THE AUSTRALIAN NATIONAL UNIVERSITY
Centre for Economic Policy Research

DISCUSSION PAPERS

SEX AND LOCATION DIFFERENCES IN WAGES IN THE AUSTRALIAN PUBLIC SERVICE

Bruce J. Chapman

Discussion Paper No. 98

July 1984

G.P.O. Box 4. Canberra 2601, Australia
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* I wish to thank Sue Richardson and the Australian Public Service Board, George Rothman in particular, for the provision of the data. Participants in the Bureau of Labour Market Research workshop made useful comments on an earlier draft.

ISBN: 0 86938 99 3
ISBN: 0725-430X
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Abstract

While some attempts have been made to investigate wage determinants with Australian data, most of these studies have important limitations. This is particularly the case with regard to analyses of the influence of sex and location. As far as the former is concerned, little attention has been given in Australia to the influence of on-the-job experience and women's labour force participation intermittency. Moreover, past analyses have typically analysed wage determinants across a broad range of occupations, and have more than likely misrepresented the influence of education. Location factors have generally been ignored in micro-wage studies.

This paper avoids these limitations through an examination of salary determinants for a large number of Australian Public Servants employed in what is arguably one occupation, the Clerical/Administrative division. A feature of the investigation is that the same set of persons is observed at three points in time, 1963, 1974 and 1979, allowing important improvements over the usual cross-section studies. The estimations hold constant the influence of education, on-the-job experience and general labour market experience, thus allowing insight into the following question: what is the independent contribution to salary of both Canberra employment and being male?

The results suggest that Canberra employees of both sexes are systematically advantaged, and that this advantage did not dissipate over the decade. As well, males received salaries greater than those
received by females that were not a consequence of measured levels of human capital. This unexplained male salary advantage was independent of location, and not markedly affected by adjusting the data for assumed initial exaggerations of true female experience. In both locations the male advantage fell from 1969 to 1974, but remained unchanged from 1974 to 1979.
Introduction

Recent research into wage determination in Australia has allowed examination of the factors contributing to sex differences in earnings. These studies typically cover broad occupational groupings and as such do not allow a disaggregated examination of wage determinants within particular jobs. Moreover, little consideration is paid to location factors.

This paper avoids these limitations through an analysis of data specific to what is arguably a single job designation: the clerical/administrative (CA) division of the Australian Public Service (APS). The data distinguish individuals according to whether they are in Canberra or otherwise, thus allowing some insight into the influence of locational factors.

Several features of the investigation are novel in labour market research and unique in the Australian context. The first is that the same set of individuals is observed over the course of a decade, and thus it is possible to establish how wage determinants have varied over time. This represents an important improvement over the usual cross-sectional analyses. Second, adjustments are incorporated which enable a correction to be made to the female experience measures which, in unadjusted form, overstate true female experience because of this group's relatively intermittent labour force participation.
The approach adopted is as follows. The conventional human capital earnings function is utilised to measure the roles of general labour market and time on-the-job experience and education as salary determinants. Within this framework it is possible to estimate the extent to which male- female and office location average wage differentials are explainable in terms of differences in measurable experience and educational attainment levels, and variations in returns to these factors.

With important qualifications the analysis suggests that males enjoyed small salary advantages beyond what is the consequence of this group's apparently greater endowments of human capital. While the unexplained male-female salary difference decreased substantially in the 1969-74 period, no further decreases occurred in the years from 1974 to 1979. For both men and women, employment in Canberra was associated with higher salaries because of differences in rates of return to measurable productivity factors. Over the decade there was no diminution of this advantage for males, and for females the disparity grew. These location wage differences are probably interpretable purely in economic terms, but it is not obvious that the same is true for sex differences. The latter may be a consequence of direct employer discrimination, but such a conclusion must be tempered in the light of inadequate information with regard to true experience, ability, motivation and expected turnover differences between the sexes.
Section I explains how the theoretical model typically employed in these investigations (and presented in Appendix I) may be used to interpret the origins of sex and location differences in salaries. In section II the results of the investigation for the CA division are presented for three different time periods covering the decade from 1969. Section III adjusts female experience measures to allow a more valid representation of underlying causes of sex differences in salaries. A concluding discussion examines and interprets the major findings.
I. The Use of the Earnings Function to Estimate Sex and Location Differences in Wages

