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## **Labour Market Outcomes:**

### **A Cross-National Study**

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McMaster University

DEPARTMENT OF ECONOMICS

**UNION EFFECTS AND EARNINGS DISPERSION  
IN AUSTRALIA, 1986-1994**

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**Abstract**

In Australia a large decline in union density has occurred since the mid-1970's. This paper examines the relation between the decline in union density and the dispersion of earnings in Australia between 1986 and 1994. Changes in union density are found to be associated with an increase in earnings dispersion for male employees over this period, but do not appear to be strongly related to changes in earnings dispersion for female employees. The main cause of changes in earnings dispersion for both male and female employees has been an increase in the dispersion of earnings of nonunion employees.

## **1. Introduction**

In the period since the mid-1970's there have been substantial changes in earnings dispersion in Australia. Table 1 shows that between 1975 and 1994 changes in real weekly earnings for both male and female employees were positively correlated with an employee's position in the distribution of earnings. For example, real weekly earnings of a male employee at the 10th percentile of the earnings distribution decreased by 6.6 per cent, whereas real earnings of a male employee at the 90th percentile increased by 13 per cent over the same period. Similar findings on changes in earnings dispersion in Australia have been obtained in a number of studies; for example, King et al. (1992), Gregory (1993), Gregory and Woodbridge (1993), Borland and Wilkins (1994), and McGuire (1994).

Analyses of the determinants of changes in earnings dispersion have attempted to distinguish between the role of changes in the observable characteristics of employees, changes in the return to those observable characteristics, and changes in unobservable factors. Changes in the distribution of employment between education, experience, or occupational groups do not appear to have been an important explanatory factor for increases in earnings dispersion, and changes in the return to the set of observable characteristics have caused a narrowing of dispersion at the lower end of the earnings distribution and a widening of dispersion at the top end of the earnings distribution with little net impact on measures of overall dispersion (Gregory, 1993, Borland and Wilkins, 1994, and McGuire, 1994). Instead, the main cause of the changes in earnings dispersion which have occurred are changes in the distribution of unobservable characteristics and returns to those characteristics (Borland and Wilkins, 1994).

In the United States and United Kingdom it has also been found earnings dispersion increased rapidly since the mid-1970's (see for example, Juhn et al., 1993, and Schmitt, 1993). In those countries the changes in earnings dispersion which have occurred can be explained to some extent - but by no

means wholly - by changes in the distribution of observable characteristics, and in the returns to those characteristics. Therefore the role of other factors which may have affected earnings dispersion has also been considered. One set of studies has examined the effect of changes in union density on earnings dispersion. In many developed economies, union density has declined rapidly since the early 1980's (Blanchflower and Freeman, 1992). A decline in union density can affect earnings dispersion in a number of ways. For example, suppose that within-group earnings dispersion is lower for the group of union employees than for nonunion employees. Then a decline in union density - by shifting employees from the low-dispersion group to the high-dispersion group - would cause an increase in overall earnings dispersion.

For the United States, Freeman (1993) has found that approximately 20 per cent of the increase in the variance of earnings for male employees in the United States between 1978 and 1988 can be attributed to declines in union density. Card (1992) has also examined union effects on earnings dispersion in a longitudinal study which controls for the effects of differences in unobserved characteristics of union and nonunion members, and of misclassification errors in union status, on union/nonunion earnings differentials. This study obtains similar results on earnings dispersion in the United States - that one-fifth of the increase in the variance of adult male wages between 1973 and 1987 is accounted for by declining union density. For the United Kingdom, Gosling and Machin (1994) conclude that about 15 per cent of the increase in the variance of earnings for semi-skilled workers between 1980 and 1990 is due to changes in union density.

During the 1970's and 1980's there have also been large declines in union density in Australia. Figure 1 displays changes in union density for the groups of all male and all female employees aged 15 and over between 1976 and 1994. The downward trend in union density is clearly evident. Table 2 presents disaggregated information on union density and shows that the decline has been relatively uniform between age, sectoral and occupational groups<sup>1</sup>. Table 3 shows union density by quintile of the earnings distribution in 1986 and 1994. It is evident that declines in union density have occurred at

all points of the distribution of earnings.

The extent of the decline in union density in Australia, and the potential effect of this decline on earnings dispersion, suggests that an examination of the effect of changes in union density may provide new insights into the determinants of changes in the dispersion of earnings in Australia. This study applies unpublished data on the distribution of earnings for union and nonunion members between 1986 and 1994 to examine this issue.

