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DISCUSSION PAPERS

HOW DO AUSTRALIAN PART-TIME WORKERS COMPARE TO THEIR UNITED STATES COUNTERPARTS?

Anne Hawke
DISCUSSION PAPER NO. 273
June 1992

G.P.O. Box 4, Canberra 2601, Australia
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Anne Hawke*
Economics Program
Research School of Social Sciences
Australian National University

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Executive Summary

Part-time work represents one of the fastest growing areas of the labour market in Australia and the United States of America. Most of this growth has been in female employment. In 1986, the wages paid to part-time workers in Australia were approximately 20 per cent higher per hour than the full-time wage for men and women. The comparative estimate for the United States has been estimated to have been between 11 and 44 per cent lower per hour than the full-time wage for men and women. This paper attempts to evaluate the extent to which human capital or other factors such as worker quality adjust in response to the observed wage differential in each country.
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1. Introduction

Part-time work represents one of the fastest growing areas of the labour market in Australia and the United States of America. Most of this growth has been in female employment. In 1986, the wages paid to part-time workers in Australia were approximately 20 per cent higher per hour than the full-time hourly wage for men and women. For the United States, part-time workers receive wages between 11 and 44 per cent lower per hour than full-time workers. The aim of this paper is to investigate the causes of the female wage differential between full- and part-time work for Australia and the United States in 1986. Although overseas literature on part-time employment is quite substantial\(^1\), few studies have been conducted in Australia\(^2\). This paper represents the first attempt to incorporate part-time workers into a cross-country analysis.

Part-time work is perceived differently between individuals and across countries. One view is that in comparison with full-time equivalent jobs, part-time jobs pay less per hour, provide lower fringe benefits, and do not have structured career development. Alternatively, part-time work may be perceived as a voluntary choice which provides flexible hours of work, additional income, continued labour market involvement and allows non-market activities such as child-rearing to be pursued. Another perception is that part-time work is a refuge for workers who are unable to find full-time jobs. These workers for one reason or another have been categorised as less desirable or "bad" workers, and are subsequently forced into searching for jobs in the part-time market (which may be viewed as a type of secondary labour market).

In investigating the wage differential which exists between full- and part-time workers in Australian and the United States, it is interesting to

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2. Exceptions are Saffer and Aungles (1989) and Robertson (1989).
analyse whether the full-time/part-time "differences" are the result of the individuals which are part of each sector (using the supply side characteristics such as preferences and human capital endowments), or do the "differences" result from the jobs associated with each sector (the demand side effects such as employer treatment of similar skills in each sector). Each of the stylized explanations of part-time work will be discussed within an orthodox human capital framework.

The principal sources of data used in this analysis is derived from the 1986 Population and Housing Survey of Australia, Labour Force Survey of Australia (various issues) and the 1987 Current Population Survey (March) of the United States of America. The paper is structured as follows: (1) a brief discussion of the trends in part-time employment for Australia and the United States of America over the last 20 years. Additionally, an analysis of the relationship between the changes in part-time employment over time and aggregate unemployment for each country is undertaken in order to provide some indication of the role part-time work has in underemployment of females in each country; (2) theoretical development of a model of participation and wages for full- and part-time workers; (3) specification of the female wage differential measure and estimation of the model for each country; (4) assess the relative importance of endowments, and discrimination and sample selection on the full- and part-time wage differential; and (5) draw together the major findings of the paper and provide suggestions for further work.
2. Trends in Part-time employment

Figure 1 illustrates the trend in proportion of employment of women which is part-time\(^3\) for Australia and the United States over the last 15 years. For both countries the majority of part-time workers are female. We may observe from the figure that the percentage of women working part-time over this time period as a proportion of total female workers for Australia grew at a higher rate than for United States females between 1967 and 1978. Since 1967, part-time employment of females has steadily increased from around 25 percent to nearly 40 percent in 1992. This trend compared markedly with the United States experience where although the numbers of part-time females has continued to increase, the proportional representation of part-time workers has remained fairly constant.

![Figure 1. Female part-time employment trends; 1967-1991](image)

For both Australia and the United States we are able to gain some evidence on the (in)voluntary component of part-time employment in both countries\(^4\). For the United States in 1986, the majority of female part-time workers (around 80 per cent) work part-time on a voluntary basis. For the

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\(^3\) Part-time refers to individuals who work less than 35 hours per week.

corresponding period in Australia, the rate of voluntary part-time employment was 61 percent for females. Formerly, Hawke (1992) has demonstrated using time series analysis that two very different situations appear to characterise the part-time labour markets of Australia and the US. Hawke finds that for Australia, the unemployment rate is not a significant factor to the part-time participation rate for both males and females. This is in contrast to the US where the overall unemployment rate was found of be a significant determinant of both involuntary and voluntary part-time employment for both males and females. Thus, although the time series evidence does suggest that part-time work is responsive to cyclical factors and is, to some degree indicative of underemployment in the United States, it is clear that this explanation of part-time work does not apply for Australia. That is, part-time employment for females in Australia does not appear to be characterised by underemployment in full-time jobs.

3. Data

The Australian data is derived from the 1 per cent tape of the 1986 Population and Housing Survey. The United States data is derived from a 15 per cent randomly selected sample of the March 1987 Current Population Survey. The datasets used in this analysis (for both countries) comprises of females aged 18 to 65 years who were working at the time of the survey. The occupational classifications represented in this paper follow from the International Standard Classification of Occupations.

Before any analysis can be conducted it is important to understand what is meant by the term part-time. Part-time work is a generalised term commonly applied to individuals who work less than 35 hours per week including permanent, casual and temporary workers. Additionally, part-time work is also taken to include temporary full-time, seasonal, outwork and contract work. The Australian Bureau of Statistics (ABS) in both their monthly Labour Force
Survey, and the Population and Housing Survey (Census) 1986 distinguish between full- and part-time workers on the basis of hours usually worked, with part-time defined as someone who usually works less than 35 hours per week, and full-time as more than 35 hours per week. Unfortunately this definition excludes an important distinction between part-time workers who are employed on a permanent or casual basis. This breakdown is particularly important in the analysis of Australian part-time earnings as a result of the different institutional treatment of these groups. A permanent part-time employee is entitled to full-time award entitlements such as holiday and sick pay on a pro-rata basis. Casual employees generally refer to employees who are employed on an "as required" basis. Although these employees do not generally receive holiday or sick pay, some awards do specify an additional loading in lieu of such benefits. Before any analysis of wage differentials can be conducted it is important to understand to what degree loadings and award coverage applies to working females. Table 1 attempts to illustrate the degree to which this loading applies.