On average, OA employees of both sexes located in Canberra earned more than OA employees not located in Canberra, and males earned more than females in all localities. This is illustrated in Table 1.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>1969</th>
<th>1974</th>
<th>1979</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canberra</td>
<td>5547</td>
<td>12421</td>
<td>19260</td>
</tr>
<tr>
<td>Non-Canberra</td>
<td>4254</td>
<td>9720</td>
<td>15417</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canberra</td>
<td>3750</td>
<td>10310</td>
<td>16450</td>
</tr>
<tr>
<td>Non-Canberra</td>
<td>2975</td>
<td>8522</td>
<td>13654</td>
</tr>
</tbody>
</table>

Two possible explanations of these differences are as follows: one, that the higher average salaries of a group are a consequence of that group's higher average endowments of schooling and experience; and two, that the APS rewards schooling, experience and unobservable characteristics differently depending on sex and location. These hypotheses are investigated in the following way, using the Canberra-non-Canberra distinction as an illustrative example.

If non-Canberra employees were paid the same reward for their
schooling, experience and an unobservable component (reflected in the intercept) as Canberra employees, would their average salary be increased or decreased? If the average salary of non-Canberra employees is predicted to increase given Canberra salary rewards, it follows that some advantage exists in Canberra employment. In the following analysis the gap between the predicted average wage and the actual average wage is referred to as the wage difference attributable to endowment returns. In essence the predicted wage is that wage that would have been paid to a group if, given its actual level of measurable human capital, it had been paid the same returns to this human capital stock as the alternative group.

The analysis was applied to the male/female and Canberra/non-Canberra dichotomies. The technique may be expressed more technically as follows. If the earnings functions for men and women located in Canberra and non-Canberra are given by:

\[ \ln W_{mc} = \beta_0 + \sum_{j=1}^{n} \beta_{ij} x_{ji} + \epsilon_{mc} \]  
(males in Canberra)  
(1)

\[ \ln W_{fc} = \beta_0 + \sum_{j=1}^{n} \beta_{ij} x_{ji} + \epsilon_{fc} \]  
(females in Canberra)  
(2)

\[ \ln W_{mn} = \beta_0 + \sum_{j=1}^{n} \beta_{ij} x_{ji} + \epsilon_{mn} \]  
(males not in Canberra)  
(3)

and

\[ \ln W_{fn} = \beta_0 + \sum_{j=1}^{n} \beta_{ij} x_{ji} + \epsilon_{fn} \]  
(females not in Canberra)  
(4)
where, for individual \( i \), \( \ln \omega \) is the logarithm of annual salary, \( x_j \) is a vector of productivity endowments (for this study, schooling, on-the-job experience and general labour market experience), the \( \beta_{0i} \) and \( \beta_{1j} \) are endowment intercepts and coefficients respectively, and the \( \epsilon_i \) are error terms, it follows that the predicted average wages of a group are given as follows:

\[
W_{1i} = \text{antilog} \left( \beta_{0i} + \sum_{j=1}^{n} \beta_{1j} x_{ij} \right) 
\]

\[
W_{2i} = \text{antilog} \left( \beta_{0j} + \sum_{j=1}^{n} \beta_{1j} x_{ij} \right) 
\]

\[
W_{3i} = \text{antilog} \left( \beta_{0i} + \sum_{j=1}^{n} \beta_{1j} x_{ij} \right) 
\]

\[
W_{4i} = \text{antilog} \left( \beta_{0i} + \sum_{j=1}^{n} \beta_{1j} x_{ij} \right) 
\]

where \( W_{1i} \), \( W_{2i} \), \( W_{3i} \), \( W_{4i} \), \( W \), and \( \bar{X}_j \) are predicted average salaries attributable to location and sex endowment returns, and \( \bar{x}_j \) are average human capital levels for the relevant group. They represent, on average, respectively: what non-Canberra men with their given human capital would have earned in Canberra had they been paid the same endowment returns as Canberra men; what non-Canberra women with their given human capital would have earned had they been paid the same endowment returns as Canberra women; what Canberra women with their given human capital would have earned had they been paid the same endowment returns as Canberra men; and what non-Canberra women with their given human capital would have earned had they been paid the same endowment returns as non-Canberra men. If \( W > \bar{W} \) and \( W > \bar{W} \), where \( \bar{W} \) and \( \bar{W} \) are non-Canberra men, If \( W > \bar{W} \) and \( W > \bar{W} \), where \( \bar{W} \) and \( \bar{W} \) are
average non-Canberra male and female salaries respectively, then non-Canberra persons would have received higher salaries for their given measured human capital endowments as a consequence of being employed in Canberra. If $\text{M} \succ \text{MC}$ and $\text{F} \succ \text{FC}$, where $\text{MC}$ and $\text{FC}$ are average Canberra and non-Canberra female salaries respectively, then females would have received higher salaries for their given measured human capital endowments if they had been rewarded in the same way as males were. Put simply, this approach determines the extent to which office location and sex are wage determinants holding constant measured human capital endowments.
II. The Data and Results