Section 2 of the paper describes the main data source applied in the paper and the methods used to construct measures of earnings dispersion. Section 3 examines the relation between changes in union density and changes in earnings dispersion in Australia. It is found that changes in union density have been associated with an increase in earnings dispersion for male employees, but do not appear to be strongly related to changes in earnings dispersion for female employees. The relation between the decrease in union density and changes in the variance of earnings for males is similar to the estimated effect found in the United States and United Kingdom. Although changes in union density appear to be somewhat related to changes in earnings dispersion, the main cause of changes in earnings dispersion in Australia between 1986 and 1994 has been an increase in the dispersion of earnings of nonunion employees.

## **2. Data Source and Measures of Earnings Dispersion**

The data source for this study is unpublished data on weekly earnings for union and nonunion members from the ABS Survey of Trade Union Members (catalogue #6325.0). This is a supplementary survey to the monthly household Labour Force Survey and has been undertaken on seven occasions between 1976 and 1994. Data on weekly earnings in main job of full-time male and female, and union and nonunion, employees are available from the 1986, 1988, 1990, 1992 and 1994 surveys. For this study data were obtained from the 1986 and 1994 surveys on average earnings, and on the distribution

of earnings disaggregated on the basis of age, gender, and union status of employees<sup>2</sup>. Data on the distribution of earnings were provided in grouped form on the numbers of employees with weekly earnings in twenty intervals from \$0 to \$800, and above \$800; information on the average earnings of employees with earnings above \$800 was also provided. The grouped earnings data were also disaggregated on the basis of gender, union status, and age.

To examine the effect of changes in union density on the distribution of earnings, two measures of earnings dispersion have been considered. First, differences in weekly earnings between employees at different points in the distribution of earnings are examined. Weekly earnings for employees at the 10th, 25th, 50th, 75th and 90th percentiles are estimated from the grouped earnings data assuming that employees with earnings in a specified interval are uniformly distributed over the values of earnings in that interval<sup>3</sup>. Second, the variance of earnings is examined. The variance of earnings is estimated assuming that each employee with earnings in a bounded interval has weekly earnings at the mid-point of that interval; and that each employee with earnings in the unbounded top interval (above \$800) has weekly earnings equal to average earnings for the group of employees in the top interval. This estimate of the variance ignores within-interval dispersion in earnings and hence will underestimate the true variance of weekly earnings. However, provided that excluding within-interval variance does not cause a time-varying bias in the estimate of variance of earnings, it will still be informative to examine changes in this measure of earnings dispersion.

The time period for which data on weekly earnings of union and nonunion members are available - 1986 to 1994 - is more restricted than the period which has been examined in recent studies of earnings dispersion in Australia. It is therefore of interest to examine how the structure and dispersion of earnings in Australia have varied over this sub-period. Table 1 shows changes in real weekly earnings between 1986 and 1994 for employees at different points in the distribution of earnings. It is evident that for male employees there has been little change in dispersion between the 50th and 10th percentiles between 1986 and 1994 but that an increase in earnings dispersion between

the 50th and 90th percentiles has occurred. This contrasts with changes in dispersion over the longer time span from 1975 to 1994 where both the 90/50 and 50/10 earnings differentials widened. For female employees at the 75th and 90th percentiles, changes in real earnings have been much lower relative to females at the 10th, 25th, and 50th percentiles in the period from 1986 to 1994 than from 1975 to 1994. Hence the measure of the difference in real weekly earnings between employees at the 90th and 10th percentiles suggests that, in contrast to the period from 1975 to 1994, earnings dispersion for female employees declined between 1986 and 1994. However, the measure of the difference in real weekly earnings between employees at the 75th and 25th percentiles increased over both time periods.

### **3. Union Effects on Earnings Dispersion**

The operation of trade unions can have a number of effects on an individual employee's earnings. First, trade union membership may raise the earnings of an employee relative to the earnings of an identical employee who is not a union member. For example, most Australian studies find a union/nonunion earnings differential of between five and fifteen per cent (Miller and Mulvey, 1993, p.324). Second, trade unions may reduce earnings dispersion between their members relative to earnings dispersion between nonunion members. For example, in Australia in 1986 the difference between log weekly earnings for a male employee at the 10th and 90th percentiles was 0.87 for union members and 1.20 for nonunion members; and for a female employee at the 10th and 90th percentiles the difference was 0.91 for union members and 1.04 for nonunion members<sup>4</sup>.

