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**EARNINGS INEQUALITY IN AUSTRALIA:  
CHANGES, CAUSES AND CONSEQUENCES**

**Jeff Borland**

**DISCUSSION PAPER NO. 390**

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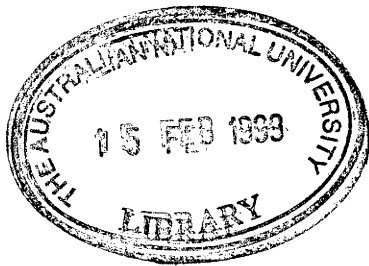
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## **Executive Summary**

### **1. Changes in earnings inequality**

- Earnings inequality for male and female employees in Australia has increased from the mid-1970s onwards. Increases in inequality have been somewhat larger for male employees than female employees; and female employees have had larger increases in real weekly earnings than male employees over this period.
- Earnings inequality increased rapidly for both male and female employees between 1975 and 1982; in the period since 1982 there has been further steady growth in inequality for male employees, whilst for female employees inequality has also increased during the 1990s.
- Increases in earnings inequality appear to have been smaller than in the United States or United Kingdom, about the same as in Canada, and larger than in a range of other European and Nordic countries.
- These findings on earnings inequality are largely robust to choice of measure of earnings inequality; choice of data source; and type of earnings variable. However, findings on the magnitude of changes in earnings inequality can be sensitive to the sample of employees chosen for analysis. For example, in the period since the early 1980s earnings inequality has grown more rapidly amongst employees aged 25-54 years than for a sample aged 15-64 years.

### **2. Causes of changes in earnings inequality**

- Increases in earnings inequality between the early 1980s and mid-1990s in Australia are mainly explained by increases in inequality within groups of employees with the same level of educational attainment and years of labour market experience; on the other hand, changes in relative earnings of employees in different education/experience groups appears to have had a slightly compressing effect on the distribution of earnings.
- Changes in the relative earnings of employees in different education/experience groups in Australia can be explained satisfactorily in a simple supply/demand framework. For example, decreases in the relative earnings of degree holders between the late 1960s and early 1980s are consistent with a large increase in the relative supply of persons with a degree over that period.
- A range of evidence suggests that there has been an increase in the relative demand for high-skill (and decline in demand for low-skill) labour in Australia

over the period since the 1970s. Possible causes of this change in demand for labour by skill category are the expansion of international trade, and technical change. Existing evidence on the relative effect of each of these influences is not conclusive.

- A number of possible sources of increases in earnings inequality within groups of employees with the same education and years of experience can be identified from existing studies - most notably: changes in the distribution of and return to worker skills not proxied for by educational attainment and years of experience; changes in inter-industry earnings dispersion; and the decline in trade union density. However, as yet little is known about the relative effect of each of these factors.

### **3. Consequences of changes in earnings inequality**

Increases in earnings inequality appear to have been one factor behind increases in inequality in the distribution of market income in Australia since the early 1980s. Changes in earnings inequality are also likely to have important consequences for skill acquisition, and the social security system.

### **4. Future research**

There are a range of areas where further research would be most useful for understanding the causes and consequences of changes in earnings inequality in Australia. In particular, more research is required to establish the nature and causes of changes in demand for labour by skill category, and the factors which have caused increases in earnings inequality within education/experience groups of workers. Research could also be undertaken on the precise relation between changes in earnings inequality and the distribution of income between income units in Australia.

## 1. Introduction

Writing about the Australian wage-setting system in the 1930s W.K. Hancock (1930, p.153) commented that "...the dominant passion of Australian labour is for substantial equality". Traditionally, this passion has been regarded as having its manifestation in a more egalitarian wage structure in Australia than in other countries (see for example Norris, 1986, and Borland and Woodbridge, 1998). However, in recent years a range of studies have suggested that - at least in terms of the distribution of earnings - Australia is moving progressively further away from the goal of substantial equality. Following studies undertaken in the United States and United Kingdom which showed large increases in earnings dispersion in those countries in the period since the mid-1970s (for example, Juhn et al., 1993, and Schmitt, 1995), researchers in Australia have undertaken similar analyses and found evidence that earnings dispersion has also increased in this country.

Several years after the beginning of this new wave of research on earnings inequality in Australia, it seems an appropriate time to assess where we currently stand in our knowledge about changes in earnings inequality, and to consider what future research might be desirable.<sup>1</sup> In this paper a review of recent developments in research on earnings inequality in Australia is presented - organised into three main parts. First, section 2 presents a range of descriptive information on changes in earnings inequality. Second, section 3 reviews evidence on the causes of changes in earnings inequality and on developments in earnings differentials between workers in different skill groups. Third, section 4 assesses possible consequences of changes in earnings inequality - with a particular focus on changes in the distribution of income.

The motivation for understanding the nature and causes of changes in earnings inequality derives from a number of sources. First, the degree of earnings inequality is one of the main determinants of how income is distributed between families and households in a society. Hence, information on changes in earnings inequality is necessary for assessing changes in social welfare.<sup>2</sup> Second, to the extent that the main changes in labour market outcomes in Australia in recent years - for example, higher rates of unemployment, lower rates of real wage growth, and changes in the distribution of earnings - have been caused by a common set of factors, understanding the causes of changes in earnings dispersion may provide a 'window' for obtaining insights into the causes of other important labour market developments.

## 2. Changes in Earnings Inequality

This section reviews descriptive information on changes in earnings inequality in Australia in the period since the mid-1970s. The first sub-section presents measures of changes in earnings inequality using data on weekly earnings from the ABS Labour Force Survey (LFS). The second sub-section examines whether alternative data sources - the ABS Survey of Employee Earnings and Hours (SEEH) and the ABS Income Distribution Survey (IDS) - provide consistent information on changes in earnings inequality.<sup>3</sup> The third sub-section compares and attempts to reconcile the findings from alternative measures of changes in earnings inequality. The fourth sub-section examines changes in earnings inequality using alternative measures of earnings (i.e., hourly wage and annual earnings). The fifth sub-section compares changes in earnings inequality between Australia and a range of other industrialised countries. The final sub-section provides some comments on interpretation of descriptive information on changes in earnings inequality.

### *a. Descriptive Information - Labour Force Survey*

A number of studies have used earnings data from the LFS to describe changes in earnings inequality for the period between the 1970s and 1990s (for example, Watts and Mitchell, 1990, and Borland and Wilkins, 1996). Figures 1a and 1b use the LFS data source to show annual observations of real weekly earnings in main job for full-time employees at different percentiles of the distribution of earnings between 1975 and 1997 (all percentiles normalised to 100 in 1975). For both male and female employees the emerging dispersion between each earnings series - with individuals at the top of the distribution of earnings achieving higher real weekly earnings than individuals at the bottom of the distribution - shows that earnings inequality has increased. For example, between 1975 and 1997 real weekly earnings of a male employee at the 25th percentile increased by 1.3 per cent, whereas earnings of an employee at the 75th percentile increased by 19.3 per cent. And for female employees over the same period real weekly earnings of an employee at the 25th percentile increased by 15.8 per cent, whereas earnings of an employee at the 75th percentile increased by 32.1 per cent.

Figure 2 provides summary information on changes in log real weekly earnings in main job for full-time male and female employees by decile position in the distribution of earnings between 1975 and 1997. One notable finding is that - at all points of their respective earnings distributions - female employees have had higher increases in real weekly earnings than male employees over this period. Changes in above-median earnings inequality appear to have been of a similar magnitude for both

Figure 1a: Adjusted Real Weekly Earnings by Percentile - Full-time Male Employees in Main Job - 1975-1997 (August)

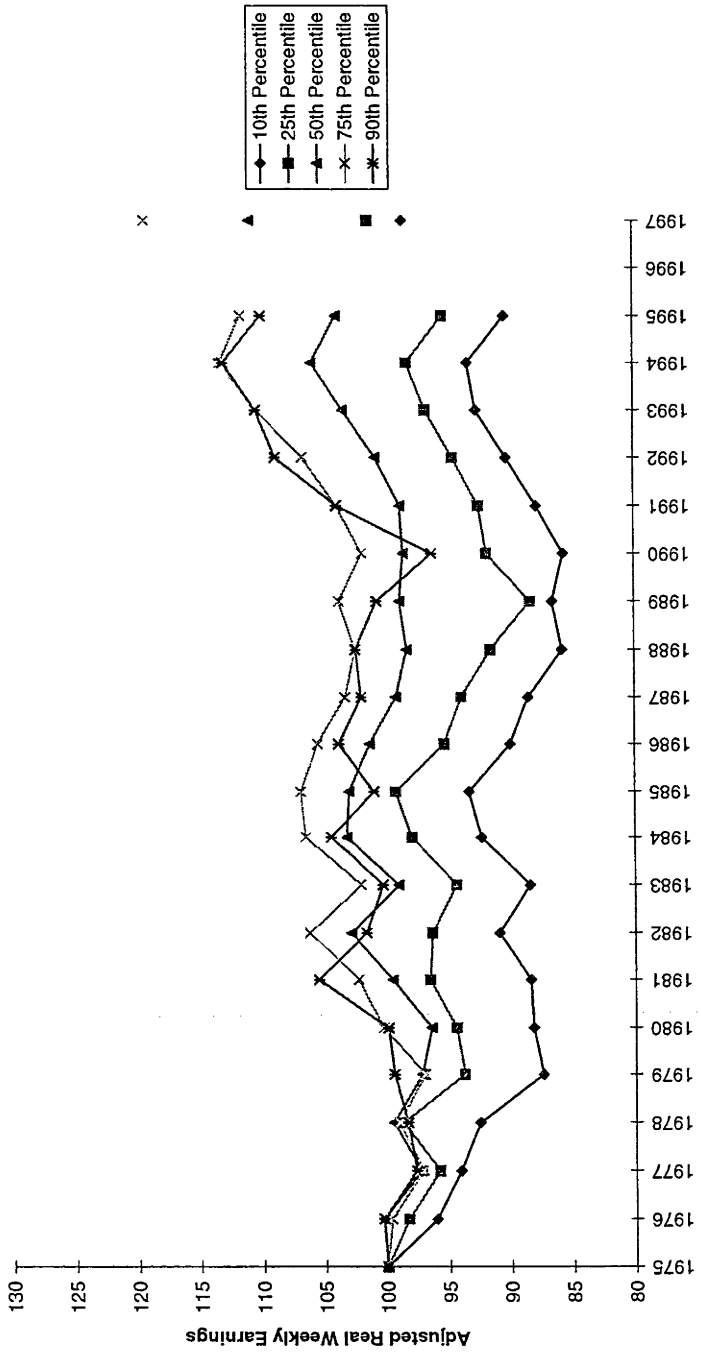


Figure 1b: Adjusted Real Weekly Earnings by Percentile - Full-time Female Employees in Main Job - 1975-1997 (August)