An estimate of the relative proportion of females employed as casuals is 17.1 per cent. For females working part-time, between 40 and 50 per cent were employed as casuals. Approximately 11 per cent of all females were not covered by an award. The reasons casuals receive an award loading varies between awards. Although one reason for the award loading is to compensate an employee for the lack of non-pecuniary benefits such as holiday leave, it should not be ignored that unions regard a loading as a deterrent to employers who wish to hire casuals rather than permanent workers.

For United States females who work part-time, aside from some minimum wage legislation, there is no broad-based institutional arrangement

which governs wages. Table 2 illustrates the differences which occur in the hourly wage ratio for females by occupation in Australia and the United States. We observe without exception, part-time hourly wages exceeding full-time hourly wages for Australia in 1986. For the United States, this phenomena is reversed8.

### TABLE 1: CASUAL LOADING IN AUSTRALIAN AWARDS

<table>
<thead>
<tr>
<th>LOADING</th>
<th>NUMBER OF FEDERAL AWARDS</th>
<th>NUMBER OF VICTORIAN AWARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Specified</td>
<td>33 (7.3)</td>
<td>n.a.</td>
</tr>
<tr>
<td>less than 15%</td>
<td>17 (3.7)</td>
<td>n.a.</td>
</tr>
<tr>
<td>15 %</td>
<td>33 (7.3)</td>
<td>3 (5.0)</td>
</tr>
<tr>
<td>15 - 20%</td>
<td>18 (4.0)</td>
<td>n.a.</td>
</tr>
<tr>
<td>20 %</td>
<td>250 (55.1)</td>
<td>17 (28.3)</td>
</tr>
<tr>
<td>20 - 25%</td>
<td>4 (0.4)</td>
<td>n.a.</td>
</tr>
<tr>
<td>25 %</td>
<td>70 (15.4)</td>
<td>18 (30.0)</td>
</tr>
<tr>
<td>25+</td>
<td>29 (6.4)</td>
<td>22 (36.67)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>454 (100.0)</td>
<td>60 (100.0)</td>
</tr>
</tbody>
</table>

( ) brackets denote percent of total; n.a represents not applicable
Source: Specialist Research Services (1986) as quoted in Lewis (1990)

Although we may gain some insights into the relative performance of part-time workers in Australia and the United States, caution needs to be

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8 The ratio recorded for trades should be viewed with caution due to high standard errors. For sales, although the ratio exceeds one, it should be noted this groups are among the lowest paying occupations for females working full- or part-time.
TABLE 2: Female wage ratios *, by occupation, 1986/87

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Australia</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>managers and administrators</td>
<td>1.5</td>
<td>0.79</td>
</tr>
<tr>
<td>professional</td>
<td>1.22</td>
<td>0.91</td>
</tr>
<tr>
<td>para-professionals</td>
<td>1.34</td>
<td>0.85</td>
</tr>
<tr>
<td>tradespersons</td>
<td>1.57</td>
<td>1.02</td>
</tr>
<tr>
<td>clerks</td>
<td>1.35</td>
<td>0.81</td>
</tr>
<tr>
<td>sales and personal service workers</td>
<td>1.42</td>
<td>1.04</td>
</tr>
<tr>
<td>plant and machine operators</td>
<td>2.05</td>
<td>0.86</td>
</tr>
<tr>
<td>labourers and related workers</td>
<td>1.30</td>
<td>0.81</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1.31</td>
<td>0.84</td>
</tr>
</tbody>
</table>

* ratio is (ln W_{pt} / ln W_{ft})

applied to any discussion of the raw wage differentials. Firstly, hourly wages represent only part of the compensation employees receive. If individuals choose part-time work as a result of their preference for the a combination of hours and compensation among the available part-time and full-time opportunities, then we may conclude the appropriate benchmark is the observed compensation for full-time workers\(^9\). Holden argues that

"if women are prevented in working in those occupations where they face the most favourable full-time opportunities, the full-time wage rates of women in the occupations in which they do work is not an appropriate standard." \(^10\)

Secondly, no account for the differences in the characteristics of the individuals has yet been made. It may be that rather than part-time work being

\(^9\) This conclusion is based upon the assumption that both full and part time jobs are equally available to the individual and therefore the outcome of which job to take is a result of choice rather than labour demand constraints in the labour market.

\(^10\) Holden, K.,(1990) p158
"bad" (in terms of lower compensation) in the United States, it may simply be inhabited by poor quality workers who have low productivity, and who are employed in part-time jobs as a result of selection out of full-time jobs. The following sections attempt to determine the relative importance of the endowment, productivity and selection in explaining differences in wages between full- and part-time workers in both countries.

