience matters a great deal to the results of the wage decomposition. Studies which use potential experience generate relatively large estimates of the discrimination component of the gender wage gap.

While the studies listed in Table 1 appear to provide a reasonable basis for discussing wage discrimination in the Australian labour market, they are deficient in a number of respects, and some of the major problems will now be examined.

First, many of the studies may suffer from omitted variables bias. For example, marital status is included in some studies but not in others. To the extent that marital status influences wages, excluding this variable will diminish the accuracy of results. Gregory and Ho (1985), for example, suggest marital status is important because:

...experience coefficients for married female workers are significantly less than those of married men. For never married workers the difference in the experience coefficients across the sexes is not statistically different. For the never married group the earnings gap between men and women.....is much narrower than that for married workers [Gregory and Ho (1985), p.20].

Second, the studies by Haig (1982) and Jones (1983) are deficient in that they include hours worked as an independent variable. As the conventional labour-leisure model illustrates, an hours of work variable would be endogenous in a wage equation, implying that the estimated coefficients will be biased.

Third, the studies rely on the Mincer proxy, $X = A - SLA$, as an estimate for actual labour market experience. This constitutes the most obvious weakness inherent in the methodology of each of the Australian studies. Unfortunately the use of this measure has been necessitated by the lack of information on actual labour market experience in each of the data sets used. The empirical analysis presented in Section IV overcomes the problems associated with the Mincer proxy by using data on actual labour market

experience.

A final problem deals with an issue which has generally been skimmed over in the Australian studies. This is the impact on female wages of the depreciation of acquired human capital during time out of the labour force. No attempt has been made to quantify this phenomenon. Thus, the Australian studies are lagging in this area in comparison to overseas research.⁶

IV AN EMPIRICAL STUDY OF GENDER WAGE DISCRIMINATION

This Section utilises data from the 1984 National Social Science Survey [NSSS] to derive an estimate of the current gender wage differential in the Australian labour market. The analysis proceeds as follows.

First, estimates of the human capital earnings function, based upon a potential labour market experience measure, are presented. This allows a direct comparison between the results obtained from the analysis of the NSSS data and those of the studies presented in Table 1. Following this, data on actual labour market experience are used to provide a more accurate measure of discrimination against females in the Australian labour market.

The NSSS covers a wide range of issues encompassing the individual's background and labour market activity. Background information collected includes education, age, sex and marital status. The information on labour market activity is particularly valuable as it includes data on wages, weeks and hours worked, and previous labour market activity. The information regarding each individual's working history facilitates the construction of an actual experience variable. The importance of these data is highlighted by the fact that no other Australian study has had the benefit of using a measure of actual labour market experience.

Table 3 presents descriptive statistics of the male and female samples.

⁶Several overseas studies have addressed this important issue. Of particular note are Mincer and Polachek (1974), Corcoran and Duncan (1978) and Zabalza and Arrufat (1985).

Table 3

Means and Standard Deviations of Variables

Variable	Pooled Sample	Female	Male
lnWage	2.13 (0.56)	2.04 (0.57)	2.18 (0.55)
Yrs School	10.41 (1.62)	10.45 (1.52)	10.38 (1.68)
Yrs Experience	19.25 (12.24)	18.35 (11.83)	19.81 (12.46)
Yrs Experience Squared	520.44 (592.98)	476.41 (553.64)	547.79 (614.88)
Higher Deg (%)	1.66 (12.78)	0.56 (7.50)	2.34 (15.12)
Grad Dip (%)	1.95 (13.83)	2.82 (16.58)	1.40 (11.77)
Bach Deg (%)	8.95 (28.55)	8.29 (27.59)	9.36 (29.14)
Diploma (%)	8.73 (28.24)	11.68 (32.14)	6.90 (25.36)
Trade Cert (%)	30.95 (46.25)	26.55 (44.20)	33.68 (47.29)
Rural (%)	7.72 (26.70)	6.21 (24.16)	8.66 (28.13)
City (%)	38.46 (48.67)	38.42 (48.69)	38.48 (48.68)
Single (%)	27.27 (44.55)	26.93 (44.40)	27.48 (44.67)
Div/Sep (%)	10.68 (30.89)	15.44 (36.17)	7.72 (26.71)
Female (%)	38.31 (48.63)		

Figures in parentheses are the standard deviations

These figures indicate an average gender wage differential of 14.6 per cent.