Where trade union membership lowers the within-group earnings dispersion of union members, and introduces a differential between the earnings of identical employees, this suggests four main potential determinants of changes in earnings dispersion. First, a change in union density will alter the proportions of employees with high and low within-group earnings dispersion, and hence change

overall dispersion. Between 1986 and 1994 union density declined from 50 per cent to 38 per cent for male employees, and from 39 per cent to 31 per cent for female employees. This decline in union density would have reduced the proportion of employees with relatively low within-group earnings dispersion, and therefore should be expected to have raised overall earnings dispersion. Second, the extent of within-group earnings dispersion for union members may change which will affect overall earnings dispersion. Third, changes in the extent of within-group earnings dispersion for nonunion members may shift overall earnings dispersion. Fourth, a change in the union/nonunion earnings differential - by increasing or decreasing the earnings differential between otherwise identical employees - will affect earnings dispersion.

Adopting this framework the sources of changes in earnings differentials between employees at different percentiles of the earnings distribution or in the variance of earnings, over the period from 1986 to 1994, can be decomposed between the effects of: a) changes in union density; b) changes in the union/nonunion earnings differential; and c) changes in within-group earnings dispersion for union members and for nonunion members. For example, the variance of weekly earnings at time  $t$ ,  $\sigma_t^2$ , can be decomposed as:

$$\sigma_t^2 = \rho_t \sigma_{ut}^2 + (1 - \rho_t) \sigma_{nut}^2 + \rho_t(1 - \rho_t)(W_{ut} - W_{nut})^2 \quad (1)$$

where  $\rho_t$  = union density at time  $t$ ,  $\sigma_{ut}^2$  = within-group variance of earnings at time  $t$  for union members,  $\sigma_{nut}^2$  = within-group variance of earnings at time  $t$  for nonunion members,  $W_{ut}$  = average earnings of union members at time  $t$ , and  $W_{nut}$  = average earnings of nonunion members at time  $t$ .

Hence, the change in the variance of earnings between 1986 and 1994,  $\sigma_{1994}^2 - \sigma_{1986}^2$ , can be decomposed into effects which are due to changes in  $\rho_t$ ,  $W_{ut} - W_{nut}$ ,  $\sigma_{ut}^2$ , and  $\sigma_{nut}^2$ .



It is important to note that the earnings data applied in this study do not allow the effects of trade unions on earnings to be separated from effects of other characteristics which might differ between union and nonunion members. This is relevant in a number of ways for interpreting analysis of the effects of unions on changes in earnings dispersion. For example, suppose that differences in within-group earnings dispersion are due to greater dispersion of skill characteristics of nonunion members than union members rather than to union effects on earnings dispersion. In this case, the relation between changes in union density and changes in earnings dispersion should be seen as a process whereby a decline in unionisation is associated with job losses for union members who have relatively less dispersion in characteristics and job gains for nonunion members who have relatively greater dispersion in characteristics. This also raises the issue of causality. Any relation between the decline in union density and changes in earnings dispersion may simply be a manifestation of some other factor which has caused changes in the structure of employment. Hence, the findings in this study should be interpreted as providing evidence of empirical linkages between changes in union density and changes in overall earnings dispersion, but are not a sufficient basis for establishing causality from changes in union density to changes in earnings dispersion.

Table 4 shows the relation between changes in union density and changes in differences in log weekly earnings between employees at specified percentiles of the distribution of earnings between 1986 and 1994. To examine this relation a hypothetical earnings distribution is computed. This distribution keeps the proportion of union employees in each earnings interval and proportion of nonunion employees in each earnings interval fixed at 1986 values, but sets the share of union employees in total employment equal to 1994 values.

From Table 4 it is evident that for male employees, the decline in union density can account for approximately 30 per cent of the increase which occurred in the 75-25 percentile log earnings difference, and 40 per cent of the increase in the 90-10 percentile log earnings difference. The main difference in the distribution of earnings of union and nonunion employees is that a nonunion member is

more likely than a union member to have earnings in the bottom quintile of the earnings distribution. Therefore a decrease in union density has the strongest effect on the bottom quintile of the distribution of earnings. This explains why the relation between the decrease in union density and changes in earnings dispersion is mainly observed in the lower half of the earnings distribution, and why there is a larger effect on the 90-10 percentile log earnings difference than the 75-25 percentile log earnings difference. For female employees changes in union density are only weakly related to changes in earnings differentials. The decline in union density accounts for part of the decrease in the 90-50 percentile log earnings difference. However, for the 90-10 and 75-25 percentile log earnings differences, the change in union density has shifted earnings dispersion in the opposite direction to the overall change.