4. The model

Following from Mincer and Polachek (1974), the human capital earnings function may be stated as

\[
E_t = E_{t-1} + rC_{t-1}
\]

where \( E_t \) is the gross earnings in period \( t \), \( C_{t-1} \) is the dollar amount of investment in period \( t-1 \) and \( r \) is the average rate of return to an individuals human capital. Rewriting (1) becomes

\[
E_t = E_{t-1} + E_{t-1}r \frac{C_{t-1}}{E_{t-1}}
\]

and if \( \frac{C_{t-1}}{E_{t-1}} \) represents the ratio of investment expenditure to gross earnings in period \( t-1 \), we may re-write (2) as

\[
E_t = E_{t-1} + E_{t-1}rk_{t-1}
\]

\[=E_{t-1}(1+rk_{t-1})\]

where \( k_{t-1} \) is the ratio of investment expenditure to gross earnings in the period \( t-1 \). Following a simple expansion of (3) we may approximate the earnings function as follows

\[
E_t = E_0 + r \sum_{i=0}^{t-1} k_i
\]

Now, if we assume a constant \( r \) \(^{11} \), we may separate school and post school experience as follows

\(^{11}\) This specification is identical to that discussed in Chapman and Harding (1980), p. 363.
(5) \[ E_t = E_0 + r \sum_{i=0}^{s-1} k_i + r \sum_{j=s}^{t-1} k_j \]

where \( k_i \) and \( k_j \) are investment ratios during and after school respectively. Imposing the assumption that the investment ratio in school equals one, the earnings function becomes

(6) \[ E_t = E_0 + rs + r \sum_{j=s}^{t-1} k_j \]

We may now estimate this equation as

(7) \[ W_t = X'\beta + \epsilon \]

where \( W_t \) is the hourly wage rate for individual \( i \), \( \beta \) represents productivity returns to endowments, and \( X \) represents a vector of occupational, demographic and human capital attributes such as marital status, regional identifiers, occupational groupings, potential experience, and the number of dependants. As returns to experience are not thought to be constant over an individual's lifetime, a quadratic experience term is also included in the specification of the earnings function.

The theoretical premise for most wage models is that wages are invariant to hours of work. Usually, if part-time work is considered it is typically done so using a dummy variable which acts as a shift parameter in the wage equation. The specification may therefore be stated as follows

(8) \[ \ln(w) = X'\beta + \alpha PT + \epsilon \]

where \( \ln(w) \) represents the log of wages, \( X \) is the vector of human capital and demographic characteristics thought to affect wages exogenously, \( PT \) is a dichotomous dummy variable which distinguishes full- and part-time workers, and \( \epsilon \) is a random error. Under this specification, the part-time coefficient is expected to be positive for Australia and negative for the United States.

3 reports the findings for Australia and the United States. All traditional human capital and demographic variables are included in this specification (see appendix A and B for data definitions). The constant for both countries represent an individual who is single and has not graduated from high school, lives in a rural area, is employed in the private sector in a managerial/administrative job. As predicted, the part-time dummy (lf2) is significant and positive for Australian males and females, whilst negative and significant for the United States\textsuperscript{12}. The results indicate that for Australia, a 20 percent premium is paid to females working part-time. For the United States, the penalty for females who work part-time work (given human capital and demographic characteristics) is estimated to be approximately 19 per cent.

There are however some difficulties with the specification as detailed in Table 3. Without interacting the part-time dummy variable with all explanators, it is impossible to determine the magnitude of the return to part-time employment compared to full-time employment for each of the exogenous variables. Additionally, no account has been made of sample selection which may occur in the choice of working full- or part-time. Thus, it is desirable to develop an alternative specification.

4.1 An alternative specification for a full- and part-time model

As revealed by the previous specification, it is necessary to model full- and part-time jobs explicitly. This can be done within the following framework. Initially, we assume the individual weights up the relative advantages which accrue as a result of a choice between part- and full-time

\textsuperscript{12} The United States results are consistent with those reported in Blank, R.M., (1990).
TABLE 3: Female Wages, 1986

<table>
<thead>
<tr>
<th>Variable</th>
<th>Australia Coefficient</th>
<th>United States Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>murban</td>
<td>0.115</td>
<td>0.115</td>
</tr>
<tr>
<td></td>
<td>(3.411)</td>
<td>(3.827)</td>
</tr>
<tr>
<td>urban</td>
<td>0.049</td>
<td>0.174</td>
</tr>
<tr>
<td></td>
<td>(1.273)</td>
<td>(6.695)</td>
</tr>
<tr>
<td>cd2</td>
<td>0.065</td>
<td>0.207</td>
</tr>
<tr>
<td></td>
<td>(2.085)</td>
<td>(4.477)</td>
</tr>
<tr>
<td>cd3</td>
<td>0.186</td>
<td>0.315</td>
</tr>
<tr>
<td></td>
<td>(4.337)</td>
<td>(6.083)</td>
</tr>
<tr>
<td>cd4</td>
<td>0.269</td>
<td>0.551</td>
</tr>
<tr>
<td></td>
<td>(5.385)</td>
<td>(10.191)</td>
</tr>
<tr>
<td>if2</td>
<td>0.205</td>
<td>-0.188</td>
</tr>
<tr>
<td></td>
<td>(9.108)</td>
<td>(-6.854)</td>
</tr>
<tr>
<td>exp</td>
<td>0.016</td>
<td>0.027</td>
</tr>
<tr>
<td></td>
<td>(4.511)</td>
<td>(7.240)</td>
</tr>
<tr>
<td>exp2</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(-3.814)</td>
<td>(-5.968)</td>
</tr>
<tr>
<td>abnor</td>
<td>-0.137</td>
<td>-0.035</td>
</tr>
<tr>
<td></td>
<td>(-1.110)</td>
<td>(-1.042)</td>
</tr>
<tr>
<td>occ2</td>
<td>0.033</td>
<td>-0.037</td>
</tr>
<tr>
<td></td>
<td>(0.526)</td>
<td>(-0.773)</td>
</tr>
<tr>
<td>occ3</td>
<td>0.072</td>
<td>-0.217</td>
</tr>
<tr>
<td></td>
<td>(1.096)</td>
<td>(-4.669)</td>
</tr>
<tr>
<td>occ4</td>
<td>-0.324</td>
<td>-0.062</td>
</tr>
<tr>
<td></td>
<td>(-4.468)</td>
<td>(-0.733)</td>
</tr>
<tr>
<td>occ5</td>
<td>-0.062</td>
<td>-0.180</td>
</tr>
<tr>
<td></td>
<td>(-1.178)</td>
<td>(-4.326)</td>
</tr>
<tr>
<td>occ6</td>
<td>-0.230</td>
<td>-0.431</td>
</tr>
<tr>
<td></td>
<td>(-4.128)</td>
<td>(-9.033)</td>
</tr>
<tr>
<td>occ7</td>
<td>-0.150</td>
<td>-0.249</td>
</tr>
<tr>
<td></td>
<td>(-2.046)</td>
<td>(-5.459)</td>
</tr>
<tr>
<td>occ8</td>
<td>-0.272</td>
<td>-0.571</td>
</tr>
<tr>
<td></td>
<td>(-4.835)</td>
<td>(-7.238)</td>
</tr>
<tr>
<td>govt</td>
<td>0.108</td>
<td>0.090</td>
</tr>
<tr>
<td></td>
<td>(4.289)</td>
<td>(2.863)</td>
</tr>
<tr>
<td>married</td>
<td>0.030</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>(1.003)</td>
<td>(0.480)</td>
</tr>
<tr>
<td>divorced</td>
<td>0.198</td>
<td>0.037</td>
</tr>
<tr>
<td></td>
<td>(4.688)</td>
<td>(0.915)</td>
</tr>
<tr>
<td>_cons</td>
<td>1.736</td>
<td>1.377</td>
</tr>
<tr>
<td></td>
<td>(27.494)</td>
<td>(19.609)</td>
</tr>
</tbody>
</table>