The data consist of information on CA officers employed in the Third Division of the APS in 1969. The individuals involved perform public sector white collar duties such as the preparation of reports on various aspects of government, and the administration of government projects and personnel. Required job skills vary somewhat between both Departments and class divisions within the designation. While most jobs are of a clerical or administrative nature the group does contain some career streams which are relatively distinct. Further, a small minority of the sample were promoted to Second Division positions over the 1970s in which duties are more of a management or executive nature. Nevertheless, it is not a gross over-simplification to treat the group as relatively homogenous. Conclusions reached concerning the existence of earnings differences in what is assumed to be a single occupation should be interpreted in the light of these qualifications.

Given that information on this group of workers is available for the years 1969, 1974 and 1973, thus allowing an examination of variations in earnings determinants over a decade was undertaken. The analysis was limited to individuals both aged less than 45 years in 1969 and employed in all three cross-sections. This restricted the sample sizes to 12,278 men and 1,349 women. Table 2 presents the statistical characteristics of the data.
Table 2

Statistical Characteristics of the Data (as of 1969)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Canberra Men</th>
<th>Canberra Women</th>
<th>Non-Canberra Men</th>
<th>Non-Canberra Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>29.59</td>
<td>7.52</td>
<td>25.31</td>
<td>6.69</td>
</tr>
<tr>
<td>Internal Experience (IJE)</td>
<td>7.89</td>
<td>7.09</td>
<td>3.76</td>
<td>4.91</td>
</tr>
<tr>
<td>Total Labour Market Experience (GEXP) (years)**</td>
<td>11.43</td>
<td>7.59</td>
<td>7.48</td>
<td>6.47</td>
</tr>
<tr>
<td>Education (S) (years)</td>
<td>13.11</td>
<td>1.53</td>
<td>12.83</td>
<td>1.40</td>
</tr>
<tr>
<td>Observations</td>
<td>4068</td>
<td>320</td>
<td>8205</td>
<td>959</td>
</tr>
</tbody>
</table>

*Time since joining CA division.
**Time in the labour force (age 5-5). See discussion following.

The calculation of several of these variables given the available data required the imposition of restrictive assumptions. First, the individual's education was recorded as the highest qualification as of 1969. Second, an implication of the form of presentation of education qualification is that, for the purposes of calculation of the general
labour market experience variable, qualifications obtained need to be converted into year-of-schooling equivalents. Table 2 presents information on the distribution of qualifications and the assumptions imposed in order to derive years of education.

Table 2

Educational Qualifications of the Sample

<table>
<thead>
<tr>
<th>Qualifications</th>
<th>Per Cent of Sample</th>
<th>Assumed Year-of-Schooling Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matriculation</td>
<td>64.39</td>
<td>12</td>
</tr>
<tr>
<td>Diploma</td>
<td>8.79</td>
<td>14</td>
</tr>
<tr>
<td>Bachelor - Ordinary</td>
<td>22.94</td>
<td>15</td>
</tr>
<tr>
<td>Bachelor - Honours</td>
<td>3.16</td>
<td>16</td>
</tr>
<tr>
<td>Master</td>
<td>0.67</td>
<td>18</td>
</tr>
<tr>
<td>Doctorate</td>
<td>0.052</td>
<td>20</td>
</tr>
</tbody>
</table>

From these assumptions it is possible to estimate the length of time an individual has been in the labour market. The method uses the formula (age - schooling - 5), and thus assumes that all schooling is obtained before work begins, individuals begin work immediately after finishing school and that labour force participation is continuous once commenced. These assumptions are clearly questionable for the sample. In particular, the distortions are likely to be greater for women given this group’s more intermittent labour force participation (an issue
addressed in section III).