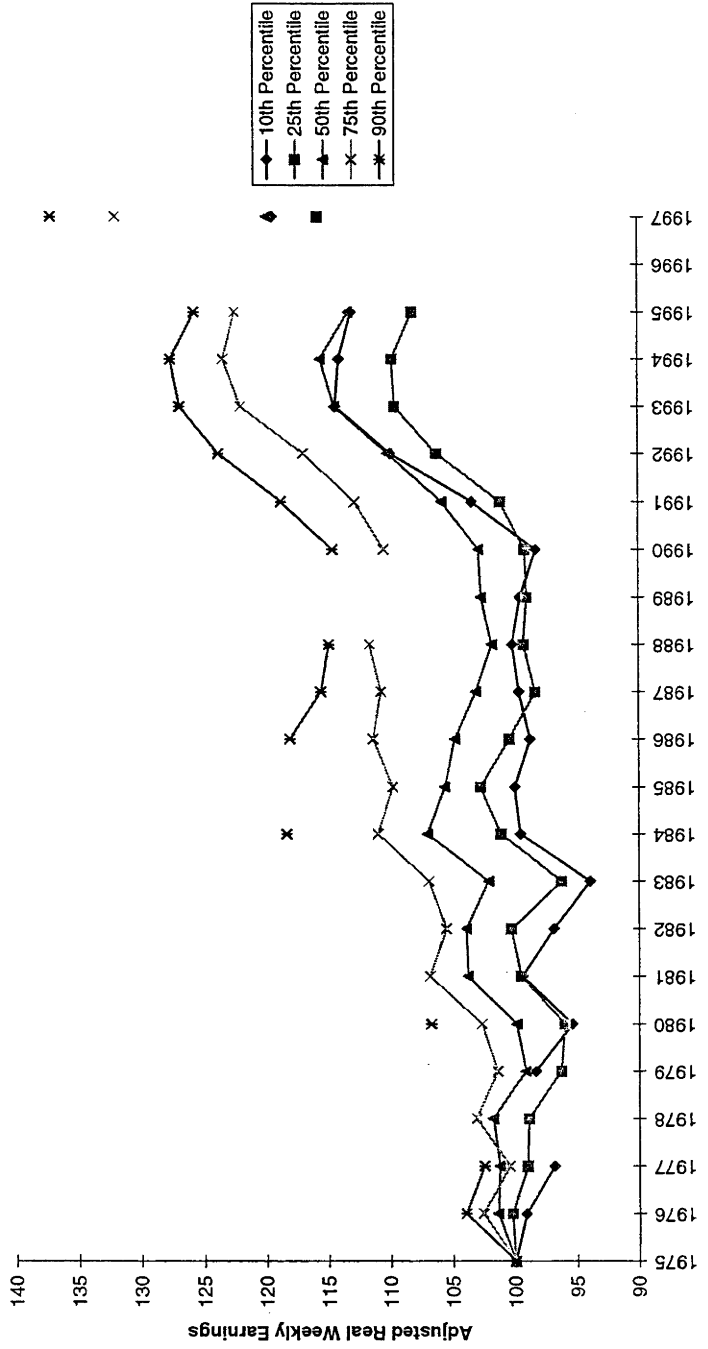
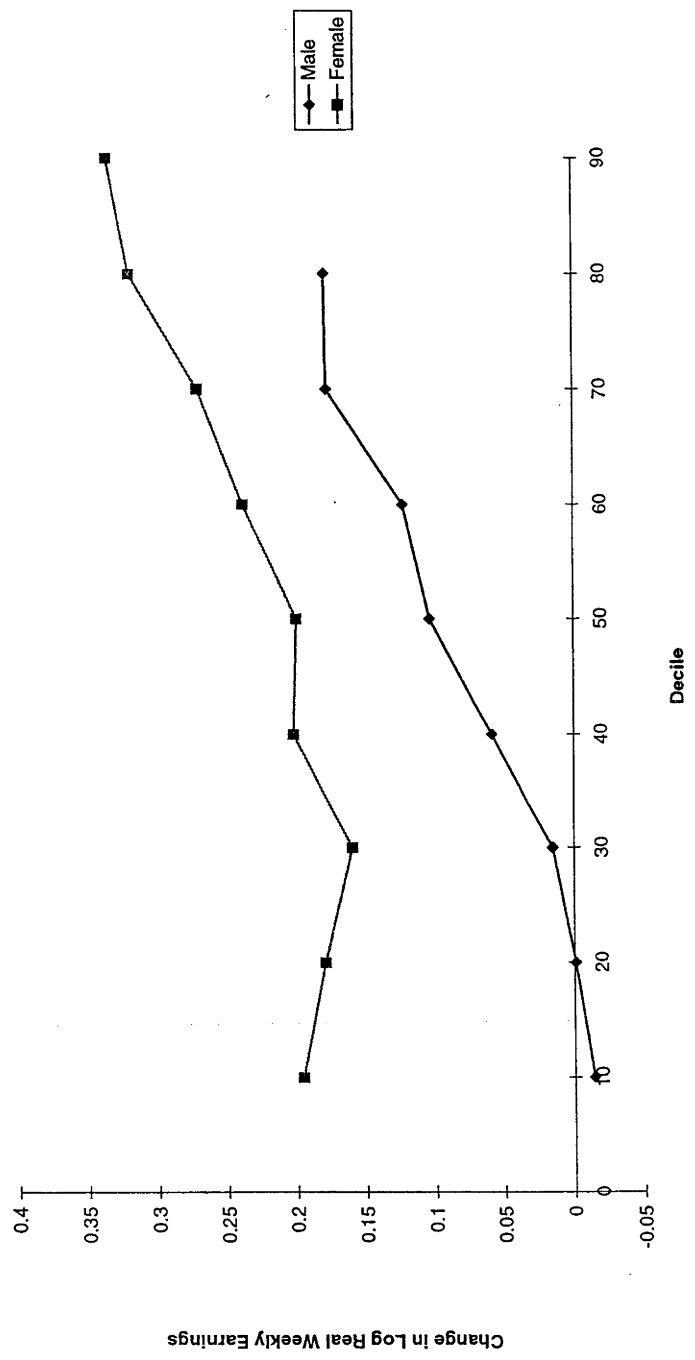


Figure 2: Change in Log Real Weekly Earnings by Decile - Full-Time Employees in Main Job - 1975-1997 (August)



males and females; however, males have experienced a greater rise in below-median earnings inequality than female employees.

What has been the timing of changes in earnings dispersion? Figures 3a and 3b show the evolution of a range of percentile difference measures of earnings inequality for male and female employees. The 90-50 percentile difference, for example, shows the difference in log real weekly earnings between employees at the 90th and 50th percentiles of the distribution of earnings. For male employees, there have been fairly steady increases in all measures of earnings dispersion throughout the period since 1975. For example, the 75-50 and 50-25 percentile difference measures have followed quite similar paths over time. The main exceptions from the pattern of steady growth are the period between 1975 and 1982 which saw very rapid growth in earnings dispersion between the 10th percentile and median; and a period from the early 1980s to the mid 1980s where earnings dispersion remained relatively constant. For female employees increases in earnings dispersion appear to have been largely concentrated in the period from 1975 to the mid-1980s. Up until 1983 all measures of earnings dispersion increased. In the period from 1983 to 1988 earnings dispersion between above-median percentiles and the median continued to rise, whereas earnings dispersion between below-median percentiles and the median was falling. In the subsequent period to the mid-1990s the main change has been some continued narrowing in earnings dispersion between employees at the 10th percentile and the median of the distribution of earnings (although the most recent evidence for 1997 also suggests some further increase in dispersion of above-median earnings).

#### *b. Alternative Data Sources*

A range of studies have used alternative data sources to the LFS to examine changes in earnings inequality. Watts and Mitchell (1990), King et al. (1992), Gregory (1993), Gregory and Woodbridge (1993), and McGuire (1994) have applied data from the SEEH; and Borland and Wilkins (1996) and Borland and Kennedy (1998) use data from the IDS. These studies which apply alternative data sources arrive at the same general conclusion that the extent of earnings dispersion in Australia has increased since the mid-1970s. However, whether the data sources match in estimates of the size and timing of changes in earnings dispersion has not been assessed.

To examine the relation between earnings data from the LFS and the SEEH Table 1 presents a decomposition of changes in average 90-10 and 75-25 percentile differences in log real weekly earnings for sub-periods between 1975-77 and 1993-95 for each data source. Data have been averaged across three-year periods to take account of differences in the timing of the surveys. In making the comparison it is

Figure 3a: Changes in Percentile Log Real Weekly Earnings Differences - Full-time Male Employees in Main Job - 1975-1997 (August)

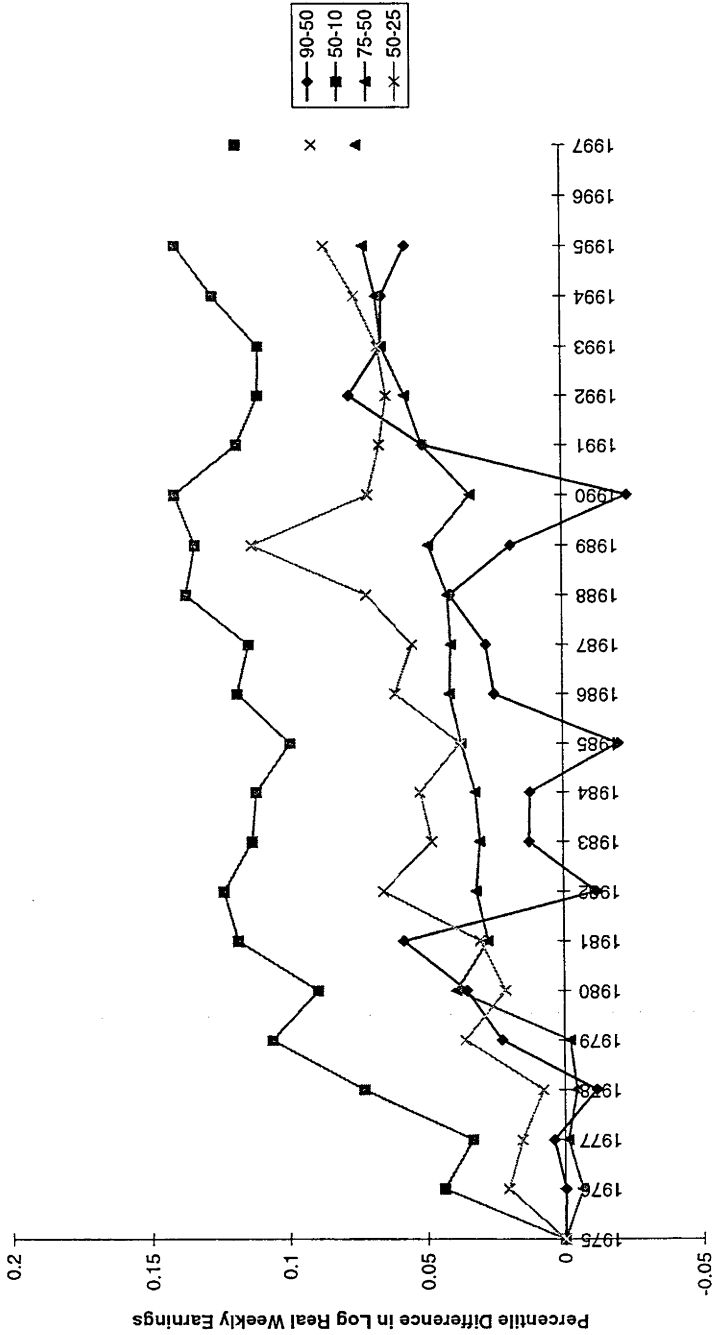
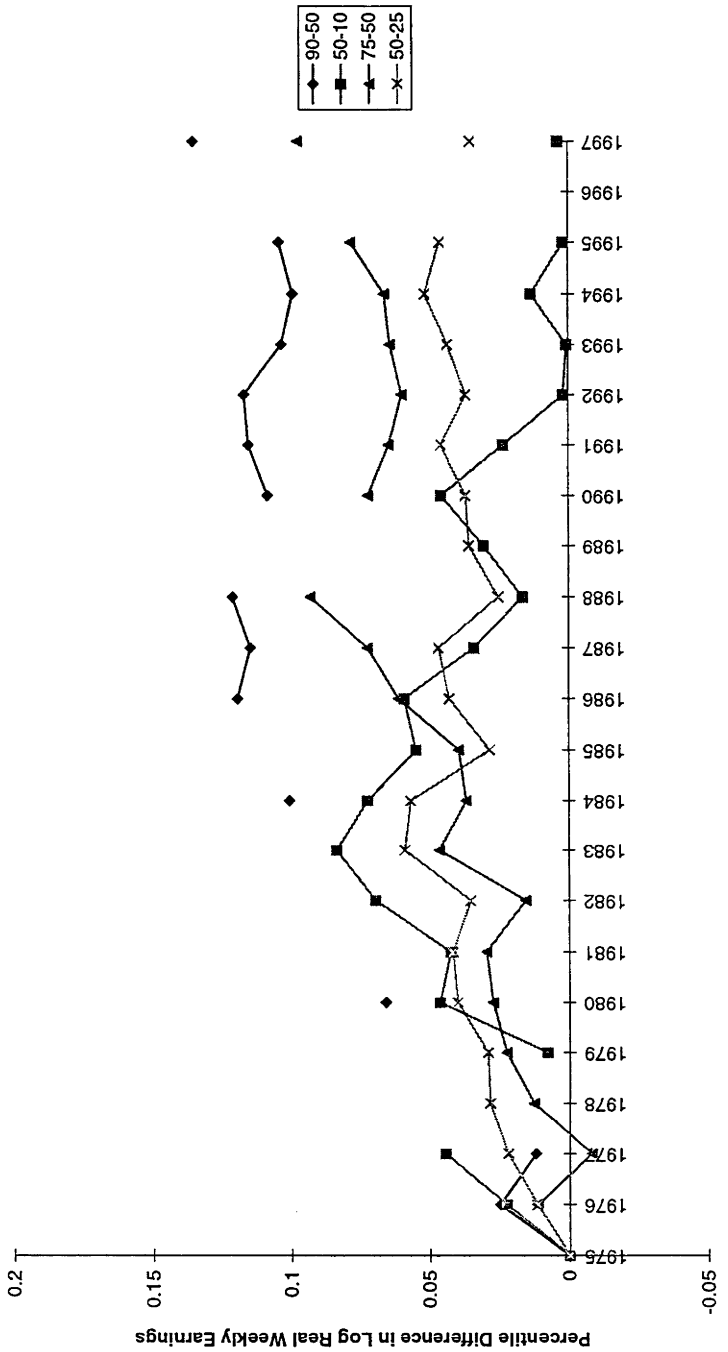


