Women and Work:
Changes in Employment and Earnings Since the 1970s

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ABSTRACT

The aim of the thesis is to examine changes in the recent labour market experience of women relative to men. It uses micro economic data from the mid-1970s to the mid-1990s. The thesis has seven chapters. Chapter 1 provides an introduction. In the second chapter trends in the gender pay gap across the full wage distribution are examined, and the impact of rising wage inequality on the earnings differential is assessed for full time workers. Chapter 3 examines changes in the relative earnings of part-time female workers relative to full-time men and women. It finds that part-time workers, in contrast to those working full time, have failed to increase their earnings relative to men over recent decades. Chapter 4 examines the impact of children on female wages in seven countries. The wage penalty to having children is found to vary substantially across countries, and is greatest in the UK. The fifth chapter looks at earnings differentials across education groups. It finds that demand shifts for more educated workers have outweighed recent increases in supply, and lead to increases in their relative wages. This shift in demand towards more educated workers has been particularly marked for women. In Chapter 6 changes in the gender pay gap across cohorts are examined. It suggests that while the pay gap widens considerably between the ages of 20 and 35, for more recent birth cohorts the pay gap has grown more slowly with age. It finds that the largest improvements in relative earnings over recent decade have been among more educated women of child bearing age. Finally, Chapter 7 concludes.

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LIST OF ABBREVIATIONS

BHPS	British Household Panel Survey
FES	Family Expenditure Survey
FT	Full Time
GHS	General Household Survey
IV	Instrumental Variables
LIS	Luxembourg Income Survey
OLS	Ordinary Least Squares
PT	Part Time

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Declaration

Chapter 4 of this thesis is joint work with Jane Waldfogel, and Chapter 5 is joint work with Stephen Machin. All other work presented in this thesis is my own.

I confirm that the work in Chapter 5 was joint work to which Susan and I contributed fully as a joint venture.

Stephen Machin 11 March 2002

CHAPTER ONE
INTRODUCTION

This thesis examines changes in female employment and earnings *vis-à-vis* men since the 1970s. There is a large literature on the gender pay gap in the UK and elsewhere. However, much of the previous analysis of the gender pay gap has focused on average female earnings. What distinguishes this thesis is that trends in female earnings and employment across the wage distribution, across qualification groups and for full and part-time workers are examined separately. The thesis is largely empirical, and draws on a wide range of micro economic data sources.

The rise in female labour force participation over recent decades has been one of the most striking changes to occur in Western industrialised countries labour markets. In the United Kingdom the labour force participation rate of women aged 15-64 rose from 46 percent in 1960 to 65 percent by 1991. Equally striking trends are observed in other countries: the United States saw an increase in the analogously defined female labour force participation rate from 43 to 68 percent between 1960 and 1991; in France, comparable figures were 47 and 57 percent; in Germany the rise was from 49 percent to 59 percent.[1] At the same time, the gender pay gap has been falling in most countries, although significant cross-country differences remain. For example in 1994-8, in the UK the full-time ratio of female to male weekly earnings gender was is 75 percent, and in US 76 percent, compared to a ratio of 84 percent in Sweden, 87 percent in Australia and 90 percent in Belgium (Blau and Kahn 2000). There have been a number of studies that have analysed cross-country differences in the gender pay gap (see, for instance, Blau and Kahn, 1992, 1995, 1996, and 1998; Callan, Adams, Dex, Gustafsson, Schupp, and Smith, 1996). These have tended to place particular emphasis on the importance of differences in wage structures to the pay gap.

In Britain, three other major labour market trends define the period from the late 1970s to the mid-1990s. First, the period saw a dramatic and well-documented rise in wage inequality for men (see, for instance, Machin 1996a, Schmitt 1995). One of

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1. The source for these numbers is various issues of the OECD Economic Outlook.

the main explanations for increasing wage inequality has been that the demand for skilled labour has increased, and this has been reflected in increasing wage premiums for those with higher educational qualifications and more work experience. The second major trend has been the shift in labour demand away for the manufacturing towards service sector employment. Thus while the 28 percent of all jobs were in manufacturing, and 60 in services in 1978, by 2000 the share of manufacturing in employment had fallen to 19 percent while services employment share had grown to 76 percent.[2] These shifts in labour demand have tended to favour women, who make up fewer than 30 percent of the manufacturing workforce but account for over one half of all service sector workers. The third trend is the rise in the number of employees who work part time. Between 1984 and 1999 the number of part time jobs in the economy grew by 37 percent, from 4.97 to 6.82 million jobs.3 Consequently, the share of employees working part time grew from 25 to 33 percent. While the majority of part-time workers are still women (80 percent in 1999), men are increasingly likely to work part time. The incidence of part-time employment doubled for men (from 4.3 percent to 9.1 percent of male jobs) while for women it remained constant at around 45 percent of all female employees between 1984 and 1999.[4]

The second chapter of this thesis brings together two of these labour market trends and examines the implications of rising wage inequality in the UK for the female/male wage differential in Britain for full-time workers. Data from the General Household Survey (GHS) shows that from the mid-1970s to the late 1990s a significant closing of the average gender wage gap is found, with most of this improvement occurring in the late 1980s. However, this chapter argues that, as this time period saw very large rises in wage inequality in Britain, to properly consider women's relative wage position one should also look at the impact of rising wage inequality on the gender wage differential. This is important because, if one group of workers is less skilled than another then, as wage inequality increases the relative wage of the less skilled group will decline *ceterus paribus*. It is important therefore, in a

2 Source: Labour Force Survey data available from wwww.statistics.gov.uk/statbase/tsdataset.asp.
3 Source: Labour Force Survey.
4 Source: Social Trend 2000, available from wwww.statistics.gov.uk/statbase/xsdataset.asp.

period of rising wage inequality, to separate out the effects of changes in gender specific factors affecting the gender pay gap from those that affect the pay gap via the wage structure. Blau and Kahn (1992) have done this for the US. They find that there rising wage inequality since the late 1970s has hampered the narrowing of the male / female wage gap. They suggest that while female employees have made significant improvements in their labour market skills, and in spite of a decline in 'discrimination', the trend of rising wage inequality has hampered women's progress to equality. Chapter Two of this thesis uses Blau and Kahn's methodology to assess the impact of rising wage inequality on the gender wage gap in the UK. The chapter also documents other reasons for a change in the full-time gender pay gap, such as the improved educational profile of women *vis a vis* men and changes in the industrial and occupational structure of male and female employment.

Chapter 2 looks only at the experience of full-time workers. Forty five percent of female employees, however, work part-time and these workers are the focus of Chapter 3. The separation of workers into full time versus part time categories may clearly be problematic, particularly as among part-time workers the number of hours worked may be very heterogenous. However, while this limitation is recognised, the division seems justified because evidence suggests that part timers are treated differently to full-time workers, in terms of recruitment and in the ways in which those working shorter hours are rewarded and promoted.

Previous work on part-time female earnings in the UK has been done by Ermisch and Wright (1993), who used data from the 1980 Women and Employment Survey to examine differences in returns to full-time and part-time female employment characteristics. Elsewhere a number of other studies have looked at similar issues using American data (Blank (1988), Long and Jones (1979)) and Canadian data (Simpson (1986)). No work has, however, been done on changes in part-timers' relative earnings over time in the UK. Data from the Family Expenditure Survey (FES) shows that in 1993, average hourly earnings of part-time women were equal to only 81 percent of the full-time female average. This full-time / part-time earnings gap has, however, emerged only recently: in the 1970s, there was little difference in female average earnings by employment status. Chapter 3 uses a range of data sets to examine the emergence of the full-time / part-time pay gap and to examine differences in returns to full-time and part-time female employees' characteristics, and changes in these differences in returns, from the mid 1970s until the early 1990s. The chapter then assesses how much of the deterioration in the relative earnings position of part timers can be attributed to changes in characteristics and how much is due to an increase in the penalty for working part time.

Chapter 4 of the thesis moves on to examine the impact of children on women's wages in seven industrialised countries. Much of the literature on the gender pay gap, cited earlier, takes as given that much of the differential between women and men is due to the fact that women bear children and have primary responsibility in most instances for caring or arranging care for them. It is thought that more progressive family policies in Nordic countries, for example, are important in explaining the relatively small gender pay gaps observed there. Studies within countries provide evidence of a persistent family gap in pay between women with children and women without children (see, for instance, Joshi, Paci, and Waldfogel, 1999, and Waldfogel, 1997a and 1997b on the U.S.). However, evidence comparing the family gap across countries has been lacking. Thus, we do not know whether countries have similar family gaps, or whether countries that have a larger family gap have a larger gender gap in pay. We also do not know much about the relationship between the employment effects of children and the wage effects of children. In countries where children have a large negative effect on women's employment, do they also have a large negative effect on women's wages, or is the opposite true? Put another way, do women in some countries accommodate their family responsibilities by reducing their employment while women in other countries instead remain in employment but at lower wages? The objective of Chapter 4 is to examine cross-country differences in the pay penalty to having children, and to examine the relationship that this bears to the gender pay gap.

Chapter 5 of the thesis looks at the returns to education for men and women. Increasing returns to education have been an important component of the rise in male wage inequality (Machin 1996b and Schmitt 1995) in the 1980s. In this chapter changes in the wage returns to education from the 1970s to the late 1990s are examined separately for men and women. Since the 1970s, the female labour force has become much better qualified, and this has implications both for trends in female employment and earnings. By examining changes in the supply of educated workers, and changes in the wage premiums received by more educated workers, we can infer something about what has happened to the demand for labour generally, and in particular the relative demand for educated female workers. It has been suggested that increased demand for skilled workers has resulted from skill biased technological change (SBTC) (see Bound and Johnson 1992 or Johnson 1997). It could be the case that such a demand shift has tended to favour women. This too is tested here using data on computer usage, and this is assessed as a possible factor behind the narrowing of the gender pay gap.

Chapter 6 of the thesis examines the impact of improvements in the earnings of women on employment. Using data from 1974 and 1998 it looks at the evolution of the gender pay gap over the lifecycle for different year of birth cohorts. It attempts to assess the extent to which changes in the gender pay gap can be attributed to changes over time, differences across cohorts and differences by ages. It then goes on to assess the impact of demographic factors, shifts in relative female labour supply and demand, and inequality on the gender wage gap.

Together these five analytical chapters provide an account of some the major changes in patterns of female employment in the UK over the last thirty years or so. They also provide some evidence on how the labour market experience of British women differed from that of women in other industrialised countries in the 1990s. Major trends in employment and earnings are reviewed, and particular attention is paid to the employment experience of women at different points of the wage distribution, across qualification groups and for full and part-time workers. Together these chapters aim to improve our understanding of female employment, earnings and inequality.

CHAPTER TWO

CHANGES IN FULL-TIME WOMEN'S WAGES IN BRITAIN

2.1. Introduction

This chapter examines recent trends in the gender pay gap in Britain. Analysis of data from the Family Expenditure Survey (FES) reveals that, while women have improved their relative wage position over the last twenty-five years, these gains have been concentrated into two sub-periods. The first very well known increase coincides with the introduction of the Equal Pay Act in 1975. The second, rather less well known, period of improvement occurred from about 1988 onwards.

The empirical analysis considers information from several of the large-scale British micro-data sources. Each provides complementary evidence on various issues of interest and we feel that one can obtain a much more coherent picture by drawing on several data sets, each of which has limitations that make generalisation from a single source rather difficult.

As the period studied saw very large rises in wage inequality in Britain it also seems necessary and important to look at the potential impact of this on the gender wage differential. Decompositions based on the full wage distribution are therefore considered, and we find that the observed rise in wage inequality limited the closing of the gender wage gap. Had the structure of wages remained at the level of the mid-1970s the gender wage differential would have closed more by the 1990s than it did in practice. Thus it seems that looking at the evolution of the entire wage distribution is vital for examining changes in women's relative wage position. The estimates also suggest that, even with the observed closing of the gender wage gap, by the 1990s women were still paid substantially less than men in otherwise comparable jobs and that the rise in wage inequality has put a partial brake on women's earnings improvements.

The remainder of the paper is structured as follows. In the next Section descriptive material on what has happened to the gender wage gap since the 1970s is reported. In order to obtain a clear picture of the patterns that we are interested in, we report material from several data sources, and focus on several different measures that describe the relative wage fortunes of women as compared to men in Britain. In Section 2.3 a simple, full distribution accounting analysis of the rise in the female/male wage differential between the late 1970s and 1990s is carried out. Section 2.4 then considers a number of decomposition methods and other econometric issues to examine the robustness of the results of the previous sections. Section 2.5 then concludes.

2.2 Data Description and Descriptive Material

Data Sources

1). General Household Survey (GHS)

(Sample size: 3,500 to 6,500 men and 2,000 to 3,000 women working full-time each year.)

Data from the GHS is available from 1977 to 1998/9. As data was collected on a biannual basis from 1996/97, no data is available for 1997/8. The main limitation of the GHS data is that earnings are reported as weekly earning including over time payments, while hour of work are reported as weekly hours excluding overtime. Data on over time hours are collected only between 1974 and 1982. As over time hours are an important component of total hours of work for men, this only allows us to compare men and women's weekly earnings.

2). Family Expenditure Survey (FES)

(Sample size: 3,000 to 5,000 men and 2,500 to 3,500 women working full-time each year.)

Utilising hourly wage information from the FES can rectify the main drawback of the GHS. The FES contains much more limited in information on industry and occupation (including definition changes through time) and on education where there is only information on years of schooling (only from 1978 onwards) as compared to the educational qualifications data in GHS.

3). British Household Panel Survey (BHPS)

(Sample size: approximately 2,000 men and 1,200 women working full-time annually.)

The BHPS longitudinal data begins in 1990/1, and has very rich data on the characteristics of individuals and on their labour market earnings. The BHPS is particularly attractive as it has data on actual work experience, unionization and establishment size. Its major drawback is that it is available only from 1990 and that sample sizes are relatively small.

Sample Definition

The observed rise in female labour force participation raises questions about sample composition, and in particular changes in sample composition, that may cause potential problems with the analysis. For most of the paper, this issue is side stepped by considering wage differences between men and women in full-time jobs (> 30 hours per week). The samples used include all employees aged 16-60 who work over 30 hours per week. Those reporting very low or very high earnings (under £50 or over £2000 per week in January 1999 prices) are excluded. Potential sample selection biases that may be associated with this set of sample restrictions are considered in Section 2.4 of the paper.

Trends in Women's Employment in Britain

Figure 2.1 plots the proportion of full time workers of working age that were female using data from the General Household Survey (GHS) between 1974 and 1998. It is evident that women have steadily increased their share of full-time employment, making up only around 26 percent of all full time employees in 1974 compared to 35 percent by 1998. However, when employment shares are disaggregated by age, marked differences in both the levels and changes in employment shares are observed. This is illustrated in Figure 2.2. Looking first at those aged 17-24, full-time female employment shares rates have increased only marginally over the period, and in 1998 women made up just over 40 percent of all full time employees in this age group. More striking increases in employment are seen in the other age groups, although rates of full time employment remain lower than for younger workers. The biggest increases in full time employment shares are seen among those aged 25 to 34, where women accounted for just over one-fifth of full-time workers in this age group in 1974 compared to just under 40 percent in 1998. For women aged 35 and over full time employment shares rose rapidly too, so that in 1998 in each of these age groups women accounted for around one-third of full-time employees.

Trends in the Composition of Women's Employment

The educational composition of the full-time labour force has changed dramatically over recent decades. Table 2.1 reports some summary statistics from the GHS on the distribution of full-time employees by educational attainment for men and women in four age groups for three sub-periods, 1976-1978, 1986-88 and 1996-1998. It is clear that in 1976-1978 full-time female employees were much less well qualified than their male counterparts, although the difference is smaller for younger workers. By 1986-1988 this difference had closed considerably, and women under 35 won average better qualified than their male counteparts. By 1996-1998, women who worked full time had improved had markedly improved their position relative to men, with the proportion holding degrees being larger and the fraction with no qualifications smaller than for men. Indeed, for those under 35, a large gap in the educational attainment of full time working men and women had emerged by 1996-1998, with women being significantly better qualified than their male counterparts. For older women, the educational gap had practically disappeared.

The composition of employment by industry and occupation has also undergone change since the 1970s, with more full-time female employees working in the service sector and in higher grade non-manual occupations. It is noteworthy that women remain significantly over-represented in the non-manual category of employment and underrepresented amongst skilled manual workers. Furthermore, despite union decline (Disney et al., 1995) women are much less likely to be union members and more likely to work in smaller firms (see Green, Machin and Manning, 1995, for evidence on wage penalties received by women in smaller workplaces).

Changes in Male and Female Earnings

Figure 2.3 plots indexed real weekly earnings for the 10th, 50th and 90th percentile man and woman from GHS and FES over time. While the dispersion of earnings growth for the 10th, 50th and 90th percentiles is similar for men and women, earnings growth is higher for women at all percentiles. Figure 2.4 shows kernel density estimates of the male and female wage distribution in 1978, 1988 and 1998 for weekly earnings from GHS and for hourly earnings from FES. It is clear that, in both periods and for both measures, the earnings distribution is more concentrated for women than for men. However, for both men and women there is a considerable widening of the distribution over the period. This is confirmed by the various inequality measures reported in Table 2.2, which shows the extent of the widening of male and female wage distributions between 1978 and 1998. It is also clear that wage inequality is lower among women than across men.

Aggregate Trends in the Mean Gender Earnings Ratio

Figure 2.5 shows the mean weekly and hourly gender earnings ratios from 1968 to 1999 using the FES and 1974 to 1998 using the GHS. All show very similar trends, although the level of the gender earnings ratio is higher when hourly wages are used. The gender earnings ratio rose rapidly prior to and following the introduction of the Equal Pay and Equal Opportunities Acts in December 1975. FES data indicates that between 1973 and 1977 the full-time gender earnings ratio rose from 60 to 70 percent for hourly earnings, and from 53 to 62 percent for weekly earnings. The GHS gives similar results, with the weekly wage gender earnings ratio rising 6 percentage points, to 63 percent, between 1974 and 1977. By 1978 the effect of the new legislation on the gender earnings ratio appears to be exhausted, and there was little further change until the late 1980s. Since the late 1980s there has been a progressive increase in the gender earnings ratio. By 1999 the FES gender earnings ratio had risen to 79 percent for hourly earnings, and to 73 percent for weekly earnings. For GHS weekly wages this ratio rose to 73 percent in 1998.

Changes in the Gender Earnings Ratio Across the Male and Female Wage Distributions

The use of averages may well conceal differences in the experience of workers within the male and female distributions. This is especially true given the dramatic widening of the wage distribution in Britain since the late 1970s depicted in Figure 2.3.[1] It is therefore useful to examine changes in the median wage gap, and earnings at different percentiles of the wage distribution, to see how the experience of workers has varied across the wage distribution.

Figure 2.6 graphs the ratio of median female to male wages from FES and GHS data. The trend and level of the female / male median wage ratio is almost identical to that for mean values for weekly wages. For hourly wages, however, the median ratio is around 4 percentage points higher than the mean ratio. Figure 2.7 shows the gender wage ratio for the 10^{th} to 90^{th} percentile (calculated as the ratio of the earnings of the i^{th} percentile woman to the i^{th} percentile man) in 1968, 1978, 1988 and 1998. There is surprisingly little variation in the gender earnings ratio across all percentiles prior in the 1968, 1978 and 1988 data, with improvements in the gender earnings ratio been seen across all percentiles over each of these decades. By 1998, however, the pattern has changed somewhat, with the gender earnings ratio being substantially higher, particularly in the hourly FES data, at the lower end of the wage distribution. In 1998, therefore, women in the bottom fifth of the wage distribution earned around 85 percent of the wage of men in the same position of the distribution. Those in the top of the distribution however did significantly worse than comparable men, earning 70 percent or less of the equivalent male wage.

Where are Women Located in the Male Wage Distribution?

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1. For more details on the nature of the UK rise in wage inequality see Gregg and Machin (1994) or Gosling, Machin and Meghir (1994), among others.

Blau and Khan (1992) suggest that mean comparisons of male and female earnings may not be a very useful indicator of changes in the relative labour market position of women in a period of rapidly rising wage inequality. For example, if returns to 'skill' rise, then women, because they have on average fewer labour market skills than men, will see a fall in their relative earnings. As such rising wage inequality disproportionately penalises women and may act to mask improvements in women's relative earnings position. Given rapidly increasing wage inequality in some countries (especially the UK and US), one may learn more about changes in the labour market status of women by considering the position of women in the male wage distribution. One method of examining this is to look at the distribution of female workers by male earnings deciles. A second method is to examine the percentile ranking of women in the male wage distribution.

Figure 2.8 illustrates the ranking of women in the male earnings distribution in 1977, 1983 and 1991 for GHS weekly earnings and FES hourly earnings data. The x-axis plots male earnings deciles and the y-axis plots the proportion of women in each of these deciles in each period. The line at 0.1 indicates the proportion of women we would expect to find in each decile if women had the same earnings distribution as men. The GHS weekly wage data indicates that in 1978 almost 50 percent of full-time female employees had weekly earnings in the bottom male earnings decile, while only 1 percent of women had earnings in the top decile. Between 1978 and 1988 the position of women in the male distribution had changed little. However, by 1998 there had been a significant improvement in the position of women in the male distribution, with the proportion of women in the bottom of the male earnings decile falling to 29 percent, although only around 3 percent made it into the top male earnings decile. FES weekly wage data gives similar results, and also illustrate that some significant improvement in the position of women in the male wage distribution occurred between 1968 and 1978. When hourly earnings data is used there is less clustering of women at the bottom of the male distribution in all periods, with the proportion of women in the bottom decile falling to just over one-third in 1978 and 16 percent in 1998. However, use of hourly earnings data does not significantly improve the position of women at the top, with only

2 by 1998.

A second method of examining the position of women in the male wage distribution is to assign women a percentile ranking according to the position of their earnings in the male wage distribution. The median percentile ranking of women in the male wage distribution can then be computed. Any change in the median percentile ranking indicates a change in the relative labour market status of women as a result of gender specific changes.

Figure 2.9 graphs changes in the median percentile ranking of women in the male distribution over time. Unlike trends in the mean or median gender earnings ratio, the median percentile ranking of women in the male wage distribution appears to have steadily improved throughout the 1980s, although the biggest changes are still in the late 1980s / early 1990s. Using GHS weekly wage data, we find that in 1978 the median full-time working women earned an amount equivalent only to the 19th percentile man. By 1988 there had been some improvement in her relative position, with her percentile ranking rising to that of the 29th percentile man. By 1998, however, she had improved her ranking in the male earnings distribution markedly, to that of the 38th percentile man. This increase represents a major improvement in the relative position of women in the labour market, as a result of gender specific factors. FES data produces a similar median percentile ranking for women when the weekly wage is used: 13 in 1968 rising to 19 in 1978, 31 in 1988 and 39 in 1998. Using hourly earnings, the median percentile ranking was 18 in 1968 and rising to 44 by 1998.

According to GHS weekly wage data, had women's median percentile ranking remained unchanged at its 1978 level by 1998 the female/male median wage ratio would have fallen from 63.3 to 54.0 percent as a result of increased male wage inequality. In fact the median wage ratio rose to 72.3 percent. This indicates that had it not been for rising wage inequality the median gender wage ratio would have risen further, and that use of aggregate data therefore understates the extent by which women have improved their relative labour market status as a result of gender specific factors.

2.3. Econometric Analysis of Changes in the Gender Wage Gap

The descriptive material of the previous Section makes it evident that the relative wage position of women *vis-a-vis* men shifted markedly since the late 1970s (at least for this sample of full-time men and women). It also makes it clear that analyses based on comparing and contrasting trends in the mean gender gap may be potentially misleading so that econometric analysis should consider the entire wage distribution. In this Section what has shaped the observed trends in the gender wage differential in Britain is more formally consider.

Modelling Procedure

Here regression analysis of microeconomic data for three cross-sections (1978, 1988 and 1998) is used to analyse the change in the gender gap for full-time employees. Simple decompositions, which break down the average gender gap into components due to changing prices or quantities, using a simple earnings function is used. The analysis then goes on to use a full distribution accounting method to implement a decomposition method initially introduced by Juhn, Murphy and Pierce (1993), but translated over to the gender earnings gap context by Blau and Kahn (1992). This method makes an explicit link between the general rise in wage inequality and the change in the gender gap. In this framework, the change in the gender wage gap is decomposed into, first the change in the gap due to women catching up with men in measured labour market skills, second the change in the gap due to changes in returns to skills, third the change due to a rise in inequality for both men and women, which cannot be explained by changes in observed characteristics, and finally the change in the gender gap which has resulted from reduced discrimination.

Using this framework the gender wage gap can partly be explained by differences in male and female labour market skills, and partly by differences in returns to skills by gender. The explanatory variables of interest, which are available from the General Household Survey, are age, education, region, industry and occupational classification. Employer size is also available to us in 1991, and union status is available in 1983. Unfortunately, the General Household Survey does not include any variables which allows us to compute labour market experience. For this reason we therefore supplement this information with data from the British Household Panel Survey for 1990 and 1998.

Simple Regression Models

Table 2.3 reports various wage regressions from our three data sources (Table A2.1 reports means for the data used in the empirical analysis). In Panel (a) we present a set of simple human capital earnings functions (weekly and hourly) including a quadratic in age and education variables for 1978, 1988 and 1998. Panel (b) includes controls for region, industry and occupation for GHS and BHPS, whilst Panel (c) includes the fullest set of controls, also including a set of workplace size dummies, unionization and (for BHPS) a quadratic in work experience.

The simple human capital models tell a very similar story across data sources, for both hourly and weekly earnings. The estimated coefficients on the age and education variables are very similar for the wage equations from different data sources within each sex-year group. Probably the clearest pattern concerns the intertemporal behaviour of returns to education and age, both of which have risen significantly over the 1978 to 1998 time period for both men and women. This is clearly part of the observed rise in wage inequality that has occurred (see also Schmitt, 1995; or Gosling, Machin and Meghir, 1994).

Fuller Regression Models

It may be the case that we are missing a number of important explanatory variables in our wage equations. Panel (b) of Table 2.3 reports models that also include controls for region, industry and occupation, whilst Panel (c) reports our fullest specification that supplements the Panel (b) models with controls for previous work experience, employer size, and the existence of a trade union at work, all of which are of potential importance to the process of wage determination (and may well have different means and different wage effects for men and women). All these variables are available (in addition to those variables already included in the regressions) from the BHPS.

In the Panel (b) models the reported R^2's suggest that about 40-50 percent of the variation in log(wages) can be accounted for by these variables. There are some interesting effects, especially if one considers intertemporal variations in the estimated coefficients. Over and above the rising returns to age and education (which remain robust to the addition of the extra controls), there is some evidence (especially for women) that the wage premium for professionals and managers has risen, and that the wage penalty for unskilled manuals has become larger (in absolute terms). In the Panel (c) models the establishment size, unionization and work experience variables exert a significant impact on wages.

Oaxaca Decompositions

The gender gap can be decomposed into two components: that part of the gender gap which can be explained by differences in measured characteristics, and that part which can be explained by differences in male and female returns to measured characteristics. The theory behind the decomposition is outlined below, and the results are reported in Table 2.4.

If the log wage is determined by :

$$\log w_m = b_m X_m \quad \text{for men}$$

and

$$\log w_f = b_f X_f \quad \text{for women}$$

then

$$\log w_m - \log w_f = (b_m - b_f)\, X_f + (X_m - X_f)\, b_m$$

The results of this decomposition are shown in Table 2.4 and illustrate that, in 1978, for the simple human capital models of Table 2.4 (a), only about 11 percent (FES Weekly) to 18 percent (GHS) of the gender gap can be explained by quantity differences in male and female characteristics. The bulk of the gender gap is explained by differences in returns to male and female characteristics. As expected, when industry, occupation and regional dummies are added, the proportion of the gap explained by differences in characteristics rises, but still only to 27 percent (GHS).

According to the GHS weekly wage data the log wage gap had narrowed from .451 in 1978 to .305 by 1998. That part of the gender gap explained by differences in measured characteristics fell from .083 (or 18 percent) to .025 (8 percent) under the human capital specification. When industry, occupation and regional dummies are added, that part of the gap explained by differences in characteristics falls by a greater amount, from .121 (27 percent) to .026 (8 percent). However, it remains the case that in 1998 the majority of the gender gap (over 90 percent) results from differences in returns to skills by gender. In the fullest BHPS regression models a larger proportion of the variation in wages is explained by characteristics, with differences in experience, unionisation and employer size increasing the proportion of the wage gap explained by characteristics to 48 percent in 1998.

Decomposing Intertemporal Changes in the Gender Gap

Following Blau and Khan (1992), the Juhn, Murphy & Pierce (1993) decomposition is used to analyse the change in the gender gap over time. The decomposition uses the male wage equation to estimate the position of women in the wage structure. This assumes that the regression coefficients are the same for men and women, and requires discrimination to be reflected in the residual only[2]. It further assumes that there is no sex correlated measurement error. The theory behind the decomposition is outlined below.

Suppose for a male worker i in year t wages are given by:

$$Y_{it} = X_{it} B_t + s_t S_{it}$$

where X_{it} is a vector of explanatory variables, B_t is a vector of coefficients, s_t if the male residual standard deviation and S_{it} is the standardized residual. In year t the male female wage gap is then given by:

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2. Note that in the Oaxaca decompositions:

$$Y_m - Y_f = (b_m - b_f) X_f + (X_m - X_f) b_m$$

In the Juhn, Murphy, Pierce decompositions:

$$Y_m = b_m X_m + u_m$$

$$Y_f = b_f X_f + u_f$$

and $\quad Y_m - Y_f = (X_m - X_f) b_m + (u_m - u_f)$

Therefore: $\quad u_m - u_f = (b_m - b_f) X_f$

and therefore the measures of discrimination resulting from the Oaxaca and Juhn, Murphy, Pierce decompositions are identical.

$$D_t = Y_{mt} - Y_{ft} = dX_t B_t + s_t dS_t$$

where Y_{mt} is average log male earnings, Y_{ft} is average log female earnings, dX_t is the average male/female difference in explanatory variables and dS_t is the average difference in male/female standardized residuals from the male wage equation.

Using this model structure the change in the gender pay gap between period 0 and period 1 can be decomposed into:

$$D_1 - D_0 = (dX_1 - dX_0) B_1 + dX_0 (B_1 - B_0) + (dS_1 - dS_0) s_1 + dS_0 (s_1 - s_0)$$

The first term on the RHS may be interpreted as the contribution of changes in differences in female-male labour market skills to the change in the gender earnings gap. The second term measures the contribution of changes in returns to measured labour market skills to the change in the gap. Term three reflects changes in female-male residual differences, resulting from an improvement (or worsening) in the relative labour market position of women, after controlling for changes in female-male differences in measured characteristics and for changes in returns to characteristics. Term four, on the other hand, measures the change in female-male residual inequality, which has resulted from a general rise in inequality not reflected in the change in returns to measured characteristics. Terms one and three together reflect changes in the gender gap which have resulted from gender specific changes. Terms two and four taken together reflect the change in the gender gap which has resulted from changes in observed and unobserved price effects, or in other words from a change in the wage structure.

Descriptive Statistics on Male and Female Wage Structures

Table 2.5 reports some simple descriptive statistics derived from the GHS and BHPS male wage equations in 1978, 1988 and 1998. The male residual standard deviation rises by 28 percent between 1978 and 1998, reflecting an increase in wage inequality which cannot be explained by changes in measured characteristics, or by changes in returns to those characteristics. The female residual standard deviations and mean residuals, computed from the male wage equation, are also reported in Table 2.5. The residual standard deviation also rises for women between 1978 and 1998. The mean female residual fell over the period, indicating a reduction in the unexplained component of the gender gap. This may reflect a reduction in discrimination, or a fall in productivity related unmeasured female-male differences.

The inverse log of the mean female residual gives us a measure of the gender gap after controlling for differences in male and female measured characteristics. The raw GHS data gives us a gender earnings gap of 63.7 percent in 1978, rising to 73.7 percent in 1998 (and to 75.1 percent in the 1998 BHPS). When controls are added for differences in measured human capital the gender earnings gap closes to 69.1 percent in 1978 and 75.6 percent in 1998. Adding further controls for occupation, industry and region reduces the gap even further to 71.9 percent in 1978 and 75.7 percent in 1998. In the full BHPS specification the weekly wage gap (after controls) is as high as 86.3 percent in 1998.

Full Accounting Decompositions

In Table 2.6 the change in the gender gap is decomposed into that change due to changes in the difference between measured male and female characteristics, that due to changes in returns to observed characteristics, and that due to a change in the difference between the mean male and female residual. This third component is further decomposed into the change in the female residual due to changes in gender specific factors, and that part due to the overall change in residual male earnings inequality.

Between 1978 and 1998 the gender log wage gap fell by -.146. Results from the human capital specification in Table 2.6(a) indicate that had gender specific factors acted alone there would have been a much greater decline in the gender wage gap (-.340), as changes in the wage structure served to increase the gender wage gap (by .194). So, had inequality remained at its 1977 level the male/female wage differential would have fallen by more.

Of the gender specific factors, quantity changes in the differences in observed X's reduced the gender log wage gap by -.075. About four-fifths of this reflects changes in age structure, whilst the remainder reflects changes in the structure of education. The change in the 'gap' term (or that part of the gap attributed to differences in male and female residuals) on the other hand accounted for -.199 (or about 150 percent) of the change in the gender gap. This reflects a big reduction either in discrimination or in unobserved differences which are positively related to productivity. As already noted, the wage structure effects all worked against the narrowing of the wage gap. Changes in returns to observables widened the gender gap by .018. Changes in returns to unobservables however had a much greater impact on the gender gap, with the general rise in unexplained inequality raising the gender gap by .176.

Adding controls for occupation, industry and region reduce both the negative change in the gender gap attributed to changes in gender specific factors (-.249) and that attributed to changes in the wage structure (.106). Now quantity differences in observed X's reduce the gap by -.053, with changes in mean age differences still having the dominant impact on reducing the gap, but with changes in regional differences, occupation and industry all having a small impact on reducing the gap. Changes in the difference in the mean male and female residuals have a smaller effect on reducing the gender wage gap (-.196) when these additional controls are added. On the wage structure side, the observed price effect is now smaller and negative (-.039), as a result of changes in returns to occupation and industry helping reduce the gap. The unobserved price effect is also smaller than before (.146), as the change in the standard deviation of the mean male residual is smaller with these additional controls.

The same decomposition was also carried out for the two sub periods 1978 to 1988, and 1988 to 1998. The results are reported in Table 2.6(b). Practically all the closing of the gender gap took place in the second time period. In the first sub period, gender specific factors helped to narrow the pay gap (by -.120 in the human capital specification and -.091 in the full specification) while changes in wage structure negated this change (by .082 in the first specification and .052 in the second), leading to a small net reduction in the gap. The second sub period saw larger reductions in the pay gap due to gender specific factors (-.192 in the first specification and -.154 in the second) while changes in wage structure, while still important, had a smaller impact on increasing the pay gap than between 1978 and 1988.

The same decomposition is carried out in Tables 2.6 c and d using data from the BHPS between1990-98. The change in the gender pay gap using weekly wages is smaller than the change in the wage gap over 1988 to 1998. The pattern of change is however similar when decompositions using the same sets of controls are used. Adding in controls for experience however suggest that changes in levels of and returns to work experience relative to men have had an adverse impact on the wage gap. Table 2.6(d) illustrates the results from this decomposition when hourly wages are used. The fall in the pay gap is larger using the hourly wage measure, reflecting the increase in number of hours worked by women. The contribution of changes in relative characteristics, and returns to those characteristics, to the change in the log wage gap are however similar.

Overall these results illustrate that the sharp rise in male wage inequality that occurred from the late 1970s onwards retarded some of the improvement in women's relative wages. Like some of the US work (e.g. Juhn, Murphy and Pierce, 1993) that stresses that increasing returns to observables like age and education and unobservables like ability underpin the rise in US wage inequality. The results here suggest that the same things have been going on in the UK male wage distribution and that they have set back women's quest for equal wages. Some related UK work (Gosling, Machin and Meghir, 1994) also notes these trends in the UK, but prefers to interpret them as reflecting cohort or generational effects. If it is reasonable to suggest that these cohort effects may have long-lasting effects on relative wages our work seems to suggest that any such permanent shifts in the extent of male wage inequality may well further hinder women's progress towards equal labour market rewards.

2.4. Robustness of Results and Extensions

In this section the robustness of the results obtained are evaluated. The sensitivity of the results to the choice of, first the wage inequality used to carry out the decomposition, second the price measure used and, third the impact of selection into employment on wage equation estimates, are all assessed.

Other Inequality Decompositions

Wage inequality measures are sensitive to choice of wage inequality used.

Variances and standard deviations, for example, give equal weighting to all observations. It is of interest however to see how using alternative measures of wage inequality, which give a different weighting to different points of the wage distribution, impact on our results. Table 2.7 presents the results from the Juhn Murphy Pierce decomposition, were the male residual standard deviation, s_{it}, is replaced by the 90-10 log wage difference as the measure of wage inequality. The results obtained are very similar to those reported in Table 2.6, suggesting that the conclusions drawn are robust to the choice of inequality measure.

Index Number Issues

The results reported so far have been based on decompositions were the "prices" of skills are assumed to be given by the coefficients from the male wage equation. Any differences in returns to skills between men and women are then commonly interpreted as "discrimination". It would be equally valid to assume that the price of skill is given by the coefficients in the female wage equation, and that any divergence in male and female coefficients can alternatively be interpreted as resulting from a system of "patriarchy". It is, of course, likely that the true price of skill lies somewhere between the male and female coefficients. Oaxaca decompositions are sensitive to the choice of skill price. This is discussed in detail in Oaxaca and Ransom (1994) who suggest a range of decompositions based on different price measurements. Table 2.8 reports further decompositions based on the different measures of skill prices suggested by Oaxaca and Ransom. For each of the three time periods, four decompositions are performed using an equation of the form:

$$\log w_m - \log w_f = (b_m - b)\, X_m + (b - b_f)\, X_f + (X_m - X_f)\, b$$

Skill prices are represented by 'b', and in Table 2.8 four different methods of estimating b are used. These are explained in further detail below. The first term in the above equation, and in the first column of Table 2.8, is intended to measure the share to the male female wage gap resulting from "patriarchy". Term two is the share of the wage gap resulting from "discrimination", while the third term measures wage differences resulting from differences in observed characteristics.

The first line of Table 2.8 uses, for each period, the coefficients from the female wage equation to estimate b (ie. $b=b_f$). In this scenario, the second term (ie the part of the wage gap due to "discrimination") is by definition equal to zero. Wage differences are in this case due to differences in characteristics and "patriarchy". The second line uses the male coefficients as the estimates of b (ie $b=b_m$), and in this case term 1 equals zero. In this case, wage differences are attributable to differences in characteristics and "discrimination". The third and fourth lines represent intermediate cases, with b lying between b_m and b_f. The third decomposition is Cotton's decomposition, where b is a weighted average of the male and female coefficients, and the proportions of workers that are male determine the weights. In this case $b=p_m b_m+(1-b_m)b_f$, where p_m is the proportion of male full time employees. Finally, the pooled decomposition estimates b from the coefficients obtained from regressing log wages of all full time workers on characteristics. Of most interest is how the choice of coefficients changes the estimated share of the wage gap explained by differences in characteristics. Our previous models all used $b=b_m$. Comparing these decompositions with those using other measures of skill price we find similar results, with the pooled regression attributing the largest proportion of the wage gap to differences in characteristics and the female wage equation the smallest.

Table 2.8(b) assesses how the change in log wage gap varies according to the type of decomposition used. While there is some variation across the four methods, the differences are relatively small, and the conclusions of the previous analysis therefore appear robust to variations in the chosen measure of skill price.

Selection Issues

So far no attempt has been made to account for the non-random selection of workers into full-time employment. In this section results are reported, in Table 2.9, for GHS wage equations with and without controls for the non-random selection of men and women into full-time work using the basic human capital specification. The selection model used is Heckman's selection correction, where selection into full-time employment is identified by other household income. The Mills ratio is statistically insignificant in all years and the coefficients remain stable in response to these additional controls for selection. The results in the previous analysis do not therefore appear to be affected by sample selection issues.

2.5. Concluding Remarks

Since the late 1970s women have improved their relative wage position compared to men in the UK labour market. For example, among the full-timers that we study in this paper, the weekly wage gap rose from around 64 percent in 1978 up to 74 percent by 1998. After estimating a range of regression models controlling for detailed characteristics we find a weekly wage ratio of about 86 percent in 1998.

Hence, women still seem to be paid substantially less for doing similar jobs and for similar sets of observable characteristics. The main interest of this paper was to document the observed changes, and to ask how this was affected by the sharp rise in wage inequality that occurred in the UK since the end of the 1970s. The results show that much of women's relative wage improvement took place in the late 1980s and 1990s, but that rising wage inequality (part of which reflects increased returns to observed and unobserved skill) over this period had a detrimental impact on the reduction of the male/female wage differential. Had inequality remained at its 1978 level, the model suggests that the gender wage gap would have closed twice as fast (the overall fall in the log wage gap was .146 log points, but had inequality remained at its 1978 level the models predicts that the gap would have fallen by .330 log points).

Table .2.1: Composition of Employment and Gender Earnings Ratios by Education and Age

	1976-78			1986-88			1996-98		
	Men	Women	Gender Earnings Ratio	Men	Women	Gender Earnings Ratio	Men	Women	Gender Earnings Ratio
				All aged 17-59					
Degree	0.07	0.04	.718	0.14	0.11	.740	0.18	0 20	.729
Alevels / Highers	0.11	0.13	.733	0.20	0.21	.757	0.27	0.25	.734
5+ "O"s	0.10	0.09	.607	0.14	0.14	.690	0.14	0.13	.718
1-4 "O"s & below	0.26	0.28	.615	0.27	0.34	.684	0.25	0.29	.722
No quals	0.46	0.46	.633	0.25	0.20	.657	0.16	0.13	.693
				Aged 17-24					
Degree	0.04	0.02	.947	0.06	0.06	.903	0.10	0.15	.953
Alevels/ Highers	0.14	0.13	.887	0.19	0.19	.862	0.27	0.29	.778
5+ "O"s	0.17	0.15	.799	0.21	0.21	.849	0.21	0.20	.845
1-4 "O"s & below	0.36	0.43	.739	0.42	0.48	.814	0.32	0.30	.867
No quals	0.29	0.26	.742	0.12	0.07	.746	0.10	0.05	.773
				Aged 25-34					
Degree	0.11	0.08	.780	0.17	0.18	.829	0.21	0.26	.809
Alevels/ Highers	0.15	0.19	.743	0.24	0.24	.824	0.29	0.27	.798
5+ "O"s	0.12	0.08	.731	0.16	0.15	.792	0.14	0.15	.743
1-4 "O"s & below	0.27	0.29	.652	0.28	0.33	.746	0.29	0.27	.771
No quals	0.35	0.36	.636	0.15	0.10	.691	0.07	0.04	.722
				Aged 35-44					
Degree	0.08	0.03	.755	0.17	0.12	.764	0.21	0.22	.750
Alevels/ Highers	0.11	0.12	.725	0.22	0.22	.764	0.30	0.24	.750
5+ "O"s	0.09	0.06	.527	0.14	0.10	.672	0.13	0.11	.721
1-4 "O"s & below	0.26	0.22	.593	0.22	0.29	.670	0.22	0.29	.721
No quals	0.47	0.57	.587	0.25	0.27	.612	0.14	0.15	.664
				Aged 45-59					
Degree	0.05	0.02	.736	0.13	0.08	.721	0.16	0.13	.708
Alevels/ Highers	0.07	0.10	.704	0.15	0.18	.731	0.23	0.21	.744
5+ "O"s	0.06	0.05	.565	0.10	0.09	.648	0.11	0.09	.723
1-4 "O"s & below	0.22	0.15	.683	0.23	0.25	.647	0.22	0.32	.644
No quals	0.60	0.68	.639	0.38	0.40	.653	0.27	0.25	.778

Notes: Data source is the GHS. The gender earnings ratios based on weekly wages.

Table 2.2: Inequality Measures of Male and Female Earnings

GHS Weekly Earnings

	Men			Women		
	1978	1988	1998	1978	1988	1998
90-10 Log(Wage) Differential	.9151	1.1566	1.3162	.9123	1.1203	1.2740
90-50 Log(Wage) Differential	.4479	.5844	.6541	.4744	.6067	.6379
50-10 Log(Wage) Differential	.4672	.5722	.6621	.4378	.5137	.6361
Reative Mean Deviation	.1477	.1845	.2110	.1430	.1793	.2075
Coefficient of Variation	.4496	.5179	.6022	.3908	.4864	.5861
SD of Logs	.3918	.4775	.5439	.3631	.4532	.5265
Gini Coefficient	.2144	.2615	.2988	.2038	.2505	.2908

FES Weekly Earnings

	Men			Women		
	1978	1988	1998	1978	1988	1998
90-10 Log(Wage) Differential	.9510	1.1900	1.3463	.9559	1.1727	1.2306
90-50 Log(Wage) Differential	.4770	.6022	.6932	.4981	.6163	.6256
50-10 Log(Wage) Differential	.4741	.5878	.6531	.4578	.5563	.6050
Relative Mean Deviation	.1510	.1958	.2190	.1494	.1841	.1975
Coefficient of Variation	.4437	.6082	.7129	.4040	.4877	.5995
SD of Logs	.3932	5061	.5481	3886	.4712	.5035
Gini Coefficient	.2171	.2801	.3110	.2127	.2564	.2782

FES Hourly Earnings

	Men			Women		
	1978	1988	1998	1978	1988	1998
90-10 Log(Wage) Differential	.9555	1.2329	1.3709	.9173	1.1712	1.2126
90-50 Log(Wage) Differential	.4946	.6658	.7473	.5070	.6384	.6355
50-10 Log(Wage) Differential	.4609	.5670	.6236	.4103	.5328	.5772
Relative Mean Deviation	.1567	.2052	.2270	.1471	.1854	.1936
Coefficient of Variation	.4696	.6243	.6913	.4092	.4924	.5701
SD of Logs	.4027	.5157	.5587	.3981	.4831	.4975
Gini Coefficient	.2244	.2895	.3158	.2114	.2590	.2726

Table 2.3 (a): Regression Results: Human Capital Specification

	1978					
	GHS		FES			
Wage Measure	Weekly	Weekly	Weekly	Weekly	Hourly	Hourly
	Male	Female	Male	Female	Male	Female
Age	.097 (.003)	.047 (.004)	.094 (.003)	.040 (.005)	.083 (.003)	.047 (.005)
$Age^2/100$	-.114 (.003)	-.054 (.005)	-.111 (.004)	-.047 (.006)	-.098 (.004)	-.057 (.006)
Years of education	-	-	.016 (.001)	.028 (.002)	.022 (.002)	.028 (.002)
Degree	.465 (.018)	.686 (.033)				
As	.250 (.015)	.371 (.033)				
5+ Os	.206 (.015)	.226 (.025)				
Under 5 Os	.096 (.010)	.108 (.015)				
Constant	3.502 (0.047)	4.019 (0.059)	3.604 (.056)	4.068 (.080)	-.019 (.058)	.306 (.081)
Sample size	5850	2450	4062	1843	4063	1848
R^2	.366	.317	.256	.131	.223	.144

Table 2.3 (a) continued

	1988					
	GHS		FES			
Wage Measure	Weekly	Weekly	Weekly	Weekly	Hourly	Hourly
	Male	Female	Male	Female	Male	Female
Age	.098 (.004)	.073 (.005)	.104 (.005)	.067 (.006)	.091 (.005)	.067 (.006)
$Age^2/100$	-.110 (.005)	-.085 (.007)	-.117 (.006)	-.079 (.008)	-.101 (.006)	-.078 (.008)
Years of education	-	-	.052 (.003)	.065 (.004)	.059 (.003)	.064 (.004)
Degree	.556 (.020)	.694 (.030)				
As	.372 (.019)	.528 (.025)				
5+ Os	.236 (.021)	.313 (.029)				
Under 5 Os	.134 (.017)	.222 (.023)				
Constant	3.565 (.070)	3.688 (.087)	3.120 (.084)	3.335 (.105)	-.538 (.086)	-.329 (.108)
Sample size	3840	2252	3357	1804	3357	1806
R^2	.383	.342	.285	.227	.275	.223

Table 2.3 (a) continued

	1998					
	GHS		FES			
Wage Measure	Weekly	Weekly	Weekly	Weekly	Hourly	Hourly
	Male	Female	Male	Female	Male	Female
Age	.105 (.006)	.094 (.008)	.117 (.006)	.089 (.007)	.107 (.006)	.091 (.007)
$Age^2/100$	-.117 (.008)	-.112 (.011)	-.130 (.008)	-.105 (.010)	-.118 (.008)	-.107 (.010)
Years of education	-	-	.057 (.003)	.068 (.004)	.065 (.003)	.066 (.004)
Degree	.672 (.033)	.786 (.044)	-	-	-	-
As	.355 (.030)	.480 (.044)	-	-	-	-
5+ Os	.130 (.036)	.298 (.051)	-	-	-	-
Under 5Os	.186 (.031)	.224 (.041)				
Constant	3.405 (.117)	3.389 (.142)	2.793 (.110)	2.999 (.132)	-.870 (.112)	-.696 (.130)
Sample size	2424	1471	2649	1599	2650	1600
R^2	.300	.317	.297	.253	.292	.263

Table 2.3 (a): (Continued)

	1990 BHPS			
Wage Measure	Weekly Male	Weekly Female	Hourly Male	Hourly Female
Age	.109	.082	.100	.089
	(.006)	(.009)	(.006)	(.009)
Age^2/100	-.124	-.100	-.111	-.109
	(.008)	(.012)	(.009)	(.013)
Degree	.555	.695	.673	.707
	(.038)	(.052)	(.039)	(.053)
As	.370	.421	.445	.447
	(.032)	(.050)	(.033)	(.053)
5+ Os	.262	.248	.323	.288
	(.034)	(.052)	(.035)	(.051)
Under 5 Os	.155	.174	.185	.201
	(.031)	(.043)	(.030)	(.043)
Constant	4.719	5.050	-.418	-.227
	(.111)	(.146)	(.112)	(.152)
Sample size	1723	1106	1723	1106
R^2	.394	.390	.404	.316

	1998		BHPS	
Wage Measure	Weekly Male	Weekly Female	Hourly Male	Hourly Female
Age	.106	.087	.108	.094
	(.007)	(.008)	(.007)	(.008)
Age^2/100	-.119	-.105	-.121	-.111
	(.007)	(.011)	(.009)	(.011)
Degree	.638	.682	.729	.716
	(.045)	(.055)	(.046)	(.052)
As	.391	.374	.430	.399
	(.038)	(.055)	(.039)	(.052)
5+ OS	.322	.292	.367	.329
	(.043)	(.063)	(.044)	(.060)
Under 5 Os	.236	.214	.242	.226
	(.038)	(.052)	(.038)	(.049)
Constant	4.708	4.948	-.615	-.344
	(.124)	(.154)	(.123)	(.152)
Sample size	1700	1120	1699	1120
R^2	.351	.289	.374	.308

Table 2.3 (b): Regression Results : Full Specification

Wage Measure	1978 GHS Weekly Men	Women	1988 GHS Men	Women	1998 GHS Men	Wome n
Age	.089	.041	.091	.067	.095	.078
	(.002)	(.003)	(.004)	(.005)	(.006)	(.008)
$Age^2/100$	-.105	-.052	-.103	-.078	-.108	-.092
	(.003)	(.005)	(.005)	(.006)	(.008)	(.010)
Degree	.305	.608	.371	.532	.403	.553
	(.021)	(.034)	(.022)	(.032)	(.036)	(.046)
As	.155	.339	.251	.433	.212	.333
	(.015)	(.021)	(.019)	(.026)	(.030)	(.045)
5+ Os	.146	.192	.134	.216	.087	.184
	(.014)	(.024)	(.021)	(.029)	(.034)	(.048)
Under 5 Os	.064	.082	.094	.150	.129	.134
	(.010)	(.016)	(.016)	(.023)	(.029)	(.041)
Regional Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Energy, mining and minerals	.160	.366	.209	.233	.210	.217
	(.038)	(.134)	(.054)	(.067)	(.077)	(.154)
Engineering and vehicles	.132	.389	.091	.171	.233	.179
	(.037)	(.133)	(.052)	(.064)	(.065)	(.133)
Other Manufacturing	.105	.294	.119	.156	.203	.135
	(.038)	(.133)	(.053)	(.063)	(.066)	(.131)
Construction	.096	.231	.117	.121	.141	.101
	(.038)	(.144)	(.054)	(.073)	(.066)	(.144)
Services	.031	. 275	.043	.163	.168	.184
	(.037)	(.132)	(.052)	(.060)	(.068)	(.138)
Transport and communications	.118	.410	.141	.324	.087	.058
	(.038)	(.135)	(.052)	(.068)	(.064)	(.126)
Prof/Manager	.359	.297	.402	.493	.441	.635
	(.026)	(.047)	(.031)	(.071)	(.044)	(.111)
Non-manual (other)	.159	.115	.233	.332	.198	.379
	(.024)	(.037)	(.031)	(.068)	(.044)	(.107)
Personal Services	.057	-.062	-.049	.005	.046	.051
	(.074)	(.043)	(.067)	(.075)	(.100)	(.116)
Skilled manual	.151	.074	.172	.253	.018	.165
	(.022)	(.043)	(.029)	(.072)	(.041)	(.119)
Semi skilled manual	.074	.073	.115	.220	-.049	.170
	(.023)	(.039)	(.031)	(.070)	(.043)	(.111)
Constant	3.426	3.680	3.402	3.303	3.327	3.316
	(.054)	(.142)	(.084	(.111)	(.135)	(.182)
Sample Size	5850	2450	3840	2252	2424	1471
R^2	.443	.399	.470	.457	.415	.442

Notes: 1. As for Table 2.3 (a).
2. Omitted occupation group is unskilled manuals and the omitted industry group is agriculture.

Table 2.3(b) continued

	1990 BHPS				1998 BHPS			
Wage measure	Weekly		Hourly		Weekly		Hourly	
	Men	Women	Men	Women	Men	Women	Men	Women
Age	.089	.069	.080	.076	.093	.076	.095	.082
	(.006)	(.007)	(.006)	(.009)	(.006)	(.008)	(.006)	(.008)
$Age^2/100$	-.102	-.085	-.088	-.095	-.107	-.092	-.108	-.098
	(.008)	(.011)	(.008)	(.012)	(.008)	(.010)	(.008)	(.010)
Degree	.334	.444	.376	.428	.391	.432	.407	.425
	(.039)	(.056)	(.040)	(.059)	(.043)	(.057)	(.044)	(.056)
As	.198	.253	.225	.255	.231	.212	.236	.209
	(.031)	(.054)	(.031)	(.058)	(.034)	(.053)	(.033)	(.051)
5+ Os	.132	.099	.163	.115	.181	.124	.197	.133
	(.031)	(.052)	(.032)	(.054)	(.037)	(.060)	(.037)	(.058)
Under 5 Os	.074	.035	.089	.041	.142	.075	.137	.066
	(.028)	(.043)	(.028)	(.045)	(.034)	(.051)	(.033)	(.049)
Energy, mining	.134	.005	.219	.034	.145	.251	.246	.270
and minerals	(.041)	(.076)	(.040)	(.074)	(.042)	(.070)	(.040)	(.067)
Engineering and	-.008	-.084	.075	-.074	.069	.162	.155	.170
vehicles	(.035)	(.068)	(.036)	(.069)	(.037)	(.064)	(.038)	(.061)
Other	-.036	-.229	.021	-.214	-.015	.024	.060	.063
Manufacturing	(.037)	(.071)	(.038)	(.072)	(.039)	(.066)	(.040)	(.063)
Construction	-.063	-.283	-.020	-.292	-.016	-.130	.034	-.093
	(.050)	(.197)	(.038)	(.198)	(.044)	(.116)	(.045)	(.121)
Services	-.169	-.385	-.130	-.365	-.223	-.150	-.163	-.162
	(.040)	(.069)	(.041)	(.073)	(.040)	(.055)	(.040)	(.053)
Transport and	.010	-.163	.097	-.116	-.043	.079	.045	.098
communications	(.035)	(.061)	(.037)	(.063)	(.035)	(.049)	(.036)	(.046)
Prof/Manager	.538	.595	.568	.596	.547	.481	.596	.504
	(.054)	(.109)	(.054)	(.116)	(.061)	(.100)	(.058)	(.093)
Non-manual	.299	.389	.361	.423	.344	.217	.416	.254
	(.050)	(.104)	(.050)	(.105)	(.059)	(.097)	(.056)	(.090)
Personal Services	.059	.018	.056	.042	-.016	-.027	.041	.018
	(.112)	(.110)	(.104)	(.113)	(.087)	(.102)	(.083)	(.096)
Skilled manual	.241	.265	.224	.250	.220	.158	.187	.054
	(.047)	(.113)	(.047)	(.115)	(.059)	(.110)	(.055)	(.097)
Unskilled Manual	.122	.207	.127	.205	.140	.014	.129	-.014
	(.050)	(.112)	(.050)	(.113)	(.062)	(.103)	(.058)	(.096)
Constant	5.090	5.439	-.058	.120	4.959	5.197	-.405	-.066
	(.117)	(.173)	(.113)	(.181)	(.131)	(.172)	(.124)	(.168)
Regional Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample Size	1723	1106	1723	1106	1700	1120	1700	1120
R^2	.506	.481	.534	.478	.479	.460	.527	.489

Notes: 1. As for Table 2.3 (a).

2. Omitted occupation group is unskilled manuals and the omitted industry group is agriculture.

Table 2.3 (c): Regression Results : Full Specification

	1990 BHPS				1998 BHPS			
Wage Measure	Weekly Men	Weekly Women	Hourly Men	Hourly Women	Weekly Men	Weekly Women	Hourly Men	Hourly Women
Age	.091	.064	.087	.072	.091	.061	.092	.063
	(.008)	(.008)	(.007)	(.009)	(.009)	(.009)	(.009)	(.009)
$Age^2/100$	-.001	-.077	-.098	-.087	-.001	-.075	-.104	-.076
	(.000)	(.011)	(.010)	(.012)	(.000)	(.011)	(.011)	(.011)
Degree	.329	.400	.369	.380	.381	.411	.387	.396
	(.039)	(.055)	(.040)	(.059)	(.043)	(.053)	(.043)	(.051)
As	.187	.213	.213	.216	.216	.196	.212	.186
	(.031)	(.050)	(.031)	(.054)	(.034)	(.048)	(.033)	(.046)
5+ Os	.132	.081	.160	.096	.178	.111	.184	.112
	(.031)	(.049)	(.032)	(.051)	(.037)	(.054)	(.038)	(.051)
Under 5 Os	.077	.035	.091	.042	.140	.061	.128	.045
	(.028)	(.040)	(.027)	(.042)	(.033)	(.046)	(.033)	(.043)
Energy, mining and	.108	-.006	.192	.027	.120	.184	.217	.200
minerals	(.040)	(.069)	(.040)	(.068)	(.040)	(.065)	(.039)	(.063)
Engineering and vehicles	-.023	-.077	.067	-.063	.040	.130	.130	.147
	(.036)	(.064)	(.036)	(.065)	(.036)	(.056)	(.036)	(.054)
Other Manufacturing	-.042	-.205	.024	-.188	-.034	-.013	.042	.029
	(.037)	(.065)	(.038)	(.067)	(.038)	(.058)	(.039)	(.055)
Construction	-.048	-.186	.005	-.186	-.006	-.076	.055	-.036
	(.050)	(.162)	(.049)	(.161)	(.042)	(.124)	(.042)	(.119)
Services	-.127	-.306	-.074	-.286	-.200	-.130	-.121	-.142
	(.041)	(.064)	(.042)	(.067)	(.039)	(.049)	(.039)	(.046)
Transport and	.001	-.130	.090	-.081	-.038	.063	.054	.077
communications	(.035)	(.055)	(.036)	(.058)	(.033)	(.042)	(.034)	(.040)
Prof/Manager	.497	.535	.535	.530	.531	.437	.578	.459
	(.054)	(.098)	(.054)	(.100)	(.060)	(.111)	(.055)	(.108)
Non-manual	.244	.305	.305	.330	.308	.177	.373	.212
	(.050)	(.093)	(.050)	(.094)	(.059)	(.109)	(.054)	(.106)
Personal Services	.008	.055	.008	.079	-.047	-.002	.005	.039
	(.108)	(.098)	(.100)	(.099)	(.085)	(.114)	(.079)	(.111)
Skilled manual	.189	.186	.171	.159	.212	.132	.176	.068
	(.048)	(.103)	(.047)	(.103)	(.058)	(.117)	(.053)	(.113)
Unskilled Manual	.062	.132	.067	.118	.114	-.055	.098	-.091
	(.051)	(.099)	(.050)	(.100)	(.061)	(.113)	(.056)	(.109)
Size: 1-2 Employees	-.393	-.413	-.425	-.478	-.361	-.331	-.419	-.322
	(.088)	(.098)	(.085)	(.115)	(.093)	(.105)	(.099)	(.109)
Size: 3-24 Employees	-.151	-.159	-.152	-.157	-.173	-.113	-.205	-.102
	(.032)	(.038)	(.032)	(.039)	(.041)	(.036)	(.039)	(.036)
Size: 25-99 Employees	-.024	-.056	-.043	-.049	-.122	-.020	-.160	-.007
	(.028)	(.037)	(.028)	(.037)	(.039)	(.034)	(.038)	(.033)
Size: 100-999 Employees	-.023	-.023	-.031	-.026	-.026	.041	-.033	.050
	(.027)	(.035)	(.026)	(.035)	(.037)	(.033)	(.036)	(.033)
Trade Union at Workplace	.014	.101	.041	.106	-.024	.050	.006	.071
	(.021)	(.025)	(.021)	(.026)	(.021)	(.024)	(.021)	(.025)
Years FT work experience	-.002	.006	-.006	.005	.000	.012	-.000	.015
	(.003)	(.004)	(.003)	(.004)	(.004)	(.004)	(.004)	(.004)
Years FT work	.003	-.016	.013	.014	.000	-.022	-.002	-.029
$experience^2/100$	(.008)	(.010)	(.008)	(.011)	(.009)	(.009)	(.008)	(.009)
Years PT work experience	-.037	-.035	-.024	-.033	-.006	-.039	-.041	-.038
	(.027)	(.008)	(.028)	(.008)	(.020)	(.006)	(.021)	(.006)
Years PT work	.109	.002	-.028	.143	-.287	.169	.040	.173
$experience^2/100$	(.332)	(.000)	(.342)	(.046)	(.194)	(.029)	(.192)	(.028)
Constant	5.187	5.571	-.049	.252	5.129	5.487	-.193	.289
	(.132)	(.162)	(.128)	(.169)	(.172)	(.191)	(.162)	(.191)
Regional Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample Size	1723	1106	1723	1106	1700	1120	1700	1120
Adjusted R^2	.531	.543	.561	.541	.505	.532	.562	.561

Notes: 1. As for Table 2.3 (b).
2. The omitted establishment size variable is 1-2 Employees.

Table 2.4: Decomposing the Gender Gap

GHS Weekly Wages

	1978		1988		1998	
	Human Capital	Human Capital SIC,SOC Region	Human Capital	Human Capital SIC,SOC Region	Human Capital	Human Capital SIC,SOC Region
Log w_m - Log w_f	.451	.451	.413	.413	.305	.305
$(b_m - b_f) X_f$	.369	.330	.327	.308	.280	.279
$(X_m - X_f) b_m$	.083	.121	.086	.106	.025	.026

FES Weekly Wages

	1978	1988	1998
	Human Capital	Human Capital	Human Capital
log w_m - log w_f	.485	.437	.343
$(b_m - b_f) X_f$	.431	.376	.321
$(X_m - X_f) b_m$	.053	.061	.022

FES Hourly Wages

	1978	1988	1998
	Human Capital	Human Capital	Human Capital
Log w_m - Log w_f	.361	.312	.237
$(b_m - b_f) X_f$	.3121	.256	.217
$(X_m - X_f) b_m$	.049	.056	.020

Table 2.4 (continued): Decomposing the Gender Gap

BHPS Weekly Wages

	1990			1998		
	Human Capital	Human Capital SIC,SOC Region	Human Capital SIC,SOC Region, experience, TU & Size	Human Capital	Human Capital SIC,SOC Region	Human Capital SIC,SOC Region, experience, TU & Size
Log w_m - log w_f	.328	.328	.328	.259	.259	.259
$(b_m - b_f) X_f$	.271	.293	.236	.248	.258	.132
$(X_m - X_f) b_m$	.057	.035	.092	.011	.001	.126

BHPS Hourly Wages

	1990			1998		
	Human Capital	Human Capital SIC,SOC Region	Human Capital SIC,SOC Region, experience, TU & Size	Human Capital	Human Capital SIC,SOC Region	Human Capital SIC,SOC Region, experience, TU & Size
log w_m - log w_f	.224	.224	.224	.153	.153	.153
$(b_m - b_f) X_f$	.167	.223	.155	.141	.190	.089
$(X_m - X_f) b_m$	.057	.002	.069	.012	-.037	.064

Table 2.5 : Descriptive Statistics: Standard Deviations and Residuals from the Male Wage Distribution (GHS and BHPS)

Weekly wages

	No Explanatory Variables	Human Capital Only	Human Capital, SIC, SOC, Region	Human Capital, SIC, SOC, Region, Trade Union, Employer Size
Male Residual Standard Deviation				
1978 GHS	.391	.311	.292	-
1988 GHS	.474	.372	.345	-
1990 BHPS	.494	.386	.348	.339
1998 GHS	.549	.460	.420	-
1998 BHPS	.500	.404	.364	.357
Female Residual Standard Deviation				
1978 GHS	.364	.326	.314	-
1988 GHS	.453	.386	.357	-
1990 BHPS	.472	.409	.364	.337
1998 GHS	.528	.450	.413	-
1998 BHPS	.456	.387	.349	.390
Mean Female Residual				
1978 GHS	-.451	-.369	-.330	-
1988 GHS	-.413	-.327	-.308	-
1990 BHPS	-.318	-.282	-.297	-.238
1998 GHS	-.305	-.280	-.279	-
1998 BHPS	-.286	-.246	-.251	-.147
Gender Earnings Ratios after Controls				
1978 GHS	63.7	69.1	71.9	-
1988 GHS	66.2	72.1	73.5	-
1990 BHPS	72.8	75.4	74.3	78.8
1998 GHS	73.7	75.6	75.7	-
1998 BHPS	75.1	78.2	77.8	86.3

Hourly Wages

	No Explanatory Variables	Human Capital Only	Human Capital, SIC, SOC, Region	Human Capital, SIC, SOC, Region, Trade Union, Employer Size
Male Residual Standard Deviation				
1990 BHPS	.515	.399	.353	.341
1998 BHPS	.525	.414	.364	.353
Female Residual Standard Deviation				
1990 BHPS	.485	.413	.367	.350
1998 BHPS	.472	.391	.348	.344
Mean Female Residual				
1990 BHPS	-.212	-.175	-.222	-.154
1998 BHPS	-.185	-.142	-.184	-.097
Gender Earnings Ratios after Controls				
1990 BHPS	80.9	83.9	80.1	85.7
1998 BHPS	83.1	86.8	83.2	90.8

Table 2.6(a): Decomposition of the Change in the Gender Gap, 1978-1998 (GHS)

	No Controls	Human Capital	Human Capital, SIC, SOC, Region
Change in Differential	-.1462	-.1462	-.1462
Observed X's		-.0747	-.0523
age		-.0602	-.0098
education		-.0145	-.0002
region			.0065
SOC			- .0005
SIC			
Observed Prices		.0175	-.0393
Age		.0178	.0115
Education		-.0003	-.0014
region			.0027
SOC			-.0501
SIC			.0005
Gap	-.3296	-.2652	-.1964
Unobserved Prices	.1833	.1761	.1455
Sum Gender Specific	-.3296	-.3399	-.2487
Sum Wage Structure	.1833	.1936	.1062

Table 2.6(b): Decomposition of the Change in the Gender Gap 1978-1988 and 1988-1998 (GHS)

	1978-88			1988-98		
	No Controls	Human Capital	Human Capital, SIC, SOC Region	No Controls	Human Capital	Human Capital, SIC,SOC Region
Change in Differential	-.0381	-.0381	-.0381	-.1082	-.1082	-.1082
Observed X's		-.0059	-.0074		-.0669	-.0587
age		-.0099	-.0096		-.0499	-.0423
education		.0040	.0030		-.0171	-.0100
Region			-.0011			.0011
SOC			.0030			-.0074
SIC			-.0016			-.0008
Observed Prices		.0090	-.0083		.0066	-.0210
age		.0103	.0076		.0071	.0034
Education		-.0013	-.0020		-.0005	-.0023
region			.0026			.0008
SOC			-.0127			-.0272
SIC			-.0012			.0036
Gap	-.1343	-.1138	-.0831	-.1739	-.1246	-.0952
Unobserved Prices	.0962	.0726	.0607	.0657	.0768	.0668
Sum Gender Specific	-.1343	-.1197	-.0905	-.1739	-.1915	-.1539
Sum Wage Structure	.0962	.0816	.0524	.0657	.0834	.0458

Table 2.6(c): Decomposition of the Change in the Gender Gap 1990-1998 (BHPS)

Weekly Wages

	No Controls	Human Capital	Human Capital, SIC,SOC Region	Human Capital, SIC, SOC, Region,TU at Work, Employer Size, Work Experience
Change in Differential	-.0694	-.0694	-.0694	-.0694
Observed X's		-.0396	-.0402	-.0123
Age		-.0340	-.0274	-.0267
Education		-.0056	-.0031	-.0029
Region			-.0032	-.0021
SOC			-.0087	-.0095
SIC			-.0012	.0010
TU				.0024
Size				-.0055
Work Experience				.0308
Observed Prices		-.0066	.0061	.0463
Age		-.0000	-.0004	-.0028
Education		-.0066	-.0052	-.0048
Region			-.0032	.0007
SOC			-.0149	-.0078
SIC			.0256	.0197
TU				-.0005
Size				.0012
Work Experience				.0572
Gap	-.0733	-.0360	-.0488	-.1163
Unobserved Prices	.0039	.0129	.0136	.0129
Sum Gender Specific	-.0733	-.0756	-.0890	-.1286
Sum Wage Structure	.0039	.0063	.0197	.0592

Table 2.6(d): Decomposition of the Change in the Gender Gap 1990-1998 (BHPS)

Hourly Wages

	No Controls	Human Capital	Human Capital, SIC,SOC Region	Human Capital, SIC, SOC Region, TU at Work Employer Size and Work Experience
Change in Differential	-.0710	-.0710	-.0710	-.0710
Observed X's		-.0435	-.0398	-.0229
Age		-.0355	-.0285	-.0288
Education		-.0079	-.0041	-.0038
Region			.0012	-.0027
SOC			-.0056	-.0066
SIC			.0000	.0009
TU				-.0006
Size				-.0060
Work Experience				.0247
Observed Prices		-.0023	.0015	.0182
Age		.0027	.0025	.0020
Education		-.0050	-.0040	-.0033
Region			.0027	.0005
SOC			-.0253	-.0170
SIC			.0000	.0204
TU				-.0005
Size				.0204
Work Experience				.0130
Gap	-.0751	-.0319	-.0397	-.0714
Unobserved Prices	.0041	.0066	.0070	.0051
Sum Gender Specific	-.0751	-.1029	-.0795	-.0943
Sum Wage Structure	.0041	.0043	.0085	.0233

Table 2.7: Decomposing Using the 90-10 Log Differecence of the Residual from the Male Wage Distribution, GHS Weekly Wages

	No Dummy Variables	Human Capital	Human Capital, SIC, SOC,Region
1978-98			
Change in Differential	-.1462	-.1462	-.1462
Observed X's		-.0747	-.0559
Observed Prices		.0175	-.0410
Gap	-.3479	-.2685	-.1889
Unobserved Prices	.2016	.1794	.1395
1978-88			
Change in Differential	-.0381	-.0381	-.0493
Observed X's		-.0059	-.0017
Observed Prices		-.0090	-.0061
Gap	-.1553	-.1261	-.1311
Unobserved Prices	.1172	.0848	.0897
1988-98			
Change in Differential	-.1082	-.1082	-.1082
Observed X's		-.0670	-.0608
Observed Prices		.0066	-.0198
Gap	-.1695	-.1161	-.0077
Unobserved Prices	.0613	.0683	.0495

Table 2.8(a): Further Oaxaca Decompositions

1978	Log Wage Gap = .451		
	Term 1: $(b_m - b)X_m$	Term 2: $(b - b_f)X_f$	Term 3: $(X_m - X_f)b$
Female Wage Equation ($b = b_f$)	.375	0	.077
Male Wage Equation ($b = b_m$)	0	.330	.121
Cotton ($b = p_m b_m + (1-p_m) b_f$)	.111	.233	.108
Pooled ($b = b_a$)	.070	.167	.215

1988	Log Wage Gap = .413		
	Term 1: $(b_m - b)X_m$	Term 2: $(b - b_f)X_f$	Term 3: $(X_m - X_f)b$
Female Wage Equation ($b = b_f$)	.352	0	.062
Male Wage Equation ($b = b_m$)	0	.327	.086
Cotton ($b = p_m b_m + (1-p_m) b_f$)	.130	.194	.089
Pooled ($b = b_a$)	.085	.145	.183

1998	Log Wage Gap = .305		
	Term 1: $(b_m - b)X_m$	Term 2: $(b – b_f)X_f$	Term 3: $(X_m - X_f)b$
Female Wage Equation ($b = b_f$)	.311	0	-.006
Male Wage Equation ($b = b_m$)	0	.288	.017
Cotton ($b = p_m b_m + (1-p_m) b_f$)	.118	.179	.008
Pooled ($b = b_a$)	.086	.142	.077

Note: All decompositions use GHS weekly wage data, regressions include age, age squared, education, region, SICs and SOCs.

