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Women & Equality Unit

The impact of women's position in the labour market on pay and implications for UK productivity

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Women & Equality Unit

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Introduction

This report investigates the impact of women's position in the labour market on women's pay and considers the implications for UK productivity and productivity growth. Gender relations in employment have often been addressed in terms of equity, justice and discrimination. The focus here is rather on whether and if so the extent to which women's position in employment has implications not only for their pay, but also the UK's productivity and economic performance.

The government has identified problems of skills deficits and market failures as important barriers to raising productivity to the level of competitor countries. These problems have a gender dimension. The skills deficits are gendered in that women have lower levels of educational qualifications than men do. Failures in the market for labour, stemming from out-moded rigidities due to occupational sex segregation and discrimination against women which limit the flexibility needed to enable women to combine caring and employment so as to achieve work/life balance, prevent the most effective deployment of labour. Well-functioning labour markets reward workers according to their performance and skill. When markets for labour fail, this interferes with the best allocation of resources and lowers the productivity of the British economy.

The report discusses some of the gender implications of the different ways of measuring productivity. It reviews the literature relevant to understanding the causes of the gender pay gap and tries to draw some tentative conclusions about how analysis of the gender pay gap can inform our understanding of the UK's economic performance, in particular our levels of productivity. Original statistical analysis of the British Household Panel Survey is conducted in order to identify the relative size of the components of the gender pay and productivity gap. Data collected in a new national survey reports on women's occupational mobility over childbirth and childcare and women's own perceptions of the barriers to their more productive employment.

Why productivity matters

> *Productivity is the largest single component of economic growth. So raising the productivity performance of the British economy and making progress towards closing the productivity gap with our international partners is vital to the aim of increasing the country's growth potential. (HM Treasury, 1999c, 1.12).*

Productivity is one of the key components of the level of economic output and of the rate of economic growth. Productivity is a measure of the extent to which economic resources are used effectively in an economy. The UK has lower rates of productivity than comparable countries including the US, France and Germany. Raising the level of productivity in order to raise the rate of economic growth is a priority in government economic policy. Policies that raise productivity are actively pursued.

Measuring the gender dimension of productivity

The measurement of productivity per gendered worker is a challenge since it is not possible to measure directly the value of the different contribution of men and women workers to any given output. The procedure adopted here is the current Treasury method of measuring the productivity of government services. This is to assume that wages are the best available proxy for productivity. This method has the disadvantage that any reduction in wages as a result of discrimination artificially affects the size of the measure of output. Nevertheless, wages are the best available proxy for measuring gendered productivity. Whilst this approach has been taken in this report to enable the authors to draw some tentative conclusions relating to women's position in the labour market and UK productivity, the problems of using pay as a proxy for aggregate productivity (outlined in detail in the Report) mean that it is not appropriate simply to use pay as a basis for estimating aggregate potential gains to the economy as the position of women in the labour market changes. Rather, the link between pay and productivity has been used in order to illuminate particular aspects of women's labour market experience that are likely to have a bearing on the UK's productivity levels.

Whether the unit of input used in measuring productivity is that of 'worker' or 'hour worked' makes a difference to the relative position of the UK in international comparisons of productivity. The key difference is in the treatment of part-time workers. While part-time workers may have the same productivity per hour as a full-time worker, it is unlikely that part-time workers can be as productive per week as a full-time worker, since they work fewer hours. In league tables based on productivity per worker the UK has a lower relative position than in those based on productivity per hour worked. A key reason for this difference is that of the comparatively large part-time sector in the UK, which is disproportionately female.

Components of gendered pay and productivity differences: skills deficits and labour market failures

There are two main causes of gendered pay and productivity differences: skills deficits and labour market failures. Skills deficits have been identified by the government as a specific part of the problem of low productivity among British workers. Market failures occur when the labour market does not allocate the most appropriate worker to any given job slot as a result of labour market rigidities.

Skills Deficit

Women on average have fewer educational qualifications than men. Although young women have recently managed to close this gap, the average woman is less qualified than the average man. The analysis of the BHPS data showed that in order to raise the average employed woman to the educational level of the average man, she would need the equivalent of 0.3 years of education. However, the gender gap in educational qualifications is concentrated among those women who are over 40, and those who are employed part-time or not at all. This gendered qualifications gap among this specific group of women is a significant part of the skills deficit.