As the relative experience endowments and rates of return to both experience and education may have changed over the period, observations of average salary changes illustrated in Table 1 is not illuminating in terms of understanding the underlying sex and location specific salary differential. Of more use is analysis of the regression results, which are estimations of the following form:

\[ \ln W_i = a + bS_i + c JEX_i + d JEX_i^2 + e GEX_i + f GEX_i^2 + c \]  \hspace{1cm} (9)

were, for individual i, \( \ln W_i \) is the logarithm of annual salary, \( S \) is years of schooling, \( JEX \) is years in the OA, \( GEX \) is years in the labour force and \( c \) is an error term. The results are presented in Tables 4 and 5.
Table 4

Log of Salary Estimations: Men

<table>
<thead>
<tr>
<th></th>
<th>1969</th>
<th>1974</th>
<th>1979</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Canberra</td>
<td>Non-Canberra</td>
<td>Canberra</td>
</tr>
<tr>
<td>Intercept</td>
<td>6.972</td>
<td>(246.89)</td>
<td>7.115</td>
</tr>
<tr>
<td>S</td>
<td>0.016</td>
<td>(40.70)</td>
<td>0.0601</td>
</tr>
<tr>
<td>DJEX</td>
<td>0.0346</td>
<td>(20.38)</td>
<td>0.0313</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DJEX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEXP</td>
<td>0.0541</td>
<td>(27.63)</td>
<td>0.0520</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEXP</td>
<td>-0.00143</td>
<td>(21.13)</td>
<td>-0.00161</td>
</tr>
</tbody>
</table>

2

R  .64  .64  .44  .34  .33  .22

*Absolute t-statistics in parentheses.*
Table 5

Log of Salary Estimates: Women

<table>
<thead>
<tr>
<th></th>
<th>1969</th>
<th>1974</th>
<th>1979</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Canberra</td>
<td>Non-Canberra</td>
<td>Canberra</td>
</tr>
<tr>
<td></td>
<td>(59.88)</td>
<td>(83.32)</td>
<td>(97.17)</td>
</tr>
<tr>
<td>S</td>
<td>0.109</td>
<td>0.0607</td>
<td>0.0756</td>
</tr>
<tr>
<td></td>
<td>(13.75)</td>
<td>(9.30)</td>
<td>(14.24)</td>
</tr>
<tr>
<td>OJEX</td>
<td>0.0711</td>
<td>0.0537</td>
<td>0.0223</td>
</tr>
<tr>
<td></td>
<td>(9.12)</td>
<td>(13.66)</td>
<td>(2.30)</td>
</tr>
<tr>
<td>OJEX²</td>
<td>-0.00289</td>
<td>-0.00177</td>
<td>-0.000700</td>
</tr>
<tr>
<td></td>
<td>(7.42)</td>
<td>(8.99)</td>
<td>(2.70)</td>
</tr>
<tr>
<td>GEXP</td>
<td>0.0558</td>
<td>0.0651</td>
<td>0.0188</td>
</tr>
<tr>
<td></td>
<td>(7.32)</td>
<td>(18.63)</td>
<td>(2.58)</td>
</tr>
<tr>
<td>GEXP²</td>
<td>-0.00164</td>
<td>-0.00222</td>
<td>-0.000392</td>
</tr>
<tr>
<td></td>
<td>(5.15)</td>
<td>(15.61)</td>
<td>(1.79)</td>
</tr>
</tbody>
</table>

R² .63 .65 .38 .20 .30 .093

+ Absolute t-statistics in parentheses.

Table 6 presents interpretive estimates of the coefficients shown in Tables 4 and 5. The percentage change in the dependent variable is shown for a one year increase in schooling, time in the labour force and time in the CA, the latter two being calculated at the mean.
Table 6

Percentage Change in Salary Associated with Changes in Independent Variables

| Variable | 1969 | | | | 1974 | | | | 1979 | | |
|----------|------|------|------|------|------|------|------|------|------|------|------|------|
|          | Men  | Women| Men  | Women| Men  | Women| Men  | Women| Men  | Women| Men  | Women|
|          | Canberra | Non-Canberra | Canberra | Non-Canberra | Canberra | Non-Canberra | Canberra | Non-Canberra | Canberra | Non-Canberra | Canberra | Non-Canberra |
| s        | 8.18 | 6.01 | 10.90 | 6.07 | 6.77 | 4.55 | 7.58 | 4.93 | 6.06 | 4.89 | 7.41 | 4.74 |
| GEXP     | 2.12 | 1.85 | 3.13 | 3.68 | 0.88 | 0.35 | 0.94 | 0.18 | 0.44 | -0.04 | 0.37 | -0.17 |
| OJEX     | 2.13 | 2.40 | 4.93 | 4.17 | 0.96 | 1.37 | 1.03 | 1.37 | 0.81 | 1.15 | 0.97 | 0.83 |
### Table 5