Mean Dep. 2.063934  Mean Dep. 1.809593
F 28.42  F  43.84
R2 Adj 0.1949  R2 Adj 0.1481
N 2153  N  4683

( ) represent t-statistics
work 13. Individuals are assumed to compare the maximum utility attainable
given each participation alternative 14 and selects the alternative which yields
the maximum utility. Preferences for labour market states15 are assumed to
follow a well behaved utility function 16.

Let $V_{ji}$ be the maximum utility attainable for individual i upon choosing
either part- or full-time work. We assume this indirect utility function may be
decomposed as follows

$$V_{ji} = S_{ji} + \varepsilon_{ji}$$

where $S_{ji}$ is the non-stochastic component which is a function of observed
variables, and $\varepsilon_{ji}$ is the stochastic component of the utility function which itself
is a function of unobserved characteristics.

To determine the labour force states more precisely we may simplify the
notation such that there exist k states from which the individual may choose
(full- or part-time work), and there are j possible outcomes of the participation
decision (also part-time work and full-time work).

Thus we may specify the probability that the maximising individual i
chooses a particular state j out if the choices k as follows

$$I_{ji} = Pr ( V_{ji} > V_{ki} \text{ for } k \neq j, k = ft, pt)$$

Using this result in conjunction with the previously specified indirect utility
function we have

$$I_{ji} = Pr [(S_{ji} - S_{ki}) > (\varepsilon_{ki} - \varepsilon_{ji}) \text{ for } k \neq j, k = ft, pt]$$

If we assume the difference of the stochastic components are distributed with a

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13 The labour force participation decision should obviously be modelled more appropriately in a
life-cycle context, especially as has been pointed out (see Ben-Purrah (1973)) when there
exists heterogeneity across individuals in their propensity to work in each state.
14 Unfortunately, panel data for Australia is only available for the youth labour market.
15 Note the underlying assumption that full- and part-time work are both equally available
alternatives. That is, this framework does not allow for labour market demand constraints.
16 This specification does not allow for multiple employment states. That is, the individual
participation state is based upon their principal job.
17 See Varian, H.,(1984), Microeconomic Analysis for a discussion of well-behaved utility
functions.
normal distribution and hence an appropriate choice of model is a binomial probit \textsuperscript{17}.

Assuming that $S_{ji}=X\beta$, and the errors are normally distributed, and recalling that $V_{ji}$ is unobserved, we may state the relationship between the observed outcomes and the unobserved indirect utility function as

\begin{equation}
I = 0 \quad \text{if } V_{ji} < 0 \quad \text{... working part-time}
I = 1 \quad \text{if } 0 < V_{ji} < \mu_1 \quad \text{... working full-time}
\end{equation}

where $\mu_1$ represent the unknown threshold values of the parameters to be estimated by $\beta$.

Until now we have developed a model which provides an explanation as to why individuals choose either full- or part-time work. Next we turn to the choices we observe individuals making in their determination of their maximised utility. Individuals who choose to work select from two inter-related regimes - hours and wages. Although neoclassical theory suggests wages are invariant to hours, factors such as fixed costs of working and institutional constraints combine to determine the labour/leisure choice from full- and part-time work \textsuperscript{18}. The switching regression model \textsuperscript{19} is particularly useful in modelling the wage determination process using two different sets of parameters whereby the wage an individual receives is a function not only of demographic, human capital and other individual specific variables but also of the hours worked per week \textsuperscript{20}. As found in the preceding section, the model may be specified as follows \textsuperscript{21}

\textsuperscript{17} This specification takes no account of the decision to work. This represents a simple extension to this analysis where there exists two decisions - to work or not, and, if the individual works then whether to work full- or part-time. The relative importance of this extension is discussed in a forthcoming paper.

\textsuperscript{18} Amongst others, Heckman and McCurdy (1980) and Long and Jones (1981) find non-constant hourly wage compensation across hours of work.

\textsuperscript{19} For more information on switching regression models see Greene (1990) or Maddala (1984).

\textsuperscript{20} The following is a standard discussion of the wage specification which may be found in Hoehn (1991), Simpson (1986).

\textsuperscript{21} We acknowledge the same result (although differences will occur in the residuals) could have been specified as one equation with interactive dummies on each of the regressors. Although equivalent, this approach offers more convenient interpretation.
(13a) \[ \ln(w_{ft,i}) = X_i\alpha + \varepsilon_{1i} \quad \text{if } H_i > H^* \]
(13b) \[ \ln(w_{pt,i}) = X_i\delta + \varepsilon_{2i} \quad \text{if } 0 < H_i < H^* \]
(13c) \[ H_i = Y_i\chi + (\ln W_{ft,i} - W_{pt,i})\theta + \upsilon_i \]

where for individual \( i \), \( X \) represents a vector of regressors thought to influence wages, \( Y \) is a vector of variables which are thought to affect the value of non-market time, \( a,\delta,\chi,\theta \) are parameters and \( \varepsilon_{1i}, \varepsilon_{2i} \) and \( \upsilon_i \) are errors.