Table 2.8(b): Change in Log Wage Gap: Oaxaca Decompositions

1978-1998	Change in Log Wage Gap = -.146		
	Term 1: Change $(b_m - b)X_m$	Term 2: Change $(b - b_f)X_f$	Term 3: Change $(X_m - X_f)b$
Female Wage Equation $(b = b_f)$	-.064	0	-.083
Male Wage Equation $(b = b_m)$	0	-.042	-.104
Cotton $(b = p_m b_m + (1-p_m) b_f)$	.007	-.054	-.100
Pooled $(b = b_a)$	.016	-.025	-.138
1978-1988	**Change in Log Wage Gap = -.038**		
	Term 1: Change $(b_m - b)X_m$	Term 2: Change $(b - b_f)X_f$	Term 3: Change $(X_m - X_f)b$
Female Wage Equation $(b = b_f)$	-.023	0	-.015
Male Wage Equation $(b = b_m)$	0	-.003	-.035
Cotton $(b = p_m b_m + (1-p_m) b_f)$	.019	-.039	-.019
Pooled $(b = b_a)$	.015	-.022	-.032
1988-1998	**Change in Log Wage Gap = -.088**		
	Term 1: Change $(b_m - b)X_m$	Term 2: Change $(b - b_f)X_f$	Term 3: Change $(X_m - X_f)b$
Female Wage Equation $(b = b_f)$	-.041	0	-.068
Male Wage Equation $(b = b_m)$	0	-.039	-.069
Cotton $(b = p_m b_m + (1-p_m) b_f)$	-.012	-.015	-.081
Pooled $(b = b_a)$	.001	-.003	-.106

Note: Decompositions use GHS weekly wage data, regressions include age, age squared, education, region, SIC & SOC.

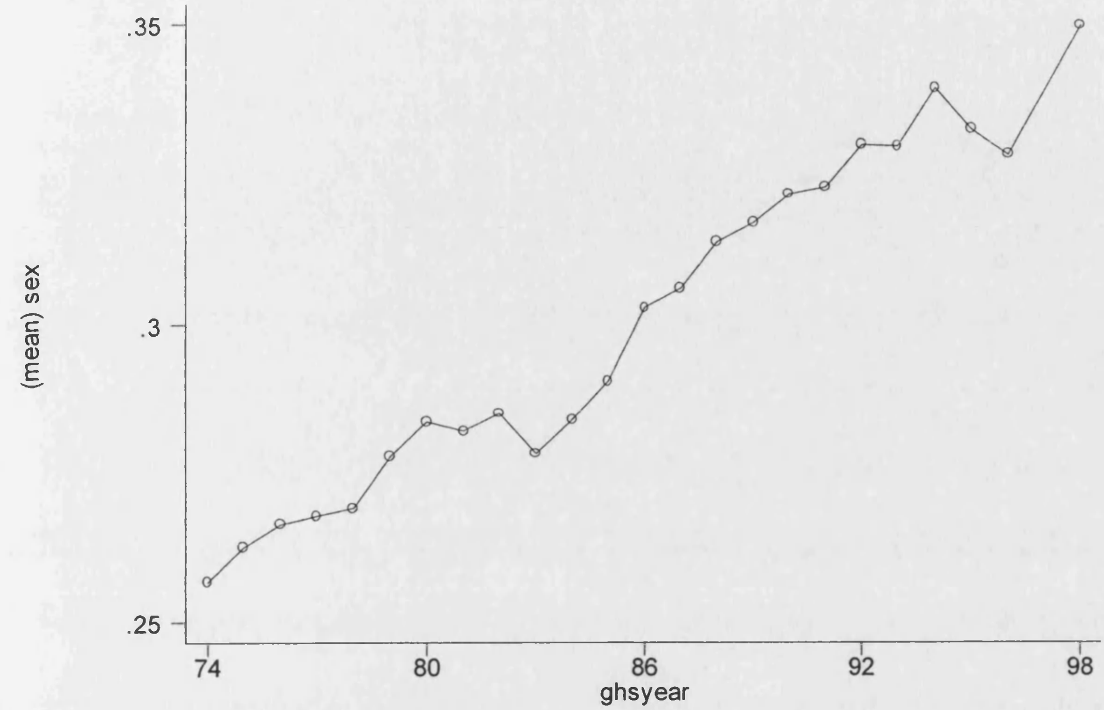
Table 2.9: Basic GHS Weekly Wage Equations With Selection Corrections

	1978 Men		1988 Men		1998, Men	
Age	.097 (.003)	.095 (.003)	.098 (.004)	.096 (.007)	.105 (.006)	.099 (.029)
$Age^2/100$	-.114 (.003)	-.111 (.004)	-.110 (.005)	-.108 (.009)	-.117 (.008)	-.110 (.037)
Degree	.465 (.018)	.4665 (.019)	.556 (.020)	.575 (.039)	.672 (.033)	.660 (.096)
As	.250 (.015)	.249 (.016)	.372 (.019)	.384 (.032)	.355 (.030)	.347 (.084)
5+ Os	.206 (.015)	.205 (.017)	.236 (.021)	.264 (.032)	.130 (.036)	.160 (.079)
Under 5 Os	.096 (.010)	.088 (.013)	.134 (.017)	.1553 (.027)	.186 (.031)	.176 (.071)
Constant	3.502 (0.047)	3.604 (0.078)	3.565 (.070)	3.576 (.159)	3.405 (.117)	3.543 (.721)
Mills Ratio		-.145 (.078)		.043 (.078)		-.079 (.313)
	1978 Women		1988 Women		1998 Women	
Age	.047 (.004)	.057 (.026)	.073 (.005)	.071 (.013)	.094 (.008)	.101 (.015)
$Age^2/100$	-.054 (.005)	-.065 (.031)	-.085 (.007)	-.083 (.018)	-.112 (.011)	-.119 (.019)
Degree	.686 (.033)	.635 (.140)	.694 (.030)	.809 (.192)	.786 (.044)	.941 (.244)
As	.371 (.033)	.330 (.111)	.528 (.025)	.619 (.150)	.480 (.044)	.568 (.172)
5+ Os	.226 (.025)	.209 (.062)	.313 (.029)	.406 (.129)	.298 (.051)	.399 (.154)
Under 5 Os	.108 (.015)	.084 (.069)	.222 (.023)	.298 (.113)	.224 (.041)	.295 (.122)
Constant	4.019 (0.059)	3.987 (0.138)	3.688 (.087)	3.524 (.329)	3.389 (.142)	2.961 (.597)
Mills Ratio		-.117 (.300)		.168 (.293)		.185 (.306)

Notes:

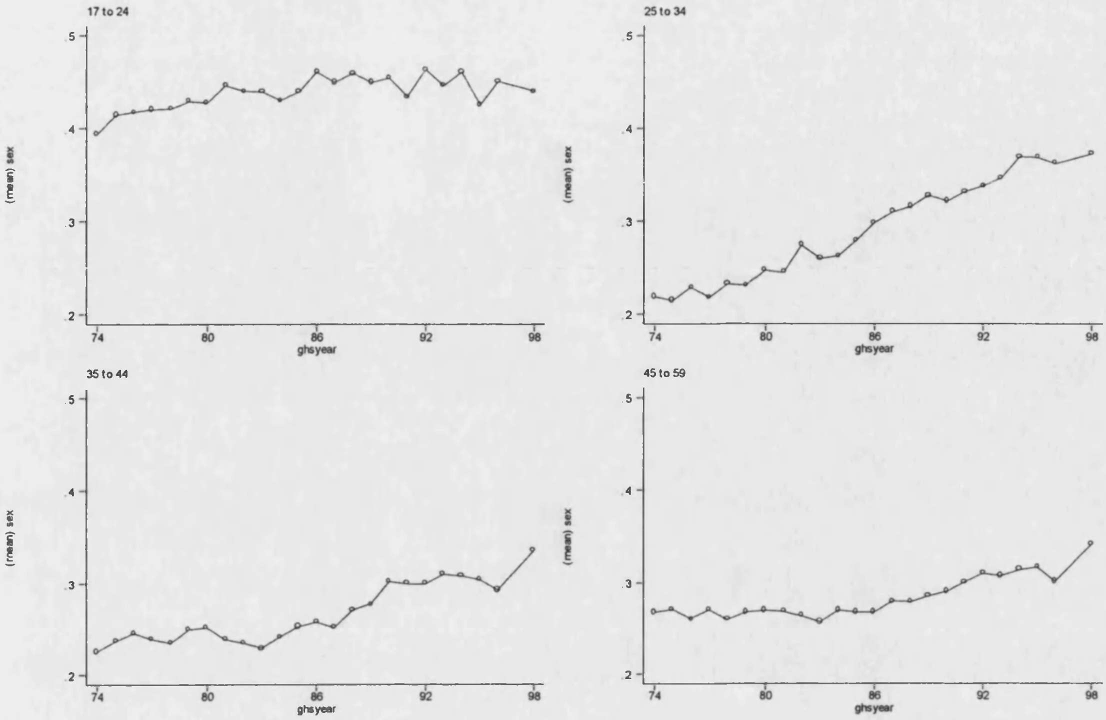
1. The dependent variable is log(weekly wages) from GHS.
2. The Mill's ratio is from a probit model of full-time employment, which includes all right-hand side variables in the wage equation, plus other household income(/1000).

Figure 2.1: Female Share of Full time Employment (GHS)



Source: General Household Survey

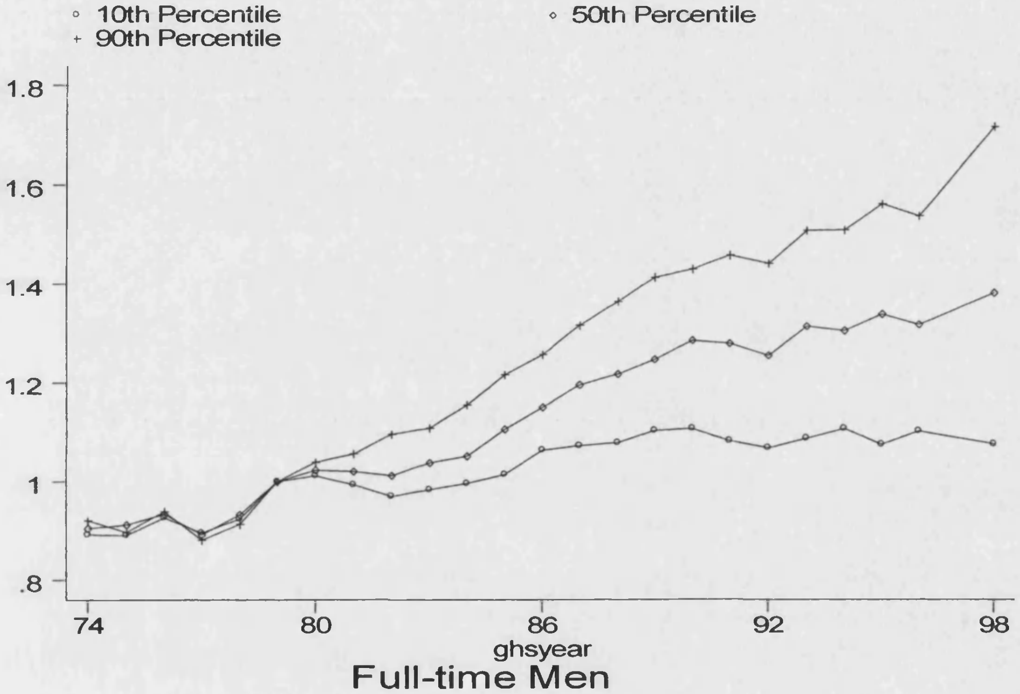
Figure 2.2: Female Share of Full-time Employment by Age Group



Source: General Household Survey

Figure 2.3: Indexed Real Weekly Earnings for the 10th, 50th and 90th Percentile Full-time Men and Women (1979=100)

GHS



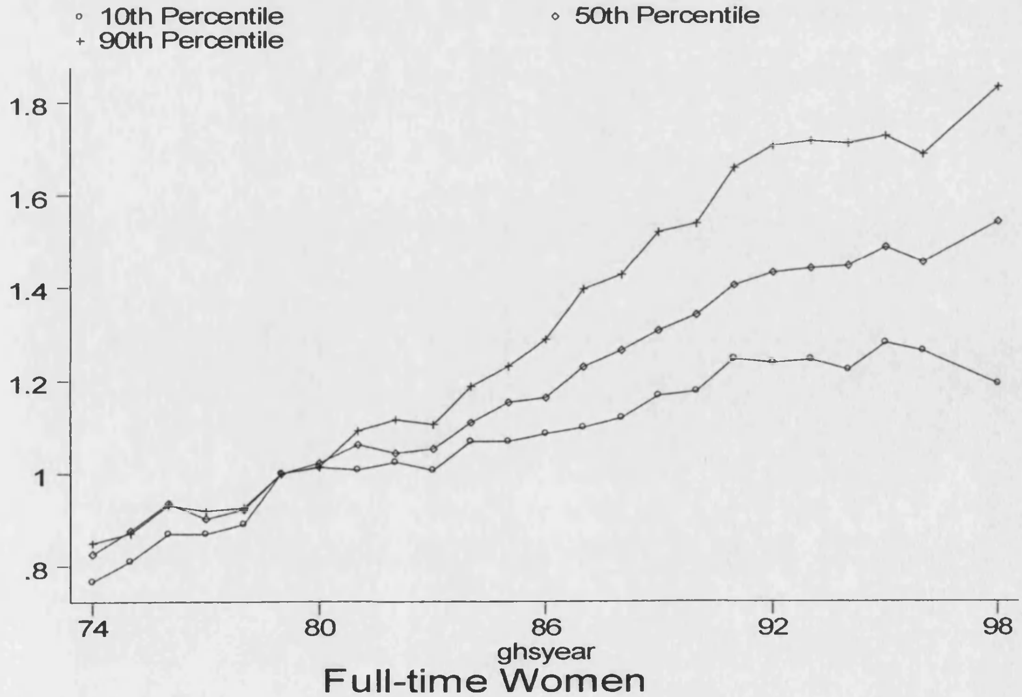
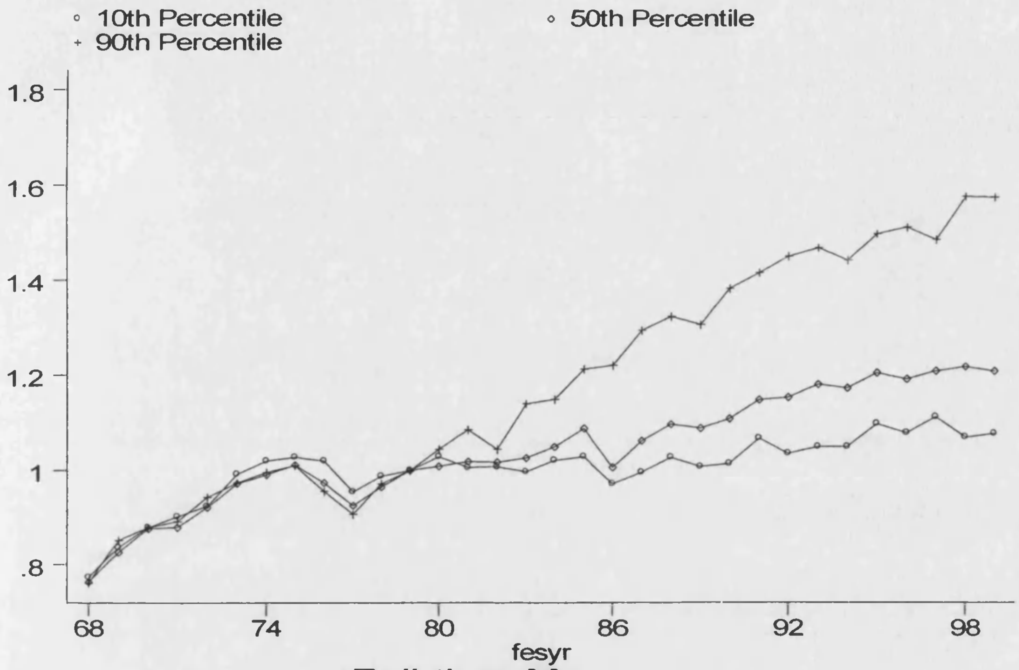
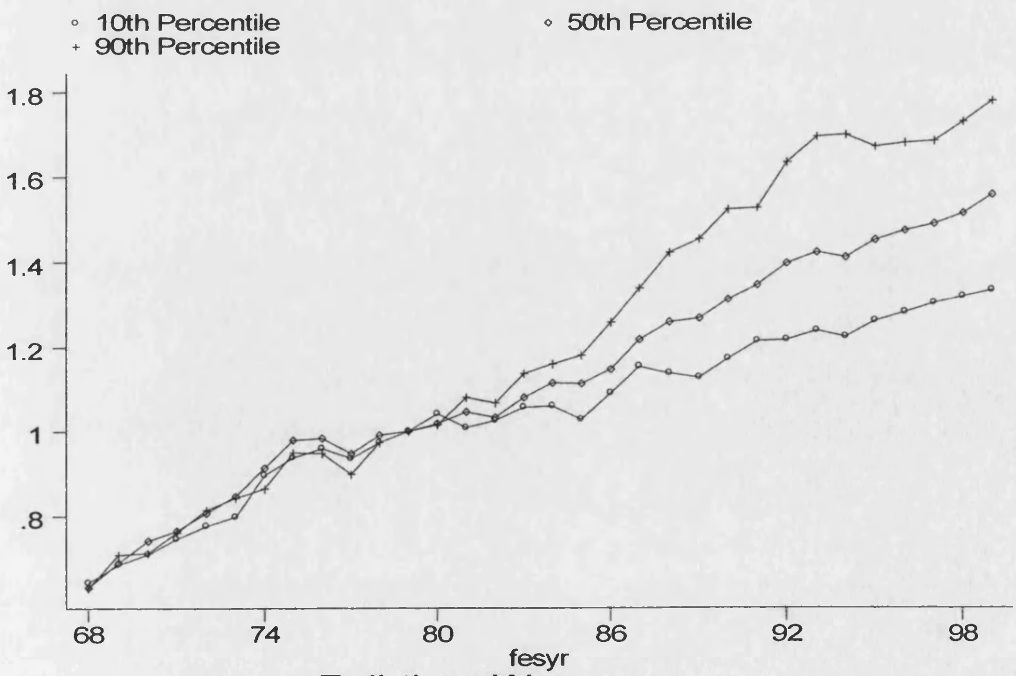


Figure 2.3 (continued)

FES Weekly Wage



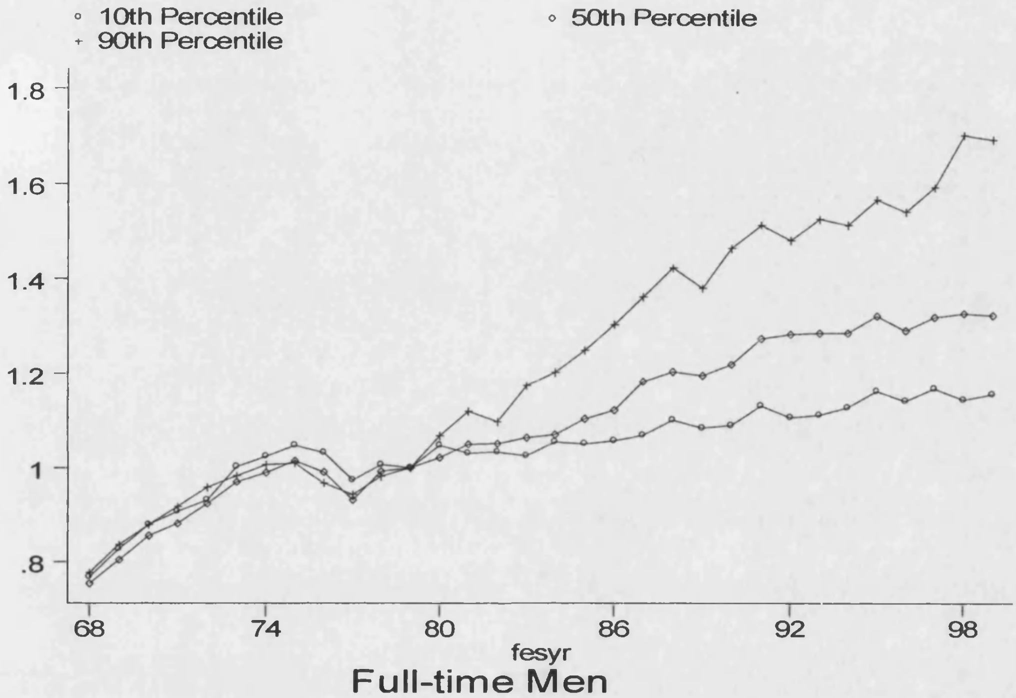
Full-time Men



Full-time Women

Figure 2.3 (continued)

FES Hourly Wage



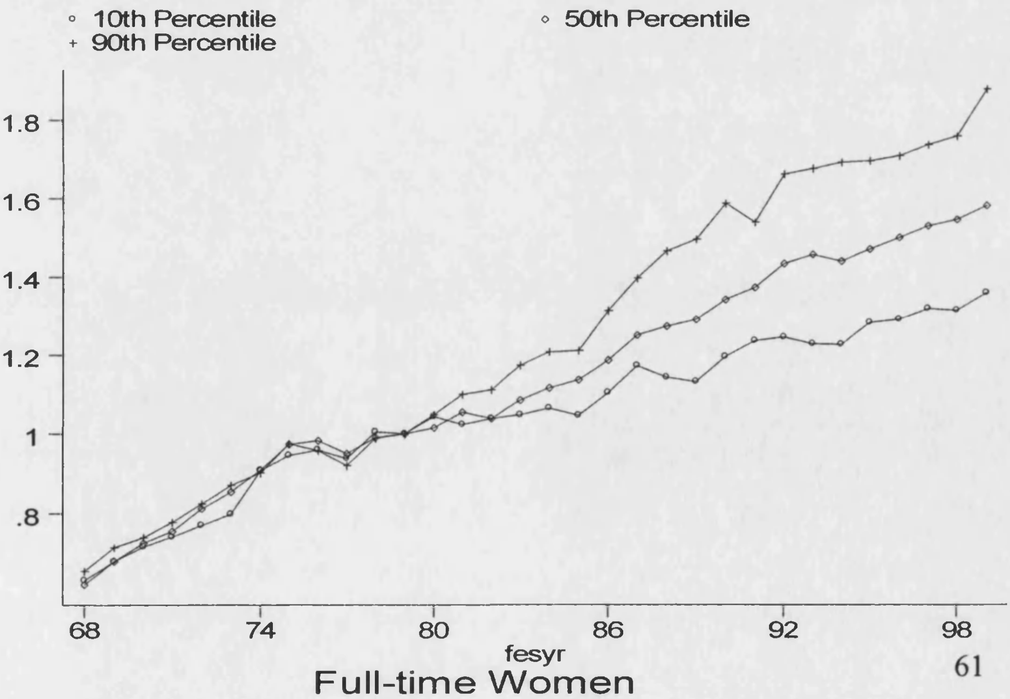
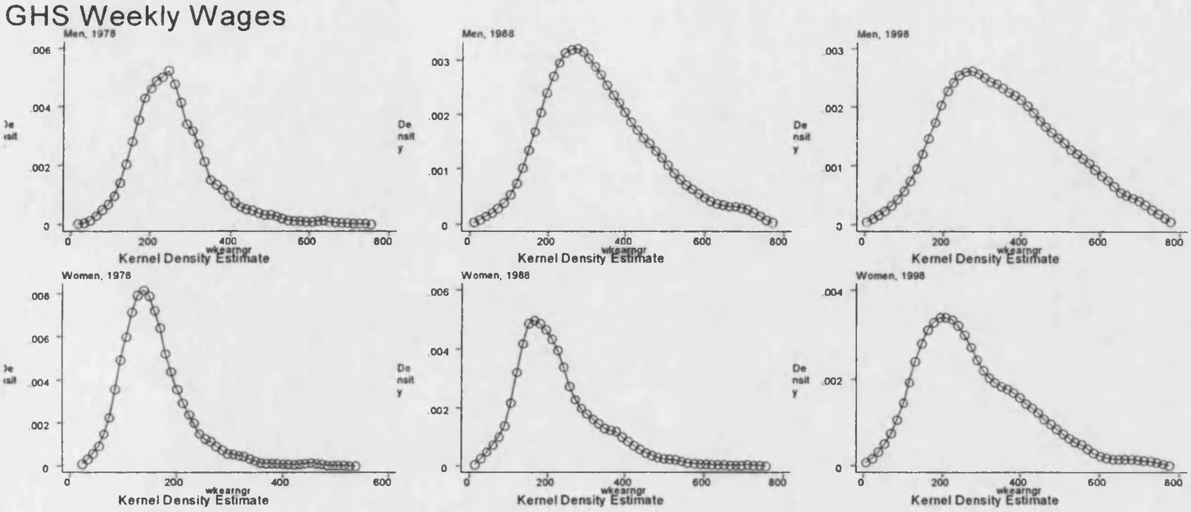


Figure 2.4: Kernel Density Estimates of the Male and Female Wage Distribution

GHS Weekly Wages



FES Weekly Wages

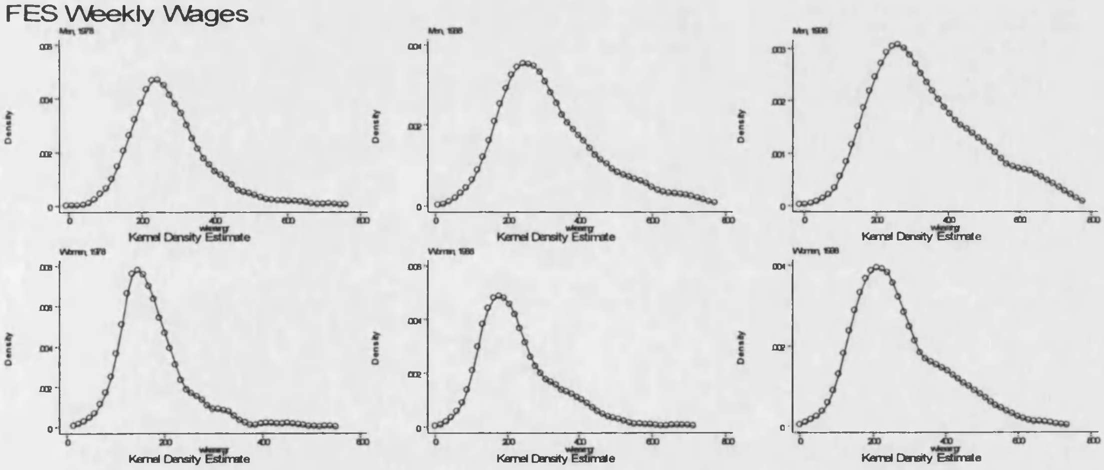


Figure 2.4 (continued)

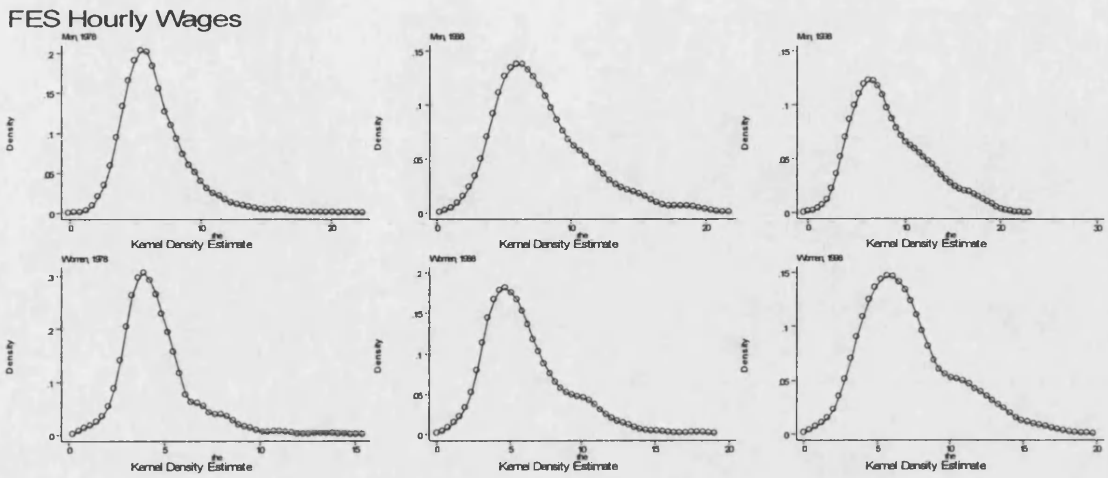
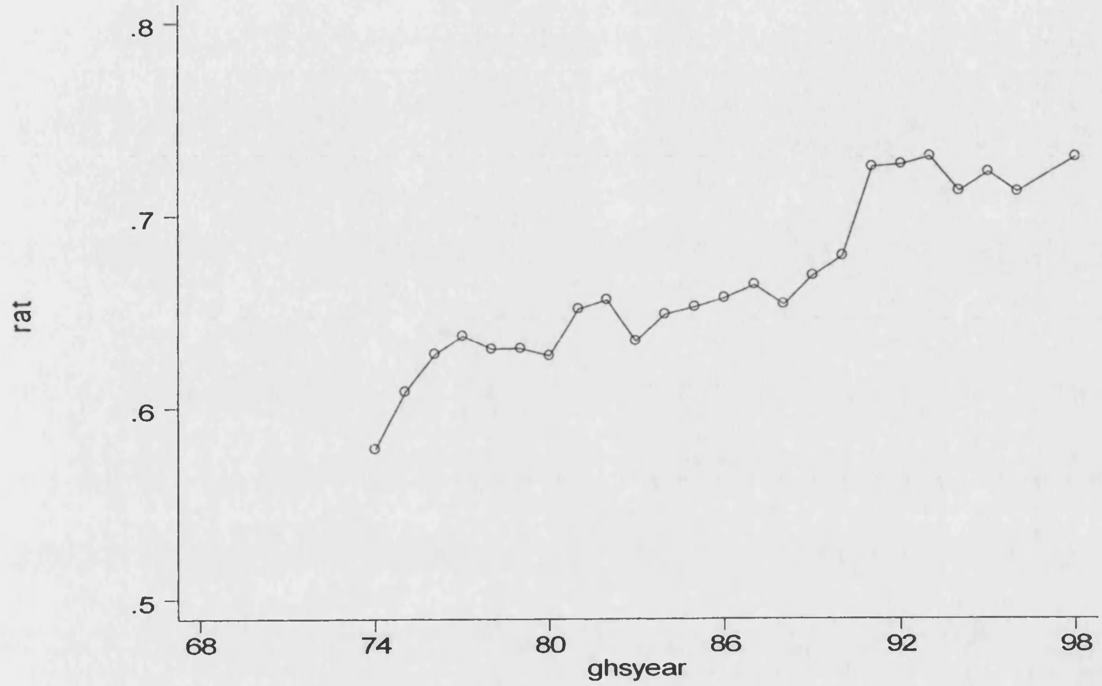


Figure 2.5: Changes in the Gender Earnings Ratio

GHS Weekly Wages



FES Weekly Wages

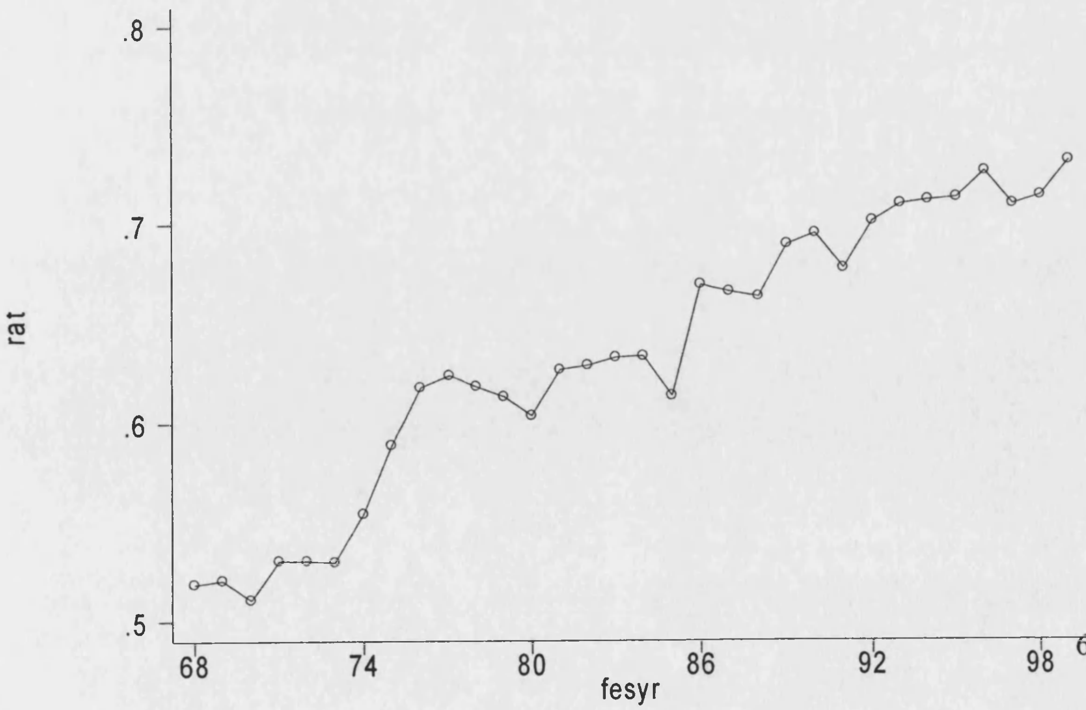


Figure 2.5 (continued)

FES Hourly Wages

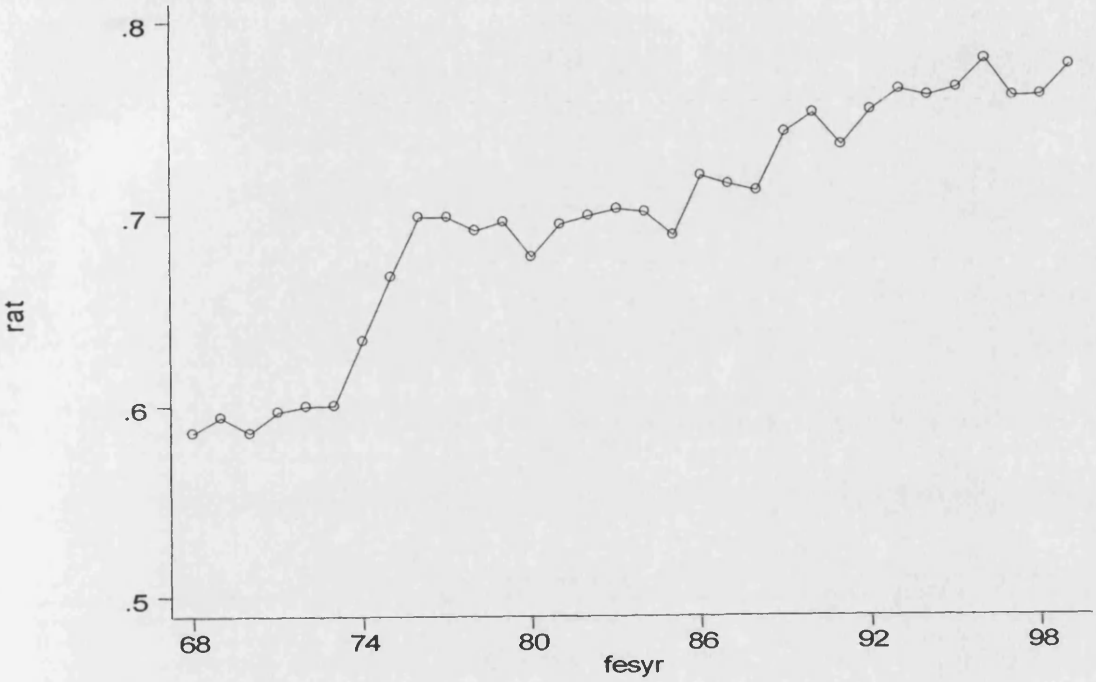
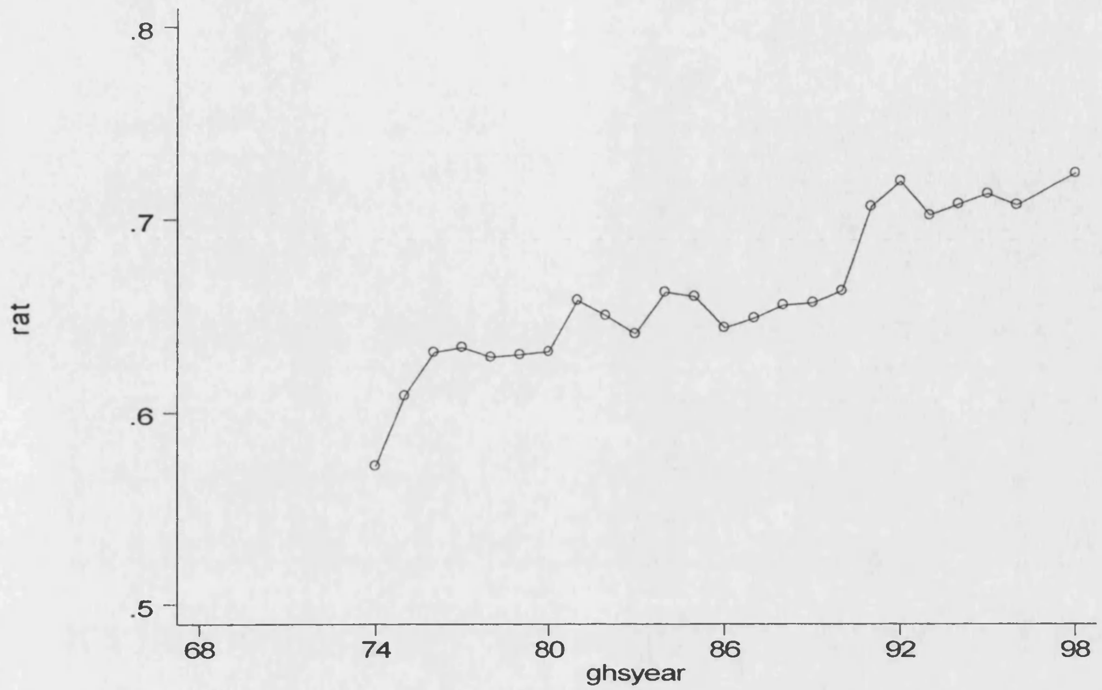


Figure 2.6: Ratio of the Median Female to Male Wages

GHS Weekly Wages



FES Weekly Wages

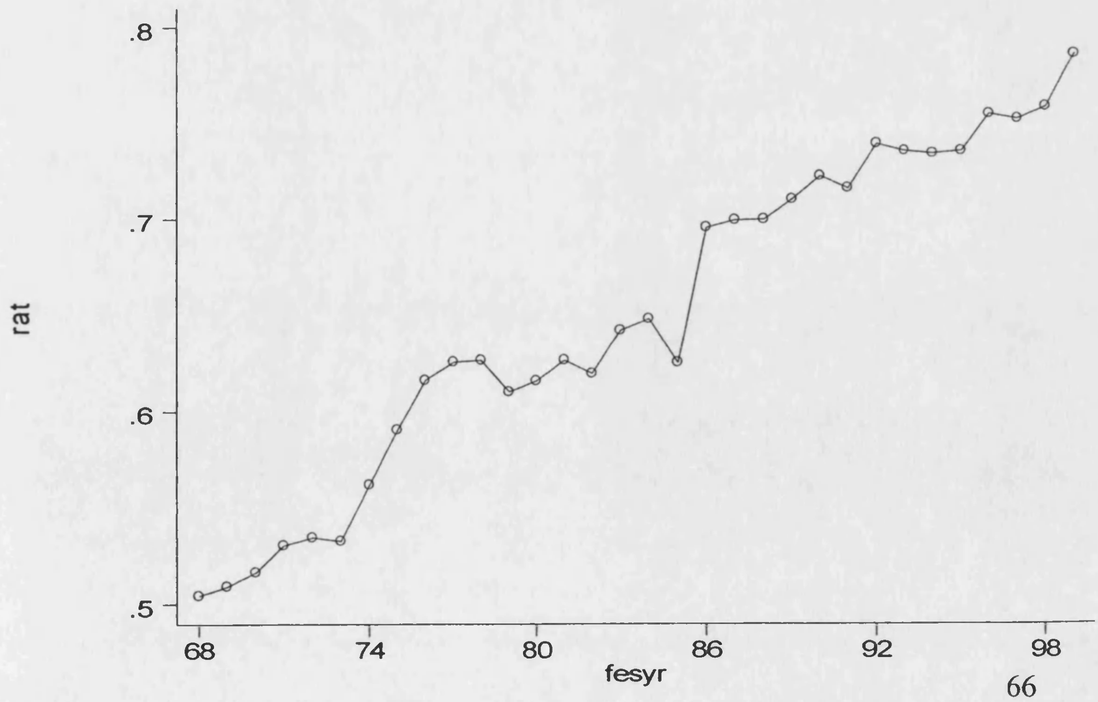


Figure 2.6 (continued)

FES Hourly Wages

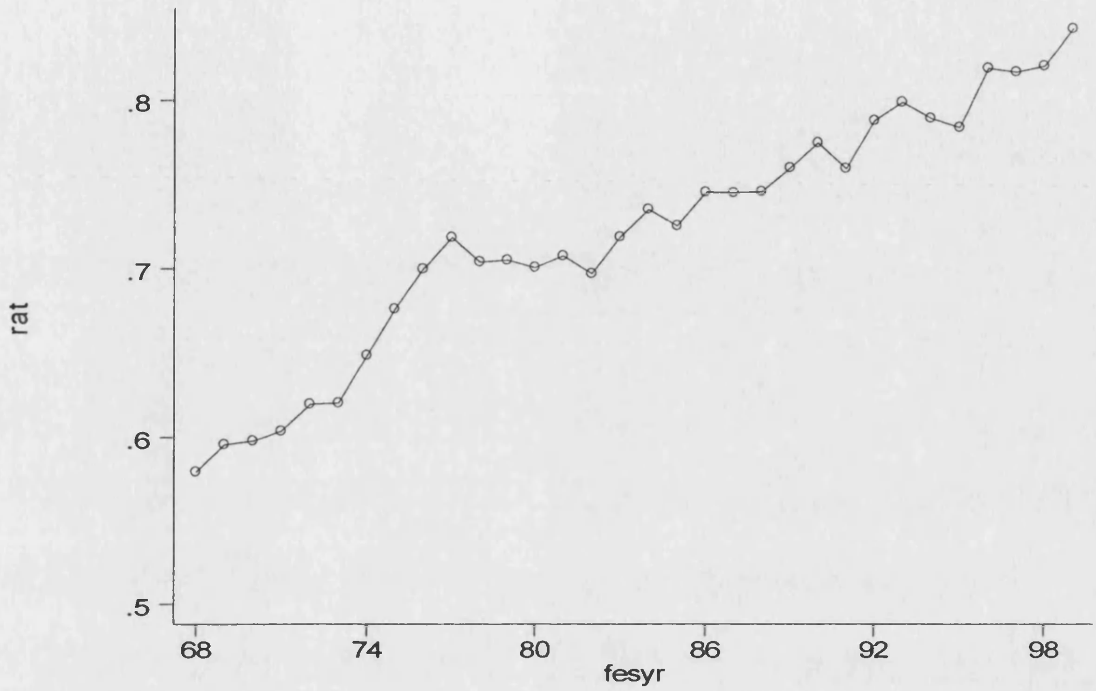
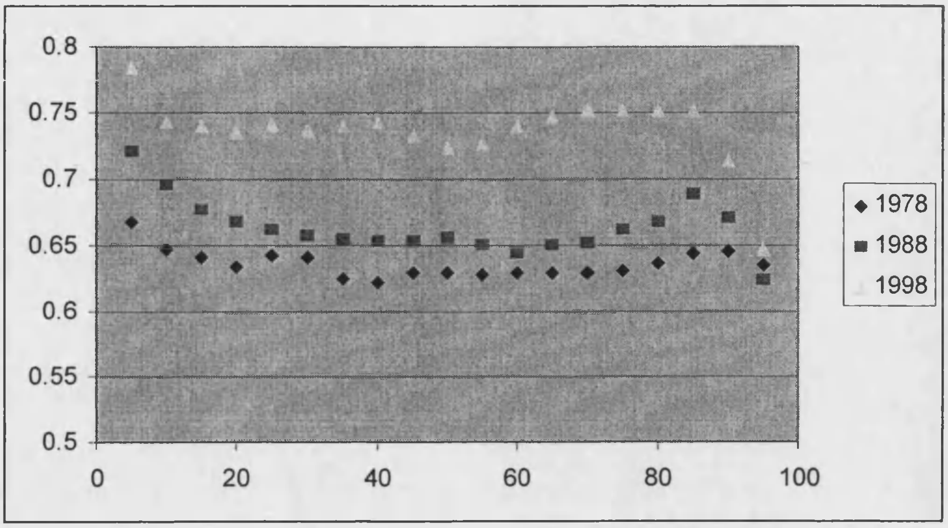


Figure 2.7: Gender Wage Ratio for the 5th to 95th percentile

GHS Weekly Wages



FES Weekly Wages

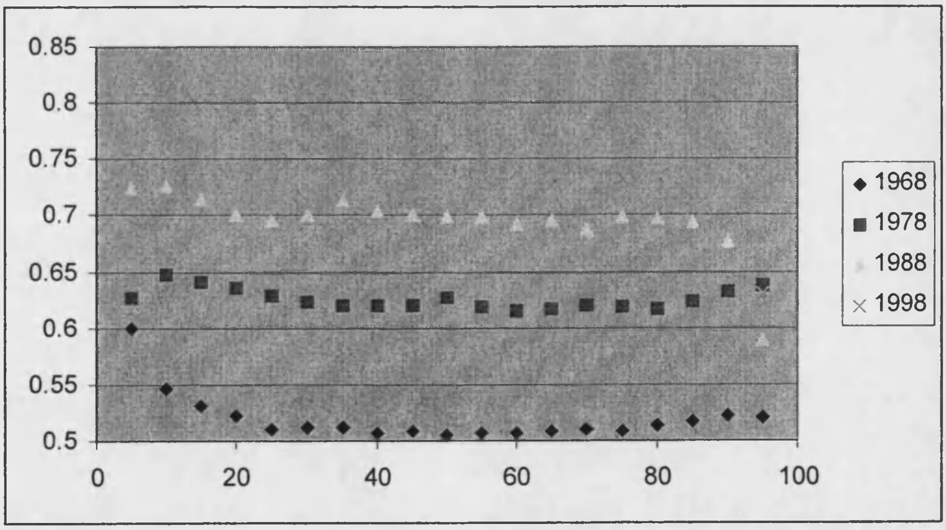


Figure 2.7 (continued)

FES Hourly Wages

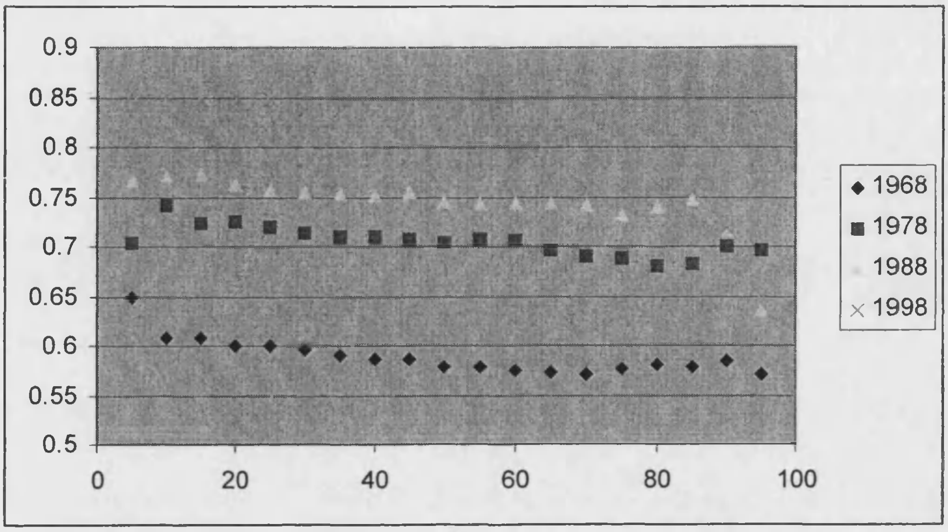


Figure 2.8: Ranking of Women in the Male Earnings Distribution

GHS Weekly Wages

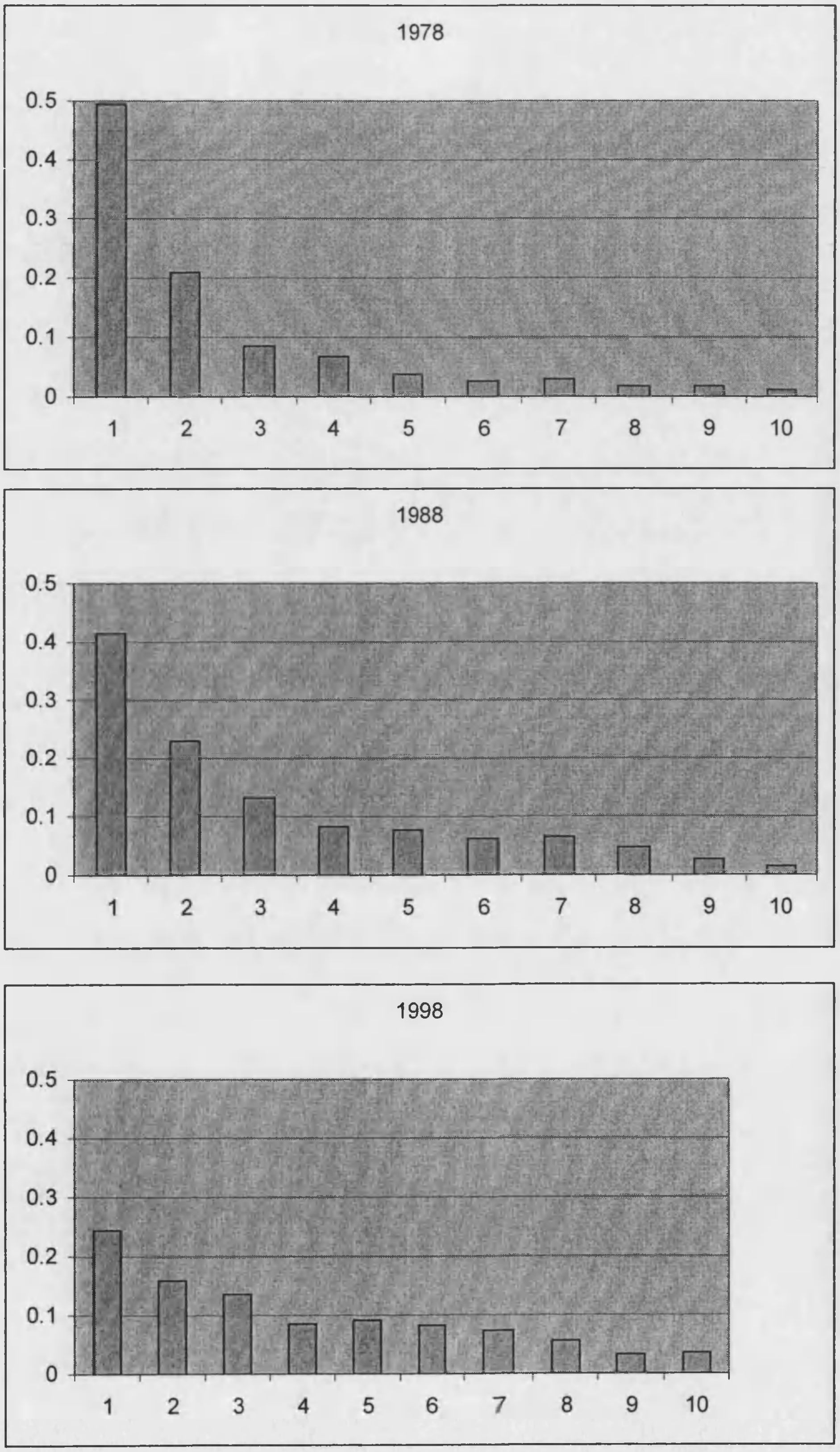
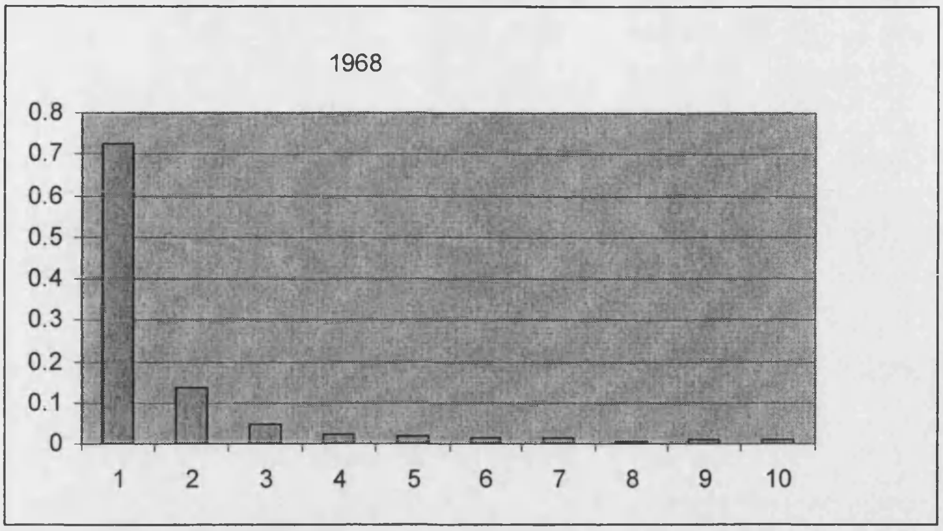
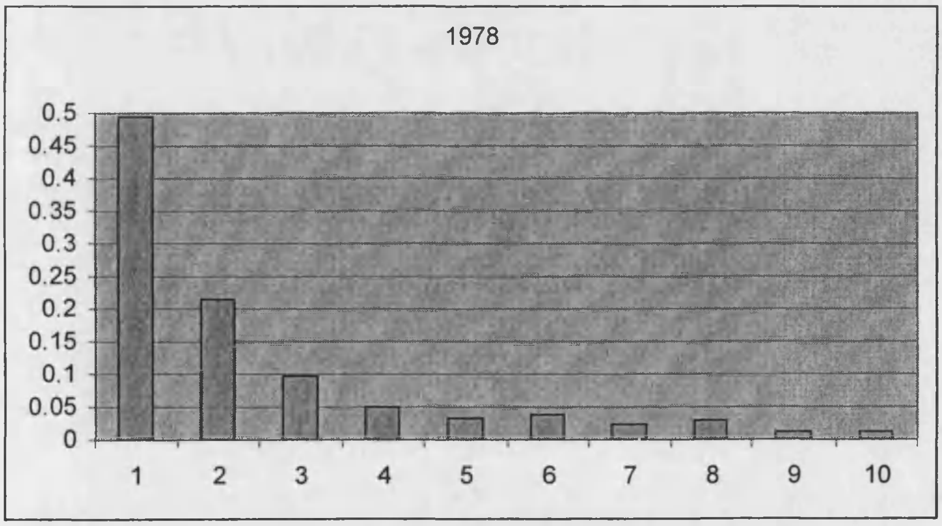


Figure 2.8 (continued)
FES Weekly Wages





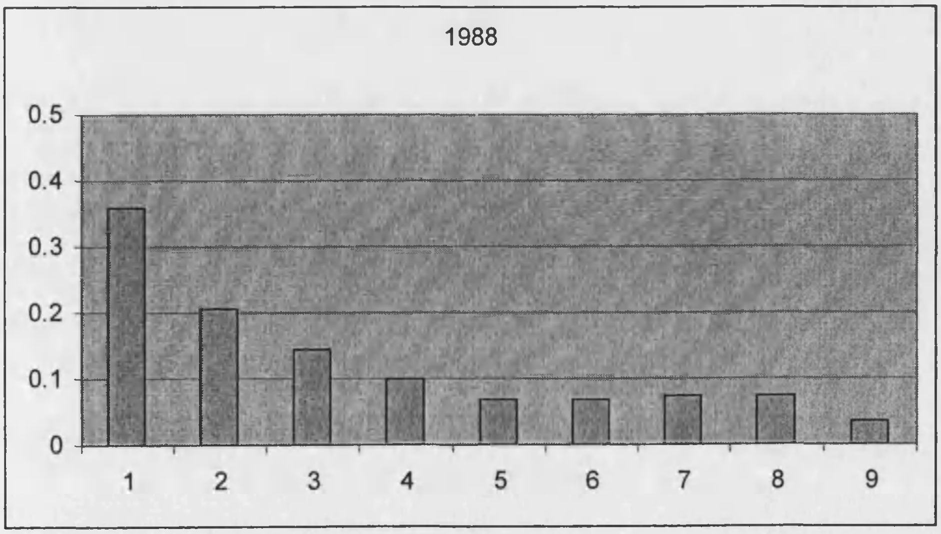


Figure 2.8 (continued)

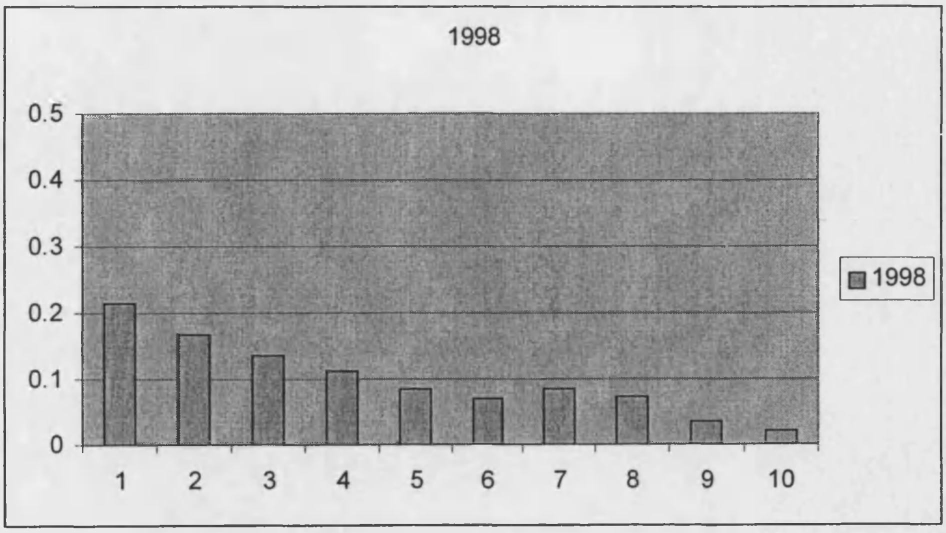
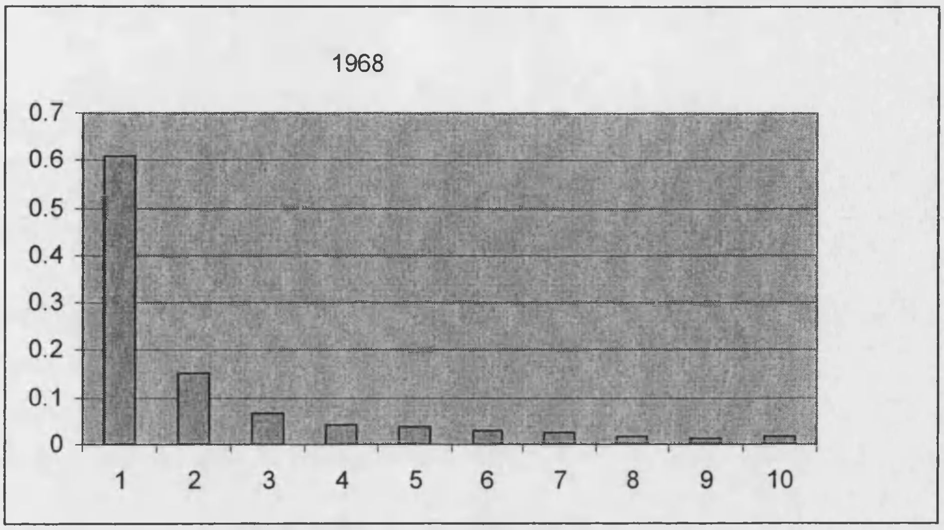
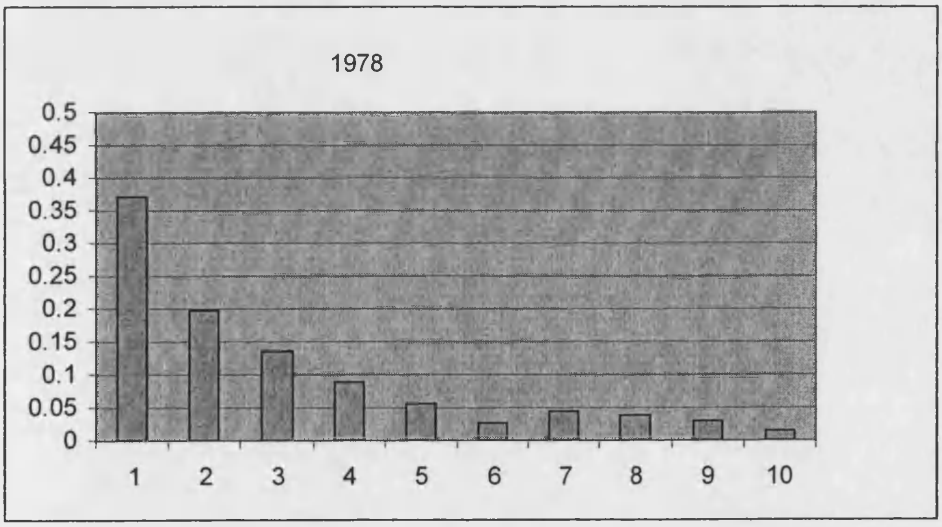


Figure 2.8 (continued)
FES Hourly Earnings





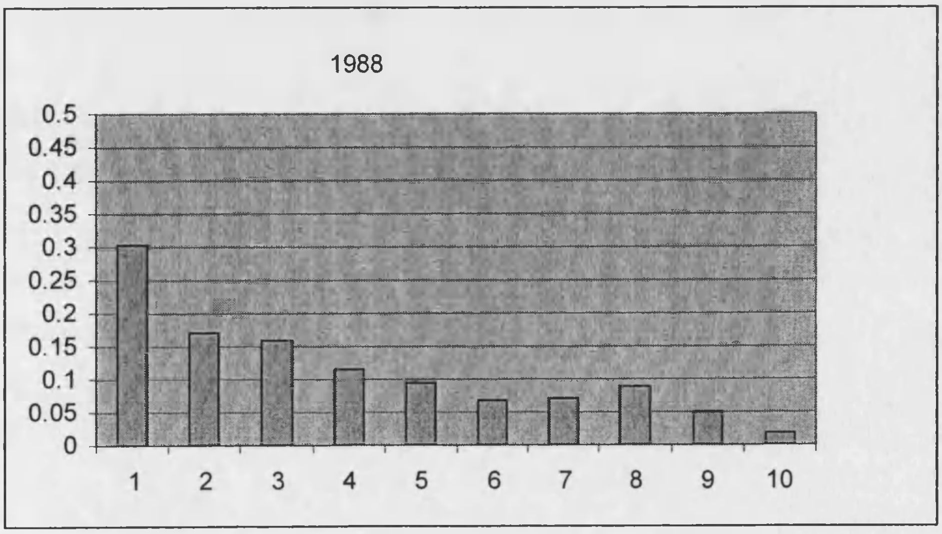


Figure 2.8 (continued)

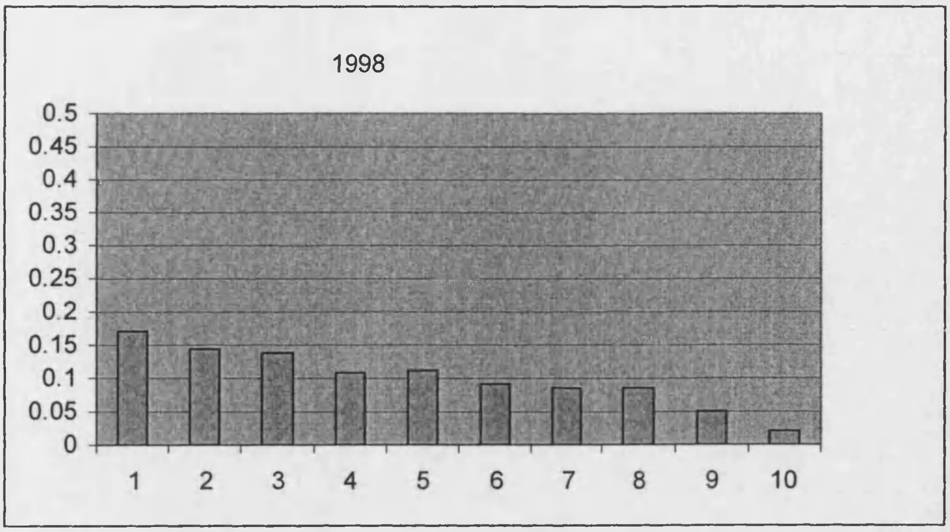
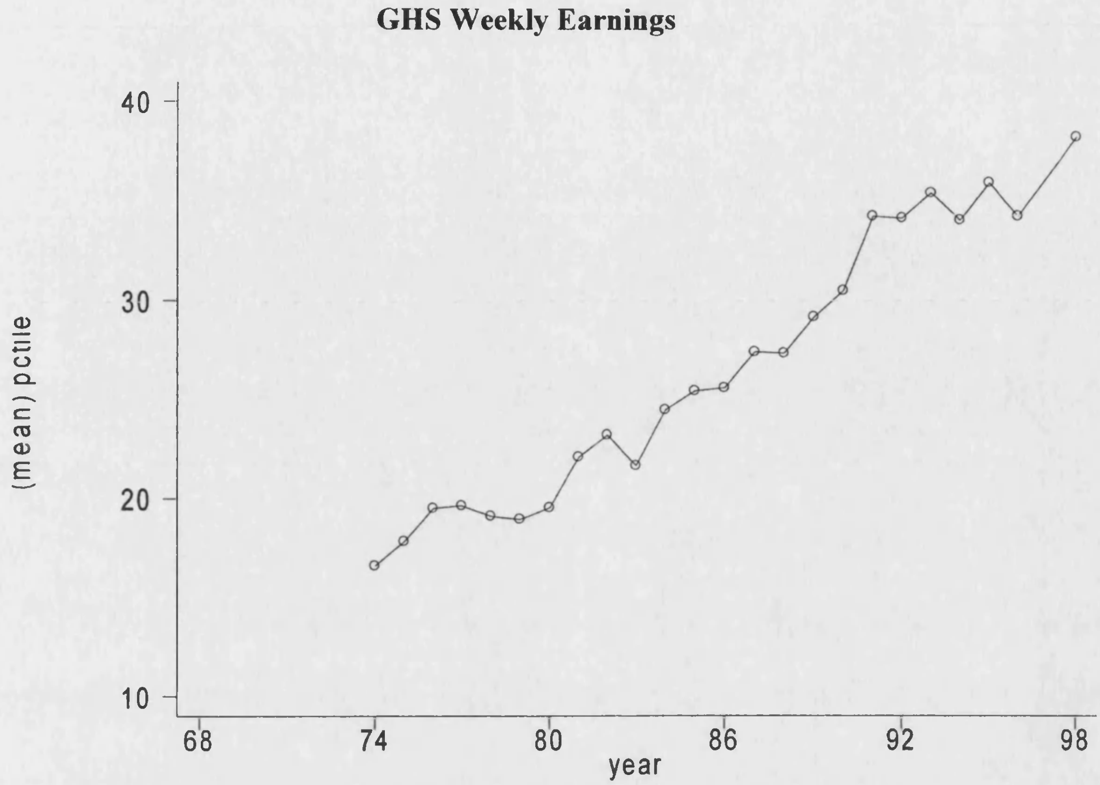


Figure 2.9: Median Percentile Ranking of Women in the Male Wage Distribution



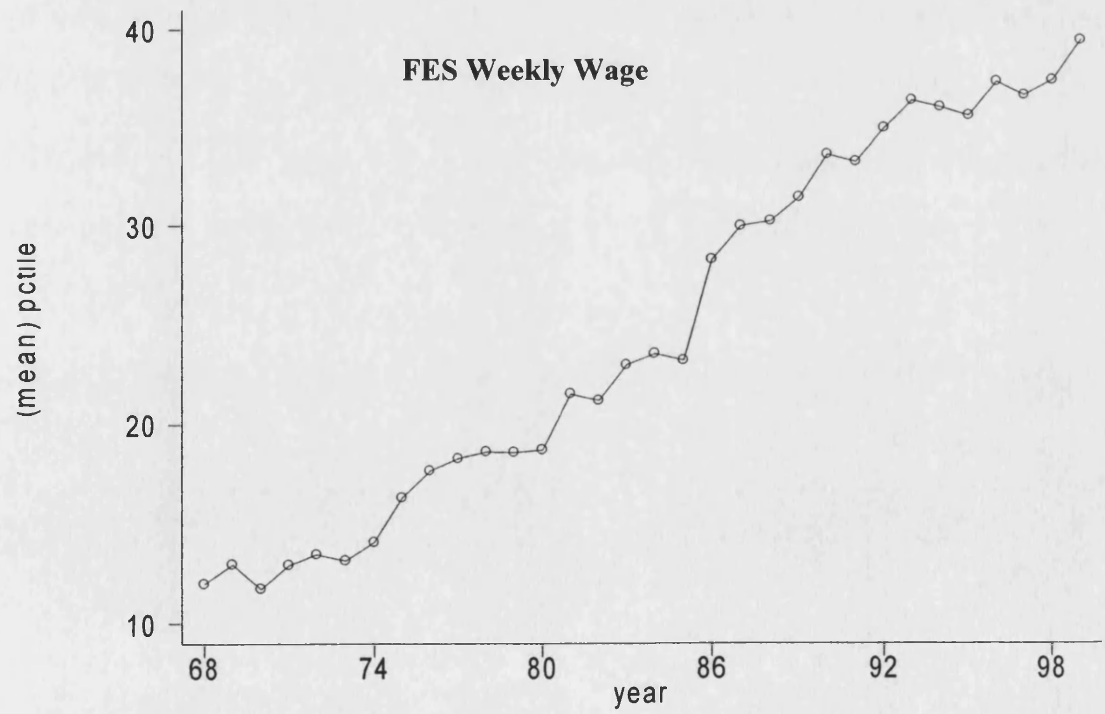


Figure 2.9 (continue)

FES Hourly Wages

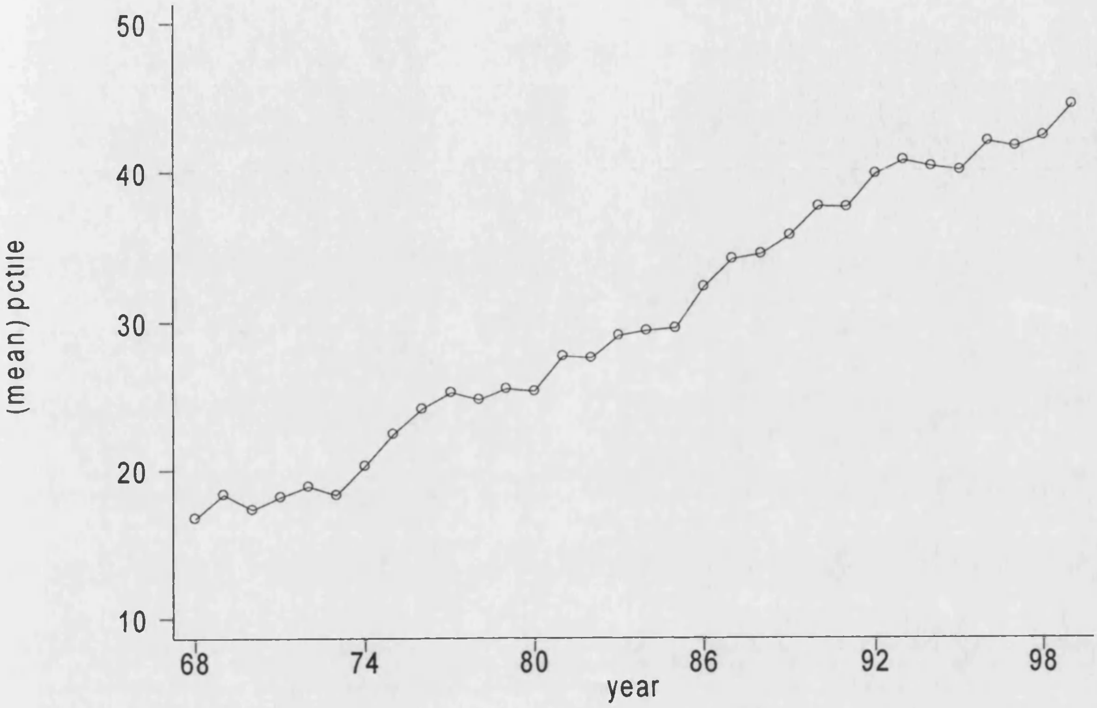


Table A2.1: Mean Values for Explanatory Variables

	FES						GHS						BHPS			
	Men 1978	Wome n 1978	Men 1988	Wome n1988	Men 1998	Wome n1998	Men 1978	Wome n 1978	Men 1988	Wome n 1988	Men 1998	Wome n 1998	Men 1990	Wome n1990	Men 1998	Wome n 1998
Age	36.77	33.87	36.59	33.53	37.63	35.98	37.3	34.9	36.8	34.0	39.1	37.9	35.9	35.1	36.0	34.8
Years ed.	15.32	15.40	16.66	16.86	16.26	17.52										
Degree							.072	.037	.126	.082	.198	.205	.123	.126	.162	.176
'As' +							.113	.137	.197	.186	.314	.257	.230	.207	.307	.295
5+ 'O's							.102	.079	.125	.119	.109	.103	.158	.120	.158	.144
<5 'O's							.278	.300	.288	.372	.239	.318	.306	.415	.267	.315
Mining							.114	.048	.095	.035	.026	.010	.092	.043	.078	.035
Eng							.225	.126	.173	.084	.144	.050	.170	.078	.148	.060
Other ma.							.121	.159	.121	.119	.136	.109	.130	.090	.115	.079
Construct							.112	.015	.092	.014	.118	.020	.060	.009	.062	.007
Service							.308	.609	.424	.692	.476	.759	.307	.602	.332	.604
Transport							.102	.039	.087	.049	.082	.044	.142	.142	.154	.163
Prof/Man							.186	.072	.296	.137	.352	.242	.195	.163	.215	.199
Other non-manu							.190	.588	.202	.614	.213	.541	.318	.628	.324	.602
Personal Services							.003	.078	.010	.067	.011	.051	.016	.066	.020	.061
Ski Manu							.419	.065	.327	.058	.291	.059	.324	.051	.284	.047
SS Manu							.151	.168	.123	.109	.093	.090	.115	.076	.116	.075
Number employees																
1-2													.026	.029	.025	.022
3-24													.239	.293	.266	.293
25-99													.260	.266	.245	.264
100-999													.351	.314	.359	.306
TU at wk													.575	.565	.469	.539
FT exp													17.6	12.0	15.5	10.8
PT exp													.140	2.19	.218	2.51

CHAPTER THREE
EXPLAINING CHANGES IN THE RELATIVE EARNINGS OF PART-TIME FEMALE EMPLOYEES

3.1. Introduction

It is well known that the number of people in part-time work has increased rapidly in recent years. This increase has largely been driven by two factors, a rise in the numbers of women (particularly mothers) working and by the growth in the service sector. Less well known perhaps is that as the number of part-time jobs has grown, the quality of part time work has declined. This has been reflected in a substantial fall in the relative earnings of part -time workers. Thus, while the growth in part-time work should have provided an ideal opportunity for women with children to combine work and family life, working part time has come at a price. In 1999, while full-time working women earned a wage equal to almost 80 per of male average hourly earnings, for part timers earning were considerably lower at around 60 percent of average male wage. In contrast, in 1968 there was little earnings difference between full and part-time women (both earned around 60 percent of the average male wage). This chapter sets out some of the reasons for this change, examining the evolution of the part-time pay gap and employment since the 1970s.