**Log of Salary Estimations: Women**

<table>
<thead>
<tr>
<th></th>
<th>1969</th>
<th>1974</th>
<th>1979</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Canberra</td>
<td>Non-Canberra</td>
<td>Canberra</td>
</tr>
<tr>
<td>Intercept</td>
<td>6.348 (59.88)</td>
<td>6.046 (53.32)</td>
<td>7.969 (97.17)</td>
</tr>
<tr>
<td>$S$</td>
<td>0.103 (13.75)</td>
<td>0.0607 (9.30)</td>
<td>0.0756 (14.24)</td>
</tr>
<tr>
<td>OJEX</td>
<td>0.0711 (9.12)</td>
<td>0.0537 (13.66)</td>
<td>0.0225 (2.20)</td>
</tr>
<tr>
<td>$2$</td>
<td>-0.00289 (7.42)</td>
<td>-0.00177 (0.88)</td>
<td>-0.000700 (2.70)</td>
</tr>
<tr>
<td>GEXP</td>
<td>0.0558 (7.32)</td>
<td>0.0651 (18.63)</td>
<td>0.0188 (2.58)</td>
</tr>
<tr>
<td>$2$</td>
<td>-0.00164 (5.15)</td>
<td>-0.00222 (15.61)</td>
<td>-0.000392 (1.79)</td>
</tr>
</tbody>
</table>

$R^2$ | .63 | .65 | .38 | .20 | .30 | .093 |

+ Absolute t-statistics in parentheses.

Table 6 presents interpretive estimates of the coefficients shown in Tables 4 and 5. The percentage change in the dependent variable is shown for a one-year increase in schooling, time in the labour force and time in the CA, the latter two being calculated at the mean.
Table 6

Percentage Change in Salary Associated with Changes in Independent Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1969</th>
<th></th>
<th>1974</th>
<th></th>
<th>1979</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td></td>
<td>Canberra</td>
<td>Non-Canberra</td>
<td>Canberra</td>
<td>Non-Canberra</td>
<td>Canberra</td>
<td>Non-Canberra</td>
</tr>
<tr>
<td>S</td>
<td>8.18</td>
<td>6.01</td>
<td>10.90</td>
<td>6.07</td>
<td>6.77</td>
<td>4.55</td>
</tr>
<tr>
<td>GEXP</td>
<td>2.12</td>
<td>1.85</td>
<td>3.13</td>
<td>3.68</td>
<td>0.88</td>
<td>0.35</td>
</tr>
<tr>
<td>GJEX</td>
<td>2.13</td>
<td>2.40</td>
<td>4.93</td>
<td>4.17</td>
<td>0.96</td>
<td>1.37</td>
</tr>
</tbody>
</table>
An additional year of schooling adds between about 5 and 11 percent to salary, and women appear to be slightly advantaged. Persons employed in Canberra receive greater salary increments from higher schooling than persons not employed in Canberra. For the early part of the period men receive lower salary increments for additional years of CA employment. In general, Canberra persons are advantaged in return to general labour market experience relative to non-Canberra persons.

These human capital coefficients are quite similar to those found in other studies. Their decrease over time is of interest, suggesting the increased influence of unmeasured productivity characteristics (such as ability and motivation) in wage determination, a contention supported by the decreases in $R$ over the period. One interpretation of these changes is that employers come to recognise over time individuals' true capacity independently of schooling and experience.

The results of Tables 4 and 5 were used in calculations of $W_{1,2}$, $W_{3,4}$, $R_{1,2}$ and $R_{3,4}$, the average salaries predicted for the various groups if they had been rewarded in the same way as the alternative group. This allows insights into the extent to which rate of return differences (including the intercept term) explain sex and location average salary differentials. They are presented in Tables 7 and 8.
Table 7

Predicted Average Salaries Received if Non-Canberra Persons
Had Been Rewarded as Canberra Persons

<table>
<thead>
<tr>
<th></th>
<th>1969</th>
<th>1974</th>
<th>1979</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td>Actual</td>
<td>4254</td>
<td>2975</td>
<td>3720</td>
</tr>
<tr>
<td>Predicted</td>
<td>4919</td>
<td>3160</td>
<td>11491</td>
</tr>
<tr>
<td>Percentage Difference</td>
<td>14.50</td>
<td>6.02</td>
<td>16.70</td>
</tr>
</tbody>
</table>