Figure 3b: Changes in Percentile Log Real Weekly Earnings Differences - Full-time Female Employees in Main Job - 1975-1997 (August)



**Table 1: Change in Inequality (Percentile Difference) in Log Real Weekly Earnings - 1975-77 to 1993-95 - Comparison of Data Sources**

	<b>1975-77 to 1979-81</b>	<b>1983-85 to 1989-91</b>	<b>1989-91 to 1993-95</b>	<b>1975-77 to 1993-95</b>
<b>A. Males</b>				
<b>a. LFS</b>				
90-50	0.0379	0.0142	0.0466	0.0987
50-10	0.0791	0.0227	-0.005	0.0968
75-50	0.0244	0.0111	0.0238	0.0593
50-25	0.0174	0.0370	-0.0071	0.0473
<b>B. SEEH</b>				
90-50	0.0190	0.0286	0.0062 (0.0181)	0.0538
50-10	0.0334	0.0138	0.0060 (0.0146)	0.0532
75-50	0.0227	0.0167	0.0054 (0.0028)	0.0448
50-25	0.0187	0.0033	0.0090 (0.0111)	0.0310
<b>B. Females</b>				
<b>a. LFS</b>				
90-50	0.0433	-0.0031	-0.0152	0.0250
50-10	0.0101	-0.0372	-0.0275	-0.0546
75-50	0.0250	0.0330	-0.0044	0.0536
50-25	0.0258	-0.0084	0.0076	0.0250
<b>B. SEEH</b>				
90-50	0.0544	0.0177	0.0091 (0.0105)	0.0812
50-10	-0.0105	-0.0368	-0.0281 (-0.0185)	-0.0754
75-50	0.0229	0.0264	0.0145 (0.0190)	0.0638
50-25	0.0051	0.0289	-0.0030 (0.0048)	0.00310

Note: a) Data from the SEEH are not available for 1982; and differences in sampling methodology prevent comparisons of data from before 1981 and after 1983.

b) LFS data are weekly earnings of full-time employees in main job; and SEEH data are total weekly earnings of full-time non-managerial employees.

c) '90-50' denotes the difference in log weekly earnings of employees at the 90th and 50th percentiles of the distribution of earnings. Other measures of inequality are similarly defined.

d) Numbers in brackets for SEEH 1989-91 to 1993-95 are changes in the percentile differences in real weekly earnings for all employees.

Source: a) LFS - ABS, Weekly Earnings of Employees (Distribution) Australia, catalogue no.6310.0; and b) SEEH - ABS, Distribution and Composition of Employee Earnings and Hours - Australia, catalogue no.6306.0.

also important to note that there are two differences between the earnings series: first, the LFS data are for all employees whereas the SEEH data are for non-managerial employees; and second, the LFS data are for weekly earnings in main job whereas the SEEH data are for total weekly earnings.

For the period 1975-77 to 1993-95 the alternative data sources provide similar findings on changes in earnings inequality. Both data sources show increasing earnings dispersion at all points of the distribution of earnings for male employees, and for female employees a narrowing of dispersion between the 10th and 50th percentiles and increasing earnings dispersion at other points of the distribution of earnings. The main differences are that for male employees the LFS shows a larger increase than the SEEH in earnings dispersion between employees at the 10th and 50th percentiles, and 50th and 90th percentiles; and for female employees the LFS shows a larger increase in earnings dispersion than the SEEH between employees at the 50th and 90th percentiles. Hence, it appears that the data sources display greater consistency in measures of changes in earnings inequality around the mid-points of the distribution of earnings than at the end-points of the distribution.

For the disaggregated time periods there is again a reasonable degree of consistency between the data sources. For males both data sources show steady increases in the 75-50 and 50-25 percentile difference measures, and both also show a large increase in the 50-10 percentile difference between 1975-77 and 1979-81. One point of difference is that the LFS data show a much larger increase than the SEEH data in above-median earnings dispersion between 1989-91 and 1993-95. For females the two data sources show very similar changes. Both show strong increases in earnings dispersion between 1975-77 and 1979-81, a decrease in the 50-10 percentile earnings difference from 1983-85 to 1993-95, and a slower increase in above-median earnings dispersion in the 1990s than 1980s.

To compare earnings data from the LFS and IDS, Borland and Kennedy (1998) examined the correlation between measures of changes in real weekly earnings by decile between 1982 and 1994/95 from the two data sources. For both male and female employees the measures from the alternative data sources display a high degree of consistency (correlation coefficients greater than 0.95). Both data sources show, for example, narrowing of the 50-10 percentile earnings difference for female employees, and steady increases in the 75-50 and 50-25 percentile earnings differences for male employees between 1982 and 1994/95. One point of difference however is that the IDS data tends to show stronger increases in earnings dispersion for females during the 1990s than is evident from the LFS data source.

*c. Alternative Measures of Earnings Dispersion*

The approach to measurement of changes in earnings inequality applied in the previous sub-sections involves analysis of whether changes in real weekly earnings over some time period vary for employees at different positions in the distribution of earnings. Two alternative approaches to measurement of changes in earnings inequality - motivated by the idea that 'polarization' in the distribution of earnings may have grown - have also been applied.

One approach -used by King et al. (1992) and McGuire (1994) - is to define 'low-wage', 'medium-wage' and 'high-wage' jobs and to examine changes over time in the proportion of employees with each type of job. Job categories are defined on the basis of earnings relative to median earnings. For example, 'low-wage' jobs might be defined as jobs with weekly earnings less than 75% of median weekly earnings.

A second approach - applied in Gregory (1993) and Watts (1996) - is to examine changes in employment in different segments of the earnings distribution. This approach involves two main stages. In the first stage, the ratio of quantile earnings boundaries (for example, quintile boundaries) to median earnings in a base period is calculated, and those ratios are applied to median earnings in an end-period to construct hypothetical quantile earnings boundaries in that end-period. In the second stage the actual and hypothetical distributions of earnings in the end-period are compared. Consider the example of quintile earnings boundaries. Where the actual distribution of earnings in the end-period is such that 20 per cent of workers are in each hypothetical quintile it is concluded that there has been no change in earnings dispersion; on the other hand, where the actual proportion of employees in the hypothetical bottom and top quintile ranges is greater than 20 per cent, this can be interpreted as an increase in earnings dispersion. More formally, it is possible to use information on the difference between the actual and hypothetical distributions across all quantiles of the distribution of earnings to construct a summary statistic (MRP index) which measures the extent of change in earnings dispersion, and to assess whether any change in dispersion is statistically significant (Morris et al., 1994).<sup>4</sup>

Table 2 presents some results from studies which have applied these alternative measurement approaches. Panel A - from King et al. (1993) - shows that the proportion of male and female employees in low-wage (below 75% of median

**Table 2: Changes in the Distribution of Employment by Earnings**

**Panel A: Shares of Low-, Medium-, and High-Wage Employment - All Males and All Females - 1975-1989**

	<u>1975</u>	<u>1989</u>
<u>Male:</u>		
High	6.83	8.72
Middle	75.82	66.58
Low	17.36	24.70
<u>Female:</u>		
High	3.67	9.12
Middle	70.83	57.64
Low	25.50	33.25

Source: King et al. (1992, Table 1, p.395)

**Panel B: Australian Employment Growth by Earnings Quintiles - 1976-1990 (Thousands)**

Quintile	Full-Time Non-Managerial Employees (May Survey)		All Male Employees (August Survey)
	<u>Male</u>	<u>Female</u>	
First (Lowest)	176	114	279
Second	-51	24	-14
Third	-82	54	-24
Fourth	15	104	45
Fifth (Highest)	94	50	196

Source: Gregory (1993, Table 1, p.67)

weekly earnings) and high-wage (above 150% of median weekly earnings) jobs increased between 1975 and 1989. Panel B - from Gregory (1993) - shows that employment in 1990 was disproportionately concentrated in ranges of the distribution of earnings which were in the bottom and top quintiles of the distribution of earnings in 1976. Similarly, Watts (1996) concludes from calculations of the MRP statistic for changes in earnings dispersion that a statistically significant increase in the polarisation of earnings occurred in the period from 1986 to 1995. Hence, both methods of measurement find a 'disappearing middle' in the distribution of earnings and produce results consistent with increased earnings inequality.

Recently, some criticism of these alternative methods of measurement of earnings dispersion has been raised (see Belchamber, 1996). The basis of the criticism is that in calculating a hypothetical earnings distribution for an end-period it is necessary to make some assumption on how to adjust base-period earnings for changes in nominal prices. In King et al. (1993) and Gregory (1993) the adjustment factor is set equal to the change in median weekly earnings between the base-period and end-period. To the extent that this adjustment factor understates the 'correct' adjustment factor any relative shift in employment toward 'middle-wage' and 'high-wage' jobs will be over-estimated, and any shift toward 'low-wage' jobs will be under-estimated. The opposite outcome applies where the adjustment factor overstates the 'correct' adjustment factor.<sup>5</sup>

How reasonable and what is the significance of this criticism of the alternative measures of changes in earnings dispersion? Belchamber (1996) examines data on weekly earnings in Australia for the period from 1985 to 1991 and finds that - using an alternative deflator of the rate of change in award wages - there is no evidence of polarisation in the distribution of earnings. Hence, Belchamber is correct to assert that calculations of the change in the distribution of employment between 'low-wage' and 'high-wage' jobs using the alternative measures will be sensitive to the choice of adjustment factor. However, what constitutes an appropriate adjustment factor - and hence what conclusions should be drawn on changes in the distribution of employment - seems a more difficult issue to resolve. For example, Gregory (1996a) argues that although compositional changes in the workforce may cause a median earnings deflator to overstate the correct adjustment factor, on the other hand, since an award wage index does not take into account earnings drift, it is likely to understate the correct adjustment factor.

#### *d. Alternative Samples of Employees/Earnings Measures*

Are findings on earnings inequality sensitive to the group of employees or earnings measure which is examined? Studies of changes in earnings inequality in

Australia which have been reviewed thus far in this section have concentrated exclusively on weekly earnings of full-time employees in main job aged between 15 and 64 years. Hence it is of interest to consider the robustness of the findings from that research to changes in choices of sample of employees and earnings measures.

One modification to the choice of sample of employees is to restrict attention to employees who have 'permanent attachment' to the labour force; another type of modification is to include both part-time and full-time employees. Borland and Kennedy (1998) examine the effects of both types of modifications. The main findings from their analysis are reported in Table 3. First, a significantly greater increase in earnings dispersion between 1982 and 1994/95 occurred for the sample of employees aged 25-54 years than for the sample aged 15-64 years. This is primarily due to a larger increase in the 50-10 percentile earnings difference for the sample of employees aged 25-54 years than for the full sample. Composition effects - the withdrawal of a large number of employees aged 15-24 from the full-time workforce during the 1980s and 1990s - which raise the relative earnings of the bottom quintile of the full sample of employees but have no effect on the sample aged 25-54 years appear to explain this difference. Second, analysis of the sample of part-time and full-time employees reveals changes in earnings inequality which are very similar to those for the subset of full-time employees.