This chapter uses a range of data sets to look at the emergence of the full-time / part-time pay gap, examining differences in characteristics and returns to characteristics, for full-time and part-time female employees between the mid-1970s and the late 1990s. It then goes on to assess how much of the deterioration in the relative earnings position of part timers can be attributed to changes in characteristics and how much is due to an increase in any part-time pay penalty. The structure of this paper is as follows. Section 2 looks at attitudes towards part-time work and at some descriptive data on preferences over working hours. In Section 3 a brief review of the data sets used for the rest of the chapter is given, and then Section 4 goes on to examine changes in female employment rates and the composition of the part-time female work force relative to other workers over the period. The fifth section looks at changes in part-time women's earnings relative to full-time workingwomen and examines how the experience of part-time workers has varied across the wage distribution. Section 6 details the econometric techniques used to estimate the wage equations for full-time and part-time workingwomen. Results are reported in Sections 7 and 8. In Section 9 reasons for differences in returns to characteristics are discussed while in Section 10 results uses the results to decompose the earnings gap into that part due to differences in characteristics and that part due to differences in returns to characteristics. The final empirical section looks at how differences in occupation affect the part-time / full-time wage gap. Section 12 then concludes.

3.2 Attitudes towards Part Time Work and Working Hours

Part-time jobs are seen as bad jobs, offering low pay and little job security to a poorly skilled section of the labour force. As a result, while part-time work has become a more important component of employment (part-time jobs accounted for fewer than one in twenty jobs in 1951 compared with one in five in 1991[1]) it has increasingly come to be regarded as a problem. It has, for example, been suggested that part-time employment is a form of disguised underemployment, that part timers are taking full timers' jobs, and that part-time earnings do little to alleviate poverty or reduce inequality (as these jobs go to women who live in households where there is already another earner). Part-time work has been particularly berated in the face of a secular decline in full-time permanent male jobs. As John Prescott has said:

> "if I want to create employment, should I target full-time men who are on the dole and may never get a job, or should I encourage low paid part-time employment for mostly middle class women"
>
> (Guardian 24/6/94)

Other writers, such as Patricia Hewitt (1993), have argued that part-time work is one of the many new forms of flexible working patterns which we can expect to observe increasingly in the future. Part-time work, by allowing women to combine work and family life is likely to be part of a growing labour market trend as women's employment rates increase. In addition women's part-time earnings have been shown to be increasingly important for

[1] Source: Census of Population, Great Britain 1951 and 1991.

keeping families out of poverty (Harkness, Machin and Waldfogel 1996). For most part-time workers the decision to work part time is a voluntary one. In 2000, data from the Quarterly Labour Force Survey shows that 15 percent of part time workers were students, 9 percent worked part time because they could not find a full time job, while 74 percent did not want a full time job. Men were more likely to be involuntarily working part time, with 20 percent of part time men unable to find a full time job (another 39 percent were students) compared with 7 percent of part time women. A higher proportion of part-time women would have preferred to work more hours, and this proportion has increased over time: in 2000, 17 percent of part-time women would have liked more hours compared with 11 percent in 1980, suggesting rising underemployment amongst female part timers.

Average earnings for female part timers are significantly lower than for those working full time. One reason for this may be that "good" jobs are only available to those willing to work full time, leading to a concentration of part-time workers in low skill, low paid jobs. The British Household Panel Survey (1998-99) and Women and Employment Survey (1980) show a substantial number of women working full time who would prefer to work fewer hours, and this proportion has been rising (in 1998-99, 44 percent of full-time women said they would have liked to work fewer hours compared with 35 percent in 1980). Significantly, there are higher proportions of professional full timers wanting to work fewer hours than other workers (in 1998-99, 53 percent of professional full timers would have preferred fewer hours). This lends some support to the hypothesis that part-time women are crowded into low skill occupations because part-time employment is not available in more highly skilled jobs.

Another explanation offered for low pay amongst part-time employees is that non-pecuniary benefits compensate part-time workers for their low relative earnings. According to the International Social Attitudes Survey (Jowell, Brook and Dowds 1993) levels of job satisfaction are higher among part-time than full-time workers. Thus, while few part timers think their job is well paid, they are more likely to report that their job has flexible working hours and good management relations and fewer describe their job as boring or stressful. Differences in expectations may however go some way to explaining these disparities.

3.3 Data and Sample Definition

This rest of this paper uses data from the Family Expenditure Survey (FES), General Household Survey (GHS), British Household Panel Survey (BHPS) and Women and Employment Survey (WES) to investigate the changing labour market position of women working part time between the mid 1970s and early 1990s. Each of these data sets provides complementary information on earnings and employment characteristics at different points in time. Our first data set, the FES, contains wage data from the 1960s to date but has little information on personal characteristics. The GHS, on the other hand, provides detailed information on personal and employment characteristics from 1974 onwards, and reports weekly earnings, including overtime. There is however no measurement of overtime hours after 1983, which means that computing wage rates for men is difficult. For women this is less of an issue, as they tend to work fewer overtime hours. Data from the Quarterly Labour Force Survey (2000) shows that women work 1.5 paid overtime hours on average, compared to 3 hours per week for men. The WES and BHPS are the most detailed data sets available. Both include detailed information on personal and employment characteristics including total previous full-time and part-time work experience. The WES is however only available in 1980 and has the additional limitation of only providing in depth information for women of working age.[2] The BHPS is available from 1990-91 onwards and contains retrospective information on previous work experience.

Throughout the paper full-time and part-time employment is defined on the basis of hours usually worked, with those who normally work more than 30 hours per week, excluding overtime, being classed as full time and those working 30 hours or less as part time. The one exception is teachers, who are considered to be employed full time if they work over 26 hours per week. In some other studies self-reported definitions of full-time and part-time employment are used. In the data sets used here, results obtained using this definition are very similar to those obtained from an hours-based classification. Throughout wages are defined as the usual hourly average wages (including over-time were data is available) and are deflated to January 2000 prices.

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[2] Only husbands of women interviewed are sampled and the information provided for these men is much less detailed than that for women.

3.4. Trends in Full and Part-time Employment

Increased part-time employment accounted almost entirely for the rise in the number of women working between 1950 and the early 1970's (Rice 1993). Since the mid-1970s the growth rate of part-time female employment has slowed and the proportion of women in full-time employment began to increase. Figure 3.1 plots full-time and part-time employment rates for all women aged 17 to 59, excluding students, between 1968 and 1998 using FES data. In 1968, 18 percent were in part-time employment while 34 percent worked full time. Between 1968 and 1974, the proportion of women in part time employment grew steadily reaching around 24 percent in 1974. Since then, there has been little change in part-time employment, with the rate of part time employment standing at 28 percent in 1999. Full time employment rates showed only a small increase, reaching 35 percent in 1999. While these changes are relatively small, they disguise bigger swings in employment rates across age groups. Figure 3.2 plots full- and part-time employment rates by age in 1968-70, 1977-79, 1987-89 and 1997-99.

Looking first at full-time employment rates a U-shaped pattern is observed, with full-time employment rates dropping rapidly between the ages of 20-24 and 30-34, rising again between the ages of 35-39 and 45-49, before declining once more as women approach retirement. Over time, however, the dip in full-time employment around childbearing age has become smaller, with the largest changes in full-time employment observed among women in their 20s and 30s, while for younger and older women (i.e. those aged 20-24 and 55-59) full-time employment rates have actually shown a slight fall. The largest increases in full-time employment have however been observed for those aged 25-29 and 30-34, with full-time employment increased from 26 to 49 percent for those age 25 to 29, and from 20 to 34 percent for those age 30-34, between 1968 and 1998. For women aged 35-49 employment rates increased by around 10 percentage points over the same period.

The incidence of part time work is quite different, with part-time employment rates increasing sharply between the ages of 20-24 and 35-39, thereafter levelling out. For each age group, the incidence of part time work has increased. However, while for full-timers part time work has increased steadily over time, for part timers the biggest change was between 1968-70 and 1977-79. Over this period part time employment rates increased by around 10 percentage points, but since then there has been little or no change in the incidence of part time work.

There are also marked differences in patterns of employment by education, and this is illustrated in Figure 3.3. This plots full- and part-time employment rates by highest educational qualification using GHS data. Looking first at full-time employment rates, it is clear that while full-time employment rates among those with degrees are around 80 percent in all periods, for those with no qualifications full time employment rates have fallen from over 50 percent in 1974 to below 40 percent in 1998. The increase in full time employment observed has been entirely due to changes in educational composition, rather than a result of increasing full-time employment rate within education groups. Looking at part time employment, the reverse is observed. Rates of part-time employment are twice as high among women with no qualifications as compared to those with degrees (fewer than 10 percent of women with degrees worked part time in 1998 compared to 23 percent of those with no qualifications).

While at any one point in time over the last twenty years less than one-third of women have been working part time, a great many more women have worked part time at some point in their life. Data from the Women and Employment Survey (1980) and British Household Panel Survey (1998-99) shows that in both periods of those aged 21-59 over 50 percent had at some point worked part time.

Changes in the Composition of Employment

These differences in changes in employment rates by age have lead to shifts in the age composition of female employment. Table 3.1 reports data on the age composition of part-time and full-time female employees in 1978, 1988 and 1998 from the GHS. In each period the age composition of part timers differed significantly from that of full-time workingwomen, with a much higher proportion of part-time workingwomen being over the age of 35. Full time work has tended to be concentrated on the relatively young, although rapid growth in full-time employment among those aged 25-34 meant that the age profile of full-time workingwomen in 1998 had become significantly older.

Table 3.1 also reports summary statistics from the GHS on the distribution of employees by educational attainment, work experience and the proportions married and with children. Looking first at education, it is clear that full time workers in all periods are better qualified. In 1998, 22 percent of full time working women held a degree compared with 9 percent of those working part time, while 21 percent held no qualifications compared to 12 percent of full-timers. In 1978, similar educational differences existed, with 4 percent of full timers holding a degree compared to 2 percent of part timers and 44 percent of full timers having no qualifications compared to 62 percent of part timers. Some of this difference in the educational composition of full and part time workers is related to age differences, with older part time workers less likely to hold formal qualifications than younger full-timers. However, over and above this, part time workers are less well qualified than those who work full time are.

Differences in demographic characteristics of full and part time workers are also marked, with over two-thirds of full-time workers having no dependent children compared to just over one third of part timers, while only 3 percent of full time working women have more than 2 children. These proportions have changed very little between 1978 and 1998 because, although the employment rates of mothers have increased, this increase has been offset by the overall decline in fertility.

3.5. Comparing Part-time Women, Full-time Women and Full-time Men's Earnings

Aggregate Trends in Average Earnings Ratios

In the mid 1970s women working part time had average earnings almost equal to those working full time, although both earned considerably less than men. In recent decades however, as full-time working women have considerably improved their earnings position relative to men, part-time women have seen a sharp drop in their relative earnings position vis-à-vis full-time women and little change relative to men. Figure 3.4 plots the ratio of full-time and part-time female earnings to full-time male earnings, and part-time female to full-time female earnings between 1968 and 1998. Between 1968 and 1973 both full and part-time women earned an average wage equal to around 59 percent of the full-time male wage. Before and shortly after the introduction of the 1975 Equal Pay and Sex

Discrimination Acts pay rose rapidly, for both full and part time workers, so that by 1978 part time women earned around 66 percent, and full time working women earned around 69 percent, of the average male wage. Since 1978, however, the fortunes of full and part time workers have diverged, with the relative earnings of full timers levelling out in the early1980s before steadily increasing again in the late 1980s and 1990s. By 1999, full time workers earned 80 percent of the average male wage. For part time workers, however, the gain in earnings achieved around the time of the Equal Pay Acts was reversed in the late 1970s, and part time workers have seen no real improvement in their earnings subsequently. By 1999, part time workers earned only 59 percent of the average male wage. The relative decline in the fortune of part time women relative to those working full time is charted in the second panel of Figure 3.4. This indicates that part-time women's earnings have declined from a position of parity with full time working women, to just 75 percent of the full-time average female wage.

Part-time men are not considered here as, although since the 1980s the proportion of men working part time has increased, they still represent a small portion of the part-time work force and have very different characteristics to part time women. In 1999, fewer than 3 percent of men aged 21-60 worked part time and men accounted for 12 percent of part-time employees.3 It is instructive to note however that there is a significant pay gap between part-time women and part-time men. In the 1970s and early 1980s there was little difference in part-time and full-time male earnings rates and as a result the part-time female / part-time male pay gap was similar to the part-time female / full-time male gap. The latter half of the 1980s and early 1990s however saw a sharp decline in part-time men's relative pay, leading to a rise in the part-time female / part-time male earnings ratio which stood at around 75 percent in the early 1990s.

Changes in Earnings across the Wage Distribution

It is possible that changes in average earnings may disguise large variations in the experience of workers at different points of the earnings distribution. It is therefore useful to look at real earnings growth for men and women at different points of the distribution.

Figure 3.5 plots indexed real hourly earnings for full-time and part-time women at the 10th, 50th and 90th percentile between 1968 and 1999. 1979 is used as the base year because the distribution of earnings between these percentiles narrowed between 1968 and 1979 and widened thereafter.

From 1968 to 1979 earnings grew at a similar rate across percentiles. After 1979, however, for full-time women earnings of the 90th percentile woman grew notably faster than those of the 50th percentile woman and the earnings growth of the 50th percentile was significantly greater in turn than those of the 10th percentile. This pattern is observed throughout the 1980s and 1990s. Earnings growth of part-time workingwomen was slower, particularly at the 10^{th} and 50^{th} percentiles. Thus, while earnings grew rapidly for the 90^{th} centile part time woman, earnings at the 10^{th} and 50^{th} grew less rapidly with these women experiencing slower earnings growth than the10^{th} centile full time woman.

A difference in earnings growth rates by percentile reflects a widening of the income distribution. More formal measures of earnings inequality are given in Table 3.2, which reports six alternative measures of wage inequality in 1968, 1978, 1988 and 1998 for full- and part-time women. The reported measures differ in that they attach different weights to individuals at different points of the wage distribution. For example, the coefficient of variation defined as the variance of the wage divided by the mean, gives high weighting to those at the top of the earnings distribution. The standard deviation of logs attaches more equal weighting to those on very low and very high incomes as, by using logs, the weight attached to those at the top of the distribution is reduced and that attached to those at the bottom increased. The third measure, the gini coefficient, compares the proportion of cumulative total earnings held by individuals at each point of the earnings distribution with the proportion that would be held were earnings equally distributed. Finally, the 90-10, 90-50 and 50-10 log wage differentials allow relative wages at different points of the wage distribution to be compared.

All measures of wage inequality, except the 50-10 log wage differential, suggest a higher degree of wage inequality among part time workers in all periods. The 50-10 log wage differential for part time workers was however considerably lower than for full-

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3 Family Expenditure Survey.

timers. This suggests that the high levels of wage inequality observed for part time workers result from a bimodal wage distribution, with the majority of part timers concentrated in low wage occupations and a small minority employed in high paid professional occupations. For full-timers, all measures suggest a decline in wage inequality between 1968 and 1978, and an increase thereafter. The pattern of changing wage inequality for full time women is therefore similar to that observed elsewhere for full-time workingmen (see for example Machin 1996). For part timers, however, wage inequality has not shown such a consistent trend. The standard deviation of logs, gini coefficient, 90-10 and 90-50 log wage differentials all indicate a fall in wage inequality between 1968 and 1978, and an increase thereafter. However, the coefficient of variation shows a fall in wage inequality again between 1988 and 1998 and this may reflect a decline in the number of very highly paid part time workers over this period. This is discussed in more detail in the following section. The 50-10 log-wage differential also shows a different trend, with wage inequality rising between 1968 and 1978, falling again in 1988 and then increasing in 1998. The 50-10 log wage differential however suggest a relatively low level of inequality at this point of the wage distribution, with much more substantial wage differences being observed between the 50th and the 90th centiles.

Changes in the Wage Gap across the Wage Distribution

Differences in rates of earnings growth across the wage distribution may mean that the gender earnings ratio has improved more at some points of the wage distribution than at others. For example, the top 10 percent of female earners may have gained a great deal relative to the top 10 percent of men while the bottom 10 percent may have seen only a marginal gain. To see how rising wage inequality has affected women at different points of the wage distribution, changes in the wage gap at different percentiles of the male and female wage distribution are examined. Figure 3.6 shows the gender earnings ratio at each percentile (calculated as, for example, the ratio of the earnings of the 10th percentile full-time woman to the 10 percentile full-time man etc.) for full-time and part-time women relative to full-time men, and for part-time women relative to full-time women, in 1968, 1978, 1988 and 1998.

Looking first at comparisons of full-time female to male earnings in the top panel we see that the gender earnings ratio increased across all percentiles between 1968 and 1998. However, while in 1968 the ratio was flat across the distribution, by 1998 there was a steady fall in the gender earnings ratio at the higher end of the earnings distribution. The biggest improvement in the gender earnings ratio therefore occurred at the bottom end of the wage distribution. The earnings of women working part time also improved *vis a vis* men across the distribution between 1968 and 1998.This is illustrated in the middle panel. Changes in the gender earnings ratio where however much smaller at all percentiles than occurred for full time working women. Moreover, these improvements were concentrated at the lower end of the wage distribution. Finally, comparing part-time and full-time female employees earnings in the third panel reveals that while the earnings of these two groups were similar in 1968 for all except those in the top 20 percent of the distribution (who earned considerably more per hour than the highest paid full timers). Each decade saw a continuing decline in the relative earnings of part timers across all percentiles. It is also notable that in 1998 the size of the pay gap between full-time and part-time workers was larger at the top end of the wage distribution.

Women in the Male Wage Distribution

So far we have used earnings comparisons to assess changes in the labour market status of part-time workingwomen over the last twenty years. Blau and Khan (1992) however suggest that such earnings comparisons may not be the best indicator of *changes* in the relative labour market position of groups of workers in periods of rapidly rising wage inequality. This is because if, for example, returns to 'skill' rise then, part-time women, because they have on average fewer labour market skills than other groups of workers, will see a fall in their relative earnings. Thus, while rising wage inequality disproportionately penalises part-time women, the resulting fall in relative average earnings has not resulted from gender or part time specific factors (such as a rise in the skills gap, or an increase in discrimination). As a result earnings comparisons may understate any improvement in part-time women's relative labour market position as a result of gender specific or part time specific changes if wage inequality is increasing rapidly.

Given rapidly increasing wage inequality, changes in the position of part-time women in the full-time male and female wage distributions may give a better indication of changes in their relative labour market status. One way to do this is to look at the distribution of female workers by full-time male or full-time female earnings deciles. A second method is to examine the percentile ranking of women in the male wage distribution.

Figures 3.7 (a) – 3.7 (c) show the distribution of female workers by various earnings deciles in 1968, 1978, 1988 and 1998 using FES hourly earnings data for those aged 21 to 60. Figure 3.7 (a) illustrates the position of part-time working women in the full-time male earnings distribution, 3.7 (b) shows that of full-time working women in the full-time male distribution and 3.7 (c) shows the position of part-time working women in the full-time female wage distribution. The x-axis plots the corresponding earnings deciles and the y-axis plots the proportion of women in each of these deciles in each period. The line at 0.1 indicates the proportion of women we would expect to find in each decile if, for example, part-time women had the same earnings distribution as full-time men. Figures (a) and (b) show that women working part time in all periods were more likely than those working full time to fall within the lowest male earnings deciles. Moreover, while women working full time have seen a significant improvement in their earnings position in the last two decades (particularly in the lower deciles) the change for women working part time has been much less dramatic. Indeed, for part-time workingwomen there has been relatively little improvement in their relative earnings position over the last two decades. Part-time women remain considerably over-represented in the bottom male earnings deciles, and although the proportion falling within the very lowest decile did fall significantly between 1968and 1998, this was mainly as a result of an increased proportion falling within the second decile. Part timers remain massively over-represented in the bottom half of the male earnings distribution: in 1998 81 percent of part timers earned less than the male median compared with 89 percent in 1968. Finally, it is noteworthy too that as many part-time working women made it into the top male earnings decile as full timers: around 5 percent in 1968 and 4 percent in 1998. For full timers the FES hourly earnings data indicates that in 1968 61 percent of full-time female employees had earnings in the bottom male earnings decile and that 90 percent earned less than the male medians. Just 2 percent of women had made it into the top male earnings decile. Each decade has seen a considerable improvement in women's position in the male wage distribution and by 1998 the proportion of women in the bottom male earnings decile had fallen to 13 percent and the proportion earning less than the male median had fallen to 65 percent. There remains however significant under-representation of women in the very top earnings deciles: in 1998 only 2 percent of full-time workingwomen made it into the top male earnings decile.

Comparing the position of part-time and full-time women in Figure 3.7 (c) shows that between 1968 and 1998 part-time women moved from being fairly evenly spread throughout the full-time female wage distribution to being heavily concentrated in the bottom third of the distribution. By 1998 the proportion of part-time women in the lowest decile had increased to 25 percent, while a further quarter were in the second decile. At the same time the percentage in the top decile fell too, to 8 percent in 1998. Together these shifts indicate a substantial deterioration in the relative labour market position of part-time *vis-à-vis* full-time women.

Another way of looking at the changing position of part-time women while accounting for changes in the wage structure is to assign women a percentile ranking according to the position of their earnings in the full-time male and full-time female wage distribution. Changes in the position of the percentile ranking of, for example, the median woman in the male wage distribution can then be computed over time. Panel (a) of Figure 3.8 graphs the mean percentile ranking of full-time and part-time workingwomen in the male wage distribution between 1968 and 1998. For full-time workingwomen the median percentile ranking in the male wage distribution rose from the 17th percentile in 1968 to the 41st percentile in 1999. Part timers again fared much less well, with their median percentile ranking increasing from the 17^{th} percentile to the 25^{th} percentile between 1968 and 1998. Use of the percentile ranking therefore suggests an improvement in the relative labour market position of part-timers, which is not observed in the changes in relative earnings. It is noteworthy too that the gap between the percentile ranking of full-time and part-time women was quite large in the mid-970s, suggesting that the part-time / full-time earnings gap was low because at this time the wage distribution was relatively compressed. In panel

(b) we can see how the mean earnings percentile ranking of part-time women has fared *vis-à-vis* full-time women. It is apparent that there has been a sharp decline in the median percentile ranking of part-time women in the full-time female earnings distribution over the last twenty years. Thus, while in 1968 the mean part-time woman earned an amount equivalent to the 45th percentile full-time woman; this percentile ranking dropped substantially over the next ten years so that by 1998 the median part timer earned amount equivalent to the 32nd percentile woman.

It is possible to extend our analysis to examine how women at different points of the wage distribution have fared using similar methodology. From this, it is clear that, for both full-time and part-time workingwomen across the earnings distribution; changes in percentile rankings suggest a substantially greater improvement in women's relative labour market status than changes in the earnings ratio. Looking however at the ranking of part-time women in the full-time female wage distribution we see that part timers once again appear to have persistently fallen behind full timers over the last two decades at all points of the earnings distribution.

3.6. Wages, Labour Supply and Hours of Work

Wage Determination

A typical wage equation estimates an individual's hourly earnings as a function of human capital and job characteristics. The wage offer received is normally assumed to be independent of hours of work. Table 3.3 reports results from regressions of the log of wages on a part time dummy variable and personal characteristics using data from the 1980 WES and 1990 and 1998 BHPS.[4] No attempt is made to control for selection into either employment or part time work at this point. These results show that, while in 1980 there was no significant wage penalty to part time work, the wage penalty associated with part time work had increased to approximately 17 percent in 1990 and 21 percent in 1998. It is notable too that in the 1990s including controls for part time work and previous years work experience eliminates the pay penalty to having children found in earlier studies (see Joshi,

4 Controls include a quadratic in age, four education dummy variables, quadratics in previous full and part time work experience, regional dummies and three dummy variables for the number of children in the

Paci and Waldfogel 1999). It is notable too that years of previous part time work experience actually leads to significantly lower current wages in both 1990 and 1998.

Moffitt (1984) and Lundberg (1985), using US data, have both found wages to be endogenous to the number of hours of worked (wages were found to increase with hours of work). Similarly a number of studies of part-time earnings find significant differences in returns to full and part time work (Ermisch and Wright 1993, Simpson 1986, Long and Jones 1979, Blank 1990a and 1990b). An F 'test' for equality of the parameters in the full- and part-time wage equations rejects the hypothesis of equality in all periods using GHS data for 1978, 1988 and 1998, 1980 WES data and BHPS data for 1990 and 1998. Separate full time and part time wage equations are therefore developed in the following sections, and in addition methods of controlling for selection into full and part time employment are discussed.

If we allow wage offers to differ by full-time and part-time employment status female wage offer equations are estimated by the functions: -

(1) $\log W_f = \alpha_f X_f + e_f$ for full-time women

(2) $\log W_p = \alpha_p X_p + e_p$ for part-time women

Where $W_{f,,p}$ are estimated wage offers, $X_{f,,p}$ are vectors of employment characteristics, and $\alpha_{f,p}$ are estimated returns to characteristics for full-time and part-time employees respectively. As we observe only accepted wage offers, and as we do not know whether our pool of observed full-time and part-time workers are randomly selected, we must also control for the selection of individuals into different states labour market states. The use of a Tobit model to estimate female labour supply functions has been rejected by a number of studies including that of Mroz (1987) who concluded that women's hours of work and labour force participation decisions were distinct. It is therefore preferable to use a two-stage model, such as that of Heckman (1979), as such models allow variables to take on different parameters in the wage and participation decision equations. Ermisch and Wright (1993) use an ordered probit model to estimate the parameters determining selection into non-employment, part-time employment or full-time employment, and then use the

household.

parameter estimates to control for selectivity bias in the wage equations. This assumes proportionality of the parameters determining selection into employment and those determining the choice of hours worked. This assumption is relaxed in Blank (1988) and Nakamura and Nakamura (1983). These studies use separate equations to model the participation and part-time / full-time work decision, but both considerably increase the complexity of the model to be estimated. Ermisch and Wright (1993) tested Nakamura and Nakamura's model against that outlined above and found that the results obtained from both were similar. The ordered probit model further assumes that preferences are ranked, with the probability of choosing some outcome 'j' determined by a latent variable 'y', which is itself a function of a set of characteristics 'z'. It is not clear, however, that the choice between non-employment, part time work and full-time work is an ordered one. For example, if full-time employment is an individuals preferred employment status, this need not imply that part time employment is preferred over non-employment. For this reason a multinomial logit model, which does not assume any ranking of employment states, is used instead to correct for selection into full and part-time employment when wage equations are estimated. The methodology used here is similar to that of Ogawa and Ermisch (1996) and Lee (1982, 1983).

Suppose utility Y from a choice of employment j is given by some set of characteristics V such that:

$$Y_j = V\alpha_j + \varepsilon_j$$

If a choice 'k' is made it implies that $Y_k > \max Y_j$ for all j not equal to k. Assuming the j error terms are independently and identically distributed and follow a Weibull distribution, then

$$\varepsilon_j = \max Y_k - u_j$$

follows a multivariate logistic distribution $F_j(\varepsilon)$, and a woman is observed in work status k iff $\varepsilon_j \leq V\alpha_j$. The probability of observing outcome Z_i=j can be written as the multinomial logit model with:

(4)

$$\text{Prob}[z_i = j] = \frac{\exp(\alpha_j' v_i)}{1 + \sum_{k=1}^{J} \exp(\alpha_k' v_i)}$$

Here Z is the selection variable which takes the values 0,1, ..., J for J+1 outcomes, 'i' indexes individuals, 'j' indexes outcomes and selection is made on z_i=j. 'V' is a vector of characteristics that are thought to influence Z, the decision to work full-time, part-time or not at all. The possible outcomes j are:

j	=	0	non employment
	=	1	part time work
	=	2	full time employment

Selecting on Z_i=j, Lee (1983) shows that implied regression equation for the conditional expectation of wages is now given by:

(4)

$$\mathrm{E}[\log \mathrm{w_k} \mid \varepsilon_\mathrm{k} < \mathrm{v}\alpha_\mathrm{k}] = X\beta_k + E[e_k \mid \varepsilon_k < V\beta_k]$$

The selection problem arises because $E[e_k \mid \varepsilon_k < V\beta_k$ may not be zero. Lee proposes a transformation of ε_k to $\varepsilon_k{}^* = J(\varepsilon_k) = \Phi^{-1}[F_k(\varepsilon)]$, where Φ is a cumulative density function with standard normal distribution. Now if $\varepsilon_k < V\alpha_k$ then $\varepsilon_k{}^* < J_k(V\alpha_k)$. Hence $E[e_k \mid \varepsilon_k < V\alpha_k] = E[e_k \mid \varepsilon_k{}^* < J_k(V\alpha_k)]$ where $\varepsilon_k{}^*$ has a standard normal distribution. From the properties of conditional expectations and the truncated normal distribution, we can now write:

$$\mathrm{E}[\mathrm{e_s} \mid \varepsilon_\mathrm{s} < \mathrm{v}\alpha_\mathrm{k}] = -\rho_k\sigma_k\phi[J_k(V\beta_k)]/F_k(V\beta_k) = -\rho_k\sigma_k\lambda_k$$

Where ρ_k is the correlation coefficient between e_k and ε_k, and $\sigma_k{}^2$ is the variance of e_s and $\lambda_j = \emptyset[J(V\beta_k)/F_k(V\beta_k)]$, where $\emptyset$ is the standard normal density function. Consistent estimates of β_j and θ_j can now be obtained by OLS regression of log W_j on X and λ_j, with:

$$\mathrm{E}[\log \mathrm{w_k} \mid \varepsilon_\mathrm{k} < \mathrm{v}\alpha_\mathrm{k}] = X\beta_k - \rho_k\sigma_k\lambda_k = X\beta_k + \theta_k\lambda_k$$

The standard errors obtained must however be corrected. Details of the procedure for correcting standard errors can be found in Greene (1992, pp618-622). Note that if θ_k is not significantly different from zero then there is no evidence of selection bias and we could simply obtain estimates of the wage equations from (1) and (2). It should be noted that the selection procedure adopted here is based on the Heckman (1980) selection correction. While this is a commonly adopted approach several authors including Manski (1989) have criticized it for lack of robustness. For this reason, results are presented for the full and part-time wage equations both with and without controls for selection in Section X.

3.7. Results from the Multinomial Logit Model of Full- and Part-time Employment

Employment decisions are expected to be a function of potential earnings, demographic characteristics and other household income. Table 3.4(a) reports the marginal effects from the multinomial logit (computed as dPj/dv) using 1978, 1988 and 1998 GHS data. The mean values from the multinomial logit model are reported in Appendix A1. This model includes as controls all variables in the wage equation (i.e. a quadratic in age, dummy variables for educational qualifications, the number of children in the household and region), plus dummy variables for being married/cohabiting, for the presence of children under 5 in the household, and the log of other weekly household income. Table 3.4(b) reports results using the same control variables using 1980, 1990 and 1998 data from the WES and BHPS. These data sets have the advantage of also including information of previous full and part time work experience. Past experience would be expected to influence current employment decisions, first because past work experience influences current wages, and therefore increases the benefit of working. Second, there is likely to be persistence in employment behaviour, which may, for example, reflect preferences for work or improved employment networks. Quadratics in full and part time work experience, and the interaction of full and part time work experience, are also therefore included as controls in Table 3.4(c). In all cases non-employment is the omitted category, and the marginal effects are therefore interpreted as the change in the probability resulting from a change in 'v' of being in part- or full-time employment *vis a vis* being non-employed.

Looking first at Table 3.4(a), in 1978 we observe a positive and significant coefficient on age for part-time workers and a negative and significant coefficient on age for full timers. This suggests that as women age they were more likely to work part time, while the probability of full-time work falling with age. By 1998 the coefficient on age was insignificant or part timers, while for model suggests that the probability of full-time work now increased at a decreasing rate, with age. This may be a result of not only increasing employment among women in their 30s, but also a result of declining employment rates among women under 20. The coefficients on the education dummies tell us that, while in 1978 education had no impact on the probability of part time work, by 1998 the probability of working part time (vis a vis non employment) was significantly lower among the most educated. In 1998, women with a degree were 12 percent less likely to work part time than those with no qualifications. On the other hand, women with higher qualification levels have always been more likely to work full-time, and the magnitude of the coefficients has been increasing. Thus while in 1978 having a degree increased a woman's probability of working full time by 11 percent, by 1998 this had increased to 40 percent. This reflects an increasing polarisation in the employment of low and high skill women, which has been documented in Rake (2000).

The impact of children on the probability of being full or part time employed has been changing, reflecting the increased employment of mothers, particularly among those with young children, that has occurred since the 1970s (see Desai et al 1999). In 1978, having a child under 5 in the household reduced the probability of part time employment by 8 percent but by 1998 the impact was no longer statistically significant. The number of children in the household also had a significant impact on employment, with the probability of part time work increasing and of full time work decreasing with the number of children in all periods. Marriage and other household income increased the probability of part time work in all periods, while other household income reduced the probability of full time work. Marriage, on the other hand, had no impact of full time work in 1978 and 1988, but by 1998 those who were married or cohabiting were significantly more likely to work full-time.

Together these changes reflect increased female labour force participation, with women today being more likely to continue working after marriage and to take less time out of the labour market after childbirth (McRae and Daniel 1991). The increased magnitude of the negative coefficients on the children dummies reflect the fact that childbirth, rather than marriage, is now the most important factor determining female labour force participation decisions.

Table 3.4(b) reports marginal effects from the multinomial logit model, using the same set of explanatory variables, and data from the 1980 WES and 1990 and 1998 BHPS. The results obtained are similar to those in Table 3.4(a). In Table 3.4(c) controls for previous full and part-time work experience are added. Including these variables increases the explanatory power of the models, with pseudo R^2 increasing from .150 to .318 in 1980 and from .127 to .195 in 1998. In 1980, part time work experience tended to increase the probability of both part- and full-time work, while full time work experience increased the probability of working full time only. By 1998, the impact of previous work experience on current employment choices had changed slightly, with previous part time work experience increasing the probability of part time work, and reducing the probability of full time work. Full-time work experience, on the other hand, increased the probability of working full time but reduced the probability of part time work. This change may reflect the increasingly dichotomous nature of full and part time employment, with part time work experience doing little to enhance full-time employment opportunities. On the other hand those with full time work experience do not appear to regard part time employment as an alternative to full-time work, with these women being more likely to switch out of the labour force than into part-time work. This is likely to reflect the increasing concentration of part time work in low wage work. The inclusion of previous work experience tends to increase the size of the coefficients on the dummy variables for number of children in the household and age of youngest child.

3.8. Wage Equations with and Without Sample Selection

Table 3.5 reports results from full-time and part-time wage equations both with and without sample selection. In Table 3.5(a) results are reported using GHS data, for 1978, 1988 and 1998 where controls included are a quadratic in age and dummy variables for education, number of children in the household, and region. The selection term, lambda is calculated from the multinomial logit model and estimates the probability of full-time, part-time or non-employment. In Table 3.5(b) results are reported for wage equations with the same set of explanatory variables, using WES and BHPS data for 1980, 1990 and 1998. In Table

3.5(c) additional controls for full and part-time work experience are added.

Looking first at Table 3.5(a) without controls for selection, we find that for full timers returns to age and education have been increasing over time, which is consistent with other findings (see, for example, Gosling, Machin and Meghir 1994) which show that increased returns to age and education have been an important component of the general increase in wage inequality since the late 1970s. There is also a pay penalty to having children, of around 10 percent for one or two children in 1998 and as high as 29 percent among those with three or more children. This again is consistent with other work on the family pay gap (see Waldfogel 1998a). It is perhaps notable that the pay penalty to having children has not changed significantly over time. The returns to characteristics differ quite considerably between full- and part-time workers for age and demographic characteristics, with returns to age being considerably lower and the wage penalty associated with having children considerably smaller than for full-time workers. The explanatory power of the model is considerably greater for full-time workers; with between 30 and 40 percent of wages being explained in the full-time wage models compared to around 20 percent in the part time models. Controlling for selection, we find that selection into full-time work is significant and positive in 1978, but by 1998 the coefficient is negative and insignificant. In 1988 and 1998 therefore the hypothesis of sample selection bias is rejected, telling us that unobserved characteristics (e.g. motivation) which affect a woman's full-time wage (through e_f) do not also affect the probability that she will be observed to be working full time. Full-time workingwomen are therefore found to be randomly selected in 1988 and 1998 and ordinary least squares estimation should therefore give unbiased and consistent parameter estimates of the full-time wage equation. Selection into part time work on the other hand tended to reduce wages in 1978, but by 1998 the coefficient on lambda was large and positive. The positive coefficient on lambda in 1998 tells us that unobserved characteristics, such as motivation, which raised a woman's part-time wage also increased the probability that she would be observed working part time. This implies that non-random selection of workers into part time jobs tended to reduce wages in 1978 but increase them in 1998. Coefficients on the other variables are not changed greatly as a result of correcting for selection into employment. Table 3.5(b) reports results for full- and part-time wage equations using data from the 1980 WES and 1990 and 1998 BHPS. The estimated coefficients are very similar to those found using GHS data, except for the 1998 the coefficients on the number of children in the household. In the BHPS data having one or two children has an insignificant impact on wages, although having three or more children in the household reduces wages by 15 percent.

In Table 3.5(c) additional controls are then included for previous full and part time work experience. The coefficients on full-time work experience in both the full time and part time wage equations show that previous full time work experience increases wages, although the impact of previous work experience on wages is greater for those working full-time. Ermisch and Wright (1993) also find that using 1980 WES data returns to work experience were greater for full timers than part timers. On the other hand part time work experience has no impact on wages for part timers, and actually has a significant negative impact on the wages of full time workers. Adding controls for work experience tends to reduce the coefficients on age, as would be expected. In the full-time wage models, the size of the coefficients on the number of children in the household fall with the addition of controls for previous work experience with the number of children in the household having no significant impact on wages in 1998. This suggests that, for full time working women in 1998, the observed child penalty in the Tables 3.5(a) and 3.5(b) resulted from lower levels of labour market experience among mothers. In 1980 and 1990, however, a wage penalty to motherhood existed over and above any loss in work experience. Looking at the coefficients on the selection terms in Table 3.5(c), the model suggests that once previous work experience is controlled for, negative selection into part time work is observed in all periods. This implies that in all periods part time workers are not randomly selected into part time work; instead unobserved characteristics that tend to increase the probability of a woman working part time also tend to reduce her part time wage. Table 3.5(c) does not therefore provide any evidence of non-random selection into full-time work in any period.

Overall, the wage equations estimated here suggest that the ways in which full and part time workers are rewarded are quite different. For part time women returns to education and age or work experience tend to be much lower than for those working part time. However, while full time workingwomen have tended to have a large pay penalty to having children, for part time workers the penalty to having children is much smaller. Much of this difference in the wage penalty to having children appears to result from years of lost work experience, and this is particularly true for the later time periods. Finally, there is some evidence of non-random selection into full and part time employment.

3.9. Why might Returns to Characteristics Differ?

If the labour market were perfectly competitive then workers with the same marginal productivity would have to be paid the same wage in equilibrium. There are, however, several explanations as to why part timers might be paid less than full timers with the same characteristics might. One argument is that fixed costs of employment, such as training and recruitment costs, may lead to lower wages when fewer hours are worked (see Rosen 1976). Alternatively the labour supply function of full-time and part-time workers may be distinct if, for example, part timers are more concerned about their work fitting in with other household responsibilities or if there are fixed costs associated with labour supply, such as travel to work expenses. A third related reason for lower wage offers to part timers may be compensating wage differentials, with convenience of hours, lower levels of stress etc. making up for lower remuneration.

An alternative explanation of full-time / part-time or gender differences in returns to characteristics may be that the wage equation is misspecified, for example, as a result of the omission of variables which differ systematically across full-time / part-time employees or across genders. One such omitted variable was suggested by Becker (1985), who argued that women typically have less 'energy' for work than men because of their responsibility for household tasks. This argument could also be applied to full-time and part-time employees if it was thought that differences in household responsibilities between these two groups affected effort. Becker's effort hypothesis has been tested by Bielby and Bielby (1988) in the US and Baxter (1992) in Australia. No conclusive evidence in support of the hypothesis was found in either study. There may also be other areas in where there are unobserved differences between full-time and part-time employees, such as in motivation for work. Therefore a selection term derived from the multinomial logit model is included in the wage equations.

Finally, returns to characteristics could differ because of discrimination which may arise if the presence of market imperfections. Imperfect information, for example, may lead employers to discriminate against women or part timers, and this may adversely affect their employment, promotion opportunities and wages. Alternatively, if all employers derive utility from discrimination, discrimination may persist (see Arrow (1972), Becker (1957) and Neumark (1988) for models of discrimination) in the absence of perfect information. It is probable that a mixture of discrimination, differences in returns to unobserved characteristics, variations in fixed costs of employment and compensating wage differentials explain differences in returns to observed characteristics.

3.10. Simple Decompositions

Using Oaxaca's (1973) methodology, the part time pay gap can be decomposed into two components: that part of the gender gap which can be explained by differences in measured characteristics, and that part which can be explained by differences in male and female returns to measured characteristics. The decomposition is outlined below, and the results are reported in Table 3.6.

From equation (4), evaluated at the mean the log wage is given by:

(5)

$$\log \mathrm{w_f} = \beta_f{}'\mathrm{X_f} + \theta_f\, \lambda_\mathrm{f} + \eta_\mathrm{f}$$

(6)

$$\log \mathrm{w_p} = \beta_p{}'\mathrm{X_p} + \theta_p\, \lambda_\mathrm{p} + \eta_\mathrm{p}$$

and therefore:

(7)

$$\log \mathrm{W_f} - \log \mathrm{W_p} = \beta_f(\mathrm{X_p} - \mathrm{X_f}) + (\beta_p - \beta_f)\mathrm{X_p} + \theta_f(\lambda_\mathrm{p} - \lambda_\mathrm{f}) + (\theta_p - \theta_f)\,\lambda_\mathrm{p}$$

The first term in equation (7) tells us how much of the log(wage) gap results from differences in observed characteristics, the second term tells us how much of the log(wage) gap can be accounted for by differences in returns to these characteristics, and the third term reflects differences in unobserved characteristics, and fourth term differences in returns to these unobserved characteristics. The second term is often interpreted as that part of the wage gap resulting from "discrimination". For reasons discussed above it may not, however, be a entirely accurate measure of discrimination as it includes that part of the gap arising from differences in fixed costs of employment and compensating wage differentials.

Results from the Decomposition

Results from the part-time / full-time earnings decomposition for women are reported in Table 3.6. Looking first at the results from the GHS data, it is observed that between 1978 and 1998 the log wage gap widened from -.068 to -.264 log point. Moreover, in 1978 the entire wage gap was accounted for by differences in returns to characteristics. 1998 had reversed this position. In 1998 differences in employment characteristics accounted for -.109 of the wage gap, with -.084 of the wage gap accounted for by differences in education -.037 by motherhood. Looking at returns to observed characteristics, differences in returns to age and in the constant are the largest components of this part of the wage gap. In 1998, returns to education were lower and the wage penalty to having children greater for part time workers (in 1978 the reverse was true). Looking at the change in the log wage gap, the increasing differential between full and part time pay between 1978 and 1998, of -.196 log points, was mostly accounted for by an increase in the skills gap between full and part time workers (-.123 of the change in the differential resulted from a change in the difference in characteristics). Of this the change in the difference in the age and educational profile of part time workers vis-à-vis full timers was most important. Changes in prices also mattered, with part timers in 1998 facing lower rewards to education and age than those working full-time and this has also contributed to the emerging pay gap.

Data from the Women and Employment Survey (1980) and BHPS (1990 and 1998) give a similar picture when the same sets of controls are used. Using this data the log wage gap between full and part time workers increases from -.104 to –.260 log points between 1980 and 1998. Controlling for age, education, number of children and region, that part of the wage gap accounted for using differences in characteristics rises from -.016 to -.069 between 1980 and 1998. One of the most important factors behind the full time /part time wage gap is the way in which returns to age differ. This is not a surprising result if, for full timers, age is a proxy for years of full-time work experience while for part timers this is not the case. Adding in controls for full and part time experience might therefore be expected to increase the portion of the wage gap that is explained. The results reported here show that controlling for work experience increases the portion of the explained wage gap from -.069 log points in 1998 to -.131, with differences in years of work experience accounting for -.081 of this. Looking at the change in the log wage gap, once controls for experience are added, it appears to be changes in the way full- and part-time workers are rewarded which are most significant to the change in the part time pay gap. In particular, falling rewards to age for part timers have tended to increase the part time pay penalty.

Differences in characteristics accounted for a large part of the earnings gap in all periods once controls for work experience are included. However, while between 1980 and 1998 the size of the log wage gap resulting from differences in characteristics rose from -.105 to -.131 log points, worsening returns to employment characteristics relative of part timers relative to full time workers accounted for the majority of the increase in the wage gap (in 1980 differences in returns closed the wage gap by .001 log points, while by 1998 they accounted for a -.130 log point increase in the wage gap). Changes in the relative returns to characteristics for part timers therefore accounted for -.131 log point of the -.156 increase in the log wage gap.

3.11. Employment and Earnings by Occupation

Changes in Employment by Occupation

So far the analysis of the part time pay penalty has focussed on individual characteristics. However, part of the reason for the wage differential between full and part time workers is that they do different jobs. Table 3.7 reports the occupational distribution of full- and part-time jobs, and the proportion of female employees who work part-time, in 1980, 1990 and 1998. Looking first at the occupational distribution of full and part time workers we see that in all periods women working part time where much less likely to be in professional or managerial occupations, and much more likely to work in unskilled manual jobs or personal services. In 1998 20 percent of full-time workingwomen were employed in professional and managerial occupations, 6 percent were in personal services, and 2 percent in unskilled manual jobs. For part time workers however only 5 percent worked in professional /

managerial occupations, 17 percent were employed in personal services and 11 percent were unskilled manual workers. This is reflected in the proportion of part time workers by occupation. The variations in the proportion of women working part time are stark: in 1998 fewer than one fifth of professional and managerial jobs held by women were part time, while 68 percent of personal service workers and 83 percent of those in unskilled manual occupations worked part time. Table 3.8 reports earnings ratios for part-time women relative to those who work full-time by occupation. It is notable that in 1980 there is no evidence of part-time jobs being lower paid within occupational groups except in personal services. By 1990 however, a pay gap had emerged, particularly among those in manual and non-manual (other) occupations. By 1998 the relative earnings ratio of part time to full time staff had declined to just 65 percent in skilled manual occupations, and to between 75 and 85 percent in semi-skilled and unskilled occupations, personal services and non-manual (other) occupations. Only those in professional / managerial occupations who worked part-time fared relatively well with an earnings ratio of 94 percent. So differences in occupational structure therefore appear to explain only a limited part of the full and part time pay gap. In Table 3.9 wage equations are estimated including controls for industry and occupation. It is of interest to ask to what extent do differences in characteristic contribute towards the part-time pay gap. Table 3.10 reports the results from decomposing the Oaxaca decomposition into its component parts. Jones (1983) has argued that such further decompositions are problematic because the contribution of any set of characteristic to the pay gap is dependent on how variables are measured. This is because the value of the intercept term shifts in response to changes in the unit of measurement, and any decomposition of the gender pay gap which attempts to breakdown the "explained" and "unexplained" components further is therefore dependent on the choice of measurement unit. The contribution of these components to the pay gap therefore depends "arbitrary decisions about how to impose a metric on the variables implicated in the process of discrimination". Leslie, Clark and Drinkwater (2000) suggest that the problem identified by Jones is essentially one of normalization, which results because there is no universally accepted standard for measure ment of wage equations. However, the degree to which the choice of variable is arbitrary varies considerably. Nielsen (2001) suggests that for continuous variables the problem of measurement is less acute as "institutional settings dictate how we should measure the variables" (p3). However, a particular problem arises with indicator variables, as the contribution of indicator variables to the decomposition is not robust to changes in the reference group. However, the summation and evaluation of sets of indicator variables as a whole avoids this problem. Here no attempt is made to identify the separate effects of indicator variables[5]. Bearing these limitations in mind, the decomposition reported in table 3.10 suggests that differences in the occupational and industrial composition of full- and part-time workers accounted for 10 percentage points of the 26 percentage point pay gap in 1998. However, differences in returns to occupation and industry actually helped narrow the pay gap in 1998. Breaking down the Oaxaca decomposition into its component parts suggests that in 1998 20 of the 26 points of the log wage gap resulted from differences in observed characteristics, and the relative decline in characteristics of full-time workers accounted for 7 percentage points of the 16 percentage point increase in the part-time pay gap. Changes in the occupational, industrial and educational composition of the part time workforce were the most important factors in explaining this relative decline. Differences in returns are less important in explaining the part time pay differential, although increasing differences in observed prices have been important in explaining the rise in the pay gap accounting for 9 percentage points of the 16 percentage point rise in the pay gap, with increasing differences in returns to age being of particular importance.

3.12. Conclusion

Since the 1980s a substantial gap has emerged between the pay of full and part time female employees. In 1994-5 part-time women earned only 69 percent of the full-time female wage. This gap appears to have emerged largely because part-time employees are now considerably less well qualified than those working full time. Indeed this research indicates that there is little or no part-time pay penalty *per se*. Part time jobs appear to be increasingly dichotomously distributed - with the top one fifth of part timers in highly paid

5 Note too that the index problems arising from the choice of parameter estimates, discussed in chapter 2, also occur here.

professional jobs while the majority of workers are stuck in low paid, low skill jobs. However, we have also reported evidence that suggests that many women working full time would prefer to work part time, but may be unable to do so because part-time employment is not available in more highly skilled jobs. This constraint on part-time work may exacerbate the observed gap between full- and part-time pay. The most immediate policy implication to be drawn from this research is that policies should be put in place to improve opportunities for those women who want to work part time. Policies, such as the right to return to work part time after maternity leave, would go some way towards improving the quality of part time jobs on offer.

Table 3.1: Characteristics of Part and Full Time Female Workers

	1978		1988		1998		1980 WES		1990 BHPS		1998 BHPS	
	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT
Age												
16-24	0.06	0.32	0.09	0.30	0.10	0.14	0.05	0.31	6.44	24.18	15.15	20.99
25-34	0.24	0.20	0.23	0.25	0.25	0.29	0.26	0.21	25.25	30.83	23.43	31.54
35-44	0.31	0.18	0.34	0.22	0.31	0.26	0.32	0.19	35.25	22.39	30.96	22.39
45-59	0.39	0.30	0.34	0.23	0.35	0.31	0.37	0.28	33.07	22.60	30.46	25.08
Education												
Degree	0.02	0.04	0.04	0.09	0.09	0.22	0.03	0.04	4.89	12.17	8.34	17.07
Alevels	0.09	0.14	0.12	0.19	0.25	0.28	0.13	0.17	23.53	32.77	35.49	44.12
5 + 'O's	0.06	0.08	0.09	0.12	0.09	0.10	0.26	0.38	27.32	29.91	28.34	23.44
< 5 'O's	0.21	0.30	0.29	0.37	0.37	0.28	0.01	0.05	12.36	10.63	9.28	7.03
No qual	0.62	0.44	0.45	0.23	0.21	0.12	0.56	0.37	31.90	14.52	18.55	8.34
Married or Cohabiting												
Share	.89	0.58	0.84	0.59	0.77	0.65	0.88	0.56	.833	.627	.738	.649
Number of Children												
0	0.37	0.67	0.37	0.71	0.36	0.68	0.37	0.77	41.19	75.54	40.65	72.74
1	0.24	0.17	0.24	0.17	0.24	0.17	0.25	0.13	22.67	15.02	25.66	17.15
2	0.29	0.11	0.29	0.09	0.29	0.12	0.28	0.07	27.03	7.58	24.67	7.74
3	0.11	0.05	0.10	0.03	0.11	0.03	0.48	0.80	9.11	1.86	9.02	2.36
Years Work Experience												
FT	-	-	-	-	-	-	9.48	12.40	8.89	11.73	7.77	10.36
PT	-	-	-	-	-	-	6.90	2.15	8.70	2.16	6.77	2.35
N	2386	2887	1996	2684	1643	2348	1284	1602	1010	1398	1208	1563

Note: Excludes those in FT education

Table 3.2: Inequality Measures

FES Hourly Earnings

	FT Women				PT Women			
	1968	1978	1988	1998	1968	1978	1988	1998
90-10 Log(Wage) Differential	.945	.889	1.153	1.197	.979	1.058	1.122	1.256
90-50 Log(Wage) Differential	.536	.480	.622	.609	.687	.656	.758	.839
50-10 Log(Wage) Differential	.409	.409	.531	.588	.292	.431	.364	.417
Coefficient of Variation	.473	.393	.478	.570	.843	.825	.965	.757
SD of Logs	.393	.389	.473	.499	.478	.473	.516	.532
Gini Coefficient	.224	.205	.253	.271	.291	.288	.315	.316

Source: FES

Table 3.3: Wage Equations - All Women

	1980		1990		1998	
	Coef	se	Coef	Se	Coef	se
Part-time	-.021	.020	-.172	.022	-.215	.018
Age	.015	.009	.100	.006	.086	.006
$Age^2/100$	-.026	.011	-.115	.008	-.096	.008
Degree or equivalent	.716	.048	.701	.028	.671	.028
"A" levels or equivalent	.373	.025	.424	.021	.344	.024
5 "O" levels or equivalent	.081	.019	.211	.022	.221	.026
Fewer than 5 "O" levels	-.038	.069	.151	.027	.128	.031
One kid	-.076	.024	-.006	.021	.023	.020
Two kids	-.100	.026	.037	.022	.058	.022
Three + kids	-.113	.035	-.028	.033	.043	.032
Full-time experience	.022	.005	-.003	.002	.011	.003
Full time experience squared	.000	.000	.000	.000	.000	.000
Part-time experience	.016	.006	-.036	.004	-.042	.005
Part time experience squared	.000	.000	.001	.000	.001	.000
Full-time * Part time experience	-.001	.000	.000	.000	.000	.000
Constant	1.881	.145	-.484	.099	-.304	.105
FStat(pvalue)	22.52		121.21		128.22	
R2	.225		.447		.439	
Obs.	1971		3473		3788	

Note: Regional dummies also included in the regressions.

Table 3.4 (a): Multinomial Logit Results for Selection into PT and FT Employment

	1978				1988				1998			
	PT		FT		PT		FT		PT		FT	
	Coef	s.e.	Coef	s.e.	Coef	s.e.	Coef	s.e.	Coef	s.e.	Coef	s.e.
Age	.038**	.004	-.009*	.004	.013**	.005	.026**	.005	.002	.005	.044**	.006
Age^2 / 100	-.043**	.005	-.001	.005	-.010	.006	-.050**	.007	.003	.007	-.068**	.007
Degree	-.040	.041	.112**	.041	-.081*	.036	.303**	.039	-.124**	.029	.398**	.030
A levels	.005	.021	.087**	.021	-.078**	.024	.262**	.027	-.007	.023	.250**	.026
5 O levels	.018	.024	.050**	.023	-.011	.026	.227**	.028	-.046	.030	.206**	.033
< 5 O levels	.009	.014	.105**	.013	-.040*	.018	.197**	.021	.016	.021	.163**	.025
Children <5	-.081**	.018	-.376**	.022	-.072**	.022	-.353**	.029	.020	.020	-.245**	.026
One Child	.068**	.017	-.137**	.016	.135**	.020	-.238**	.023	.156**	.021	-.201**	.023
Two Children	.120**	.017	-.246**	.017	.251**	.021	-.410**	.026	.229**	.022	-.350**	.025
Three plus children	.068**	.022	-.243**	.023	.196**	.029	-.373**	.036	.216**	.030	-.475**	.038
Married	.155**	.019	-.020	.015	.092**	.021	.031	.022	.064**	.021	.110**	.022
Log other HH income (weekly)	.018**	.005	-.048**	.006	.040**	.010	-.03**	.008	.026*	.011	-.038**	.008
Constant	-1.202**	.078	.681**	.070	-.741**	.108	.043	.110	-.455**	.114	-.361**	.115
P>Chi2	.000				.000				.000			
Pseudo R2	.150				.171				.127			
Log likelihood	-6668				-4173				-4327			
Obs.	7278				4611				4535			

Notes: Regional dummy variables also included.

Table 3.4(b)

	1980				1990				1998			
	PT		FT		PT		FT		PT		FT	
	Coef	s.e.	Coef	s.e.	Coef	s.e.	Coef	s.e.	Coef	s.e.	Coef	s.e.
Age	.049**	.008	.006	.006	.022**	.007	.024**	.006	-.031**	.007	.060**	.007
Age^2 / 100	-.055**	.010	-.018*	.008	-.021**	.008	-.049*8	.009	.046**	.009	-.089**	.009
Degree	.068	.056	.030	.055	-.115**	.039	.332*8	.041	-.213**	.039	.295**	.041
A levels	-.027	.029	.085**	.024	-.034	.023	.227**	.026	-.146**	.030	.239**	.034
5 O levels	-.048*	.021	.064**	.017	-.006	.022	.192**	.026	-.066*	.031	.216**	.036
< 5 O levels	.005	.075	.067	.061	-.038	.027	.093**	.031	-.102*	.040	.177**	.045
Child < 5	-.122**	.028	-.334**	.028	-.038	.026	-.291**	.033	.003	.030	.001	.035
One Child	.111**	.027	-.184**	.023	.121**	.024	-.251**	.028	.281**	.028	-.257**	.031
Two Children	.156**	.029	-.329**	.026	.222**	.025	-.456**	.032	.453**	.031	-.471**	.036
Three plus children	.106**	.037	-.281**	.033	.185**	.035	-.558**	.050	.470**	.046	-.593**	.057
Married	.033	.094	-.061	.078	.071**	.023	.065**	.023	-.010	.023	.129**	.025
Log other household income	.011**	.004	.014**	.003	.017	.010	-.066**	.009	.048**	.010	-.065**	.010
Constant	-1.139**	.179	.094	.141	-.700**	.135	.331*	.134	.052	.142	-.462**	.146
P>Chi2	.000				.000				.000			
Pseudo R2	.1544				.170				.116			
Log likelihood	-310.63				-3328				-3015			
Obs.	3396				3679				3221			

Notes: Regional dummy variables also included.

Table 3.5(a): Wage Equations

	Selection												No Selection											
	1978				1988				1998				1978				1988				1998			
	PT		FT		PT		FT		PT		FT		PT		FT		PT		FT		PT		FT	
	Coef	Se	Coef	se	Coef	se	Coef	se	Coef	Se	Coef	Se	Coef	Se	Coef	se	Coef	Se	Coef	se	Coef	se	Coef	Se
Age	.027**	.007	.060**	.004	.048**	.009	.088**	.006	.045**	.008	.106**	.007	.050**	.006	.059**	.004	.050**	.008	.088**	.006	.040	.129	.106**	.007
$Age^2/100$	-.036**	.009	-.072**	.005	-.056**	.011	-.106**	.009	-.047**	.011	-.126**	.010	-.062**	.001	-.070**	.001	-.057**	.002	-.105**	.001	-.047**	.003	-.126*8	.001
Degree or equivalent	.771**	.106	.694**	.036	.696**	.095	.643**	.040	.775**	.065	.723**	.039	.724**	.064	.705**	.032	.686**	.066	.638**	.037	.850**	.070	.722**	.038
"A" levels or equivalent	.484**	.045	.409**	.023	.591**	.050	.547**	.030	.382**	.042	.471**	.040	.466**	.029	.414**	.019	.584**	.041	.547**	.027	.382**	.045	.487**	.027
5 "O" levels or equivalent	.130**	.046	.233**	.028	.179**	.052	.322**	.035	.227**	.054	.310**	.049	.127**	.034	.225**	.023	.180**	.043	.325**	.030	.243**	.061	.327**	.036
Fewer than 5 "O" levels	.124**	.024	.113**	.016	.127**	.029	.222**	.027	.143**	.034	.262**	.038	.124**	.019	.109**	.013	.123**	.028	.225**	.019	.124**	.031	.279**	.024
One kid	-.063**	.026	-.105**	.020	-.020	.038	-.122**	.027	.007	.046	-.091**	.027	-.033	.020	-.098**	.017	-.006	.033	-.122**	.026	-.152**	.046	-.084**	.029
Two kids	-.095**	.028	-.148**	.027	-.036	.038	-.220**	.038	.038	.045	-.078*	.036	-.047**	.017	-.120**	.022	-.014	.027	-.229**	.033	-.163**	.029	-.083*	.033
Three + kids	-.088*	.040	-.202**	.039	-.064	.060	-.316**	.083	-.020	.058	-.261**	.075	-.057*	.025	-.172**	.033	-.048	.041	-.322**	.051	-.202**	.044	-.285**	.061
Constant	.771**	.138	.319**	.070	.699**	.165	.081	.113	.572**	.158	-.344**	.132	.699**	.007	.185**	.006	.698**	.012	.125**	.009	.361**	.636	-.261**	.010
MU(1)													-.773**	.232	.487**	.099	-.196	.329	-.150	.158	1.729**	.442	-.325	.195
Fstat	14.53		72.41		15.55		59.17		14.81		5.88		15.01		7.53		14.81		59.17		14.93		48.70	
(pvalue)	(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)	
R2	.170		.353		.262		.391		.206		.325		.174		.359		.262		.391		.214		.326	
Obs.	2054		2500		1150		1641		1314		1864		2054		2500		1150		1641		1314		1864	

Table 3.5(b)

	NoSelection												Selection											
	1980				1990				1998				1980				1990				1998			
	PT		FT		PT		FT		PT		FT		PT		FT		PT		FT		PT		FT	
	Coef	Se	Coef	se	Coef	se	Coef	Se	Coef	Se	Coef	Se	Coef	Se	Coef	Se	Coef	Se	Coef	Se	Coef	se	Coef	Se
Age	*	.010	.037**	.009	.058**	.012	.109**	.008	.053**	.011	.110**	.008	.039**	.010	.028**	.009	.062**	.011	.110**	.008	.057**	.011	.106	.008
$Age^2/100$	-.046**	.012	-.045**	.011	-.066**	.015	-.136**	.012	-.056**	.015	-.130**	.011	-.050**	.002	-.035**	.001	-.070**	.002	-.136**	.012	-.061**	.002	-.125**	.001
Degree or equivalent	.769**	.069	.535**	.104	.802**	.088	.703**	.047	.847**	.071	.672**	.053	.770**	.063	.539**	.067	.788**	.068	.699**	.047	.860**	.058	.699**	.056
Alevels or equivalent	.407**	.045	.327**	.037	.534**	.046	.414**	.042	.314**	.044	.365**	.050	.405**	.035	.323**	.033	.531**	.038	.434**	.043	.341**	.036	.400**	.028
5O levels or equivalent	.018	.026	.143**	.028	.227**	.033	.242**	.041	.217**	.041	.217**	.050	.016**	.025	.132**	.024	.227**	.032	.266**	.041	.221**	.032	.252**	.026
Fewer than 5 Olevels	-.120	.156	.030	.103	.156**	.039	.120*	.048	.109	.051	.164**	.057	-.122	.106	.022	.075	.153**	.044	.155**	.049	.115*	.049	.202**	.042
One kid	-.085*	.034	-.106**	.033	-.039	.048	-.100**	.037	.032	.046	.001	.034	-.080**	.029	-.070*	.033	-.023	.037	-.094*	.038	.007	.037	.023	.032
Two kids	-.107**	.039	-.153**	.054	.013	.046	-.171**	.058	.055	.050	-.092	.050	-.101**	.024	-.088*	.043	.035	.032	-.200**	.058	.030	.033	-.112*	.053
Three+ kids	-.149**	.048	-.182**	.056	-.100	.062	-.386**	.104	.011	.071	-.152**	.014	-.144**	.036	-.125*	.061	-.081	.049	-.447**	.107	-.013	.049	-.208	.111
Constant	1.655**	.187	1.557**	.154	.031	.224	-.583**	.144	.141	.177	-.662**	.144	1.625**	.057	1.551**	.112	.019	.014	-.473**	.148	.001	.014	-.422**	.011
MU(1)													-.127	.390	.452	.237	-.223	.552	-.510**	.164	.277	.395	-.590*	.234
Fstat	13.71		9.83		14.23		41.74		18.30		43.92		13.84		9.51		13.72		42.94		17.43		42.79	
(pvalue)	(.000)		(.000)		(.000)		(.000)		(.000)				(.000)		(.000)		(.000)		(.000)		(.000)		(.000)	
R2	.237		.193		.283		.399		.296		.388		.237		.197		.283		.377		.297		.392	
Number of observations	1084		887		830		1117		928		1187		1084		887		830		1117		928		1187	

Table 3.5(c)

	No Selection												Selection											
	1980				1990				1998				1980				1990				1998			
	PT		FT		PT		FT		PT		FT		PT		FT		PT		FT		PT		FT	
	Coef	Se	Coef	Se	Coef	se	Coef	se	Coef	Se	Coef	se	Coef	Se	Coef	Se	Coef	Se	Coef	Se	Coef	se	Coef	Se
Age	.026*	.012	.004	.013	.063**	.014	.103**	.010	.031*	.014	.089**	.009	.028*	.013	.003	.012	.061**	.014	.102**	.009	.027	.014	.091**	.009
Age^2/100	-.041**	.015	-.012	.016	-.076**	.017	-.127**	.013	-.034	.019	-.107**	.012	-.042**	.003	-.011**	.002	-.073**	.003	-.125**	.003	-.028**	.003	-.109**	.003
Degree	.804**	.073	.608**	.098	.805**	.085	.684**	.048	.825**	.068	.672**	.053	.803**	.063	.611**	.069	.796**	.069	.676**	.047	.807**	.060	.671**	.049
A level	.419**	.046	.341**	.038	.527**	.045	.390**	.042	.313**	.043	.350**	.049	.410**	.035	.342**	.034	.524**	.038	.390**	.030	.301**	.037	.348**	.026
5Olevels	.021	.026	.146**	.028	.228**	.034	.229**	.040	.199**	.040	.197**	.050	.024	.025	.146**	.024	.227**	.032	.230**	.025	.193**	.031	.196**	.025
< 5 Olevels	-.122	.158	.025	.101	.151**	.039	.104*	.048	.102*	.049	.138*	.056	-.132	.109	.023	.081	.149**	.044	.109**	.036	.094*	.047	.136**	.040
One kid	-.073*	.034	-.062	.035	-.049	.049	-.075*	.037	.038	.045	.030	.032	-.075*	.032	-.061*	.031	-.021	.040	-.064	.034	.064	.039	.025	.030
Two kids	-.090*	.039	-.080	.057	.008	.046	-.120*	.059	.056	.050	-.068	.046	-.087**	.027	-.080*	.038	.033	.033	-.114*	.046	.079*	.033	-.072	.042
Three+ kids	-.121*	.049	-.084	.058	-.095	.062	-.302**	.109	.043	.070	.006	.095	-.118**	.036	-.083	.052	-.059	.049	-.307**	.087	.069	.047	-.013	.087
Full-time experience	.012	.008	.032**	.008	.003	.008	.008*	.004	.030**	.007	.018**	.004	.012	.036	.033**	.005	.005	.007	.007*	.003	.030**	.006	.019**	.003
FT Exp^2/100	.000	.000	-.052**	.000	.027	.024	-.014	.011	-.063**	.020	.031**	.009	-.015*	.006	-.052**	.003	.002	.011	-.012**	.004	-.071**	.010	-.031**	.003
PT experience	.015*	.007	.014	.011	-.008	.007	-.040**	.013	-.004	.008	-.055**	.009	.013	.007	.014*	.007	-.005	.005	-.041**	.009	-.009	.006	-.055**	.008
PT exp^2/100	.000	.000	-.024**	.000	.038*	.017	.175**	.013	.032	.023	.232**	.036	-.017**	.006	-.024	.016	.003	.008	.002	.018	-.039**	.010	.233**	.022
FT*PT exp/100	.000	.000	-.062**	.000	-.025	.035	.014	.052	-.063	.043	.030	.036	-.023*	.011	-.059**	.017	.001	.005	.025	.018	-.036*	.017	.027*	.014
Constant	1.753**	.206	1.925**	.195	-.044	.241	-.512**	.157	.497**	.222	-.332	.167	1.850	.011	1.953	.011	.114*	.052	-.444**	.011	.724**	.014	-.381**	.010
MU(1)													-.398	.180**	-.061	.143	-.517*	.200	-.164	.140	-.513*	.219	.088	.172
Fstat	11.22		1.17		12.46		35.62		16.64		41.40		1.92		9.75		12.68		34.68		16.57		39.69	
(p-value)	(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)	
R^2	.244		.229		.304		.420		.317		.438		.248		.229		.310		.421		.321		.439	
Obs.	1084		887		830		1117		928		1187		1084		887		830		1117		928		1187	

Table 3.6: Decomposing the Wage Gap of PT/FT Women

Human Capital Specification

	GHS				*WES*	*BHPS*			*WES*	*BHPS*		
	1978	1988	1998	Δ	1980	1990	1998	Δ	1980	1990	1998	Δ
Differential	-.068	-.237	-.264	-.196	-.104	-.232	-.260	-.156	-.104	-.232	-.260	-.156
Observed X's	.014	-.116	-.109	-.123	-.016	-.112	-.069	-.053	-.105	-.141	-.131	-.026
Age	.092	.078	.025	-.067	.015	.094	.042	.027	-.009	.090	.033	.042
Education	-.045	-.095	-.084	-.039	-.023	-.096	.069	.092	-.025	-.090	-.067	-.042
Kids	-.039	-.084	-.037	.002	-.028	-.083	.032	.06	-.025	-.052	-.010	.015
Region	-.003	-.011	-.006	-.003	.003	-.007	.005	.002	.003	-.007	-.005	-.008
Experience	-	-	-						-.047	-.076	-.081	
Lambda	.008	-.004	-.006	-.014	.017	-.019	-.004	-.021	-.002	-.006	.000	.002
Observed Prices	-.083	-.121	-.155	-.072	-.088	-.120	-.191	-.103	.001	-.091	-.130	-.131
Age	-.565	-.647	-1.251	-.686	.193	-.820	-.870	-1.063	.502	-.745	-1.128	-1.63
Education	.004	-.039	-.092	-.096	-.017	.016	-.023	-.006	-.022	.042	-.010	.012
Kids	.031	.140	-.033	-.064	-.011	.115	.047	.058	-.012	.073	.050	.062
Region	-.002	-.006	-.050	-.048	-.145	.022	.076	.221	-.165	-.016	-.073	.092
Experience	-	-	-						-.131	.110	.125	
Lambda	-.104	-.087	.732	.836	-.230	.099	.307	.537	-.112	-.112	-.198	-.086
Constant	.553	.518	.538	-.015	.123	.492	.423	.3	-.059	.557	1.105	1.164

Table 3.7: Occupational Composition of Full and Part time Female Employees

Occupation	1980	1990	1998	Change
	Proportion part-time			
Prof/Manager	.225	.137	.163	-.062
Non-manual(other)	.488	.398	.427	-.061
Personal Services	.808	.622	.678	-.130
Skilled manual	.484	.308	.315	-.169
Semiskilled manual	.386	.452	.416	.030
Unskilled manual	.868	.795	.826	-.042
	Distribution of FT female employees			
Prof/Manager	.089	.157	.201	.122
Non-manual(other)	.604	.623	.585	-.019
Personal Services	.059	.067	.063	.004
Skilled manual	.072	.052	.049	-.023
Semiskilled manual	.143	.078	.085	-.058
Unskilled manual	.033	.023	.017	-.016
	Distribution of PT female employees			
Prof/Manager	.021	.035	.051	.030
Non-manual(other)	.471	.570	.565	.094
Personal Services	.202	.152	.172	-.030
Skilled manual	.055	.032	.029	-.026
Semiskilled manual	.074	.089	.078	.004
Unskilled manual	.176	.123	.106	-.070
Number obs.	1971	1010	1208	

Table 3.8: Earnings Ratios by Occupation

Occupation	1980	1990	1998
Professional / Managerial	.993	.998	.936
Non-manual (other)	1.007	.793	.793
Personal Services	.915	.979	.844
Skilled manual	.955	.788	.652
Semiskilled manual	1.068	.806	.768
Unskilled manual	.972	.813	.826

Table 3.9:Wage Equations

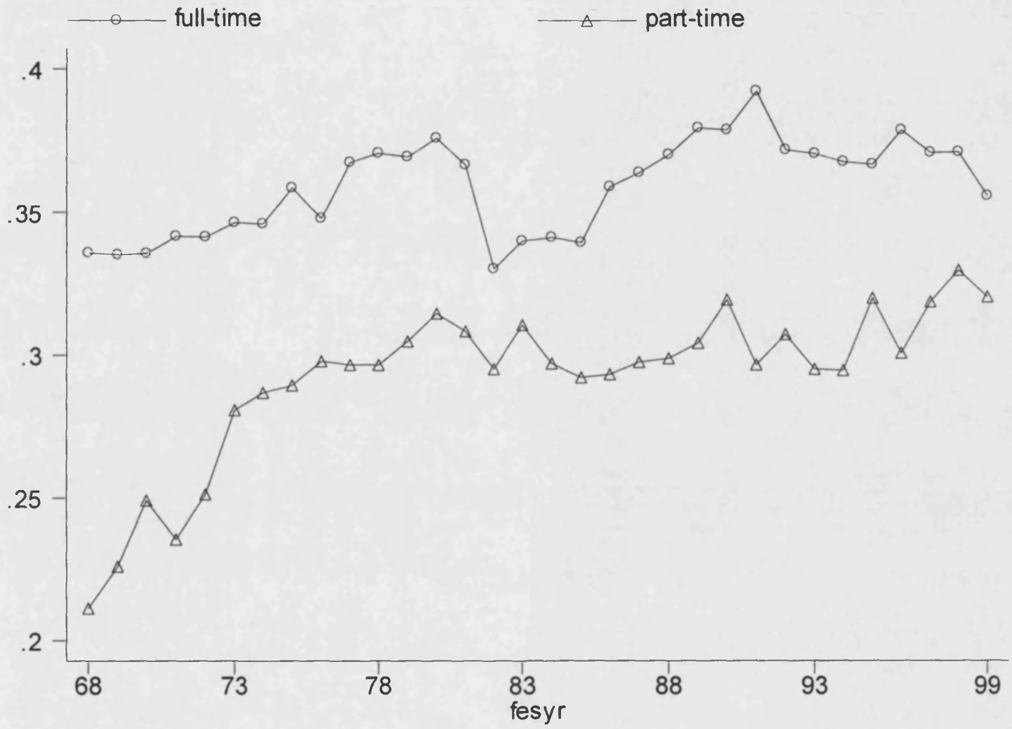
	1980				1990				1998			
	PT		FT		PT		FT		PT		FT	
	Coef	se	Coef	Se	Coef	Se	Coef	Se	Coef	Se	Coef	Se
Age	.022	.012	.007	.013	.058**	.013	.095**	.010	.026	.014	.076**	.010
$Age^2/100$	-.034*	.014	-.014	.016	-.070**	.017	-.117**	.013	-.030	.018	-.093**	.012
Degree	.751**	.076	.583**	.103	.549**	.097	.438**	.055	.518**	.073	.439**	.058
A levels	.373**	.047	.298**	.041	.357**	.050	.229**	.049	.153**	.044	.206**	.052
5 O levels	-.017	.028	.110**	.032	.136**	.036	.103*	.044	.064	.042	.087	.051
<5 O levels	-.120	.150	.002	.100	.075	.042	.004	.049	.031	.049	.066	.056
One kid	-.060	.033	-.050	.034	-.043	.048	-.067*	.034	.005	.041	.020	.032
Two kids	-.068	.039	-.064	.057	.012	.048	-.101	.058	.012	.047	-.045	.044
Three + kids	-.112*	.048	-.051	.059	-.041	.062	-.290**	.110	.039	.065	.035	.091
FT experience	.012	.008	.031**	.008	.001	.008	.000	.004	.018**	.007	.017**	.004
Ft exp^2/100	.012	.019	-.050**	.018	.027	.025	.001	.010	-.036	.020	-.033**	.009
Pt exp	.015*	.007	.011	.011	-.008	.007	-.022	.013	-.009	.007	-.042**	.010
Pt exp^2/100	-.017	.022	-.009	.033	.028*	.014	.088	.051	.039	.022	.176**	.036
FT*PT exp /100	-.058	.045	-.058	.046	-.005	.034	-.008	.050	-.028	.040	.029	.035
Prof/Manager	-.008	.103	.096	.084	.414**	.100	.496**	.102	.635**	.077	.370**	.114
Non-manual (other)	.116**	.029	.118	.064	.264**	.045	.324**	.096	.323**	.039	.148	.111
Personal Services	-.042	.026	-.044	.073	.047	.050	-.065	.103	.038	.044	-.054	.115
Skilled manual	-.052	.078	-.044	.090	.026	.088	.167	.107	.046	.094	.009	.117
Semi-skilled manual	.071	.049	.009	.067	.093	.066	.153	.105	.072	.056	-.118	.113
Agriculture	.069	.152	-.143	.112	-.045	.104	-.642**	.133	-.054	.141	-.025	.067
Energy, mining, minerals	.023	.135	.089	.066	-.011	.071	.105*	.045	.193	.166	.173**	.044
Engineeering and vehicles	.033	.121	.016	.059	.144	.098	.024	.034	.232*	.110	.067	.039
Other manufacturing	-.056	.126	.033	.061	-.050	.059	-.093*	.041	-.142	.114	-.035	.043
Construction	.262	.188	.028	.103	-.183	.186	-.170	.191	-.032	.114	-.107	.084
Services	-.092	.116	-.034	.058	-.249**	.031	-.239**	.035	-.259**	.029	-.198**	.031
Constant	1.882**	.239	1.840**	.207	.000	.272	-.427*	.174	.644**	.221	-.141	.205
Fstat	11.03		8.73		12.75		39.13		19.79		39.76	
(p-value)	(.000)		(.000)		(.000)		(.000)		(.000)		(.000)	
R^2	.286		.253		.385		.343		.451		.526	
Number observations	1084		886		746		1030		864		1106	

Note: omitted categories are, for occupation, unskilled manual, and for industry, transport and communications.