The error structure of this system is assumed to be

\[
\begin{pmatrix}
\varepsilon_{1i} \\
\varepsilon_{2i} \\
\upsilon_i
\end{pmatrix} = \begin{pmatrix}
0 \\
0 \\
0
\end{pmatrix} + \begin{pmatrix}
\sigma_{nH} & \sigma_{nPt} & \sigma_{FH} \\
\sigma_{nPt} & \sigma_{Pt} & \sigma_{Ft}
\end{pmatrix} \begin{pmatrix}
\delta_n \\
\delta_{Pt} \\
\delta_{Ft}
\end{pmatrix}
\]

where \( \tau = \theta(\varepsilon_{1i} - \varepsilon_{2i}) + \upsilon_i \).

We may therefore simplify the hours equation to the more familiar

\[
H_i = Z_iY_i + \tau_i
\]

where \( Z_i = [Y_i\chi_i] \) and \( \gamma = [\chi_i(\beta_{H} - \beta_{Pt})\theta_i] \).

At this point it is important to address the issue of what is the actual threshold values of full- and part-time work. The values traditionally chosen for full-time work is when \( H_i > 35 \), and for part-time work when \( 0 < H_i < 35 \). This dichotomy was chosen for two primary reasons: (1) legislative and hence employer perceptions of part-time hours have been defined in this way; and (2) since this is a two-country analysis it is important to remain consistent in respective breakdown of hours forming full- and part-time work. This approach of using predetermined threshold points is known as applying an exogenous switching rule.

---

Hochkiss (1991) applies a switching model for various groups when the threshold values of \( H_i \) are unknown. For the US, the \( H_i \) for males and females was estimated as 38 hours.

Exogenous switching has been used in several labour economics contexts. See Simpson (1985), Robinson and Tomes (1984), Duncan and Leigh (1980) and Lee (1978).
If there is a relationship between the wage rate and employment status then we would observe

\begin{align}
(16a) & \quad w_{ft} \text{ when } I = 1 \quad (\text{that is, } H_i > H^*) \text{ and} \\
(16b) & \quad w_{pt} \text{ when } I = 0 \quad (\text{if } 0 < H^* < H_i)
\end{align}

where \(w_{ft}\) and \(w_{pt}\) represent wages for full- and part-time workers respectively, and \(I\) is the index function defined previously. This simultaneity may be shown to induce biases in the specification of the traditional wage function for separate full- and part-time wage equations.

Taking expectations of equations (15) and (6) and noting that

\begin{align}
(17) & \quad \Pr (I = 1) = \Pr \left( (S_{ji} - S_{ki}) > (e_{ki} - e_{ji}) \text{ for } k \neq j, k = f,t,p \right) \\
(18) & \quad E[\ln w_{ft} \mid y = 1] = X'\alpha + E[\varepsilon \mid \nu > Z'\pi] \\
& \quad \quad \quad \quad = X'\alpha + (\sigma_{\varepsilon Y} / \sigma_{\nu})\lambda
\end{align}

where \(\sigma_{\varepsilon Y}\) is the covariance between the errors in the wage equation and selection equation, \(\sigma_{\nu}\) is the variance of the errors in the selection equation, and \(\lambda\) represents the inverse Mills ratio \(^\text{24}\). The corresponding expression for part-time wages is

\begin{align}
(19) & \quad E[\ln w_{pt} \mid y = 0] = X'\delta + E[\varepsilon \mid \nu > Z'\pi] \\
& \quad \quad \quad \quad = X'\delta + (\sigma_{\varepsilon Y} / \sigma_{\nu})\lambda
\end{align}

From the above specification it is apparent that by using the sample selection technique of capturing the inverse Mills ratio and adding it to the regressors in the respective wage equations, the source of potential bias may be removed.

Thus, may respecify the respective wage equations as

\begin{align}
(20a) & \quad \ln (w_{ft}) = X_{11}'\alpha + \rho_1 \lambda_{11} + \varepsilon_{11} \\
(20b) & \quad \ln (w_{pt}) = X_{21}'\delta + \rho_2 \lambda_{21} + \varepsilon_{21}
\end{align}

As was pointed out by Heckman (1979), if we knew the actual values of \(\lambda\) for each individual, then we could estimate the above equation by ordinary least squares. However, as we not know the actual values of \(\lambda\) the OLS

\(^{24}\) See Maddala (1983), Heckman (1979) for a discussion and derivation of the inverse mills ratio.
estimates of $\alpha$, $\delta$ and $\rho$ are unbiased but are inefficient. The derivation of the corrected variance-covariance matrix when sample selection is important may be found in Appendix C.

5. Results

5.1 Participation Equation Results

Table 4 represents the participation decision to work full- or part-time. Since we may not directly interpret the coefficient from the probit equation, Table 5 provides some indication of the relative effect of each significant regressor on the probability to participate full-time for a representative individual in each country. The constant represents a single, non-black, unqualified rural dweller who has no dependant children. From Table 5 we may observed that the most important factors for females which affect their decision to work full- or part-time is the presence and number of children. In an alternative specification of children for the United States (not reported) the age of the children was also shown to be an important factor effecting the participation probability. It is interesting to note that education for females in either country does not, in general, appear to significantly effect the probability of participating in either full- or part-time employment. This finding shall be explored in the context of wages in the following section.

5.2 Wage Equation for Full- and Part-time workers

Based upon the specification detailed in the earlier sections, estimates of both selectivity adjusted and unadjusted wage equations for both countries are provided in Tables 6 and 7. Human capital theory suggests that the coefficient on the education dummies should increase as the level of education increases.

\[ \text{(1)} \]

This finding supports the results from Teal, F. (1991) for Australian females.
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<th>UNITED STATES</th>
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Mean Dep. 0.566667 Mean Dep. 0.690509
chi2(15) 266.81 chi2(15) 221.51
Log-Like -1077.69 Log L -3063.76
N 1770 N 5131

( ) represent t-statistics; * see Appendix A and B for explanation
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</table>

n.s. - not stated due to insignificant coefficients or sample size of cell too small to form reliable estimates.