This raw wage gap may reflect, in part, different endowments between males and females.

The difference in the years of schooling variable is marginal (females: 10.45 years, males: 10.38 years). Similar conclusions are reached when qualifications are examined. It would therefore be difficult to advance differences in levels of schooling, tertiary or trade qualifications as a source of wage differences. Similar conclusions are derived from an examination of locational differences between males and females.

Variables which may contribute to the wage gap include potential labour market experience and marital status. Potential labour market experience differs by 1.47 years between males and females. The marital status differences are of interest as it is generally accepted that single females earn more than married females, and single males and females have similar earnings capacity. Accordingly, it is noted that approximately 27 per cent of both the male and female samples are single, whilst 64 per cent of the male sample and 58 per cent of the female sample were married.

The extent to which these differences contribute to the wage gap depends on the weights attached to each factor in the wage determination process. These weights may be quantified by estimation of the human capital model of wages, outlined in Section II. In this paper, only personal characteristics [education, qualifications, experience, marital status and location] are used in the estimating equation. This allows the concept of discrimination defined as "unequal pay for equal productivity generating traits"⁷ to be focused upon.

Table 4 presents Ordinary Least Squares (OLS) estimates of this model. Results from the pooled regression will be discussed first, followed by analyses of both the separate female and male regressions.

Earnings increase with additional years of experience over the greater

⁷ See Shapiro and Stelcner (1981) for discussion of this concept.

Table 4

**OLS Estimates of Human Capital Earnings Functions,
Based on Potential Labour Market Experience
(Dependent Variable: Natural Logarithm of Hourly Earnings)**

Variable	Pooled Sample	Female Sample	Male Sample
Constant	1.295 (9.35)	1.141 (5.05)	1.302 (7.68)
Yrs Potential Experience (PEXP)	0.023 (4.16)	0.022 (2.56)	0.024 (3.52)
Yrs (PEXP) ²	-0.00037 (3.35)	-0.00036 (1.99)	-0.00039 (2.86)
Yrs School	0.058 (5.42)	0.053 (2.86)	0.059 (4.63)
Higher Deg	0.450 (9.73)	0.348 (2.65)	0.448 (9.07)
Grad Dip	0.279 (2.74)	0.234 (1.39)	0.353 (3.89)
Bach Deg	0.349 (7.68)	0.349 (4.25)	0.309 (6.22)
Diploma	0.288 (5.39)	0.289 (3.17)	0.267 (4.26)
Trade Cert	0.094 (2.98)	0.025 (0.44)	0.123 (3.21)
Rural	-0.300 (3.56)	0.141 (1.29)	-0.505 (4.46)
City	-0.045 (1.61)	0.019 (0.39)	-0.091 (2.82)
Single	-0.061 (1.50)	0.037 (0.55)	-0.095 (1.89)
Div/Sep	0.011 (0.22)	0.060 (0.89)	0.003 (0.04)
Females	-0.151 (5.11)		
R ²	0.1421	0.0715	0.1942
F	18.647	4.402	18.149
Sample Size	1386	531	855

Note: Omitted categories for categorical variables define the control group as married, metropolitan dwelling individuals with no tertiary qualifications.

part of the working life. Returns to experience are calculated to be 1.56 per cent, evaluated at experience of ten years. The coefficient for years of schooling indicates that for each additional year of primary and secondary education earnings will increase by 5.82 per cent. With regard to tertiary qualifications, the estimated coefficients show the annual percentage increase in earnings resulting from a specific qualification, in comparison to an individual with no tertiary qualifications. These rates of return vary from 45 per cent, for an individual with a Higher Degree, to 9.4 per cent for an individual with a Trade Certificate. Rates of return for both Graduate Diplomas and Diplomas are approximately 28 per cent, whilst that for a Bachelor's Degree is 34.9 per cent.

Rural dwellers earn a statistically significant 30 per cent less than individuals in the control group, that being the metropolitan area. The wages of individuals in city areas are not significantly different from those of the control group. The marital status variables are also found to be insignificant. That is, earnings do not differ significantly across the married, single and divorced and separated categories.

The coefficient on the female variable is -15.12 per cent. This shows that the earnings of female workers in the Australian labour market are 15.12 per cent lower than that of males, other things being equal. This then provides an initial estimate of the adjusted wage gap.