Table 8

Predicted Average Salaries if Females Had Been Rewarded as Males

<table>
<thead>
<tr>
<th></th>
<th>1969</th>
<th>1974</th>
<th>1979</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Canberra</td>
<td>Non-Canberra</td>
<td>Canberra</td>
</tr>
<tr>
<td>Actual</td>
<td>3750</td>
<td>2975</td>
<td>10310</td>
</tr>
<tr>
<td>Predicted</td>
<td>4861</td>
<td>3401</td>
<td>11186</td>
</tr>
<tr>
<td>Percentage Difference</td>
<td>15.52</td>
<td>15.69</td>
<td>8.15</td>
</tr>
</tbody>
</table>
These data may be interpreted with the use of the following examples. If non-Canberra men had been paid the same human capital returns as Canberra men in 1969, 1974 and 1979, given their own levels of measurable human capital, their salaries would have been on average 14.50, 16.70 and 15.70 percent higher in each of the time periods. From Table 8, if Canberra women had been paid the same human capital returns as Canberra men in 1969, 1974 and 1979, given their own levels of measurable human capital, their salaries would have been on average 15.52, 8.15 and 7.96 percent higher in each of the time periods.

The results of Table 7 imply the following. First, if non-Canberra CA employees had been paid the same returns to human capital as Canberra CA employees, they would have received higher salaries on average in 1969, 1974 and 1979. Second, for males the Canberra wage advantage changed little over the decade and was approximately 16 percent. Third, for females, the Canberra wage advantage increased substantially from 1969 to 1974 (doubling from about 6 percent), but remained stable from 1974 to 1979.

The results of Table 8 suggest that if women had been paid the same returns to human capital as men, they would have received higher salaries in every year, independently of office location. Second, the male advantage decreased substantially from about 15.5 percent in 1969 to between 4.5 percent and 8 percent in 1974. However, there was basically no change in this advantage from 1974 to 1979. Third, women in Canberra were disadvantaged vis-a-vis men compared to women employed outside Canberra after 1969. This was a consequence of the relatively
rapid advances made by non-Canberra women after 1969.

III. An Adjustment to Female Experience

A major problem arises in an interpretation of the results of Table 8 as evidence for the advantage associated with being male in the CA. This is that it is highly likely that for women the general labour market experience variable exaggerates actual time in the labour force. This factor tends to overstate the sex earnings differences attributable to prejudice, a point illustrated below.

It is well recognised that women on average have less continuous labour force participation than men. If this is the case, the use of (age-schooling-5) relatively overstates the actual general labour market experience of women. This may be demonstrated by assuming that true experience, TE, is some fixed proportion of measured experience, ME. That is,

$$ TE = ME \cdot \alpha $$

where $0 < \alpha < 1$. Dropping the quadratic term for expositional simplicity, it follows that in the estimation of

$$ \ln W = a + b ME + cZ + e $$

where $Z$ is a vector of other wage determinants, the coefficient $b$ is biased towards zero as an estimate of the true relationship between salary and experience. This is because equation (11) may be written
\[
\ln W = a + \frac{b}{\alpha} \text{EXP} + cZ + \epsilon
\]  \hspace{1cm} (12)

where \( b/\alpha \) is the true experience coefficient and \( b/\alpha > b \) since \( 0 < \alpha \leq 1 \).

This issue has an important implication for the derivation of female predicted salaries. It is that calculations of \( \frac{3}{4} \) and \( \frac{4}{4} \) overstated because the measured experience variable represents an exaggeration of \( (1/\alpha) \) of female labour force experience prior to 1969. A potential solution to this problem is to adjust measured female GEXP by an estimate of \( \alpha \), the proportion of each year since joining the labour force prior to CA employment that females actually spent in employment. Such an estimate is calculated from the data under a set of restrictive assumptions. Given that it is possible to identify which individuals were not employed in the CA in 1974 but nevertheless were in 1969, an approximation of \( \alpha \) is given by \( (1-x/y)/5 \) where \( x \) is the number of leavers by 1974 over the original population \( y \). In other words, the average general labour market experience accumulation of women prior to 1969 is assumed to be given by the proportion of each year, on average, that the original population remained in employment. For the sample, \( \alpha \) is .904.

This estimate of \( \alpha \) is likely to be biased downwards. The reason is that the members of the sample of which the wage analysis is applied are all employed in 1969, 1974 and 1979 and it is thus unconvincing to
argue that their average time spent out of the labour force before Can employment is as high as those individuals who have demonstrated a propensity for labour turnover. That δ is likely to be too low represents an advantage of the analysis since (for this issue) this defines a lower bound for estimates of \( W^3 \) and \( W^4 \). Predicted average female salaries, under the assumption of discontinuous labour force participation rates up until 1969, are presented in Table 9.