Our survey found that two-thirds of the women who were employed part-time (66%) or not at all (63%) were willing to undergo additional training

or education. However, many of them (63% not working, 53% part-time) would find it difficult to pay for themselves. Among those prepared to undergo training or education, 79% said that the greatest help would be if it were free.

Segregation
There is a pronounced concentration of women and men in different occupations, with women over-represented in lower paid occupations. Gender segregation involves a form of labour market rigidity that prevents the allocation of the most appropriate worker to any given job slot. It is a failure of the market to allocate people to their most productive location.

Discrimination
Discrimination can be a labour market failure in that it prevents the best allocation of workers to jobs. It is a form of rigidity that may depress women's potential productivity levels, if it means that, for example, there are mis-matches between women's skills and experience and the jobs they are doing.

Interruptions in employment to care for family members because of lack of flexibility and insufficient childcare

All interruptions to employment, whether for unemployment or to care for family members, have a depressing effect on productivity. While men experience more unemployment, women take much more time out of the labour market than men do in order to care. A new national survey shows that significant numbers of women suffer downward mobility between their best job before having children and their current job. However, not all mothers relinquish their employment as a result of having children. Those who are better educated, better paid and who have the most flexible employers are more likely to retain their labour market attachment. Lack of flexibility at work is one of the major reasons that women find it hard to combine caring and employment. Our survey found that increased flexibility and better wages were the circumstances under which women were more likely to enter employment or increase their employment.

Part-time employment
Part-time employment is the location where many of the factors that depress women's pay and productivity are clustered. Women who work part-time are the least educated, work in the most segregated occupations, and have the shortest employment histories. While extra years of experience of full-time work increase pay and productivity, our statistical analysis of BHPS data showed that extra years of part-time work experience are associated with lower pay. Many women enter part-time work when they have young children, but considerable numbers do not return to full-time work when their children grow up. Of women employed part-time, 44% do not have dependent children, while 32% of women with no dependent children work part-time, according to calculations from the Labour Force Survey. The part-time sector, at 23% of the workforce, is larger in the UK than in many other countries. It is a large site of low paid and low productivity work.

Components of the pay and productivity gap

Our statistical analysis of BHPS data found that the following issues were associated with the gendered pay and productivity gap per hour. The gap between women's and men's education is associated with a 6% of the gap. Occupational segregation is associated with a pay 13% of the gap. This involves comparing a situation of no occupational segregation with the current level of segregation. Just being female is associated with a pay 29% of the gap. The difference in the length of women's full-time work experience, 10.9 years, and that of men, 18.2 years, is associated with 26% of the gap. The greater interruptions to employment due to family care by women as compared with men were associated with 15% of the gap. The extent to which women are more likely than men to work part-time, 4.4 years, rather than 0.3 years, is associated with 12% of the gap. See Table S.1 below.

Table S.1: Components of the pay and productivity gap per hour worked

Component	Women's levels compared to men's	% of gap
Full-time employment experience	-7.7 years	26
Interruptions due to family care	+3.2 years	15
Part-time employment experience	+4.1 years	12
Education	-0.3 years	6
Segregation	.34/.70*	13
Discrimination and other factors associated with being female		29
Total		**100**

* These figures are an index of the extent to which women and men work in male dominated occupations and show that women work in occupations that are 34% male, whilst men work in occupations that are 70% male.

The impact of women's position in the labour market on women's pay, and implications for UK productivity

Introduction

> *Productivity is the largest single component of economic growth. So raising the productivity performance of the British economy and making progress towards closing the productivity gap with our international partners is vital to the aim of increasing the country's growth potential. (HM Treasury, 1999c, 1.12).*

This report considers the impact of women's position in the labour market on their pay and tries to draw conclusions from that analysis which could have implications for Government when considering the UK's productivity challenge. Traditionally, the concepts and methods used to analyse productivity have not included a gender dimension. This report attempts to build the case for including a gender dimension in order to improve the analysis of the determinants of productivity. Productivity is one of the key elements in the determination of the level of output and of the rate of economic growth. The other main element is that of the size of the employed labour force.

> *The Government is pursuing a comprehensive and co-ordinated strategy to meet its central economic objective of high and stable levels of growth and employment. Its aim is to raise Britain's national economic potential and achieve sustainable growth in economic prosperity, through creating economic and employment opportunities for all (HM Treasury 1999c, 1.1).*
>
> *Achieving high levels of participation in the labour market, through the promotion of employment opportunities for all – the modern definition of full employment – is also central to raising the economy's long-term growth capacity (HM Treasury, 1999c, 1.13).*

Women's jobs are on average at a lower level of pay than those of men and they do not engage as fully as men in paid work. The under-utilisation of women's labour in the market economy can be seen as a potential loss to the British economy as well as a loss to women themselves.