Table 5 presents information on changes in the percentile log earnings differences disaggregated for union and nonunion employees, and on changes in union/nonunion earnings differentials. Changes in the union/nonunion earnings differential do not appear to have been strongly related to changes in earnings dispersion for either male or female employees. For male employees the main determinant of the increase in percentile log earnings differences was an increase in differences within union and nonunion groups of employees. This effect was particularly pronounced for employees aged 35-54. For female employees the main determinant of the decrease in the 90-10 percentile log earnings difference was a decline in earnings dispersion for both union and nonunion employees concentrated in the group of employees aged 15-24. An increase in earnings dispersion for both union and nonunion members accounts for the rise in the 75-25 percentile log earnings difference.

Table 6 shows changes in the variance of log real weekly earnings for male and female employees between 1986 and 1994, and decomposes these changes between the sources described above. For both male and female employees there was an increase in the variance of earnings over this period. Although the 90-10 percentile log earnings difference narrowed for females, the increase in the variance of earnings suggests that this was offset by an increase in dispersion in the middle ranges of the

distribution of earnings (for example, between the 25th and 75th percentiles). The finding that for female employees the 90-10 percentile log earnings difference narrowed at the same time as the variance of earnings increased is also obtained for the period from 1986 to 1990 using individual-level data from the ABS Income Distribution Survey (Borland and Wilkins, 1994, Table 2).

Table 6 shows that for males, the decrease in union density can account for about 30 per cent of the change in the variance of log earnings; and, for females, the decrease in union density accounts for approximately 15 per cent of the change in the variance of earnings. Changes in the union/nonunion earnings differential, and in the within-group variance of earnings of union employees have had little impact on the overall variance of earnings for either males or females. For both groups the main determinant of the increase in the variance of earnings has been an increase in the within-group variance of earnings for nonunion employees. The greater change in earnings dispersion between nonunion employees than union employees over the period of this study suggests that the operation of Prices and Incomes Accord has maintained relatively stable earnings differentials between union employees, but that some groups of nonunion employees have been able to obtain increases in earnings outside of the guidelines for wage-setting established by the Prices and Incomes Accord<sup>5</sup>.

The findings in this section on the relation between changes in union density and changes in the variance of earnings for male employees appear consistent with the results for the United States and United Kingdom cited in the introductory section. However, for females, any relation between changes in union density and changes in earnings dispersion is less pronounced. Part of the explanation for this difference is that there appears to be a smaller difference in within-group earnings dispersion between union employees and nonunion employees for females than males; as well, there was a smaller decline in union density between 1986 and 1994 for female employees than for male employees.

#### 4. Conclusion

This study has applied grouped data on weekly earnings of union and nonunion employees in 1986 and 1994 to examine the relation between union effects and changes in earnings dispersion in Australia<sup>6</sup>. Measures of differences in log earnings between employees at different percentiles of the earnings distribution, and the variance of earnings, have been considered. The decline in union density between 1986 and 1994 is found to account for approximately 30 per cent of the increase in earnings dispersion for male employees, but to be only weakly related to changes in earnings dispersion for female employees. The finding for male employees is similar to results from studies of union effects on the variance of earnings in the United States and United Kingdom. It also provides further supporting evidence for the apparent inverse relation between the change in union density and change in earnings dispersion which is noted by Gosling and Machin (1994, p.16) for a range of countries. The main source of changes in earnings dispersion for both male and female employees is shown to have been changes in earnings dispersion of nonunion employees. This suggests that at the same time as the Prices and Incomes Accord has maintained stability in the relative earnings of union employees, some nonunion employees have achieved increases in real earnings which were significantly above average rates of change in real earnings.

## Endnotes

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1. For analyses of the causes of the decline in union density in Australia see Kenyon and Lewis (1992), Peetz (1992), and Borland and Ouliaris (1994).

2. Due to data limitations it has not been possible to examine earnings dispersion for part-time employees in this study. The main difficulty in extending the analysis to part-time employees is that earnings data disaggregated by hours of work are not available for those employees. However, it should be noted that in August 1994, part-time employment accounted for 11 per cent of total employment for males, and 43 per cent of total employment for females (ABS, Labour Force Survey Australia, catalogue #6203.0).

3. For example, suppose that there are three weekly earnings intervals, \$0-\$200, \$200-\$400, and \$400+, and that one-third of all employees are in each interval. Then weekly earnings at the 50th percentile would be calculated as the mid-point of the middle interval; that is, \$300.