Table 9

<table>
<thead>
<tr>
<th></th>
<th>1969</th>
<th>1974</th>
<th>1979</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Canberra</td>
<td>Non-Canberra</td>
<td>Canberra</td>
</tr>
<tr>
<td>Actual</td>
<td>3750</td>
<td>2375</td>
<td>10310</td>
</tr>
<tr>
<td>Predicted</td>
<td>4079</td>
<td>3286</td>
<td>10949</td>
</tr>
<tr>
<td>Percentage</td>
<td>8.40</td>
<td>9.92</td>
<td>6.01</td>
</tr>
</tbody>
</table>

The results presented in Table 9 suggest that even given an adjustment of experience for the relatively low labour force participation rates of women, the male unexplained wage advantage
remains. Comparing the results with those of Table 8, the unexplained sex component is significantly reduced only for 1969. Whether or not these results are strong evidence for the existence of direct employer discrimination against women in the APS is an issue considered in the concluding discussion.

IV. Discussion of the Results

This paper has reported the results of a disaggregated wage analysis of a large group of OA officers in the APS over the 1969-79 period. Persons not employed in Canberra apparently received lower salaries given their measurable human capital characteristics than would have been the case in Canberra. This result was a consequence of greater returns to schooling and experience in Canberra, which is probably due to the larger number and range of promotion prospects in the head office. The absence of richer data on the persons concerned does not allow strong conclusions however; the results are also consistent with the view that for the samples considered Canberra employees were relatively more able and motivated.

A major part of the exercise was concerned with an examination of sex differences in salaries, and how they vary both by location and over time. Males are apparently rewarded more than females in all locations, holding constant measurable human capital. This unexplained sex advantage decreased from 1969 to 1974, but increased slightly from
1974 to 1979. Even given an adjustment for female general labour force experience which is likely to be extreme, the unexplained male advantage remained. With the adjustment, non-Canberra employee sex differences decreased by 50 percent from 1969 to 1979, but there was little change for Canberra employees.

However, given the data inadequacies it is not appropriate to claim that there is strong evidence of direct employer sex discrimination in the CA occupation of the APS. Several factors not accounted for may be important in an explanation of the findings. First, women working full-time may be less willing to pursue promotions if they still take relatively great family responsibilities. Second, it is possible that structural change in the APS over the 1970s favoured male dominated departments, ensuring more rapid promotions for those individuals with knowledge of such departments (a possible example of this would be the relatively rapid expansion of the Department of Minerals and Energy in the 1973-74 period.) Third, less rapid promotions may be a consequence of the higher expected turnover of females. But even if this phenomenon explains part of the differential, it nevertheless represents statistical discrimination against women since the employer is attributing to members of a group the average characteristics of the group. This point may be particularly poignant for the women of this sample given their demonstrated commitment to CA employment.
The results of this study may be compared to those of a similar exercise by Haig (1982). He used cross-sectional data from the 1973 Henderson Inquiry into Poverty. His findings suggest that females received lower returns to both schooling and experience, findings not generally supported in this paper.

The Haig approach differed in important respects to that of the present study. First, his analysis used age as an experience proxy, taking no account of on-the-job experience or women's lower labour force participation rates. This methodology systematically biases experience returns towards zero for women. As age is a poorer proxy for experience for women than men, adjustments of the type noted in section III above are necessary to gain insight into the true experience picture. Further, using age instead of experience biases schooling returns to zero because of the negative relationship between years in the labour force and years in education. As well, by using only broad occupational categories, the Haig methodology constrained education and experience returns to be identical between individuals in arguably very different jobs. By focusing on a narrowly defined occupation, the present investigation allows a truer picture of rate of return differences between the sexes.

Given that women do not obviously receive lower returns to observable human capital in the CA occupation, but nevertheless experience wage disadvantages, it is clear that most of the discrepancy arises from the
higher male intercept in the earnings function. This implies that answers to the question of the origin of sex differences in wages are to be found in the unobserved differential treatment of women per se, rather than in returns to measurable human capital. As far as location differences are concerned, the opposite is true. Non-Canberra persons are disadvantaged mainly because they receive lower returns to both schooling and general labour market experience.