Table 3.10: Decomposing the Pay Gap – Full Specification

	1980	1990	1998	Change
Log Wage Differential	-.104	-.235	-.262	-.158
Observed X's	-.131	-.204	-.199	-.068
Age	-.005	.082	.025	.017
Education	-.020	-.053	-.045	-.026
Kids	-.019	-.049	-.004	.019
Region	.001	-.008	-.009	-.008
Experience	-.045	-.057	-.059	-.014
Occupation	-.028	-.081	-.061	-.036
Industry	-.014	-.039	-.047	-.033
Observed Prices	.027	-.031	-.063	-.090
Age	.275	-.670	-.930	-.866
Education	-.022	.053	-.022	.039
Kids	-.010	.059	.011	.031
Region	-.107	-.052	-.019	.111
Experience	-.104	.073	.050	.154
Occupation	.002	-.032	.146	.127
Industry	-.049	.007	-.024	.025
Constant	-.042	.427	.726	.432

Figure 3.1: Changes in Full and Part time Employment, 1968-99



Note: Source FES. Sample includes all women aged 17-59. FT defined as working over 30 hours per week, PT defined as working more than 2 hours and less than or equal to 30 hours per week. Self employed and students excluded.

Figure 3.2: Full Time and Part Time Employment by Age

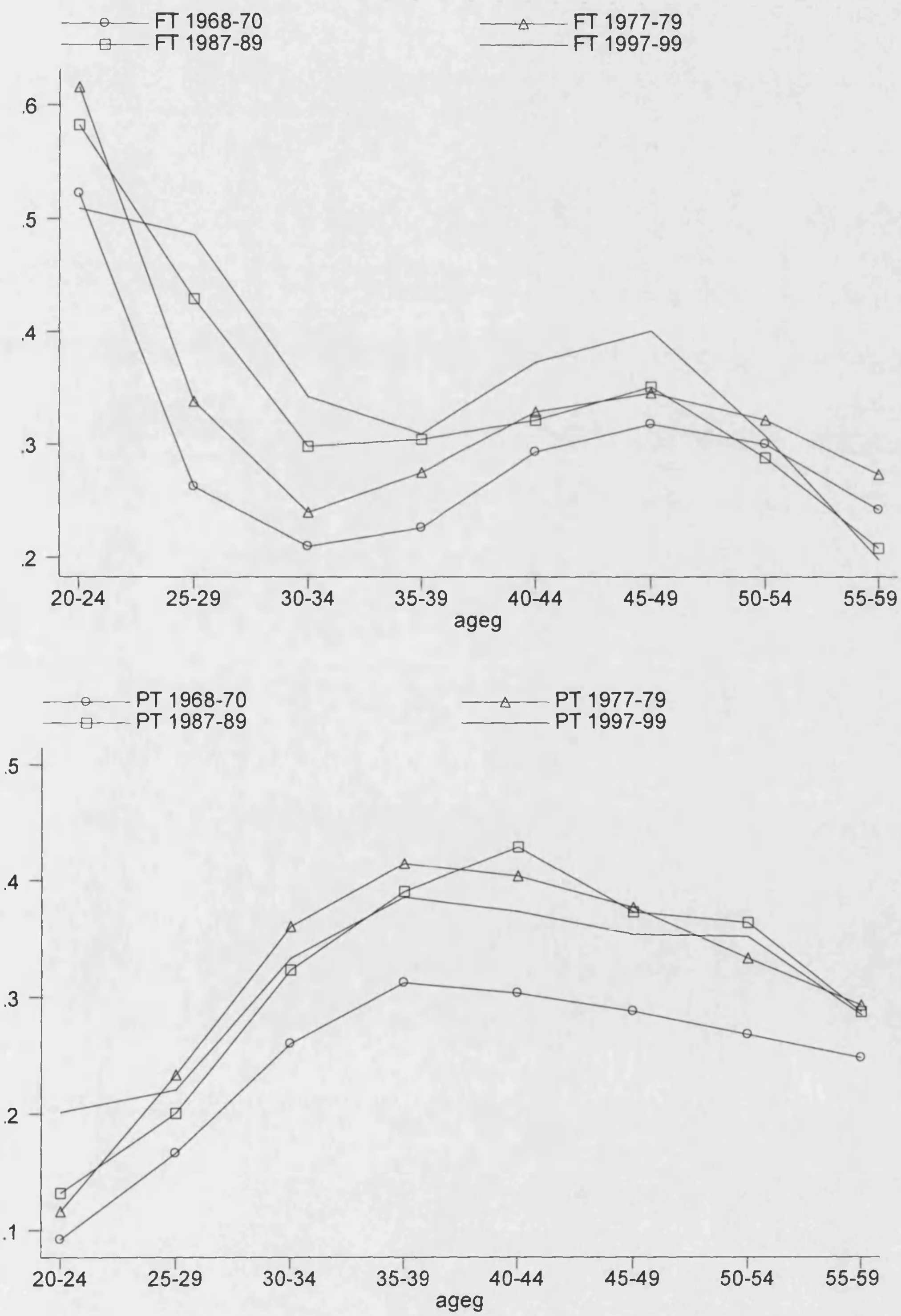
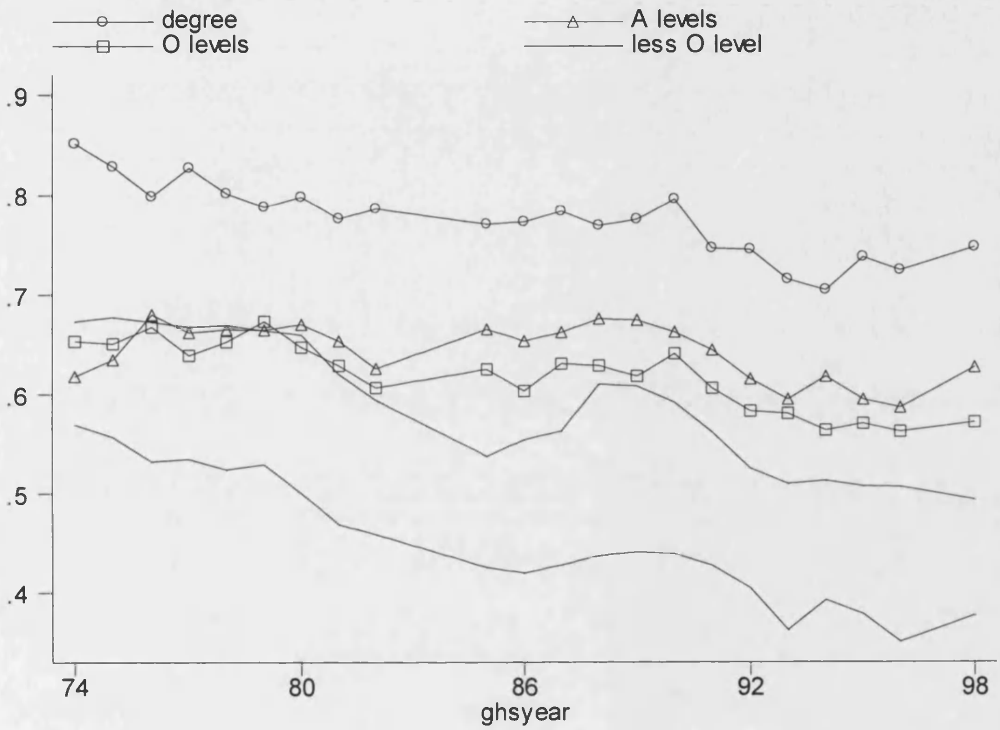


Figure 3.3: Employment Rates by Education

Full-time Employment Rates by Education



Part-time Employment Rates by Education

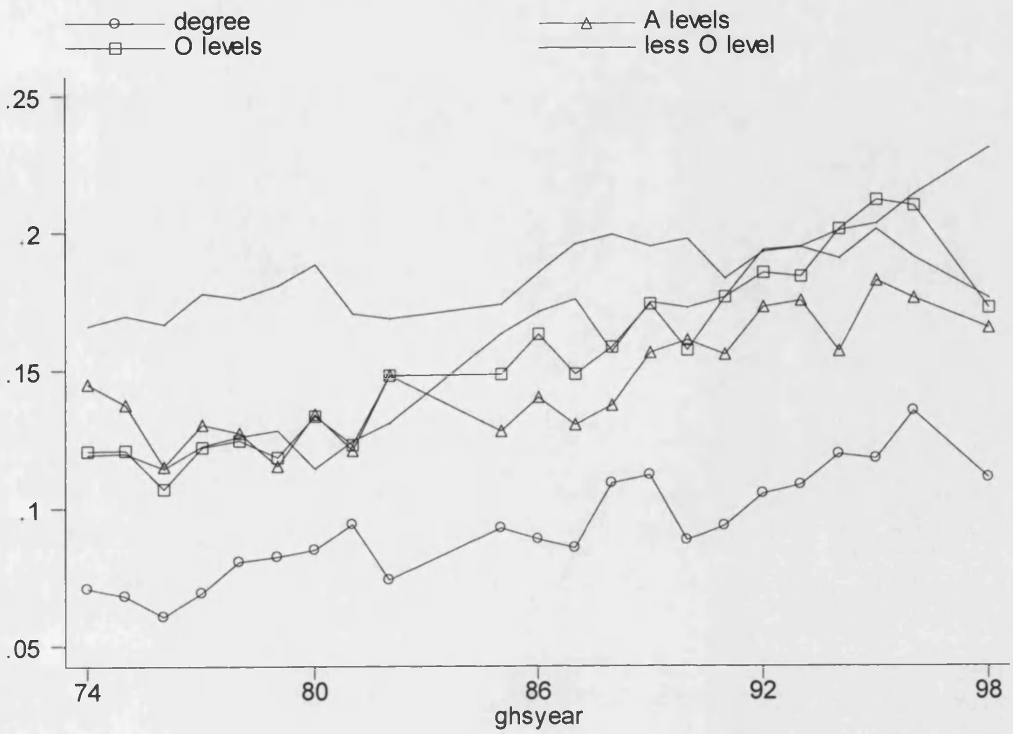
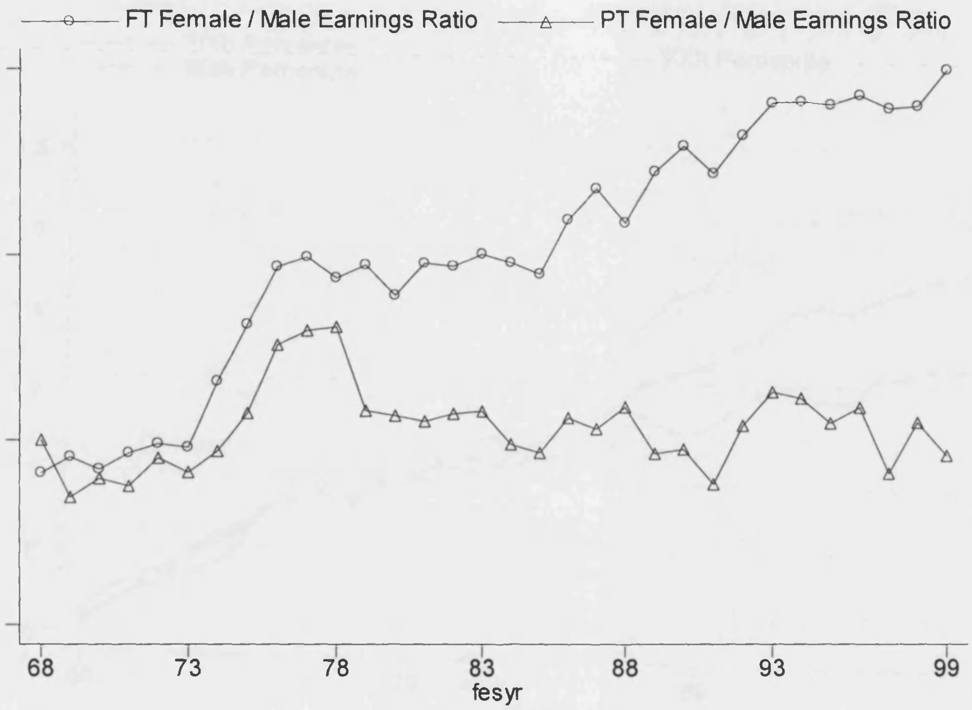


Figure 3.4: Relative Hourly Earnings Ratios, 1968-99



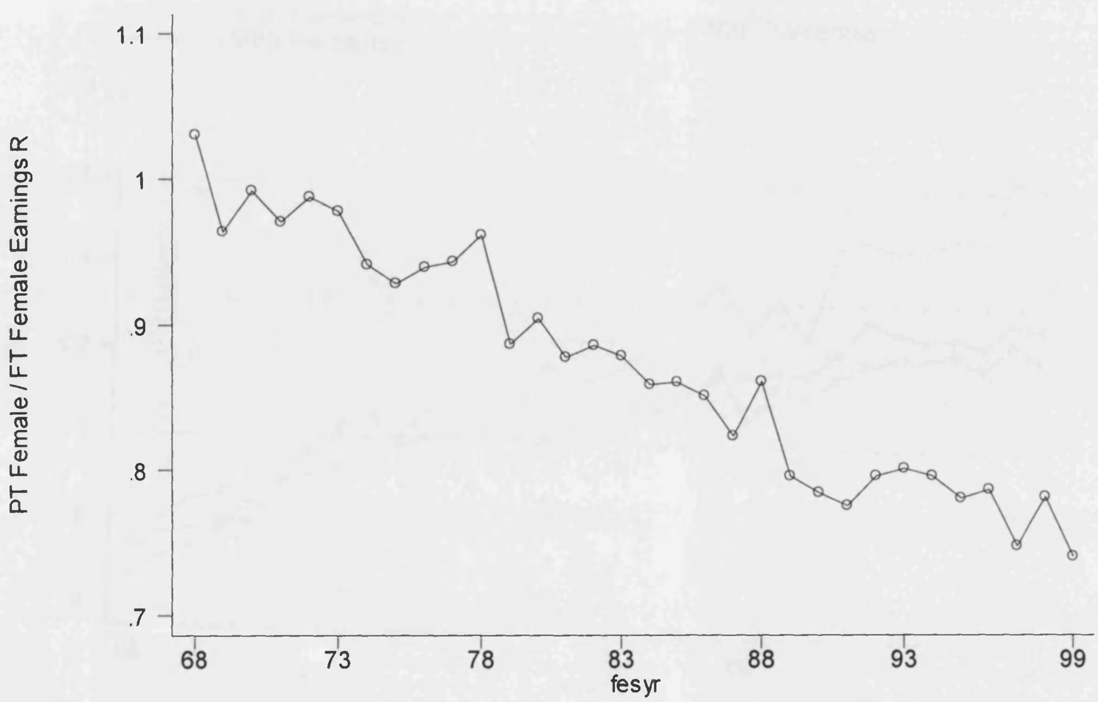


Figure 3.5: Indexed Real Hourly Earnings; 10th, 50th and 90th Percentile

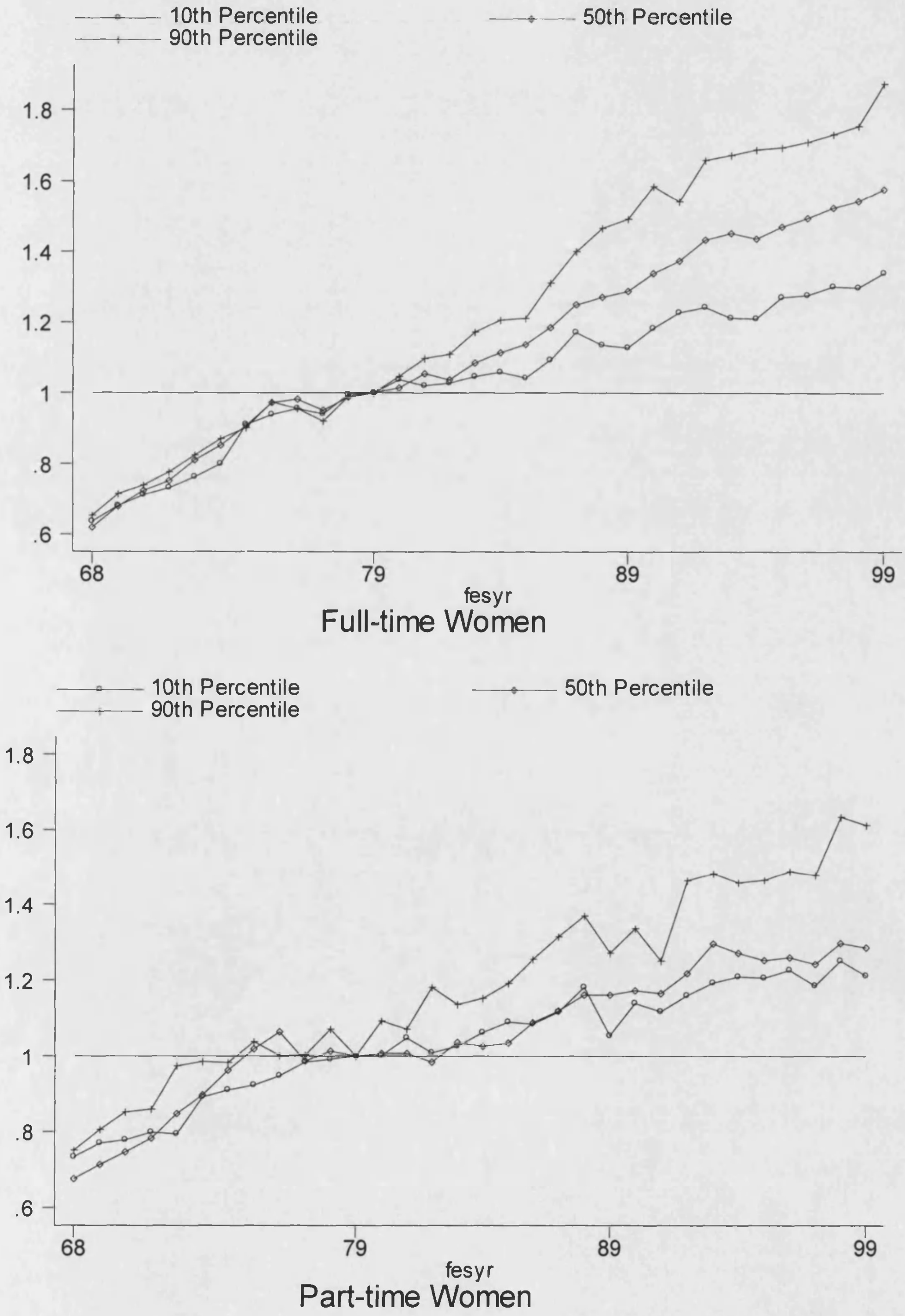


Figure 3.6: Gender Earnings Ratio by Percentile

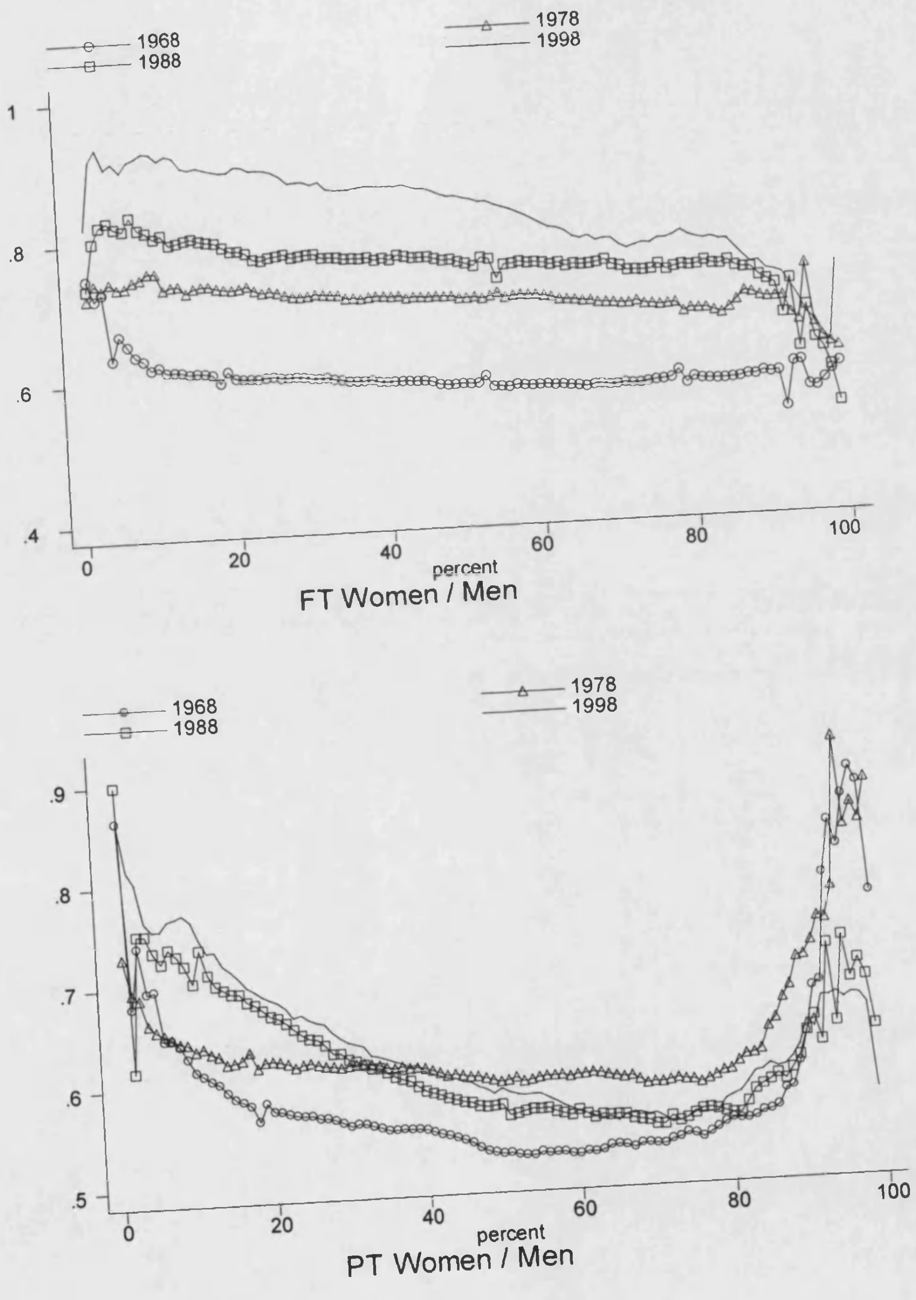


Figure 3.6 (continued)

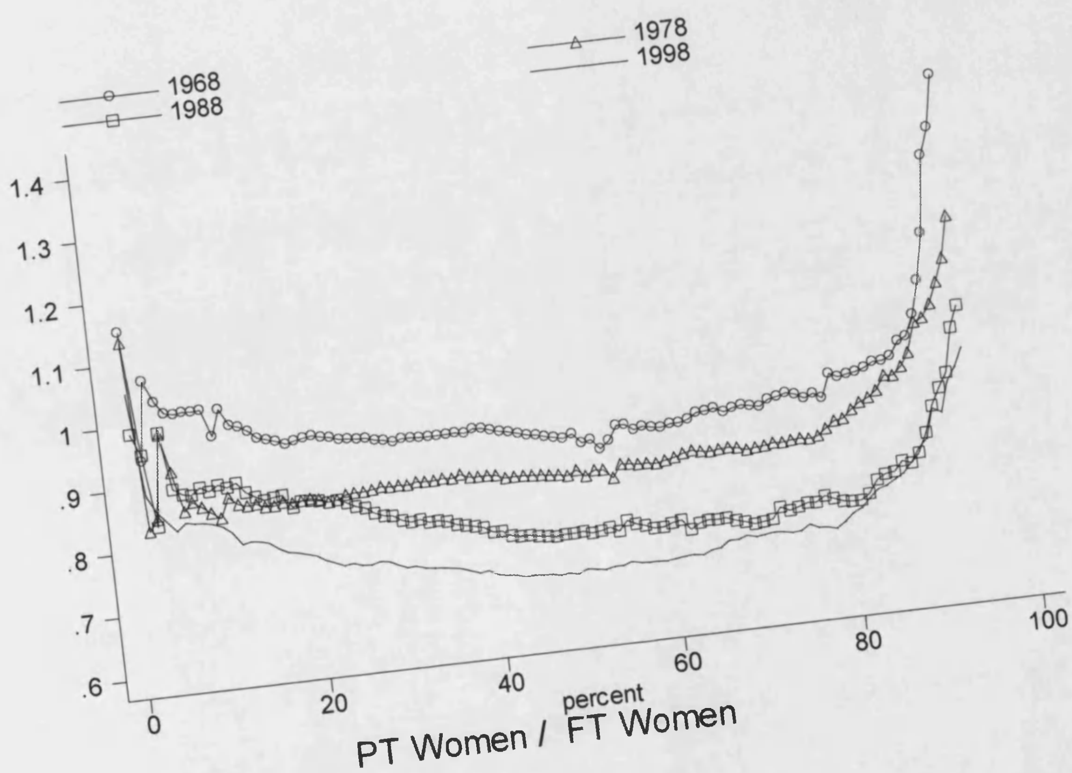
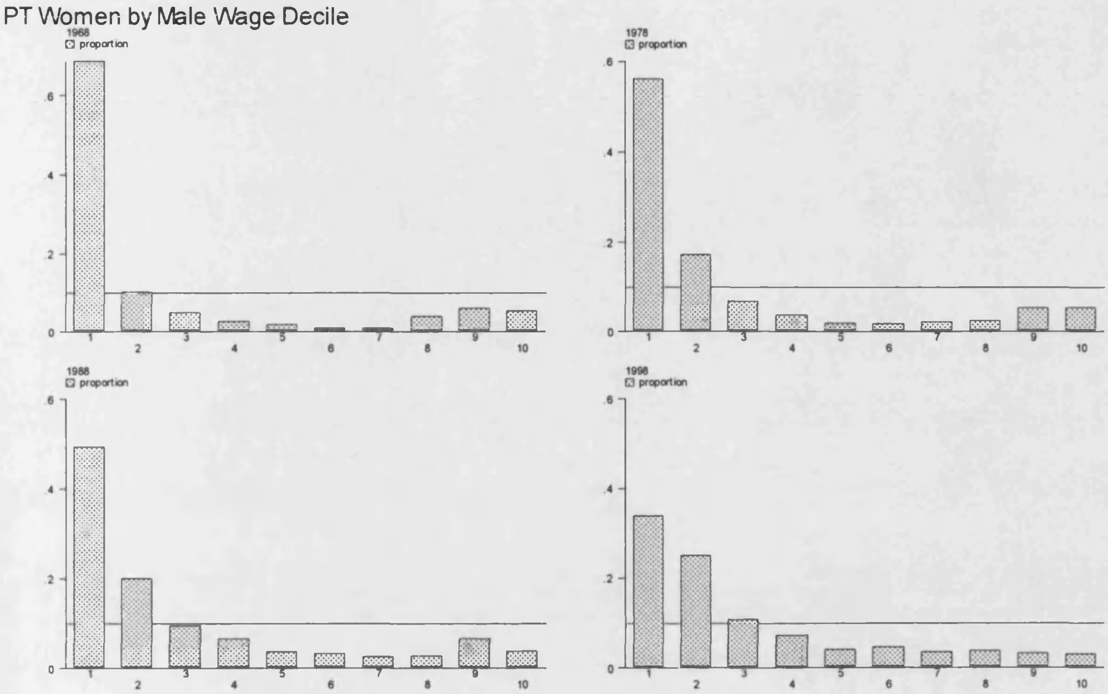


Figure 3.7: Part-time Women in the Full-time Male and Female Wage Distributions



(b)

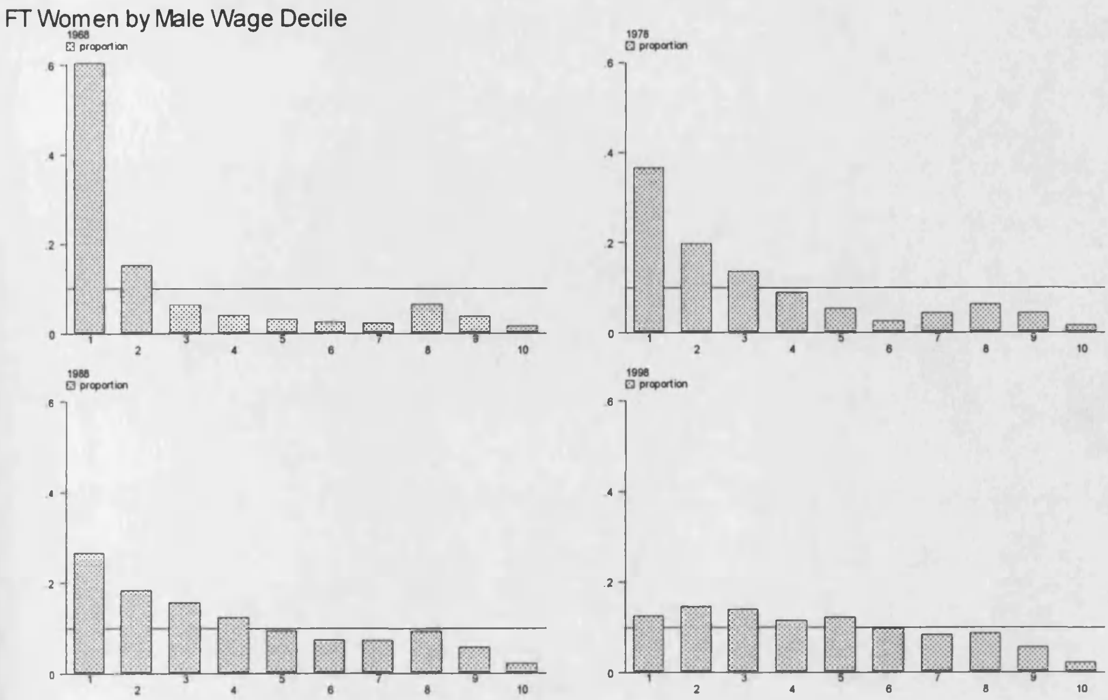


Figure 3.7(continued)

c)

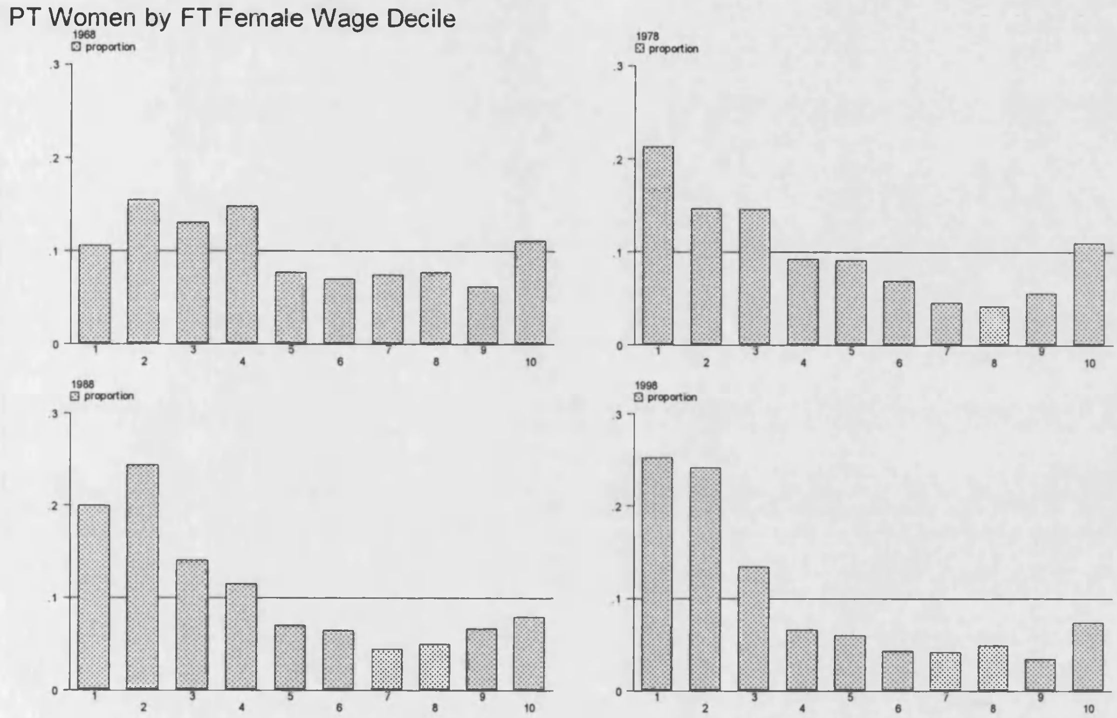
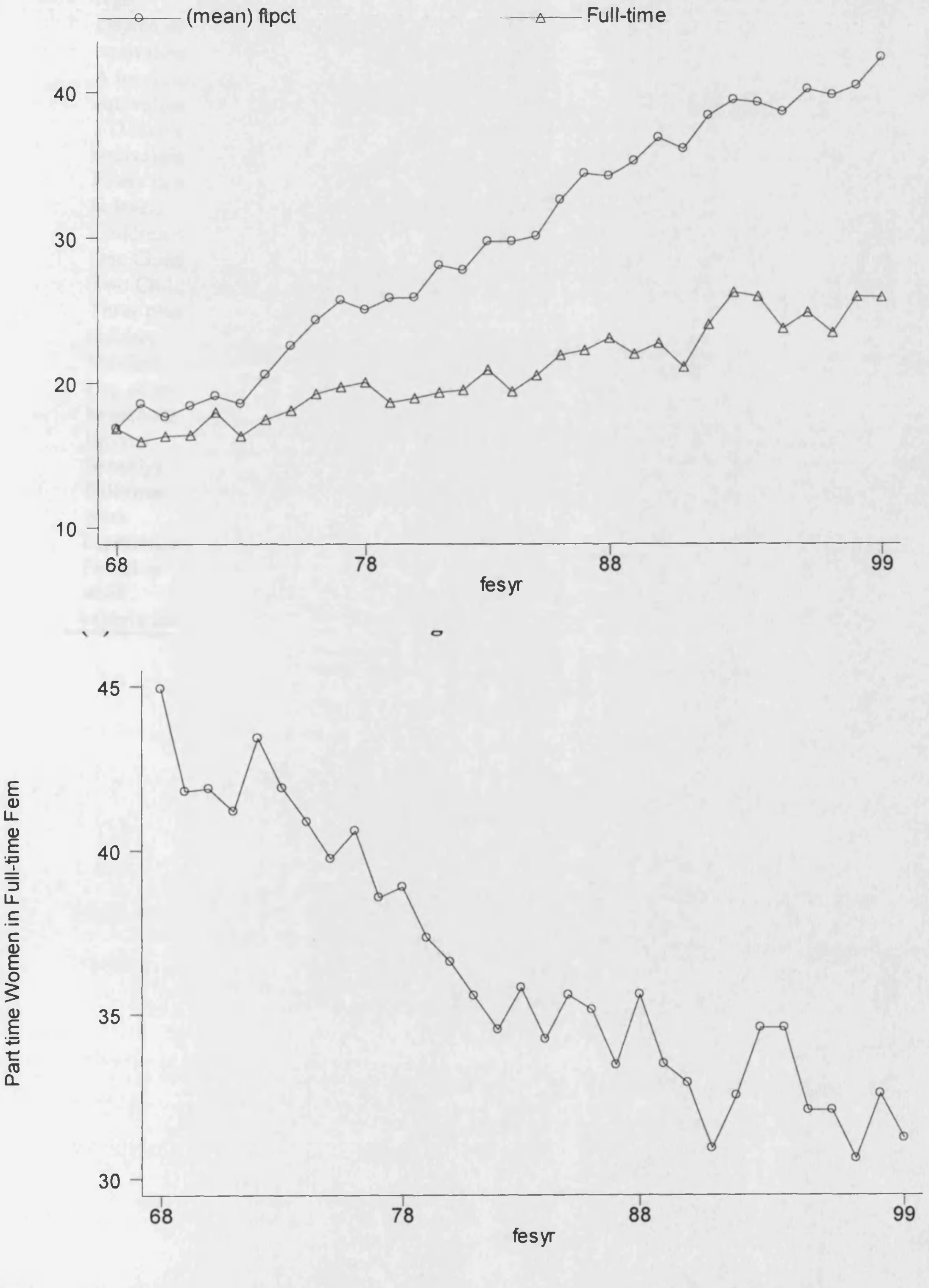


Figure 3.8: Changes in the Median Percentile Ranking

(a) FT and PT women in male wage distribution



Appendix A3.1: Mean Values from the Multinomial Logit Model

	1978	1988	1998	1980	1990	1998
Age	37.3	36.4	38.3	38.4	37.4	37.0
Degree or equivalent	.021	.058	.135	15.9	.076	.127
A levels or equivalent	.095	.139	.242	.028	.254	.400
5 O levels or equivalent	.070	.101	.093	.136	.263	.241
Fewer than 5 O levels	.244	.325	.321	.308	.131	.082
Children < 5	.209	.202	.212	.253	.187	.111
One Child	.229	.217	.216	.237	.182	.170
Two Children	.239	.199	.214	.257	.180	.135
Three plus children	.110	.093	.096	.108	.078	.048
Married	.789	.698	.703	.988	.736	.673
Log other household Income (weekly)	.789	5.96	5.56	4.28	7.03	7.02
Full-time work experience	-	-	-	1.00	9.57	9.10
Part-time work experience	-	-	-	3.76	4.17	4.21

CHAPTER FOUR

THE FAMILY GAP IN PAY ACROSS SEVEN INDUSTRIALISED COUNTRIES

4.1 Introduction

Despite a good deal of progress in recent years, women still tend to have lower employment rates than men and to earn lower hourly wages if they do work. There is a large literature that examines the gender gap in pay within countries and a growing literature that examines the gender gap in pay across countries (see, for instance, Blau and Kahn, 1992, 1995, 1996, and 1998; Callan, Adams, Dex, Gustafsson, Schupp, and Smith, 1996). It is taken as given in these literatures that much of the differential in hourly earnings between women and men is due to the fact that women bear children and also tend to have primary responsibility for their care. Studies within countries provide evidence of a persistent family gap in pay between women with children and women without children (see, for instance, Waldfogel, 1998a for the U.S., and Joshi, Paci, and Waldfogel, 1999 for the U.K.). However, evidence comparing the family gap in pay across countries has been lacking. Thus, we do not know whether countries have similar family pay gaps, or whether countries that have larger family gaps in pay also have larger gender gaps in pay. We also do not know much about the relationship between the effects of children on employment and their effects on wages. In countries where children have a large negative effect on women's employment, do they also have a large negative effect on women's wages, or is the opposite true? Put another way, do women in some countries accommodate their family responsibilities by reducing their employment while women in other countries instead remain in employment but at lower wages?

In this paper, we use microdata on employment and earnings from seven industrialized countries to examine these questions. We find that there are large differences across countries in the family gap in pay, with the United Kingdom displaying the largest wage penalties to children among the seven countries we study here. We also find that there appears to be a relationship between gender and family pay gaps, and between gender and family employment gaps, across countries. Countries where there is a large negative effect of children on women's pay tend to have a large gender gap in pay as well, and countries where mothers have lower employment rates have lower employment rates of women overall. We also find that in countries where children have a large negative effect on employment, they tend to have a large negative effect on pay as well.

4.2 Background

The Gender Gap in Pay

It has long been observed that women receive lower hourly wages than men. Although this "gender gap in pay" between men and women has narrowed in many countries over the past few decades, a persistent gap remains. Human capital theory (see for instance Mincer and Polacheck, 1974 and Becker, 1985) is the most widely accepted explanation put forward by economists to account for both the existence of the gender gap in pay, and for its narrowing in recent years.[1] According to human capital theory, the fact that historically women have had lower levels of wage-enhancing human capital such as education and work experience than otherwise comparable men explains why women receive slower wages in the labor market. In recent years, as women have obtained more education and have taken shorter periods of time out of the labor market for marriage and childbearing, their wages relative to men's have improved (although note also that as women re-enter the labor market with lower than average levels of

[1] Attention to issues of human capital has a long history in economics. For an excellent historical overview, see Polachek (1995a), who credits Ben-Porath (1967) with being the first to apply human capital theory to individuals' decisions about how to invest over their lifetime. Studies that applied human capital theory to the study of the gender gap in pay include Mincer and Polachek, 1974; Becker, 1975; Polachek, 1975a and b, Weiss and Gronau, 1981; Mincer and Ofek, 1982; Goldin and Polachek, 1987. See also Goldin's (1990) excellent book on the gender gap in the United States. Other theories that have been proposed to account for the gender gap in pay include occupational segregation and discrimination (see, for instance, Bergmann, 1974; see also Blau, Ferber, and Winkler (1998) for a useful overview of both human capital and other theories).

work experience, average wages of women are held down, see O'Neill and Polachek, 1993).

In spite of women's recent progress in closing the gender gap in pay, to the extent that women still retain primary responsibility for children, there are at least four reasons to expect their wages to continue to lag behind otherwise comparable men's (see Mincer and Polachek, 1974; Becker, 1985). First, if taking care of children involves a great deal of effort, women who are involved in taking care of children may have less effort to bring to the labor market and/or may select jobs that require less effort and therefore would be lower paid. Second, if women take some time out of the labor market after having children, they would accumulate less human capital over their lifetime than otherwise comparable men. Third, if women change jobs after having children, they would have lower levels of tenure when they return to work than otherwise comparable men. Fourth, if women at the start of their careers anticipate having children and working less intensively over their lifetime, they may invest less in education and/or may choose less competitive careers, resulting in lower lifetime earnings.

The Family Gap in Pay

As was apparent in the above discussion, a key factor in explaining the gender gap in pay is the fact that women have more responsibility for children than men do. This suggests that the gender gap in pay should be largest for women who have responsibility for children and smallest for women who do not. Put another way, there should be a "family gap in pay" – a differential in hourly wages between women who have children and women who do not.

A growing body of research has investigated this family gap in pay in the United States and has found that women with children do have lower wages than women without children. One of the earliest to document this phenomenon was Polachek (1975b), who noticed in studying pay differences associated with marriage that there were differences associated with motherhood too. More recent studies in the U.S. have found that as the gender gap in pay between women and men has narrowed, pay differences between women with and without children have persisted. For instance, Waldfogel (1998a) reports that even after controlling for age, work experience, education, marital status, race, and ethnicity, having children lowers a woman's pay by about 10 percent (see also Hill, 1979; Fuchs, 1988; Korenman and Neumark, 1992; Neumark and Korenman, 1994; Waldfogel, 1997a and b; Waldfogel, 1998b; Waldfogel and Mayer, 2000; Budig and England, 2001). Pay penalties to children have been found in the United Kingdom as well (see, for instance, Joshi, 1991; Waldfogel, 1995; Joshi, Paci, and Waldfogel, 1999). However, as discussed in the next section, there appears to be quite a bit of variation in the family gap in pay across countries.

Cross-Country Differences in the Gender Gap and Family Gap in Pay

Welfare state analysts such as Gosta Esping-Anderson (1990) typically divide industrialized countries into three regime types: Anglo-American or Anglo-Saxon; Continental European; and Nordic or Scandinavian.[2] These regime types reflect differences in the countries' political, institutional, and other structures. The Anglo-American group, which includes Britain and its former colonies, has welfare states that are characterized by a fairly high reliance on means-tested public assistance programs, in contrast with the Continental European or Nordic models, which rely to a larger extent on universal social insurance programs. A further point of difference is that that Nordic and Continental European countries tend to have more fully developed family leave and child care policies than the Anglo-American countries (Waldfogel, 1998a). As we can see in Figure 4.1, the ratio of female to male earnings has risen in countries from all three regime types in recent years.[3] The Figure 4.also shows that the gender pay gap tends to be smaller in the Nordic countries and higher in the Anglo-American countries, with the continental European countries displaying a mixed pattern.

Some analysts have linked these patterns to the pattern of family policies and equal opportunity policies on offer in these countries, arguing for instance that the

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[2] See also Sainsbury (1994) whose typology takes gender more explicitly into account.

[3] The data used to produce in Figure 1 were originally collected by Francine Blau and Lawrence Kahn, updated by Heather Joshi, and then updated again by Wen-Jui Han. We are grateful to all these individuals for sharing these data with us, and to Wen-Jui Han for producing Figure 1 for us.

Scandinavian countries' strong female-male earnings ratios reflect at least in part their strong family and equal opportunity policies while the weak performance of the Anglo-American countries reflects their weak policies (Joshi, Paci, and Waldfogel, 1998; Waldfogel, 1998).[4]

Implicit in these analyses is the notion that lower wages for women with children in countries without well-developed family policies can go a long way toward explaining the higher gender pay gaps in those countries. However, direct evidence on this point has been lacking. Although there have been many analyses of the pay effects of children in recent years in the United States (see for instance Korenman and Neumark, 1992; Neumark and Korenman, 1994; Waldfogel 1997b) and the United Kingdom (see for instance Joshi 1991), and at least one in Australia (Baxter, 1992), studies of the pay effects of children in Scandinavian and continental European countries have been much rarer.[5] Moreover, even where individual country studies exist, it can be difficult to compare results across studies given differences in samples, methodology, model specification, and so on. In this study, we overcome that difficulty by conducting our own estimates of the family gap in pay using comparable microdata from seven industrialized countries, drawing primarily on the Luxembourg Income Study (LIS) database. Although several studies have used LIS data to study gender differentials in employment and pay (see, for instance, Gornick, 1999; Jacobs, and Gornick, 2001; Sorensen, 2001), none of these prior studies has had as its primary focus the pay effects of children. Ours is the first study to investigate the family gap in pay using data from more than a few countries.

In the sections that follow, we describe the data and methods and then present results. We conclude with suggestions for further research.

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[4] See also the work of Gornick, Meyers, and Ross (1998) who examined women's employment across a range of industrialized countries and Gustafsson, Wetzels, Vlasblom, and Dex (1996) who examined women's labor force transitions in connection with childbirth in Germany, Sweden, and Great Britain.

[5] An important exception is a recent study by Albrecht, Edin, Sundstrom, and Vroman (1998) which found that in Sweden, children tended to have a positive or not significant effect on women's wages. See also Rosholm and Smith (1996) who find no significant effects of children on women's wages in Denmark.

4.3 Data and Methods

Our data come primarily from the Luxembourg Income Study (LIS), a project in Walferdange, Luxembourg that brings together in one accessible location comparable microdata from a range of industrialized countries. LIS does not release the data to researchers; rather, LIS mounts the datasets on a central computer, where analyses can be run (via remote access) by registered LIS users. In operation since 1983, LIS places particular emphasis on harmonizing the data, so researchers can estimate models using comparably defined variables. However, since LIS does not gather the data itself, there are some differences across datasets in what variables are available, and sample sizes vary widely. Further information on LIS is available at the LIS website (http://www.lis.ceps.lu; see also Smeeding, 2001 for a helpful overview).

We included in our sample every Western industrialized country in the LIS database for which gross hourly wages could be computed, in each case using the most recent year of data that was available. Because the Swedish dataset in LIS did not include earnings data, we instead used data from the most recent year (1991) of the Swedish Level of Living Survey (LNU), a nationally representative household dataset that is frequently used in studies of labor supply and earnings.[6] Our final set of countries includes at least one representative of each regime type. Our sample countries (and original data source and year) are: Australia (Australian Income and Housing Survey, 1994), Canada (Survey of Consumer Finances, 1994), United Kingdom (Family Expenditure Survey, 1995), and United States (March Current Population Survey, 1994) from the Anglo-American group; Germany (German Social Economic Panel Study, 1994) from Continental Europe; and Finland (Income Distribution Survey, 1991) and Sweden (Level of Living Survey, 1991) from the Nordic group.[7]

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[6] The Level of Living Survey is used by permission of the Swedish Institute for Social Research in Stockholm, Sweden. For further information on this dataset, see Fritzell and Lundberg (1998).

[7] Each of these datasets comes from a large nationally representative survey (although as noted earlier sample sizes vary a good deal across countries). We present unweighted estimates because the way in which weights are defined varies somewhat across countries.

For each of our sample countries, we use a sample of prime-age women and men, those between the ages of 24 and 44. We exclude individuals younger than 24 in order to avoid estimating wage equations for young people who are still in school. We exclude individuals older than 44 because women in that age range who have no children are very likely to have had children in the past; thus, including women older than 44 would confound our comparison of women with children and women without children.

Our key outcome variables are: employment, defined as having a job during the survey week; full-time employment, defined as having a job during the survey week and working 30 or more hours per week; [8] gross hourly wages, defined as gross annual earnings divided by annual hours worked (which is the product of weeks worked and hours worked per week); and the log of hourly wages. Individuals who describe themselves as self-employed are excluded from our sample, but all other workers are included.[9] We particularly wanted to include part-time workers because of the importance of part-time work among women with children. However, as detailed below, we conduct some analyses separately for full-time workers due to concerns about measurement error and part-time wages.

The datasets held by LIS, and the LNU data for Sweden, contain detailed demographic and human capital information that we use to construct independent variables for our employment and wage models. A description of these variables, and means for the key family status variables in our samples, are shown in the Appendix.

It is important to note the limitations of the data we use. We are limited in that

[8] The definition of full-time is not consistent across countries. For instance, in the U.S., usually 35 or more hours per week is considered full-time, whereas in the U.K., a cut-off of 30 hours per week is used. We use 30 hours per week here because it represented the best compromise among the definitions used by the various countries in this study.

[9] For the most part, the data held by LIS have been cleaned and do not contain extreme values. However, this was not the case for the wage data for the United States. Therefore, for the U.S. sample, we had to exclude extreme wage values (wages less than $2.00/hour or greater than $200/hour); this affected only 1.3% of the observations in the U.S. sample.

we can only use those data elements that are available across all our sample countries. Therefore, because most of the available datasets are cross-sectional, we are not able to trace out women's earnings or employment histories over time, as they marry and have children. Thus, we are not able to control for pre-existing differences among women that may be correlated with both having children and with having lower wages or lower levels of employment. Moreover, we do not have measures of actual work experience. Thus, we are not able to control for time out of the labor force associated with childbearing, which as we saw is an important factor in accounting for the gap in hourly pay between women who have had children and those who have not. As such, the analyses we present here should be considered primarily descriptive and as pointing to the overall general magnitude of the family gaps in pay that exist in various countries and the extent to which these gaps vary across countries. More precise estimates of the causes of those family gaps and the shares due to heterogeneity, work experience, and so on would require more detailed analysis of longitudinal data within countries (data that for the most part are not available through LIS or any other cross-national database).

4.4 Raw Gender and Family Gaps in Employment and Full-Time Employment

Table 4.1 provides an overview of the raw gender and family gaps in employment and full-time employment in our sample countries. Comparing all women in a country to all men in the same country, we find that the raw gender gap in employment ranges widely: it is largest in Australia, where women's mean employment rate is 24 percentage points lower than men's, and smallest in Sweden, where women's employment is 4 points higher than men's.

Women without children are generally much more likely to be employed. In all but one of our sample countries, when we compare women with children to women without children relative to men, we find a substantial family gap in employment, ranging from a high of 29 percentage points in the UK to a low of 11 in Finland (the one exception is Sweden, where the employment rate of women with children is less than 1 percentage point lower than that of women without children). Turning to full-time employment in panel B of Table 4.1, we find larger gender gaps in employment but again a large range, with a high of 41 percentage points in Australia and a low of 0 in Finland, and even larger family gaps in employment, ranging from a high of 51 percentage points in the UK to a low of 13 in Sweden.

Figure 4.2 shows how these mean employment rates vary by the age of the youngest child. Across all but one of our sample countries (Sweden again is the exception), employment rises as the age of the youngest child rises, but there are some differences in timing. In Australia and Germany, for instance, there is a sharp increase in employment when the youngest child turns one and another large increase as the youngest child moves from age five to age six or seven (which may reflect women returning to work when their children start school). In Canada and the U.S., employment is somewhat flatter in the early years and then increases from age five to six (when children start school), while in the U.K., employment is low (relative to Canada and the U.S.) throughout the pre-school years but then rises to Canadian and U.S. levels by age six. In Finland, employment rates rise as children age from one and two to four, but from a fairly high base, while in Sweden, employment rates hover at around 80 percent until children reach age seven at which point they rise to 85 or 90 percent. Interestingly, employment rates become very similar across our sample countries by the time children reach age 11 which probably reflects the fact that this is when children leave primary school and start middle or secondary school.

Table 4.1 and Figure 4.2 indicate that, across our sample countries, women, and especially women with children, have lower levels of employment, with particularly large differences in mean levels of full-time employment. Figure 4.2 indicates that these differences are most pronounced for women with young children in most of our sample countries.

Marital status also affects the probability of mothers being employed. Table 4.2 reports the employment rate, the share employed full time, and earnings as a proportion of male earnings for women who are married and single, with and without children. Again, there are marked differences in employment patterns across countries, with these differences being greatest for those with children. Looking first at married mothers, we find that employment rates range from 54 percent in Australia and 60 percent in the UK, to 70 percent in Finland and 82 percent in Sweden. Contrasting employment rates of married and single mothers, it is notable that while in Germany and Finland single mothers are more likely to work than married mothers, in most countries the reverse is true. The difference in employment between married and single mothers is largest in the UK, where single mothers are 23 percentage points less likely to work than those without children, and Sweden, where this gap is 22 percentage points.

Similar differences are observed in the second panel of Table 4.2, which reports full time employment rates. The final panel reports average wages of women in different family types as a ratio of the average male wage, and this shows that earnings of single mothers' are lower than those of married mothers in all countries except Canada and Finland.

Table 4.3 shows how employment rates vary with age across countries. Marked differences across countries emerge, particularly in full time employment rates. Full time employment rates vary even more widely than total employment rates, from 25 percent in Australia and 27 percent in the UK to 64 percent in Finland and 81 percent in Sweden. For single mothers employment ranges from just 37 percent in the UK and 43 percent in Australia, to 68 percent in Germany and 78 percent in Finland. We might expect employment to decline during the years when women have responsibilities for young children and therefore employment in the 30-34 age group to be lower than among those aged 25-29. However, what we find is that full time employment rates remain relatively constant over the 25-44 age range in Canada, the US and Finland. In Australia, UK, Germany and Sweden, however, full time employment rates dip for women in their 30s and then show some increase when women reach their 40s. The final panel shows the ratio of the average female wage to the average male wage in each age group. Women in the 25-29 age group earn close to 90 percent of the average wage of men aged 25-29 in all countries. However, in all countries this wage ratio falls with age and at age 40-44 the wage ratio varies from 69 percent in the UK and 70 percent in the US to 83 percent in Germany and 86 percent in Australia.

Table 4.4 shows the ratio of women's mean hourly wages to men's mean hourly wages for all women, and then women by family status, in our sample countries. The raw gender gap in pay varies a good deal by country, ranging from a high of 23 percent in the UK to a low of 11 percent in Australia. The raw family gap in pay varies as well: in five of our sample countries (Australia, Canada, Germany, Finland, and Sweden), women with children are paid about the same as or even more than women without children, while in the other two there is a family gap in pay, 8 percent in the US and 13 percent in the UK.

When only full-time workers are considered, the wages of women without children exceed the wages of women with children in each of our sample countries. This difference in results between all workers and full-time workers is due to the fact that women who work part-time are observed to have higher hourly wages than full-time workers in the raw data in several of our sample countries. This raises the possibility that some of the part-time wages are measured with error; it is also possible that part-time workers in other countries do not face the wage penalties that part-timers face in the US and UK (see, for instance, Ferber and Waldfogel, 1998 for the US; Harkness, 1996 for the UK).

The raw wage data in Table 4.4 indicate that there are substantial differences between the earnings of women with children and women without children in several of our sample countries, and in all our countries when only full-timers are considered. The raw wage data also suggest that there is some relationship between a country's gender gap in pay and its family gap in pay. When we plot a country's gender gap in pay and its family gap in pay (see Figure 4.3), we find that countries with higher family gaps in pay do tend to have higher gender gaps in pay. Interestingly, we also find that countries with higher gender employment gaps tend to have higher family employment gaps (see Figure 4.4).

The raw data can also tell us something about the relationship of the employment and wage effects of children. Is it the case that countries where the employment rate of mothers is lower than that of other women are also countries where the wages of mothers are lower than those of non-mothers? Or, is there a trade-off, such that women with children either reduce their employment, or work at lower wages? Figure 4.5, which plots a country's employment gap between mothers and non-mothers against its wage gap between mothers and non-mothers, suggests that there is no simple relationship between a country's family gap in pay and its family gap in employment, but for the most part the relationship appears to be positive.

The raw data can not tell us to what extent the employment and wage gaps between mothers and other women simply reflect differences in human capital or demographic characteristics between the two groups. It may be that women who have children are less-educated or are from disadvantaged racial or ethnic groups in some of our countries but not others. If so, these differences in characteristics might account for some of the observed employment or pay differences between mothers and other women. Therefore, in the next sections, we estimate the effects of children on women's employment and wages, controlling for some measures of these other characteristics. Although as noted earlier, we lack measures for some important characteristics, most notably work experience (but also differences in attitudes towards work and family and towards career), nevertheless controlling for other human capital and demographic characteristics will allow us to determine the extent to which the gender gaps and family gaps we see in the raw data are due to differences in those characteristics and the extent to which they persist even after controlling for those characteristics.

4.5 The Effect of Children on Women's Employment

We model a woman's employment decision as a function of the following human capital and demographic variables: age and its square, a set of dummy variables for level of education, a set of dummy variables for ethnicity, the amount of other family members' earnings, the amount of other family income, and a set of dummy variables for region and whether the woman resides in an urban area. In addition, we include a set of controls for her responsibility for children, which we measure with a set of dummy variables for the age of her youngest child, using the three categories youngest child under age one (infant), youngest child age one to five (pre-schooler), or youngest child age six to seventeen (school-age child).[10] Because the presence of a husband may affect

[10] There is some ambiguity in the coding for Germany, where we find very few (7) women with a child age 0 in the data.

a woman's employment decision, we also control for marital status by including a dummy variable for being married.[11] We estimate similar models for full-time employment (defined as working 30 or more hours per week), since as we saw in the raw data in many instances the largest impact of children is not on the employment decision but rather on the decision to work full-time. We estimate both the employment and full-time employment models using probit (because the outcome variables are categorical), and report marginal effects (and their standard errors).

The marginal effects of children (and their standard errors) on employment and full-time employment from the probit models estimated for our seven sample countries are shown in Table 4.5 (complete results are shown in Appendix Table 4.2). In all four Anglo-American countries and in Germany, there is a strong relationship between the age of the youngest child and women's employment. As suggested by the raw data in Figure 4.2, employment of women in these countries rises steadily as the youngest child ages. Marriage, in contrast, seems to be less important, with no significant effect on employment in Finland and Germany, and a small negative impact on employment in the US and UK. Only in Australia is marriage an important factor in explaining women's employment. The results for the Nordic countries are different, as we might have expected given the pattern of the raw data in Figure 4.2. In both Finland and Sweden, women with infants and pre-school age children, but not school age children, are significantly less likely to be employed, but the effects are small compared to the Anglo-American countries and Germany.[12] Marriage is associated with lower women's employment in Sweden, but not in Finland.

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[11] As noted in the appendix, the category of married includes those living as married in all of our sample countries except the U.S. and Germany. Although we also control for other family members' earnings (including those of the husband or partner), to the extent that these are measured with error, the dummy variable for being married may also pick up some effects of income.

[12] The small effect of children under the age of one on women's employment in Finland and Sweden probably reflects the fact that these countries have very generous parental leave provisions which many women take advantage of. Since women on maternity leave are counted as employed, the high share of women taking maternity leave would boost the share employed among women with children under the age of one.

The results for full-time employment are similar. We find very large negative effects of children, generally declining by the age of the child, in the Anglo-American countries and Germany. In contrast, we find much smaller effects of children in Finland and Sweden. Being married again has a negative effect in Sweden; we also see a negative effect of being married on full-time employment in Australia and the US.

Although the pattern of results is similar for the four Anglo-American countries and Germany, it is worth noting that the magnitude of the effects varies a good deal across these countries. Children reduce women's employment much more in Australia, Germany, and the UK than they do in Canada and the US. And, in turn, children have a much larger effect on women's employment in these countries than they do in our two Nordic countries. These differences across countries raise the question of the extent to which institutional or policy differences might account for these differences in outcomes. With data from just one point in time, we can not answer this question in this paper, but the variation in results across countries suggests that it is worth considering in future research.[13]

4.6 The Effects of Children on Women's Wages

We estimate human capital earnings functions with the natural logarithm of hourly wages as our dependent variable and a set of family status and other variables (detailed below) as our independent variables. To control for a woman's responsibility for children, we include controls for the number of children, with dummy variables for one child, two children, or three or more children. Our wage model also includes controls for: marriage; age and its square; a set of dummy variables for level of education; a set of dummy variables for ethnicity; and a set of dummy variables for region and whether the woman lives in an urban area. Because as noted earlier, we are concerned about the possibility of measurement error in the part-time wages, we estimated this model for all workers and for full-time workers only.[14]

[13] We hope to be able to address this type of question in future work, by using multiple waves of data from LIS in conjunction with data on policies and institutions in the various countries.

[14] We also estimated models in which we added a control for whether the woman

There are many reasons why children might affect women's wages (see Mincer and Polachek, 1974; Becker, 1985). Children may affect women's wages directly, by for instance lowering a woman's effort on the job, or indirectly, by lowering the amount of work experience and job tenure a woman accumulates over time. The lower wages of women with children may also reflect other pre-existing differences among women, such as differences in their attitudes or commitment to a career. Or, the lower wages of women with children may reflect employer preferences or discrimination. Since we can not control for effort, experience, tenure, employee attitudes or commitment, or employer preferences or discrimination in our datasets, we can not place a causal interpretation on the wage effects of children. We can only determine whether such "child penalties" exist in our sample countries and how much they vary across countries once we control for other characteristics that can be measured in our datasets.

The effects of children from the wage models (coefficients and standard errors) are shown in Table 4.6 (full results are shown in Appendix Table 4.3). In our results for all workers, shown in panel 1, we find sizeable negative effects of children on women's wages in all four Anglo-American countries. Because our dependent variable is the log of hourly wages, the coefficients can be interpreted as percentage effects. Thus, looking at the Anglo-American countries, we find a pay penalty for one child that ranges from a low of 3 percent in the US and 4 percent in Canada to a high of 7 percent in the UK, a pay penalty for two children that ranges from 5 percent in Canada to 23 percent in the UK, and a pay penalty for three or more children that ranges from 5 percent in Australia to 31 percent in the UK. It is worth noting that in each instance, the pay penalty to children is higher in the UK than in the other Anglo-American countries. The results for Germany are less conclusive, with an 11 percent penalty for two children but no significant penalties for one child or for three or more children. In Finland, in contrast, we find no significant penalty to one or two children, and a small pay penalty (6 percent)

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works part-time (less than thirty hours per week) since working part-time may account for some of the lower wages of women with children. The results of these models (not shown) suggest that although working part-time does have a significant negative effect on women's hourly wages in two of our countries (the U.S. and U.K), significant negative effects of children in those countries remain even after controlling for part-time working status.

to three or more children, while in Sweden, we find no significant child penalties at all.

When we restrict our sample to full-time workers (see panel 2 of Table 4.6 and of Appendix Table 4.3), we find generally larger negative effects of children in five of our countries (Australia, Canada, Germany, Finland, and Sweden) and smaller effects in the other two countries (the UK and US). Nevertheless, the overall pattern of results is similar to that found for all workers, with the largest pay effects of children found in the UK and the smallest in the Nordic countries. Interestingly, the US has relatively low child penalties when we restrict the sample to full-time workers (because the penalties become somewhat smaller in the US while becoming somewhat larger in Finland and Sweden).

Taken together, these wage models provide evidence of negative pay effects of children across our sample countries. Even more interestingly, they also provide evidence that these effects vary a great deal by country. As noted above, we can not definitively explain these negative pay effects of children - they may reflect individual factors such as effort or commitment, work experience, or tenure, or employer factors such as preferences or discrimination that we do not observe in our datasets[15] - but it is worth speculating as to why they vary so much across countries. We consider several alternative explanations below.

Endogeneity Bias

One potential problem with the results from the OLS log wage regressions is that the decision to have children may be endogenous. That is, women who earn lower wages may have more children, rather than vice versa, and the strength of this relationship may vary across countries. If so, this endogeneity might bias our estimates of the pay effects of children and the extent to which they vary across countries.[16] In

[15] Another possibility is that at least some portion of these pay penalties may be due to differences in the occupations of women with children and women without children. We plan to control for occupation in future research (details on occupational coding are not currently available from LIS).

[16] A more general problem is that decisions regarding employment and childbearing may be made simultaneously and may be affected by differences in attitudes and norms across countries. See, for instance, Kiernan (1992) and Hobcraft and Kiernan (1995) for discussions of the factors that influence a woman's decision to become a parent and how

order to deal with this potential endogeneity bias, ideally we would want an instrument that affects a woman's number of children (but not her wage). Angrist and Evans (2001) discuss the difficulties of finding an instrument for childbearing, the problem being that factors that affect a woman's fertility also tend to be correlated with wages and employment. As we lack data on background variables that might affect a woman's preferences regarding number of children, we instrument the number of children a woman has by the average number of children of all women by age and region[17]. We therefore compare OLS regressions, where the number of dependent children in the family is included as an explanatory variable, with instrumental variable (IV) estimates where the number of children is instrumented by the average number of children by age and region. To carry out the IV estimation we therefore regress the actual number of children on the average number of children by age and region. From this we then predict the number of children a woman has, and this prediction then replaces actual number of children in the regression equation. The results from OLS and instrumental variable estimation are reported in Appendix Table 4.5. Note however that finding an instrument for childbearing is fraught with difficulties, and as region and age are also correlated with wages our instrument is unlikely to be a strong one.

For all workers (panel 1) the Hausman test statistic is insignificant in all countries. The fact that the Hausman statistic is insignificant in all countries indicates that either the instrument too is endogenous (as indeed the decision about where to live may be), that the predictive power of the instrument is weak (Nakurma and Nakurma 1985), or that the number of children a woman has is exogenous to wages. For full time workers (panel 2), the Hausman test statistic is again insignificant in all countries except the Canada and Sweden. In Canada instrumentation suggests a greater penalty to having children, suggesting that in Canada women with higher wages are more likely to be working full-time and have children. However, in Sweden instrumentation actually reduces the wage penalty. The reduced wage penalty found in the Sweden could capture the effect of lower wages on the probability of having children.

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those may vary across countries.

17 The mean number of children is computed for women across one-year age groups by standard

Selection Bias

Another possibility is that the difference in the negative pay effects of children across countries reflects the differential selection of women into employment across our sample countries. If women with children and low earnings potential are more likely to work in the Anglo-American countries, for instance, then the pool of working mothers might include more women with lower wages and thus we would estimate a larger negative effect of children on women's pay. However, as we saw in Figure 4.5 earlier, the employment and wage effects of children tend to be correlated. In countries such as the Anglo-American group where children have a large negative effect on wages, they also tend to have a large negative effect on employment. This evidence does not support the hypothesis that differential selection into employment plays an important role in explaining the differences in the pay effects of children across countries.

To test this hypothesis more formally, we estimated Heckman (1979) sample selection correction models, using the age structure of the children in the household, the amount of other family members' earnings, and the amount of other family income as our identifying variables. Specifically, we included in our wage models the same variables as before (age, age squared, controls for level of education, race/ethnicity, married, dummy variables for one child, two children, or three or more, region, and urban residence), while including in our employment probit models age, age squared, controls for level of education, race/ethnicity, married, number of children under age 1, number age 1 to 4, and number age 5 to 17, other family members' earnings, other family income, region, and urban residence.[18] The results, shown in Table 4.7, suggest that the estimated effects of children on women's pay are not affected a great deal by sample selection bias. The sample selection correction term, lambda, is not statistically significant in any of our countries except the US, where it is strongly positive. And, the relative ranking of the countries in terms of the magnitude of their family penalties is much the same as it was in the uncorrected wage models, shown in Panel 1 of Table 4.6: the UK has the largest pay penalties to children, followed by the other three Anglo-

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regions as defined in the appendix.

[18] We also estimated similar models for selection into full-time employment. The results of these models are available upon request.

American countries, then Germany, and then the two Nordic countries. This evidence does not favor selection as a primary reason for the differences in the family gap in wages across countries.

Wage Structure

Another possibility is that the differences in the wage effects of children across countries reflect differences in wage structure. A series of studies by Blau and Kahn (1992, 1995, 1996, and 1998) have found that to a large extent, the difference in the gender earnings gap across countries can be explained by the difference in the extent of earnings inequality across countries. Blau (1992) illustrates this by first ranking countries by their gender earnings ratios and then ranking countries by their mean female percentile in the male wage distribution. She finds that Sweden has a high gender earnings ratio (77 percent in her data) in spite of having a relatively low female percentile (28) in the male wage distribution, while the US has a lower gender earnings ratio (67 percent) in spite of having a higher female percentile (33) in the male wage distribution. The reason for this discrepancy between the two measures is that the penalty for one's position in the wage distribution varies widely across countries, depending on the dispersion of earnings in a country; in the above example, the penalty for a low percentile position is greater in the US than in Sweden, because the US has a more unequal wage structure. Thus, if one wants to understand the difference in the gender gap in pay between two countries such as the US and Sweden, taking wage structure into account is important.[19]

This explanation, however, may not fit as well when it comes to explaining differences in the *family gap* in pay across countries. Consider Table 4.4, panel A, which shows that among all workers the wages of women with and without children are nearly identical in Finland and Sweden. In this case, wage structure would not explain the smaller family gap in these two Nordic countries; the main reason for the smaller family gap is that there is little or no difference in pay between women with and without children, rather than that the difference is penalized less than it is in other countries.