Some criticisms can be made of using a weekly earnings measure to study changes in earnings inequality. First, a weekly earnings measure may not be sufficiently closely related to welfare considerations. For information on the distribution of earnings to be useful for welfare purposes it may be necessary to examine a longer-term measure such as annual earnings. Second, changes in inequality in weekly earnings need not be directly related to changes in the price of labour. Changes in inequality in weekly earnings can occur either due to changes in inequality in weekly hours of work or to changes in inequality in the hourly wage rate.

Borland and Kennedy (1998) examine changes in earnings inequality using these alternative - hourly and annual - earnings measures. Results from this exercise are presented in Table 4. Changes in inequality in hourly wages are shown to have been very similar to changes in inequality in weekly earnings for both male and female employees. Hence over the period between 1982 and 1994/95 it seems that changes in inequality in weekly earnings are primarily reflecting changes in the distribution of hourly wages rather than in the distribution of hours worked per week. Changes in

**Table 3: Changes in Earnings Inequality - Alternative Samples of Employees - Full-time Employees in Main Job - 1982 to 1994/95**

Percentile Difference	<u>Males:</u> <u>1982-1994/95</u>		<u>1986-1994/95</u>		<u>Females:</u> <u>1982-1994/95</u>		<u>1986-1994/95</u>	
	<u>All - Full time</u>	<u>25-54 years - Full time</u>	<u>All - Full time</u>	<u>All - Full time/ Part time</u>	<u>All - Full time</u>	<u>25-54 years - Full time</u>	<u>All - Full time</u>	<u>All - Full time/ Part time</u>
90-10	0.0449	0.1324	0.0292	0.0280	-0.0397	0.0734	0.0201	0.0510
90-50	0.0449	0.0624	0.0292	0.0331	0.0258	0.0014	0.0241	0.0506
50-10	0.0000	0.0700	0.0000	-0.0051	-0.0655	0.0720	-0.0040	0.0004
75-25	0.0804	0.0566	0.0618	0.0637	0.0659	0.0799	0.0242	0.0282
75-50	0.0331	0.0143	0.0412	0.0414	0.0492	0.0187	0.0242	0.0314
50-25	0.0473	0.0423	0.0206	0.0223	0.0167	0.0612	0	-0.0032
<b>Standard Deviation</b>	0.0511 (12.3%)	0.0623 (17.4%)	0.0428 (10.6%)	0.0625 (15.5%)	0.0372 (10.3%)	0.0603 (19.6%)	0.0327 (9.1%)	0.0514 (13.9%)
<b>Gini Coefficient</b>	0.0415 (18.4%)	0.0518 (25.6%)			0.0253 (13.1%)	0.0359 (21.6%)		

Source: ABS, Income Distribution Survey, Unit Record File, 1981/82 - 1994/95.

**Table 4: Changes in Earnings Inequality - Full-Time Employees in Main Job - Alternative Earnings Measures**

	<u>Panel A</u> 1986- 1994/95		<u>Panel B</u> 1981/82- 1993/94	
	<u>Weekly</u> <u>Earnings</u>	<u>Hourly</u> <u>Wage</u>	<u>Weekly</u> <u>Earnings</u>	<u>Annual</u> <u>Earnings</u>
<b><u>Males</u></b>				
<b>Percentile</b>				
<b>Difference:</b>				
90-10	0.0044	-0.0157	0.0449	0.0079
90-50	0.0215	0.0100	0.0449	0.0712
50-10	-0.171	-0.0257	0.0000	-0.0633
75-25	0.0617	0.0213	0.0804	0.0344
75-50	0.0224	0.0237	0.0331	-0.0171
50-25	0.0393	-0.0024	0.0473	0.0515
<b>Standard</b>	0.0489	0.0428	0.0511	0.0860
<b>Deviation</b>	(11.7%)	(10.6%)	(12.3%)	(14.8%)
<b><u>Females</u></b>				
<b>Percentile</b>				
<b>Difference:</b>				
90-10	-0.0077	-0.0148	-0.0397	-0.0633
90-50	0.0245	0.0161	0.0258	0.0922
50-10	-0.0322	-0.0309	-0.0655	-0.1555
75-25	0.0617	0.0129	0.0659	0.1030
75-50	0.0250	0.0110	0.0492	0.0947
50-25	0.0367	0.0018	0.0167	0.0083
<b>Standard</b>	0.0327	0.0327	0.0372	0.0318
<b>Deviation</b>	(8.9%)	(9.1%)	(10.3%)	(3.3%)

Source: ABS, Income Distribution Survey, Unit Record File, 1981/82 - 1994/95.

inequality in weekly and annual earnings are quite similar for male employees; however for female employees it appears that increases in inequality in weekly earnings have been larger than increases in inequality in annual earnings.

Some disaggregated analysis of changes in earnings inequality for sub-groups of employees is also undertaken in Borland and Kennedy (1998). The main findings from this analysis are that increases in earnings inequality have occurred for employees in the private sector but not in the public sector, and have been mainly concentrated in a subset of industry sectors - manufacturing, construction and transport/storage, wholesale/retail trade, and finance/property/business. Increases in earnings inequality are shown to have occurred for both Australian-born and immigrant employees.

#### *e. International Comparisons*

How do changes in earnings inequality in Australia compare with other countries? To provide some perspective on this question Table 5 presents summary information on changes in earnings inequality between 1981 and 1994 for a range of OECD countries (see also Davis, 1992, OECD, 1993, and 1996, Freeman and Katz, 1994, and Gottschalk and Smeeding, 1997). Table 5 shows - and this is a result which seems robust to virtually any choice of time period since the mid-1970s or choice of measure of earnings - that increases in earnings inequality have been much larger in the United States and United Kingdom than in other countries. Of the other countries apart from Australia, increases in earnings inequality appear to have been larger in Canada than in France, Japan or Sweden. From Table 5 it also appears that changes in earnings inequality in Australia have been closer to the latter group of countries than to Canada. This is a little different to the classification usually made which would place Australia together with Canada in a group of countries which have experienced 'intermediate' increases in earnings inequality. For example, Gottschalk and Smeeding (1997, p.652) divide countries into different groups as follows:

"The first consists of countries that experienced at least as large an increase in inequality as in the United States. This group includes only the United Kingdom. A second group which experienced substantial increases in inequality but less than the United States and United Kingdom includes Canada, Australia and Israel. France, Japan, the Netherlands, Sweden and Finland form a third group with positive but quite small changes in earnings inequality..."

The apparent inconsistency between Table 5 and the conclusion of that Australia has had relatively large increases in earnings inequality is probably mainly due to the time period in Table 5. A starting date in 1981 excludes the late 1970s where earnings inequality increased rapidly in Australia. Extending international comparisons of

**Table 5: Changes in Earnings Inequality -  
International Comparisons - 1981 to 1994**

<u>Country -</u> <u>Percentile Earnings</u> <u>Ratio:</u>	<u>Change:</u>				
<b>Australia</b>			<b>Sweden</b>		
Males - 90/50	+0.03		Males - 90/50	+0.06	
50/10	+0.02		50/10	+0.03	
Females - 90/50	+0.09		Females - 90/50	+0.05	
50/10	-0.05		50/10	-0.01	
<b>Canada</b>			<b>United Kingdom</b>		
Males - 90/50	+0.06		Males - 90/50	+0.18	
50/10	+0.11		50/10	+0.16	
Females - 90/50	+0.02		Females - 90/50	+0.10	
50/10	+0.13		50/10	+0.18	
<b>France</b>			<b>United States</b>		
Males - 90/50	+0.08		Males - 90/50	+0.27	
50/10	-0.04		50/10	+0.21	
Females - 90/50	+0.03		Females - 90/50	+0.18	
50/10	+0.08		50/10	+0.36	
<b>Japan</b>					
Males - 90/50	+0.08				
50/10	-0.01				
Females - 90/50	+0.03				
50/10	+0.01				

Source: OECD (1996, Table 3.1).

**Table 6: Changes in Earnings Inequality -  
Full-time Adult Non-Managerial Male Employees - 1965 to 1995**

<u>Percentile Ratios</u>	<u>1965</u>	<u>1971</u>	<u>1975</u>	<u>1995</u>
10/50	0.753	0.712	0.760	0.656
25/50	0.848	0.826	0.856	0.790
75/50	1.225	1.250	1.210	1.278
90/50	1.374	1.417	1.359	1.596

Source: Norris (1977, Table 4); and ABS, Distribution and Composition of Employee Earnings and Hours - Australia, May 1995, catalogue no.6306.0.

changes in earnings inequality back to mid-1970s makes the Australian experience seem much closer to that of the United States than to countries such as France or Sweden (see for example, Gregory and Woodbridge, 1993, and Gregory et al., 1998).

#### *f. Interpretation*

In interpreting evidence on changes in earnings inequality in Australia from the studies reviewed in this section it is important to recognise a number of important characteristics of the way these studies have been undertaken. In particular, the use of cross-section data, the types of inequality measures which are applied, and the use of a 'cash' earnings variable, all affect the way in which the findings on earnings inequality should be interpreted.

##### *f.i. Cross-Section Data*

The descriptive information on the distribution of earnings presented in this section is constructed from a series of annual cross-section samples of full-time employees. The use of this type of data implies a number of limitations in interpreting causes and consequences of changes in earnings inequality:

- Changes in earnings inequality can occur either due to changes in relative earnings between the existing stock of jobs, or due to variation in net job creation at different points of the distribution of earnings. Distinguishing between these explanations is likely to be of some welfare significance. For example, an increase in earnings dispersion that is caused by an increase in relative earnings for existing high-pay jobs and a net expansion in the number of low-pay jobs suggests a less positive labour market outlook than if the change in earnings dispersion had occurred due to a net expansion in the number of high-pay jobs and declining relative earnings of low-pay jobs (perhaps a precursor to the disappearance of those low-pay jobs). Unfortunately though, with a sequence of cross-section data sets it is not possible to distinguish between these two possible causes of changes in earnings inequality.
- It is important to take into account the possibility that the composition of the sample of full-time workers in main job has been altered by selection effects over the period between 1975 and 1997. For example, suppose that there is an increase in the number of unemployed persons and that the new entrants to unemployment are drawn exclusively from the bottom decile of the distribution of earnings. In this situation the composition of the sample of employed persons changes over time. Due to the sample selection effect measures of earnings dispersion would show an increase in earnings inequality even where real weekly earnings of all persons who remain in employment are unchanged over time.

- It would generally be regarded that the welfare consequences of earnings dispersion are related to more to differences between individuals in lifetime earnings than to earnings differences in any particular year. From this perspective it is important to establish how a change in earnings dispersion affects inequality in lifetime earnings. However, many different patterns of change in lifetime earnings inequality can be associated with a given change in earnings inequality estimated from a sequence of cross-section data sets. Suppose, for example, that cross-section earnings inequality increases but that average earnings remain unchanged over time. At one extreme, where individuals' relative positions in the distribution of earnings are unchanged throughout their lifetimes, the increase in cross-section earnings inequality must involve an increase in lifetime earnings inequality. At the other extreme, where all individuals begin at the bottom of the earnings distribution but move through to the top of the distribution by the end of their lifetimes, the increase in cross-section earnings inequality will involve no change in lifetime earnings inequality. As this example illustrates, it is not possible to draw direct inferences on changes in lifetime earnings inequality from a sequence of cross-section measures of changes in earnings inequality.

#### *f.ii. Earnings Variable*

One problem with the type of weekly earnings variable which is available from data sources reviewed in this section is that it excludes non-monetary compensation. Hence changes to the composition of employee compensation (monetary/non-monetary) may therefore affect the earnings measure even where there is no change in total employee compensation. One example of a circumstance where changes in the composition of compensation are likely to have occurred in Australia over the period examined in this study is following changes to taxation of fringe benefits. Taxation of fringe benefits was introduced in the Commonwealth Budget of 1985 and in subsequent years a number of amendments to that legislation have been made. Each of these changes would be expected to have had the effect - predominantly for high-paid employees - of reducing the share of non-monetary payments in total employee compensation. Taxation of fringe benefits therefore means that measures of changes in weekly earnings inequality in Australia between 1980s and 1990s may over-estimate somewhat increases in inequality in total employee compensation.