(1) This represents the mean of the dependent variable in participation equation. See Table 2 for summary statistic.

(2) For Australia, the representative individual is single, non-Aboriginal, of average age (approx. 40 years), no children, average other income sources, and lives in rural Australia. For the United States, the representative individual is single, of average age (approx. 37 years), no children, white, lives in the south, rural areas and has average other income sources.
(indicating increasing returns to education). This expectation is supported for both groups. For the United States the magnitude of the returns to similarly defined education variables are much higher than Australia. Following from Mincer’s (1974) specification of earnings functions, we expect a positive coefficient on potential experience and negative return on potential experience squared. The data for both countries support these a priori expectations with appropriate signs and coefficients which are all significant at the 5 per cent level.

Discrimination literature in labour economics predicts that race dummies will demonstrate a negative coefficient for non-white individuals in Western developed economies such as Australia and the United States. For Australian females in either full- or part-time employment, Aboriginality was not a significant factor in the determination of hourly wage rates. This does not indicate that discrimination does not occur against Aboriginals in the Australian labour market, but rather that there exists no systematic, statistically significant discrimination with respect to hourly wages for Aboriginals in this sample. For the United States, an interesting dichotomy between full- and part-time individuals arises with respect to race. For full-time American non-whites, their racial status was seen to have a significant negative effect in the order of 4 to 6 per cent on hourly wages. For part-time workers, no significant effect due to race was evident.

The coefficients on marital status dummies change significantly between the selectivity adjusted and unadjusted equation for both countries indicating a high degree of bias which would result from not considering participation choice in the earnings function as well as correlation between marital status and participation choice.

26 In the measurement of female experience over the life-cycle it is important to account for time outside paid employment due to family responsibilities. Unfortunately, estimates of this factor are not readily available. Hence, experience in this paper is the traditional Mincer formula of age-age left school.
<table>
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Mean Dep. 2.162 2.153915 1.996653 1.974992
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N 876 760 1277 977

( ) represent t-statistics with adjusted standard errors
n.a. means not estimated
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<td>(17.414)</td>
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| Mean Dep.   | 1.593463 | 1.593463 | 1.691422 | 1.691422 |
| F           | 4.71     | 4.47     | 42.18    | 40.59    |
| Adj R2      | 0.0513   | 0.0507   | 0.1896   | 0.1916   |
| N           | 1237     | 1237     | 3170     | 3170     |
Using the selectivity adjusted equations it is evident that married and divorced females do have significantly different hourly earnings to single females - probably indicating to some degree the differences in age cohorts between single and other females. For the United States, selectivity again plays an important role in the marital status variables, with the most interesting result being that full-time US female divorcees earn significantly less than their single counterparts whilst part-time divorcees earn more. Two possible explanations are suggested for this results. Firstly, whilst female divorcees are seen as less desirable workers in the full-time market and their offered wage is in the lower tail of the wage offer distribution, in the part-time market they are desirable workers (possibly as the part-time market is dominated by "bad" employees) and their offered wage is in the right tail of the offer distribution. For females in both countries, sample selection is a significant determinant of hourly wages of full-time workers only.

Using the insights described in Borjas and Bronas (1989) and Reimers (1983) we may draw some insights into the population characteristics of each labour force state from the sample selection term 27. The type of selection is determined by the sign on the coefficient of the lambda term. Thus, using Tables 6 and 7 we may gain some insights into the population characteristics of full- and part-time works from the coefficient of lambda in the full- and part-time wage equation of both countries. Since the selectivity variable in the full-time equation ($\lambda_{FT}$) is positive, this result indicates that there is negative self-selection into full-time work for both countries whilst for part-time work, it would appear that there is not any significant sample selection in part-time work. It is perhaps most interesting to interpret these findings in the context of offered wages 28. Since sample selection is not significant in the part-

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27 For more information on interpretation of the sample selection term see Hawke (1992b).
28 See Gronau (1974) for more information on the relationship of sample selection to the observed and actual wage distribution.
time wage equation we may state that the offered wage is equal to the actual wage. For the full-time wage equation two principal conclusions arise. Firstly, the negative sample selection implies that since

\[ \ln W_{ft} = \tilde{X}_{ft} \hat{\alpha} + \hat{\beta}_1 \tilde{\lambda}_1 \]

where \( \tilde{X}_{ft} \hat{\alpha} \) represents a consistent estimate of an individual's wage offer whether the wage is observed or not, then \( \tilde{X}_{ft} \hat{\alpha} \) represents a consistent estimate of the wage offer for a person with the average characteristics of the average earner, and \( \hat{\beta}_1 \tilde{\lambda}_1 \) represents an estimate of the selectivity bias in the average observed wage for full-time workers. The negative selection coefficient in the full-time wage equation indicates that the current full-time workers earn less than the average which would result if all individuals in this sample worked full-time. Thus, it would appear that individuals who work in the part-time sector (a sector in which there is a random allocation of full- and part-time workers) do so even though they could earn above average full-time wages. This finding is consistent with many overseas studies. The question which results from this finding is why do women in the United States and Australia work part-time given these findings? The answer would appear to have two main explanations. Firstly, the average mean wage of part-time work in Australia is 20 per cent higher than for full-time workers, thus although they would expect to earn above average full-time wages, this would be equivalent to average part-time wages. The interpretation of the United States sample selection is more complex and is dealt with in section 6 of this paper. Secondly, females remain the primary care-givers. Hence, in Australia, they are able to perform family responsibilities without the direct wage cost imposed on United States women.

6. Decomposition of the Female Wage Differential

Since the decomposition of wage differences was first explored by Oaxaca (1974), the most significant change to this decomposition has been the inclusion of the sample selection effects. Recalling the general specification of the wage equation as

\[(20a) \quad \ln (w_f) = X_1 \alpha + \rho_1 \lambda_1 + \varepsilon_1\]
\[(20b) \quad \ln (w_p) = X_2 \delta + \rho_2 \lambda_2 + \varepsilon_2\]

where \(\rho\) represents \((\sigma_{eY}/\sigma_{eY})\). Thus, the decomposition of the wage differential, as is generally used, may be represented by

\[(22) \quad W_{fT} - W_{pT} = (\alpha_{fT} - \delta_{pT}) X_{pT} + (X_{fT} - X_{pT}) \alpha_{fT} + (\rho_1 \lambda_1 - \rho_2 \lambda_2)\]

where all symbols are as previously defined with all estimates evaluated at their respective mean.