A more accurate estimation technique for determining the gender wage differential is to estimate separate regressions for males and females and use the decomposition technique outlined in equations [5] and [6] to assign weights to each of the variables present in the wage equation.⁸ Columns (ii) and (iii) of Table 4 list the relevant regression results. These reveal that potential labour market experience will add 1.6 per cent to male earnings, and 1.48 per cent to female earnings, evaluated at 10 years of potential labour

⁸ This approach is superior as it does not constrain the estimated coefficients to be the same in the male and female earnings equations.

market experience.

Returns to schooling and tertiary qualifications produce an interesting pattern. Returns for an additional year of primary and secondary schooling are higher for males, at 5.9 per cent, than for females, at 5.3 per cent. This is consistent with both Chapman and Miller (1983) and Chapman and Mulvey (1986). Additions to earnings from acquiring a Higher Degree vary between the sexes by approximately 10 percentage points, with females receiving a 34.9 per cent return and males a 44.8 per cent return. Similar differences are found amongst individuals possessing Graduate Diplomas and Trade Certificates. In the case of Bachelor Degrees, however, returns to females are slightly above those for males.

Results of the Blinder decomposition, based on data contained in Table 4, are presented in Table 5.

Table 5
Decomposition of the Wage Differential

(i) Endowments		(ii) Coefficients		(iii) Shift	(iv) Discrimination
Exp	0.0072	Exp	0.0226	0.1611	Shift 0.1611
Yrs Sch	-0.0039	Yrs Sch	0.0729		Coeff -0.0074
Quals	0.0023	Quals	0.0239		
Loc	-0.0124	Loc	-0.0825		
Mar Stat	-0.0007	Mar Stat	-0.0443		
	-0.0076		-0.0074	0.1611	0.1538

Summing the figures in column (i) reveals that the contribution to the wage gap of different endowments is negative (equal to -0.0076). This indicates that females have superior endowments, as measured here, to males. If endowments were equalised across the sexes the wage gap would actually widen from 14.6 per cent to approximately 15.3 per cent. To determine the extent of wage discrimination from the two separate regressions, the sum of the coefficients terms in column (ii) is added to the shift factor in column (iii) as follows: $(-0.0074) + 0.1611 = 0.1538$. That is, when holding endowments constant, a discriminatory wage differential of 15.38 per cent is

established. This is almost identical to the estimated component from the pooled sample (15.12 per cent).

These results are fairly consistent with those of the most recent Australian study by Chapman and Mulvey (1986), where an adjusted wage differential of 11.8 per cent was calculated. It can therefore be concluded that when the regression analyses are based on potential labour market experience, as other Australian studies have done, the analysis of the NSSS data produces results which conform to the conventional wisdom.

The primary purpose of this paper is to take this analysis one step further and provide estimates of the human capital earnings function based on actual labour market experience. The extent to which Mincer's measure of potential experience mismeasures actual labour market experience is examined in Table 6, where potential and actual labour market experience, and the derived α coefficient are examined. Table 6(A) lists the labour market experience information by marital status, whilst Tables 6(B) and 6(C) present similar information by educational attainment and for the total male sample.⁹

Consistent with expectations, the α coefficient of single women is considerably higher than those of the married, divorced and separated categories. Similarly the α of the better educated is greater than that of the less-well educated. This variation in α across categories of workers provides support to the belief that adjusting by the same α [as per Chapman and Miller (1983)] is inadequate. Consequently the remainder of this section uses the approach suggested by Mincer and Polachek as outlined in equation [3]. This equation is modified to suit the NSSS data set which provides only two measures of labour market activity, that is, total home time and total years of actual labour market experience. The use of these variables is

⁹ Potential experience is based on the Mincer proxy, $X = A - SLA$. This then explains the fewer years of potential labour market experience of single women, as being due to their younger age. Actual experience is equal to the number of years worked full time plus a third of the years worked part time. Hence home time and actual experience will not, in general, sum to potential experience.