The Kingsmill Review (2001: 5) noted that issues of women's employment and pay are not only matters of equal treatment and social justice, but are also important for the future productivity and competitiveness of the UK. Rapid technological innovation, globalisation and the growth of the knowledge economy place a premium on human capital. This report addresses this new framing of women's employment in terms of its implications for productivity, and takes steps to move the discussion forward.

The reasons for this potential gendered loss of productivity are the focus of this report. These are primarily of two kinds: first, the relative lack of education and training among many women as compared with men, which contributes to their lesser human capital; and, secondly, failures of the labour market due to outmoded rigidities, such as segregation by occupation and by part-time/full-time working hours, discrimination, and insufficient flexibility to enable women to combine caring and employment without detriment to their productivity.

This report is in four sections. The first section discusses and clarifies the concept and measurement of productivity, and considers the difficulties inherent in measuring gendered productivity. The second section reviews the existing literature as to why the gender pay gap exists and the implications for gendered productivity. This involves a consideration of women's position in the UK labour market, the barriers to their more productive involvement, and the range of policy instruments available. The third section uses original analysis of data drawn from the British Household Panel Survey to measure the gender pay gap and also its component parts. It also attempts to draw conclusions for UK policies aimed at increasing UK productivity. This is supported by six technical appendices. The fourth section uses specially commissioned survey data to explore women's occupational mobility on childbirth and to report on the way that women understand the barriers to their more productive involvement in employment.

Section 1: The concept and measurement of productivity

Introduction

The concept and measurement of productivity is the focus of this section. The implications of variations in these will be discussed. Productivity measures the ratio of economic output to economic inputs. The most important economic input is that of labour, measured either in units of 'worker' or 'hour' worked. The choice of 'worker' or 'hour' worked has gender implications. Sometimes capital and other items such as natural resources or innovation are treated as economic inputs, but these are not the focus of this analysis. The focus here is on labour and productivity.

The rate of economic growth is affected by both the productivity and size of the workforce. An increase in the size of the inputs usually increases the size of the output, so an increase in the size of the labour force increases the output of the UK economy. However, the focus of this report is productivity rather than output. The productivity of labour and the size of the labour supply are usually treated separately. However, in relation to gender there are connections that require discussion. In particular, the extent to which an increase in women's pay and productivity can lead to an increase in the size of female labour supply is important for predicting the size of the UK GDP.

Productivity

The government has identified as a key failing of the British economy its lower rates of productivity growth than comparable European and North American countries, in particular those of the USA and Germany (HM Treasury, 1999c, 2000b, 2001a). The extent of this lower rate of productivity is shown in Table 1.1.

Table 1.1: International Comparisons of Productivity

Country	GDP per worker (UK=100)	GDP per hour (UK=100)
Italy	130	132
US	145	126
France	119	123
Germany	107	114
Canada	118	114*
Japan	100	93*
UK	100	100

All data is for 1999 except for * which is 1998.
Source: Drew, Richardson and Vaze, 2001. Original source: DTI 1999.

HM Treasury (2000d) states that there are several components in labour productivity: physical capital; human capital; innovation; and technical progress. These have recently been reformulated as five productivity drivers: skills, investment, innovation, enterprise and competition (HM Treasury, 2001d; HM Treasury and Department of Trade and Industry, 2001). The importance of human capital has been highlighted by recent developments in endogenous growth theory. In comparison with the US and Germany, UK employees have low rates of skill. By comparison with the US, low rates of high skill workers and, by comparison with Germany, low rates of intermediate level skilled workers. These reports note that, in addition to macroeconomic stability, an important role for government policy is in setting the right microeconomic environment, which includes not only well functioning capital markets but also well functioning labour markets. Three elements of labour markets are identified as particularly important for economic growth: an increased labour supply; flexibility so as to be able to adjust to new growth opportunities; and that 'well-functioning labour markets reward workers according to their performance and skills' (HM Treasury, 2000d: 29).