4. Evidence of differences in average earnings and within-group earnings dispersion between union and nonunion members derived from regression analyses which correct for differences in observable characteristics between union and nonunion members may still be attributed either to union effects or to the effect of differences in unobserved skill or job characteristics between union and nonunion employees. Card (1993) has applied longitudinal data to attempt to separate the role of these factors for employees in the United States and concludes that (p.41) ‘...the effect of unions on the overall variance of wages at a point in time is relatively modest’. However, as noted in the introductory section, Card does still conclude that changes in union density can explain a sizeable fraction of changes in overall earnings inequality for male employees. For Australia, Kornfield (1993) has applied longitudinal data from a sample of employees aged 15-24 in 1984 to correct for selection effects on estimates of union effects on earnings. He finds that even after controlling for selection effects that there is a significant union effect of 7-18 per cent on an individual employee’s earnings.

5. Some attention has been focused on the issue of increases in earnings achieved by company executives in Australia over the past decade; see for example, ‘It’s Open Season for Executive Salaries’, Sydney Morning Herald, October 29, 1994, pp.39-42. For further information on the operation of the Prices and Incomes Accord see Lewis and Spiers (1990), Borland (1991), and Hancock and Isaac (1992).

6. An earlier version of this paper also examined the effect of changes in union density on relative earnings between age groups. For both male and female employees decreases in union density were found to have had little effect on relative earnings between age groups. The only exception is for males aged 15-24 where the decrease in union density explains the small decrease which occurred in the relative earnings of that group.

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Table 1: Percentage Change in Real Weekly Earnings - Full-Time Employees in Main Job - 1975-1994

	1975-1986	1986-1994	1975-1994
A. Male:			
Percentile in Earnings Distribution:			
10	-.099	.033	-.066
25	-.047	.030	-.017
50	.013	.046	.059
75	.055	.077	.132
90	.038	.092	.130
B. Female:			
Percentile in Earnings Distribution:			
10	-.018	.159	.141
25	.004	.094	.108
50	.048	.108	.156
75	.114	.121	.235
90	.181	.095	.276

Source: ABS, Weekly Earnings of Employees (Distribution) Australia, catalogue #6310.0.



Table 2: Union Density - All Employees - 1976-1994

		November 1976	August 1986	August 1994
A. Age				
Male	15-24	.44	.37	.25
	25-34	.57	.52	.38
	35-44	.60	.55	.44
	45-54	.62	.58	.44
	55-64	.65	.59	.45
Female	15-24	.42	.36	.23
	25-34	.43	.42	.30
	35-44	.39	.37	.37
	45-54	.50	.45	.35
	55-64	.52	.43	.37
B. Sector				
Public		na	.71	.63
Private		na	.34	.26
C. Occupation				
Male	Manual	.65	.59	.49
	Nonmanual	.46	.41	.32
Female	Manual	.39	.46	.34
	Nonmanual	.41	.38	.31

Note: In 1976 Manual = Farmer, Transport, Trade Worker; and Nonmanual = Professional, Administrative, Clerical, Sales, Service Worker. In 1986/1994 Manual = Machine Operator, Trade Worker, Labourer; and Nonmanual = Manager, Professional, Para-professional, Clerical, Sales Worker.

Source: ABS, Trade Union Members Australia, catalogue #6325.0.

Table 3: Union Density by Earnings Quintile - Full-Time Employees in Main Job - 1986-1994

Male		Female	
1986	1994	1986	1994

Quintile in Earnings  
Distribution:

1	.39	.26	.33	.26
2	.51	.43	.45	.35
3	.56	.49	.42	.35
4	.55	.50	.43	.36
5	.49	.40	.55	.50

Note: 1 = Percentiles 1-20, 2 = Percentiles 21-40, 3 = Percentiles 41-60,  
4 = Percentiles 61-80, and 5 = Percentiles 81-100.

Source: Unpublished data from Trade Union Members Australia, catalogue #6325.0.

Table 4: Relation Between Changes in Union Density and Percentile Log Earnings Differences - Full-Time Employees in Main Job - 1986-1994

Difference in Log Weekly Earnings	1986 Actual	1994 Density	1994 Actual
A. Male			
90-10	1.027	1.049	1.077
75-25	0.519	0.533	0.559
90-50	0.528	0.537	0.569
50-10	0.499	0.512	0.508
B. Female			
90-10	1.000	1.003	0.934
75-25	0.460	0.455	0.474
90-50	0.484	0.479	0.464
50-10	0.516	0.524	0.470

Source: Unpublished data from ABS, Trade Union Members Australia, catalogue #6325.0.