Table 6(A)

Labour Force Experience Measures by Marital Status, Females

Marital Status	Potential Experience	Actual Experience	Home Time	$\hat{\alpha}$
Married	20.53	10.60	7.94	0.52
Div/Sep	25.48	14.01	9.15	0.55
Single	9.59	7.40	1.62	0.77
Total (All Females)	18.35	10.27	6.43	0.56

$\hat{\alpha}$ = Actual experience $\div$ potential experience

Table 6(B)

Labour Force Experience Measures by Education, Females

Education Level	Potential Experience	Actual Experience	Home Time	$\hat{\alpha}$
<9 yrs	29.04	14.24	11.62	0.49
10 yrs	17.99	10.24	6.35	0.57
11 yrs	16.92	9.72	5.95	0.58
>12 yrs	12.02	7.82	3.17	0.65
Total (All females)	18.35	10.27	6.43	0.56

$\hat{\alpha}$ = Actual experience $\div$ potential experience.

Table 6(C)

Labour Force Experience Measures of Males

Males	Potential Experience	Actual Experience	Home Time	$\hat{\alpha}$
Total Sample	19.81	17.19	2.18	0.867

$\hat{\alpha}$ = Actual experience $\div$ potential experience.

equivalent to setting $k_1^* = k_3^*$ and $\delta_1 = \delta_3$ in Mincer and Polachek's equation.

Separate equations were estimated for both the male and female samples, each revealing the estimated coefficient on home time to be insignificantly different from zero. From this result it can be concluded that stocks of human capital, or skills, are not subject to depreciation as a consequence of time out of the labour force. In other words the relevant experience-earnings profile for females in Figure 2 is in fact OAC rather than OABF as previously suggested.

It is noted that this result is different from that reported by Zabalza and Arrufat (1985) and Mincer and Polachek (1974). However, the analyses undertaken here cover a much later time period than these other studies, and involve a country with a considerably different institutional setting. Australia has moved a long way in the direction of eliminating gender wage discrimination. This is reflected in the Equal Pay decisions of 1969 and 1972. In fact Gregory and Ho (1985) suggest that the Australian pay structure can be considered as providing a non-discriminatory norm in international comparisons. The differences between the present result and those of other overseas studies may lend support to Zabalza and Arrufat's hypothesis that employers could use time out of the labour force as an excuse for paying female workers less upon reentry into the labour market, that is, a form of wage discrimination.

As the home time variables may be excluded from the earnings function on statistical grounds, the estimations presented in Table 7 are distinguished only by including a measure of actual labour market experience.

A feature of the estimates of the human capital earnings functions, based on potential and actual labour market experience, as presented in Tables 4 and 7, is that the estimates associated with experience are broadly similar. Returns to labour market experience, evaluated at ten years of actual labour market experience, equal 1.45 per cent for males, and 1.32 per cent for females (compared with 1.6 per cent and 1.48 per cent respectively when the

Table 7

**OLS Estimates of Human Capital Earnings Functions,
Based on Actual Labour Market Experience
(Dependent Variable: Natural Logarithm of Hourly Earnings)**

Variable	Pooled Sample	Female Sample	Male Sample
Constant	1.315 (10.14)	1.311 (6.76)	1.297 (7.92)
Yrs Actual Experience (AEXP)	0.020 (4.18)	0.021 (2.26)	0.021 (3.76)
Yrs (AEXP) ²	-0.00032 (2.94)	-0.00039 (1.71)	-0.00032 (2.68)
Yrs School	0.060 (5.56)	0.046 (2.46)	0.064 (4.87)
Higher Deg	0.447 (9.39)	0.344 (2.48)	0.443 (8.97)
Grad Dip	0.285 (2.74)	0.257 (1.44)	0.349 (3.77)
Bach Deg	0.343 (7.54)	0.349 (4.24)	0.308 (6.11)
Diploma	0.282 (5.28)	0.285 (3.13)	0.272 (4.34)
Trade Cert	0.095 (3.04)	0.030 (0.54)	0.127 (3.42)
Rural	-0.299 (3.33)	0.135 (1.23)	-0.499 (4.39)
City	-0.045 (1.63)	0.019 (0.37)	-0.091 (2.82)
Single	-0.075 (2.09)	-0.015 (0.25)	-0.085 (2.05)
Div/Sep	-0.012 (0.23)	0.049 (0.73)	0.010 (0.12)
Female	-0.103 (3.30)		
R ²	0.1453	0.0716	0.1968
F	19.12	4.41	18.44
Sample Size	1386	531	855

Note: Omitted categories for categorical variables define the control group as married, metropolitan dwelling individuals with no tertiary qualifications.