Two major caveats of this work - particularly in terms of interpretation of the results in the context of wage discrimination - are the following. One, the sample becomes a smaller subset of CA employment over the 1970s. New additions over the recent decade may experience quite different employment prospects than those apparent for the group considered. Consequently it is incalculous to use the results as indicative of present employment practices for less experienced CA officers. Two, the analysis did not make adjustment for the type of degree held by graduate. Thus the results overstate the underlying male advantage if men have post-secondary qualifications that are considered to be more valuable than those held by women. It is important not to exaggerate this point as two-thirds of the sample were matriculants only.
Footnotes


2. For a more broadly-based investigation of the CA occupation, see Bruce J. Chapman (1982). Also, Bruce J. Chapman (1984a) analyses the same data set but in both a less disaggregated way and incorporating no experience adjustment. His constraining of the returns to human capital to be identical between Canberra and non-Canberra employees explains the different results to those reported here.

3. The Chapman and Miller (1983) study incorporated a correction similar to the one employed here. Their study suffers from the other limitations noted.


5. For example, Auditors, Computer Systems Officers, Naval Stores Officers and Interpreter/Translators. I am indebted to Dr George Rothman of APESB for this information.

6. In 1979 2.99 percent of the original sample had advanced to the Second Division.
7. Using only the group employed in all three cross-sections allows more valid comparisons over time compared with using different groups. I wish to thank Dick Miller for this suggestion.

8. See Jacob Mincer (1974).

9. Actual salaries were not available in the data. They were computed by taking the midpoint of the salary range for the Class level of the individual.

10. See, for example, Zvi Griliches (1976) or Bruce J. Chapman and Hong W. Tan (1980).

11. This possibility is consistent with the notion of job matching. See Boyan Jovanovic (1979).

12. The Department of Minerals and Energy expanded by about 26 percent in 1973-74, compared to an average APS expansion of about 5 percent. Source: Public Service Board Annual Report, 1975.


14. Haig recognises this point in his discussion.

15. For a demonstration of this point, see Mark A. Rosenzweig and Jack Morgan (1975).
16. One further methodological problem of the Haig analysis warrants discussion. His earnings functions included hours worked as an explanatory variable. This constitutes an important econometric problem because hours will be endogenous in such an estimation. So long as wages determine hours, and vice-versa, the general specification is questionable and the coefficient on hours is uninterpretable.
REFERENCES


Appendix I

The Theoretical Model

The human capital earnings function may be developed following Jacob Mincer and Solomon Polachek (1974):

\[ E_t = E_{t-1} + rC_{t-1} \]  \hspace{1cm} (1)

where \( E_t \) is gross earnings in period \( t \), \( C_{t-1} \) is the dollar amount of net investment in period \( t-1 \) and \( r \) is the average rate of return to the individual's investment in human capital. If the ratio of investment expenditures to gross earnings, \( C_t/E_t \), is given by \( k_t \), then, by viewing investment in time-equivalent units,

\[ E_t = E_{t-1} (1 + r k_{t-1}) \]  \hspace{1cm} (2)

Since \( E_t = E_{t-1} (1 + r k_{t-1}) \) and since \( \ln(1+rk) = rk \) for small values of \( rk \), equation (2) may be rewritten as:

\[ \ln E_t = \ln E_{t-1} + r k_{t-1} \]  \hspace{1cm} (3)

Analysing schooling and postschool experience, it is possible to separate the \( k \) terms, giving
\[
\ln E_t = \ln E_0 + r \sum_{j=0}^{s-1} k_j + r \sum_{j=s}^{t-1} k_j
\]

where \( k_s \) and \( k_j \) are respectively investment ratios during and after the schooling period. Assuming \( k_1 = 1 \),

\[
\ln E_t = \ln E_0 + r s + r \sum_{j=s}^{t-1} k_j
\]

where \( s \) is the number of years of schooling.

Given that post-school investments are expected to decline over the lifetime (as retirement approaches, the expected return from investment falls), (5) may be approximated with the inclusion of quadratic experience terms. Thus the estimating equation becomes:

\[
\ln W_i = a + h s_i + c GEPF_i + d GEPF_i^2 + c DJEX_i + d DJEX_i^2 + e
\]

where, for individual \( i \), \( \ln W \) is the logarithm of wage, \( S \) is years of schooling, \( GEPF \) is length of time in the labour force, \( DJEX \) is length

--------

1. This is equivalent to the assumption that tuition equals student earnings.
of time in the DA and 

\[ e \] is an error term assumed to be randomly distributed with zero mean.