The report notes the problems of market failures that interfere with the best allocation of resources. 'Market failure exists when the competitive outcome of markets is not efficient from the point of view of the economy as a whole. This is when the benefits that the market confers on individuals or firms carrying out a particular activity diverge from the benefits to society as a whole' (HM Treasury, 2000d: 30). Market failures are of four kinds: externalities, market power, lack of information, and poor regulation (p.31). An example of a government attempt to deal with market failure due to market power is that of the minimum wage and the Low Pay Commission, while an example of dealing with market failure due to poor regulation is that of policy to make work pay such as the Working Families Tax Credit (p.33). Within this framework the report notes the role of government in encouraging skill and human capital formation, such as the development of education through investment in schools and lifelong learning. It concludes that the government has a 'reform agenda based on a strategy to correct market failures that obstruct productivity growth' (HM Treasury, 2000d: 37).

In this report, the gender components in those market failures that reduce the productivity of the economy as a whole will be considered.

A second paper (HM Treasury 2001b) states that government policy is to raise productivity and increase employment in order to increase economic growth. Among many matters affecting productivity a key factor in the long run was found to be 'whether skills levels of the new entrants to the labour force increase over time' (p.11). It notes that the UK's poor productivity record can in part be explained by the low level of skills in that around 55% of workers have low skills compared to 23% in Germany and 27% have degrees as compared to 38% in the US (p. 20). The report also notes the importance of continued growth in employment. Policies to encourage this include those to ensure that work pays.

In this report, the gender components of the skills deficit will be addressed.

While these two papers do not address gender specifically, they lay the ground in their concern for market failures and skills deficits. Market failures and skills deficits are areas where there is significant gender differentiation in their nature and causation.

The productivity of the workforce is better understood with a gender dimension, since women, on average, have fewer qualifications than men. While the youngest group of women has closed the gender gap in qualifications and labour force experience, which are key components of productivity, this has not happened for the majority of women and men. There remain significant gendered differences in the factors related to productivity.

Gender

By gendered, is meant, at the simplest level, that phenomena affect women and men differently. More complexly, it means that the categories of analysis are varyingly affected by gender. For instance, caring for children is a gendered activity since it is predominantly done by women, but, because it is not only done by women, it should not be equated with being a woman's job – the term 'gendered' is used to capture this imbalance while rejecting the notion of an absolute link. While care-work is an important gendered area that affects interaction with the labour market, and it is argued in this report has implications for the productivity levels of women, it is not the only one. Gendered social institutions have complex relations with each other; that is, it is not possible to directly read off the gendered nature of one institution from that of another. For instance, it is not possible to know the gendered nature of employment from the gendered nature of the family, even though there are links. Further, for social conduct to be gendered does not require that people actively think about gender. Social institutions may be gendered even if the participants do not intend this. Indeed this is a significant dimension of the legal concept of indirect discrimination.

Productivity per 'worker' or per 'hour worked'?

Productivity is a measure of the performance of an economy, concerned with the efficiency of the economy. It is measured as a ratio of inputs to outputs in the economy. The most important input is that of labour. Sometimes capital and other items such as natural resources or innovation are treated as economic inputs (Barrell and Willem te Elde, 1999; Mayes, 1996; Oulton, 1998; PIU, 2001b). However, the focus of this report is confined to that of labour.

Outputs can be measured either per unit of labour or in relation to units of total factor input. The measurement of both input and output is subject to debate (ONS, 1998c; HM Treasury, 2000d). One way of measuring units of output is that called total factor productivity (TFP). This is the element of growth which reflects the way in which factors of production (composed of labour, and capital) are used, and might be influenced by, and other matters, which might include factors such as innovation and technology. This method has two disadvantages: first, the element other than labour and capital is merely a residual and can be little more than a measure of what cannot be explained; second the measurement of capital stock demands data which are hard to obtain in a consistent way and which tend to be unreliable. Hence this method is not the preferred one (HM Treasury, 2000d).

The preferred government HMT method of measuring productivity is productivity per worker (HM Treasury, 2001c). Drew, Richardson and Vaze (2001) note that: 'output per worker is the most straightforward to measure and also has the advantage of being consistent with the government's broader objective of raising trend growth'.

However, there has been a recent debate within government as to whether the unit should be 'worker' or 'hour worked'. In some quarters there has

been a recent move to measuring output per hour worked rather than per worker (Partington, 1999). This is partly because measuring units of labour by counting the number of workers engaged in the economic activity under consideration has the disadvantage that this treats the input of full-time and part-time workers as if they were the same, even though part-time workers are spending fewer hours in this work. As a consequence of the mix of advantages and disadvantages of each method Drew, Richardson and Vaze (2001) suggest that both should be monitored, even though the preferred measure is that of output per worker.