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[19] In a similar vein, Edin and Richardson (2001) find that changes in solidarity wage policy have been an important factor in narrowing the gender earnings gap within a country (Sweden) over time.

To illustrate this more clearly, we calculated the position of women in each country in the male earnings distribution in their country, and then calculated the average percentile ranking of women in each country. The results are shown in Table 4.8. Looking first at the results for all workers, we can see that in four countries there is at most a 1 or 2 point family gap as measured by the difference between the mean percentile rankings of women with children and women without children: in Australia, both women with children and women without children have wages that are on average at about the 40th percentile of the male wage distribution; in Canada, women without children are at the 40th percentile while women with children are just two points behind; in Finland, women with children are at the 36th percentile while women with children are 2 point behind; and in Sweden, women with children are at the 32nd percentile while women with children are 1 point behind. The results for the other three countries are quite different: in the US and Germany, there is about a 6 point family gap, with women without children at the 43rd (US) or 45th (Germany) percentile and women with children at the 37th percentile and 39th percentiles respectively; and in the UK, the family gap is over 11 points, with women without children at the 40th percentile as compared to women with children at the 29th percentile.[20] Overall, these results are quite consistent with the pattern of results we obtain when we use the gender earnings ratio as our measure, as we can see in Figure 4.6. On both measures, we find the largest family gaps in pay in the US, Germany, and UK.

So, how important is wage structure in accounting for the differences in the family gap in pay across countries? Following Blau (1992), it is informative to compare the rankings of countries using the percentile position of women with their rankings using the gender pay ratio, as this will tell us how important a role wage structure plays

[20] When we restrict the analysis to full-time workers only, the percentile ranking of U.K. women with children improves dramatically, which makes sense given the links in that country between motherhood, part-time work, and low pay, whereas we find the opposite result for Sweden, where as we saw earlier the wages of mothers who work full-time tend to be somewhat lower than those of mothers who work part-time. One might wonder whether these results are driven by the fact that most women in the age group considered here are mothers. However, in each of our sample countries, at least one third of women in the sample do not have children.

in the differences across countries. Given our interest in the position of women with children as compared to women without children, we compare these groups separately, as shown in Figure 4.7. Looking first at the non-mothers, we find that using the mean percentile ranking as opposed to the mean gender pay ratio changes the ranking of our countries a good deal, with all of our seven countries changing position. We also find that, while there is relatively little spread in the pay ratio between countries, with the pay ratio of non-mothers relative to men ranging from 82 to 86 percent, there is much more variation in the mean percentile ranking. The mean percentile ranking of non-mothers in the male wage distribution ranges from 32 in Sweden to 45 in Germany. When we turn to mothers, we find a much larger spread in the pay ratio of mothers relative to non-mothers, ranging from a low of 70 percent in the UK to a high of 92 percent in Australia. In contrast to our results for non-mothers (and to Blau's (1992) results for women overall), measuring mothers' pay by their mean percentile ranking in the male distribution does not for the most part alter the ranking of the countries. Four countries change position: Sweden and Finland are now further down the ranking while the US and Canada move up. Thus, wage structure seems to be important in understanding why mothers are lower paid relative to men in the US or Canada than they are in Finland or Sweden.

However, wage structure does not fully explain why mothers are lower paid relative to non-mothers. If a country such as the UK adopted Sweden's pay structure, this would reduce the penalty that mothers face in the labor market for being at a lower percentile in the male wage distribution, but it would not change the fact that they are at a lower position. Thus, changing the pay structure alone would not close the family gap in pay between mothers and non-mothers in the UK or the US or Germany, since mothers in those countries are at a much lower percentile ranking than non-mothers to start with.

Differences in Family Policies

Another possibility is that the differences we observe in the pay effects of children across countries reflect differences in family policies across countries. However, whether adopting changes in family policy such as maternity leave or child care improves the pay position of mothers is an open question. It is possible that the wage parity achieved by Nordic mothers relative to non-mothers comes about as a result of their extensive family policies, which support the labor force attachment of women with children and thus are likely to raise women's levels of work experience and job tenure (Waldfogel, 1998a; Joshi, Paci, and Waldfogel, 1998). But this parity may come at the price of lower wages for women overall, if employers shift the costs associated with such policies to those perceived to be most likely to benefit from them, namely, women. The low position of all Swedish women in the male wage distribution, and the under-representation of Swedish women at the top of the distribution (see Albrecht, Bjorklund, and Vroman, 2001; Sorensen, 2001) may reflect the price women pay for Sweden's extensive family policy supports, or it may reflect other factors entirely. We are not able to estimate the effect of family policies here, but clearly, more research on this question, and on the impact of family policies more generally on the employment and pay of mothers, and non-mothers, is warranted.

4.7 Conclusions

This paper adds to the growing literature on the "family gap in pay" by tackling the question of whether the family gap in pay that has been documented for some Anglo-American countries is unique to those countries or whether a comparable gap is found in other Western industrialized countries. The results for the seven countries examined here indicate that, controlling for differences in earnings-related characteristics, the effect of children on women's pay is largest in the United Kingdom, followed by the other Anglo-American countries and Germany, and smallest in the Nordic countries.

We also sought to learn whether there is a link between the family gap in pay and the gender gap in pay across countries, such that countries with higher family pay gaps tend to have larger gender pay gaps as well. This was in fact the case in our data, as we saw in Figure 4.3, with the UK displaying both the largest gender gap in pay and the largest family gap in pay. We also examined the relationship between the employment gap between mothers and other women, and the wage gap between mothers and other women, and found that they were positively correlated. Thus, we found no evidence that women with children make a choice between lower employment or lower wages; the two seem to go together. This suggests that the high pay penalty to children in the UK, for instance, is not simply due to the fact that women with children are more likely to work in that country. We found little evidence to support the hypothesis that endogeneity or differential selection into employment account for the differences in the family gap across countries. Nor did we find much evidence that wage structure, which has been found to be so important in explaining the gender gap in pay, explains much of the cross-country differences in the family gap in pay.

Why does the family gap in pay vary so much across countries? What role do family policies such as maternity leave and child care play in closing the pay gap between mothers and other women? And what impact do such policies have on the pay of women overall? This study, using data from one point in time, could not answer these questions, but our results suggest that they are worth investigating in future. Studies that track the wages of mothers, and other women, over time within countries as family policies change would be particularly useful. So too would multi-country studies that use data from multiple points in time.

Table 4.1: Employment Rates of Men and Women Age 24-44 in the Sample Countries

A. Share Employed	AU 1995 (N=4,980)	CN 1994 (N=30,227)	UK 1995 (N=4,403)	US 1994 (N=42,919)	GE 1994 (N=5,113)	FI 1991 (N=9,804)	SW 1991 (N=2,184)
All men	.863	.792	.806	.871	.861	.787	.793
All women	.624	.697	.645	.688	.707	.798	.836
Women without children	.823	.788	.842	.799	.829	.870	.842
Women with children	.520	.648	.550	.634	.634	.760	.833
Gender gap (line 2 - line 1)	-.239	-.095	-.161	-.183	-.154	.011	.043
Family gap (line 4 - line 3)	-.303	-.140	-.292	-.165	-.195	-.110	-.009

B. Share Employed FT	AU 1995	CN 199	UK 1995	US 1994	GE 1994	FI 1991	SW 1991
All men	.830	.762	.790	.844	.830	.777	.771
All women	.421	.542	.421	.573	.490	.758	.653
Women without children	.731	.677	.763	.731	.722	.851	.745
Women with children	.258	.469	.256	.495	.352	.710	.611
Gender gap (line 1 - line 2)	-.409	-.220	-.369	-.271	-.340	.019	-.118
Family gap (line 3 - line 4)	-.473	-.208	-.507	-.236	-.370	-.141	-.134

Notes: Authors' estimates from LIS data. Employment is defined as the share who have a job during the survey week. Full-time employment is defined as the share who have a job during the survey week and who work 30 or more hours per week

Table 4.2: Employment Rates, Full Time Employment and Female/Male Wage Ratio by Family Type

	Married		Single	
	Kids	No Kids	Kids	No Kids
Employment Rates				
AU 94	.53	.82	.44	.82
CN 94	.66	.81	.53	.76
UK 95	.60	.87	.37	.80
US 94	.64	.80	.62	.80
GE 94	.62	.83	.70	.83
FI 91	.74	.83	.85	.89
SW 91	.82	.82	.60	.75
FT Employment				
AU 94	.26	.71	.26	.76
CN 94	.47	.70	.43	.65
UK 95	.27	.79	.19	.73
US 94	.48	.73	.54	.74
GE 94	.32	.67	.49	.76
FI 91	.69	.81	.84	.87
SW 91	.81	.78	.50	.71
Wage / Male Wage				
AU 94	.935	.861	.784	.853
CN 94	.830	.824	.854	.823
UK 95	.713	.824	.643	.837
US 94	.798	.841	.655	.831
GE 94	.857	.803	.895	.880
FI 91	.856	.840	.752	.840
SW 91	.838	.971	.809	.901

Table 4.3: Employment Rates, Full Time Employment and Female/Male Wage Ratio by Age Group

Age Group	25-29	30-34	35-39	40-44	Difference (age 25-99 to 40-44)
Employment Rate					
AU 94	.66	.55	.60	.69	+.03
CN 94	.67	.69	.70	.73	+.07
UK 95	.63	.61	.62	.74	+.12
US 94	.67	.68	.70	.70	+.03
GE 94	.76	.72	.68	.67	-.09
FI 91	.81	.78	.79	.81	0.00
SW 91	.78	.85	.88	.84	+.06
FT Employment Rate					
AU 94	.55	.34	.35	.42	-.13
CN 94	.55	.53	.52	.57	+.02
UK 95	.49	.38	.35	.45	-.04
US 94	.58	.57	.56	.57	0.00
GE 94	.63	.49	.41	.41	-.10
FI 91	.78	.74	.75	.77	-.01
SW 91	.74	.63	.67	.64	-.10
Female / Male Wage Ratio					
AU 94	.949	.906	.859	.859	-.090
CN 94	.879	.832	.849	.750	-.129
UK 95	.882	.799	.669	.695	-.187
US 94	.878	.841	.740	.700	-.178
GE 94	.902	.872	.879	.797	-.105
FI 91	.963	.842	.823	.757	-.206
SW 91	.916	.876	.812	.752	-.164

Table 4.4:Mean Hourly Wages of Women Relative to Mean Hourly Wages of Men in the Sample Countries

A. Women's Wage / All Men's Wage	AU 1994 (N=3,473)	CN 1994 (N=21,053)	UK 1995 (N=3,166)	US 1994 (N=32,806)	GE 1994 (N=3,607)	FI 1991 (N=7,064)	SW 1991 (N=1,755)
All women	88.9%	82.8%	75.6%	78.5%	85.7%	84.0%	83.9%
Women without children	85.7%	82.4%	83.0%	83.5%	84.8%	84.0%	85.0%
Women with children	91.7%	83.1%	70.3%	75.5%	86.4%	83.9%	83.4%
Gender gap (line 1-100%)	- 11.1%	- 17.2%	- 23.4%	-21.5%	-14.3%	-16.0%	-16.1%
Family gap (line 3-line 2)	+ 6.0%	+ 0.7%	- 12.7%	- 8.0%	- 1.6%	- 0.1%	- 1.6%

B. FT Women's Wage / FT Men's Wage	AU 1994 (N=2,909)	CN 1994 (N=18,337)	UK 1995 (N=2,573)	US 1994 (N=27,400)	GE 1994 (N=3,135)	FI 1991 (N=6,813)	SW 1991 (N=1,541)
All FT	84.6%	77.4%	81.9%	79.2%	82.6%	80.7%	82.7%
FT without children	85.9%	80.5%	83.9%	84.1%	85.2%	83.1%	85.6%
FT with children	82.4%	75.0%	79.0%	75.6%	78.8%	79.2%	81.0%
Gender gap (line 1-100%)	-15.4%	-22.6%	-18.1%	-20.8%	-17.4%	-19.32%	-17.3%
Family gap (line 3-line 2)	- 3.5%	- 5.5%	- 4.9%	- 8.5%	- 7.4%	-3.9%	- 4.6%

Note: Wages are defined as gross annual earnings divided by annual hours worked (the product of weeks worked and hours per week).

Table 4.5: Effects of Marriage and Age of Youngest Child on Women's Employment, Marginal Effects from Probit Models

A. Employment	AU 94	CN 94	UK95	US 94	GE94	FI91	SW91
Married	-.203** (.037)	-.019 (.013)	-.080* (.038)	-.071** (.013)	-.002 (.044)	.001 (.017)	-.082 (.041)
Child age <1	-.597** (.024)	-.277** (.018)	-.479** (.038)	-.273** (.016)	-.297 (.249)	-.056* (.028)	-.156* (.094)
Child age 1-5	-.424** (.028)	-.219** (.011)	-.402** (.030)	-.197** (.009)	-.347** (.032)	-.078** (.020)	-.103** (.036)
Child age 6-17	-.190** (.030)	-.095** (.011)	-.142** (.032)	-.068** (.009)	-.127** (.028)	.041* (.016)	.001 (.034)
Pseudo R2	.205	.121	.256	.094	.126	.180	.109
No. observations	2654	16077	2438	22091	2372	4870	1060

B. Full Time Employment	AU 94	CN 94	UK95	US 94	GE94	FI91	SW91
Married	-.219** (.049)	-.019 (.015)	-.066 (.048)	-.052** (.015)	.006 (.052)	-.030 (.018)	-.155* (.067)
Child age <1	-.431** (.014)	-.249** (.016)	-.387** (.019)	-.290** (.014)	-.453 (.067)	-.025 (.029)	-.056 (.099)
Child age 1-5	-.465** (.019)	-.273** (.011)	-.502** .020)	-.272** (.009)	-.474** (.022)	-.095** (.022)	-.166** (.046)
Child age 6-17	-.311** (.024)	-.149** (.011)	-.358** .024)	-.131** (.010)	-.280** (.028)	.035 (.018)	-.114* (.048)
Pseudo R2	.231	.089	.278	.0911	.216	.167	.077
No. observations	2654	16077	2438	21682	2372	4870	1059

Notes:

1. Employment and full-time employment models also include controls for age, age squared, education, race or ethnicity (except in Sweden), presence of a working husband/partner, other family members' earnings, other family income, region, and urban residence (except in Germany). See Appendix 4 for variable definitions and Appendix Table 4.3 for complete results.

2.* indicates statistically significant at p<.05; ** indicates statistically significant at p<.01

Table 4.6

Effects of Marriage and Children on Women's Log of Hourly Wages, Coefficients (and Standard Errors) from OLS Regressions

All Workers	AU 94	CN94	UK 95	US 94	GE 94	FI 91	SW 91
Married	.035 (.038)	-.005 (.015)	.037 (.027)	.060** (.009)	-.058 (.032)	.034* (.014)	.033 * (.018)
One child	-.078 (.045)	-.036* (.017)	-.071* (.030)	-.027* (.011)	-.018 (.036)	-.026 (.016)	-.008 (.021)
Two children	-.106* (.044)	-.050** (.017)	-.232** (.029)	-.067** (.011)	-.175** (.041)	-.012 (.017)	-.014 (.021)
Three or more children	-.053 (.062)	-.209** (.027)	-.309** (.045)	-.088** (.016)	.068 (.072)	-.064** (.025)	-.025 (.025)
N	1547	10219	1564	15307	1515	3592	874
Adj R2	.065	.097	.295	.234	.119	.198	.1787

Full-Time Workers	AU 94	CN 94	UK 95	US 94	GE 94	FI 91	SW 91
Married	.035 (.036)	-.005 (.015)	.016 (.029)	.059** (.010)	.013 (.031)	.020 (.013)	.037** (.018)
One child	-.110* (.046)	-.036* (.017)	.010 (.036)	-.014 (.011)	-.041 (.037)	-.037* (.015)	-.031 (.021)
Two children	-.168** (.049)	-.050** (.017)	-.169** (.037)	-.040** (.012)	-.108* (.046)	-.022 (.016)	-.056** (.021)
Three or more children	-.193* (.082)	-.209** (.027)	-.279** (.059)	-.062** (.018)	-.079 (.091)	-.075** (.023)	-.102** (.027)
N	1046	7885	999	11588	1107	3385	685
Adj R2	.090	.137	.308	.275	.122	.241	.1996

Notes:

1. Log wage models include controls for age, age squared, education, race or ethnicity (except for Sweden), region, and urban residence (except for Germany). Model 1 is estimated for all workers; model 2 is estimated only for full-time workers (those who work 30 or more hours per week). See appendix 4 for variable definitions and Appendix 4.5 for complete regression results.
2. * indicates statistically significant at p<.05; ** indicates statistically significant at p<.01

Table 4.7

Effects of Marriage and Children on Women's Log of Hourly Wages, Coefficients (and Standard Errors) from OLS Regressions, Corrected for Sample Selection Bias

	AU 94	CN 94	UK 95	US 94	GE 94	FI 91	SW 91
Married	.037	-.009	.048 *	.059 **	-.031	.034 **	.033 **
	(.038)	(.017)	(.027)	(.010)	(.031)	(.017)	(.018)
One Child	-.086 **	-.035 **	-.093 **	-.067 **	-.019	-.044 **	-.006
	(.049)	(.019)	(.033)	(.013)	(.037)	(.018)	(.021)
Two Children	-.120 **	-.050 **	-.255 **	-.105 **	-.107 **	-.027	-.013
	(.048)	(.019)	(.032)	(.013)	(.042)	(.019)	(.020)
Three or More	-.113 **	-.123 **	-.321 **	-.152 **	.003	-.063 **	-.026
Children	(.061)	(.026)	(.044)	(.016)	(.064)	(.024)	(.025)
Lambda	.030	-.011	.031	.162 **	.019	.028	-.028
	(.049)	(.033)	(.034)	(.031)	(.055)	(.024)	(.043)
N	1,046	16,077	2,438	22,091	1,107	4,870	685

Notes: Log wage models include controls for age, age squared, education, race or ethnicity (except for Sweden), region, and urban residence. Model is estimated for all women in the sample using the standard sample selection correction technique as described in the text . See appendix for variable definitions. Complete regression results available from the authors on request.

Table 4.8
Mean Percentile Ranking of Women in the Male Wage Distribution

	AU 1994	CN 1994	UK 1995	US 1994	GE 1994	FI 1991	SW 1991
1. All women	40.59	38.65	33.78	39.14	41.71	34.29	30.95
2. All workers:							
a. Women without children	*41.09*	*40.09*	*40.34*	*42.82*	*44.77*	*35.80*	*31.68*
b. Women with children	*40.15*	*37.70*	*28.95*	*36.91*	*39.06*	*33.39*	*30.62*
c. Family gap for all workers	0.94	2.39	11.39	5.91	5.71	2.41	1.06
3. Full-time workers only:							
a. Women without children	40.63	39.23	41.26	44.30	45.03	35.38	32.87
b. Women with children	37.10	35.61	36.05	38.62	38.12	32.28	28.53
c. Family gap for FT workers	3.53	3.62	5.21	5.68	6.91	3.10	4.34

Note: Percentile ranking in the male wage distribution is calculated for each woman, and then the mean for all women in the group is calculated. The family gap for all workers is the mean percentile ranking of women workers with children minus the mean percentile ranking of women workers without children; the family gap for FT workers is the mean percentile ranking of full-time women workers with children minus the mean percentile ranking of full-time women workers without children.

Figure 4.1:

Female-Male Hourly Earnings Ratios, 1967-1995

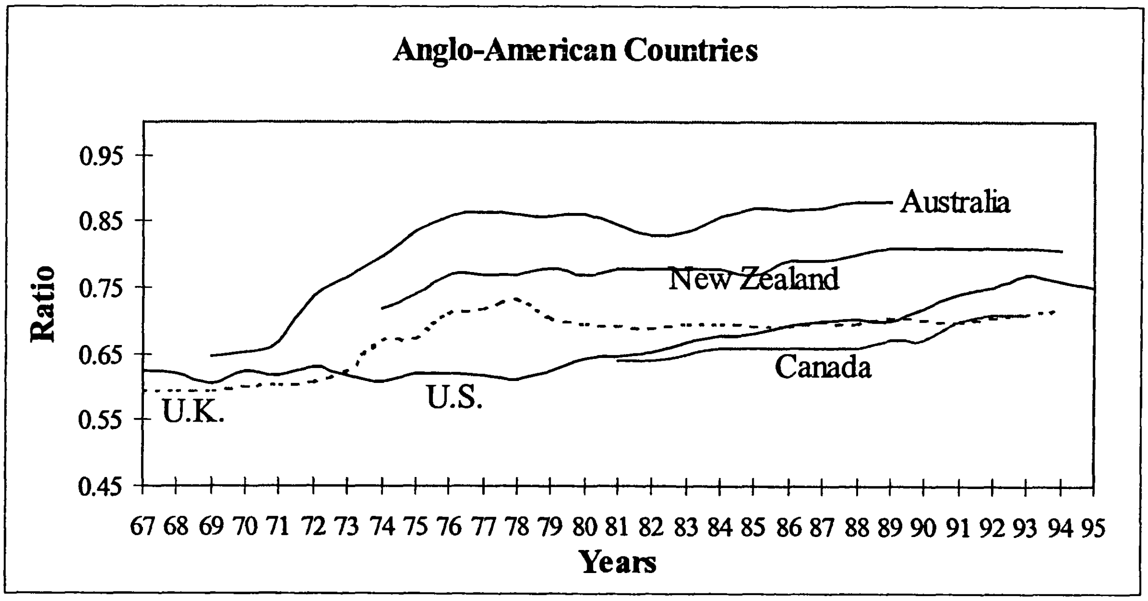


Figure 4.1 (continued)

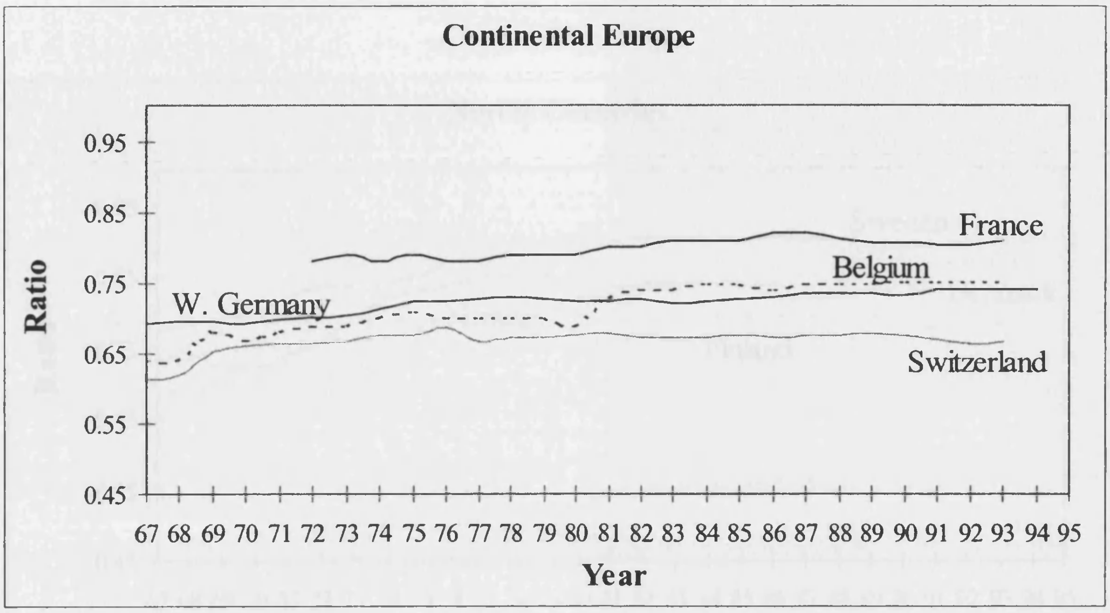


Figure 4.1 (continued)

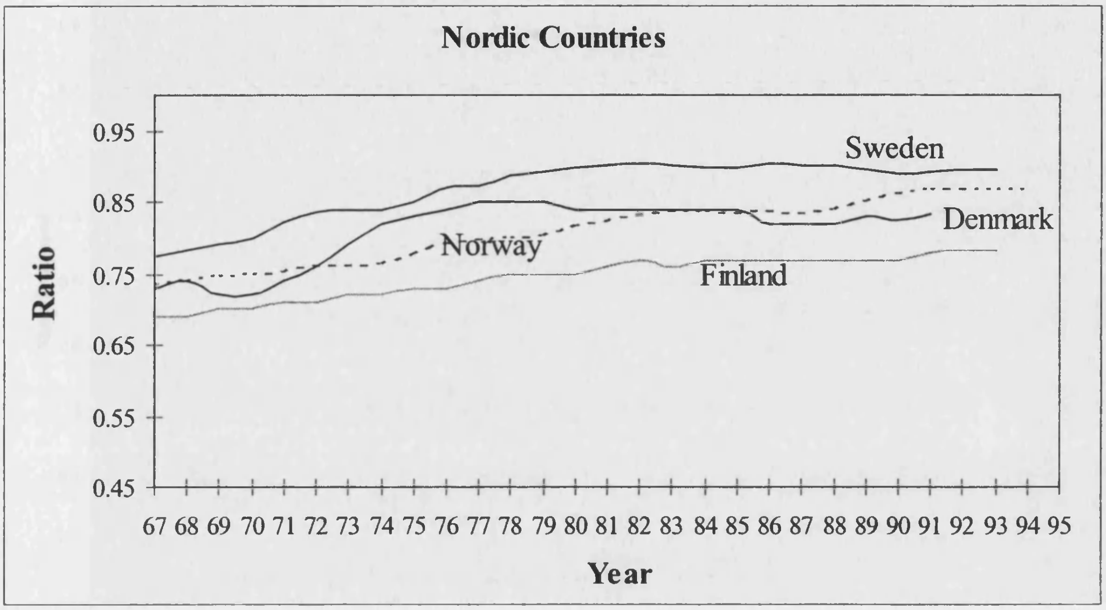
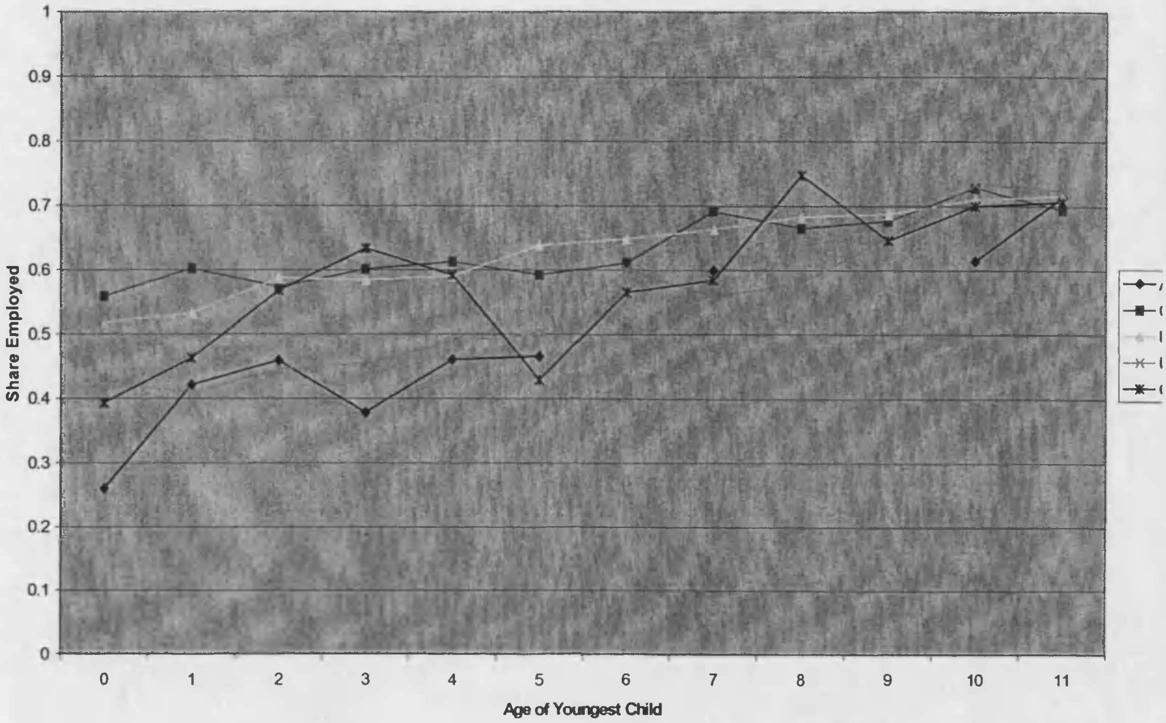


Figure 4.2
Share Employed, by Age of the Youngest Child



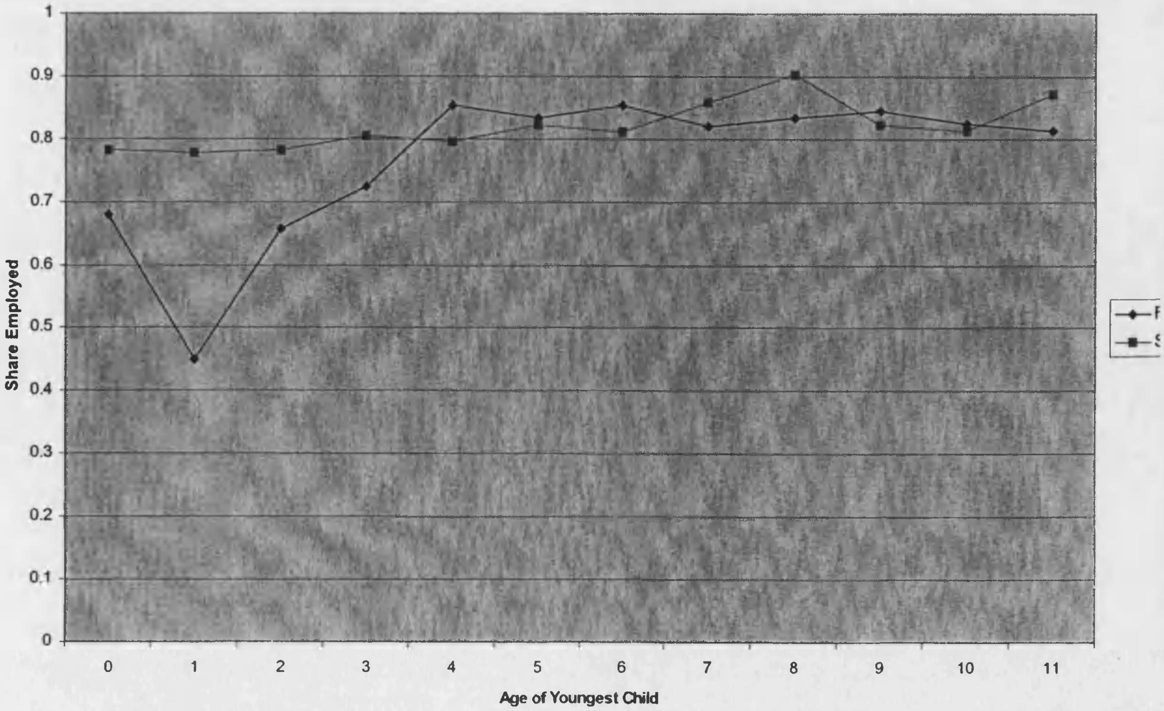


Figure 4.3
The Family Gap in Pay and the Gender Gap in Pay

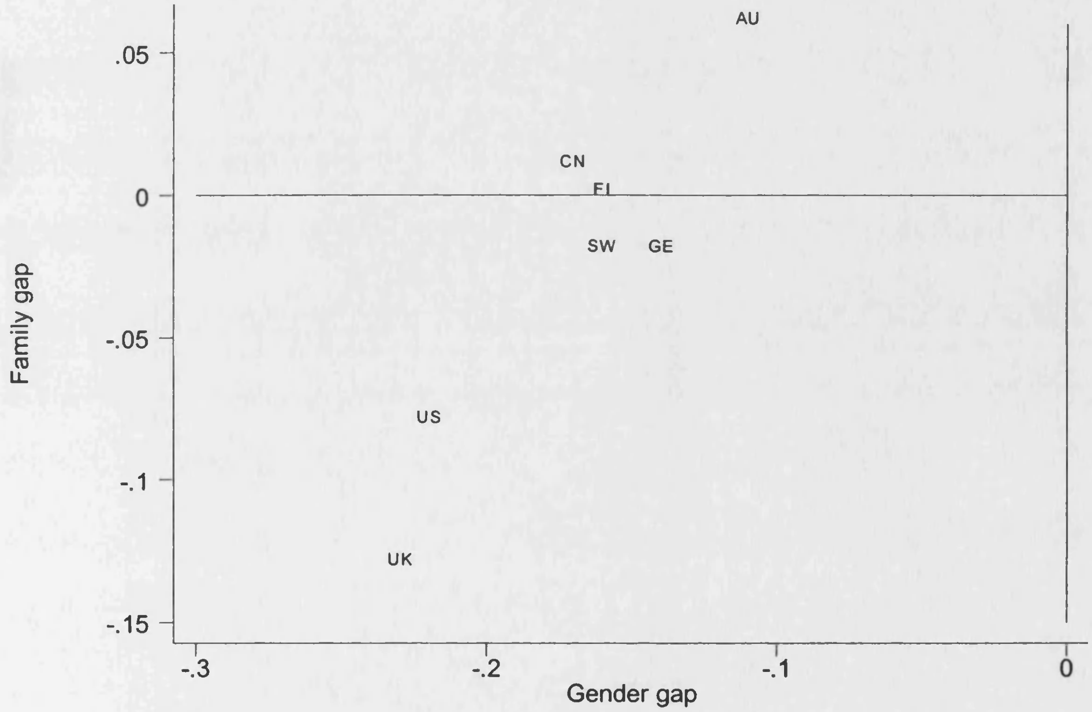


Figure 4.4
The Family Gap in Employment and the Gender Gap in Employment

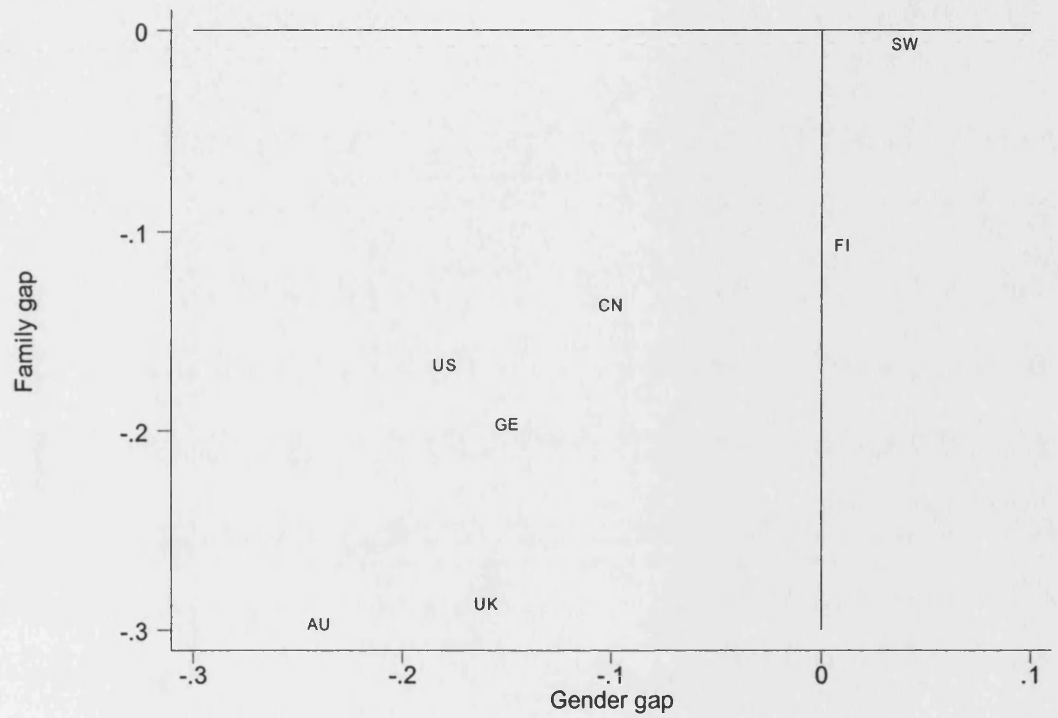


Figure 4.5
The Family Gap in Pay and the Family Gap in Employment

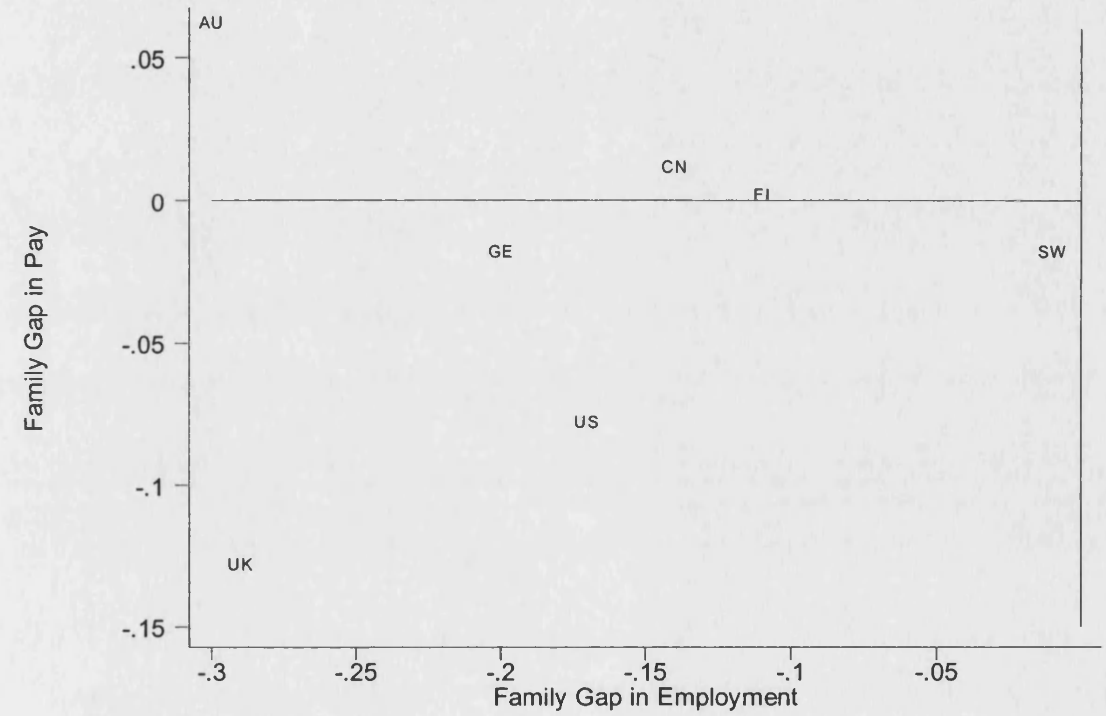
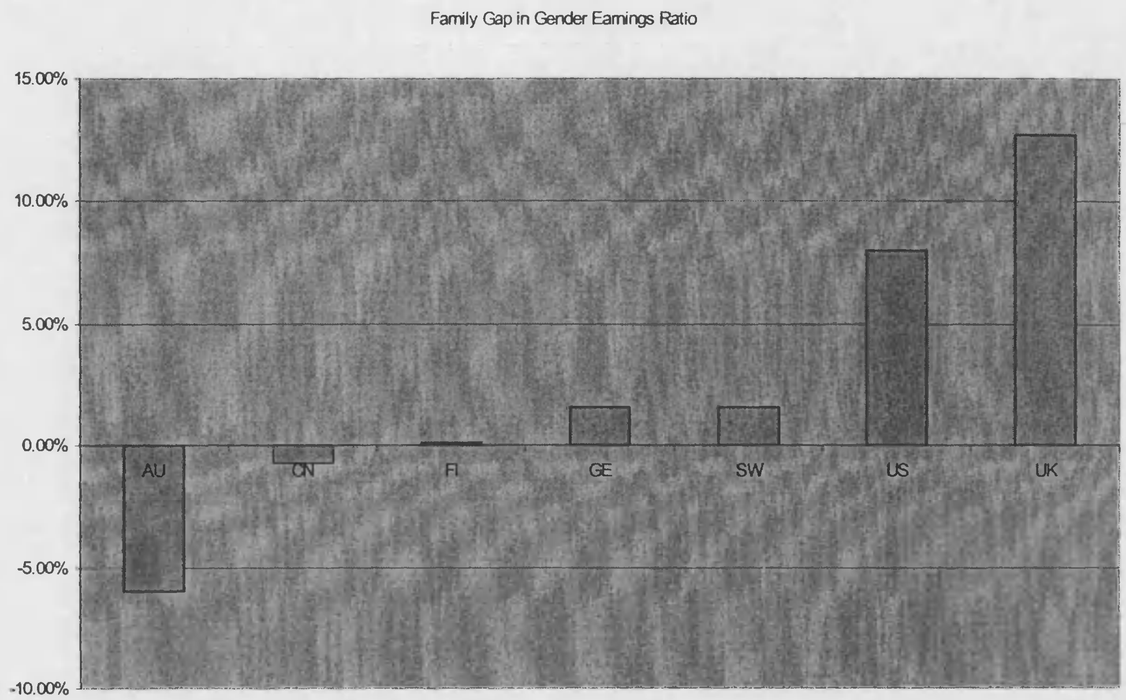


Figure 4.6
Family Gaps in the Seven Countries



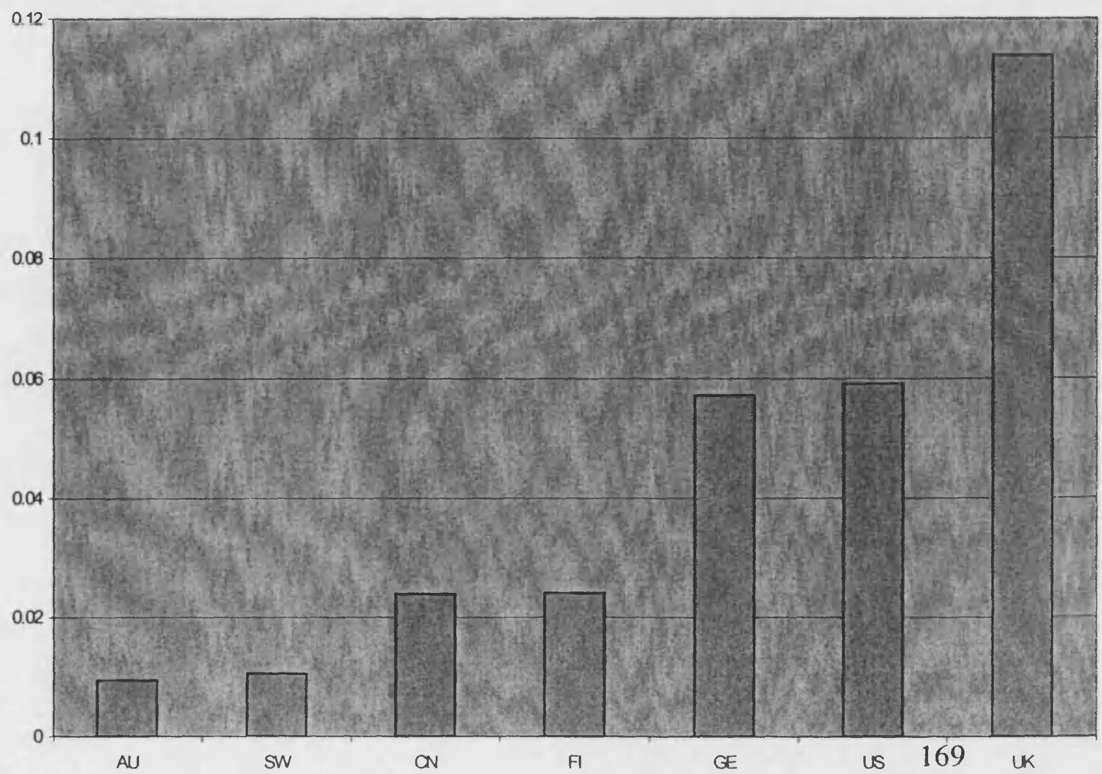
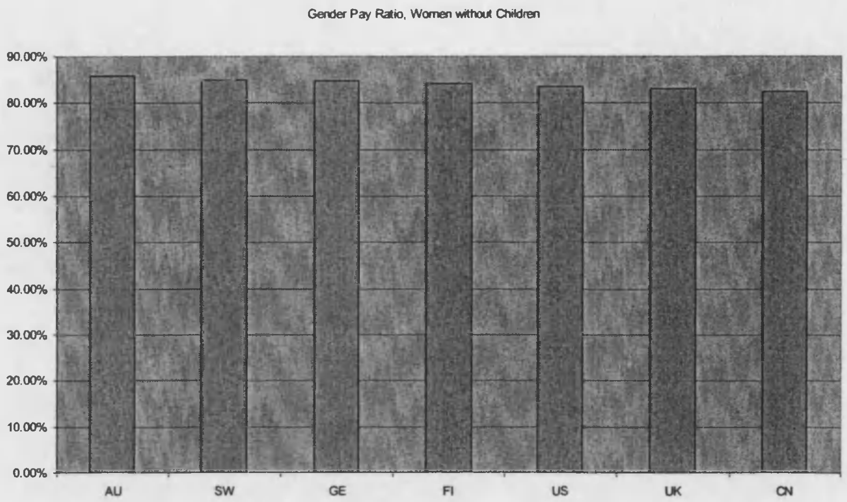


Figure 4.7
Rankings of the Seven Countries



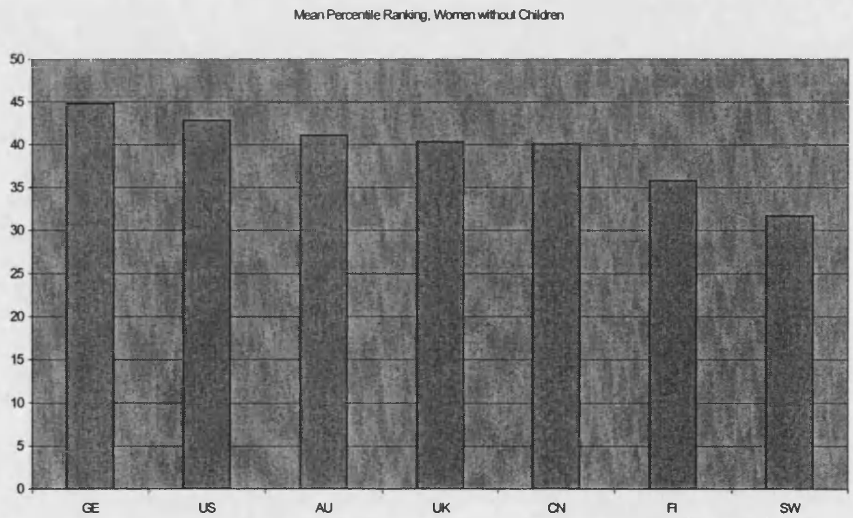
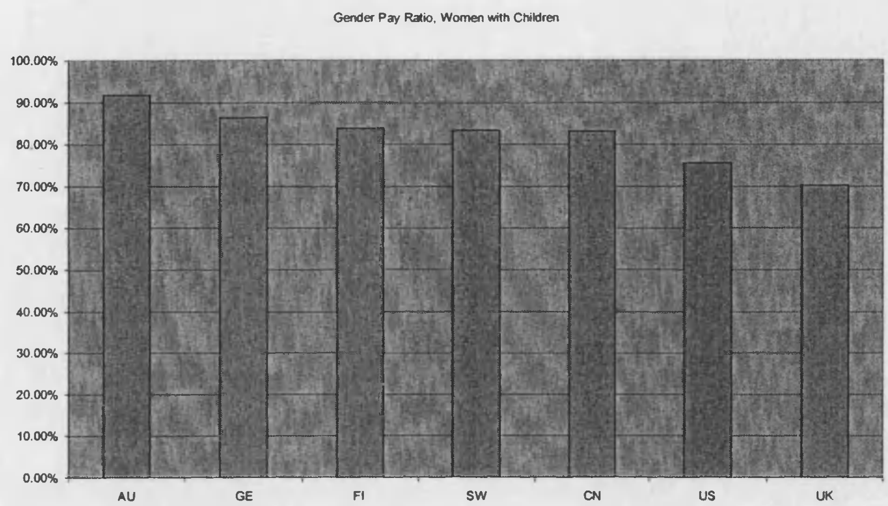
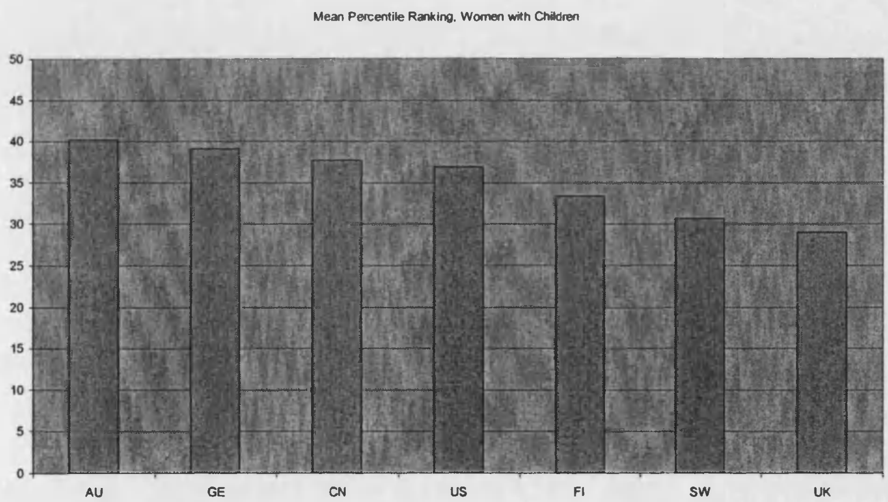


Figure 4.7 (continued)





Appendix 4.0

Variable Definitions

Employed Dummy variable for whether employed during survey week.
Log wage Log of gross hourly wage (annual wage and salary income divided by weeks worked & hours worked).
Age Age in years.
Age squared Age in years squared.
Married Dummy variable for whether married. Includes those cohabiting or living together as married except in U.S. and GE.
Child<1 Dummy variable for whether youngest child is under age 1.
Child 1-5 Dummy variable for whether youngest child is age 1 to 5.
Child 6-17 Dummy variable for whether youngest child is age 6 to 17.
1 ChildDummy variable for having 1 child.
2 Children Dummy variable for having 2 children.
3+ Children Dummy variable for having 3 or more children.
Partner work Dummy variable for whether husband/partner works.
Other earn Other family members' earnings.
Other income Other family income (total family income minus own earnings and other earnings).
Education Dummy variables defined by country:
AU 8 categories (no qualifications, basic vocational, skilled vocational, associated diploma, undergraduate diploma, bachelor degree, postgraduate diploma, higher degree)
CN 7 categories (grade 8 or lower, grade 9-10, grade 11-13 not h.s. grad, grade11-13 h.s. grad, post-secondary no degree, post sec. certificate or diploma, university degree)
UK 13 categories (dummy variables for left school at age 0-13,14,15,16,17,18,19,20,21,22,23,24 and age 24 and over)
US 8 categories (elementary, some high school, high school, some college, associate degree, bachelor degree, masters, doctorate)
GE 7 categories (no degree, other degree, secondary, tech school degree, high school degree, technical college, university)
FI 7 categories (no years of schooling, 10-11, 12, 13-14, 15, 16, post-grad education)
SW 8 categories (unspecified, primary 1, primary 2, secondary 1, secondary 2, university 1, university 2, research)
Race or Ethnicity/Nat'l Origin. Dummy variables defined by country:
AU 4 categories (oceania, antarctica, europe or USSR, africa or middle east, asia, americas)
CN 3 categories (English, French, other)
UK Not available
US 6 categories (white, black, asian/pacific islander, eskimo/aleut/indian, other race, hispanic)

GE 4 categories (W. German, Foreign, E. German, immigrant)
FI 2 categories (Finnish-speaking, Swedish-speaking)
SW Not available.

Region Dummy variable defined by country:

AU 7 categories (New South Wales, Victoria, Queensland, Southern Australia, Western Australia, Tasmania, A.C.T and N.T.)
CN 10 categories (Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia)
UK 11 categories (North, Yorkshire and Humberside North West, East Midlands, West Midlands, East Anglia, Greater London, South East, South West, Wales, Scotland, Northern Ireland)
US 9 categories (New England, Middle Atlantic, East North Central, North Central, South Atlantic, East South Central, West South Central, Mountain, Pacific)
GE 16 categories (West Berlin, Schleswig Holstein, Hamburg, Lower Saxony, Bremen, North Rhine Westfalia, Hesse, Rhineland, Badenwurttemburg, Bavaria, East Berlin, Mecklenburg, Brandenburg, Sachsen, Thueringen, Saxony)
FI 11 categories (Uusimaa, Turku/Pori, Home, Kymi, North Karelia, Kuopio, Central Finland, Vaasa, Oulu, Lapland, other)
SW 7 categories (Stockholm, bigger cities, south, north, north sparsely populated, Gothenburg, Malmo)

Urban Dummy variables defined by country:

AU 2 categories (state capital, rest of country)
CN 6 categories (urban 500,000+, urban 100,000 to 499,999, urban 30,000-99,999, urban 2,500-29,999, urban <2,500, rural)
UK 5 categories (Greater London, Metropolitan districts and central Clyde, non metropolitan, 3.2+ persons, non-metropolitan 0.9-3.2 persons, non metropolitan under 0.9 persons)
US 9 categories (city<1,000,000, city 1-2.5 million, city 2.5-5 million, city >5 million, suburb <1,000,000, suburb 1-2.5 million, suburb 2.5-5 million, suburb>5 million, non-metropolitan)
GE Not available.
FI 2 categories (urban, non-urban)
SW 6 categories

Table A4.1: Means of Family Status Variables Used in Employment and Wage Models

A. Employment Models

	AU 94	CN 94	UK 95	US 94	GE 94	FI 91	SW 91
Married	.736	.724	.726	.619	.666	.677	.763
Child <1	.075	.065	.077	.064	.002	.077	.030
Child 1-5	.264	.248	.291	.288	.224	.266	.323
Child 6-17	.315	.312	.308	.323	.400	.342	.305

B. Wage Models

	AU 94	CN 94	UK 95	US 94	GE 94	FI 91	SW 91
Married	.708	.730	.755	.593	.634	.644	.763
One Child	.187	.218	.218	.244	.270	.262	.207
Two Children	.251	.258	.267	.252	.219	.265	.327
Three or More Children	.109	.078	.076	.094	.041	.084	.154

C. FT Wage Models

	AU 94	CN 94	UK 95	US 94	GE 94	FI 91	SW 91
Married	.630	.709	.711	.566	.535	.633	.736
One Child	.177	.221	.178	.247	.236	.262	.223
Two Children	.161	.232	.167	.227	.150	.259	.295
Three or More Children	.046	.063	.056	.078	.025	.081	.130

Table A4.2: Marginal Effects from Employment Models

A. All Employed

	AU 94	CN94	UK 95	US 94	GE 94	FI 91	SW 91
Married	-.203** (.037)	-.019 (.013)	-.080* (.038)	-.071** (.013)	-.002 (.044)	.001 (.017)	-.082 (.041)
Child under 1	-.597** (.024)	-.277** (.018)	-.479** (.038)	-.273** (.016)	-.297 (.249)	-.056* (.028)	-.156* (.094)
Child 1-5	-.424** (.028)	-.219** (.011)	-.402** (.030)	-.197** (.009)	-.347** (.032)	-.078** (.020)	-.103** (.036)
Child 6-17	-.190** (.030)	-.095** (.013)	-.142** (.032)	-.068** (.009)	-.127** (.028)	.041* (.016)	.001 (.034)
Ethnicity 1	-.012 (.029)	.018 (.015)	-	.061** (.012)	.173** (.047)	.029 (.026)	-
Ethnicity 2	-.255** (.070)	-.061** (.012)	-	.013 (.014)	.048 (.049)		-
Ethnicity 3	-.195** (.043)	-	-	-.015 (.045)	.136 (.065)		-
Ethnicity 4	-	-	-	-.015 (.021)	-		-
Ethnicity 5	-	-	-	-.000 (.056)	-		-
Partner works	.308** (.040)	.110** (.012)	.199** (.044)	.071** (.013)	-.034 (.040)	-	.020 (.052)
Other income/1000	-.006** (.001)	-.007** (.000)	-.037** (.003)	-.005** (.000)	-.005** (.001)	-.003** (.000)	.004 (.187)
Other earning /1000	.001 (.000)	-.004** (.000)	-.001 (.001)	-.001** (.000)	.001** (.000)	-.001** (.000)	.533** (.158)
Age	-.030 (.025)	.025** (.008)	-.043 (.024)	.015* (.007)	.012 (.022)	-.010 (.016)	.067** (.025)
Age squared/100	.041 (.036)	-.033** (.012)	.068 (.036)	-.022* (.010)	-.020 (.032)	.014 (.022)	-.095** (.036)
Education 2	-.103 (.167)	.015 (.021)	.242 (.073)	.029 (.018)	-.128* (.066)	.067** (.013)	.138** (.023)
Education 3	-.131 (.153)	.080** (.020)	.241** (.056)	.175** (.015)	-.078 (.057)	.107** (.013)	.134 (.023)
Education 4	-.039 (.153)	.181** (.015)	.330** (.070)	.197** (.013)	-.205** (.038)	.131** (.011)	.178** (.027)
Education 5	-.311* (.148)	.170** (.014)	.331** (.035)	.246** (.010)	-.009 (.033)	.127** (.014)	.308** (.063)
Education 6	-.296* (.147)	.264** (.015)	.355** (.030)	.247** (.011)	.073 (.068)	.162** (.008)	.169** (.018)
Education 7	-.275 (.150)	.268** (.011)	.311** (.021)	.238** (.010)	-.084 (.049)	.153** (.014)	.171** (.031)
Education 8	-.364** (.118)	-	.305** (.023)	.259** (.010)			.164** (.019)
Education 9	-	-	.319** (.025)	-			-
Education 10	-	-	.335** (.016)	-			-
Education 11	-	-	.314** (.018)	-			-
Education 12	-	-	.305** (.024)	-			-
Education 13	-	-	.308** (.021)	-			-
Pseudo R2	.205	.121	.256	.094	.126	.180	.109
No obs	2654	16077	2438	22091	2372	4870	1060

Regional and urban dummies are also included.
** Significant at 1 percent, * Significant at 5 percent

B. Full Time Employment

	AU 94	CN94	UK 95	US 94	GE 94	FI 91	SW 91
Married	-.219** (.049)	-.019 (.015)	-.066 (.048)	-.052** (.015)	.006 (.052)	-.030 (.018)	-.155* (.067)
Child under 1	-.431** (.014)	-.249** (.016)	-.387** (.019)	-.290** (.014)	-.453 (.067)	-.025 (.029)	-.056 (.099)
Child 1-5	-.465** (.019)	-.273** (.011)	-.502** (.020)	-.272** (.009)	-.474** (.022)	-.095** (.022)	-.166** (.046)
Child 6-17	-.311** (.024)	-.149** (.011)	-.358** (.024)	-.131** (.010)	-.280** (.028)	.035 (.018)	-.114* (.048)
Ethnicity 1	.048 (.030)	.050** (.017)	-	.013 (.013)	.090 (.051)	-.011 (.032)	-
Ethnicity 2	-.150* (.065)	-.003 (.012)	-	.006 (.016)	.117 (.064)		-
Ethnicity 3	-.079 (.040)	-	-	-.061 (.051)	.203* (.087)		-
Ethnicity 4	-		-	.002 (.023)			
Ethnicity 5	-		-	.031 (.061)			
Partner works	.234** (.042)	.058** (.058)	.090 (.048)	.019 (.015)	-.118* (.050)	-	.084 (.075)
Other income	-.005** (.001)	-.008** (.000)	-.003** (.003)	-.001** (.000)	-.006** (.001)	-.003** (.000)	-.510* (.256)
Other earning	-.001 (.000)	-.001** (.000)	-.001 (.001)	-.002** (.000)	-.001 (.000)	-.001** (.000)	.158 (.185)
Age	-.038 (.026)	.024** (.009)	-.017 (.026)	.030** (.007)	.018 (.026)	-.018 (.017)	.047 (.034)
Age squared/100	.046 (.038)	-.032* (.013)	.022 (.037)	-.045** (.011)	-.035 (.038)	.027 (.024)	-.063 (.050)
Education 2	.185 (.127)	.030 (.026)	.165 (.231)	.033 (.022)	-.157* (.065)	.075** (.015)	.213 (.090)
Education 3	.043 (.114)	.097** (.027)	.381** (.111)	.206** (.019)	-.035 (.062)	.116** (.015)	.256* (073)
Education 4	.058 (.119)	.191** (.021)	.417** (.111)	.221** (.018)	-.148** (.039)	.145** (.016)	.274* (.083)
Education 5	-.033 (.115)	.178** (.022)	.516** (.083)	.278** (.016)	.015 (.038)	.147** (.018)	.370** (.107)
Education 6	-.089 (.105)	.265** (.020)	.574** (.068)	.285** (.016)	.164 (.081)	.196** (.010)	.306** (.059)
Education 7	-.129** (.101)	.299** (.019)	.536** (.058)	.279** (.017)	-.130** (.048)	.191** (.019)	.279 (.085)
Education 8	-.172 (.107)	-	.556** (.054)	.328 (.017)			.337** (.048)
Education 9			.563** (.050)				
Education 10			.560** (.050)				
Education 11			.584** (.031)				
Education 12			.494** (.081)				
Education 13			.522** (.068)				
Pseudo R2	.231	.089	.278	.091	.216	.167	.077
No obs	2654	16077	2438	21682	2372	4870	1059

Regional and urban dummies are also included.
** Significant at 1 percent, * Significant at 5 percent

Table A4.3: Wage Equations – Full Results

A. Employment

	AU 94	CN 94	UK 95	US 94	GE 94	FI 91	SW 91
Married	.035 (.038)	-.005 (.015)	.037 (.027)	.060** (.009)	-.058 (.032)	.034* (.014)	.033 (.018)
One Child	-.078 (.045)	-.036* (.017)	-.071* (.030)	-.027* (.011)	-.018 (.036)	-.026 (.016)	-.008 (.021)
Two Children	-.106* (.044)	-.050** (.017)	-.232** (.029)	-.067** (.011)	-.175** (.041)	-.012 (.017)	-.014 (.021)
Three + Children	-.053 (.062)	-.209** (.027)	-.309** (.045)	-.088** (.016)	.068 (.072)	-.064** (.025)	-.025 (.025)
Ethnicity 1	.013 (.045)	.002 (.027)	-	.112** (.017)	.096 (.070)	-.035 (.030)	-
Ethnicity 2	-.202 (.133)	-.096** (.020)	-	.022 (.020)	.066 (.087)	-	-
Ethnicity 3	-.139 (.072)	-	-	-.031 (.062)	-.022 (.110)	-	-
Ethnicity 4	-	-	-	-.013 (.030)	-	-	-
Ethnicity 5	-	-	-	.082 (.079)	-	-	-
Age	.069 (.038)	.098** (.014)	.107** (.024)	.097** (.009)	.074* (.030)	.022 (.017)	.013 (.016)
Age squared/100	-.088 (.056)	-.117** (.020)	-.135** (.035)	-.123** (.013)	-.087* (.044)	-.019 (.024)	-.009 (.023)
Education 2	.064 (.169)	.115 (.052)	-.182 (.225)	.064 (.034)	-.350** (.084)	.051** (.017)	-.114 (.098)
Education 3	-.044 (.155)	.176** (.054)	-.045 (.154)	.288** (.030)	-.388** (.084)	.175** (.018)	-.063 (.098)
Education 4	-.054 (.160)	.317** (.046)	.068 (.152)	.399** (.031)	-.389** (.047)	.336** (.026)	-.047 (.094)
Education 5	-.210 (.167)	.315** (.048)	.203 (.153)	.523** (.032)	-.128** (.043)	.410** (.031)	.018 (.093)
Education 6	-.281 (.156)	.425** (.045)	.425** (.153)	.718** (.031)	-.045 (.093)	.533** (.028)	.082 (.096)
Education 7	-.253 (.159)	.671** (.046)	.472** (.162)	.890** (.037)	-.066 (.058)	.755 (.084)	.116 (.095)
Education 8	-.346** (.151)	-	.430** (.166)	1.030** (.046)	-	-	.230* (.096)
Education 9	-	-	.644** (.156)	-	-	-	-
Education 10	-	-	.646** (.158)	-	-	-	-
Education 11	-	-	.742** (.169)	-	-	-	-
Education 12	-	-	.520** (.171)	-	-	-	-
Education 13	-	-	.550** (.183)	-	-	-	-
Adj R2	.065	.137	.295	.234	.119	.198	.179
No obs	1547	7885	1564	15307	1515	3592	874

B. Full Time Employment

	AU 94	CN 94	UK 95	US 94	GE 94	FI 91	SW 91
Married	.035 (.036)	-.005 (.015)	.016 (.029)	.059** (.010)	.013 (.031)	.020 (.013)	.033 (.018)
One Child	-.110* (.046)	-.036* (.017)	.010 (.036)	-.014 (.011)	-.041 (.037)	-.037* (.015)	-.008 (.021)
Two Children	-.168** (.049)	-.050** (.017)	-.169** (.037)	-.040** (.012)	-.108* (.046)	-.022 (.016)	-.014 (.021)
Three + Children	-.193* (.082)	-.209** (.027)	-.279** (.059)	-.062** (.018)	-.079 (.091)	-.075** (.023)	-.025 (.025)
Ethnicity 1	.008 (.045)	.003 (.027)	-	.113** (.018)	.068 (.069)	-.041 (.029)	-
Ethnicity 2	-.202 (.130)	-.096** (.020)	-	.028 (.021)	-.026 (.086)	-	-
Ethnicity 3	-.044 (.069)	-	-	-.020 (.068)	-.012 (.102)	-	-
Ethnicity 4	-	-	-	-.006 (.031)	-	-	-
Ethnicity 5	-	-	-	.109 (.081)	-	-	-
Age	.079* (.038)	.098** (.014)	.107** (.027)	.099** (.010)	.058 (.030)	.014 (.016)	-.009 (.024)
Age squared/100	-.100 (.055)	-.117** (.020)	-.131** (.040)	-.123** (.014)	-.070 (.044)	-.005 (.023)	-.009 (.023)
Education 2	.070 (.170)	.115* (.052)	-.031 (.374)	.082 (.037)	-.127 (.094)	.056** (.016)	-.114 (.098)
Education 3	-.037 (.155)	.176** (.054)	.390 (.232)	.338** (.033)	-.290** (.083)	.173** (.017)	-.063 (.098)
Education 4	-.036 (.163)	.317** (.046)	.557* (.230)	.457** (.034)	-.284** (.050)	.351** (.026)	-.047 (.094)
Education 5	-.210 (.167)	.315** (.048)	.667** (.232)	.564** (.035)	-.062 (.043)	.434** (.029)	.018 (.093)
Education 6	-.274 (.157)	.425** (.045)	.860** (.231)	.764** (.034)	-.057 (.091)	.551** (.026)	.082 (.096)
Education 7	-.247 (.159)	.671** (.046)	.841** (.238)	.972** (.039)	-.040 (.060)	.707** (.077)	.116 (.095)
Education 8	-.345 (.151)	-	.912 (.240)	1.077** (.048)	-	-	.230 (.096)
Education 9	-	-	10.60** (.233)	.890** (.037)	-	-	-
Education 10	-	-	1.071** (.235)	1.030** (.046)	-	-	-
Education 11	-	-	1.146** (.242)	-	-	-	-
Education 12	-	-	.827** (.244)	-	-	-	-
Education 13	-	-	.980** (.254)	-	-	-	-
Adj R2	.090	.137	.308	.275	.122	.241	.179
No obs	1046	7885	999	11588	1107	3385	874

Table A4.4: OLS and Instrumental Variable estimates of the Impact of Children on Employment

1. All Workers

	AU 94		CN 94		UK 95		US 94		GE 94		FI 91		SW 91	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Married	-.222** (.035)	-.252** (.055)	-.037** (.012)	-.045** (.014)	-.077* (.032)	-.082* (.034)	-.077** (.013)	-.077** (.007)	-.018 (.041)	-.038 (.046)	.008 (.014)	-.088 (.048)	-.093 (.057)	-.094 (.018)
Number Children	-.119** (.008)	-.086* (.055)	-.064** (.003)	-.047** (.014)	-.089** (.008)	-.081** (.020)	-.059** (.003)	-.060** (.007)	-.119** (.009)	-.088** (.035)	-.011* (.006)	.100 (.053)	-.038** (.011)	-.035* (.018)
Adj R^2	.198	.19384	.138	.137	.253	.253	.109	.109	.146	.142	.159	.092	.061	.061
Hausman Test	0.70		1.20		0.46		-.020		0.93		2.18*		0.19	
N.	2654		16077		2438		22091		2372		4870		1060	

2. FT Workers

	AU 94		CN 94		UK 95		US 94		GE 94		FI 91		SW 91	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Married	-.177** (.035)	-.196** (.047)	-.025 (.013)	-.031* (.015)	-.039 (.033)	-.040 (.035)	-.055** (.014)	-.050** (.014)	-.047 (.042)	-.078 (.048)	-.017 (.015)	-.104 (.051)	-.138 (.073)	-.144 (.074)
Number of Children	-.159** (.008)	-.138** (.046)	-.094** (.004)	-.083** (.016)	-.138** (.008)	-.137** (.021)	-.086** (.003)	-.096** (.008)	-.160** (.010)	-.111** (.037)	- .021** (.006)	.079 (.056)	-.070** (.015)	-.061** (.023)
Adj R^2	.251	.242	.116	.115	.253	.253	.119	.119	.243	.234	.159	.110	.103	.066
Hausman Test	0.47		0.70		0.08		-1.34		1.42		1.85		0.50	
N	2654		16077		2438		21682		2372		4870		1059	

Note: Number of children is instrumented by the average number of children of women by age and region.

Table A4.5: OLS and Instrumental Variable estimates of the Impact of Children on Wages

3. All Workers

	AU 94		CN 94		UK 95		US 94		GE 94		FI 91		SW 91	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Married	.025 (.038)	.015 (.075)	-.004 (.016)	.027 (.026)	.045 (.027)	.056 (.030)	.065** (.009)	.065** (.011)	-.074 (.032)	-.073 (.051)	.039** (.014)	-.040 (.071)	.034 (.018)	.024 (.019)
Number of Children	-.039* (.016)	-.024 (.095)	-.038** (.006)	-.090** (.034)	-.107** (.011)	-.129** (.032)	-.036** (.004)	-.037** (.011)	-.030 (.017)	-.033 (.068)	-.017* (.006)	.069 (.075)	-.009 (.007)	.004 (.010)
Adj R^2	.063	.062	.095	.090	.296	.294	.236	.236	.124	.107	.198	.159	.218	.215
Hausman Test	.158		-1.58		-0.77		-0.06		-0.05		1.17		1.901	
Number obs	1547		10219		1564		15307		1515		3592		874	

4. FT Workers

	AU 94		CN 94		UK 95		US 94		GE 94		FI 91		SW 91	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Married	.025 (.038)	-.038 (.076)	.003 (.015)	.046 (.025)	.027 (.029)	.042 (.033)	.066** (.009)	.073** (.011)	.014 (.031)	-.025 (.040)	.026* (.013)	-.022 (.065)	.037 (.018)	.025 (.019)
Number of Children	-.039* (.016)	.026** (.123)	-.051** (.007)	-.130** (.037)	-.087** (.014)	-.121** (.039)	-.031** (.004)	-.044** (.013)	-.047* (.020)	.063 (.075)	-.022** (.006)	.030 (.070)	-.030** (.018)	-.013 (.011)
Adj R^2	.095	.064	.137	.141	.308	.304	.277	.277	.124	.099	.241	.224	.202	.196
Hausman Test	.916		-2.18*		-0.77		-1.03		1.54		1.17		2.227**	
Number obs	1046		7885		999		11588		1107		3385		685	

Note: Number of children is instrumented by the mean number of children by age and region

CHAPTER FIVE:

GRADUATE EARNINGS IN BRITAIN, 1974-95

5.1 Introduction

Much has been made of the rise in wage inequality in Britain, an important part of which in the eighties was a rise in earnings gaps between workers with and without a degree. What is much less well understood is the extent to which these shifts in wage structure have continued into the nineties, how they have affected men and women differently and how relative comparisons of different educational groups (other than degree/non-degree or degree/no educational qualifications comparisons) have evolved.

In this chapter we shed some light on these questions, looking at changes in the wage returns to education between 1974 and 1995 using General Household Survey data. We pay particular attention to changes in the relative supplies of workers with different educational qualifications to explore how changing supply has varied with the labour market rewards accruing to different groups in the labour market. In the 1970s the very big shifts in supply resulting from the expansion of the higher education system seemed to depress the relative wages received by the more highly educated. After this decade, however, it is clear that changes in relative earnings are bigger than those predicted by relative supply shifts alone as one identifies groups of workers (the more skilled) who have experienced simultaneously rising relative wages and employment.

Indeed, it seems that a positive covariation between the relative wages and employment of the more educated has been the norm since the start of the 1980s, suggesting relative demand shifts in favour of more educated workers have occurred. This has been well documented for graduates versus non-graduates (Machin, 1996a; Schmitt, 1995), but looking in more detail at gender differences, and considering more detailed breakdowns of educational groupings (including subject of study for graduates) uncovers other interesting patterns. Essentially shifts in relative demand favouring more highly educated workers were more pronounced for women than for men, and are of differing magnitude as one move down the distribution of educational qualifications (for example there seem to be much less of a shift in relative demand between degree holders and those with A levels only as compared to shifts between those with A levels and no qualifications).

The chapter is structured as follows. Section II describes changes in educational attainment between the mid-seventies and mid-nineties. Section III presents descriptive material on wage gaps between workers with different qualifications and how they have evolved through time and reports education wage premiums and changes in them that emerge from simple earnings regressions. Section IV then computes relative demand shifts between different educational groups from the wage and supply changes documented in Sections II and III. Section V fixes a particular education cohort by looking at changes over time for those who in the survey year who are 3-10 years out of full-time education. In Section VI we then move on to look at changes in the graduate wage premium by subject of study. Section VII investigates whether one can identify a gender bias in terms of the impact of technological change on the extent of skill upgrading and Section VIII concludes by summarising the main findings.