#### *f.iii. Inequality Measures*

Studies of changes in earnings inequality in Australia have applied a range of summary measures of inequality or of 'polarization' in the distribution of earnings (for example, percentile earnings differences, gini coefficient, and low-wage job/high-

wage job distribution). Changes in these measures are generally interpreted as equivalent to changes in earnings inequality. However, Wolfson (1997) has shown that changes in any particular summary statistic need not be consistent with the benchmark of Lorenz dominance. Where the criterion of Lorenz dominance is accepted as the fundamental measure of changes in inequality, Wolfson's work suggests that greater weight should be attached to studies with summary statistics for inequality which characterise the entire distribution of earnings, and where multiple summary statistics are presented.

#### *f.iv. Time Period*

Another factor that must be taken into account in interpreting data on the distribution of earnings is that measures of changes in earnings inequality will be sensitive to the starting date chosen for the analysis. The implications of a finding that earnings inequality has increased substantially over some time period may differ significantly depending on the absolute level of earnings inequality in the starting year. In this study 1975 has been chosen as the starting date as it is the earliest year from which continuous annual data on the distribution of earnings are available. Norris (1977) has examined changes in dispersion of weekly earnings of full-time adult non-managerial male employees between 1965 and 1975, and concludes that although narrowing did occur between 1971 and 1975, over the whole period there was little change in earnings inequality. Furthermore - as Table 6 shows - even using 1971 as the base year it is still found that earnings inequality increases in the period to 1995.

### **3. Causes of Changes in Earnings Inequality**

#### *a. Outline*

What have been the causes of changes in earnings inequality in Australia? To answer this question the common approach is to consider what types of factors affect individuals' earnings at a point in time, and to examine how those factors might have changed over time. Adopting a regression analysis-type approach the factors which are considered to affect earnings at a point in time are generally thought of as 'characteristics' of workers, 'returns to workers' characteristics', and unobservable factors. An example of an observable characteristic would be a worker's level of educational attainment or years of experience; and an example of an unobservable factor which is often assumed to affect earnings might be an individual's IQ. The return to a characteristic measures the effect on earnings of a marginal change in that characteristic. For example, the return to educational attainment is the extra earnings which accrue to an individual who acquires an extra year of schooling.

This taxonomy of the factors which can affect individual earnings at a point in time provides the basis for a classification of factors which might cause changes in earnings dispersion over time:

- Changes in the distribution of observable characteristics amongst the workforce;
- Changes in the returns to observable characteristics; and
- Changes in unobservable factors.

In the next sub-section an overall assessment of the contribution of each factor to changes in earnings inequality in Australia is undertaken using decomposition-type analysis. The following sub-sections address the causes of changes in earnings inequality in Australia using the findings from the decomposition analysis.

#### *b. Decomposition Analysis*

A variety of methods can be applied to decompose changes in earnings inequality between the effects of changes in the distribution of, and return to, observable and unobservable characteristics of workers. For example, Borland and Wilkins (1996) report findings on the causes of changes in earnings inequality from variance decomposition analysis, and from summary statistics for residuals from regression equations for individual earnings. Here the findings from an alternative (but very similar) decomposition approach - known as the Juhn-Murphy-Pierce (JMP) (1993) method - are presented. This approach decomposes sources of changes in earnings inequality between:

- i) Changes in distribution of 'observable' skills amongst employees in the workforce;
- ii) Changes in the return to 'observable' skills; and
- iii) Changes in unobservable factors - that is, the distribution of earnings within groups of workers with the same 'observable' skills.

Here - following the 'human capital' theory of earnings determination - observable skills are identified as educational attainment and years of labour market experience.

(Of course skill is a difficult concept to define involving physical abilities, cognitive abilities, and interpersonal capabilities of workers - see for example, Spenner, 1990).

Table 7 reports the findings from Borland and Kennedy's (1998) application of the JMP decomposition method to analysis of the causes of changes in earnings inequality in Australia between 1982 and 1994/95. The results are quite striking. Analysis using the standard deviation measure of overall dispersion reveals that - for both males and females - changes in unobservable factors have been overwhelmingly the main factor causing increases in earnings dispersion. Changes in the distribution of

education and experience have had little effect on earnings dispersion, whereas changes in the relative earnings of employees by education and experience have tended to reduce earnings dispersion. A similar picture emerges from an examination of the decompositions of changes in percentile earnings differences.

Findings from the decomposition analysis suggest two main questions for understanding more about the causes of increases in earnings dispersion in Australia. First, why have changes in the returns to education and experience had the effect of reducing earnings dispersion in Australia? This question is given particular emphasis by a comparison with the United States where increases in earnings differentials between workers in different education and experience groups have generally been found to account for about one-third of increases in overall earnings dispersion (Juhn et al., 1993). Second, what are the unobservable factors which explain the increase in earnings dispersion in Australia? These questions are addressed in turn in the next two sub-sections.

### *c. Changes in the Return to Observable Skills*

Proxies for the skill level of a worker which have been commonly adopted in studies of individual wage determination in Australia are age or labour market experience, educational attainment, and occupational status. Research has examined how earnings differentials have changed between workers with different levels of educational attainment, and in different age or experience groups. This sub-section presents descriptive information on changes in earnings differentials between workers in these different skill groups; examines the role of changes in the relative demand for and relative supply of labour by skill level in explaining changes in earnings differentials; and discusses possible explanations for demand shifts.

#### *c.i. Descriptive Information*

Information on changes in relative average annual and weekly earnings of workers with different levels of educational attainment between 1968/69 and 1994/95<sup>1</sup> is presented in Table 8. The findings are consistent with evidence from a number of studies which have examined changes in earnings differentials across education groups (Miller, 1983, Maglen, 1991, 1993, Chia, 1991, Karmel, 1993, 1995, Gregory, 1995,

**Table 7: Sources of Changes in Inequality in Log Weekly Earnings -  
Juhn-Murphy-Pierce Decomposition -  
Full-Time Employees in Main Job - 1982 to 1994-95**

		<u>Effect of:</u>		
	<u>Total Change</u>	<u>Change in Observable Characteristics</u>	<u>Change in Return to Observable Characteristics</u>	<u>Change in Unobservable Factors</u>
<b><u>Males</u></b>				
<b>Percentile Differences:</b>				
90-10	0.0449	-0.0181	-0.0282	0.0912
90-50	0.0449	0.0069	-0.0147	0.0526
50-10	0.0000	-0.0250	0.00135	0.0386
75-25	0.0804	-0.0001	-0.0153	0.0958
75-50	0.0331	0.0089	-0.0049	0.0291
50-25	0.0473	-0.0088	-0.0104	0.0667
<b>Standard Deviation</b>	0.0511	-0.0024	-0.0110	0.0645
<b><u>Females</u></b>				
<b>Percentile Differences:</b>				
90-10	-0.0397	0.0404	-0.0538	-0.0263
90-50	0.0258	0.0297	-0.0382	0.0343
50-10	-0.0655	0.0107	-0.0156	-0.0606
75-25	0.0659	0.0140	-0.0256	0.0775
75-50	0.0492	0.0078	-0.0234	0.0648
50-25	0.0167	0.0062	-0.0022	0.0127
<b>Standard Deviation</b>	0.0372	0.0075	-0.0172	0.0469

Source: Borland and Kennedy (1998, Table 10).

**Table 8: Average Earnings By Level of Educational Attainment - Full-Time Full-Year Workers - 1968/69-1989/90**

	<u>Not Completed High School</u>	<u>Completed High School</u>	<u>Trade Qualificn./ Diploma</u>	<u>University Degree</u>
<b>A. Males</b>				
<b>i. Annual Earnings</b>				
1968/69	100	113.9	131.3	235.2
1973/74	100	111.9	124.9	207.8
1978/79	100	108.4	121.1	187.1
1981/82	100	99.1	117.1	178.9
1985/86	100	105.2	122.1	171.2
1989/90	100	107.4	120.4	180.4
<b>ii. Weekly Earnings</b>				
1982	100			170.9
1986	100			166.4
1990	100			170.0
1994/95	100			164.4
<b>B. Females</b>				
<b>i. Annual Earnings</b>				
1973/74	100	109.7	135.8	208.1
1978/79	100	109.2	124.3	169.8
1981/82	100	109.5	121.6	174.3
1985/86	100	109.0	124.8	167.9
1989/90	100	105.4	125.2	170.4
<b>ii. Weekly Earnings</b>				
1982	100			175.3
1986	100			162.3
1990	100			158.2
1994/95	100			167.2

Note: For Annual Earnings - Not Completed High School = Left school at 16 years of less; and Completed High School = Left school at 17 years or above and do not have higher qualification.

Sources: (i) Annual Earnings: ABS, Income Distribution Australia, 1968-69, catalogue no.6502.0; ABS, Social Indicators no.3, 1980, catalogue no.4101.0; ABS, Income Distribution Australia, 1978-79, catalogue no.4108.0; ABS, Social Indicators no.4, 1984, catalogue no.4101.0; ABS, 1986 Income Distribution Survey, Persons with Earned Income, Australia, catalogue no.6546.0; and ABS, 1990 Income Distribution Survey, Persons with Earned Income, Australia, catalogue no.6546.0; (ii) Weekly Earnings: ABS, Income Distribution Survey, Unit Record File, 1981/82 - 1994/95.

and Borland, 1996). For the annual earnings measure - using workers who did not complete high school as the base group - relative earnings of male and female employees in other education categories declined from the late 1960s to the early or mid 1980s, and remained constant or increased slightly after that time. The strongest declines in relative earnings in the initial period were experienced by workers with a degree. The weekly earnings measure - where workers with high school completion or below as the base - shows a similar pattern of change in relative earnings for degree holders during the 1980s. In the first half of the 1990s relative earnings of male degree holders appear to have declined, but to have increased for female degree holders.

In interpreting data on relative earnings between workers with different skill levels it is important to consider whether changes in earnings differentials represent effects of changes in the relative market price for the different skills of those workers, or changes in the relative quality of workers in different skill categories. Changes in the relative quality of workers with different levels of educational attainment might occur, for example, due to changes in the age composition of workers in each education group, or to changes in the relative quality of educational outcomes across cohorts of workers.

It is also possible that earnings of different cohorts of employees with the same level of education may differ where those groups are imperfect substitutes, and relative supply and demand conditions differ between the groups. For example, young and old workers with a degree may not be perfect substitutes - and hence where the relative demand for and supply of young and old workers with a degree differs, the relative earnings of those groups of workers may also differ (for example, Welch, 1979).

In some cases it is possible to control for changes in relative labour quality between skill groups, or for the effects of differences in supply and demand conditions between workers in different age groups with the same level of education. For example, within-cohort comparisons of earnings of workers in different education groups hold constant the age composition of the population, and provided the same group of workers from the cohort is employed in each time period, the quality of labour within each education group in the cohort will also be constant. Hence, time-series analysis of relative earnings by level of educational attainment within a cohort of workers can be considered to provide information on changes in the relative market return to constant quality units of labour in each education group.

Table 9 shows the ratio of average annual earnings for synthetic cohorts of workers with a degree and who had not completed high school between 1968/69 and 1989/90 (see Chia, 1991, and Borland, 1996). Numbers in the same line in the Table

show within-cohort relative annual earnings of workers in those education groups. Importantly, within-cohort changes in relative earnings follow the same pattern over time as is evident in the aggregate data for male and female workers in Table 7 - there are strong decreases in relative earnings of degree holders between the late 1960s onwards, with generally some reversal of this trend during the 1980s. Perhaps the main difference between the within-cohort changes in relative earnings and the aggregate data is that for some older groups of males increases in relative earnings of workers with a degree are shown to have increased from the late 1970s onwards rather than from the mid-1980s. As well as evidence of within-cohort changes in relative earnings by level of educational attainment, there also appear to have been cohort effects on relative earnings. For example, the 'Degree/NCHS' earnings ratio for workers aged 15-24 declined between 1973/74 and 1985/86, and then increased between 1985/86 and 1989/90. This pattern could be due to changes in relative quality of labour in each education group across cohorts, or to changes in the supply and demand conditions by education level for each cohort.