This distinction between output per worker and output per hour is important for international comparisons, especially with the US where the rate of part-time working is significantly lower. If productivity per worker is used, then the productivity of the British economy as compared with the US appears lower than when productivity per hour is used. That is, the productivity gap is wider if 'worker' is the unit, and narrower if 'hours worked' is the unit. See Table 1.1 above.

The choice between the two measures of the input side in the estimation of productivity is gendered. This is because of the high rate of part-time working in the UK compared to other countries, especially the US and Germany, and the association of part-time working with women. Thus the implications of a change to an hour-based, rather than worker-based, unit for the measurement of the rate of productivity are affected by the way that the British workforce has a different gender structure as compared with that in other countries.

Underlying the choice of units (worker or hours worked) is an implicit set of assumptions or norms in relation to working part-time and full-time. The choice of the unit for the measurement of productivity is affected by assumptions about working-time. If full-time working is assumed to be the norm, either currently or for the future, then the unit preferred is likely to be that of the worker. If part-time working is considered to be as normal as full-time working, then the unit preferred is likely to be that of hour-worked. This is a gendered assumption.

The use of the 'hourly' rather than 'worker' unit puts a premium on the accurate measurement of hours worked. ONS has made several adjustments to its statistics in order to improve the accuracy of the measurement of productivity including the unit of output (Vaze, 2001), and the integration of several surveys into an integrated Annual Business Inquiry Survey from 1998 (Tse, 2001). At least one of these adjustments has a gender component. This is in the re-calculation of full-time and part-time average hours to remove the slight bias towards full-time workers, which had been larger for female than male employees because of the larger number of women working part-time (Daffin and Dunstan, 2000).

A comparison between the old measure of output per worker and the new series of output per hour worked shows slightly different pictures of changes in the rate of productivity growth. The rate of growth of output per job was higher than hourly productivity growth during the period 1994-5. However, since then there does not appear to be much divergence between the two measures of output growth (Daffin, 2001). Daffin interprets this as meaning that increased hours worked, as well as increased labour productivity, raised output during 1994-5.

However, the data provided on the annual rates of productivity growth in the UK since 1995 vary with the unit of output used. The data for the period between 1995 and the first quarter of 2001 show that output per worker (filled job) for the whole economy showed an annual growth rate of 2.2%, while that for output per hour was only 1.0% (ONS, 2001b). This

appears to be more significant than a one-off divergence in productivity growth in 1994-5.

The explanation of this divergence between productivity rate for output per worker and output per hour is open to more than one interpretation. While it may be due to full-time workers increasing the number of hours that they worked, it might alternatively be due to differences in productivity growth between the full-time and part-time workforce such that the rate of productivity growth was higher in full-time jobs than in part-time jobs.

This report will follow HM Treasury practice in utilising output per worker as the primary measure of productivity, while following the advice of Drew, Richardson and Vaze (2001) to also monitor the alternative measure of output per hour worked. The choice of measure of productivity has important gender implications. This is because the former might appear to be consistent with a policy dynamic favouring a move away from part-time towards full-time work, which would affect considerable numbers of women currently employed part-time.

Measuring the value of economic outputs

The question in this section is how to measure output per gender. The development of a measure of gendered contributions to productivity and to economic output is an innovation. This report represents a first step towards this goal; it examines potential methods and provides an assessment of the strengths and weaknesses of applying these to this question. The procedure is to consider which of the existing methods of measurement of productivity used by the Treasury, if any, is most appropriate to be developed for this task.

The Gross Domestic Product is a key measure of the output of the UK economy. In the UK in 2000 this was £943,412million in terms of current market prices (ONS, 2001c). Within this total, employees' compensation is £521,443million, which is 55% percent of the GDP. The second major component of GDP is 'corporations gross operating surplus', that is, basically, profits. There are further components, of which the major one is that of taxes on products and production less subsidies. See Table 1.2. The output from a worker contributes not only to 'employee compensation' but also to 'corporations gross operating surplus' and to the other components of GDP.

Table 1.2: UK GDP, 2000 (In £million)

Employees compensation	Corporations gross operating surplus	Other income	Taxes on products and production less subsidies	Total GDP
£521,443	£213,175	£78,318	£130,231	£943,412
55%	23%	8%	14%	100%

Source: calculated from ONS Quarterly National Accounts 2001.