5.2. Changes in the Distribution of Educational Qualifications

Throughout this chapter we utilise data from the General Household Survey (GHS) and restrict out analysis to economically active men aged 16-64 and women aged 16-59. This gives samples of about 10-13000 people per year on whom we have data on education and around 5-9000 people working full time with wage data. Due to problems with the GHS hours question changing over time we consider weekly earnings throughout. The remainder of this Section documents trends over time in the distribution of educational qualifications.

Changes in the Distribution of Educational Qualifications

It is well known that over recent decades the workforce has become much better qualified. This reflects several changes in the educational system including the expansion of higher education, the move towards vocational education, changes in school leaving ages and changes in examinations systems. Overall these moves mean that the average person in the education distribution now possesses more formal qualifications than before, and that far fewer people have no formal educational qualifications.

Table 5.1 reports the distribution of educational qualifications by sex using GHS data grouped into three-year intervals between 1974-6 and 1993-5.[1] The numbers given are the shares of the employed in each highest educational qualification category. There are clearly sharp increases in the percentage of people in the higher educational categories. The supply of highly educated labour has risen at a rapid rate. Indeed there is a 155 percent increase in the share of graduates in the male population between the mid-1970s and mid-1990s; and an even bigger percentage increase, of 347 percent, for women. Other qualification groups also increase their shares rapidly. For men there is (roughly) a doubling of the proportion of people with A levels, the share of this group rising by 95 percent for those with two or more A levels as their highest qualification and 149 percent for those with one A level. For women the shares rise faster at 110 percent for those with two A levels and 202 percent for those with one A level. Finally, the move towards vocational qualifications[2] is also brought out in the Table. For men, the share with higher vocational qualifications rises by 146 percent, and the share with lower vocational qualifications increases by 123 percent. For women comparable percent increases are huge at 418 and 900 percent, reflecting the fact that hardly any women possessed vocational qualifications in the mid-1970s.

Relative Supply Changes Across Decades

As the reported supply changes cover a relatively long time period they may mask differences in supply trends over shorter periods. And, because we are interested in the extent to which changes in the supply of education have the potential to dampen education based wage differentials it is interesting to look at the evolution of supply over different time periods. Table 5.2 shows changes in relative supply for sub-periods between the mid-1970s and mid-1990s for various pairwise comparisons of groups with different educational qualifications. The pattern revealed by the Table is clear. The supply of graduates relative to three benchmark groups (all non graduates, those with A

[1] The three year grouping is to ensure sample sizes are large enough.

[2] Higher vocational qualifications include HNC, HND and full City and Guilds awards. Middle vocational qualifications include ONC, OND and City and Guild Part II.

levels and those with no qualifications) shows a rapid increase in the 1970s, a deceleration in the 1980s and then a speeding up in the 1990s (though in most cases not to the same rate of increase as the 1970s). The rate of increase is faster for women in all cases.

Perhaps the most striking result from the Table is that the relative supply of all qualification groups increased rapidly in all periods compared to those with no qualifications, reflecting skill upgrading across the labour force.[3] The relative supply of graduates and those with higher vocational qualifications increased most rapidly, although the latter was at a very low level in the seventies (particularly for women). The relative supply of those with A levels has seen a fast rise too, in particular since the 1980s, while the supply of those with higher vocational qualifications has also grown quickly, particularly amongst women. For men, however, the rate of increase in supply of those with higher vocational qualifications slowed relative to those with A levels and middle level vocational qualifications from the 1990s.

5.3 Trends in Relative Wages

If a group of people with particular educational qualifications increases its population share this gives potential employers a larger group of workers to choose from. If employers' demand requirements do not change, then increases in relative supply should induce a fall in the relative wages of the group in question. In this Section we examine the extent to which this has happened. We begin by documenting relative wage premia for different educational groups, and then move on to compare the magnitude of relative wage shifts across decades. We consider the role of changing demand for particular sorts of workers with differing educational qualifications in the next Section.

Relative Wage Differentials

Relative weekly wage ratios for full-time workers are reported in Table 5.3. Various education-based differentials are reported between the mid-70s and mid-90s.

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[3] This remains the case for computations based on total hours rather than employment.

They show that the more highly educated earn more, but there is some evidence of a fall in this earnings differential in the 70s, a rise in the 80s and a more mixed pattern in the 90s. However, these raw earnings ratios do not standardise for the different characteristics of workers within education groups and, as such, inference based upon them could be misleading. To properly consider the evolution of relative wage differentials through time one should standardise for the different characteristics of individuals in the sample. The next sub-section uses regression techniques to do so.

Estimated Wage Differentials Between Education Groups

Table 5.4 reports coefficient estimates (and associated standard errors) on education dummy variables included in semi-log earnings equations estimated for full-time employees. The upper panel of the Table reports estimates for men and the lower panel reports those for women. Each coefficient reported comes from a regression based on the sample of individuals (i = 1, 2,....N) in the pairwise education comparison

$$\log(W_{it}) = \alpha_t + \beta_t D_{it} + \gamma_t X_{it} + \varepsilon_{it}$$

of interest over a given time period t:
where log(W) is log earnings, D is a dummy variable distinguishing between the education groups of interest, X is the set of control variables and ε is an error term.

So, to illustrate the way in which the results are reported, Table 5.4 gives time-varying estimates of β, the education based wage premium, for different education groups. The upper panel reports results for men, and the lower panel results for women. In the first row of the Table the estimate of β compares the (characteristics corrected) log earnings of those with degrees and those without. In this formulation D is a dummy variable equal to 1 for those with a degree and 0 for those without. The second row just focusses on people with degrees or A levels and estimates an earnings equation for this sub-set of individuals, with D again being a dummy variable for whether an individual has a degree or not, and β being the *ceteris paribus* log (earnings) difference between people with a degree and A levels. Analogous comparisons between other education groups are given in the other rows of the Table. Sample sizes for each comparison are given in Appendix Table A5.1.

The control variables included in the specifications reported in Table 5.4 are age, age squared, a dummy variable reflecting whether people are teachers or not[4], plus sets of region and industry dummy variables. It should be noted that the pattern of results, particularly the way estimates of β shift over time, remains very robust to alternative specifications. Two examples are given in Tables A5.2 and A5.3 of the Appendix, which include health and non-white variables.[5]

For comparisons based on individuals with degrees, the estimated coefficients show a pattern of a declining graduate earnings premium in the 1970s, followed by increases in the 1980s and 1990s. This pattern broadly holds if the comparison group is non-degree, A levels or no qualifications. It is also true for both men and women. However, the magnitudes of the changes in the graduate earnings premium are rather different for different comparison groups, and differ by gender.[6]

In terms of the comparison between people with A levels and those with no educational qualifications, the coefficient on the A level dummy variable falls for men

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[4] This teacher dummy variable is included because teachers with degrees earn substantially less than other graduates.

[5] The basic pattern of results over time remains, but is somewhat dampened in cross-section comparisons, if one includes a full set of occupation controls. See Appendix Table A4.

[6] Appendix Table A5 reports formal statistical tests of whether the estimates of β in Table IV are significantly different for men and women. The pattern is mixed but on the whole points to statistically significant differences in the earlier years, with male/female gaps in education based wage differentials tending to converge by the 1990s.

in the 1970s, with little change for women, but rises thereafter. Shifts in the wage structure for people possessing higher vocational qualifications are a little different. For men, the high vocational/A levels wage gap remains much the same in the 70s, and falls to zero by the 90s. For women, while the cross-section differential is a little larger, a similar pattern of change in the high vocational/A levels wage gap emerges.

But there are some notable gender differences when one looks at what has happened to the relative wages of those possessing higher vocational qualifications as compared to either the middle vocational group or those with no qualifications. For men the high vocational/middle vocational wage gap falls a little in the 70s and then rises back up to its mid-1970s level by the mid 1990s. For women, the magnitude of change is larger with a very sharp fall in the 1970s, an increase in the 80s, before flattening off in the 90s. The final comparison drawn in the Table, between high vocational qualifications and no educational qualifications shows a fall in the 70s for both men and women, and increasing again throughout the 80s.

Because patterns of labour force participation for both men and women have altered very markedly over this time period one may be concerned that these cross-time patterns of change in education based earnings differences may be biased by compositional changes in the labour force. In particular, since the 1970s male and female participation rates have gone in opposite directions, reflecting the rapidly falling employment rates of less skilled men and the rising employment rates of women.

We have therefore experimented with trying to correct the estimated wage differentials for any selection bias due to the changing composition of employment over time. To do so we adopt a standard Heckman (1976) type correction to the wage equation. In practice this is done by estimating a probit model of employment participation across the working age population and then including a variable to correct for sample selection (the inverse Mills ratio) from this probit specification in the wage equation.[7] The most crucial issue concerns the identification of the coefficient on this

[7] This correction is adopted to allow for the fact that people with positive earnings may be a selected sample of individuals in that their characteristics may be different from those who are out of work. For an earnings equation $\log(W) = X\theta + \varepsilon$ the issue arises because the equation is based only upon people who have $W>0$. As such it is possible that the mean of the error term ε ($E(\varepsilon)$) may not equal 0 as one would require

correction factor, which requires one to include variable(s) in the employment probability equation that are excluded from the wage equation. The identification restrictions we adopt are to include family non-labour income and the employment status of other working age adults in the employment probit, whilst excluding them from the wage equation.

Selection corrected wage equations are given in Table A5.6 of the Appendix.[8] The specifications reported there are identical to those in Table 5.4 except they also include the inverse Mills ratio from the first stage probit. Selection bias is not very important for men in all educational comparison groups. For women selection bias is more important, with larger shifts in the estimated coefficients. The basic thrust of the results however remains. But, because of the scope for selection to alter the nature of the reported results, from now on we report results that both do and do not control for possible selection bias.

The Magnitude of Changes in Relative Wage Differentials

Our principal interest is the evolution of education-specific wage differentials over time. Table 5.5 therefore converts the estimates of log earnings differentials into

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for estimates of θ to be unbiased. To ensure the error term does have a zero mean one needs to include a selection correction term (the inverse Mills ratio) in the wage equation. To see this note that the earnings equation for those with positive earnings can be written $[\log(W)|W>0] = X\theta + \sigma(\varphi/\Phi) + v$ where $E(v) = 0$ and φ and Φ are the density function and distribution function of the standard normal distribution. The inverse Mills ratio can be calculated from a first stage probit model explaining the probability that an individual has positive earnings, $\Pr[W>0] = \Phi(Z\zeta + \omega)$.

[8] The coefficients on the key variables in the probit equations used to generate the inverse Mills ratio are given in Table A7 of the Appendix.

changes observed in the 1970s, 80s and 90s. The Tables report annualised log changes in education based wage differentials over these time periods (for two particular time periods s and t, with t>s, these correspond to $[\beta_t - \beta_s]/[t - s]$). Two sets of changes are reported in each case, one from the models in Table 5.4, the other from the selectivity corrected wage equations in Appendix Table A5.6. Whilst the cross-section comparisons are affected (particularly for women), the overall pattern of change is, for the most part, robust to the selection corrections.

Table 5.5 makes it clear that, while one can identify some similar patterns in the direction of shifts in educational wage differentials across qualification groups, the magnitudes of some of these shifts are rather different. This, of course, is what we would expect given that, as we have shown earlier, the magnitudes of relative supply shifts differ.

For men the numbers in Table 5.5 make it clear that the relative wages of more educated groups fell in the 1970s. This is in line with the relative supply changes documented earlier. According to Table 5.5, between 1975 and 1980 the wage differential between men with and without degrees fell by about 1.1 percent a year. The biggest falls seem to be relative to the no qualifications group: for example, the wage differential between those with a degree and no qualifications fell by 1.1 percent a year, and by a huge 1.6 percent a year between those with higher vocational qualifications and those with no qualifications. The other comparisons in the Table also show falls in the 1970s, but they are more moderate than when benchmarked against the no educational qualifications group.

In the 1980s and 1990s, however, relative wages of the more educated rose relative to their less qualified counterparts, despite increasing relative supply. For men, this is true of all comparisons in the 80s except for high vocational/A levels, where the relative wage premia received by those with higher vocational qualifications fell slightly. In terms of magnitude, the biggest increases in education based wage premia occurred relative to the no qualifications group. For example, the degree/no qualifications wage premium rose twice as fast in the 80s as the degree/A levels and degree/no degree premium. In the 90s the degree/no qualifications wage premium continued to rise, but the Degree/A levels premium seemed to fall or (at worst) stop rising.

The lower panel of the Table shows more qualified women experiencing a fall in educational wage premiums in the 70s but rapid increases (faster than those for men) in the 80s. The shifts in wage structure by education for women are, however, somewhat different to those for men. Female graduates have improved their relative wage position by more than men since the start of the 1980s. This is the case despite faster relative supply increases which were documented earlier. This gender difference suggests that the relative demand for female graduates has grown faster than the relative demand for male graduates over this period. This is what we turn to next.

5.4. Implied Relative Demand Shifts

We are now in a position to calculate the extent to which the observed wage shifts reflect supply or demand factors, or both. As in Autor and Katz (1998), we assume CES technology and two factors of production (high and low-skilled labour). Assuming the economy operates on its labour demand curve[9], then a simple expression can be defined to show the relationship between changes in wage differentials for two different groups of workers i and j ($\Delta W_{ij}/W_{ij}$) and changes in the relative supply ($\Delta S_{ij}/S_{ij}$) and demand ($\Delta D_{ij}/D_{ij}$) of those groups:

$$\frac{\Delta W_{ij}}{W_{ij}} = \frac{1}{\sigma_{ij}}\left[\frac{\Delta D_{ij}}{D_{ij}} - \frac{\Delta S_{ij}}{S_{ij}}\right]$$

where σ_{ij} is the aggregate elasticity of substitution between the two groups. Under CES production cross-price elasticities are constant. As in reality there are more than two factor inputs, estimation within this conditional demand framework requires the effects of changes in other input prices to be incorporated within the demand shift term. Therefore σ_{ij} reflects both substitution possibilities at the firm production level, and also substitution possibilities in consumption. The aggregate theta is larger than that reported at the firm level therefore under this conditional demand framework. As we have computed $\Delta W/W$ and $\Delta S/S$ equation (2) can be used to calculate the implied relative demand shifts, ΔD/D, if one is prepared to make an assumption about the ease with which employers can substitute between different sorts of workers. There are ranges of estimates of σ that have been estimated (see Hamermesh's, 1993, book). Katz and Murphy (1992) and Autor, Katz and Krueger (1998) assume its value to be 1.4 and, as this does not seem implausible, we do the same.

Table 5.7 reports the demand shifts implied by the estimated wage differentials and the supply changes presented earlier for $\sigma = 1.4$.[10] Again the Table reports two sets of estimates, which depend upon whether or not the selection correction was implemented. There is clear evidence of demand shifts in favour of the relatively more educated in almost all cases. Relative demand for graduates has increased *vis-a-vis* those without degrees. The biggest shifts are away from those with no qualifications, as the shifts against those with A levels are much more moderate. As hinted at earlier there are very marked gender differences, with demand for those with degrees relative to those without rising by about 6 percent per year for men and 9 percent per year for women.

That the most marked shifts in demand have been against those with no qualifications is very clear if one looks at separate comparisons between people with degrees or A levels and those with no qualifications. Both the degree/no qualifications and the A levels/no qualifications comparisons point to big shifts in wage and employment in favour of the more educated. Again these shifts are more marked for women than for men.

Other pairwise comparisons of education groups show interesting trends. In particular the demand for higher vocational qualifications has fallen or remained stable relative to A levels or middle vocational qualifications (the latter comparison of high vocational/middle vocational falls massively for women). But, at the same time, the high vocational group has faced big increases in demand *vis-a-vis* people with no qualifications. This is particularly marked for women.

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9 Supply is assumed to be inelastic in the short-run.

[10] The choice of $\sigma = 1.4$ is not critical. Estimates based on $\sigma = 1$ or 2 give similar results.

Overall, the story emerging seems to be that relative supply changes have influenced relative wage differentials but that relative demand has shifted too. In particular changes in the demand for highly educated workers seem to have grown faster than changes in relative supply and this explains the simultaneous rise in employment and relative wages for more highly educated workers.

Even more striking is the fact that there is an important gender component. Despite faster increases in the relative supply of more highly educated workers among women than men, the relative wages of educated women have grown even faster. This suggests that demand has shifted towards the more educated even faster for women than for men. Put alternatively, it seems that the skills possessed by female graduates are increasingly demanded by employers who are willing to pay them higher relative wages.

5.5 Changes in the Graduate Wage Premium For Labour Market Entrants

Because shifts in relative supply have taken place so rapidly in recent years it may be more appropriate to look at cohorts of workers who have recently entered the labour market after finishing their education. This section therefore looks only at workers who are three to ten years out of the education system at the time of the survey.

Table 5.7 reports changes in relative supply for these labour market entrants. A slightly different picture does emerge. In particular it suggests that supply changes have been faster for this group than for the whole population, and that there is some sign of faster increases in the supply of more educated workers in the 1990s. There is less evidence of marked gender differences here.

Despite this there is not much evidence of falling wage premiums for the more educated groups in the 1980s and 1990s. Table 5.8 reports coefficients on the education variables from standard wage equations which are comparable to those in Table 5.4 (coefficients from selection corrected earnings equations are given in Appendix Table A5.8[11]). Table 5.9 converts the estimated coefficients into within-decade changes and shows that there is scant evidence of falling wage premiums in periods of more rapidly increasing relative supply. This is true for both men and women.

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[11] Coefficients on the identifying variables from the probit models generating the selection term are in Appendix Table A9.

Indeed, when one computes the implied relative demand shifts for labour market entrants they are sizable and, due to the rapid expansion of supply at the same time as rising relative wages, show an increase in the 1990s. These are reported in Table 5.10. For more recent entrants to the labour market employers are clearly prepared to pay more despite there being a larger pool to choose from than in earlier years. It seems very likely that employers would link the higher qualifications of more recent entrants to skills that are more applicable in the modern workplace and that is why they demand still more of them despite their increased supply. This is entirely in line with recent work on changes in wage inequality which, in the face of rapid technological change and the changing demands of the modern employer, argues more recent cohorts have experienced more wage dispersion than their older counterparts (Gosling, Machin and Meghir, 1995).

5.6 Changes in the Graduate Wage Premium by Subject of Degree

Since 1980 the General Household Survey has collected information on the subject area of people's first degrees. Table 5.11 reports changes in the subject composition of degrees between 1980-2 and 1993-5, again looking at men and women separately. For both sexes, the share of degrees in the Arts falls (from 15 to 11 percent for men, from 38 to 25 percent for women). At the same time, the percentage of science/engineering graduates rises from 40 to 45 percent for men, and from 15 to 24 percent for women.

Table 5.12 converts these numbers into annualised supply changes, relative to the A levels group. The supply changes towards science/engineering graduates are quite marked. Again the effects are larger for women than for men, especially at the start of the 90s. In the light of such compositional changes, and given that the earnings of graduates have risen since the start of the 1980s, it is interesting to see if there are differences by subject of degree. Table 5.13 reports the characteristics corrected wage premiums derived from log earnings equations.[12] For men there is evidence of rising

[12] Sample size constraints mean that these are estimated from single wage equations in a given time period with four subject of degree dummies entered (relative to the base group of A levels only). Sample sizes for each regression and F-tests showing that the four dummies are significantly different from one another in all time

wage premiums relative to A levels throughout the 80s (except for the residual 'other ' group), but falls in the early 90s. For women arts and science graduates the wage differentials rise through the whole time period. Table 5.14 shows the magnitude of the changes in relative wage differentials, reporting annualised changes in log earnings premia. Like the earlier changes we also report changes in earnings differentials from models that correct for possible selection bias.[13]

These patterns of changes in wage differentials and relative supply translate into an implied relative demand shift very much in favour of engineering and science graduates. In particular the demand shifts, given in Table 5.15, are very large for female science and engineering graduates. There is also some evidence of important relative demand shifts in favour of female social science and business graduates. Clearly part of the rapidly improving labour market position of female graduates is related to subject of study.

5.7 Is There a Gender Bias to Skill-Biased Technological Change?

Many people believe the key factor behind relative demand shifts in favour of the skilled is skill-biased technological change (SBTC) (see Bound and Johnson, 1992, or Johnson, 1997, for more discussion). It is probably surprising therefore that there has not been much investigation into whether the effects of SBTC differ by gender. Given that the earlier sections show differential rates of skill upgrading in Britain for men and women it seems natural to ask if there is also a gender bias of SBTC that has influenced the skill structure of the labour market.

In Britain the lack of detailed industry data on wages and employment by education group and gender makes it hard to carry out the kinds of exercises at the disaggregate level that investigations of the role of SBTC have carried out using data on

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periods are given in Table A10 of the Appendix.

[13] The selectivity corrected earnings regressions are given in Table A11 of the Appendix.

all workers (e.g. US work by Berman, Bound and Griliches, 1994, UK work by Machin, 1996b, and international evidence in Berman, Bound and Machin, 1998 or Machin and Van Reenen, 1997). Nevertheless we can carry out some exercises at the broad 1-digit industry level by aggregating the GHS data used earlier.

We follow the literature on SBTC by presenting two pieces of evidence, one of which pertains to indirect evidence based on shift-share decompositions of industrial skill upgrading over time, the other of which looks at regression based correlations between skill upgrading and direct measures of technology. For the former we use the by now familiar decomposition (see Berman, Bound and Griliches, 1994) of changes in the skill composition of industry wages and/or employment into a component that reflects changes within industries and one that reflects changes between industries.[14] This decomposition breaks down the aggregate change in the

skilled proportion over a given time period, ΔP, for industries ($i= 1,2,.....N$) as:

$$\Delta P = \sum_i \Delta \Phi_i \overline{P_i} + \sum_i \Delta P_i \overline{\Phi_i}$$

where: $P_i = SK_i/L_i$ is the proportion (in wage bill or employment) of skilled workers in industry i and $\Phi_i = L_i/L$ is the share of total wage bill or employment in industry i. A bar over a variable denotes a time mean. The first term on the right hand side of the equation is the change in the aggregate proportion of skilled workers attributable to shifts *between* industries with different proportions of skilled workers. The final term in the expression is the change in the aggregate proportion of skilled workers attributable to changes in the proportion of skilled workers *within* industries.

[14] For decompositions of this sort based on international data see Berman, Bound and Machin (1998).

Table 5.16 reports the results of this decomposition for changes in graduate wage bill shares[15] for 9 GHS industries in the 70s, 80s and 90s. The results show almost all the relative demand shifts in favour of graduates to have happened within, rather than between, industries. This is not at all surprising given the coarse industry definition forced upon us by the nature of the data. However, what we are more interested in here is whether rates of male and female skill upgrading are concentrated in the same industries or not. The correlation coefficients given in the final column of the Table strongly support that they are. This is drawn out more fully in Figure 5.1 which presents scatterplots of male and female within-industry components of skill upgrading. The Figure shows that there are some differences - most notably the big increases in graduate wage bill shares for women in public services - but mostly the patterns by gender are similar. This is true for all three time periods considered.

Turning next to more direct tests of whether there exists a gender bias in SBTC effects on skill upgrading we have assembled data for our GHS industries on the proportion of men and women in each industry who use computers at work. This data comes from the British Social Attitudes Survey (BSAS) in the mid 1980s and is aggregated up to industry level from the individual level BSAS data. For the nine industries we look at there is a positive correlation of industry computer use by gender with the correlation coefficient of male and female computer usage being .57 (p-value = .10).

We look at the correlation between skill upgrading and industry computer usage in Table 5.17. The Table reports regressions of changes in the graduate wage bill share for three time periods (1974-80, 1980-90 and 1990-94) on computer usage, industry employment growth and period dummies to see if one can uncover any evidence of a complementarity between skill upgrading and computer usage (these kinds of regressions are reported for US industries in Autor, Katz and Krueger, 1997, and for UK

[15] Recall from the discussion above that, for an elasticity of substitution near unity, the graduate wage bill share measures the relative demand shift between graduates and non-graduates.

and US industries in Machin and Van Reenen, 1998). Irrespective of whether one conditions on industry employment growth the estimated coefficient on the computer usage variable is positive and significant in all the regressions. Industries with more workers using computers have experienced faster skill upgrading. More importantly for our focus the magnitude of the complementarity between skill upgrading and computer usage is rather similar for men and women, suggesting that SBTC effects associated with new computer technologies have had similar effects on male and female graduate wage bill shares. Interestingly, the coefficients on the year dummies (which can be thought of as measuring the rate of skill upgrading after netting out computer usage and, in the more detailed specifications, industry employment growth) are larger for women than for men, suggesting faster skill upgrading for women in the 80s and 90s.

5.8 Concluding Remarks

There have been important shifts in the distribution of educational qualifications in Britain since the 1970s. There are now many more individuals who possess some kind of formal educational qualification and there has been a large increase in the share of the population who have a degree. The observed changes that we have documented in this report point to sizable increases in the relative supply of more educated labour since the 70s. There is an important time dimension to this with the 70s seeing faster increases in relative supply than the 80s and 90s.

Patterns of change in education based wage differentials are, at first glance, in line with the observed supply shifts. Wage differentials for the more educated fell in the 1970s, but then showed sharp rises in the 1980s and, in some cases, the 1990s. These overall labour market trends suggest that education based wage differentials are doing more than merely responding to shifts in relative supply. Indeed, the fact that the 1980s and 1990s saw simultaneously rising wages and employment for the more educated suggests that relative demand rose faster than relative supply as employers both demanded more educated workers and, at the same time, were prepared to pay them relatively higher wages.

Changes in relative wages by education show very clearly that changes in demand have dominated over changes in supply, particularly when one considers differences by gender. It is well known that the male/female wage differential has fallen in recent years, despite increases in female labour force participation (Harkness, 1996). In this chapter we shed more light on what may be behind this by showing that, while relative demand shifts in favour of the more highly educated have occurred for both sexes, they are more marked for women than for men (with the exception of recent labour market entrants where gender differences are less marked). In particular, there seem to have been very big demand shifts in favour of female graduates with degrees in science and engineering (and, to a lesser extent, in social studies and business).

Finally, when we investigate whether one can identify a gender bias associated with skill biased technological change we find little evidence of such an effect. Faster skill upgrading appears to have occurred in much the same industries for men and women and correlations of industrial skill upgrading with computer usage seem to be similar across the sexes. This probably suggests that the gender earnings gap has been closing as a result of reduced discrimination, which has enabled women to improve their labour market position in terms of both wages and employment, and has lead to faster relative demand shifts for women than for men. We have only scratched the surface on this important question and clearly the extent to which faster relative demand shifts do reflect reduced discrimination rather than a gender bias in SBTC is worthy of more investigation in future. So is the possible substitution of men and women across the skills hierarchy. The comparisons we draw here look at men and women separately. A potentially important aspect of recent changes in labour market structure may be the extent to which more skilled women are substituting for less skilled men (given that according to estimates of wage equations women are still, *ceteris paribus*, cheaper to employ than men within a given skill group).

Table 5.1: Percent of Employed in Specific Education Groups (General Household Survey)

	1974-6	1979-81	1984-6	1989-91	1993-95	Percent Change [(1993/5 - 1974-6) / 1974-6] X 100
Men						
Degree	5.77 (1351)	8.16 (1799)	11.39 (1872)	12.48 (2051)	15.31 (2109)	165.34
Higher vocational	4.68 (1096)	6.78 (1494)	10.46 (1591)	11.39 (1872)	11.88 (1636)	153.85
Teaching	.97 (228)	.99 (219)	1.05 (159)	.95 (156)	.94 (129)	-3.09
Nursing	.20 (48)	.30 (66)	.32 (49)	.24 (39)	.43 (59)	115.00
2+ A Levels	2.36 (553)	3.34 (737)	3.24 (493)	3.79 (622)	4.10 (565)	73.73
1 A Level	.78 (182)		1.67 (254)	1.62 (266)	1.92 (265)	146.15
Voc Middle	4.44 (1039)	5.95 (1310)	8.07 (1227)	8.87 (1457)	9.92 (1366)	123.42
Some quals.	30.61 (7170)	31.93 (7035)	27.73 (4218)	33.62 (5524)	33.86 (4663)	10.62
No quals	50.18 (11753)	42.55 (9375)	35.36 (5379)	27.06 (4446)	21.64 (2981)	-56.88
Sample Size	23420	22035	15213	16433	13773	
Women						
Degree	2.21 (343)	3.57 (566)	6.20 (777)	7.53 (1038)	10.12 (1275)	357.92
Higher vocational	.73 (113)	1.34 (212)	2.01 (252)	2.91 (401)	3.82 (481)	423.29
Teaching	3.14 (487)	3.25 (514)	3.85 (482)	3.15 (434)	2.60 (328)	-17.20
Nursing	2.63 (408)	3.52 (557)	4.58 (573)	4.73 (652)	5.15 (649)	95.82
2+ Alevels	2.06 (320)	3.51 (555)	3.44 (431)	4.09 (564)	4.50 (567)	118.45
1 Alevel	.90 (140)		2.12 (266)	2.17 (299)	2.81 (354)	212.22
Voc Middle	.40 (62)	.97 (154)	1.90 (238)	3.02 (416)	3.88 (489)	870
Some quals.	29.68 (4609)	35.09 (5557)	39.08 (4894)	42.79 (5900)	43.41 (5468)	46.26
No quals.	58.25 (9045)	48.76 (7723)	36.81 (4610)	29.61 (4083)	23.69 (2984)	-59.33
Sample Size	15527	15838	12523	13787	12595	

Table 5.2: Shifts in Relative Supply in the 1970s, 1980s and 1990s

	Changes in Relative Supply (100*Log Annual Changes)			
Comparison	1975-80	1980-90	1990-94	1975-94
Men				
Degree/Non-Degree	7.462	4.726	5.934	5.700
Degree/A Levels	5.673	-.553	2.386	1.704
Degree/No Qualifications	10.249	8.771	10.691	9.564
A Levels/No Qualifications	4.576	9.324	8.305	7.860
High Vocational/A Levels	6.141	.392	-1.680	1.469
High Vocational/Middle Vocational	1.560	1.192	-1.757	.668
High Vocational/No Qualifications	10.717	9.716	6.625	9.329
Women				
Degree/Non-Degree	9.902	7.870	8.113	8.456
Degree/A Levels	6.262	1.650	3.515	3.257
Degree/No Qualifications	13.177	12.438	12.980	12.747
A Levels/No Qualifications	6.915	10.788	9.465	9.490
High Vocational/ A Levels	8.829	1.959	2.922	3.970
High Vocational/Middle Vocational	-5.612	-3.564	.506	-3.246
High Vocational/No Qualifications	15.744	12.747	12.387	13.460

Notes:
1. Calculated from Table I.

Table 5.3: Weekly Wage Ratios by Educational Qualifications, Full Timers

	1974-6	1979-81	1984-6	1989-91	1993-95
Men					
Degree/Non-Degree	1.717	1.574	1.621	1.68	1.66
Degree/A Levels	1.521	1.448	1.449	1.424	1.312
- Degree (no teachers) /As	1.552	1.47	1.478	1.474	1.335
- Degree (teachers) /As	1.403	1.351	1.259	1.2	1.207
Degree/No Qualifications	1.85	1.678	1.784	1.94	1.973
A Levels/No Qualifications	1.216	1.159	1.231	1.362	1.504
High Vocational/A Levels	1.26	1.182	1.172	1.099	0.998
High Vocational/Middle Vocational	1.295	1.181	1.243	1.219	1.259
High Vocational/No Qualifications	1.532	1.366	1.442	1.497	1.5
Teachers (no degree) / Alevels	1.13	1.174	1.121	1.105	1.063
Nurses /A Levels	0.825	0.995	0.961	0.911	0.823
Women					
Degree/Non-Degree	1.87	1.716	1.646	1.72	1.701
Degree/A Levels	1.424	1.516	1.492	1.471	1.465
- Degree (no teachers) /As	1.327	1.46	1.484	1.459	1.452
- Degree (teachers) /As	1.536	1.564	1.513	1.49	1.493
Degree/No Qualifications	2.049	1.883	1.879	2.12	2.134
A Levels/No Qualifications	1.438	1.242	1.259	1.442	1.456
High Vocational/ A Levels	1.251	1.219	1.266	1.18	1.096
High Vocational/Middle Vocational	1.644	1.387	1.371	1.417	1.371
High Vocational/No Qualifications	1.799	1.515	1.594	1.701	1.596
Teachers (no degree) /A Levels	1.259	1.464	1.485	1.408	1.443
Nurses /A Levels	1.015	1.202	1.201	1.219	1.194

Table 5.4:
GHS Wage Equations (Including age, age^2, region, industry and teacher dummy), Full Timers

	1974-6	1979-81	1984-6	1989-91	1993-95
Men					
Degree/Non-Degree	.416 (.012)	.359 (.024)	.386 (.012)	.416 (.012)	.435 (.014)
Degree/A Levels	.179 (.026)	.142 (.019)	.188 (.021)	.229 (.021)	.204 (.024)
Degree/No Qualifications	.551 (.012)	.496 (.011)	.575 (.012)	.661 (.068)	.685 (.017)
A Levels/No Qualifications	.231 (.015)	.224 (.014)	.309 (.017)	.399 (.019)	.452 (.023)
High Vocational/A Levels	.077 (.023)	.055 (.019)	.077 (.020)	.038 (.019)	-.029 (.025)
High Vocational/Middle Vocational	.142 (.016)	.098 (.052)	.130 (.015)	.135 (.015)	.162 (.019)
High Vocational/No Qualifications	.393 (.011)	.313 (.010)	.389 (.012)	.422 (.013)	.418 (.016)
Women					
Degree/Non-Degree	.363 (.027)	.296 (.020)	.349 (.019)	.393 (.018)	.414 (.019)
Degree/A Levels	.153 (.047)	.205 (.029)	.266 (.026)	.260 (.024)	.263 (.030)
Degree/No Qualifications	.607 (.032)	.603 (.027)	.662 (.023)	.793 (.022)	.778 (.029)
A Levels/No Qualifications	.331 (.024)	.301 (.020)	.363 (.023)	.479 (.022)	.453 (.029)
High Vocational/ A Levels	.130 (.065)	.089 (.031)	.138 (.034)	.133 (.028)	.071 (.031)
High Vocational/Middle Vocational	.402 (.074)	.176 (.039)	.154 (.049)	.218 (.033)	.214 (.038)
High Vocational/No Qualifications	.575 (.044)	.468 (.030)	.534 (.032)	.622 (.027)	.556 (.031)

Notes:
1. Each cell contains a coefficient estimate from a dummy variable included in a semi-log earnings equation.
2. Standard errors in parentheses.
3. Sample sizes and R^2's for each regression are given in Table A1 of the Appendix.

Table 5.5: Shifts in Full Timers Relative Wages in the 1970s, 1980s and 1990s (from wage equations including age, age^2, region, industry)

	Changes in Relative Wage (100*Log Annual Changes)			
Comparison	1975-80	1980-90	1990-94	1975-94
Men				
Degree/Non-Degree, no selection	-1.14	0.57	0.48	0.10
Degree/Non-Degree, with selection	-1.12	0.61	0.72	0.18
Degree/A Levels, no selection	-0.74	0.87	-0.63	0.13
Degree/A Levels, with selection	-0.60	0.72	0.32	0.29
Degree/No Qualifications, no selection	-1.1	1.65	0.60	0.71
Degree/No Qualifications, with selection	-1.06	1.89	0.98	0.91
A Levels/No Qualifications, no selection	-1.4	1.75	1.33	1.16
A Levels/No Qualifications, with selection	-0.46	1.93	1.10	1.13
High Vocational/A Levels, no selection	-0.44	-0.17	-1.68	-0.56
High Vocational/A Levels, with selection	-0.20	-0.07	-0.95	-0.29
High Vocational/Middle Vocational, no selection	-0.88	0.37	0.68	0.11
High Vocational/Middle Vocational, with selection	-0.86	0.03	0.80	0.16
High Vocational/No Qualifications, no selection	-1.60	1.09	-0.10	0.13
High Vocational/No Qualifications, with selection	-1.58	1.25	0.23	0.29
Women				
Degree/Non-Degree, no selection	-1.34	0.97	0.53	0.27
Degree/Non-Degree, with selection	-0.20	1.36	2.05	1.20
Degree/ A Levels, no selection	1.04	0.55	0.08	0.58
Degree/ A Levels, with selection	2.80	0.51	1.43	1.31
Degree/No Qualifications, no selection	-0.08	1.9	-0.38	0.90
Degree/No Qualifications, with selection	0.64	2.33	2.10	1.84
A Levels/No Qualifications, no selection	-0.6	1.78	-0.65	0.64
A Levels/No Qualifications, with selection	-1.46	2.52	-0.90	0.75
High Vocational/ A Levels, no selection	-0.82	0.44	-1.55	-0.31
High Vocational/ A Levels, with selection	0.56	0.19	0.13	0.27
High Vocational/Middle Vocational, no selection	-4.52	0.42	-0.10	-0.99
High Vocational/Middle Vocational, with selection	-7.64	0.22	1.38	-1.29
High Vocational/No Qualifications, no selection	-2.14	1.36	-1.65	-0.10
High Vocational/No Qualifications, with selection	0.60	1.76	-0.10	-1.06

Notes:
1. Calculated from Table IV (no selection) and Table A6 in the Appendix (with selection).

Table 5.6:
Implied Relative Demand Shifts ($\sigma = 1.4$)

	1975-80	1980-90	1990-94	1975-94
Men				
Degree/non degree, no selection	5.87	5.52	6.61	5.84
Degree/non degree, with selection	5.89	5.58	6.94	5.95
Degree/As, no selection	4.64	0.67	1.50	1.89
Degree/As, with selection	4.83	0.46	2.83	2.11
Degree/no qualifications, no selection	8.71	11.08	11.53	10.56
Degree/no qualifications, with selection	8.76	11.42	12.06	10.84
A level/no qualifications, no selection	2.62	11.77	10.17	9.48
A level/no qualifications, with selection	3.93	12.03	9.85	9.44
High vocational / A levels, no selection	5.53	0.24	-4.03	0.69
High vocational / A levels, with selection	5.86	0.29	-3.01	1.06
High Vocational / mid vocational, no selection	0.33	1.71	-0.81	0.82
High Vocational / mid vocational, with selection	0.36	1.23	-0.64	0.89
High vocational/no qualifications, no selection	8.48	11.24	6.49	9.51
High vocational/no qualifications, with selection	8.51	11.47	6.95	9.74
Women				
Degree/non degree, no selection	8.03	9.23	8.86	8.83
Degree/non degree, with selection	9.62	9.77	10.98	10.14
Degree/As, no selection	7.72	2.42	3.63	4.07
Degree/As, with selection	10.18	2.36	5.52	5.09
Degree/no qualifications, no selection	13.07	15.10	12.45	14.01
Degree/no qualifications, with selection	14.07	15.70	15.92	15.32
A level/no qualifications, no selection	6.83	13.28	8.56	10.39
A level/no qualifications, with selection	4.87	14.32	8.21	10.54
High vocational / A levels, no selection	7.35	2.58	0.75	3.54
High vocational / A levels, with selection	9.61	2.23	3.10	4.35
High Vocational / mid vocational, no selection	-11.94	-2.98	0.35	-4.63
High Vocational / mid vocational, with selection	-16.31	-3.26	2.44	-5.05
High vocational/no qualifications, no selection	12.75	14.65	10.08	13.32
High vocational/no qualifications, with selection	16.58	15.21	12.25	11.98

Notes:
1. Calculated from the changes in relative supply and relative wages in Tables II and V using the formula given in equation (2) in the main text.

Table 5.7: Shifts in Relative Supply of Labour Market Entrants in the 1970s, 1980s and 1990s (Entrants defined as 3-10 years after leaving FT education)

	Changes in Relative Supply (100*Log Annual Changes)			
Comparison	1975-80	1980-90	1990-94	1975-94
Men				
Degree/Non-Degree	6.018	2.042	10.384	4.845
Degree/A Levels	5.162	-1.204	3.651	1.493
Degree/No Qualifications	15.142	7.517	19.883	12.127
A Levels/No Qualifications	9.980	8.721	16.232	10.634
High Vocational/A Levels	7.514	-0.283	-5.191	0.736
High Vocational/Middle Vocational	3.784	2.566	-4.091	1.486
High Vocational/No Qualifications	17.494	8.438	11.041	11.369
Women				
Degree/Non-Degree	6.778	3.930	8.614	5.665
Degree/A Levels	3.761	0.810	1.958	1.828
Degree/No Qualifications	15.394	9.745	16.521	12.658
A Levels/No Qualifications	11.632	8.935	14.563	10.830
High Vocational/ A Levels	5.113	0.631	-2.886	1.101
High Vocational/Middle Vocational	3.840	0.053	-1.118	0.803
High Vocational/No Qualifications	16.846	9.566	11.697	11.931

Table 5.8:
GHS Wage Equations (Including age, age^2, region, industry and teacher dummy), Full Time Labour Market Entrants

	1974-6	1979-81	1984-6	1989-91	1993-95
Men					
Degree/Non-Degree	.182 (.021)	.151 (.018)	.163 (.021)	.228 (.029)	.295 (.025)
Degree/A Levels	.133 (.020)	.116 (.031)	.108 (.033)	.210 (.038)	.171 (.040)
Degree/No Qualifications	.267 (.031)	.248 (.029)	.284 (.036)	.495 (.043)	.492 (.053)
A Levels/No Qualifications	.080 (.026)	.078 (.026)	.156 (.036)	.195 (.041)	.277 (.053)
High Vocational/A Levels	.060 (.031)	.101 (.027)	.062 (.032)	.054 (.034)	-.022 (.042)
High Vocational/Middle Vocational	.049 (.026)	.045 (.021)	.063 (.025)	.027 (.030)	.123 (.040)
High Vocational/No Qualifications	.143 (.025)	.163 (.021)	2251 (.028)	.296 (.032)	.295 (.050)
Women					
Degree/Non-Degree	.248 (.034)	.251 (.024)	.241 (.024)	.296 (.025)	.301 (.026)
Degree/A Levels	.055 (.055)	.257 (.036)	.155 (.035)	.221 (.038)	.250 (.040)
Degree/No Qualifications	.483 (.052)	.523 (.039)	.530 (.046)	.650 (.056)	.607 (.082)
A Levels/No Qualifications	.312 (.033)	.210 (.024)	.300 (.036)	.318 (.038)	.334 (.053)
High Vocational/ A Levels	.011 (.069)	.079 (.037)	.068 (.044)	.075 (.039)	.007 (.036)
High Vocational/Middle Vocational	.236 (.090)	.114 (.055)	.075 (.069)	.164 (.045)	.235 (.057)
High Vocational/No Qualifications	.369 (.066)	.320 (.039)	.377 (.054)	.438 (.053)	.366 (.064)

Notes:
1. Each cell contains a coefficient estimate from a dummy variable included in a semi-log earnings equation.
2. Standard errors in parentheses.

Table 5.9: Shifts in Full Time Labour Market Entrants Relative Wages in the 1970s, 1980s and 1990s (from wage equations including age, age^2, region, industry)

	Changes in Relative Wage (100*Log Annual Changes)			
Comparison	1975-80	1980-90	1990-94	1975-94
Men				
Degree/Non-Degree, no selection	-0.62	0.77	1.68	0.59
Degree/Non-Degree, with selection	-0.62	0.94	1.10	0.56
Degree/A Levels, no selection	-0.34	0.94	-0.98	0.20
Degree/A Levels, with selection	-0.64	1.20	-1.63	0.12
Degree/No Qualifications, no selection	-0.32	2.47	-0.08	1.18
Degree/No Qualifications, with selection	-0.32	3.32	-1.43	1.36
A Levels/No Qualifications, no selection	-0.04	1.17	2.05	1.04
A Levels/No Qualifications, with selection	0.48	0.87	3.38	1.29
High Vocational/A Levels, no selection	0.82	-0.47	-1.90	-0.43
High Vocational/A Levels, with selection	-0.24	0.46	-2.20	-0.28
High Vocational/Middle Vocational, no selection	-0.08	-0.18	2.40	0.39
High Vocational/Middle Vocational, with selection	0.00	-0.16	2.25	0.39
High Vocational/No Qualifications, no selection	0.40	1.33	-0.03	0.80
High Vocational/No Qualifications, with selection	0.28	1.70	0.78	1.14
Women				
Degree/Non-Degree, no selection	0.06	0.45	0.13	0.28
Degree/Non-Degree, with selection	-1.40	0.52	-0.48	0.19
Degree/ A Levels, no selection	4.04	-0.36	0.73	0.03
Degree/ A Levels, with selection	3.98	-0.30	0.50	0.99
Degree/No Qualifications, no selection	0.80	1.27	-1.08	0.65
Degree/No Qualifications, with selection	-1.14	1.91	-0.25	0.65
A Levels/No Qualifications, no selection	-2.04	1.08	0.40	0.12
A Levels/No Qualifications, with selection	-5.92	1.67	2.98	-0.05
High Vocational/ A Levels, no selection	0.14	-0.04	-1.70	-0.02
High Vocational/ A Levels, with selection	1.28	-0.10	-1.63	-0.06
High Vocational/Middle Vocational, no selection	-2.44	0.50	1.78	-0.01
High Vocational/Middle Vocational, with selection	-2.46	0.61	-1.25	-0.59
High Vocational/No Qualifications, no selection	-0.98	1.18	-1.80	-0.02
High Vocational/No Qualifications, with selection	3.56	1.80	-2.10	1.44

Notes:
1. Calculated from Table VIII (no selection) and Table A8 in the Appendix (with selection).

Table 5.10:
Implied Relative Demand Shifts ($\sigma = 1.4$) - Labour Market Entrants

	1975-80	1980 -90	1990 -94	1975 -94
Men				
Degree/Non-Degree, no selection	5.150	3.120	12.736	5.671
Degree/Non-Degree, with selection	5.150	3.358	11.924	5.629
Degree/A Levels, no selection	4.686	0.112	2.279	1.773
Degree/A Levels, with selection	4.266	0.476	1.369	1.661
Degree/No Qualifications, no selection	14.610	10.975	19.771	13.779
Degree/No Qualifications, with selection	14.964	12.165	17.881	14.031
A Levels/No Qualifications, no selection	9.924	10.359	19.102	12.090
A Levels/No Qualifications, with selection	10.652	9.939	20.694	12.440
High Vocational/A Levels, no selection	8.662	-0.941	-7.851	0.134
High Vocational/A Levels, with selection	7.178	0.361	-8.271	0.344
High Vocational/Middle Vocational, no selection	3.672	2.314	-0.791	2.032
High Vocational/Middle Vocational, with selection	3.784	2.342	-0.941	2.032
High Vocational/No Qualifications, no selection	18.054	10.300	10.999	12.489
High Vocational/No Qualifications, with selection	17.886	10.818	12.133	12.965
Women				
Degree/Non-Degree, no selection	6.862	5.134	8.796	6.056
Degree/Non-Degree, with selection	4.818	4.658	7.942	5.931
Degree/ A Levels, no selection	9.417	0.306	2.980	3.270
Degree/ A Levels, with selection	9.333	0.390	2.658	3.214
Degree/No Qualifications, no selection	17.054	11.523	15.009	13.568
Degree/No Qualifications, with selection	13.798	12.419	16.171	13.568
A Levels/No Qualifications, no selection	8.776	10.447	15.009	10.995
A Levels/No Qualifications, with selection	3.344	11.273	18.735	10.760
High Vocational/ A Levels, no selection	5.309	0.575	-5.266	1.073
High Vocational/ A Levels, with selection	6.905	0.491	-5.168	1.017
High Vocational/Middle Vocational, no selection	0.424	0.753	1.374	0.789
High Vocational/Middle Vocational, with selection	0.396	0.907	-2.868	-0.023
High Vocational/No Qualifications, no selection	15.474	11.218	9.177	11.903
High Vocational/No Qualifications, with selection	21.830	12.086	8.757	13.947

Notes:
1. Calculated from the changes in relative supply and relative wages in Tables VII and IX using the formula given in equation (2) in the main text.

Table 5.11:
Percent of the Employed With Degrees by Degree Type

	1980-82	1984-86	1989-91	1993-95
Men				
Arts	14.74 (265)	12.79 (233)	12.74 (258)	11.54 (237)
Science/ Engineering	40.60 (730)	41.55 (757)	45.38 (919)	47.27 (971)
Social Science & Business	26.42 (475)	26.89 (490)	28.15 (570)	26.63 (547)
Other	18.24 (328)	18.77 (342)	13.73 (278)	14.56 (299)
Sample size	1798	1822	2025	2054
Women				
Arts	38.24 (239)	34.75 (266)	30.49 (311)	24.80 (310)
Science/ Engineering	14.56 (91)	15.69 (120)	19.12 (195)	24.08 (301)
Social Science & Business	21.92 (137)	23.01 (176)	27.25 (278)	25.20 (315)
Other	25.28 (158)	26.54 (203)	23.14 (236)	25.92 (324)
Sample size	625	765	1020	1250

Table 5.12:
Log Supply Changes (Relative to As) *100

	1981-90	1990-94	1981-94
Men			
Arts	-2.547	-.434	-1.943
Science/ Engineering	.023	3.065	.892
Social Science & Business	-.456	.659	-.138
Other	-3.933	3.509	-1.807
Women			
Arts	-1.514	-1.707	-1.569
Science/ Engineering	3.474	9.227	5.117
Social Science & Business	2.929	1.498	2.520
Other	-.135	6.297	1.702

Notes:
1. Calculated from Table XI.

Table 5.13:
Wage Equations With Degree Type Dummies Relative to A levels (Including age, age^2, region, industry and teacher dummy), Full Timers

	1980-82	1984-6	1989-91	1993-95
Men				
Arts	-.021 (.032)	.043 (.035)	.019 (.036)	.049 (.045)
Science/ Engineering	.120 (.023)	.176 (.024)	.243 (.023)	.177 (.027)
Social Science & Business	.166 (.026)	.197 (.026)	.248 (.026)	.221 (.031)
Other	.223 (.031)	.252 (.031)	.263 (.035)	.165 (.040)
Women				
Arts	.109 (.037)	.192 (.036)	.193 (.034)	.267 (.049)
Science/ Engineering	.243 (.048)	.314 (.043)	.319 (.034)	.366 (.042)
Social Science & Business	.223 (.041)	.220 (.037)	.263 (.030)	.203 (.039)
Other	.278 (.041)	.343 (.037)	.234 (.036)	.202 (.044)

Notes:
1. Each cell contains a coefficient estimate from a dummy variable included in a semi-log earnings equation. Sample size constraints mean only one regression containing four subject of degree dummy variables is estimated for each time period.
2. Standard errors in parentheses.
3. Sample sizes, R^2's and an F-test testing the equality of the coefficients on subject of degree in each time period are given in Table A10 of the Appendix.

Table 5.14:
Shifts in Full Timers Relative Wages by Degree Type (Relative to As) * 100

	1981-90	1990-94	1981-94
Men, no Selection			
Arts	0.444	0.750	0.500
Science/ Engineering	1.366	-1.650	0.407
Social Science & Business	0.911	-0.675	0.393
Other	-0.833	-2.450	-0.414
Men, with Selection			
Arts	0.044	2.350	0.738
Science/Engineering	1.422	-0.200	0.846
Social Science & Business	0.678	0.100	0.500
Other	0.056	-1.100	-0.300
Women, no Selection			
Arts	0.933	1.850	1.129
Science/ Engineering	0.844	1.175	0.879
Social Science & Business	0.444	-1.500	-0.143
Other	-0.377	-0.800	-0.543
Women, with Selection			
Arts	0.089	2.300	0.769
Science/Engineering	0.278	2.825	1.062
Social Science & Business	0.400	-0.725	0.538
Other	-0.667	-0.650	-0.662

Notes:
1. Calculated from Table XIII and Appendix Table A11.

Table 5.15:
Implied Relative Demand Shifts (Relative to As) $\sigma = 1.4$

	1981-90	1990-94	1981-94
Men, no selection			
Arts	-1.925	0.616	-1.243
Science/ Engineering	1.935	0.755	1.462
Social Science & Business	0.819	-0.286	0.412
Other	-5.099	0.079	-2.387
Men, with selection			
Arts	-2.485	2.8560	-0.910
Science/ Engineering	2.014	2.785	2.706
Social Science & Business	0.493	0.799	0.562
Other	-3.855	1.969	-2.227
Women, no selection			
Arts	-0.208	0.883	0.012
Science/ Engineering	4.656	10.872	6.348
Social Science & Business	3.551	-0.602	2.320
Other	-0.663	5.177	0.942
Women, with selection			
Arts	-1.389	1.513	-0.492
Science/ Engineering	3.863	13.182	6.604
Social Science & Business	3.489	0.483	3.273
Other	-1.069	5.387	0.775

Notes:
1. Calculated from the changes in relative supply and relative wages in Tables XII and XIV using the formula given in equation (2) in the main text.

Table 5.16:
Within/Between Industry Decompositions of Gender-Specific Changes in the Graduate Wage Bill Share

	Men		Women		
	Annualised Change in Graduate Wage Bill Share (Percentage Points)	Percent Within	Annualised Change in Graduate Wage Bill Share (Percentage Points)	Percent Within	Male/Female Correlations of Within-Industry Component (Pearson correlation coefficient and p-value in parentheses)
1974-80	0.48	108	0.34	103	.94 (.00)
1980-90	0.76	93	0.69	110	.73 (.03)
1990-94	0.87	94	0.79	96	.88 (.00)

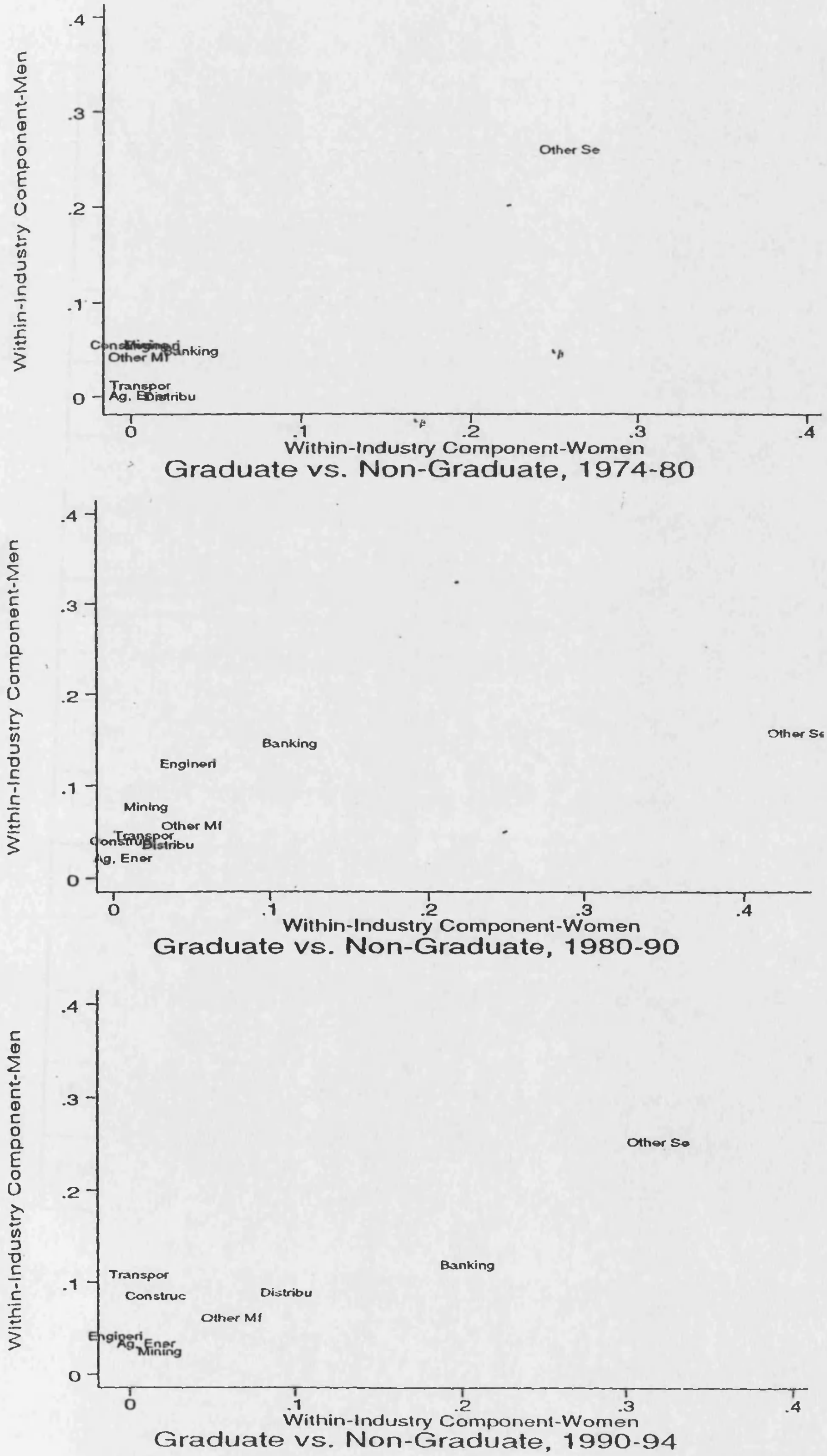
Notes:
1. Based on decomposition formula reported in equation (3) of main text.
2. Decomposition breaks down aggregate changes into components related to 9 GHS industries over time (industries are agriculture, energy & water, mining, engineering, other manufacturing, construction, distribution & hotels, transport & communication, banking & insurance, and other services).

Table 5.17:
Regressions of Gender-Specific Industry Skill Upgrading on Computer Usage

	Men		**Women**	
Computer Usage	.013 (.007)	.014 (008)	.010 (.005)	.010 (.006)
Change in Log(Employment)		.048 (.012)		-.000 (.014)
1980-90	.003 (.002)	.003 (.002)	.004 (.001)	.004 (.001)
1990-94	.002 (.002)	.002 (.002)	.004 (.001)	.004 (.001)
N	27	27	27	27

Notes:
1. The dependent variable is the annualised change in the graduate wage bill share (from the GHS) in 9 industries for three time periods (1974-80, 1980-90, 1990-94).
2. The computer data comes from the British Social Attitudes Survey and the is the fraction of men or women within the industry who use computers at work.
3. Estimation is by GLS/random effects where the industry errors are allowed to be correlated for industries over time.
4. Heteroskedastic consistent standard errors in parentheses.

Figure 5.1:
Male/Female Patterns of Within-Industry Skill Upgrading, 1974-80, 1980-90 and 1990-94



APPENDIX 5

Table A5.1:
R^2's and Sample Sizes (in Parentheses) for GHS Wage Equations (Table 5.4)

	1974-6	1979-81	1984-6	1989-91	1993-95
Men					
Degree/Non-Degree	.319 (19461)	.350 (17662)	.398 (11482)	.386 (12038)	.330 (9352)
Degree/A Levels	.470 (1674)	.152 (2015)	.441 (2008)	.397 (2257)	.350 (2054)
Degree/No Qualifications	.333 (10829)	.387 (8825)	.446 (5346)	.473 (4663)	.470 (3365)
A Levels/No Qualifications	.232 (10387)	.256 (8026)	.286 (4498)	.317 (3752)	.310 (2461)
High Vocational/A Levels	.429 (1561)	.384 (1850)	.350 (1862)	.340 (2139)	.272 (1763)
High Vocational/Middle Vocational	.346 (1859)	.295 (2348)	.343 (2245)	.313 (2579)	.272 (2171)
High Vocational/No Qualifications	.279 (10716)	.292 (8660)	.341 (5200)	.359 (4545)	.324 (3074)
Women					
Degree/Non-Degree	.269 (7756)	.284 (7780)	.320 (6021)	.346 (6656)	.292 (5436)
Degree/A Levels	.401 (541)	.486 (715)	.374 (958)	.461 (1187)	.327 (1163)
Degree/No Qualifications	.272 (4177)	.328 (3332)	.425 (2138)	.551 (2076)	.451 (1619)
A Levels/No Qualifications	.183 (4250)	.164 (3327)	.210 (2080)	.315 (1925)	.275 (1402)
High Vocational/ A Levels	.340 (374)	.366 (488)	.294 (620)	.400 (770)	.325 (751)
High Vocational/Middle Vocational	.515 (109)	.496 (240)	.423 (330)	.436 (545)	.353 (537)
High Vocational/No Qualifications	.171 (4010)	.177 (3105)	.247 (1800)	.334 (1659)	.288 (1207)

Table A5.2: GHS Wage Equations With Health Limits Activity Dummy Variable, Full Timers

	Coefficient (Standard Error) On Education Dummy Variable				Coefficient (Standard Error). on Health Limits Activity Dummy Variable			
	1979-81	1984-6	1989-91	1993-95	1979-81	1984-6	1989-91	1993-95
Men								
Degree/Non-Degree	.357 (.010)	.385 (.012)	.415 (.012)	.431 (.014)	-.079 (.008)	-.057 (.012)	-.097 (.012)	-.092 (.015)
Degree/A Levels	.142 (.019)	.188 (.021)	.230 (.021)	.201 (.024)	.001 (.027)	.015 (.030)	-.087 (.029)	-.097 (.037)
Degree/No Qualifications	.494 (.011)	.574 (.012)	.658 (.014)	.681 (.017)	-.069 (.010)	-.041 (.015)	-.113 (.017)	-.098 (.023)
A Levels/No Qualifications	.223 (.014)	.308 (.017)	.396 (.019)	.451 (.023)	-.071 (.010)	-.043 (.016)	-.102 (.019)	-.135 (.026)
High Vocational/A Levels	.055 (.019)	.077 (.020)	.038 (.019)	-.029 (.025)	-.030 (.029)	-.048 (.032)	-.095 (.029)	-.062 (.036)
High Vocational/Middle Vocational	.096 (.013)	.130 (.015)	.132 (.015)	.162 (.019)	-.079 (.021)	-.053 (.026)	-.115 (.024)	-.044 (.029)
High Vocational/No Qualifications	.310 (.010)	.387 (.012)	.419 (.013)	.416 (.016)	-.074 (.010)	-.053 (.014)	-.115 (.017)	-.091 (.022)
Women								
Degree/Non-Degree	.295 (.020)	.349 (.019)	.393 (.018)	.413 (.019)	-.045 (.012)	.002 (.017)	-.045 (.016)	-.031 (.018)
Degree/A Levels	.205 (.029)	.267 (.026)	.259 (.024)	.262 (.030)	-.048 (.042)	.063 (.043)	-.028 (.032)	-.027 (.048)
Degree/No Qualifications	.601 (.027)	.663 (.023)	.792 (.021)	.777 (.029)	-.046 (.017)	.038 (.024)	-.067 (.023)	-.027 (.035)
A Levels/No Qualifications	.301 (.020)	.365 (.023)	.480 (.022)	.454 (.029)	-.036 (.017)	.047 (.025)	-.070 (.024)	.014 (.033)
High Vocational/ A Levels	.089 (.031)	.137 (.034)	.131 (.028)	.072 (.031)	.019 (.047)	.026 (.051)	-.045 (.041)	.067 (.050)
High Vocational/Middle Vocational	.178 (.039)	.152 (.049)	.217 (.033)	.216 (.038)	-.051 (.060)	.034 (.074)	-.015 (.052)	.072 (.057)
High Vocational/No Qualifications	.468 (.030)	.534 (.032)	.621 (.027)	.556 (.031)	-.039 (.017)	.034 (.026)	-.088 (.026)	.013 (.034)

Notes:
1. Each cell contains a coefficient estimate from a dummy variable included in a semi-log earnings equation.
2. Standard errors in parentheses.
3. Each regression includes the same independent variables as in the specifications of Table 5.4.

Table A5.3: GHS Wage Equations With Nonwhite Dummy Variable, Full Timers

	Coefficient (Standard Error) On Education Dummy Variable					Coefficient (Standard Error) on Nonwhite Dummy Variable				
	1974-6	1979-81	1984-6	1989-91	1993-95	1974-6	1979-81	1984-6	1989-91	1993-95
Men										
Degree /Non-Degree	.416 (.012)	.358 (.010)	.387 (.012)	.418 (.012)	.441 (.014)	-.127 (.016)	-.114 (.014)	-.148 (.022)	-.164 (.023)	-.183 (.025)
Degree /A Levels	.175 (.026)	.140 (.020)	.194 (.021)	.231 (.021)	.205 (.024)	-.173 (.063)	-.114 (.045)	-.131 (.050)	-.112 (.050)	-.141 (.041)
Degree /No Qualifications	.552 (.013)	.494 (.011)	.575 (.013)	.662 (.014)	.685 (.017)	-.100 (.020)	-.097 (.017)	-.111 (.027)	-.148 (.032)	-.141 (.031)
A Levels /No Qualifications	.230 (.015)	.222 (.015)	.304 (.017)	.398 (.019)	.451 (.023)	-.102 (.020)	-.091 (.018)	-.120 (.029)	-.129 (.035)	-.207 (.039)
High Vocational /A Levels	.073 (.023)	.055 (.019)	.079 (.020)	.038 (.020)	-.039 (.025)	-.203 (.064)	-.122 (.048)	-.157 (.056)	-.123 (.050)	-.168 (.055)
High Vocational /Middle Vocational	.147 (.016)	.099 (.013)	.132 (.015)	.133 (.015)	.164 (.019)	-.207 (.060)	-.091 (.043)	-.144 (.049)	-.154 (.047)	-.136 (.057)
High Vocational /No Qualifications	.394 (.012)	.309 (.010)	.388 (.012)	.418 (.013)	.413 (.016)	-.105 (.019)	-.097 (.017)	-.119 (.028)	-.160 (.032)	-.184 (.036)
Women										
Degree /Non-Degree	.360 (.027)	.296 (.020)	.348 (.019)	.386 (.018)	.414 (.019)	-.025 (.024)	-.028 (.020)	-.105 (.028)	-.010 (.026)	-.041 (.025)
Degree /A Levels	.150 (.048)	.207 (.030)	.271 (.027)	.250 (.024)	.261 (.030)	-.064 (.126)	.098 (.072)	-.082 (.069)	.014 (.051)	-.085 (.057)
Degree /No Qualifications	.601 (.032)	.601 (.027)	.662 (.023)	.784 (.022)	.777 (.029)	-.021 (.029)	-.045 (.028)	-.133 (.039)	-.097 (.039)	-.088 (.047)
A Levels /No Qualifications	.331 (.024)	.299 (.020)	.363 (.023)	.477 (.023)	.457 (.028)	-.017 (.030)	-.054 (.028)	-.099 (.042)	-.094 (.041)	-.153 (.045)
High Vocational / A Levels	.136 (.067)	.088 (.031)	.133 (.034)	.122 (.029)	.071 (.031)	-.052 (.167)	.051 (.078)	.139 (.128)	-.006 (.066)	-.146 (.059)
High Vocational /Middle Vocational	.412 (.075)	.170 (.039)	.148 (.049)	.206 (.033)	.213 (.038)	-.061 (.349)	-.183 (.111)	.102 (.124)	-.072 (.081)	-.036 (.066)
High Vocational /No Qualifications	.584 (.046)	.464 (.030)	.525 (.032)	.609 (.027)	.558 (.031)	-.014 (.030)	-.050 (.029)	-.113 (.044)	-.124 (.045)	-.130 (.048)

Notes:
1. Each cell contains a coefficient estimate from a dummy variable included in a semi-log earnings equation.
2. Standard errors in parentheses.
3. Each regression includes the same independent variables as in the specifications of Table 5.4.

Table A5.4: GHS Wage Equations - Controlling for Occupation

	1974-6	1979-81	1984-6	1989-91	1993-95
Men					
Degree/Non-Degree	.226 (.012)	.202 (.011)	.217 (.012)	.221 (.014)	.263 (.014)
Degree/A Levels	.111 (.026)	.084 (.021)	.106 (.021)	.130 (.023)	.104 (.024)
Degree/No Qualifications	.335 (.015)	.328 (.014)	.357 (.016)	.372 (.023)	.434 (.024)
A Levels/No Qualifications	.120 (.015)	.152 (.015)	.182 (.018)	.203 (.022)	.283 (.025)
High Vocational/A Levels	.056 (.023)	.039 (.019)	.076 (.020)	.064 (.021)	-.020 (.023)
High Vocational/Middle Vocational	.093 (.017)	.062 (.013)	.089 (.015)	.078 (.016)	.117 (.018)
High Vocational/No Qualifications	.251 (.012)	.213 (.011)	.248 (.013)	.269 (.015)	.274 (.017)
Women					
Degree/Non-Degree	.265 (.026)	.221 (.080)	.268 (.019)	.253 (.020)	.288 (.019)
Degree/A Levels	.059 (.047)	.088 (.031)	.215 (.027)	.174 (.025)	.183 (.031)
Degree/No Qualifications	.464 (.033)	.495 (.029)	.547 (.026)	.608 (.027)	.614 (.033)
A Levels/No Qualifications	.279 (.023)	.259 (.020)	.297 (.024)	.372 (.024)	.359 (.030)
High Vocational/ A Levels	.086 (.062)	.066 (.030)	.110 (.033)	.148 (.028)	.052 (.030)
High Vocational/Middle Vocational	.306 (.071)	.140 (.038)	.064 (.048)	.190 (.034)	.159 (.037)
High Vocational/No Qualifications	.486 (.043)	.413 (.030)	.438 (.032)	.513 (.030)	.438 (.033)

Notes:
1. Each cell contains a coefficient estimate from a dummy variable included in a semi-log earnings equation.
2. Standard errors in parentheses.
3. Each regression includes the same independent variables as in the specifications of Table 5.4.

Table A5,5: P-Values Testing Differences in Male /Female Education Based Earnings Differentials

	1974-6	1979-81	1984-6	1989-91	1993-95
Degree/Non-Degree	.067	.006	.108	.290	.393
Degree/A Levels	.627	.091	.025	.356	.127
Degree/No Qualifications	.092	.000	.001	.000	.005
A Levels/No Qualifications	.000	.002	.054	.007	.959
High Vocational/A Levels	.396	.404	.129	.008	.016
High Vocational/Middle Vocational	.000	.093	.601	.026	.227
High Vocational/No Qualifications	.000	.000	.000	.000	.000

Notes:
1. Based on the Table 5.4 specifications.

Table A5.6:
GHS Wage Equations and Mills Ratios with Sample Selection Correction, Full Timers

	Coefficient (Standard Error) On Education Dummy Variable					Coefficient (Standard Error) On Inverse Mills Ratio				
	1974-6	1979-81	1984-6	1989-91	1993-95	1974-6	1979-81	1974-6	1989-91	1993-95
Men										
Degree/Non-Degree	.415 (.012)	.359 (.010)	.389 (.012)	.420 (.014)	.449 (.015)	-.092 (.015)	-.004 (.015)	.056 (.014)	.111 (.014)	.114 (.021)
Degree/A Levels	.174 (.026)	.144 (.020)	.193 (.021)	.216 (.021)	.229 (.026)	-.200 (.052)	.083 (.044)	.038 (.044)	.263 (.042)	.269 (.060)
Degree/No Qualifications	.548 (.013)	.495 (.011)	.561 (.014)	.684 (.016)	.723 (.019)	-.097 (.017)	-.016 (.017)	-.005 (.019)	.092 (.020)	.127 (.030)
A Levels/No Qualifications	.247 (.015)	.224 (.015)	.296 (.019)	.417 (.019)	.461 (.024)	-.081 (.017)	-.065 (.018)	-.035 (.019)	.050 (.023)	.075 (.030)
High Vocational/A Levels	.053 (.025)	.043 (.021)	.089 (.020)	.036 (.020)	-.002 (.025)	-.159 (.056)	-.069 (.050)	.131 (.041)	.246 (.046)	.133 (.055)
High Vocational/Middle Vocational	.140 (.016)	.096 (.025)	.132 (.015)	.138 (.015)	.170 (.018)	-.142 (.052)	-.025 (.050)	.115 (.038)	.126 (.036)	.060 (.041)
High Vocational/No Qualifications	.385 (.012)	.306 (.010)	.384 (.013)	.431 (.013)	.440 (.016)	-.086 (.016)	-.052 (.018)	-.013 (.017)	.047 (.021)	.040 (.027)
Women										
Degree/Non-Degree	.253 (.038)	.263 (.027)	.367 (.020)	.399 (.020)	.481 (.026)	-.337 (.058)	-.298 (.073)	.032 (.023)	.084 (.029)	.180 (.058)
Degree/A Levels	.062 (.064)	.202 (.030)	.264 (.026)	.253 (.025)	.310 (.034)	-.238 (.106)	-.043 (.073)	-.029 (.045)	.200 (.051)	.209 (.101)
Degree/No Qualifications	.542 (.051)	.574 (.042)	.695 (.027)	.807 (.025)	.891 (.046)	-.119 (.072)	.081 (.091)	.065 (.027)	.065 (.028)	.202 (.067)
A Levels/No Qualifications	.352 (.029)	.279 (.040)	.396 (.028)	.531 (.027)	.495 (.046)	-.147 (.080)	-.070 (.099)	.062 (.030)	.107 (.036)	.125 (.076)
High Vocational/ A Levels	.050 (.083)	.078 (.037)	.144 (.034)	.097 (.072)	.102 (.036)	-.313 (.154)	-.047 (.094)	.049 (.058)	.186 (.072)	.161 (.146)
High Vocational/Middle Vocational	.561 (.055)	.179 (.037)	.157 (.049)	.201 (.033)	.256 (.047)	.096 (.080)	-.005 (.106)	.022 (.094)	-.045 (.067)	.154 (.187)
High Vocational/No Qualifications	.417 (.068)	.447 (.067)	.204 (.047)	.623 (.031)	.619 (.049)	-.032 (.110)	-.028 (.110)	.094 (.033)	.042 (.032)	.135 (.071)

Notes:
1. Each cell contains a coefficient estimate from a dummy variable included in a semi-log earnings equation with controls for selection. Non labour income and other member of household working were used as instruments in the selection equation for full-time employment (reported in Table A5.7).
2. Standard errors in parentheses.
3. Each regression includes the same independent variables as in the specifications of Table 5.4.