Information on relative earnings of employees in different age and experience groups is presented in Table 10. Panel A shows that for both male and female employees there have generally been large and consistent decreases in relative earnings of younger and older employees between 1975 and 1994 (McGuire, 1994, and Borland and Wilkins, 1997). For example, the ratio of weekly earnings of employees aged 15-19 years and employees aged 35-44 years fell from 50.0 per cent in 1975 to 39.8 per cent in 1995. Panel B by contrast shows that - apart from a fall in relative earnings of less experienced female employees - if anything there has been a compression in relative earnings of different experience groups between 1982 and 1994/95 (Borland and Kennedy, 1998).

The main explanation for the difference between the findings disaggregating by age or experience appears to be that age and experience measures are not equivalent, and that therefore compositional effects will differ between these measures. For example, suppose that length of schooling is positively correlated with an individual's ability. In this case increases in school retention rates which occurred during the 1980s would have had the effect of reducing the average ability and hence earnings of employees in the 15-19 year age group. On the other hand, measures of average earnings by years of experience in this study will tend to reflect that less experienced workers are on average more highly educated than workers with greater years of experience.

**Table 9: Degree/NCHS - Ratio of Average Annual Earnings By Cohort - Full-Year Full-Time Workers - 1968/69-1989/90**

Cohort	1968/ 69	1973/ 74	1978/ 79	1981/ 82	1985/ 86	1989/ 90
<b>A. Male</b>						
35-44 (1968/69)	2.35	2.14	2.00	2.06	2.17	2.13
25-34 (1968/69)	2.01	1.92	1.83	1.83	1.86	1.97
15-24 (1968/69)		1.78	1.54	1.55	1.55	1.67
15-24 (1973/74)		1.60	1.57	1.46	1.47	1.60
15-24 (1978/79)			1.60	1.52	1.47	1.54
15-24 (1981/82)				1.56	1.49	1.57
15-24 (1985/86)					1.53	1.67
15-24 (1989/90)						1.74
<b>B. Female</b>						
25-34 (1973/74)		1.96	1.62	1.84	1.70	1.77
15-24 (1973/74)		1.83	1.61	1.47	1.56	1.64
15-24 (1978/79)			1.63	1.54	1.50	1.61
15-24 (1981/82)				1.58	1.46	1.58
15-24 (1985/86)					1.40	1.54
15-24 (1989/90)						1.50

Source: ABS, Income Distribution Australia, 1968-69, catalogue no.6502.0; ABS, Social Indicators no.3, 1980, catalogue no.4101.0; ABS, Income Distribution Australia, 1978-79, catalogue no.4108.0; ABS, Social Indicators no.4, 1984, catalogue no.4101.0; ABS, 1986 Income Distribution Survey, Persons with Earned Income, Australia, catalogue no.6546.0; and ABS, 1990 Income Distribution Survey, Persons with Earned Income, Australia, catalogue no.6546.0.

**Table 10: Average Weekly Earnings by Age/Experience -  
Full-Time Employees in Main Job - LFS - 1975-1995**

**A. Age**

	<u>1975</u>	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>
<b>i. Males</b>					
15-19	50.0	46.3	44.7	44.1	39.8
20-24	79.5	75.3	73.1	71.4	65.9
25-34	96.5	92.3	91.2	91.1	87.3
35-44	100	100	100	100	100
45-54	97.1	95.3	98.4	97.0	102.5
55-59	93.6	93.4	91.9	91.2	89.7
60+	82.7	85.4	83.2	84.8	83.1
<b>ii. Females</b>					
15-19	64.5	57.0	55.3	52.1	49.0
20-24	97.6	87.7	85.5	82.1	78.7
25-34	105.9	103.7	103.0	99.6	98.1
35-44	100	100	100	100	100
45-54	99.3	95.1	95.0	92.9	98.4
55-59	102.6	97.0	97.3	89.4	94.2
60+	99.3	94.4	85.5	87.7	90.7

**B. Experience**

	<u>1982</u>	<u>1994-95</u>
<b><u>Males</u></b>		
0-9	66.0	65.0
10-19	92.7	96.7
20-29	100	100.0
30-39	93.6	105.3
40+	80.0	84.6
<b><u>Females</u></b>		
0-9	82.0	76.7
10-19	101.7	100.9
20-29	100.0	100.0
30-39	94.2	94.9
40+	88.1	89.5

Source: a) Age - ABS, Weekly Earnings of Employees (Distribution) Australia, catalogue no.6310.0, and ABS, Labour Force, Australia, catalogue no.6203.0; b) Experience - Borland and Kennedy (1998).

The patterns of changes in earnings differentials between workers with different levels of educational attainment and years of labour market experience - which have been summarised in this sub-section - do provide an answer to the first question posed about the results from the JMP decomposition analysis. The slight compression in earnings differentials by education and experience between 1982 and 1994/95 is consistent with the result from the JMP analysis that changes in earnings differentials between observable skill groups had tended to reduce earnings dispersion in Australia over that period.

*c.ii. Labour Supply and Labour Demand*

What might have caused the patterns of time-series changes in earnings differentials between workers in different education and experience/age groups which have been described? The common approach to seeking to answer this question in research on earnings inequality has been to begin by considering the possible role of labour supply and labour demand influences.

In Australia large changes in the composition of labour supply and employment by age and educational attainment category have occurred since the late 1960s. This suggests the possibility that both changes in labour supply and labour demand may have affected earnings differentials between skill groups. Labour supply and employment shares of both younger and older males and females have declined, whilst labour supply and employment shares of prime-age males and females have increased (Borland and Wilkins, 1997). At the same time, there has been a large decrease in labour supply of and employment shares of males and females who have not completed high school, and increases in labour supply and employment shares of males and females with higher levels of educational attainment (Maglen, 1991, and Karmel, 1995).

To assess whether the changes in relative labour supply and labour demand by age and educational attainment could have affected earnings differentials, Karmel (1995), Borland (1996), and Borland and Wilkins (1997) have applied tests from Katz and Murphy (1992). The labour supply test examines whether data on relative earnings of workers in different age or education groups are consistent with the hypothesis of stable factor demand by comparing the directions of changes in relative wages and in employment shares of workers in age or education sub-groups over a specified time period. With CES technology the relative wage rates of two groups of workers at time  $t$  can be expressed as (Katz and Murphy, 1992, p.68):

$$\log(w_1(t)/w_2(t)) = (1/\sigma)[D(t) - \log(x_1(t)/x_2(t))] \quad (1)$$

where  $w_i(t)$  is the wage rate of group  $i$ ,  $\sigma$  is the elasticity of substitution between the two types of labour,  $D(t)$  is a time-series of relative demand shifts measured in log quantity units, and  $x_i(t)$  is labour supply of group  $i$ . Hence, from equation (1) a finding that the relative earnings of workers in two education groups have moved in the opposite direction to changes in the relative shares of labour supply of those groups would be interpreted as implying that it is not possible to reject the hypothesis of stable factor demand.

To test for the effects of demand factors on relative earnings between age and education groups a relative demand shift variable for each age and education sub-group is estimated using a CES production function and disaggregated data on wages and employment. This is done by re-expressing equation (1) as a function of the demand shift parameter and solving for that parameter assuming that relative labour supply equals relative labour demand.<sup>6</sup>

Application of the Katz-Murphy tests for the effects of changes in labour supply and labour demand on earnings differentials between workers in different age groups and with different levels of educational attainment in Australia suggests the following scenario: From the mid-1970s onwards there has been a consistent increase in the relative demand for male and female workers in prime-age groups and with higher levels of educational attainment. The rate of increase in relative demand for those groups may have gradually accelerated over the period. Changes in the supply of workers with different levels of educational attainment more than offset the effects on earnings differentials of changes in relative demand during the 1970s and in the first part of the 1980s; however, in the latter part of the 1980s demand changes appear to have been the main factor affecting earnings differentials. The switch from supply to demand factors as the primary explanatory factor for changes in earnings differentials between education groups appears to have been due mainly to an accelerating rate of change in relative demand, rather than a decreasing rate of change in relative supply of workers with different levels of educational attainment. Changes in the supply of workers in different age groups offset demand changes in the latter part of the 1970s, but since that time the main determinant of changes in earnings differentials appears to have been changes in relative demand.

The increase in relative demand for workers in prime-age groups, and with higher levels of educational attainment, can be interpreted as an increase in the relative demand for high-skill workers and a decrease in relative demand for low-skill workers. Other evidence of an increase in the relative demand for more skilled workers in Australia is also available. Gregory (1993) and Aungles et al. (1993) have shown that an increase in relative demand for workers in 'high-skill' occupation groups occurred

between 1976 and 1991; Borland and Foo (1996) present evidence of an increase in relative demand for nonproduction employees in manufacturing industry in Australia between 1952 and 1987; and Pappas (1998) finds evidence of an increase in the relative demand for interactive and cognitive skills, and a decline in demand for motor skills in Australia between 1974/75 and 1992/93.

### *c.iii. Explanations for Changes in Demand*

What factors could have caused an increase in the relative demand for workers with higher skill levels? First, changes in the industrial composition of product demand which occur, for example, due to changes in the pattern of international trade, will shift the relative demand for labour towards those types of labour which are intensive in expanding industries. Where expanding sectors are intensive in more highly skilled labour this can explain an increase in the demand for workers with higher levels of skill. A second explanation for changes in the relative demand for labour by skill level is technological change. Hicks-neutral technical change does not affect the relative demand for different types of labour within each industry sector, but may affect the composition of employment if the labour-saving effect of technical change varies between sectors which differ in skilled labour intensity. Alternatively, non-neutral technical change which occurs, for example, due to the introduction of information technology, may increase the relative productivity of and hence demand for high-skill workers within each sector (Krueger, 1993).

Research on what might have caused an increase in relative demand for high-skill workers in Australia is limited, but several studies have been undertaken in recent years. Three main approaches to analysing the demand for labour by skill category have been applied in these studies (for a general review of approaches to studying the effects of international trade and technical change on labour demand see Johnson, 1997). One type of study examines the effect of inter-industry and intra-industry changes in employment on the aggregate skill composition of employment. Underlying this approach is the assumption that changes in international trade or in Hicks neutral technical change should cause inter-industry shifts in employment, whereas non-neutral technical change should be evident in intra-industry changes in the composition of employment. A second type of study uses more sophisticated methods to decompose the sources of changes in employment between the effects of changes in domestic demand, imports, exports, and labour productivity. A third type of study uses regression analysis to seek establish the effect on employment of a range of trade and technology related variables.

Evidence on the effects of trade and technology from the first type of study has been mixed. Borland and Foo (1996) examine causes of changes in the

employment shares of production and nonproduction workers in manufacturing industry in Australia between 1952 and 1987. In this study it is found that over 90 per cent of the change in the composition of employment is explained by intra-industry effects. Berman et al. (1997) present similar results for manufacturing workers in Australia between 1970 and 1990, and also find that intra-industry changes in the composition of employment in manufacturing industry are fairly highly correlated across a group of 10 OECD countries including Australia. These studies therefore suggest little role for trade factors or neutral technical change in explaining changes in the composition of employment, and a greater role for non-neutral technical change.

In evaluating these findings it is however important to be aware of several possible shortcomings of this type of intra/inter industry study: first, the division between production and nonproduction workers may provide only a crude measure of worker skill; second, findings on the effects of inter-industry and intra-industry effects on employment composition are likely to be sensitive to the level of industry disaggregation; and third, it can be argued that international trade may cause intra-industry as well as inter-industry effects on the composition of employment.

There is also empirical evidence which suggests a stronger role for the effects of international trade, and a lesser role of technical change. Pappas (1998) finds that inter-industry effects have been important in explaining changes in relative demands for cognitive, interactive and motor skills. In this study it appears that inter-industry effects were the main explanation for changes in the composition of employment by skill type during the 1970s, and have also accounted for approximately one-half of the change in employment composition in the 1980s. As well, Haskel and Slaughter (1998) examine changes in the composition of employment within manufacturing sectors between 1970 and 1987, and find that technical change appears to have been slightly biased towards unskilled labour over that period.