There are two main ways of determining the valuation of economic output, one for the market sector and one for the non-market sector.

The first method, for the market sector of the economy, is to measure the value of outputs and is relatively straightforward, since there is a market price for the products. This is investigated using specialised survey instruments at the level of the firm, newly integrated in the Annual Business Inquiry. It is possible to derive sector specific rates of productivity, by manufacturing, production, and by a series of industrial classifications for the market sector of the economy in this way (ONS, 2001b).

The second method is used for the non-market sector, mainly composed of government services and those of non-profit institutions serving households, and includes defence, education and health. In this non-market sector it has not been found to be possible to use the first method, not least when they are provided free at the point of use, because of the absence of a market which provides relatively easy access to a valuation of these outputs. Hence the convention behind the second method is to value all government services according to the costs of production, with the assumption that the net operating surplus is zero (ONS, 1998c). There are methodological developments in progress which are intended to permit the measurement of the value of a proportion of government services, though these are not yet complete (Pritchard, 2001). Thus the current practice in construing a valuation of the output of this non-market sector is to take the inputs, largely wages, as equivalent in value to outputs.

It is not possible to measure directly productivity and output by gender in the same way that it is possible to compare industries in the market sector of the economy. This is because the smallest unit used in the measurement of the value of that output that is sold on the market is that of a firm. Within any one firm there is a mix of genders that contribute jointly to the firm's output. This is not and cannot be specified in the data collected at the level of the firm in surveys such as the Annual Business Inquiry Survey.

The issue is how to measure separately the inputs of men and women to a firm's, or country's, economic output. There is a way that this can be done using the second method, traditionally used for the non-market sector, which takes the value of the inputs, wages, as equivalent to the value of the outputs. That is, wages are taken as a proxy for productivity. This method has both advantages and disadvantages. The advantages are that wages are both an indication of the market valuation of the individual's worth to the enterprise and that data on wages are readily available in a reliable and robust form. The disadvantages are that the wage may not be a 'true' representation of the productive contribution of the person to the enterprise, to the extent that this is affected by discrimination and the imperfect functioning of the labour market.

It is also the case that whilst standard economic theory states that at the microeconomic level wages equal the marginal product of the worker (or their productivity level), there are a wide range of situations where this might not be the case. However, even if true at the level of the individual firm, it does not allow assumptions about the economy as a whole such that changes in pay reflect changes in productivity at the macro level. Such large scale changes in pay would have extremely significant implications for the economy in terms of the labour/capital split, and levels of employment. However, this report, bearing in mind these strong caveats, considers how pay might be an important signal of gendered differences in productivity.

Pay, Productivity and Labour Force Size

The size of the output of the UK economy is determined not only by productivity but also by the size of the workforce. The primary concern of this report is with pay, and the information that pay might hold in relation to productivity. However, there is a link between pay and the size of the workforce. This link is gendered. An increase in women's pay increases the propensity of women to participate in paid employment. Such a link between higher wages and increased willingness to take employment of course applies to men as well, but it has a gender dimension in that there is a larger pool of women than men who are of working age and who are not employed. This is despite the higher rate of unemployment among men than among women in the UK. Women in the home are sensitive to the price offered for their labour in the market, even though they may not consider themselves to be unemployed. An increase in women's pay is likely to increase the proportion of women choosing to take paid employment, thus increasing the size of the labour force, and increasing the output of the economy as a whole. If an increase in women's productivity leads to a rise in their average wages, this may increase the output of the economy through two routes, one direct, the other indirect: by increasing the output per worker (or hour worked), and by increasing the size of the workforce. The indirect effect is likely to be especially marked for women.

Secondary effects of increasing women's productivity and pay

In addition to contributing to economic output and to economic growth, an increase in women's productivity and pay has a series of secondary effects[1] that are related to key policy goals. These include:

- Reducing and eliminating child poverty
- Reducing crimes of violence

Child poverty

The reduction or elimination of child poverty could have significant long-term effects on the capacity of the next generation to be productive workers themselves (Department for Education and Employment, 1999a; Department of Social Security, 1999; Hills, 1999).

Child poverty cannot be eliminated or reduced significantly further while their mothers are in poverty. The ability of women to return to employment after maternity into decently paying jobs is a crucial component in the elimination of child poverty. Many of the children living in one parent families do so in poverty because of the low employment rate of lone mothers. Ensuring that mothers are able to return to the labour market in jobs that are productive enough to pay well would be a major contribution to reducing and then eliminating child poverty. In two parent families a woman's wage is often necessary in order to prevent a family falling into poverty. Again this depends on mothers being able to return to decently paid work when they return to the labour market. In short, women's wages are one of the most important elements in keeping children out of poverty (Harkness, Machin and Waldfogel, 1997; Ward, Dales and Joshi, 1996; Davies and Joshi, 1998).