Figures in parentheses are 't' statistics derived using White's (1980) heteroscedasticity consistent covariance matrix estimator.

Mincer proxy is used). This provides a basis for comment on the post-estimation adjustment outlined in Chapman (1984). Chapman suggests that dividing the coefficient on potential labour market experience by the average $\hat{\alpha}$ for the female sample should provide an accurate estimate of the coefficient on actual labour market experience. However, application of this method to the results in Table 4, and setting $\hat{\alpha}$ equal to 0.56 as in Table 6(A), yields a coefficient on actual experience of 0.039. This differs markedly from the coefficient on actual experience presented in Table 7 (ie, 0.021). This suggests that the post-estimation adjustment does not produce accurate results.

There are two important differences between the two sets of regressions. First, the rates of return for an additional year of primary or secondary schooling are altered considerably when the actual experience data are used. Increments to female earnings acquired from an additional year of schooling are 4.6 per cent in Table 7, a decrease by 0.7 percentage points over the Table 4 results. Returns for males are 6.4 per cent, representing a 0.4 percentage point increase over the Table 4 outcome. Thus, there is a 1.8 percentage point difference in returns to schooling between the sexes. Second, the estimated coefficient for the female variable differs markedly by specification of the experience variable. This estimate indicates that, when actual labour market experience is used, the level of gender wage discrimination is 10.33 per cent. This is compared to the discrimination coefficient of 15.12 per cent estimated using potential labour market experience. Recall that the specification of the experience variable is the single difference between the estimated equations discussed above. This suggests that differences in years of actual labour market experience contribute very significantly to the wage differential.

Further insight into this may be gained by using the Blinder decomposition to disaggregate the unadjusted wage gap of 14.6 per cent into discriminatory and non-discriminatory components. This enables quantification

of the extent to which different years of actual labour market experience (or equivalently time out of the labour force) contribute to the wage gap. The results of this decomposition are presented in Table 8.

Table 8
Decomposition of the Wage Differential

(i) Endowments		(ii) Coefficients		(iii) Shift	(iv) Discrimination
Exp	0.0577	Exp	0.0077	-0.0137	Shift -0.0137
Yrs Sch	-0.0045	Yrs Sch	0.1920		Coeff 0.1176
Quals	0.0023	Quals	0.0243		
Loc	-0.0120	Loc	-0.0814		
Mar Stat	-0.0012	Mar Stat	-0.0249		
	0.0423		0.1176	-0.0137	0.1040

The total unadjusted wage differential is the sum of columns (i) and (ii) and as such is 14.6 per cent. Endowments account for 0.29 of this wage gap, the remaining 0.71 being attributed to discrimination. This can be compared to the previous decomposition based on potential labour market experience, where the entire wage gap was attributed to discrimination.

Examination of column (ii) reveals that differences in returns to years of schooling is the major factor in the discrimination component of the wage differential. As noted earlier, the use of an actual experience measure widens the difference between the estimated returns to schooling for men and women, and this is what is being reflected here. This difference may be attributed to the mismeasurement of the experience variable in Table 4. Hence the Table 4 estimates may be biased: a standard econometric result [Maddala (1977)] is that the errors associated with the experience terms are expected to carry through to the other estimates. The coefficients on the other variables may be either biased upwards (as appears to be the case for females) or downwards (as seems to apply for males).

Also of importance in terms of the decomposition of the wage gap is the location variable. This shows that males, but not females, receive a substantial monetary penalty from rural residence. It might be suggested that

this is associated with the farming profession.

Turning now to that component of the wage differential associated with ~~differences in endowments~~ [column (1)], it seems that if endowments were equalised across the sexes the gender wage differential would decrease by 4.21 percentage points to 10.39 per cent. Closer examination of column (1) shows it to be dominated by two variables. Firstly, if males and females were distributed equally across locations the wage differential would widen by 1.2 percentage points. This would occur if more women worked in the rural areas where earnings are generally lower. Secondly, differences in years of actual labour market experience account for approximately 40 per cent of the unadjusted wage gap. This can be compared to the previous decomposition where differences in potential labour market experience account for only 4.9 per cent of the differential.