From the above specification we are able to determine for female workers the differential which results from productivity, endowments and selection. As pointed out by Miller (1987), this technique assumes that proxies of productivity differences are adequate and exhaustive. If the proxies are mismeasured then an errors-in-variables problem occurs. If the proxies are not exhaustive then there may be an omitted variables problem. Thus, the results from this decomposition should be viewed as indicative only.\(^{30}\)

6.1 Estimation of full- and part-time gender differentials

Table 8 illustrates the wage differential between full- and part-time work for both Australian and United States' females. As discussed earlier, casual part-time workers in Australia are likely to earn a pay loading (on top of the full-time hourly rate) of around 20 percent for individuals covered by a Federal award, and 30 per cent for individuals covered by Victorian awards. However,

\(^{30}\) An analysis of the effects of this problem may be found in Daymont and Andriani (1984).
individuals employed as permanent part-timers receive the same pay conditions as full-time employees. Combining all part-time workers together produces an average raw differential of 18 per cent for females in this sample. This raw wage differential may be decomposed into three distinct components - endowment effects (0 per cent), productivity effects (0.04 per cent) and selectivity effects (-0.22 per cent). For the United States, the female wage differential (in the reverse direction) is 30 per cent which may be decomposed into three components - endowment effects (13 per cent), productivity effects (24 per cent) and selectivity effects (-0.07 per cent).

As found by in many other Australian studies31 little of the observed differential in hourly earnings is due to endowment differences (or, human capital effects). Compared to this however, endowments play an important role in the United States. Whilst the Australian result appears to be almost entirely driven by sample selection effects, sample selection is relatively unimportant in explaining the United States differential.

<table>
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<th>TABLE 8: Summary of female full-and part-time wage differentials (a)</th>
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<tr>
<td>Full- and Part-time workers</td>
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<tr>
<td>Australia</td>
</tr>
<tr>
<td>Observed differential (ln Wf - ln Wpt)</td>
</tr>
<tr>
<td>Decomposition effects :</td>
</tr>
<tr>
<td>(1) endowment differences</td>
</tr>
<tr>
<td>(2) productivity differences</td>
</tr>
<tr>
<td>(3) sample selection effects</td>
</tr>
</tbody>
</table>

Notes:  
(a) differences in log hourly wages  
(b) full-time work is treated as base for decomposition. See Sloane (1985) for index number problem associated with this decomposition

31 See Gregory and Ho (1983) and Chapman and Mulvey (1986)
If we speculate that sample selection proxies to some extent the quality of the employee (rather than the quantity of human capital endowments which is of course directly estimated), the it would appear that higher hourly wages are inducing 'better' quality workers into the part-time labour market. This, of course, is consistent with the earlier discussion of offered wages.

For United States females, although the average part-time wage is 30 per cent lower than the full-time wage, components which may be ascribed to selection effects leads to a marginal decrease the full- and part-time wage differential. Thus, unlike Australia, discrimination and productivity differences are the main causes of the full- and part-time wage differential for females.

7. Implications of findings

Over the last 20 years part-time work has become an increasingly important component of the labour market for females around the world. Australia has not only increased the number of part-time jobs but also the proportion of jobs which are part-time. For the United States, whilst there have been significant increases in the number of part-time workers, the proportion of the workforce working part-time has remained relatively constant. This paper investigated some of the causes of the wage differential between females working full- and part-time in Australia and the United States. These two countries provided an interesting basis for comparison in that part-time workers received approximately 20 per cent more per hour than their full-time counterparts whilst in the United States, part-time workers receive approximately 30 per cent less per hour than their full-time counterparts.

The two countries approach allowed us to compare to what extent human capital, productivity and sample selections effects contributed to the full- and part-time wage differential. The results support the proposition that human capital does not explain the Australian case, but remains important in the United States experience. From the stylized descriptions of the labour
market dichotomy between the full- and part-time labour markets presented in the introduction, the following findings arise from this paper. Firstly, in both Australia and the United States, part-time jobs are principally filled by females who choose to work part-time rather than full-time. Secondly, it is argued family responsibilities remain an important inducement into part-time work for both Australian and United States females. Finally, rather than detect evidence that part-time work is for workers who are unable to find full-time jobs it was found that if part-time workers did participate in full-time work they would earn above average full-time wages.
APPENDIX A: Australian data definitions
Derived from the 1986 Housing and Population Survey

Education Variables
ed1: unqualified - age on leaving school was less than or equal to 15; no further qualifications
ed2: high school - age on leaving school was greater than 16, and had achieved some form of high school certificate
ed3: post secondary - trade certificate or diploma
ed4: degree - completion of at least a bachelor's degree or graduate diploma

Experience
exp - age minus age left school (exp constrained to be non-negative)
exp2 - experience squared

Area
murban - major urban area resident
urban - living in an urban community
rural - living in rural area

Marital status
married - currently married spouse present
divorced - separated, widowed or divorced
single - never married

Occupational Classifications
occ1 - managers and administrators
occ2 - professionals
occ3 - para-professionals
occ4 - tradespersons
occ5 - clerks
occ6 - salespersons and personal service workers
occ7 - plant and machine operators and drivers
occ8 - labourers and related workers

Other Categories
govt - dummy for employees
othinc - other income (including spouse's income)
kidn - number of dependant children
APPENDIX B: United States data definitions
Derived from the 1987 Current Population Survey

United States

Education Variables
unqualified - completed less than 4 years of high school
high school - completed 4 years of high school
post secondary - completed 1 to 3 years of college
degree - completion of at least a 4 years of degree

Experience
exp - age minus age left school (exp constrained to be non-negative)
exp2 - experience squared

Area
city - lives in major metropolitan area
msa - lives in metropolitan statistical area
rural - lives in either non-msa or rural area