Table A5.7:
Probit Model - Coefficients on Non Labour Income and Other Person Working

	Coefficient (Standard Error) On Non-Labour Income (*100)					Coefficient (Standard Error) On Dummy Variable Indicat Other Person Working in Household				
	1974-6	1979-81	1984-6	1989-91	1993-95	1974-6	1979-81	1974-6	1989-91	1993
Men										
Degree/Non-Degree	-.303 (.006)	-.222 (.005)	-.236 (.007)	-.140 (.004)	-.151 (.005)	.618 (.022)	.612 (.021)	.887 (.031)	.621 (.028)	.674 (.027
Degree/A Levels	-.231 (.014)	-.191 (.013)	-.205 (.013)	-.115 (.008)	-.103 (.008)	.539 (.069)	.571 (.064)	.661 (.080)	.426 (.070)	.457 (.062
Degree/No Qualifications	-.033 (.009)	-.270 (.008)	-.271 (.010)	-.191 (.008)	-.015 (.008)	.662 (.029)	.720 (.030)	.977 (.042)	.783 (.044)	.700 (.043
A Levels/No Qualifications	-.337 (.009)	-.272 (.009)	-.251 (.011)	-.167 (.009)	-.017 (.010)	.723 (.030)	.774 (.031)	.992 (.045)	.822 (.048)	.783 (.049
High Vocational/A Levels	-.236 (.019)	-.213 (.016)	-.227 (.017)	-.115 (.010)	-.129 (.010)	.774 (.031)	.632 (.073)	.776 (.042)	.492 (.076)	.431 (.067
High Vocational/Middle Vocational	-.293 (.023)	-.226 (.017)	-.308 (.018)	-.186 (.012)	-.174 (.011)	.491 (.083)	.433 (.071)	.930 (.088)	.600 (.073)	.559 (.063
High Vocational/No Qualifications	-.347 (.009)	-.285 (.009)	-.289 (.011)	-.218 (.010)	-.206 (.010)	.698 (.030)	.750 (.030)	1.033 (.044)	.871 (.047)	.767 (.046
Women										
Degree/Non-Degree	-.064 (.020)	-.043 (.005)	-.065 (.006)	-.046 (.005)	-.034 (.004)	-.111 (.026)	.019 (.025)	.154 (.035)	-.036 (.035)	.034 (.032
Degree/A Levels	-.154 (.020)	-.104 (.017)	-.121 (.018)	-.077 (.012)	-.049 (.009)	.123 (.027)	-.008 (.097)	.308 (.109)	.769 (.099)	-.032 (.082
Degree/No Qualifications	-.064 (008)	-.044 (.007)	-.086 (.011)	-.090 (.010)	-.068 (.008)	-.036 (.034)	.062 (.034)	.276 (.053)	.141 (.060)	.246 (.058
A Levels/No Qualifications	-.059 (.008)	-.039 (.007)	-.072 (.011)	-.070 (.010)	-.055 (.009)	-.254 (.033)	.092 (.034)	.269 (.053)	.109 (.061)	.209 (.061
High Vocational/ A Levels	-.125 (.022)	-.102 (.020)	-.109 (.022)	-.066 (.016)	-.032 (.011)	.048 (.125)	.125 (.113)	.244 (.137)	.128 (.122)	-.11 (.10
High Vocational/Middle Vocational	-.054 (.008)	-.065 (.033)	-.106 (.036)	-.129 (.025)	-.040 (.016)	-.051 (.034)	-.437 (.213)	-.233 (.227)	.259 (.171)	.066 (.12
High Vocational/No Qualifications	-.141 (.053)	-.036 (.007)	-.071 (.012)	-.086 (.012)	-.066 (.011)	-.676 (.294)	.070 (.034)	.247 (.056)	.152 (.065)	.257 (.06

Notes:
1. Probit coefficients (standard errors in parentheses).
2. Each regression includes the same independent variables as in the wage equation specifications of Table 5.4.

Table A5.8:
GHS Wage Equations and Mills Ratios with Sample Selection Correction, Full Time Labour Market Entrants

	Coefficient (Standard Error) On Education Dummy Variable					Coefficient (Standard Error) On Inverse Mills Ratio				
	1974-6	1979-81	1984-6	1989-91	1993-95	1974-6	1979-81	1984-6	1989-91	1993-95
Men										
Degree/Non-Degree	.180 (.023)	.149 (.018)	.160 (.021)	.243 (.024)	.287 (.028)	-.321 (.058)	-.126 (.052)	-.055 (.038)	.180 (.064)	-.053 (.079)
Degree/A Levels	.144 (.042)	.112 (.033)	.106 (.033)	.232 (.042)	.167 (.042)	-.299 (.124)	-.209 (.109)	-.020 (.073)	.358 (.122)	-.050 (.168)
Degree/No Qualifications	.242 (.034)	.226 (.033)	.261 (.040)	.558 (.052)	.501 (.063)	-.236 (.074)	-.229 (.073)	-.065 (.055)	.164 (.075)	.032 (.117)
A Levels/No Qualifications	.060 (.030)	.084 (.029)	.153 (.040)	.171 (.052)	.306 (.066)	-.273 (.086)	-.216 (.082)	-.012 (.079)	-.074 (.106)	.179 (.232)
High Vocational/A Levels	.029 (.038)	.017 (.035)	.066 (.035)	.063 (.035)	-.025 (.043)	-.335 (.144)	-.231 (.101)	.242 (.097)	.093 (.125)	-.058 (.275)
High Vocational/Middle Vocational	.047 (.026)	.047 (.022)	.062 (.025)	.031 (.030)	.121 (.040)	.038 (.115)	.040 (.104)	-.034 (.084)	.047 (.099)	.121 (.040)
High Vocational/No Qualifications	.097 (.032)	.111 (.029)	.207 (.040)	.281 (.077)	.314 (.063)	-.238 (.080)	-.213 (.074)	-.044 (.072)	-.039 (.077)	.073 (.152)
Women										
Degree/Non-Degree	.323 (.068)	.253 (.025)	.224 (.029)	.305 (.030)	.286 (.032)	.199 (.152)	.032 (.150)	-.111 (.094)	.041 (.074)	-.981 (.119)
Degree/A Levels	.068 (.063)	.267 (.040)	.160 (.035)	.237 (.045)	.257 (.042)	.041 (.100)	-.099 (.129)	.087 (.098)	.387 (.118)	.199 (.127)
Degree/No Qualifications	.564 (.105)	.507 (.093)	.476 (.095)	.698 (.070)	.688 (.123)	.102 (.115)	-.034 (.182)	-.088 (.137)	.078 (.071)	.117 (.132)
A Levels/No Qualifications	.348 (.068)	.052 (.138)	.307 (.053)	.219 (.070)	.338 (.107)	.053 (.118)	-.341 (.286)	.010 (.063)	-.171 (.181)	-.050 (.192)
High Vocational/ A Levels	.017 (.068)	.081 (.044)	.046 (.067)	.071 (.040)	.006 (.035)	.100 (.126)	.015 (.144)	-.150 (.338)	.171 (.172)	-.002 (.213)
High Vocational/Middle Vocational	.235 (.074)	.112 (.084)	.054 (.079)	.173 (.045)	.123 (.232)	-.008 (.166)	.389 (.268)	-.160 (.323)	-.086 (.123)	-.578 (1.111)
High Vocational/No Qualifications	.068 (.063)	.246 (.102)	.385 (.058)	.426 (.067)	.342 (.147)	.041 (.100)	-.102 (.129)	.009 (.031)	-.023 (.088)	-.050 (.221)

Notes:
1. Each cell contains a coefficient estimate from a dummy variable included in a semi-log earnings equation with controls for selection. Non labour income and other member of household working were used as instruments in the selection equation for full-time employment (reported in Table A5.9).
2. Standard errors in parentheses.
3. Each regression includes the same independent variables as in the specifications of Table 5.8.

Table A5.9: Probit Model, Coefficients on Non Labour Income and Other Person Working: Labour Market Entrants

	Coefficient (Standard Error) On Non-Labour Income (*100)					Coefficient (Standard Error) On Dummy Variable Indicating Other Person Working in Household				
	1974-6	1979-81	1984-6	1989-91	1993-95	1974-6	1979-81	1974-6	1989-91	1993-95
Men										
Degree/ Non-Degree	-.154 (.013)	-.101 (.010)	-.087 (.011)	-.037 (.007)	-.048 (.009)	.285 (.057)	.295 (.049)	.562 (.066)	.338 (.062)	.384 (.060)
Degree/A Levels	-.150 (.026)	-.103 (.022)	-.174 (.025)	-.064 (.015)	-.056 (.014)	.132 (.145)	.338 (.118)	.519 (.142)	.256 (.131)	.145 (.117)
Degree/No Qualifications	-.163 (.018)	-.138 (.019)	-.089 (.017)	-.092 (.018)	-.070 (.017)	.353 (.085)	.462 (.086)	.626 (.113)	.378 (.119)	.531 (.123)
A Levels/No Qualifications	-.151 (.021)	-.107 (.018)	-.056 (.020)	-.043 (.016)	-.034 (.020)	.391 (.087)	.475 (.087)	.611 (.125)	.597 (.135)	.344 (.140)
High Vocational/A Levels	-.175 (.043)	-.092 (.024)	-.016 (.032)	-.051 (.017)	-.032 (.018)	.165 (.180)	.294 (.124)	.319 (.174)	.389 (.157)	.097 (.137)
High/Middle Vocational	-.233 (.049)	-.127 (.028)	-.184 (.034)	-.090 (.024)	-.052 (.020)	.099 (.187)	.142 (.127)	.376 (.181)	.323 (.149)	.316 (.131)
High Vocational/ No Qualifications	-.168 (.023)	-.144 (.021)	-.063 (.020)	-.074 (.021)	-.042 (.023)	.392 (.091)	.456 (.091)	.518 (.125)	.529 (.132)	.527 (.147)
Women										
Degree/Non-Degree	-.001 (.010)	.016 (.010)	.005 (.010)	-.020 (.008)	-.001 (.007)	-.156 (.041)	.015 (.039)	.259 (.054)	.345 (.062)	.285 (.057)
Degree/A Levels	-.131 (.034)	-.073 (.025)	-.061 (.029)	-.062 (.021)	-.063 (.016)	-.342 (.144)	.190 (.115)	.219 (.136)	.403 (.150)	.431 (.116)
Degree/No Qualifications	.054 (.021)	.507 (.093)	-.016 (.017)	-.093 (.025)	-.061 (.019)	-301 (.064)	-.034 (.182)	.332 (.113)	.622 (.153)	.559 (.132)
A Levels/No Qualifications	.047 (.020)	.033 (.020)	.044 (.031)	-.012 (.016)	-.023 (.025)	-.267 (.062)	.027 (.071)	.468 (.121)	.254 (.160)	.362 (.151)
High Vocational/ A Levels	-.115 (.042)	-.072 (.137)	-.003 (.041)	-.045 (.028)	-.031 (.020)	-.312 (.171)	.214 (.037)	.126 (.179)	.238 (.186)	.202 (.143)
High /Middle Vocational	-.159 (.098)	-.039 (.063)	-.019 (.061)	-.092 (.044)	-.002 (.023)	.117 (.353)	-.485 (.262)	-.349 (.264)	.723 (.232)	.112 (.161)
High Vocational/No Qualifications	.086 (.022)	.067 (.023)	-.140 (.040)	-.059 (.042)	-.020 (.027)	-.282 (.065)	-.068 (.078)	.377 (.144)	.770 (.196)	.385 (.176)

Notes:
1. Probit coefficients (standard errors in parentheses).
2. Each regression includes the same independent variables as in the wage equation specifications of Table 5.8.

Table A5.10:
R^2's, Sample Sizes and F-tests of Equality of Coefficient on Subject of Degree Dummies for Wage Equations with Subject Degree Dummies (in Table 5.13)

	1980-82	1984-6	1989-91	1993-95
Men	49.2 (1951), $F(3, 1928) = 17.36$ ($p=.00$)	44.8 (2008), $F(3, 1985) = 9.93$ ($p = .00$)	40.9 (2257), $F(3, 2234) = 16.49$ ($p = .00$)	34.9 (2054) $F(3,2031) = 4.58$ ($p = .00$)
Women	46.9 (742), $F(3, 720) = 6.24$, ($p = .00$)	38.4 (958), $F(3, 935) = 5.62$ ($p = .00$)	46.5 (1187), $F(3, 1164) = 3.40$ ($p = .02$)	33.4 (1163), $F(3, 1140) = 5.00$ ($p = .00$)

Table A5.11: Wage Equations With Degree Type Dummies Relative to A levels after Controlling for Selection, Full Timers

	1980-82	1984-6	1989-91	1993-95
Men				
Arts	-.033 (.032)	.018 (.034)	-.029 (.035)	.065 (.046)
Science/ Engineering	.105 (.025)	.176 (.024)	.223 (.024)	.215 (.029)
Social Science & Business	.165 (.027)	.199 (.024)	.226 (.026)	.230 (.033)
Other	.229 (.031)	.244 (.031)	.234 (.034)	.190 (.043)
Mills Ratio	-.140 (.049)	.084 (.040)	.261 (.041)	.269 (.060)
Probit Model Coefficients (Standard Errors) on:				
Non Labour Income*100	-.190 (.013)	-.211 (.013)	-.119 (.008)	-.103 (.008)
Other Worker	.413 (.077)	.675 (.080)	.450 (.070)	.465 (.062)
Women				
Arts	.190 (.039)	.211 (.033)	.198 (.032)	.290 (.049)
Science/ Engineering	.295 (.051)	.324 (.043)	.320 (.037)	.433 (.047)
Social Science & Business	.267 (.045)	.224 (.037)	.303 (.034)	.274 (.046)
Other	.329 (.045)	.354 (.037)	.269 (.037)	.243 (.049)
Mills Ratio	-.033 (.077)	-.018 (.044)	.186 (.044)	.186 (.097)
Probit Model Coefficients (Standard Errors) on:				
Non Labour Income	-.082 (.015)	-.121 (.018)	-.082 (.012)	-.051 (.009)
Other Worker	-.192 (.078)	.329 (.109)	.101 (.099)	-.024 (.082)

Notes:

1. Each cell contains a coefficient estimate from a dummy variable included in a semi-log earnings equation with controls for selection. Non labour income and other member of household working were used as instruments in the selection equation for full-time employment (probit coefficients and standard errors are given in the Table).
2. Standard errors in parentheses.
3. Each regression includes the same independent variables as in the specifications of Table 5.13.

CHAPTER SIX

EMPLOYMENT AND EARNINGS OF BRITISH WOMEN FROM 1974-98: A COHORT ANALYSIS

6.1 Introduction

In this chapter, the gender earnings gap is examined as a function of time, age and year of birth cohort. This is a shift away from traditional analyses of the gender pay gap, which have typically examined differences in average earnings. Here instead, by using a production function framework, changes in the earnings of women relative to men are analysed as a function of time, age and year of birth cohort. This is potentially important because different birth cohorts may share experiences that lead to a permanent improvement (or worsening) in the relative earnings of these women. Time and age, on the other, reflect temporary changes in relative earnings. This may occur if, for example, attitudes towards work or labour force attachment vary across birth cohorts in a way not reflected by age or time.

There is a large literature on the gender earnings gap (see Joshi and Paci 1998 or Harkness 1996 for the UK, and Blau and Kahn 2000 for international evidence on the gender pay gap). This literature has tended to focus on the importance of differences in male and female worker and employer characteristics to the pay gap. A more recent strand of literature has looked at the importance of the 'family gap' in pay to the gender pay gap, with the gap in pay between women with and without children being an important component of the overall gender pay gap (see Harkness and Waldfogel, 2000). Other writers have examined the importance of motivation for work (see Swaffield, 2000) and differences in work experience and the timing of work experience (see Light and Ureta, 1995) for the pay gap. There is little work however on the evolution of the pay gap over the lifecycle, or on how this has changed across year of birth cohorts. Pencavel (1998) and Pencavel and Coleman (1993) have looked at changes in employment and earnings across birth cohorts of women in the US. Pencavel notes that the employment rates of women with high and low levels of schooling are becoming increasingly divergent among more recent birth cohorts and then goes on to see if this can be accounted for by the growing wage differential between high and low skill workers. Educational attainment is assumed to be endogenous to subsequent labour market outcomes. He finds a correlation between employment rates and movements in wages, but concludes that wages alone cannot account for the observed changes in the market work behaviour of women. The relative earnings of women and men are not explored.

Myck and Paull (2001) use repeated cross-sections of data from the UK Family Expenditure Survey to form a pseudo panel, from which they estimate the impact of experience on wages. They find that differences in work experience explain little of the gender wage gap, and rather that it is differences in returns to experience which helps to generate a wage gap as the pay gap increases with work experience. While they find that more recent birth cohorts have been doing better, they suggest that this cannot be explained by changes in the relative education or work experience of women.

While relatively few studies have taken a cohort based approach to analysing the gender pay gap, this method has been widely used to look at wage differentials across education groups (see for example Gosling, Machin and Meghir 2000 for the UK and Card and Lemieux 2000 for the US). Cawley, Heckman and Vyatcil (1998) discuss the problems associated with identifying age, cohort and time effects and this is discussed in more detail in Section 6.4. In this chapter, the gender pay gap is analysed as a function of time, age and year of birth cohort. The approach taken follows that of Card and Lemieux who examine changes in the wage differential between high and low educated workers across age, year of birth cohort and time. Card and Lemieux associate changes in wage premiums to skilled workers across cohorts with changes in supply and demand. The pay premium received by more skilled workers is then analysed as a function of the relative supply and demand for workers of different skill levels by year of birth cohort, age and time. While Card and Lemieux interpret year of birth cohorts as reflections of changes in supply and demand conditions in their analysis of the skills pay premium, the interpretation of cohort effects in the case of the gender pay gap may be somewhat different. In particular, while cohort effects may to some extent reflect changes in the relative supply of, and demand for female labour, they are also likely to reflect changes in a number of other factors which impact on relative wages. These factors are likely to include differences in labour market attachment, work experience and demographic differences across cohorts.

The analysis then goes on to examine differences in the pay gap across education groups. In the UK, authors have identified an increasing polarisation in the employment experience of women. Rake (2000) reports that women with "A" levels or above increased their rates of economic activity from 78 percent to 86 percent between 1984 and 1998. For those with no qualifications, on the other hand, activity rates declined from 59 to 50 percent. The difference across education groups is even starker for those with children. In 1998 76 percent of high skill women with a child under five were economically active compared to just 55 percent of mid skilled women and 27 percent of the low skilled. As children get older the gap closes, though a significant difference remains. Dex, Joshi and Macran (1996) report a similar finding among women returning to work after childbirth. They conclude that improved equal opportunities legislation has mainly benefited highly educated women who have increasingly been able to maintain continuous employment histories and suffered little in the way of occupational downgrading as a result of childbirth. For lower skilled women however the gains have been much smaller. They estimate that two thirds of women have not benefited much from policy changes since the 1970s. These differences in labour market attachment by education have direct implications for relative earnings.

This chapter examines the gender earnings gap of full time workers as a function of age, year of birth cohort and time. The analysis is restricted to full-time workers partly because of data limitations, discussed in more detail below. There is, however, also evidence that full time workers are rewarded differently from those working part time, and analysis of the gender pay gap therefore should look at these two employment categories separately (see for example Blank 1998, Harkness 1996). The chapter is arranged as follows. Section 6.2 describes the data and presents some descriptive statistics on the gender pay. Section 6.3 then goes on to outline the theoretical framework, while Section 6.4 presents the empirical results. In Section 6.5 the chapter goes on to assess the impact of shifts in supply and demand conditions on the gender pay gap and Section 6.6 includes controls for changes in wage inequality of the pay gap. Section 6.7 then looks at differences by education group. In Section 6.8 some robustness checks of the chosen measure of the pay gap are performed. Section 6.9 concludes.

6.2. Data and Descriptive Statistics

Throughout this chapter data is used from the 1974-1998/9 General Household Survey. As the General Household Survey became a biennial/ survey from 1996/7, there is no data for 1997/8. The sample includes all those aged 20-59. This gives between 10,000 and 16,000 observations for each year and a total of 332,177 observations. One limitation of the General Household Survey is that hourly wages cannot be computed because overtime hours are not recorded but weekly earnings include overtime payments. For this reason this chapter focuses only on the employment and wages of those working full-time (with full time employment being defined as working over 30 hours per week). Wages are defined as weekly wages and are recorded in January 2000 prices, and are reported for a total of 148,562 individuals.

The data is organised into 13 age groups with intervals of approximately three years, and eight time periods again spanning three years. The specific age bands are ages 20-22, 23-25, 26-28, 29-31, 32-34, 35-37, 38-41, 42-44, 45-47,48-50,51-53,54-56 and 57-59. The time periods are 1974-76, 1977-79, 1980-82, 1983-85, 1986-88,1989-91, 1992-94 and 1995-98 (note that there is no data for 1997). The number of observations within each age / time cell are reported in Appendix Table A6.1 and range from 740 to 2,182.

The Evolution of the Raw Log Wage Gap by Age, Time and Cohort

It is well know that the gender pay gap has fallen since the early 1970s, with the biggest changes in relative earnings occurring in the early 1970s, around the time of the Equal Pay and Sex Discrimination Acts, and during the 1990s. Figure 6.1 plots the raw log wage gap of female to male weekly earnings [log Wf – log Wm] between 1974/76 and 1995/98. It shows a decline in the gender pay gap from -.493 log points in 1974/76 (equivalent to a gender earnings ratio of 61 percent) to -.322 log points in 1995/98 (or a gender earnings ratio of 72 percent). These changes in the log wage gap at the mean however mask marked differences in the relative earnings of women at different ages. Figure 6. 2 shows how the pay gap has changed over time for four different age groups, while in Table 6.1 the raw wage gaps are reported for all 13 age groups and 8 time periods. For young workers (aged 23-25) the wage gap is the smallest in all years, and also showed a significant reduction, of .199 log points, over the period (from -.326 to -.127 log points). This was equivalent to an increase in the gender earnings ratio from 72 percent to 88 percent. Improvements in relative wages were greatest however for those in their 30s, with the wage gap for those aged 32-34 falling by .302 log points, from -.550 to -.248 (or an increase in the gender earnings ratio from 58 to 78 percent). For those over 40, however, improvements in relative earnings have been smaller, with the wage gap falling by between -.181 log points for those age 42-44 and by -.152 for those aged 51-53. In 1995-98 the gender earnings ratio stood at 67 percent for those aged 42-44 and 69 percent for those age 51-53, compared with 56 percent and 60 percent respectively in 1974-76.

An alternative representation of the change in the gender earnings ratio by age and year is given in Figure 6.3. Here the raw log wage gap is plotted against age groups for the three periods 1974-76, 1986-88 and 1995-98. In each period the wage gap grows substantially with age. However, while in 1974/76 women's relative earnings levelled out at a log wage gap of just under -.6 (or a gender earnings ratio of just over 55 percent) by the time women hit their early 30s, in 1995-98 the wage gap, while higher at all ages, continued to decline between the ages of 20 and 50. The diagram also indicates that the biggest improvements in relative earnings have been for those women aged under 40. For women over 40, the earnings gap has narrowed by less and remains large at around -.4 log points (equivalent to a gender earnings ratio of 67 percent). For those under 35, on the other hand, the log wage gap in 1995/98 is less that -.2 log points, or 82 percent. This is shown more clearly in Figure 6.4, which plots the change in the relative wage gap over the period 1974/76 and 1995/98 by age group. It is clear from this figure that women in their late 20s and early 30s, the ages when women have typically taken the most time out of the labour market to care for children have seen the greatest improvements in their relative wages.

Accounting for Differences in Characteristics

Part of the difference in wages between men and women is, of course, due to differences in characteristics. In order to account for this an "adjusted" gender wage gap is estimated from a regression of the log of full-time weekly wages on a quadratic in age, five education dummy variables, eleven regional dummy variables, and a dummy variable for being female.[1] . The coefficient on the female dummy variable is taken as the measure of the gender pay gap. This is computed for each of these 13 age groups and 8 time periods, giving a total of 104 wage gaps. The robustness of this measure of the pay gap is explored in Section 6.7, where the

[1] The controls are: a quadratic in age, education (Degree, "A" level or equivalent, 5+ "O" levels, under 5 "O" levels and no qualifications); region (the North, Yorkshire and Humberside, North West, East Midlands, West Midlands, East Anglia, South West, South East, Wales, Scotland) and individual year dummy variables.

traditional Oaxaca (1973) decomposition is used as an alternative means of computing the gender pay gap. In order to control for sample selection bias, Heckman's two-step selection procedure is also used.[2] The probability of being employed is estimated as a function of being married, the log of non-labour family income and the number of children in the family unit, these three variables interacted with a dummy variable for being female, and all variables in the wage equation.

Table 6.2 reports the adjusted wage gaps and standard errors both with and without the Heckman selection correction. The raw log wage gaps, and adjusted log wage gaps with and without correction for sample selection are plotted by age group for the periods 1974/76, 1986/88 and 1995/98 in Figure 6.5. Looking first at the period 1974/76, accounting for differences in characteristics reduces the raw log wage gap by around .03 log points for workers over 30, and made no difference to the wage gap for younger workers. This reflects the narrowing of the gap in educational attainment between men and women that was occurring over this period. Controlling for selection reduces the wage gap by approximately another .10 log points for workers over 30, suggesting that in the 1970s women were negatively selected into full time employment (or that those characteristics which increased the probability of women working also tended to reduce their wages). For younger workers, in particular those in their early 20s, selection was much less important and accounted for a smaller share of the wage gap. By 1986/88 differences in characteristics did very little to explain the wage gap among younger workers, although for older workers they accounted for around .08 log points of the wage gap once selection was accounted for. Again older workers tended to be negatively selected into employment, while for those under-35 selection had little impact on wages. By 1995/98, differences in characteristics explained none of the wage gap for those under 40. Indeed for those under 25 controlling for differences in

[2] Heckman's (1976) correction involves estimating a probit model of employment participation across the working age population and then including a variable to correct for sample selection (the inverse Mills ratio) from this probit specification in the wage equation. This correction is adopted to allow for the fact that people with positive earnings may be a selected sample of individuals in that their characteristics may be different from those who are out of work. For an earnings equation $\log(W) = X\theta + \epsilon$ the issue arises because the equation is based only upon people who have $W>0$. As such it is possible that the mean of the error term ϵ ($E(\epsilon)$) may not equal 0 as one would require for estimates of θ to be unbiased. To ensure the error term does have a zero mean one needs to include a selection correction term (the inverse Mills ratio) in the wage equation. To see this note that the earnings equation for those with positive earnings can be written $[\log(W)|W>0] = X\theta + \sigma(\phi/\Phi) + v$ where $E(v) = 0$ and ϕ and Φ are the density function and distribution function of the standard normal distribution. The inverse Mills ratio can be calculated from a first stage probit model explaining the probability that an individual has positive earnings, $\Pr[W>0] = \Phi(Z\zeta + \omega)$.

characteristics actually lead to an increase in the estimated wage gap suggesting that, had these women received the same returns to characteristics as men, their average earnings would have been higher than the equivalent male average. When controls for selection into employment are added in 1995/98, the impact is somewhat less clear than in the previous two periods. In 1995/98, selection into full-time employment is of little importance to workers under 30. For older workers however, the impact of selection into full time employment is mostly positive (leading to higher observed average wages) for those over 40, but negative for those in their 30s. The impact of selection on the wage gap is however relatively small. In 1995/98, therefore, for older workers, differences in characteristics still matter but account for a significantly smaller part of the pay gap than in earlier decades. Overall the picture to emerge suggests that, while differences in worker characteristics went some way to explaining the wage gap in 1974/76, by 1995/98 such differences could do little to account for the observed gender wage gap even among older workers. It is notable too that the reported standard errors indicate that the log wage gap is highly significant in all cases.

Figure 6.6 shows how the adjusted wage gaps have changed over time by age group. It shows an increase in the wage gap with age. The adjusted wage gaps are however smaller, particularly for older women, than suggested by the raw wage data in Figure 6.3, and the rate of decline in relative earnings with age is less dramatic.

It should be noted that the parameter estimates in the Heckman selection corrected models are sensitive to the choice of control variables. Pencavel (1998) finds that "by tinkering with the precise form of the selection variables, we could generate somewhat different estimates of θ. This does not mean, of course, that selection bias is not an issue, but it does imply that we lack the means to address the issue in a thoroughly convincing fashion". Because of the inability to satisfactorily control for sample selection bias in our model, the rest of this chapter focuses on measures of the wage gap that do not include controls for sample selection bias.

Overall the descriptive data therefore shows that in all years, relative female earnings decline with age. Over the last 20 years however, the rate of decline has slowed and this is reflected in relatively large increases in the relative earnings of women in their late 20s and 30s. Differences in characteristics account for a small part of the gender pay gap in all periods. They are most important in explaining earnings differences for older women in the 1970s and early 1980s. The same is also true of selection into employment, with non-random selection into full time work tending to increase the gender pay gap in the 1970s, particularly for older women. By the 1990s the impact of selection on relative wages is small and has an ambiguous effect on relative earnings.

6.3 Theoretical Framework

In this section a model of the relative earnings of women is developed as a function of age, time and year of birth cohort. The theoretical model outlined here uses a framework that has commonly been used in the literature on education wage differentials to analyse changes in the gender pay gap. It follows closely the work of Card and Lemieux (2000), which analyses changes in wage differentials across education groups and age cohorts. In this model output at time t depends on two constant-elasticity-of-substitution (CES) sub-aggregates of male and female labour:

(1) $$M_t = [\Sigma_j(\alpha_j M_{jt}^{\eta})]^{1/\eta}$$

(2) $$F_t = [\Sigma_j(\beta_j F_{jt}^{\eta})]^{1/\eta}$$

Where $-\infty < \eta \leq 1$ is a function of the partial elasticity of substitution σ_A between age-groups j of the same gender and $\eta = 1 - \frac{1}{\sigma_a}$. This is assumed to be the same across gender.[3] The terms α_j and β_j are "relative efficiency" parameters of men and women of age group j, assumed constant over time. Output in period t is therefore a function of male and female labour, and "technological efficiency" parameters $\vartheta_{mt} and \vartheta_{ft}$.

(3) $$y_t = f(M_t, F_t; \theta_{mt}, \theta_{ft})$$

Assuming aggregate production is CES:

(4) $$y_t = (\theta_{mt} M_t^{\rho} + \theta_{ft} F_t^{\rho})^{\frac{1}{\rho}}$$

Again $\rho = 1 - \frac{1}{\sigma_g}$; where σ_g is the partial elasticity of substitution between men and women.) The marginal product of labour for men in age group j is given by:

[3] Relaxation of this assumption is relatively straightforward, but makes little difference to the empirical results obtained.

(5)
$$\frac{dy_t}{dM_{jt}} = \frac{dy_t}{dM_t}\frac{dM_t}{dM_{jt}}$$

$$= [(\theta_{mt}M_t^\rho + \theta_{ft}F_t^\rho)^{\frac{1}{\rho}-1} \times \theta_{mt}M_t^{\rho-1}] \times [\Sigma(\alpha_j M_{jt}^\eta)^{\frac{1}{\eta}-1} \times \alpha_j M_{jt}^{\eta-1}]$$

$$= \Psi_t \times \theta_{mt}M_t^{\rho-1} \times \Sigma(\alpha_j M_{jt}^\eta)^{\frac{1}{\eta}-1} \times \alpha_j M_{jt}^{\eta-1}$$

$$= \Psi_t \times \theta_{mt}M_t^{\rho-1} \times M_t^{1-\eta} \times \alpha_j M_{jt}^{\eta-1}$$

$$= \Psi_t \times \theta_{mt}M_t^{\rho-\eta} \times \alpha_j M_{jt}^{\eta-1}$$

Where:
$$\Psi_t = (\theta_{mt}M_t^\rho + \theta_{ft}F_t^\rho)^{\frac{1}{\rho}-1}.$$

Similarly for women:

(6)
$$\frac{dy_t}{dF_{jt}} = \frac{dy_t}{dF_t}\frac{dF_t}{dF_{jt}} = \Psi_t \times \theta_{ft}F_t^{\rho-\eta} \times \beta_j F_{jt}^{\eta-1}$$

This assumes that the economy is operating on its labour demand curve, and that labour supply is fixed in the short run. In order to overcome the potential problem of sample selection bias, wages are estimated both with and without a Heckman two-step selection correction. If wages equal marginal product, the relative wages of men to women can be written as the ratio of marginal products:

(7)
$$\log\frac{w_{jt}^f}{w_{jt}^m} = \log\frac{\theta_{ft}}{\theta_{mt}} + \log\frac{\beta_j}{\alpha_j} + (\rho-\eta)\log\frac{F_t}{M_t} + (\eta-1)\log\frac{F_{jt}}{M_{jt}} + e_{jt}$$

$$= \log\frac{\theta_{ft}}{\theta_{mt}} + \log\frac{\beta_j}{\alpha_j} + (\rho-1)\log\frac{F_t}{M_t} + (1-\eta)[\log\frac{F_t}{M_t} - \log\frac{F_{jt}}{M_{jt}} + e_{jt}$$

$$= \log\frac{\theta_{ft}}{\theta_{mt}} + \log\frac{\beta_j}{\alpha_j} - \frac{1}{\sigma_a}\log\frac{F_t}{M_t} - \frac{1}{\sigma_g}[\log\frac{F_{jt}}{M_{jt}} - \log\frac{F_t}{M_t}] + e_{jt}$$

This assumes that aggregate female labour supply relative to male labour supply is endogenous. Studies that have looked at the relationship between husbands and wives labour supply have found little evidence of joint determination of labour supply among couples without pre-school children (Lundberg 1988), and no or little evidence of an added-worker-effect (Layard, Barton and Zabazlam, 1980; Lundberg, 1985; Maloney 1991; Grubber and Cullen 1996). Studies also suggest that female labour supply is much more responsive to own rather than partner's wages (Juhn and

Murphy, 1997; Coleman and Pencavel, 1994). These findings suggest that the assumption of endogeneity of relative labour supply is a reasonable one. Note that in this competitive model where wages equal marginal product, differences in wages between men and women with the same observed characteristics can only arise as a result of differences in productivity. This may result because of a mis-specification of the wage equation, for example, resulting from the omission of variables that differ systematically across genders. Such variables may include work effort or differences in accumulated human capital (such as previous work experience). This model can therefore incorporate Becker's (1985) effort hypothesis. It does not however allow for discrimination as workers are in all cases paid their marginal product. Note that the wage gap is now a function of time, age, the relative supply of women to men, and age group specific relative supplies of labour. Card and Lemieux assume that the relative supply of high skill workers consists of a cohort effect that varies by year of birth, and an age specific effect that is equal across cohorts. This also seems to be a plausible assumption when applied to the relative supplies of female to male labour. We can therefore write:

(8) $$\log\frac{F_{jt}}{M_{jt}} = \lambda_{t-j} + \phi_j$$

Where λ_{t-j} is a cohort effect and Φ_j is an age specific effect. Inserting equation (8) into (7) we get:

(9)

$$\log\frac{w_{jt}^f}{w_{jt}^m} = \log\frac{\theta_{ft}}{\theta_{mt}} + \log\frac{\beta_j}{\alpha_j} - \frac{1}{\sigma_a}\log\frac{F_t}{M_t} - \frac{1}{\sigma_g}[\lambda_{t-j} + \phi_j - \log\frac{F_t}{M_t}] + e_{jt}$$

$$= \log\frac{\theta_{ft}}{\theta_{mt}} + \log\frac{\beta_j}{\alpha_j} + [\frac{1}{\sigma_g} - \frac{1}{\sigma_a}]\log\frac{F_t}{M_t} - \frac{1}{\sigma_g}\lambda_{t-j} - \frac{1}{\sigma_g}\phi_j + e_{jt}$$

Making a number of simplifying assumptions it is possible to show that relative wages are a function of time, age and cohort. First, it seems plausible to write the relative technology parameters and log relative supply of female labour as a function of time, and are written as a series of time period dummy variables. The terms $\log\frac{\beta_j}{\alpha_j}\ and\ \frac{1}{\sigma_a}\phi_j$ (age specific differences in relative production efficiency and age specific relative supplies of labour) are functions of age and expressed as a series of age dummy variables. Finally, $\frac{1}{\sigma_a}\lambda_{t-j}$, where λ_{t-j} is a cohort effects, is represented by a series of year of birth cohort dummies. Estimation then becomes:

(10) $$r_{jt} = b_j + d_t + c_{t-j} + e_{jt}$$

where: r_{jt} is estimated wage gap for age group "j" at time "t".

b_j is an age effect

d_t is a time effect again

c_{t-j} is cohort effects

Econometric issues involved in the estimation of equation (10) are discussed in the following section, and results are presented in Section 6.4.

6.4. Estimation

In order to estimate equation (10), grouped data from the GHS is used. The dependent variable, the estimated wage gap r_{jt}, is defined as the adjusted wage gap after controlling and is computed both with and without controls for sample selection (using the Heckman (1979) selection correction). An alternative means of controlling for the non-random selection into full time employment is to use the mean adjusted pay gap without correcting for sample selection as the dependent variable and to include as a control variable the average of the inverse mills ratio. This is also carried out here. Computation of the dependent variable was described in more detail in Section 6.3. Wage gaps are calculated for 13 age groups and 8 time periods, giving a total of 104 observations. The control variables include an age effects, b_j, time effects, d_t, and cohort effects, c_{t-j}. All of these are defined over approximate three-year age bands. The age and year effects are banded as before, while the year of birth cohorts are defined as the periods: 1915/18, 1919/21, 1922/24, 1925/27, 1928/30, 1931/33, 1934/36, 1937/39, 1940/42, 1943/45, 1946/48, 1949/51, 1952/54, 1955/57, 1958/60, 1961/63, 1964/66, 1967/69, 1970/72 and 1974/78. Clearly, given that data is available to us only from 1974-1998/9, the data is censored. For the earliest birth cohorts, for example, only older workers are observed in the 1970s, while we only observe the wages and employment of women born in the 1970s when they are in their 20s. The years and ages at which workers are observed for each birth cohort are reported in Appendix Table A6.2.

This problem of 'incomplete data' is discussed in detail in Cawley, Heckman and Vytlacil (1998). They argue that such data structures prohibit the identification of all age and time effects, and their interactions. In order to overcome these problems, certain restrictions must be imposed on the data. Blackburn and Neumark (1993) for example impose a linear constraint on time and age effects. Cawley et.al. point out that the imposition of such restrictions on the data can be tested, and in the context of estimating returns to education, reject the imposition of linear constraints on age and time. The validity of the imposed restrictions is tested using a chi-squared test that compares restricted models to the 'saturated' model (which allow for a full set of interactions between age, time and cohort). The constraints imposed on the models estimated are discussed in further detail below, with these constraints being tested against the saturated model using the chi-squared test.

A further problem with the analysis of grouped data is that the sample sizes used to calculate the wage gap vary across age groups and over time. This may lead to problems of heteroscedasticity. In order to correct for this variance weighted least squares is used, where each observation is weighted by the inverse of the variance of the wage gap. Measurement error is an additional potential problem where data is grouped. This is discussed in Verbeek and Nijman (1992) in the context of pseudo panel data. They suggest that the problem of measurement error can be ignored where the cell size used to compute the grouped mean is greater than 100 individuals. Here sample sizes range from 740 to 2,182, which should be sufficient to resolve any problems of measurement error.

Empirical Results

The results from estimation of equation (10) using variance weighted least squares are reported in Table 6.3. The first specification includes only age effects and year effects. The estimates suggest that the gender pay gap has narrowed with time, and that the pay gap increases with age from 20 to 40, where after it narrows. The chi-squared statistic, which tests the validity of the restrictions against the saturated model, however suggests that the fit of the model is poor. The second column includes age and year controls again, but this time also include the average of the inverse mills ratio. The inverse mills ratio measures the probability of non-selection into the sample, and the average inverse mills ratio therefore includes the average probability of not being selected into full-time employment by age and year groups.

This ratio is included separately for men and women. The inclusion of the inverse mills ratios does little to improve the fit of the model, as denoted by the chi-squared statistics. Moreover both coefficients are statistically insignificant.

The third column includes nine dummy variables for year of birth cohort from 1946-50 on wards. Cohort dummies from 1915-45 are omitted as no change in the pay gap is observed for these cohorts and addition of earlier cohort dummies does not improve the models goodness of fit. The inclusion of cohort dummies considerably improves the fit of the model, as can be seen by the chi squared statistics. This null hypothesis, which tells us that the model is not mis-specified and that the restrictions imposed are valid, can no longer be rejected. Controls for earlier birth cohorts (from 1915 to 1945) are excluded because there appears to be little variation in the pay gap across these earlier birth cohorts. Inclusion of all 13-cohort controls reduced the chi-squared from 80.73 to 72.29 and a likelihood ratio test that compares this model against the specification in column (3) suggests that the restricted model in column 3 is preferred. Contrasting the results in columns (1) and (3) shows that inclusion of cohort controls reduces the size of the dummy variables on the time period dummies and also reduces the negative coefficients on the age dummy variables. It appears therefore that more recent birth cohorts have been doing better from the late 1940s onwards. Moreover the negative impact of ageing on the pay gap is considerably reduced once cohort controls are added. The coefficients on the time period dummies remain positive and significant, although they are smaller in magnitude compared to the earlier specifications.

In column (4), in order to increase the available degrees of freedom, the series of time period dummy variables are replaced with a linear time trend. This increases the chi-squared statistic from 80.73 to 104.35, and reduces the p-value from .305 to .041. The likelihood ratio test provides weak support for the imposition of this restriction. The specification of Column (5) is the same as Column (4) but also includes average inverse mills ratios for male and female selection into employment. The average inverse mills ratios are both insignificant and the results in columns (4) and (5) are similar. Looking at column (5), we can see that the gender pay gap has been narrowing on average by 1.5 log points every 3 years between 1974 and 1998. The coefficients on the age variables suggest that the gender pay gap began to increase with age when women reach their late 20s. The pay gap is largest for women aged 38-41, where after the gender pay gap narrows. The cohort dummies show that successive cohorts of women are doing better in the labour market. For example, the pay gap is .183 log points smaller for women born between 1970 and 1978 compared to those born between 1918 and 1946.

One reason that more recent birth cohorts have been doing better may be that changes in fertility patterns mean women are now having fewer children at a later age. The impact of children on pay has been discussed widely in the gender pay gap literature. The final specification estimated here therefore also includes controls for the average number of children and the proportion of women who are married by age and time cell. While the coefficients on these two variables have the expected sign, it is perhaps surprising that neither variable is statistically significant.

6.5. Supply and Demand Changes

Economic theory predicts that levels of supply and demand will affect the relative price of male and female labour, where male and female employees are imperfect substitutes. This has been widely assumed in the literature on wage inequality (eg. Katz and Murphy 1992, Juhn Murphy Pierce 1993, Bound and Johnson 1992, Machin 1996) and is also been assumed here. Given imperfect substitution, we would expect the unexplained gender pay gap to increase with relative female labour supply, and to fall when relative demand is higher. Blau and Kahn (1996) find this to be the case in their cross-country study of the gender pay gap. They conclude that, "controlling for wage structure, the gender differential is lower when women are in shorter supply compared to men relative to how favourable the country's demand structure is for women (female 'net supply')." In this section supply and demand indexes are constructed across age and time cohorts, and the impact of changes in the relative supply of and demand for female labour on the wage gap is assessed.

We assumed earlier that, as Card and Lemieux suggest, the relative supply of high skill workers consists of a cohort effect that varies by year of birth, and an age specific effect that is equal across cohorts. However while cohort effects reflect changes in the relative supply of, and demand, for female labour, they may also reflect changes in a number of other factors which impact on relative wages (such as differences in labour market attachment, work experience and demographic differences across cohorts). For this reason, instead of replacing the cohort effects with a measure of relative labour supply, as Card and Lemieux do, we incorporate them as additional explanatory variables.

Indices of Relative Female Labour Supply

In order to construct supply indices we follow Blau and Kahn (1996) who look at international differences in the gender pay gap. This closely follows the methodology used in the literature on wage inequality first applied by Katz and Murphy 1992. Here, relative supply indices are constructed as:

$$\text{(11)} \qquad \log(\Delta S_{jt}) = \log\left(\frac{f_{jt}}{f_{75}}\right)$$

Where f_{jt} is the proportion of full-time workers who were women of age j at time t; and f_{75} is the share of full time employees who were women (of all ages) in the base year, chosen here to be 1974-76. The supply index therefore compares the relative share of women, aged j, in full-time employment at time t to the total 1974-76 full-time female employment share.

Figure 6.7 plots the share of full-time employees who are female against time. Here we can see that the average share of women increased from 26 percent to 34 percent over the 24-year period. Most of this change took place between 1985 and 1998. In Figure 6.8 age specific female shares of full time employment are plotted for the three periods 1974-76, 1986-88 and 1995-98. Table 6.4 reports these shares. From this graph two things are evident: first, the relative share of female employment exhibits a U-shape pattern, declining with age between the ages of 20-22 and 32-34, and increasing slowly thereafter. Second, the biggest increases in relative employment have occurred for those aged between 25 and 35.

The relative supply indices, as defined in equation (11) above, are reported in Table 6.5. These indices compare female employment shares at a point in time, and at a specific age, with the aggregate share of female employment in 1974-76. This essentially shows that in 1974-76 relative employment was low for those aged 26 to 41. By 1989-91, for all age groups relative employment was higher than the 1975 average and this trend increase in the relative supply index continued across age groups until 1995-98.

Figure 6.9 plots the log female employment shares against adjusted wage gaps for 1974-76, 1986-88 and 1995-98. Ceterus paribus, we would expect that higher supply would lead to a larger wage gaps. In contrast to what economic theory would predict, the observed relationship suggest that pay gaps are larger among those with lower levels of relative labour supply. Figure 6.10 plots changes in the adjusted wage gap and in log relative supply between 1974-76 and 1995-98. Again the observed relationship is not in line with what economic theory would predict. The plotted relationship suggest that those age groups who have increased their relative supply by most have also had some of the largest improvements in their relative wages. Two things may be driving these observed relationships. First, there may be omitted variable bias. For example, years of work experience have not been controlled for when computing the adjusted wage gaps and this may be correlated with current employment. Second, higher labour supply and lower wage gaps may result from differences in labour demand across age groups. These differences in labour demand are dealt with next.

Indices of Relative Female Labour Demand

In order to find out how changes in the occupational structure of the economy have affected demand for female labour, demand indices are constructed. While changes in the occupational structure of the economy may matter too, insufficient sample sizes mean that only changes in occupational structure are controlled for here. Again the methodology used here follows that used by Katz and Murphy (1992) and Blau and Kahn (1998).

Net demand indices are written as:

$$(12) \qquad \ln[1+\Delta D_{jt}] = \ln[1+\sum_i c_{ij}(\frac{E_{it}-E_{i75}}{E_{i75}})]$$

Where c_{ij} is the proportion of female employees of age j working in industry i over the entire period 1974-98; E_{it} is the share of total employment in industry i at time t, and E_{i75} is the share of total employment in industry i over the period, 1974-76. The demand index therefore measures the extent to which changes in industrial structure have favoured women of different ages relative to the industrial structure in 1974/76, with weights being defined over the entire period 1974-1998.

Table 6.6 reports in the upper panel data on the occupational structure of all full-time employees for 8 time periods, and in the lower panel data on the on the share of employees in each occupational group by gender and age group (across all years). Looking first at the upper panel, we observe that the occupational structure of full time employment has shifted considerably over the period, with large increases in the numbers of workers employed in professional occupations, and a substantial decline in the share of workers employed in manual occupations. Looking at the second panel, we observe considerable differences in occupational structure by age and gender. Older workers, and male workers, are more likely to work in professional occupations, while the probability of working in other non-manual occupations declines with age and is considerably higher for women. Men are much more likely to work in manual occupations, and the probability of men working in skilled manual jobs increases with age. Table 6.7 reports the change in log relative demand index, defined in equation (12), by age and year. Changes in relative demand are defined relative to the base year 1974-76. Changes in the log demand index are charted in Figure 6.11 against age for 1986-88 and 1995-98. Looking at Figure 6.11, we can see that relative demand for female workers has increased by most for those in their 30s, while for younger workers their has been little change in relative demand for female employees. In Figure 6.12, changes in relative demand are plotted against changes in the adjusted wage gap (changes defined over the period 1974-76 to 1995-98). Here we observe that, in line with economic theory those age groups which have had the largest increases in relative demand have also had the biggest improvements in their relative earnings.

Controlling for Shifts in Supply and Demand

Table 6.8 reports results from the variance weighted least squares regressions of the adjusted wage gap on age and cohort dummy variables, plus controls for shifts in supply and demand. Time effect dummy variables are omitted here because of problems of collinearity between these variables. The estimated parameters suggest that shifts in labour demand have had a significant impact on closing the wage gap. However, the coefficient on labour supply suggests that while increased labour supply has tended to reduce relative pay, the effect is statistically insignificant. This specification also increases the significance of the impact of children on the wage gap, with the wage gap increasing by .141 log points with a unit increase in the average number of children. It should be noted too that under this specification it still appears to be the case that successive cohorts have been improving their labour market position. Age however is a much less important factor in determining the size of the pay gap.

6.6. Controlling for Changes in Inequality

Blau and Kahn (1996) argue that the level of wage inequality affects the size of the gender pay gap. In particular, as the level of wage inequality increases, we would expect that those with fewer observed or unobserved labour market skills would see a reduction in their relative average wage. In the final specification an indicator of the level of wage inequality is also included as a control variable. The indicator of wage inequality used here is the standard deviation of the log of the male wage and the results are reported in Table 6.9. Results are reported for two specifications. First, a time trend is included alongside a set of age dummies, year of birth cohort dummies, the average number of children and a variable controlling for the proportion married. The second specification replaces the time trend with the demand and supply indices. The chi squared statistic from the first specification suggests that the model is a good fit. The measure of wage inequality is found in this model to be strongly related to the wage gap, with a .10 increase in the standard deviation of the log male wage leading to an increase in the wage gap by -.04 log points. This specification also suggests large effects across cohorts, while age is a much less significant factor in determining the size of the adjusted wage gap. The second specification includes controls for labour supply and demand. In this case the measure of wage inequality does not appear to bear a statistically significant impact on the size of the wage gap. It should be noted however that the chi-squared statistic suggests a relatively poor fit of this model to the data.

6.7 The Pay Gap by Education

It was noted earlier that the employment experience of women varies considerably by education level. In this section differences in the employment and earnings of women relative to men are explored for five different education groups (those with degrees, higher qualifications, A levels, O levels and no qualifications).

Looking first at relative earnings, figure 13 plots the gender earnings gap, by education and year between 1974-76 and 1995-98. In 1974/76, the pay gap was around -.5 log points for those with no qualifications, compared to -.24 log points for those with a degree. For each of the educational groups the pay gap has narrowed over the last 20 years, although for those with higher qualifications and degrees any improvement has been small. For those with no qualifications and O levels have closed the pay gap by the most, although the pay gap remains greatest for low educated women.

Those with low levels of education tend to be older. To account for differences in the age composition of workers the pay gap is plotted by age for 1974/78, 1986/88 and 1995/98 in Figure 6.14. Comparing the evolution of the relative earnings profiles of those with and without degrees, it is apparent that while the pay gap is similar for older workers, those with degrees fare substantially better than unqualified workers up until their mid-30s. It is also notable that, while low qualified workers earn less relative to men than the more qualified, the largest improvements in relative earnings have been among the low skilled.

There are also substantial differences in employment rates across education groups. Figure 6.15 plots employment rates by education group for men and women, while in Figure 6.16 the differences in FT employment rate are plotted. Male full-time employment rates show a gradual decline for all education groups, except for those with no qualifications who have seen a much sharper reduction in employment. For women, employment rates have increased only among the more educated. For those with no qualifications, employment rates actually fell between 1974/76 and 1995/98. It is also notable that those with degrees were almost 3 times more likely than those with no qualifications to be employed full-time in 1995/98. The gap in full-time employment rates between men and women in the same education group are plotted over time in Figure 6.16. For those with degrees, the difference in male and female employment was around 30 percentage points in 1995/98, compared to a gap of 47 percentage points for those with no qualifications. However, it is notable that the employment gap has closed by most for those with no qualifications because employment rates have fallen most dramatically for unqualified men (in 1974/76 the employment gap was 64 percentage points for those with no qualifications and 38 percentage points for those with degrees). Figure 6.17 accounts for age differences by education, plotting the gender pay gap by age and education for 1974/76, 1986/88 and 1995/98. Here it is apparent that the gap in employment rates between men and women has changed most for less educated workers under 40.

Table 6.12 reports the results from variance weighted least squares regressions of the adjusted wage gap on age and year of birth cohort dummy variables, plus a linear time period variable and controls for the average number of dependent children and the proportion married. The chi-squared test statistic suggests that the fit of the model is good, particularly for those educated to A level or above. Looking first at the age dummy variables, for those with A levels or higher qualification relative earnings decline after the age of 30. However, the dummy variables are not significant for those with "A" level as their highest level of qualification. For women with degrees, O levels and no qualifications, however, age does not appear to be an important factor in determining relative earnings. Looking at the year of birth cohorts, again we find that recent birth cohorts have made substantial gains in their relative earnings for those with higher qualifications or O levels. For those with no qualifications and for those with degrees, however, while the magnitude of the coefficients on the cohort dummy variables suggest some improvement in relative earnings, for more recent birth cohorts, these improvements are not statistically significant. The coefficient on the time period variable suggests that the relative earnings of women have improved with time only for those with A level or no qualifications. Finally, the magnitude of the coefficient on the variable controlling for the average number of children suggests that an increase in the average number of children reduces relative earnings, but that this is only significant for those with "higher" qualifications.

To summarise, therefore, the results here suggest that the employment and earnings experience of women has varied considerably across education groups. While the less qualified still earn much less, and are much less likely to work full time, compared to comparably qualified men than women with degrees, those with lower skills have seen the largest improvements in their position relative to men. However this is likely to be in large part due to the declining fortunes of low skilled men. The model estimated suggests that while relative earnings decline with age for the more educated, this is less true of the low skilled. Cohort effects, on the other hand, appear to be most important for those with intermediate levels of qualifications. In particular, those with no qualifications and those with degrees have seen little change in relative earnings as a result of cohort effects. This may in part be due to compositional changes in those who achieve these levels of qualifications. Finally, the time period dummy suggests that relative earnings have improved over time only for those qualified to A level or with no qualifications. For the later group, this time trend may reflect the declining fortunes of low skilled men.

6.8 Robustness Checks

Using Oaxaca's Decomposition to Measure the Pay Gap

So far the analysis has computed the adjusted wage gap through the inclusion of a dummy variable for gender in a regression of wages on characteristics for the 104 age / year groups. In this section the validity of this assumption is tested by comparing the results obtained by using this measure of the wage gap for the whole sample with those obtained through the use of the wage gap calculated using the Oaxaca decomposition. This allows returns to characteristics to vary for men and women and is defined as follows:

$$\log W_m - \log W_f = (X_m - X_f)b_m - (b_m - b_f)X_f \qquad (13)$$

Where $(b_m - b_f)X_f$ is the unexplained portion of the wage gap, and defined here as the Oaxaca adjusted wage gap. Table 6.10 reports the adjusted pay gap as defined before and the Oaxaca pay gap. In the majority of cases the measured pay gaps are very close.

Table 6.11 presents the results from regressing the previously defined adjusted wage gap and Oaxaca's adjusted wage gap on a set of age and birth cohort dummies, average number of children, the proportion that are married, and either a time trend variable or the demand and supply indices. For the Oaxaca defined wage gap the observation are weighted by the inverse of the sample size. The parameter estimates obtained are very similar, suggesting the results are not sensitive to the choice of measure of the gender pay gap.

6.9 Conclusion

This chapter examined the impact of age, time and year of birth cohort on the gender pay gap between 1974 and 1998. At all ages, differences in characteristics account for only a small part of the gender pay gap, although they are most important in explaining earnings differences for older women in the 1970s and early 1980s.

Age earnings profiles show that the gender pay gap widens considerably between the ages of 20 and 30. Over the last 20 years however, the gender pay gap has grown more gradually with age, and this is reflected in comparatively large improvements in the relative earnings of women in their late 20s and 30s. Thus the greatest improvements in relative earnings over this period have been for those in their late 20s and early 30s, the ages when women have typically taken the most time out of the labour market to care for children.

There are important cohort effects, with successive birth cohort earning relatively more from the late 1940s onwards. The adjusted wage gap for those born in 1967-71, for example, is around 15 percentage points smaller than for women born before 1945. Once controls for birth cohorts are introduced, the negative impact of ageing on the pay gap is considerably reduced. However, the pay gap still increases, with the pay gap increasing by around 7 percentage points between the age of 20-22 and 32-34, and by 10 percentage points by the age of 42-44. The inclusion of controls for year of birth cohort reduces the importance of time in closing the pay gap considerably. Our estimates suggest the pay gap closed by just over 1 percentage point every 3 years between 1974 and 1998. Inclusion of controls for shifts in the occupational structure of demand has also had an important impact on reducing the pay gap. However, surprisingly, controlling for the average number of children has no statistically significant effect.

Finally, the employment and earnings experience of women has varied considerably across education groups. While the less qualified still earn much less, and are much less likely to work full time, compared to comparably qualified men, than women with degrees, those with lower skills have seen the largest improvements in their relative position. This may be in large part due to the declining fortunes of low skilled men. The model estimated suggests that while relative earnings decline with age for the more educated, this is less true of the low skilled. Cohort effects, on the other hand, appear to be most important for those with intermediate levels of qualifications. In particular, those with no qualifications and those with degrees have seen little change in relative earnings across cohorts. This could be due to compositional changes in those who achieve these levels of qualifications. Finally, the time period dummy suggests that relative earnings have improved over time only for those qualified to "A" level or with no qualifications. For the latter group, this time trend may reflect the declining fortunes of low skilled men.