Table 5: Changes in Percentile Earnings Differences - Full-Time Employees in Main Job - 1986-1994

A. Change in Log Weekly Earnings Differences:

		Union	Nonunion
Male	90-10	.021	.025
	75-25	.003	.038
Female	90-10	-.076	-.047
	75-25	.018	.024

B. Change in Union/Nonunion Differential in Log Weekly Earnings:

Male	-.017
Female	-.020

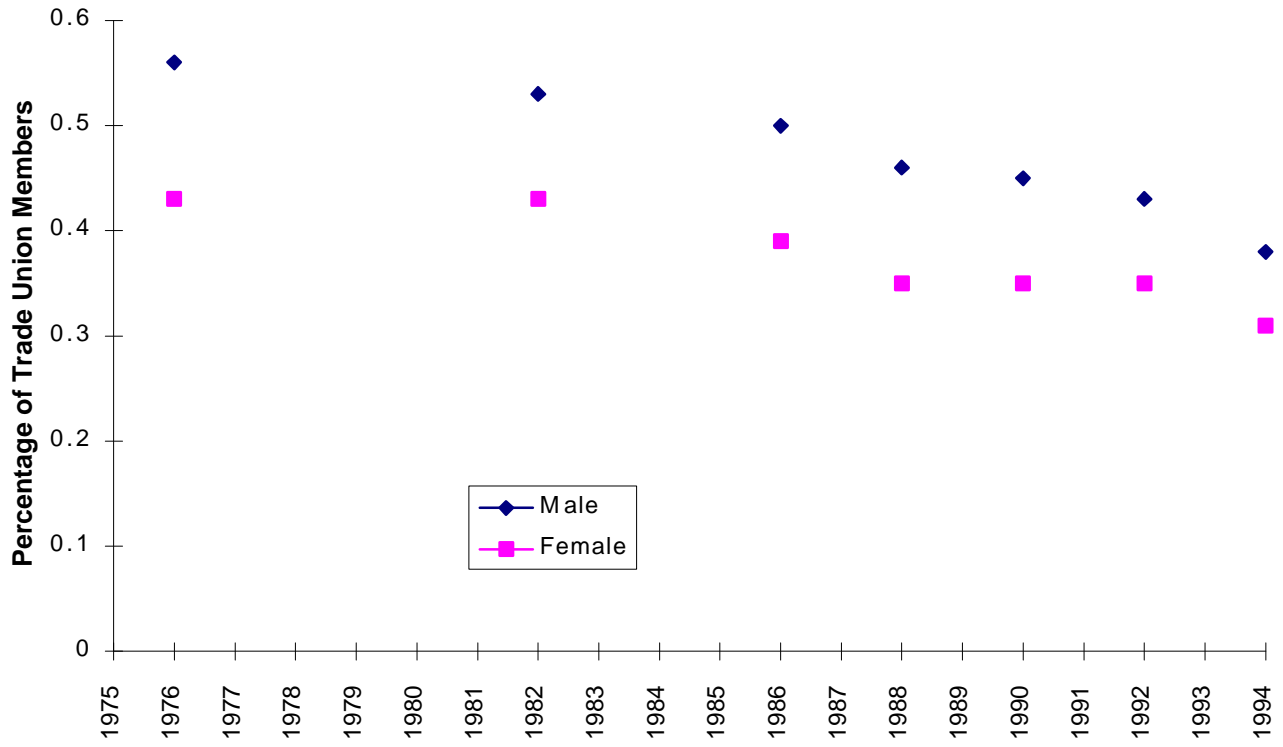
Source: Unpublished data from ABS, Trade Union Members Australia, catalogue #6325.0.

Table 6: Variance Decomposition - Log Real Weekly Earnings - Full-Time Employees in Main Job - 1986-1994

	Males	Females
Total Percentage Change in Variance of Log Real Weekly Earnings	.0561	.0142
Effect of:		
Change in Union Density	.0169	.0022
Change in Union/Nonunion Earnings Differential	-.0005	.0002
Change in Variance Union Earnings	.0004	-.0038
Change in Variance Nonunion Earnings	.0393	.0156

Source: Unpublished data from ABS, Trade Union Members Australia, catalogue #6325.0.

Figure 1: Union Density - All Employees - 1976-1994





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