The second approach to analysing the effects of international trade and technical change - a more sophisticated decomposition method - has been applied in studies of changes in employment in manufacturing industry in Australia between the early 1980s and mid 1990s. Studies by Fahrner and Pease (1994), and Murtough et al. (1998) find that the effect of import substitution on aggregate employment has been modest; and that the main negative influence on aggregate employment has been increases in labour productivity (part of which may reflect technical change). However, within a subset of industry groups - textiles, clothing and footwear, motor vehicles and parts, and chemical, petroleum and coal products - import substitution has had a significant negative effect on aggregate employment. These industry sectors

tend to be relatively intensive in use of low-skill labour, and hence trade effects on employment in these industries will have tended to reduce the relative demand for low-skill labour. Within each of these industries however, changes in labour productivity have also acted to reduce the employment share of low-skill workers (Murtough et al., 1998).

The third type of approach - regression analysis - has involved studies of the determinants of aggregate employment in manufacturing industry sectors in Australia between 1973 and 1992 (Gaston, 1998), and of the determinants of changes in the demand for different skill categories of labour in Australia between 1981 and 1991 (Pappas, 1998).

The study by Gaston (1998) is primarily concerned with the effects of international trade on employment. It is found that reductions in effective protection rates have had only a minor effect on sectoral-level employment. Only over the final part of the sample period from 1988 to 1992 - and then only in a subset of industries - do changes in effective protection appear to explain a significant proportion of changes in employment. For example, between 1988 and 1992 reductions in effective rates of protection appear to account for about 2 percentage points of the annual employment reduction of 9.6 percent in the clothing and footwear. Increases in imports appear slightly more important in explaining trends in aggregate employment. The annual rate of growth in imports of about 5.8 per cent between 1973 and 1992 is able to explain about one-quarter of the average decrease in employment of 2.1 per cent per annum over that period.

The main objective of the regression analysis undertaken in Pappas (1998) is to establish whether a relation exists between measures of capital usage and growth in technology and employment by skill category. The analysis provides mixed evidence on the effects of technical change on labour demand. Growth in capital usage and in the proportion of establishments using 'advanced technologies' are found to be positively related to demand for cognitive and interactive skills, whereas demand for motor skills is found to be inversely related to growth in use of advanced technologies. However, demand for motor skills is also found to be positively related to capital usage; and demand for cognitive skills and interactive skills does not appear to be related to usage of information technology capital.

Overall, there is mixed - and as yet inconclusive - evidence on the determinants of changes in labour demand by skill category in Australia. Effects of changes in international trade on labour demand appear to have been largely confined to a subset of manufacturing sectors. And while there is some evidence of more general effects of technical change, it is important to note that much of this evidence is indirect -

identifying technical change as a 'residual' explanatory factor for changes in labour demand. Another complicating factor is that it is likely to be very difficult to separate in a precise manner the effects of trade and technical change - for example, it might be argued that some part of any effect of technical change on labour demand is in fact due to competitive pressures to adopt new technologies which have come from an expansion of international trade.

#### *d. Changes in Unobservable Factors*

Analysis of changes in earnings inequality in Australia between the early 1980s and mid-1990s has shown that the important factor which tended to increase earnings inequality over that period was changes in unobservable factors - or otherwise put, changes in the distribution earnings between workers with the same years of experience and educational attainment.

What might these unobservable factors be? Two main approaches to identification of unobservable determinants of changes in the distribution of earnings exist. The first - competitive - approach interprets unobservable factors as unobservable worker skills. With this approach increases in earnings inequality may occur due to changes in the distribution of unobservable skills (for example, changes in the distribution of quality of schooling qualifications within each education category), or changes in the return to unobservable skill characteristics (for example, an increase in the returns to cognitive skills from introduction of computers to the workplace). The second - noncompetitive - approach identifies a range of noncompetitive or institutional factors which might have caused an increase in earnings inequality. Examples of noncompetitive factors are industry or firm-specific earnings premia which do not reflect differences in the skill composition of employment or disutility of work but instead might represent rents. In Australia it is known that even after controlling in a detailed manner for differences in skill levels and job conditions, earnings of workers vary significantly with industry classification (see for example, Borland and Suen, 1990, and Gregory and Daly, 1994). Examples of institutional factors might be changes in wage-setting rules or trade union power, or changes in social customs or norms (see for example, Atkinson, 1997, pp.310-311; and for a review of how institutions might affect earnings dispersion, see Fortin and Lemieux, 1997).

In Australia, thus far there has been little research which assists in distinguishing between these explanations for how unobservable factors might have caused changes in earnings dispersion. What evidence that does exist seems to suggest that it is a range of factors, rather than any single factor, which explains the role of unobservable factors in increasing earnings dispersion.

The role of unobservable skills in explaining increases in earnings dispersion has been addressed only tangentially in Australia. Miller and Mulvey (1997) and Borland et al. (1997) examine the effect of computer knowledge on weekly earnings in Australia, and find that workers with computer knowledge have weekly earnings 9 to 18 per cent higher than comparable workers without computer knowledge. Where increases in the usage of computers in the workplace have meant that demand for computer skills has increased relative to the supply of persons with those skills, this might indicate that increases in the return to computer skill are one unobservable skill-related factor which has increased earnings dispersion. However, recent research which indicates that estimates of the return to computer knowledge are significantly upward biased due to correlation between computer skills and unobserved ability (for example, DiNardo and Pischke, 1997) suggests that such a conclusion may not be warranted.

Indirect evidence on the effect of non-competitive earnings premia on earnings dispersion exists in studies which have examined inter-industry earnings differentials. For example, Preston (1997) has shown that the standard deviation of industry effects on weekly earnings increased from 10 per cent to 13 per cent between 1981 and 1991 in Australia. This is suggestive of some effect of inter-industry effects on changes in earnings dispersion; however, further work would be required for the magnitude of the effect to be determined.

Institutional influences on earnings dispersion which have been examined are the effects of declining union density, and changes to wage-setting institutions. Borland (1996) has examined the relation between changes in union density and changes in earnings dispersion in Australia between 1986 and 1994. As earnings dispersion for union members is less than for nonunion members, it might be expected that decreases in union density which have occurred in Australia from the early 1980s (for example, union density for male employees fell from 53 per cent to 38 per cent between 1982 and 1994) would have been associated with an increase in earnings dispersion. Indeed it is found that changes in union density can account for approximately 30 per cent of the increase in the variance of earnings of full-time male employees in Australia between 1986 and 1994, and 15 per cent of the increase in the variance of earnings of full-time female employees over the same period. Increases in the variance of earnings of nonunion members have however been the main determinant of increases in earnings dispersion. In interpreting these findings on union density and earnings dispersion it must be noted that although the findings provide evidence of empirical linkages between changes in union density and changes in overall earnings dispersion, this is not a sufficient basis for establishing causality from changes in union density to changes in earnings dispersion.

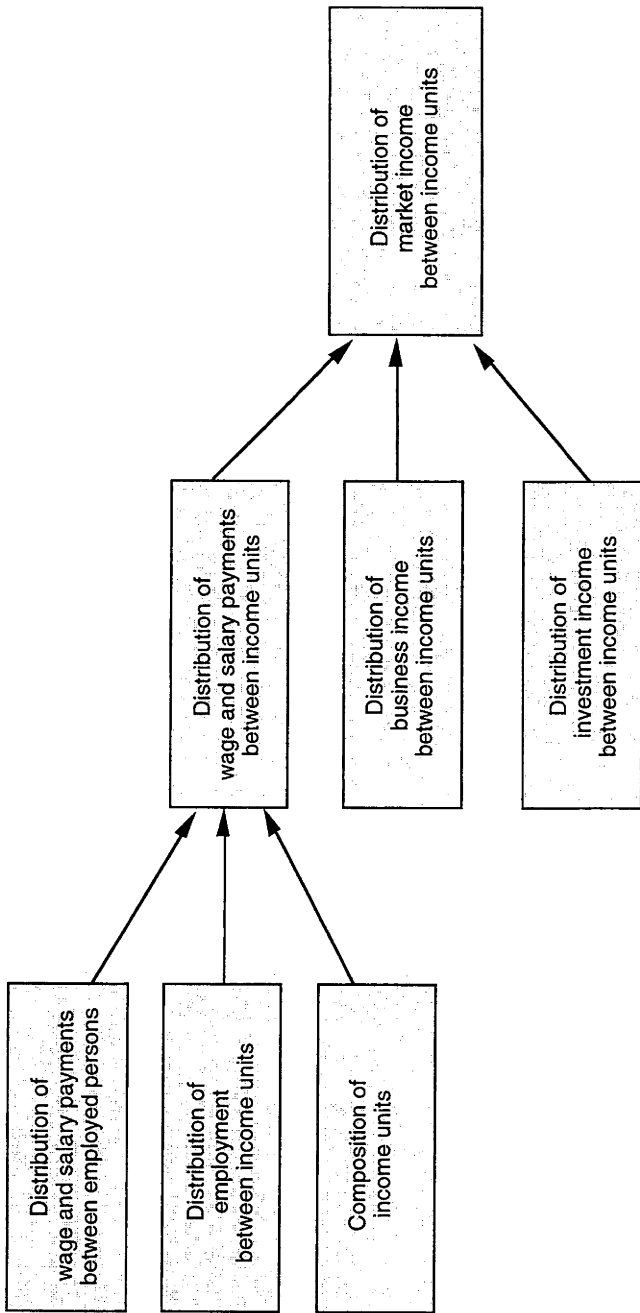
Over the past two decades Australia's wage setting system has evolved through a number of stages - centralised wage indexation (1975-1981); decentralised industry-level wage bargaining (1981-1983); and a transition from a highly centralised wage indexation system to a system with enterprise-level wage bargaining under the Prices and Incomes Accord (1983-1996) (see Dabscheck, 1995). It has been suggested that the different stages of wage bargaining have been to some extent manifested in changes in earnings inequality - for example, one explanation for the relative stability in earnings dispersion for male employees between 1982 and 1986 may be the highly centralised system of wage bargaining which existed during the initial period of the Prices and Incomes Accord (Belchamber, 1996). However, further work would be required to demonstrate this link in a more rigorous manner.

#### **4. Consequences of Changes in Earnings Inequality**

##### *a. Income Inequality*

How have changes in earnings dispersion affected income inequality in Australia? Labour market earnings account for a significant proportion of income received by most persons and income units (Saunders, 1995, p.3 shows that 62 per cent of total household income in Australia in 1989-90 was received in the form of wages, salaries, and supplements), and hence it might be expected that there would be a significant flow-on effect from changes in earnings dispersion to income inequality. Consistent with this hypothesis, a range of studies have shown that market (or pre-tax/transfer) income inequality has increased between families and between households during the 1980s (Harding, 1993, 1996, and 1997, and Johnson et al., 1995). Table 10 - from Harding (1996, 1997) - shows that between 1981-82 and 1993-94 the Gini coefficient for the distribution of family market income (between individuals) increased by 5.9 percentage points.

Despite the consistency between the directions of changes in inequality in labour market earnings and in market income, it is important to note that many other factors apart from changes in earnings inequality can affect the distribution of income. To analyse the effects of changes in earnings inequality on the distribution of market income it is therefore necessary to begin by setting out the range of factors which might affect the distribution of market income. Figure 4 shows a simple schema for understanding the determinants of changes in the distribution of market income. First,



**Figure 4: Determinants of Market Income**

changes in the distribution of market income between income units can occur due to changes in the distribution of different types of income - business income, investment income, and wage and salary income. Second, sources of changes in the distribution of wage and salary income between income units can be decomposed as: changes in the distribution of wage and salary payments between individuals; changes in the distribution of employment between income units; and changes in the composition of income units.

How have changes in inequality in the different types of market income affected the distribution of market income? Table 11 shows that increases occurred in inequality in the distributions of both wage and salary income and business/trust income between 1981/82 and 1993/94. Increases in inequality in the distribution of business/trust income appear to have been concentrated during the 1980s, whereas increases in inequality in the distribution of wage and salary income were more notable in the early 1990s. Table 12 - from Landt and Fischer (1996) - provides further evidence of increasing inequality in the distribution of wage and salary income. It shows that over the period between 1982 and 1990 changes in average real family wage and salary income have been strongly positively correlated with a family's position in the distribution of earnings. Evidence from existing studies therefore suggests that both changes in the distribution of business/trust income and in the distribution of wage and salary income may explain the overall increase in dispersion of market income. Unfortunately, these studies do not present evidence which allow the relative effect on market income inequality of changes in the distribution of each type of income to be determined.