Marital status
married - currently married spouse present
divorced - separated, widowed or divorced
single - never married

Occupational Classifications
occl - managers and administrators
occl - professionals
occl - para-professionals
occl - tradespersons
occl - clerks
occl - salesperson and personal service workers
occl - plant and machine operators and drivers
occl - labourers and related workers

Other Categories
govt - dummy for government employees
othinc - other income
kidn - number of dependant children
APPENDIX C: Derivation of the variance-covariance matrix for the wage equations when $\lambda$ is a regressor

We may restate the wage equation(s) as

$W = X\beta + \epsilon_w$

and after correcting for selection bias, this becomes

$W = X\beta - \sigma_{wu} \lambda + \varphi$

where $\varphi = \epsilon_w + \sigma_{wu} \lambda$

Since $\lambda$ is not observed, $\hat{\lambda}$ is constructed using $\hat{\lambda}$ from the participation equation. Thus,$W = X\beta - \sigma_{wu} \hat{\lambda} + \hat{\varphi}$

where

$\hat{\varphi} = \varphi + \sigma_{wu} (\hat{\lambda} - \lambda)$

and

$\hat{\lambda} = \frac{\phi(Z_1' \varphi)}{\phi(Z_1' \varphi)} = f_1 (\hat{\varphi})$

$Z$ represents the matrix of explanators from the participation equation.

Expanding equation (6a) gives

$f_1 (\hat{\varphi}) = f_1 (\varphi) + f_1 (\varphi) . (\hat{\varphi} - \varphi)$

$f_1 (\hat{\varphi}) - f_1 (\varphi) = f_1 (\varphi) . (\hat{\varphi} - \varphi)$

$\delta_i - \lambda = \lambda_i ^{\prime} (\varphi) . (\hat{\varphi} - \varphi)$

$\hat{k}_i (\varphi) = \frac{\delta}{\delta \varphi} \left( \frac{\phi(Z_1' \varphi)}{\phi(Z_1' \varphi)} \right) = - [\lambda_i ^2 + Z_i \psi \lambda_i ] Z_i$

Thus,

$\delta_i - \lambda = (\hat{\varphi} - \varphi) . \left[ \lambda_i ^2 + Z_i \psi \lambda_i \right] Z_i$

Now,

32 This appendix is derived from Maddala (1983) 252-255, and Jenkins (1989),70-73.
\[ \lambda_i - \lambda_i = DZ (\hat{\phi} - \phi) \]
where \( D = \text{diag} \lambda_i^2 + Z_i \phi \lambda_i \)

Therefore our selectivity wage equation
\[ W = X\beta - \sigma \hat{\lambda} + \hat{\phi} \]
becomes
\[ W = (X_i - \hat{\lambda}) \begin{pmatrix} \beta_1 \\ \sigma \end{pmatrix} \]

Now, letting \( G = [X_i, - \hat{\lambda}] \)
then
\[
\begin{pmatrix} \beta_1 \\ \delta_{wu} \end{pmatrix} - \begin{pmatrix} \beta_1 \\ \sigma \end{pmatrix} = (G'G)^{-1} G' \hat{\phi}
\]

and
\[
\text{var} \begin{pmatrix} \beta_1 \\ \delta_{wu} \end{pmatrix} = (G'G)^{-1} G' \text{var} \begin{pmatrix} \hat{\phi} \\ (G'G)^{-1} G \end{pmatrix}
\]

\[
\text{var} \begin{pmatrix} \hat{\phi} \\ (G'G)^{-1} G \end{pmatrix} = \text{var} \begin{pmatrix} \phi + \sigma_{wu} (\hat{\lambda} - \lambda) \\ \phi + \sigma_{wu} DZ(\hat{\gamma} - \gamma) \end{pmatrix}
\]

\[
= \text{var} \begin{pmatrix} \phi + \sigma_{wu} DZ \end{pmatrix} \text{var} (\hat{\gamma}) Z'D - \sigma_{wu}^2 DZ \text{cov} (\hat{\gamma}, \phi)
\]
\[ - \sigma_{wu}^2 \text{cov} (\hat{\gamma}, \phi) Z'D \]

This is calculated on \( I_i = 1 \). Var \( \hat{\gamma} \) is estimated from the participation equation's variance-covariance matrix.

It may be shown that \( \text{cov} (\hat{\gamma}, \phi) = 0 \text{ }^{33} \).

Now to determine \( \text{var} (\phi) \text{ }^{34} \)
\[
\text{var} (\phi | I_i = 1) = \sigma_w^2 \lambda_i \text{ }^{35}
\]

Therefore,

\[ M.W., \text{G.}(1983), 254 \]
\[ M.W., \text{G.}(1983), 225 \]
\[ \text{var}(\varphi) = \sigma_w^2 I - \sigma_{wu}^2 D \]

To estimate the variance obviously an estimate of \(\sigma_w^2\) is needed. The residuals of the underlying equation must be corrected for selection bias to ensure a consistent estimate of the variance. The approach is to estimate the residuals from the wage equation without sample selection correction. That is,
\[ \varepsilon_w = W_{1} - X_{1}\beta \]

Then, estimate the variance using the following
\[ \hat{\sigma}_w^2 = \frac{1}{k} \sum_{i=1}^{k} \left[ \varepsilon_w^2 + \hat{\sigma}_{wu}^2 Z_{i1} \hat{\gamma}_{i1} \right] \]

Now we have
\[ \text{var}(\hat{\varphi}) = \sigma_w^2 I - \sigma_{wu}^2 D + \sigma_{wu}^2 D Z \text{var}(\hat{\varphi}) Z' D \]

and
\[ \text{var}(\hat{\beta}_{wu}) = (G'G)^{-1} G' \text{var}(\hat{\varphi}) (G'G)^{-1} G \]

In the estimation of this matrix we use \(\hat{\sigma}_{wu}\) as the parameter on the correction term \(\hat{\lambda}\) in the wage equation, and \(\hat{\sigma}_w^2\) is estimated as described above.
## APPENDIX D: SUMMARY STATISTICS

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