[1] Estimates of productivity made here will refer only to the money economy, and exclude unpaid care work. However, the work that women do caring for others is an important contribution to society, even though it is not conventionally counted as part of the economy. The largest amount of work here is that for children, especially young children, but there is also care for frail elderly people, for

those who are sick, and for disabled people. There is a highly significant debate on the conceptualisation of care-work within a modern economy (Bakker, 1994; Gardiner, 1997; Grown, Elson and Çagatay, 2000). There is an increasingly sophisticated concern to estimate the equivalent monetary value of such work, for instance, the development of the household satellite accounts (Holloway and Tamplin, 2001). Estimates of productivity loss thus need to bear in mind that for some women (and a smaller number of men) being economically inactive does not mean that they are not working, albeit unpaid. However, the extent of withdrawal from the labour market in order to care is subject to ongoing social and policy change. A combination of publicly funded care facilities, tax credits and other payments for care work (e.g. statutory maternity pay) on the one hand, and redistribution between women and men, on the other, might mean that either that exit from the labour market for caring is reduced or eliminated or that women's disproportionate exit is reduced or eliminated.

Reducing crimes of violence

An increase in women's earned income decreases her likelihood of being subject to crimes of violence within the home. There are a number of dimensions to this.

Women who are employed are less likely to be subject to domestic assault than women who are housewives or unemployed. Data from the Home Office British Crime Survey (BCS) show that among women aged 16-29, 13.1% of those who were unemployed, and 11.5% of houseworkers were assaulted by partners in the previous year, as compared with 5.0% of those in full-time work, 9.6% of those in part-time work and 7.3% of students. Among women aged 30-59, 4.4% of houseworkers and 3.2% of unemployed were assaulted as compared with 1.9% of full-time workers and 2.0% of part-time workers (Mirrlees-Black 1999).

Household poverty increases the likelihood of being assaulted in the home by a partner. Data from the British Crime Survey found that among women in households that earned less than £5,000 per year, 10% were assaulted in the previous year, while in households earning £5,000 to £20,000 3.7% were assaulted, and among households earning more than £20,000, 3.0% (Mirrlees-Black, 1999).

Domestic violence is lowest in families that are more equal. Asymmetrical households are more likely to succumb to violence when conflicted than symmetrical ones (Coleman and Strauss, 1986). Women who are more economically dependant on their husbands (not employed or earning much less than their husbands and with young children) suffer more domestic violence than marriages that are equal (Kalmuss and Straus, 1982).

Domestic violence made it harder for women to hold down jobs as a result of lateness, increased ill health, and sabotage by the women's violent partners (Meier 1997; Raphael 1997; Lloyd 1997).

If women lack employment they are more vulnerable to domestic violence for several reasons: they lack the financial resources to leave, bargain or threaten to leave; and suffer greater social isolation and thus lesser access to informal and formal support networks. The increased risk of domestic violence consequent on women's lack of equal employment opportunity means that productivity issues are related to those of criminal justice. Even if the focus is kept merely on the financial dimension, there is the issue of the enormous cost to the criminal justice system and to the National Health Service of these crimes of violence.

Reductions in child poverty and in crimes of violence are two examples of potential secondary effects of increasing women's productivity and pay. However, the implications of such secondary effects for the productivity of the economy, while probably substantial, are outside the scope of the current work.

Section 2: Review of the gender pay gap and possible implications for productivity levels in the UK

Introduction

There are two main factors relating to the UK labour market which are a source of women's lower pay, and it is argued in this report, likely to be sources of differential productivity levels between men and women. The first is that of skills deficits, a key component of human capital. Women have less education and training than men. Although young women in employment have closed this gap it is still significant for the average woman. The second is that of a series of failures in the market for labour. These are labour market rigidities associated with: sex segregation by occupation and industry; with discrimination; and insufficient flexibility to enable women to combine care-work and employment without lowering their productivity.

Skills deficits

Human capital is understood to mean all the skills and experience that a person brings to employment that are relevant to that employment. It encompasses not only educational qualifications and training by employers, but also the experience that people have as a result of prior labour market experience. It is a concept parallel to that of fixed capital, which refers primarily to equipment and buildings.