What have been the main causes of changes in the distribution of wages and salaries between income units? First, inequality in the distribution of wage and salary income between individuals increased during the 1980s (Harding, 1993, and Saunders, 1995). While effects of increases in earnings dispersion amongst full-time employees were largely offset by decreases in earnings dispersion between part-time employees, an increase in the earnings differential between full-time and part-time employees and the growing proportion of part-time employees caused the distribution of wage and salary income between individuals to widen.

Second, changes in the distribution of employment between income units in the 1980s and 1990s appear to have increased inequality in the distribution of wage and salary income. Some studies have found a positive relation between the aggregate rate of unemployment and extent of income inequality (Bradbury, 1992, Saunders, 1992, and Sheehan and Gregory, 1998). Evidence that unemployed persons are disproportionately concentrated in income units at the bottom of the distribution of

**Table 11: Distribution of Family Income - Individuals - Australia - IDS - 1981/82-1993/94**

	Change in Gini Coefficient	
	1981/82-1989/90	1981/82-1993/94
Business/Trust Income	+0.037	+0.034
Investment Income	+0.001	+0.012
Wage and Salary Income	+0.007	+0.037
Market Income	+0.032	+0.059

Note: Market Income equals private or pre-government intervention income.

Source: Harding (1996, p.286, and 1997, Table 2).

**Table 12: Estimated Real Average Family Weekly Earnings of Persons by Family Earnings Decile - Australia - IDS - 1982-1990 (1995 dollars)**

<u>Earnings Decile</u>	<u>1982</u>	<u>1990</u>	<u>Change (%)</u>
1 (Bottom)	209	179	-14.3
2	401	368	-8.2
3	490	457	-6.7
4	564	540	-4.3
5	645	638	-1.0
6	743	749	+0.9
7	853	877	+2.9
8	995	1031	+3.7
9	1181	1237	+4.8
10 (Top)	1637	1787	+9.2

Source: Landt and Fisher (1996, Figure 12).

income is consistent with this finding (Richardson, 1998, and Richardson and Harding, 1998). More recent work by Harding (1997) also concludes that changes in the distribution of employment across income units are likely to have increased income inequality. However, in this study it is found that decreases in the incidence of employment have had most effect on income units in the between the 30th and 70th percentiles in the distribution of income.

Increases in the employment rate of married females have also been suggested as a factor which - by changing the distribution of employment between income units - might affect the distribution of income. Changes in employment patterns of females in married couples appear however to have had a net equalising effect on the distribution of wage and salary income over the 1980s. Although changes in employment/population rates of married females have been positively correlated with their husbands' positions in the male distribution of earnings, and this might have been expected to increase income inequality, in fact the increase in inequality caused by the growing gap between high income and low income couples has been more than offset by a falling gap between high income and middle income couples (Bradbury, 1992, and Saunders, 1993).

Third, changes in the composition of income units appear to have increased income inequality. For example, Harding (1994, and 1997) argues that the rise in the proportion of persons living in sole parent and 'couple without children' families - and the corresponding decline in the proportion living in 'couple with children' families - have exacerbated wage and salary income inequality during the 1980s.

Changes in the distribution of market income are of course only one component of the distribution of disposable income which is the measure of monetary income most relevant for making social welfare comparisons. During the 1980s and early 1990s increases in inequality in the distribution of market income in Australia appear to have been fully offset by increasing progressivity in the tax/transfer system and changes to government cash transfers (Johnson et al., 1995, and Harding, 1997). In particular, individuals in income units in the bottom quintile of the distribution of income have had increases in disposable income relative to individuals in the top quintile over this period. However, at the same time individuals in income units in the second and third quintiles have experienced declining income relative to individuals in the top quintile of the distribution of income (Harding, 1997). This latter finding is consistent with anecdotal evidence about the evolution of a class of 'working poor' in Australia.

From existing studies it seems reasonable to conclude that increases in earnings dispersion were one factor which explains increases in market income inequality in

Australia during the 1980s. However, as these studies have generally been concerned with issues apart from effects of earnings inequality on income inequality, the available evidence on the issue must be regarded as somewhat sketchy. Moreover, in assessing the effects of changes in earnings inequality on the distribution of income one problem is that recent studies of income inequality in Australia have often differed in their choices of definitions of income units (household, families, or ABS income unit), of how to report the distribution of income (over individuals or over income units), and of whether to adjust income measures for family needs. Hence, it is sometimes difficult to compare findings from different studies.

It therefore seems that there is scope for further research to determine the significance of the relation between changes in earnings dispersion and income inequality. In particular, research which attempts to decompose the change in income inequality between the set of factors - such as changes in the distribution of each type of market income - which have been described in this section, and which involves some analysis of sensitivity to alternative definitions of an income unit and methods of reporting the distribution of income, would be most valuable.

#### *b. Other Consequences*

Changes in the distribution of earnings are likely to have a range of consequences for the behaviour of labour market participants and governments. Two possible consequences which have received some attention are the effects on skill acquisition by workers, and the creation of new pressures for reform of the social security system.

Different scenarios have been proposed for how changes in the distribution of earnings might affect skill acquisition by workers. Under one scenario increased earnings dispersion and returns to skill are argued to raise incentives for skill acquisition by workers. In the long-run therefore there will be fewer low-skill workers and earnings dispersion should be expected to fall (see for example, Kuhn, 1995, and Heckman et al., 1997). In an alternative scenario increased earnings dispersion and returns to skill are assumed to raise disparities in lifetime earnings between workers. Greater inequality in lifetime earnings induces greater variance in the capacity of an 'old generation' of labour market participants to finance education by 'young generation' family members. In the long-run as the young generation join the labour market there will therefore be greater unevenness in the distribution of skills between workers (see for example, Galor and Zeira, 1993, and Atkinson, 1997). Both of these scenarios identify plausible effects of an increase in earnings dispersion - the former in a static and perfect capital markets environment, and the latter in a dynamic and imperfect capital markets environment. In the long-run the overall effect on the

distribution of skills in the workforce is likely to depend on which of the effects is dominant.

Pressures for reform of the social security system could arise from the effects of increased earnings dispersion on total government social security payments expenditure, or from the effects of increased earnings dispersion on disincentives to work where labour market participants have access to social security benefits. Decreases in real earnings of persons at the bottom of the distribution of earnings will - to the extent that these changes translate into lower real total earnings for their families - raise the level of income-tested social security benefits received by those persons. Hence, increases in earnings dispersion are likely to raise total government expenditure on social security payments which may constitute one source of pressure for reform of the social security system.

Another effect of declining real earnings of persons at the bottom of the distribution of earnings is that it reduces the ratio between the earnings of a labour market participant in a low-wage job compared to unemployment benefit payments. Table 13 - from Gregory (1996b) - shows that for a married male with 2 children who has weekly earnings at the 10th percentile of the distribution of earnings the excess of weekly earnings over unemployment benefits declined from 36 to 11 per cent between 1976 and 1991. Once the costs of work and non-cash benefits available to unemployment benefit recipients are taken into account it is evident that there may be a net disincentive for males with low wage jobs to remain in employment. As Gregory (1996b, p.96) notes "...a significant fall in earnings for the low paid would also be likely to lead to a reduction of welfare payments to avoid the emergence of a welfare trap".

**Table 13: Excess of Full-Time Weekly Earnings Relative to Unemployment Benefit Payment - Married Adult Male with Two Children - Australia**

Percentile	1976	1987	1991
10th	36	17	11
20th	51	32	30
Median	87	77	71

## Endnotes

1. Earlier studies which provide partial reviews of evidence on earnings inequality in Australia are EPAC (1995), Saunders (1995), Borland and Norris (1996), and Richardson (1997).
2. Interpreting the welfare consequences of changes in the distribution of earnings is not, however, likely to be a straightforward exercise. For example, suppose that the proportion of persons classified as low-wage earners increases. Where the increase is known to be due to an increase in the number of low-wage full-time jobs and it is also known that the jobs are occupied by primary bread-winners, the interpretation might be welfare is lower after the change. On the other hand, where the rise in the proportion of low-wage jobs is due to the entry into the labour market of students taking part-time jobs in order to better prepare themselves for full-time employment, it would be possible to argue that an increase in welfare has occurred.
3. For a more detailed review of data sources see the Appendix.
4. For the case where quintile boundaries are chosen the Median Relative Polarisation (MRP) Index is defined as:

$$\text{MRP} = \sum_{j=1}^{10} [0.5\{(j-0.5)/10\} - 0.5] |x_j / 0.1| - 1.25$$

where  $j$  indexes decile boundaries, and  $x_j$  is the proportion of workers from the actual end-period distribution of earnings who are in the hypothetical end-period range of earnings for the  $j$ th decile (see Morris et al., 1994, and Watts, 1996).

5. The same issue of sensitivity to choice of deflator is relevant in interpreting measures of changes in real weekly earnings for workers at different percentiles of the distribution of earnings.
6. The Katz-Murphy tests assume a labour market where - amongst other features - wages adjust to restore equilibrium in the labour market in response to changes in labour supply and labour demand; and firms' production functions are standard CES or Cobb-Douglas specifications. On the first point, given institutional factors such as the role of trade unions and the award wage system which are likely to affect wage outcomes in Australia, and the existence of high levels of unemployment, the assumption of wage adjustment and labour market equilibrium may seem problematic. However, in an environment with labour market disequilibrium the Katz-Murphy tests have the same interpretations for the role of demand and supply factors provided that wages and employment adjust towards equilibrium in response to changes in labour demand and labour supply (Borland and Wilkins, 1997). On the second point, it is important to note that modifications to the form of the production function may produce different equilibrium relations between changes in labour supply and earnings differentials between skill groups. Kremer and Maskin (1996) show that where workers of different skill levels are imperfect substitutes, and output is more sensitive to worker skill in some tasks than others, firm-worker matching effects can mean that increases in the relative supply of high-skill workers will raise the relative earnings of that group of workers even in the absence of any change in relative demand across skill categories.

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## Appendix - Data Sources

### A. Labour Force Survey

From 1975 onwards each year (excluding 1996) in a supplementary (August) survey to the household-based Labour Force Survey the ABS has collected information on the weekly earnings of employees. This information is reported in ABS, Weekly Earnings of Employees (Distribution) Australia, catalogue no.6310.0. The earnings variable is weekly earnings in main job for full-time employees. Earnings are the amount of last 'total pay' from wage and salary jobs prior to the survey interview. Information is available on the distribution of earnings and on average earnings for all employees and for disaggregated age and industry categories. Information on the distribution of earnings is the number of employees with weekly earnings in fixed monetary intervals (for example, less than \$80, \$80-\$120,...).

### B. Survey of Employee Earnings and Hours

From 1975 onwards each year (excluding 1982 and 1984) the ABS has undertaken the firm-based Survey of Employee Earnings and Hours. One component of the survey involves collection of information on weekly earnings of employees. This information is reported in ABS, Distribution and Composition of Employee Earnings and Hours - Australia, catalogue no.6306.0. The earnings variable (available on a consistent basis over the sample period) is total weekly earnings of full-time non-managerial employees. Earnings are weekly earnings for the sample period attributable to award, standard or agreed hours of work plus overtime earnings. Earnings from bonus payments, commissions and overaward payments are included in the measure, but retrospective payments, payments in advance, or severance payments are excluded. Information is available on the distribution of earnings and on average earnings for all employees and for disaggregated sector and occupation categories. Information on the distribution of earnings is the number of employees with weekly earnings in fixed monetary intervals (for example, less than \$80, \$80-\$120,...). Due to changes in the types of businesses included in the Survey, and in the definition of full-time and part-time employees, it is not possible to directly compare data on the distribution of earnings from the Survey of Employee Earnings and Hours from before 1981 and after 1983.

### C. Income and Housing Survey

On seven occasions between 1968/69 and 1994/95 the ABS has undertaken a household-based Income and Housing Survey (generally referred to as the Income Distribution Survey). One component of this survey involves collection of information on earnings of household members. Two types of data on earnings are available from the survey. First, for each survey information on average total annual earnings of full-year full-time employees disaggregated by age and level of educational attainment are available. Second, for the 1981/82 to 1994/95 surveys unit-record information on weekly and annual earnings in main job of full-time employees can be obtained. These individual-level earnings data can be matched with information on the labour force status and demographic characteristics of each person in the survey. For further details on this data source see Lambert (1996).

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