In terms of Figure 2, 40 per cent is a measure of the distance BK. This is a substantial wage penalty. For example, if male average annual earnings are \$20,000 and female earnings are 14.6 per cent lower at approximately \$17,000, then time out of the labour force would account for \$1,200 of the \$3,000 differential. Before considering the policy implications of this finding, it is of interest to compare these results with those of other Australian studies outlined in Table 1.

Of these, it is the study by Chapman and Miller (1983), which shows endowments as accounting for more than 50 per cent of the unadjusted wage gap, that is closest to the results of the current study. This supports the proposition that it is better to adjust potential labour market experience by an average α , if actual labour market experience data are unavailable, than to make no adjustment at all. For example, the study by Chapman and Mulvey (1986) which makes no adjustment to potential labour market experience, finds only 13 per cent of the wage differential to be due to differences in human capital.

In summary the major sources of the current gender wage differential in

Australia are:

(i) Discrimination, in particular different returns to years of schooling.

(ii) Differences in actual labour market experience between the sexes.

Attempts to narrow the gender pay gap must recognise these dual causes. Several practical possibilities exist in this regard. Prolonged time out of the labour market by females, mainly for childrearing reasons, is the primary cause of their lower actual labour market experience which has been identified in this analysis as a major source of the current wage differential. Government funded or subsidised child care, for example, may encourage mothers to reenter the labour market where the cost of child care has previously acted as a barrier. This would presumably act to lower the difference between the actual labour market experience of males and females, and so impact on the wage differential outlined in the analyses presented above.

Another avenue through which labour market outcomes might be equalised is through the equalisation of opportunities in regard to jobs and promotions. In this respect the Sex Discrimination Act of 1984 can be identified as playing an important role. The motivation behind this legislation is to prohibit discrimination on the basis of sex, marital status and pregnancy, in employment and education. This could help achieve the equalisation of returns to schooling, which has been highlighted in this paper as a significant component of the wage discrimination factor. This suggests that equal pay without equal opportunity will not eliminate the wage differential.

V CONCLUSION

Wage discrimination on the basis of sex in the Australian labour market has declined considerably since the introduction of equal pay in 1969 and 1972. In 1973 the unadjusted wage gap was 46 per cent [Haig (1982)]. In comparison, calculations using data from the 1984 National Social Science Survey show that females earn 14.6 per cent less than males. While the wage

gap can be seen as having narrowed by approximately 31 percentage points in a time period of only 10 years, the remaining wage differential is still the cause of justifiable concern.

Such wage differentials have traditionally been analysed using the Mincer education and experience model of earnings. The most recent application of this methodology to the Australian experience by Chapman and Mulvey (1986) indicates a discriminatory or adjusted wage gap of 11.8 per cent.

These earlier studies have relied on measures of potential labour market experience. This paper has built upon the foundations that they have provided by conducting similar analyses using actual labour market experience data. It thus provides the first set of comprehensive results for Australia regarding the contribution of time out of the labour market to the gender wage differential.

The theoretical framework for the analysis was provided by Mincer and Polachek's (1974) modification of Mincer's original model. The empirical analyses show that females possess fewer years of actual labour market experience than males and receive lower returns for each additional year of experience in comparison to males (ie, 1.32 per cent as opposed to 1.45 per cent, calculated at ten years of actual experience). Differences in years of actual labour market experience are estimated to account for 40 per cent of the wage differential. The discriminatory component of the wage differential is 10.33 per cent, the majority of which is linked primarily to the lower rates of return to education for females.

Several notable conclusions have been drawn from this study. For example, the home time variable was found to be statistically insignificant. This suggests that human capital is not in fact subject to depreciation during time out of the labour market. This differs from results obtained in overseas studies [eg, Oaxaca (1973) and Mincer and Polachek (1974)] where depreciation of skills occurred at a significant level.

Another important conclusion of this research was that the use of

potential labour market experience would provide a distorted view of wage discrimination. It can therefore be recommended that, where possible, actual experience data should be utilised. This fact was recognised by Chapman and Miller (1983). They estimated a measure of actual labour market experience via an adjustment method outlined in Section II. Whilst this measure was relatively crude, it produced results significantly different from previous Australian studies. This highlights the fact that the specification of the experience variable is crucial to both the calculation of the wage differential and the measurement of discrimination. This should be recognised by future researchers interested in this problem.