Figure 6.1: Log Weekly Wage Gap by Year, Full time Workers

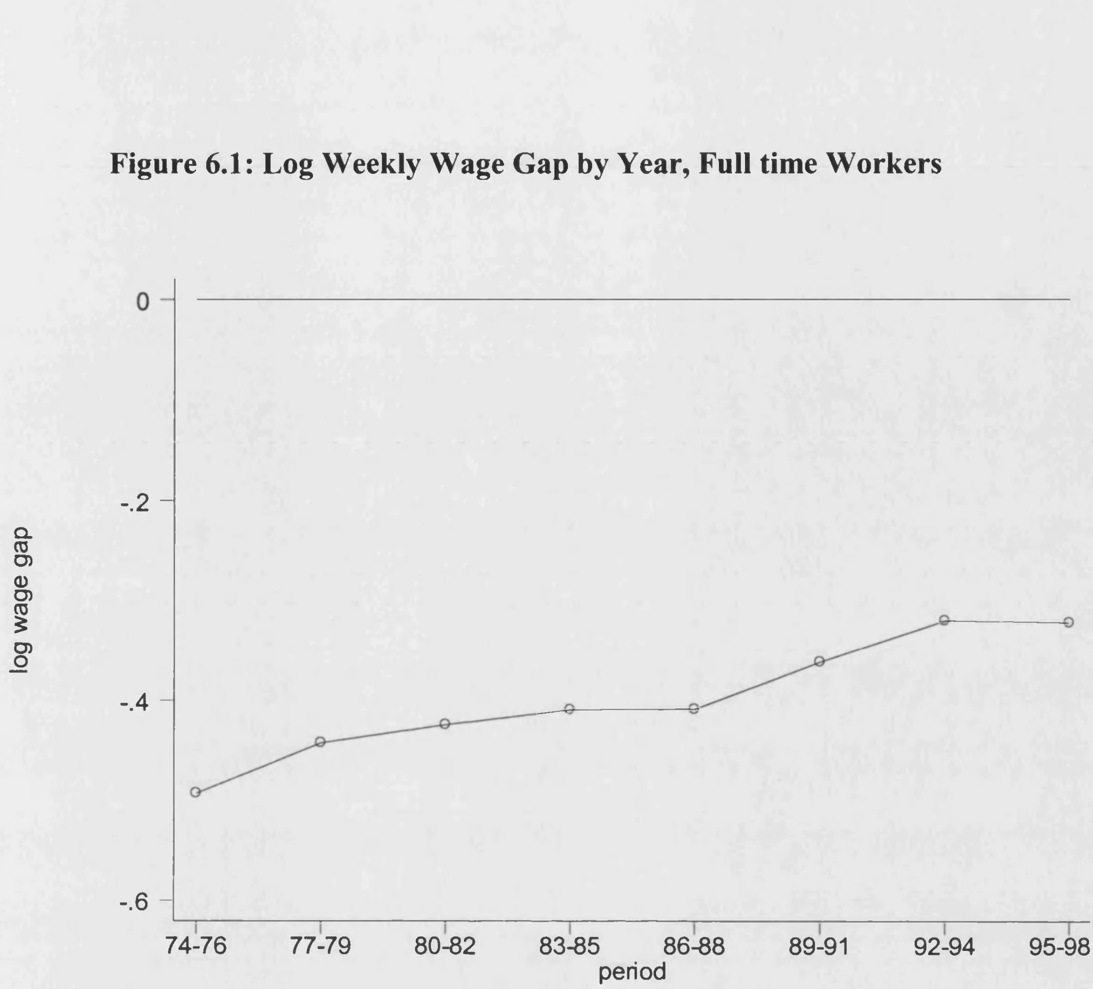


Figure 6.2: Log Weekly Wage Gap by Age and Year, Full Timers

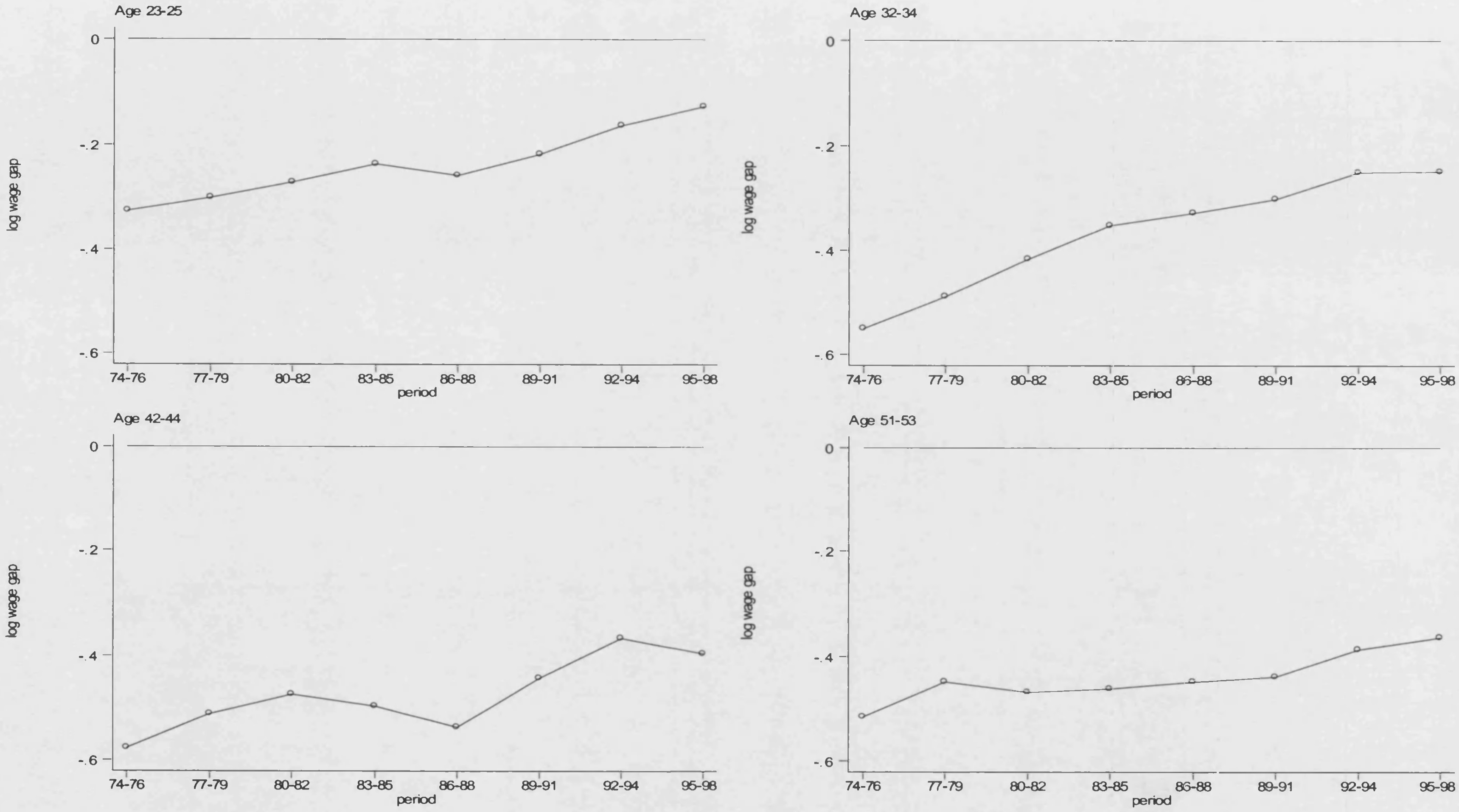


Figure 6.3: Log Wage Gap by Year and Age

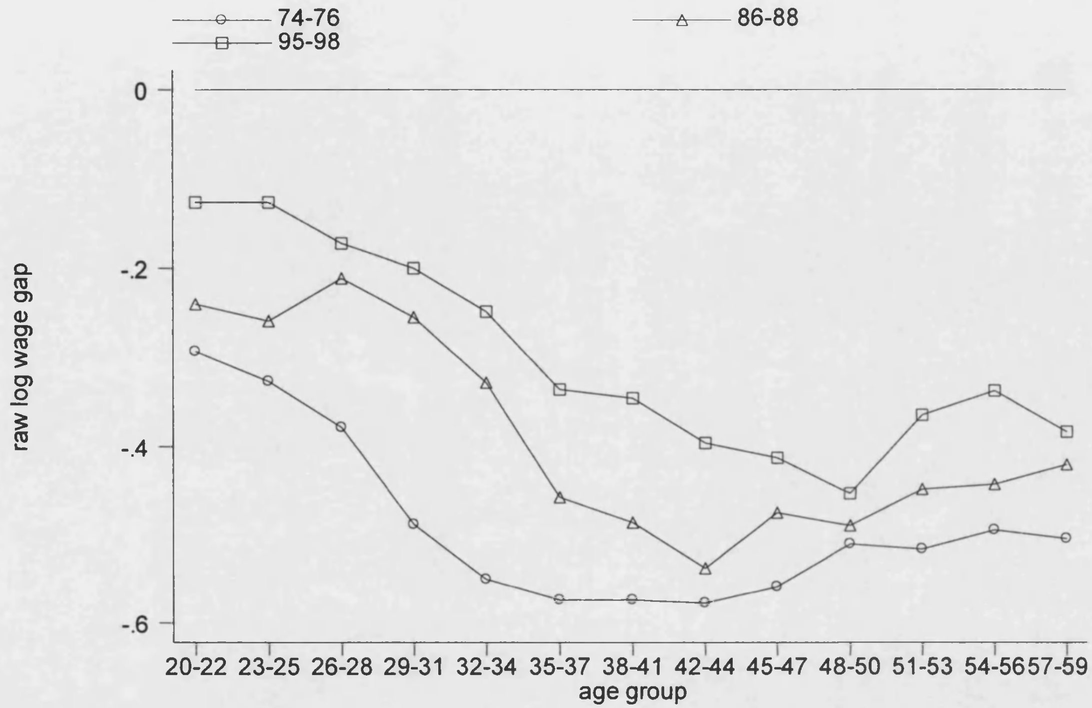


Figure 6.4: Change in the Log Wage Gap by Age

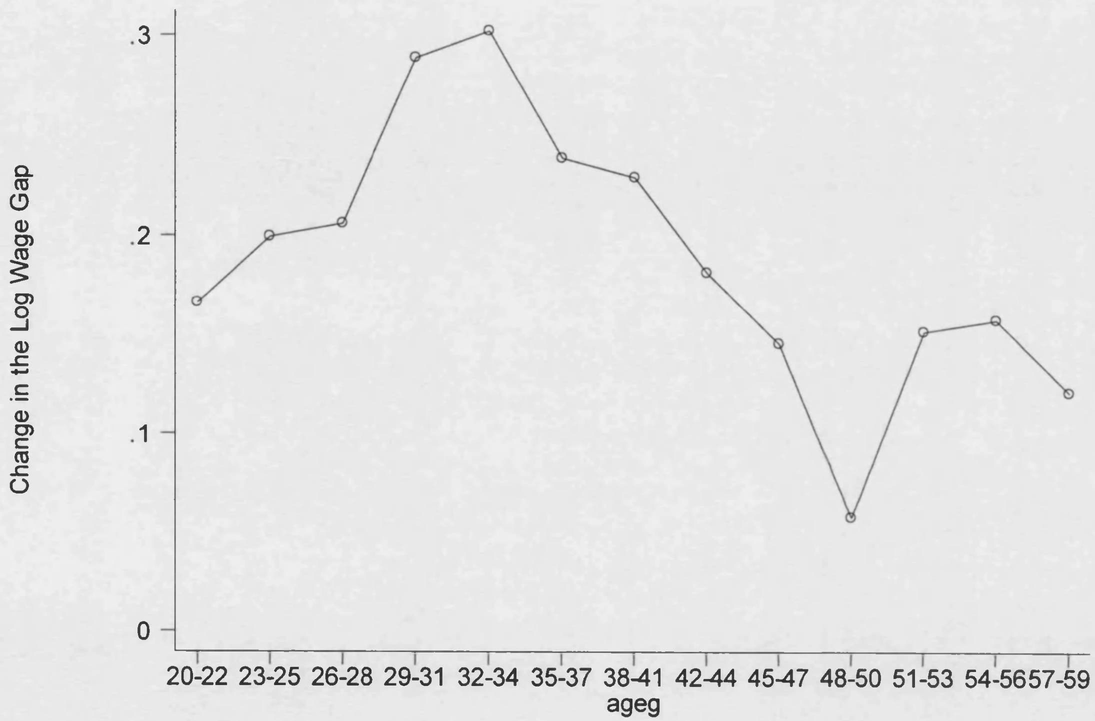


Figure 6.5: Raw and Adjusted Wage Gaps by Age

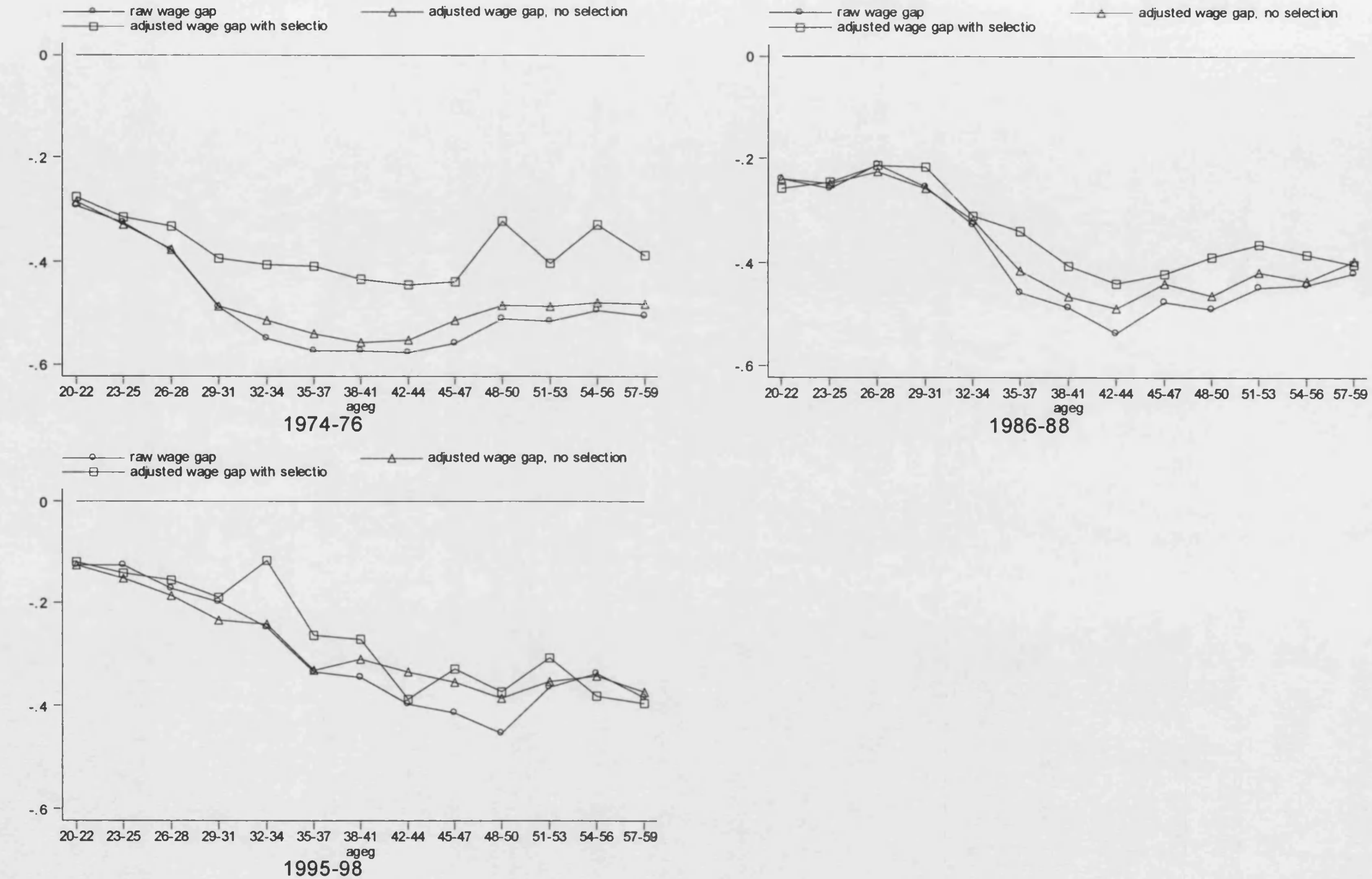


Figure 6.6: Adjusted Wage Gap by Age and Year

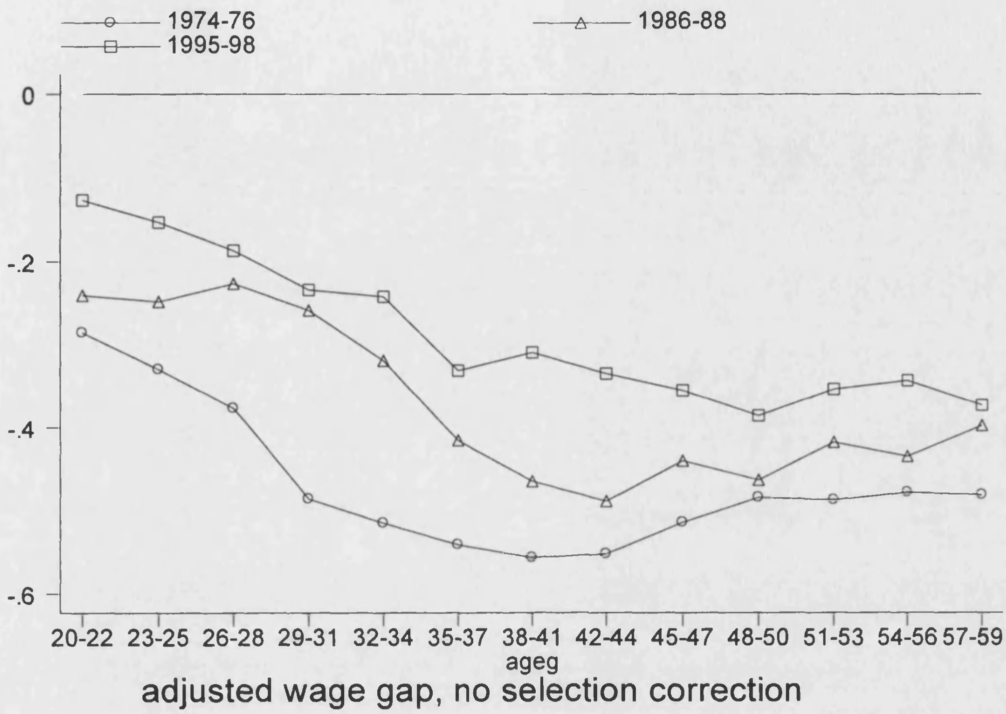


Figure 6.7: Female Share of FT Employment

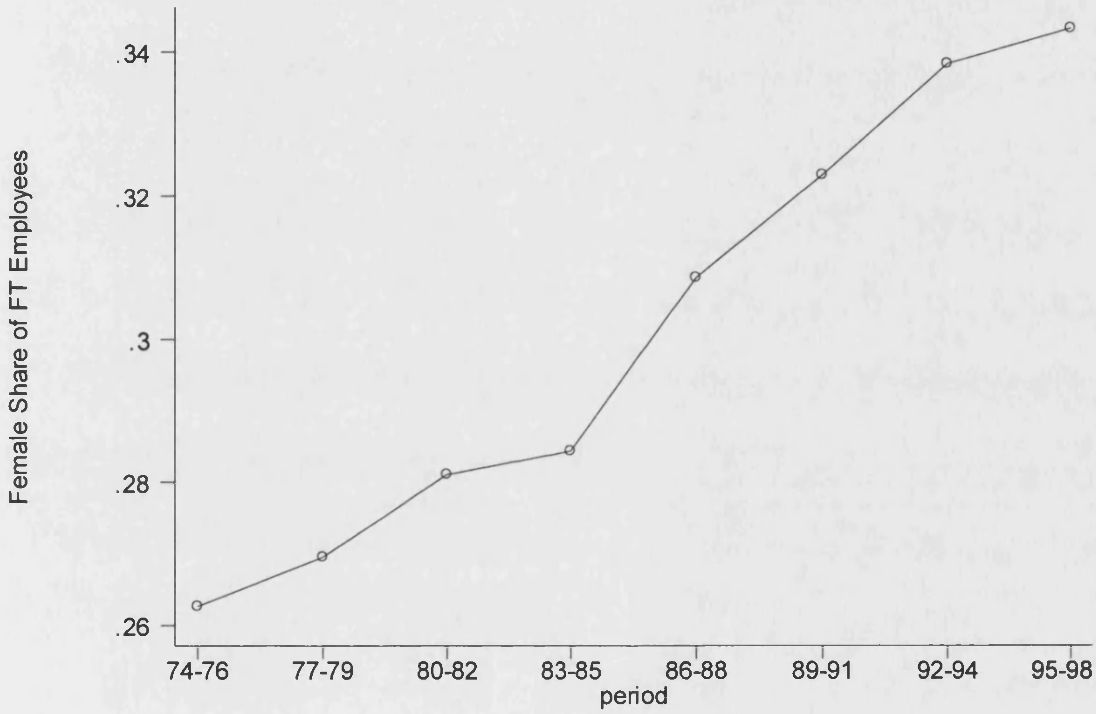


Figure 6.8: Share of Full time Employees who are Female by Age and Year

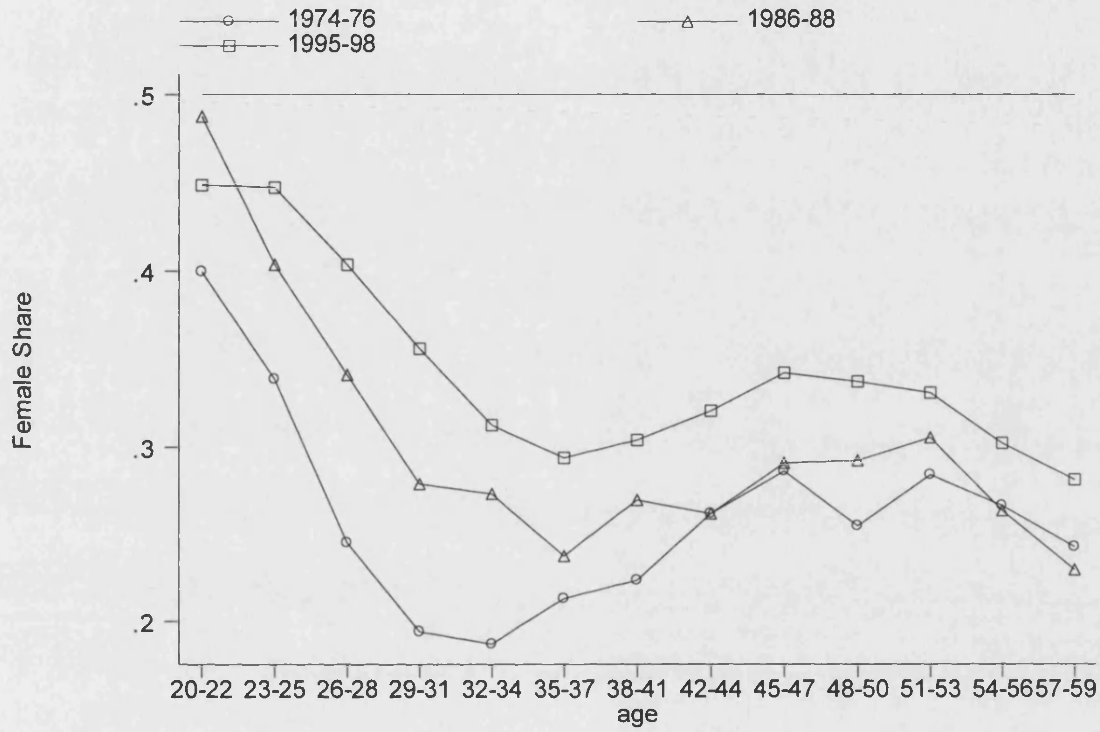


Figure 6.9: Employment shares and wage gaps

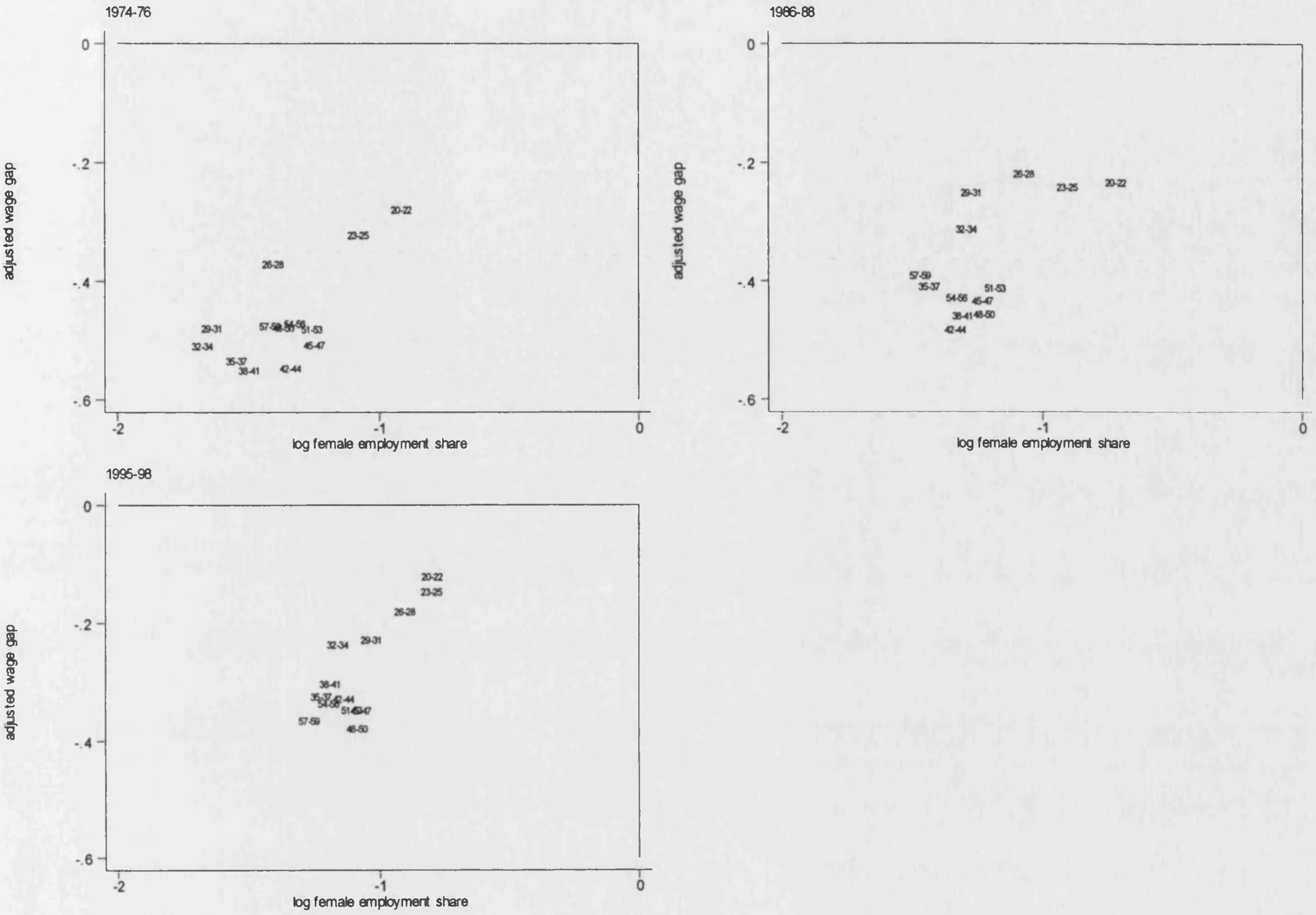


Figure 6.10: Changes in Relative Supplies and the Wage Gap

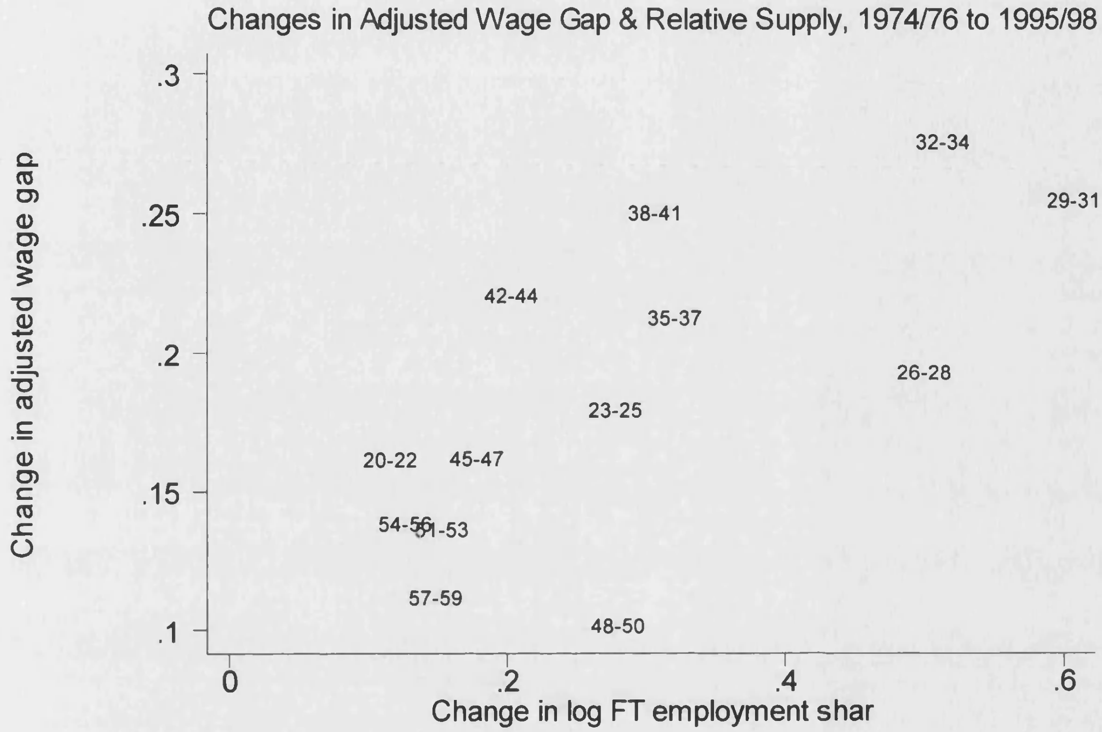


Figure 6.11: Changes in Relative Demand (base year 1974/76)

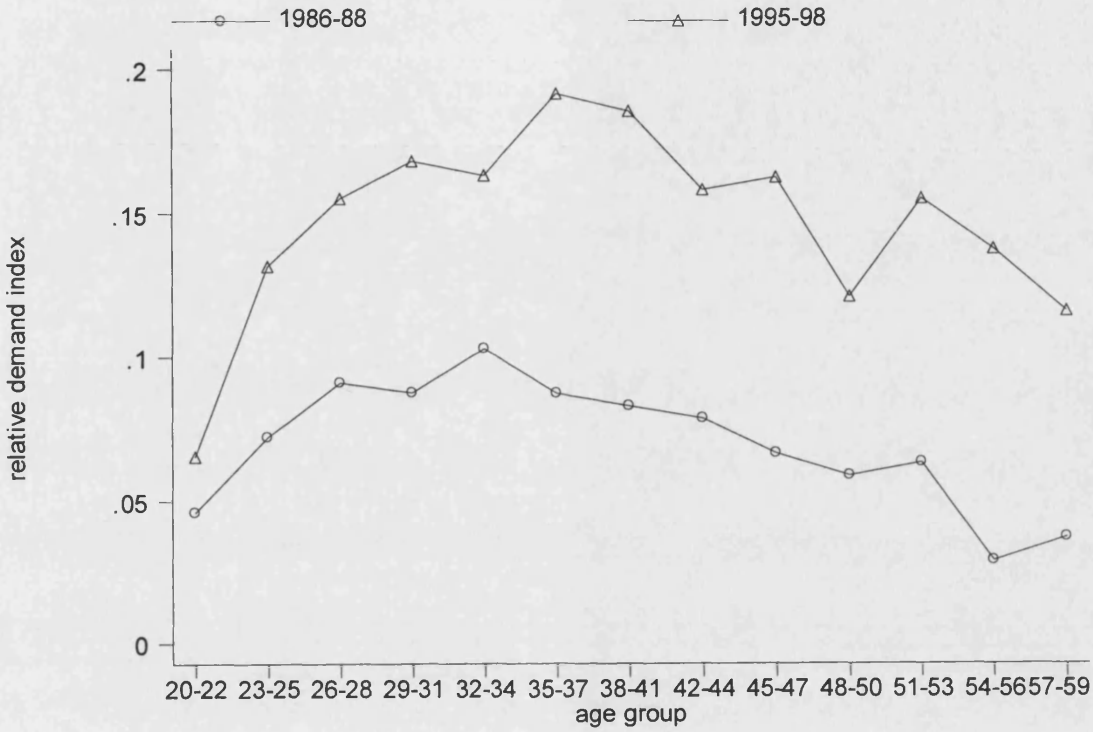


Figure 6.12: Change in Relative Demand and Change in Adjusted Wage Gap, 1995/98

No Selection Correction

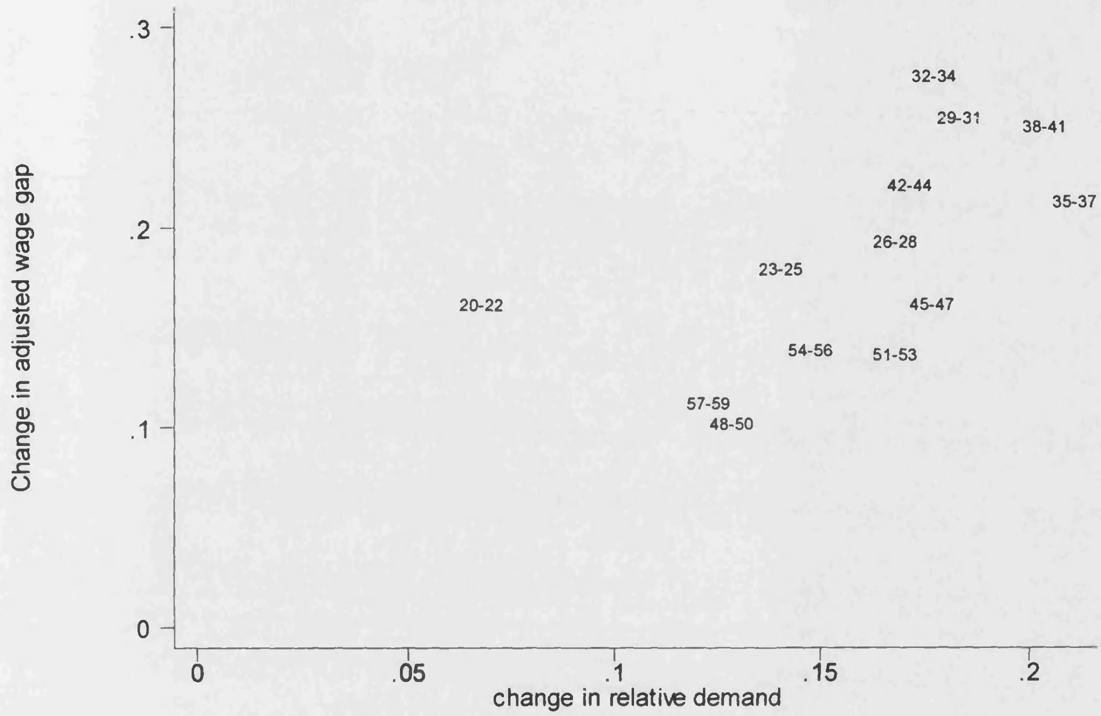


Figure 6.13: Pay Gap by Education

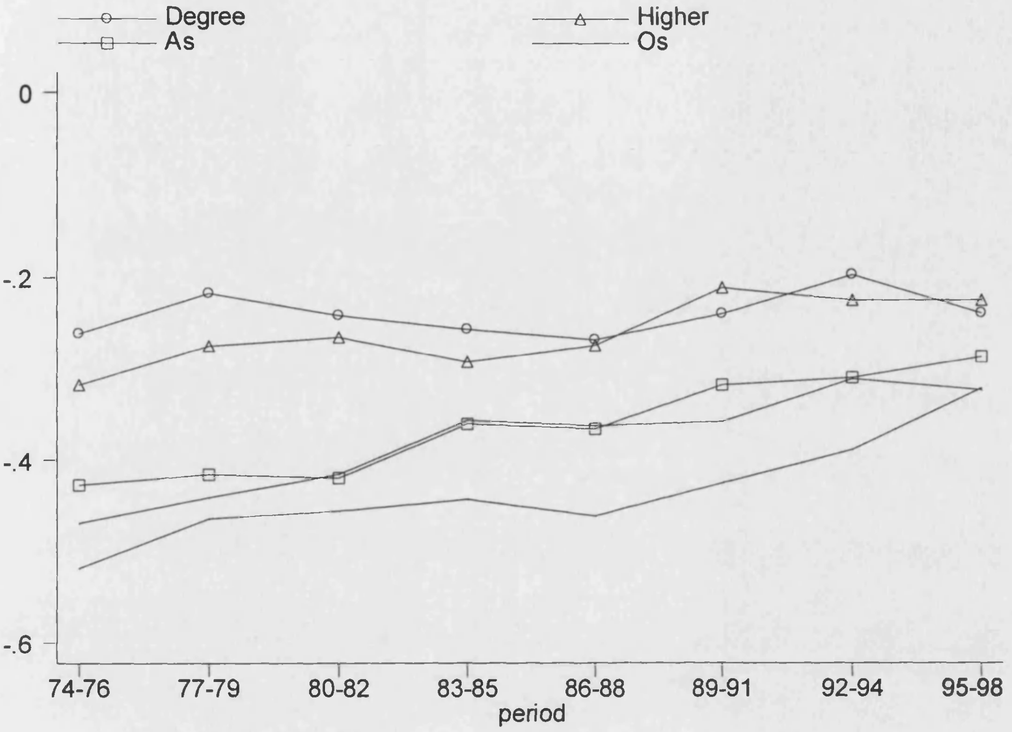


Figure 6.14: Pay Gap by Age and Education

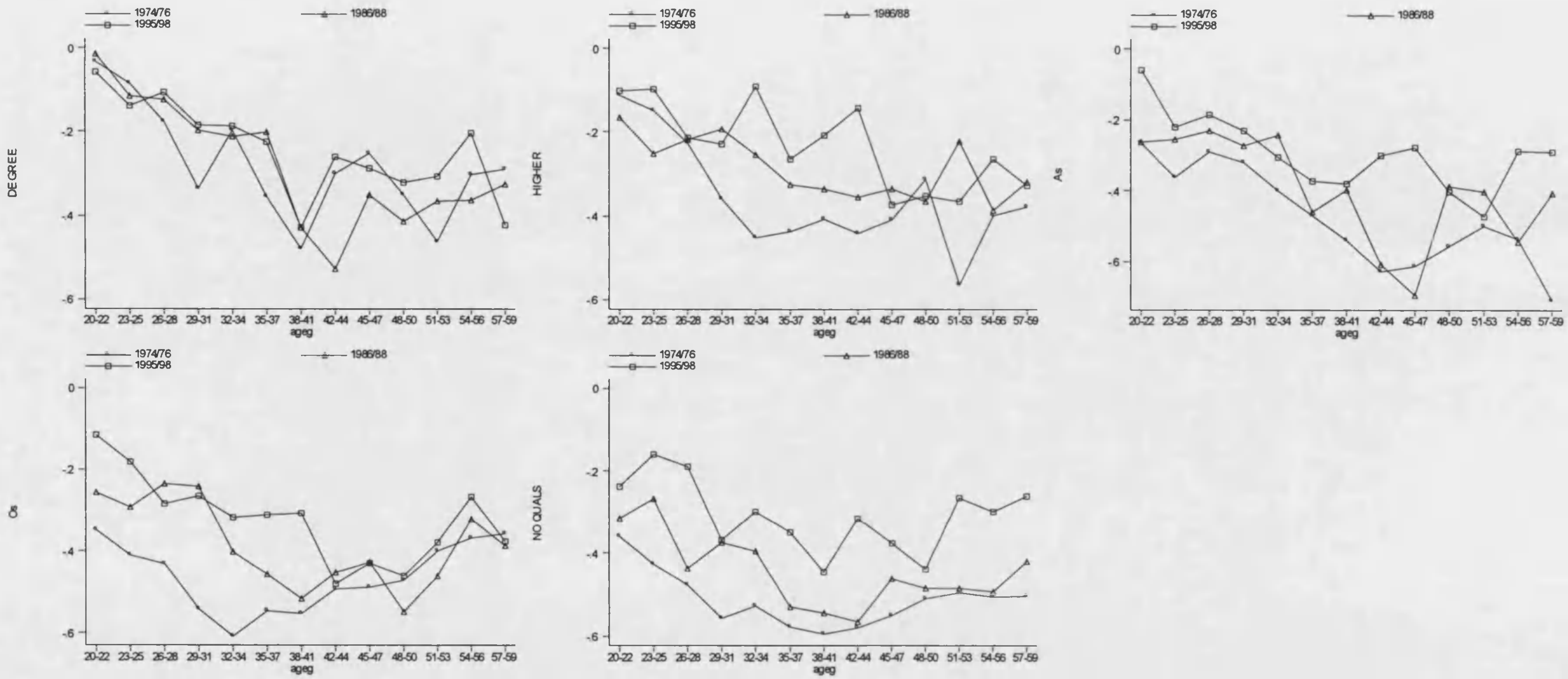


Figure 6.15: FT Employment Rates, Men and Women by Education, 1974/6-95/8

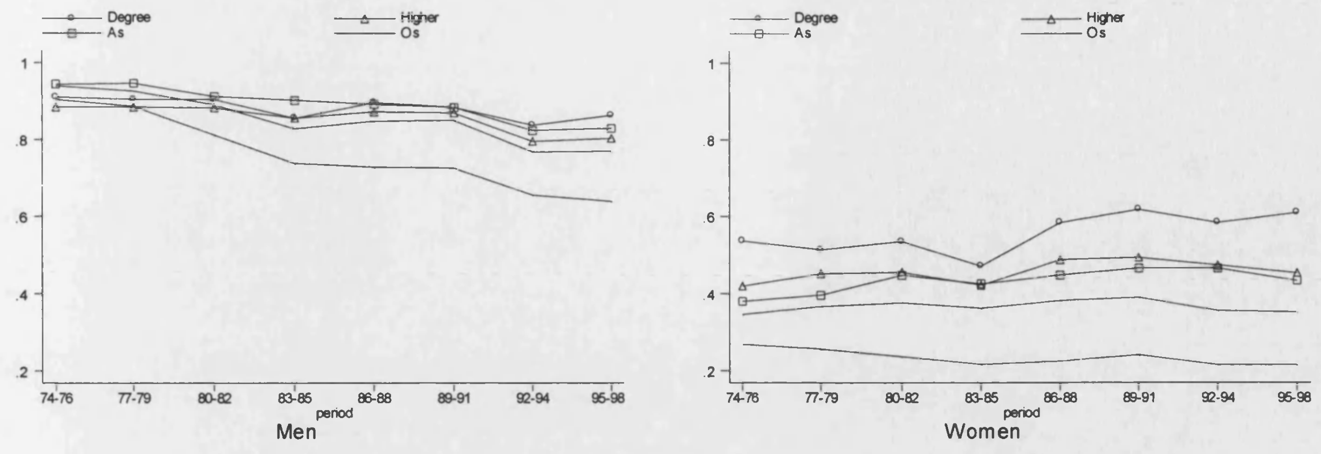


Figure 6.16: Gap in FT Employment Rates for Men and Women by Education, 1974/76-95/98

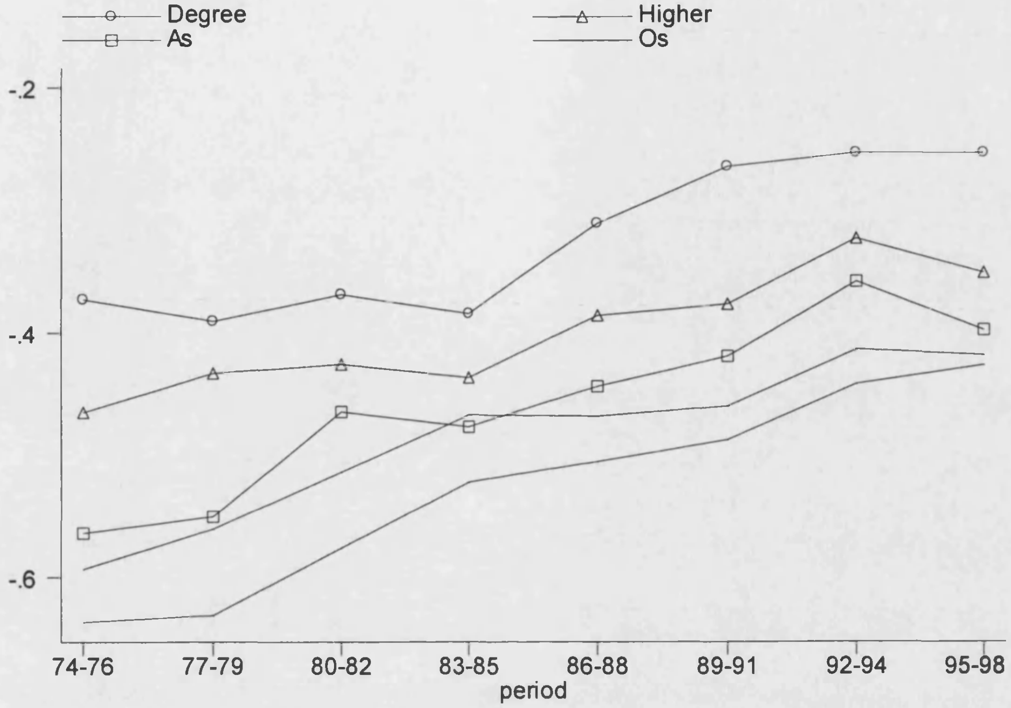


Figure 6.17: Gender Gap in FT Employment by Age; 1974/76, 1986/8 and 1995/98

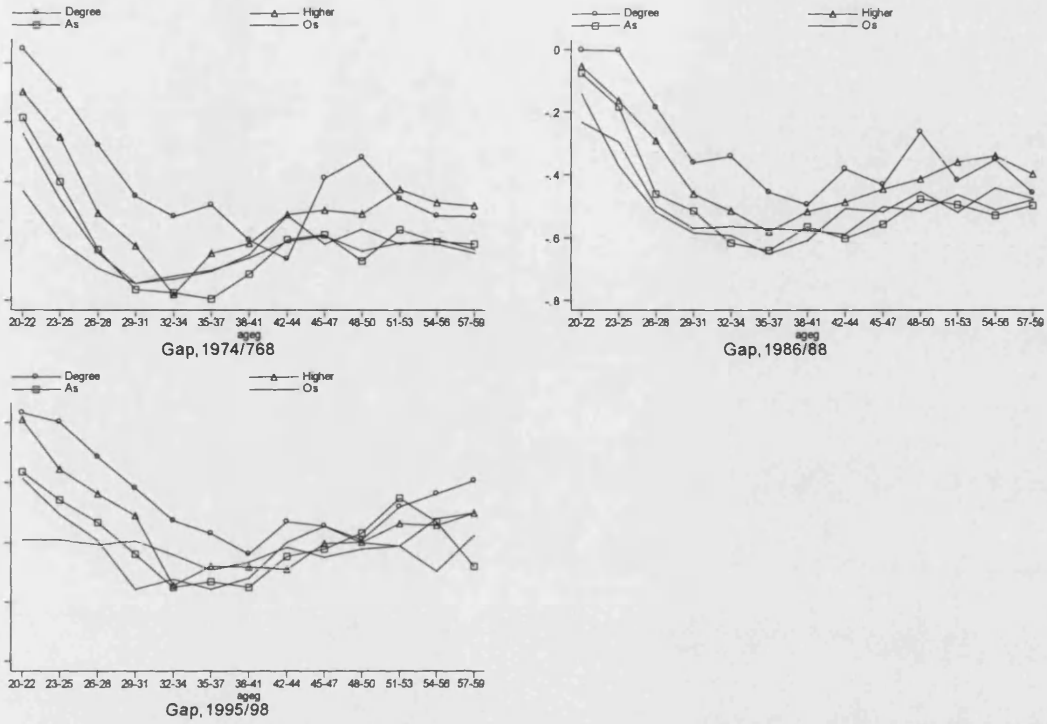


Table 6.1: Raw Wage Gaps

	74-76	*77-79*	*80-82*	*83-85*	*86-88*	*89-91*	*92-94*	*95-98*
Age								
20-22	-.293	-.291	-.272	-.215	-.240	-.182	-.128	-.127
23-25	-.326	-.300	-.271	-.236	-.258	-.218	-.162	-.127
26-28	-.378	-.298	-.270	-.246	-.211	-.198	-.153	-.173
29-31	-.488	-.390	-.361	-.268	-.255	-.251	-.193	-.200
32-34	-.550	-.489	-.416	-.352	-.328	-.300	-.250	-.248
35-37	-.574	-.536	-.496	-.452	-.457	-.356	-.317	-.335
38-41	-.574	-.533	-.534	-.512	-.486	-.417	-.391	-.345
42-44	-.577	-.511	-.474	-.497	-.538	-.444	-.366	-.396
45-47	-.559	-.512	-.515	-.507	-.475	-.449	-.435	-.413
48-50	-.511	-.489	-.457	-.529	-.490	-.463	-.461	-.453
51-53	-.516	-.448	-.469	-.461	-.448	-.439	-.387	-.364
54-56	-.495	-.440	-.414	-.446	-.443	-.453	-.360	-.337
57-59	-.504	-.406	-.404	-.408	-.420	-.362	-.352	-.383

Table 6.2: Adjusted Wage Gap (Standard Errors in Parentheses)

a) No Selection Correction

YEAR /AGE	*74-76*	*77-79*	*80-82*	*83-85*	*86-88*	*89-91*	*92-94*	*95-98*
20-22	-.287	-.289	-.281	-.205	-.238	-.187	-.145	-.103
	(.013)	(.012)	(.013)	(.015)	(.016)	(.017)	(.021)	(.030)
23-25	-.330	-.300	-.276	-.233	-.246	-.222	-.176	-.151
	(.013)	(.012)	(.013)	(.016)	(.015)	(.015)	(.018)	(.024)
26-28	-.377	-.309	-.293	-.258	-.228	-.235	-.184	-.210
	(.014)	(.015)	(.016)	(.017)	(.017)	(.018)	(.018)	(.024)
29-31	-.485	-.387	-.367	-.290	-.258	-.272	-.199	-.230
	(.018)	(.015)	(.018)	(.022)	(.020)	(.021)	(.019)	(.026)
32-34	-.515	-.474	-.401	-.365	-.321	-.307	-.253	-.245
	(.019)	(.017)	(.018)	(.023)	(.022)	(.022)	(.023)	(.030)
35-37	-.543	-.526	-.481	-.417	-.415	-.318	-.284	-.300
	(.020)	(.018)	(.020)	(.023)	(.024)	(.024)	(.025)	(.031)
38-41	-.556	-.512	-.493	-.474	-.465	-.389	-.362	-.330
	(.019)	(.018)	(.020)	(.022)	(.020)	(.023)	(.024)	(.031)
42-44	-.552	-.491	-.449	-.473	-.489	-.405	-.336	-.321
	(.019)	(.018)	(.020)	(.025)	(.024)	(.021)	(.024)	(.029)
45-47	-.515	-.491	-.487	-.490	-.447	-.418	-.404	-.356
	(.019)	(.017)	(.019)	(.025)	(.024)	(.023)	(.023)	(.033)
48-50	-.486	-.407	-.444	-.415	-.416	-.428	-.386	-.367
	(.017)	(.016)	(.020)	(.026)	(.024)	(.027)	(.028)	(.034)
51-53	-.486	-.407	-.444	-.415	-.416	-.428	-.386	-.367
	(.017)	(.016)	(.020)	(.026)	(.026)	(.027)	(.028)	(.034)
54-56	-.477	-.415	-.422	-.418	-.435	-.408	-.370	-.280
	(.018)	(.018)	(.021)	(.027)	(.027)	(.029)	(.031)	(.038)
57-59	-.480	-.399	-.399	-.381	-.397	-.343	-.340	-.316
	(.019)	(.016)	(.018)	(.025)	(.026)	(.028)	(.034)	(.041)

b) With Heckman Selection Correction

YEAR/AGE	*74-76*	*77-79*	*80-82*	*83-85*	*86-88*	*89-91*	*92-94*	*95-98*
20-22	-.277	-.280	-.280	-.204	-.258	-.182	-.153	-.121
	(.014)	(.013)	(.013)	(.021)	(.019)	(.019)	(.022)	(.029)
23-25	-.315	-.286	-.263	-.238	-.245	-.240	-.182	-.142
	(.014)	(.013)	(.013)	(.022)	(.017)	(.018)	(.018)	(.022)
26-28	-.333	-.272	-.265	-.199	-.214	-.243	-.173	-.156
	(.017)	(.017)	(.017)	(.024)	(.021)	(.020)	(.018)	(.023)
29-31	-.394	-.303	-.303	-.207	-.216	-.246	-.154	-.190
	(.024)	(.019)	(.020)	(.035)	(.023)	(.024)	(.021)	(.026)
32-34	-.406	-.433	-.320	-.252	-.310	-.264	-.223	-.118
	(.029)	(.022)	(.026)	(.042)	(.030)	(.029)	(.028)	(.034)
35-37	-.409	-.362	-.418	-.355	-.340	-.232	-.295	-.264
	(.033)	(.030)	(.031)	(.044)	(.039)	(.037)	(.031)	(.036)
38-41	-.435	-.396	-.438	-.384	-.407	-.341	-.345	-.271
	(.032)	(.030)	(.031)	(.042)	(.032)	(.036)	(.033)	(.037)
42-44	-.445	-.399	-.367	-.331	-.440	-.396	-.336	-.387
	(.031)	(.033)	(.034)	(.050)	(.042)	(.030)	(.035)	(.038)
45-47	-.439	-.411	-.411	-.441	-.421	-.412	-.377	-.329
	(.034)	(.032)	(.032)	(.064)	(.041)	(.041)	(.030)	(.045)
48-50	-.324	-.296	-.368	-.470	-.389	-.447	-.514	-.373
	(.038)	(.038)	(.032)	(.061)	(.044)	(.037)	(.042)	(.041)
51-53	-.404	-.346	-.368	-.323	-.364	-.443	-.308	-.307
	(.037)	(.033)	(.037)	(.067)	(.046)	(.048)	(.042)	(.040)
54-56	-.328	-.343	-.401	-.357	-.385	-.429	-.376	-.381
	(.042)	(.037)	(.042)	(.061)	(.053)	(.057)	(.045)	(.047)
57-59	-.388	-.259	-.326	-.320	-.404	-.430	-.409	-.395
	(.047)	(.036)	(.036)	(.067)	(.049)	(.048)	(.050)	(.054)

Table 6.3: Adjusted Pay Gap as a Function of Time, Age and Birth Cohort

	No selection correction						Heckman corrected			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Number Kids						-.069				-.011
						(.037)				(.053)
Married						.157				.148
						(.103)				(.123)
Time trend				.014	.015	.014			-.006	-.006
				(.002)**	(.002)**	(.002)**			(.003)*	(.003)
77-79	.049	.050	.037				.029	.005		
	(.006)**	(.006)**	(.006)**				(.009)**	(.009)		
80-82	.061	.065	.040				.036	-.012		
	(.007)**	(.007)**	(.007)**				(.009)**	(.011)		
83-85	.098	.104	.065				.085	.014		
	(.008)**	(.008)**	(.008)**				(.012)**	(.015)		
86-88	.101	.107	.057				.061	-.033		
	(.007)**	(.009)**	(.009)**				(.010)**	(.015)*		
89-91	.132	.139	.076				.074	-.044		
	(.008)**	(.010)**	(.010)**				(.010)**	(.017)**		
92-94	.177	.192	.104				.119	-.031		
	(.008)**	(.013)**	(.012)**				(.010)**	(.019)		
95-98	.191	.259	.103				.154	-.024		
	(.010)**	(.033)**	(.014)**				(.013)**	(.023)		
23-25	-.021	-.023	-.007	-.008	-.013	-.036	-.015	.010	.011	-.020
	(.008)**	(.010)*	(.008)	(.008)	(.012)	(.027)	(.008)	(.009)	(.009)	(.029)
26-28	-.040	-.039	-.007	-.008	-.015	-.029	-.012	.047	.049	.006
	(.008)**	(.013)**	(.009)	(.009)	(.016)	(.045)	(.009)	(.011)**	(.011)**	(.049)
29-31	-.095	-.091	-.041	-.041	-.050	-.044	-.029	.064	.066	.022
	(.009)**	(.015)**	(.011)**	(.011)**	(.019)**	(.055)	(.010)**	(.014)**	(.014)**	(.064)
32-34	-.148	-.142	-.072	-.074	-.082	-.061	-.082	.048	.048	.007
	(.009)**	(.015)**	(.012)**	(.012)**	(.019)**	(.061)	(.012)**	(.018)**	(.018)**	(.074)
35-37	-.199	-.193	-.106	-.108	-.114	-.091	-.109	.044	.045	.005
	(.010)**	(.014)**	(.014)**	(.014)**	(.018)**	(.060)	(.014)**	(.021)*	(.021)*	(.075)
38-41	-.231	-.229	-.124	-.126	-.131	-.126	-.152	.021	.022	-.019
	(.009)**	(.012)**	(.015)**	(.015)**	(.017)**	(.051)*	(.013)**	(.023)	(.023)	(.064)
42-44	-.219	-.217	-.100	-.103	-.106	-.127	-.156	.036	.035	-.010
	(.009)**	(.012)**	(.016)**	(.015)**	(.017)**	(.043)**	(.014)**	(.025)	(.025)	(.053)
45-47	-.227	-.226	-.097	-.099	-.102	-.150	-.167	.043	.043	-.006
	(.009)**	(.011)**	(.016)**	(.016)**	(.017)**	(.039)**	(.015)**	(.027)	(.026)	(.049)
48-50	-.182	-.184	-.049	-.051	-.054	-.123	-.159	.066	.066	.014
	(.009)**	(.011)**	(.017)**	(.016)**	(.017)**	(.040)**	(.016)**	(.029)*	(.028)*	(.053)
51-53	-.182	-.180	-.046	-.049	-.052	-.131	-.122	.099	.099	.049
	(.009)**	(.011)**	(.017)**	(.017)**	(.018)**	(.040)**	(.016)**	(.029)**	(.029)**	(.055)
54-56	-.173	-.168	-.038	-.040	-.043	-.129	-.121	.104	.106	.056
	(.010)**	(.012)**	(.017)*	(.017)*	(.018)*	(.041)**	(.018)**	(.030)**	(.030)**	(.058)
57-59	-.151	-.140	-.016	-.018	-.022	-.106	-.112	.109	.109	.065
	(.010)**	(.012)**	(.017)	(.017)	(.018)	(.040)**	(.018)**	(.030)**	(.030)**	(.057)
1946-50			.046	.044	.044	.044		.065	.063	.065
			(.009)**	(.009)**	(.010)**	(.010)**		(.014)**	(.014)**	(.014)**
1949-53			.086	.084	.084	.083		.117	.116	.117
			(.011)**	(.011)**	(.011)**	(.011)**		(.016)**	(.016)**	(.017)**
1952-56			.115	.114	.114	.115		.151	.151	.155
			(.012)**	(.012)**	(.012)**	(.013)**		(.018)**	(.018)**	(.019)**
1955-59			.120	.122	.123	.123		.175	.178	.187
			(.013)**	(.013)**	(.013)**	(.017)**		(.020)**	(.020)**	(.024)**
1958-62			.129	.127	.128	.136		.189	.188	.204
			(.015)**	(.015)**	(.015)**	(.021)**		(.023)**	(.023)**	(.029)**
1961-65			.146	.143	.145	.155		.231	.230	.251
			(.016)**	(.016)**	(.017)**	(.025)**		(.026)**	(.026)**	(.034)**
1964-68			.139	.133	.135	.147		.235	.229	.252
			(.018)**	(.018)**	(.019)**	(.028)**		(.029)**	(.029)**	(.038)**
1967-71			.154	.150	.152	.168		.281	.279	.305
			(.021)**	(.021)**	(.021)**	(.030)**		(.032)**	(.032)**	(.041)**
1970-78			.190	.186	.183	.204		.332	.343	.372
			(.025)**	(.024)**	(.026)**	(.035)**		(.037)**	(.036)**	(.046)**
Male inverse		-.056			-.015	-.013				
mills ratio		(.033)			(.022)	(.023)				
Female inverse		-.013			.011	.011				
Mills Ratio		(.015)			(.020)	(.021)				
Constant	-.322	-.286	-.429	-.430	-.436	-.463	-.294	-.446	-.436	-.504
	(.007)**	(.017)**	(.013)**	(.011)**	(.018)**	(.064)**	(.008)**	(.019)**	(.016)**	(.076)**
d.o.f.	84	82	75	81	79	77	84	75	81	79
Adj R2	.920	.920	.963	.956	.955	.956	.731	.843	.829	.827
R^2	.934	.936	.973	.965	.965	.967	.780	.886	.866	.867
Chi squared	197.19	191.44	80.73	104.35	103.91	98.19	203.77	105.89	124.50	123.04
(p value)	(.000)	(.000)	(.305)	(.041)	(.032)	(.052)	(.000)	(.011)	(.001)	(.001)
Log likelihood	228.06	229.59	274.50	261.15	261.37	264.31	194.07	228.11	219.69	220.30

Standard errors in parentheses; * significant at 5%; ** significant at 1%

Table 6.4: Share of Full-time Employees who are Female

	20-22	*23-25*	*26-28*	*29-31*	*32-34*	*35-37*	*38-41*	*42-44*	*45-47*	*48-50*	*51-53*	*54-56*	*57-59*
74-76	.400	.339	.245	.194	.187	.213	.223	.262	.286	.255	.284	.266	.242
77-79	.423	.351	.257	.209	.193	.228	.232	.259	.268	.280	.267	.271	.245
80-82	.444	.372	.287	.249	.200	.218	.239	.264	.277	.270	.281	.272	.242
83-85	.456	.386	.311	.225	.220	.214	.251	.251	.260	.280	.266	.260	.263
86-88	.488	.404	.341	.279	.273	.237	.270	.262	.291	.292	.305	.263	.229
89-91	.453	.421	.353	.306	.283	.268	.294	.304	.305	.326	.288	.281	.259
92-94	.445	.461	.380	.340	.300	.293	.313	.317	.317	.338	.319	.276	.268
95-98	.449	.447	.404	.356	.313	.294	.304	.321	.342	.337	.331	.302	.281
change	.049	.108	.159	.162	.126	.081	.081	.059	.056	.082	.047	.036	.039

Table 6.5: Log Relative Supply Indices

	20-22	23-25	26-28	29-31	32-34	35-37	38-41	42-44	45-47	48-50	51-53	54-56	57-59
74-76	42.04	25.37	-6.99	-30.28	-33.89	-20.96	-16.20	-0.39	8.62	-3.07	7.78	1.36	-8.01
77-79	47.62	28.99	-2.23	-22.91	-30.99	-13.97	-12.63	-1.39	2.14	6.27	1.66	3.00	-6.90
80-82	52.49	34.68	8.80	-5.35	-27.30	-18.50	-9.57	0.59	5.43	2.62	6.90	3.46	-8.12
83-85	55.17	38.51	17.00	-15.50	-17.68	-20.37	-4.40	-4.43	-0.98	6.50	1.44	-1.16	0.20
86-88	61.84	42.93	26.06	5.90	3.85	-10.16	2.57	-0.38	10.13	10.69	15.01	0.26	-13.52
89-91	54.48	47.21	29.45	15.11	7.58	2.03	11.16	14.68	15.04	21.74	9.21	6.92	-1.33
92-94	52.71	56.34	36.94	25.73	13.31	11.03	17.56	18.72	18.66	25.29	19.38	4.81	1.95
95-98	53.57	53.20	42.95	30.42	17.37	11.16	14.53	19.90	26.40	24.94	23.01	13.95	6.78

Note: The log relative supply index is defined as log(Fjt/F75)

Table 6.6: Occupational Distribution of Men and Women, 194-98

Changes in Employment

	74-76	*77-79*	*80-82*	*83-85*	*86-88*	*89-91*	*92-94*	*95-98*
Professional	18.51	19.12	19.51	23.44	26.75	27.82	29.35	30.32
Other non- manual	27.52	28.46	29.7	29.07	29.67	29.93	30.99	30.83
Personal Services	2.26	2.29	2.2	2.46	2.33	2.13	2.05	2.28
Skilled manual	33.3	32.69	32.2	30.13	28.5	27.47	25.48	23.71
Semi-skilled manual	14.57	13.49	12.66	11.41	9.83	9.59	9.12	9.91
Unskilled manual	3.84	3.95	3.73	3.49	2.91	3.06	3	2.94

Weights: Distribution of FT Employment by Age and Sex (percentage)

	Age group												
	20-22	23-25	26-28	29-31	32-34	35-37	38-41	42-44	45-47	48-50	51-53	54-56	57-59
Men													
Professional	9.40	17.29	22.29	26.98	29.29	31.63	31.84	32.36	32.77	31.77	28.32	28.05	25.11
Other non- manual	23.24	23.64	20.89	19.23	18.63	16.32	15.57	15.68	14.53	14.51	14.89	15.64	15.42
Personal Services	1.91	1.13	0.97	0.80	0.66	0.65	0.51	0.60	0.45	0.50	0.60	0.63	0.49
Skilled manual	42.49	39.85	39.93	39.22	38.66	39.07	38.84	38.01	38.41	38.22	38.86	38.10	39.35
Semi-skilled manual	16.06	13.37	12.02	10.72	9.63	9.38	10.21	9.78	10.44	11.43	12.82	12.69	14.35
Unskilled manual	6.90	4.72	3.90	3.05	3.14	2.95	3.03	3.58	3.40	3.56	4.51	4.89	5.28
Women													
Professional	5.07	10.77	15.80	18.02	20.16	18.57	18.61	17.00	16.34	17.01	15.39	14.26	13.97
Other non- manual	69.94	69.14	64.43	59.51	55.26	52.87	50.93	52.72	51.23	50.53	48.26	47.92	45.64
Personal Services	7.23	4.63	3.97	3.87	4.02	4.86	5.1	5.96	6.01	6.46	8	8.07	8.07
Skilled manual	5.46	5.33	6.33	7.15	8.8	9.4	9.79	9.26	9.78	8.98	10.07	10.33	11.62
Semi-skilled manual	11.11	9.19	8.54	10.22	10.08	12.48	12.74	12.7	14.03	13.76	14.77	15.6	15.88
Unskilled manual	1.18	0.94	0.93	1.24	1.68	1.83	2.83	2.37	2.61	3.26	3.51	3.82	4.83

Table 6.7: Change in Log Relative Demand (*100)

Period	*20-22*	*23-25*	*26-28*	*29-31*	*32-34*	*35-37*	*38-41*	*42-44*	*45-47*	*48-50*	*51-53*	*54-56*	*57-*
74-76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
77-79	1.66	1.79	1.77	1.37	1.54	0.98	0.80	0.83	0.87	0.73	0.91	0.71	0.
80-82	4.22	4.75	4.87	4.22	3.44	2.35	1.60	2.69	1.58	2.04	1.49	1.45	1.
83-85	3.64	4.49	5.66	5.74	6.15	4.73	3.88	2.88	3.44	3.32	2.73	3.17	3.
86-88	4.72	7.50	9.54	9.15	10.85	9.14	8.65	8.20	6.89	6.05	6.54	2.94	3.
89-91	3.25	9.20	12.97	11.78	12.86	11.10	9.99	11.00	9.58	9.59	8.77	6.24	3.
92-94	7.17	10.85	15.41	17.44	18.65	14.61	16.53	15.15	13.50	14.69	11.29	12.77	10.
95-98	6.77	14.06	16.79	18.33	17.72	21.11	20.38	17.14	17.66	12.86	16.78	14.77	12.

Note: The log relative demand index is given by $\log(1+\Delta D_k)$; where $\Delta D_k = \sum_j \alpha_{jk}(\frac{\Delta E_j}{E_k})$. α_{jk} is the average share for group k of employment in sector j over the entire period (weighted by the number of full time employees observed in each year), Ej if the share of aggregate employment in sector j, and Ek is the average share of total employment of group k for 1974 to 1998.

Table 6.8: Variance Weighted Least Squares Regression controlling for Supply and Demand

	Adjusted wage Gap, no selection correciton
Log demand	.426
	(.130)**
Log supply	-.074
	(.055)
Kids	-.141
	(.036)**
Married	.040
	(.100)
23-25	.016
	(.026)
26-28	.077
	(.044)
29-31	.103
	(.055)
32-34	.101
	(.060)
35-37	.066
	(.057)
38-41	.013
	(.050)
42-44	-.026
	(.042)
45-47	-.079
	(.038)*
48-50	-.067
	(.041)
51-53	-.100
	(.041)*
54-56	-.108
	(.042)**
57-59	-.092
	(.040)*
1946-50	.048
	(.010)**
1949-53	.087
	(.013)**
1952-56	.116
	(.016)**
1955-59	.119
	(.020)**
1958-62	.129
	(.024)**
1961-65	.147
	(.028)**
1964-68	.142
	(.032)**
1967-71	.175
	(.034)**
1970-78	.222
	(.038)**
Mills Ratio	.029
Male	(.024)
Mills Ratio	-.018
Female	(.021)
Constant	-.328
	(.058)**
d.o.f	76
Adj R2	.945
R^2	.960
Chi squared	121.69
(p value)	(.001)
Log likelihood	253.16

Standard errors in parentheses; * significant at 5%; ** significant at 1%

Table 6.9: Controlling for Levels of Wage Inequality

	Adjusted Wage Gap	*Adjusted Wage Gap*
SD of Log Male Wage	-0.395	-0.057
	(0.119)**	(0.120)
Time Trend	0.022	
	(0.003)**	
Demand index		0.480
		(0.172)**
Log Supply Index		-0.073
		(0.055)
Average number kids	-0.056	-0.142
	(0.037)	(0.036)**
Married	0.163	0.033
	(0.103)	(0.101)
1946-50	0.041	0.047
	(0.010)**	(0.010)**
1949-53	0.082	0.085
	(0.011)**	(0.013)**
1952-56	0.115	0.114
	(0.013)**	(0.016)**
1955-59	0.121	0.116
	(0.017)**	(0.021)**
1958-62	0.137	0.125
	(0.021)**	(0.025)**
1961-65	0.154	0.143
	(0.025)**	(0.029)**
1964-68	0.143	0.138
	(0.028)**	(0.033)**
1967-71	0.163	0.173
	(0.031)**	(0.034)**
1970-78	0.193	0.219
	(0.035)**	(0.039)**
23-25	-0.045	0.016
	(0.028)	(0.026)
26-28	-0.037	0.078
	(0.045)	(0.044)
29-31	-0.050	0.105
	(0.055)	(0.055)
32-34	-0.066	0.104
	(0.061)	(0.060)
35-37	-0.088	0.070
	(0.060)	(0.058)
38-41	-0.118	0.016
	(0.051)*	(0.051)
42-44	-0.109	-0.022
	(0.043)*	(0.043)
45-47	-0.124	-0.075
	(0.040)**	(0.040)
48-50	-0.093	-0.063
	(0.041)*	(0.042)
51-53	-0.102	-0.096
	(0.041)*	(0.041)*
54-56	-0.094	-0.104
	(0.043)*	(0.043)*
57-59	-0.070	-0.088
	(0.041)	(0.041)*
Male IMR mean	-0.009	0.029
	(0.023)	(0.024)
Female IMR mean	0.009	-0.018
	(0.021)	(0.021)
Constant	-0.368	-0.305
	(0.070)**	(0.076)**
d.o.f	76	75
Adj R2	.961	121.5
R^2	.971	94.9
Chi squared	87.19	96.0
(p value)	(.179)	(.001)
Log likelihood	270.5	253.2

Standard errors in parentheses; * significant at 5%; ** significant at 1%

Table 6.10: Comparing Measures of the Pay Gap by Age and Year

	74-76	77-79	80-82	83-85	86-88	89-91	92-94	95-98
20-22	-.286	-.292	-.278	-.202	-.241	-.189	-.144	-.097
	-.287	-.289	-.281	-.205	-.238	-.187	-.145	-.103
23-25	-.324	-.303	-.308	-.233	-.247	-.222	-.173	-.149
	-.330	-.300	-.276	-.233	-.246	-.222	-.176	-.151
26-28	-.375	-.308	-.287	-.257	-.224	-.232	-.183	-.206
	-.377	-.309	-.293	-.258	-.228	-.235	-.184	-.210
29-31	-.484	-.388	-.363	-.286	-.255	-.267	-.195	-.232
	-.485	-.387	-.367	-.290	-.258	-.272	-.199	-.230
32-34	-.517	-.475	-.404	-.370	-.326	-.303	-.252	-.255
	-.515	-.474	-.401	-.365	-.321	-.307	-.253	-.245
35-37	-.543	-.526	-.481	-.419	-.419	-.324	-.285	-.304
	-.543	-.526	-.481	-.417	-.415	-.318	-.284	-.300
38-41	-.556	-.512	-.492	-.475	-.467	-.395	-.359	-.323
	-.556	-.512	-.493	-.474	-.465	-.389	-.362	-.330
42-44	-.549	-.486	-.448	-.475	-.492	-.407	-.338	-.328
	-.552	-.491	-.449	-.473	-.489	-.405	-.336	-.321
45-47	-.517	-.488	-.487	-.489	-.445	-.426	-.407	-.359
	-.515	-.491	-.487	-.490	-.447	-.418	-.404	-.356
48-50	-.482	-.461	-.447	-.488	-.468	-.432	-.435	-.402
	-.486	-.407	-.444	-.415	-.416	-.428	-.386	-.367
51-53	-.486	-.409	-.444	-.412	-.409	-.427	-.387	-.364
	-.486	-.407	-.444	-.415	-.416	-.428	-.386	-.367
54-56	-.479	-.416	-.419	-.416	-.433	-.406	-.368	-.287
	-.477	-.415	-.422	-.418	-.435	-.408	-.370	-.280
57-59	-.479	-.397	-.397	-.380	-.395	-.344	-.339	-.305
	-.480	-.399	-.399	-.381	-.397	-.343	-.340	-.316

Table 6.11: Variance Weighted Least Squares using the Oaxaca Gender Pay Gap

	Gender Gap measured as Coefficient on female	*Oaxaca decomposition wage gap*	*Gender Gap Measured as Coefficient on female*	*Oaxaca decomposition wage gap*
period	.014	.015		
	(.002)**	(.002)**		
Demand index			.522	.608
			(.129)**	(.110)**
Supply Index			-.069	-.040
			(.067)	(.065)
Kids	-.072	-.061	-.133	-.114
	(.039)	(.038)	(.044)**	(.043)*
Married	.147	.212	.057	.133
	(.111)	(.128)	(.124)	(.142)
23-25	-.028	-.056	.001	-.042
	(.026)	(.031)	(.029)	(.035)
26-28	-.017	-.055	.050	-.013
	(.042)	(.047)	(.047)	(.055)
29-31	-.028	-.072	.070	-.003
	(.052)	(.057)	(.059)	(.068)
32-34	-.045	-.099	.067	-.020
	(.059)	(.062)	(.066)	(.074)
35-37	-.077	-.131	.036	-.051
	(.059)	(.062)*	(.065)	(.072)
38-41	-.114	-.163	-.014	-.094
	(.051)*	(.056)**	(.057)	(.065)
42-44	-.119	-.165	-.047	-.118
	(.044)**	(.049)**	(.048)	(.056)*
45-47	-.143	-.189	-.096	-.163
	(.041)**	(.047)**	(.046)*	(.054)**
48-50	-.118	-.199	-.081	-.181
	(.043)**	(.049)**	(.049)	(.056)**
51-53	-.126	-.168	-.111	-.167
	(.044)**	(.050)**	(.050)*	(.056)**
54-56	-.125	-.154	-.117	-.156
	(.045)**	(.050)**	(.051)*	(.057)**
57-59	-.102	-.127	-.099	-.129
	(.043)*	(.048)**	(.049)*	(.054)*
1946-50	.044	.034	.046	.036
	(.011)**	(.011)**	(.013)**	(.013)**
1949-53	.083	.073	.086	.071
	(.012)**	(.012)**	(.016)**	(.015)**
1952-56	.113	.108	.114	.101
	(.014)**	(.015)**	(.019)**	(.018)**
1955-59	.121	.120	.119	.109
	(.018)**	(.018)**	(.025)**	(.023)**
1958-62	.132	.134	.129	.117
	(.023)**	(.023)**	(.031)**	(.029)**
1961-65	.150	.148	.149	.135
	(.027)**	(.027)**	(.036)**	(.034)**
1964-68	.142	.136	.146	.125
	(.030)**	(.031)**	(.040)**	(.039)**
1967-71	.163	.153	.182	.156
	(.032)**	(.034)**	(.042)**	(.042)**
1970-78	.205	.208	.222	.218
	(.037)**	(.037)**	(.045)**	(.043)**
Constant	-.448	-.474	-.344	-.362
	(.065)**	(.070)**	(.071)**	(.077)**
d.o.f	79	79	78	78
Adj R2	.957		.946	.939
R^2	.967		.959	.954

Standard errors in parentheses; * significant at 5%; ** significant at 1%

Table 6.12: VWLS Regression of Gender Pay Gap by Education Group

	Degree	*Higher*	*As*	*Os*	*No quals*
Period	-0.009	0.005	0.028	-0.000	0.012
	(0.010)	(0.006)	(0.008)**	(0.004)	(0.003)**
Kids	-0.073	-0.233	0.145	-0.048	-0.084
	(0.106)	(0.081)**	(0.117)	(0.085)	(0.065)
Married	-0.006	0.795	-0.253	0.013	0.102
	(0.175)	(0.219)**	(0.270)	(0.217)	(0.247)
23-25	-0.004	-0.264	0.025	-0.013	-0.036
	(0.051)	(0.073)**	(0.077)	(0.058)	(0.052)
26-28	0.017	-0.391	0.030	0.032	-0.041
	(0.089)	(0.120)**	(0.123)	(0.096)	(0.073)
29-31	-0.005	-0.350	-0.061	0.049	-0.082
	(0.130)	(0.146)*	(0.150)	(0.122)	(0.086)
32-34	0.017	-0.321	-0.135	0.001	-0.071
	(0.166)	(0.166)	(0.168)	(0.139)	(0.091)
35-37	0.062	-0.303	-0.268	0.012	-0.103
	(0.192)	(0.176)	(0.177)	(0.143)	(0.092)
38-41	-0.091	-0.288	-0.279	0.003	-0.143
	(0.205)	(0.173)	(0.171)	(0.133)	(0.081)
42-44	-0.008	-0.344	-0.306	0.024	-0.132
	(0.203)	(0.168)*	(0.160)	(0.116)	(0.076)
45-47	-0.008	-0.447	-0.251	0.029	-0.156
	(0.188)	(0.154)**	(0.153)	(0.102)	(0.081)
48-50	-0.067	-0.462	-0.209	0.005	-0.171
	(0.168)	(0.142)**	(0.157)	(0.099)	(0.086)*
51-53	-0.090	-0.519	-0.085	0.053	-0.146
	(0.161)	(0.143)**	(0.157)	(0.100)	(0.088)
54-56	-0.091	-0.528	-0.111	0.090	-0.154
	(0.156)	(0.141)**	(0.169)	(0.101)	(0.092)
57-59	-0.030	-0.529	0.026	0.094	-0.133
	(0.155)	(0.135)**	(0.165)	(0.100)	(0.090)
1946-50	0.055	0.076	0.013	0.058	0.003
	(0.035)	(0.025)**	(0.035)	(0.020)**	(0.017)
1949-53	0.104	0.095	0.021	0.096	0.034
	(0.042)*	(0.029)**	(0.037)	(0.022)**	(0.020)
1952-56	0.143	0.110	0.032	0.143	0.056
	(0.051)**	(0.033)**	(0.043)	(0.026)**	(0.024)*
1955-59	0.097	0.147	0.026	0.178	0.069
	(0.061)	(0.041)**	(0.049)	(0.032)**	(0.029)*
1958-62	0.101	0.192	-0.004	0.207	0.036
	(0.071)	(0.048)**	(0.057)	(0.037)**	(0.042)
1961-65	0.150	0.146	-0.014	0.235	0.146
	(0.078)	(0.053)**	(0.066)	(0.042)**	(0.058)*
1964-68	0.151	0.168	-0.046	0.227	0.097
	(0.086)	(0.057)**	(0.072)	(0.049)**	(0.069)
1967-71	0.093	0.222	0.008	0.279	0.096
	(0.096)	(0.064)**	(0.078)	(0.049)**	(0.085)
1970-78	0.189	0.200	-0.057	0.344	0.060
	(0.111)	(0.069)**	(0.087)	(0.055)**	(0.105)
Constant	-0.180	-0.389	-0.324	-0.478	-0.396
	(0.076)*	(0.072)**	(0.109)**	(0.116)**	(0.137)**
Chi Squared	80.1	78.6	64.5	100.7	104.3
(p value)	(.423)	(.493)	(.880)	(.051)	(.030)
Adj R2	.648	.723	.816	.840	.753
R2	.730	.787	.859	.877	.811

Appendix

Table A6.1: Sample Sizes

Period	74-76	77-79	80-82	83-85	86-88	89-91	92-94	95-98
Age								
20-22	2,057	2,175	2,065	1,610	1,691	1,405	1,012	688
23-25	2,050	2,131	1,999	1,640	1,885	1,771	1,400	1,155
26-28	2,182	1,895	1,748	1,486	1,617	1,674	1,490	1,396
29-31	1,900	2,098	1,592	1,373	1,493	1,480	1,405	1,378
32-34	1,675	1,814	1,739	1,281	1,350	1,343	1,281	1,315
35-37	1,588	1,520	1,580	1,472	1,334	1,291	1,207	1,299
38-41	1,682	1,588	1,484	1,313	1,568	1,268	1,197	1,199
42-44	1,626	1,584	1,454	1,128	1,370	1,550	1,166	1,176
45-47	1,755	1,557	1,400	1,056	1,231	1,341	1,287	1,147
48-50	1,737	1,544	1,354	1,012	1,133	1,176	1,219	1,201
51-53	1,821	1,678	1,420	965	1,032	958	879	1,055
54-56	1,828	1,571	1,289	942	946	948	740	803
57-59	1,791	2,025	1,690	1,150	1,047	930	780	741

Table A6.2: Observations by Year / Cohort and Period / Age

Period	74-76	77-79	80-82	83-85	86-88	89-91	92-94	95-98	Number obs.
Year of Birth Cohort									
15-20	1								1
19-23	1	1							2
22-26	1	1	1						3
25-29	1	1	1	1					4
28-32	1	1	1	1	1				5
31-35	1	1	1	1	1	1			6
34-38	1	1	1	1	1	1	1		7
37-41	1	1	1	1	1	1	1	1	8
40-45	1	1	1	1	1	1	1	1	8
43-48	1	1	1	1	1	1	1	1	8
46-51	1	1	1	1	1	1	1	1	8
49-54	1	1	1	1	1	1	1	1	8
52-57	1	1	1	1	1	1	1	1	8
55-60		1	1	1	1	1	1	1	7
58-63			1	1	1	1	1	1	6
61-66				1	1	1	1	1	5
64-69					1	1	1	1	4
67-72						1	1	1	3
70-75							1	1	2
73-78								1	1

Age	20-22	23-25	26-28	29-31	32-34	35-37	38-41	42-44	45-47	48-50	51-53	54-56	57-59	No. obs.
Year of Birth Cohort														
15-20													1	1
19-23												1	1	2
22-26											1	1	1	3
25-29										1	1	1	1	4
28-32									1	1	1	1	1	5
31-35								1	1	1	1	1	1	6
34-38							1	1	1	1	1	1	1	7
37-41						1	1	1	1	1	1	1	1	8
40-45					1	1	1	1	1	1	1	1		8
43-48				1	1	1	1	1	1	1	1			8
46-51			1	1	1	1	1	1	1	1				8
49-54		1	1	1	1	1	1	1	1					8
52-57	1	1	1	1	1	1	1	1						8
55-60	1	1	1	1	1	1	1							7
58-63	1	1	1	1	1	1								6
61-66	1	1	1	1	1									5
64-69	1	1	1	1										4
67-72	1	1	1											3
70-75	1	1												2
73-78	1													1

CHAPTER SEVEN
CONCLUSION

This thesis provides an account of some the major changes in patterns of female employment in the UK over the last thirty years. It also provides some evidence on how the labour market experience of British women differed from that of women in other industrialised countries in the 1990s. Major trends in employment and earnings have been reviewed, and particular attention has been paid to the employment experience of women at different points of the wage distribution, across qualification groups and for full and part-time workers.

In the second chapter, the evolution of the full-time female/male wage gap in Britain was analysed using microeconomic data. A significant closing of the average gender wage gap was observed between the early 1970s and late 1990s, with most of the improvement occurring in the late 1980s and 1990s. Among the full-timers studied the weekly wage gap rose from around 64 percent in 1978 up to 74 percent by 1998. After estimating a range of regression models controlling for detailed characteristics we find a weekly wage ratio as high as 86 percent in 1998. However, as this time period also saw large rises in wage inequality, and to properly consider women's relative wage position it is also necessary to look at the impact of rising wage inequality on the gender wage gap. Decompositions based on the full wage distribution show that rising wage inequality limited the closing of the gender wage gap: had the structure of wages been the same in the 1990s as in the mid-1970s the gender wage differential would have closed by twice as much. The estimates also suggest that, even with the observed closing of the gender wage gap, by 1998 women were still paid substantially less than men in otherwise comparable jobs (the "corrected" weekly wage gap was about 86 percent in 1998).

Chapter 6.2 looked only at full-time employees. Chapter 6.3 goes on to consider the position of those working part-time. Since the 1980s a substantial gap has emerged between the pay of full and part time female employees. In 1994-5 part-time women earned only 69 percent of the full-time female wage. This gap appears to have emerged largely because part-time employees are now considerably less well qualified than those working full time. Indeed this research indicates that there is little or no part-time pay penalty *per se*. Part time jobs appear to be increasingly dichotomously distributed - with the top one fifth of part timers in highly paid professional jobs while the majority of workers are stuck in low paid, low skill jobs. However, we have also reported evidence that suggests that many women working full time would prefer to work part time, but may be unable to do so because part-time employment is not available in more highly skilled jobs. This constraint on part-time work may exacerbate the observed gap between full- and part-time pay. The most immediate policy implication to be drawn from this research is that policies should be put in place to improve opportunities for those women who want to work part time. Policies, such as the right to return to work part time after maternity leave, would go some way towards improving the quality of part time jobs on offer.

Children are assumed to be an important factor in determining the size of the gender pay gap. Using data from seven countries, we examine whether the pay penalty to motherhood found in Anglo-American countries is reproduced in other countries. The results for the seven countries examined indicate that, controlling for differences in earnings-related characteristics, the effect of children on women's pay is largest in the United Kingdom, followed by the other Anglo-American countries and Germany, and smallest in the Nordic countries. The fact that the "family gap" in pay is not observed in other countries suggests that policy measures can be effective in mitigating the negative impact of children on pay, and moreover that such policy responses are essential if the gender pay gap is to close.

In Chapter Five, changes in returns to education are examined by gender. The 1970s and 1980s saw rapid increases in the supply of more educated workers. However, throughout the 1980s and 1990s simultaneously rising relative wages and employment were observed for the more educated. This suggests that relative demand rose faster than relative supply, as employers both demanded more educated workers and, at the same time, were prepared to pay them relatively higher wages. Indeed, changes in relative wages by education show very clearly that changes in demand have dominated changes in supply, particularly when one considers differences by gender. It is well known that the male/female wage differential has fallen in recent years, despite increases in female labour force participation (Harkness, 1996). In this chapter show that, while relative demand shifts in favour of the more highly educated have occurred for both sexes, they are more marked for women than for men (with the exception of recent labour market entrants where gender differences are less marked). In particular, there seem to have been very big demand shifts in favour of female graduates with degrees in science and engineering (and, to a lesser extent, in social studies and business). Finally, when we investigate whether one can identify a gender bias associated with skill biased technological change we find little evidence of such an effect. Faster skill upgrading appears to have occurred in much the same industries for men and women and correlations of industrial skill upgrading with computer usage seem to be similar across the sexes. This probably suggests that the gender earnings gap has been closing as a result of reduced discrimination, which has enabled women to improve their labour market position in terms of both wages and employment, and has lead to faster relative demand shifts for women than for men. We have only scratched the surface on this important question and clearly the extent to which faster relative demand shifts do reflect reduced discrimination rather than a gender bias in SBTC is worthy of more investigation in future. So is the possible substitution of men and women across the skills hierarchy. The comparisons we draw here look at men and women separately. A potentially important aspect of recent changes in labour market structure may be the extent to which more skilled women are substituting for less skilled men (given that according to estimates of wage equations women are still, *ceteris paribus*, cheaper to employ than men within a given skill group. In the final chapter,

The final chapter examined the impact of age, time and year of birth cohort on the gender pay gap between 1974 and 1998. At all ages, differences in characteristics account for only a small part of the gender pay gap, although they are most important in explaining earnings differences for older women in the 1970s and early 1980s. Age earnings profiles show that the gender pay gap widens considerably between the ages of 20 and 30. Over the last 20 years however, the gender pay gap has grown more gradually with age, and this is reflected in comparatively large improvements in the relative earnings of women in their late 20s and 30s. Thus the greatest improvements in relative earnings over this period have been for those in their late 20s and early 30s, the ages when women have typically taken the most time out of the labour market to care for children.

There are important cohort effects, with successive birth cohort earning relatively more from the late 1940s onwards. Once controls for birth cohorts are introduced, the negative impact of ageing on the pay gap is considerably reduced. Inclusion of controls for year of birth cohort also considerably reduces the importance of time in reducing the pay gap. Shifts in the occupational structure of demand have also had an important impact on reducing the pay gap. However, surprisingly, controlling for the average number of children has no statistically significant effect. Finally, the employment and earnings experience of women has varied considerably across education groups. While the less qualified still earn much less, and are much less likely to work full time, compared to comparably qualified men, than women with degrees, those with lower skills have seen the largest improvements in their relative position. This may be in large part due to the declining fortunes of low skilled men. The model estimated suggests that while relative earnings decline with age for the more educated, this is less true of the low skilled. Cohort effects, on the other hand, appear to be most important for those with intermediate levels of qualifications. In particular, those with no qualifications and those with degrees have seen little change in relative earnings across cohorts. This could be due to compositional changes in those who achieve these levels of qualifications. Finally, the time period dummy suggests that relative earnings have improved over time only for those qualified to A level or with no qualifications. For the latter group, this time trend may reflect the declining fortunes of low skilled men.

APPENDIX 1
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