REFERENCES

- Blinder, A. (1976). "On Dogmatism in Human Capital Theory", *Journal of Human Resources*, Vol 11 (1), pp.8-22.
- Carline, D., Pissarides, C., Siebert, S. and Sloane, P. (1985). *Surveys In Economics: Labour Economics*, Longman Group Limited, London.
- Chapman, B. (1984). "Affirmative Action for Women: Economic Issues", Centre for Economic Policy Research, Australian National University, Discussion Paper 97.
- Chapman, B. and Miller, P. (1983). "Determination of Earnings in Australia: An Analysis of the 1976 Census" pp.228-259 in Sano, Y., Chapman, B., and Fayle, P. *Japanese and Australian Labour Markets: A Comparative Study*, Australia - Japan Research Centre, Canberra.
- Chapman, B. and Mulvey, C. (1986). "An Analysis of the Origins of Sex Differences in Australian Wages", *The Journal of Industrial Relations*, Vol 18, pp.504-520.
- Corcoran, M. and Duncan, G. (1978). "Work History, Labour Force Attachment and Earnings Differences Between the Races and Sexes", *The Journal of Human Resources*, Vol 14 (1), pp.3-19.
- Fuchs, V. (1971). "Differences in Hourly Earnings between Men and Women", *Monthly Labor Review*, Vol 94, pp.9-15.
- Goldin, C. and Polachek, S. (1987). "Residual Differences by Sex: Perspectives on the Gender Wage Gap in Earnings", *American Economic Review*, Vol 77 (2), pp.143-151.
- Gregory, R., and Daly, A. (1985). "Equal Pay and Comparable Worth: What can the U.S. learn from the Australian Experience?", Centre for Economic Policy Research, Australian National University, Discussion Paper 123.
- Gregory, R., Daly, A., and Ho, V. (1986). "A Tale of Two Countries: Equal Pay for Women in Australia and Britain", Centre for Economic Policy Research, Australian National University, Discussion Paper 147.
- Haig, B. (1982), "Sex Discrimination in the Reward for Skills in the Australian Labour Force", *The Economic Record*, Vol 58 (160), pp.1-10.
- Hill, M. (1978). "The Wage Effects of Marital Status and Children", *The Journal of Human Resources*, Vol 14 (4), pp.579-595.
- Jones, F. (1983). "Sources of Gender Inequality in Income: What the Australian Census Says", *Social Forces*, Vol 62 (1), pp.134-153.
- Kelley, J., Cushing, R., Headey, B. (1984). Australian National University, Social Science Survey, "User's Guide and Data File", Social Science Data Archives, Australian National University.
- Maddala, G. (1977). *Econometrics*, McGraw - Hill, Tokyo.
- Mincer, J. (1974). *Schooling, Experience and Earnings*, National Bureau of Economic Research, New York.

Mincer, J., and Polachek, S. (1974). "Family Investments in Human Capital: Earnings of Women", *Journal of Political Economy*, Vol 82, pp.76-108.

Oaxaca, R. (1973). "Male - Female Wage Differentials in Urban Labor Markets", *International Economic Review*, Vol 14 (3), pp.693-709.

Rosenweig, M., and Morgan, J. (1975). "An Exchange: On the Appropriate Specification of Human Capital Models. Wage Discrimination: A Comment", *Journal of Human Resources*, Vol 11 (1), pp.3-7.

Rummery, S. (1988). "The Contribution of Intermittent Labour Force Participation to the Gender Wage Differential", Unpublished Dissertation, Department of Economics, University of Western Australia.

Shapiro, D., and Stelcner, M. (1981). "Male and Female Earnings Differentials and the Role of Language in Canada, Ontario and Quebec, 1970", *Canadian Journal of Economics*, Vol 14, pp.341-348.

Welch, F. (1975). "Human Capital Theory: Education, Discrimination, and LifeCycles", *American Economic Association*, Vol 65, pp.63-73.

White, H. (1980). "A Heteroscedasticity - Consistent Covariance Matrix Estimator and a Direct Test for Heteroscedasticity", *Econometrica*, Vol 48, pp.817-35.

Zabalza, A., and Arrufat, J. (1985). "The Extent of Sex Discrimination in Great Britain", pp.70-94 in *Women and Equal Pay: The Effects of Legislation on Female Employment and Wages in Britain*, Cambridge University Press, Cambridge.