In a globalising world, in which a knowledge-based economy is of increasing importance, human capital becomes yet more important as the basis of productivity increases. Reich (1993) describes education and human capital as the wealth of nations. The PIU (2001a) has argued for the importance of adult skills for the 21st century economy. The more education, training and qualifications people have, the more likely they are to be in work and the more likely it is that that work is more productive and higher paid. This linkage receives substantial support from the empirical evidence.

Returns to education

Standard economic theory would suggest that the more education a person has, the greater their productivity, and the more a person will usually earn. This is borne out by the evidence. Statistics show that an individual who undertakes an additional year of full-time education will earn around 7-9% more than someone who does not, according to analyses of large scale UK data sets (Harmon and Walker, 2001). While some people may think that education is merely a signal that leads to higher wages rather than actually contributing to productivity (Killen et al 1999), Harmon and Walker (2001) find that the signally component of the returns is small compared with its productivity effect.

Successful completion of higher education leads to increased wages, according to a study by Blundell et al (2000) of 33 year olds in 1991 using the cohort data from the British National Child Development Survey. The rate of return to higher education is higher for women than for men. For men, raw wage returns were 21% for a first degree, while for women it was

39%. (This rate of return was reduced very slightly to 17% and 37% when controls for ability at age seven, region, school type, family background, demographic characteristics, employer size and unionisation were introduced.) There were also raw wage returns for non-degree higher education of 15% for men and 26% for women, and for higher degrees of 15% for men and 43% for women. A late start on a degree reduced the returns for men to 7-8%, but did not reduce the returns for women. The larger returns to women for higher education do not mean that women are paid more, merely that the gender gap in earnings is less large for well-educated women. There is a gender wage gap of 38% between men and women with no HE qualifications, reducing to a gender wage gap of 11% for those with higher degrees.

Educational qualifications gap

There is still a qualifications gap between women and men on average. Among men in 1996, 13% had degrees as compared with only 8% of women; while 34% of women have no qualifications, as compared with 27% of men (ONS, 1998a). See Table 2.1 below.

Table 2.1: Highest qualification level attained by sex, 1996
Persons aged 16-69 not in full-time education

	Men	Women
Degree	13	8
Higher education below degree	12	10
A level	14	10
GCSE grades A-C	21	24
GCSE grades D-G/apprenticeship	10	12
Foreign or other	2	2
No qualifications	27	34

Source: Adapted from GHS 1996, Table 7.1

Women on average have fewer qualifications than do men of the same age, even though younger women have now closed the gap in educational qualifications with young men. As new cohorts of more educated young women enter the labour markets over time the overall likelihood of the average woman being in employment will increase. However, there is still a gap of about 10% in the employment rates of men and women with similar levels of education, as shown in Table 2.2. Further, the gap in employment rates between those young women who have educational qualifications and those who do not is large. Low rates of educational achievement among young women are correlated with young motherhood, and young motherhood is correlated with lone motherhood. (This is well documented in the Social Exclusion Unit report on Teenage Pregnancy (Social Exclusion Unit, 1999)). Table 2.2 illustrates the interaction between age, qualification, gender and level of economic activity.

Educational qualifications have a powerful effect on the likelihood of being in employment and the wage and productivity level of those in employment.

Table 2.2: Economic activity of women by age and highest qualification level attained and of men by highest qualification attained (Persons of working age not in full-time education. Great Britain:1996)

Age and economic activity status	Higher education	GCE 'A' level or equivalent	Other qualifications	No qualifications	Total
Women	%	%	%	%	%
20-29					
Working	90	80	68	35	70
Unemployed	2	3	5	8	4
Inactive	7	17	27	58	25
30-39					
Working	80	72	70	48	68
Unemployed	3	3	4	5	4
Inactive	16	24	26	47	28
40-49					
Working	83	79	75	60	72
Unemployed	2	3	4	5	4
Inactive	16	18	21	35	25
50-59					
Working	64	71	69	48	58
Unemployed	3	4	2	3	3
Inactive	33	25	30	48	39
16-59					
Working	81	77	70	51	67
Unemployed	3	4	4	5	4
Inactive	17	20	25	45	29
Men					
16-64					
Working	89	87	80	62	79
Unemployed	3	6	8	11	7
Inactive	8	7	12	27	14

Source: Adapted from Living in Britain, 1996 General Household Survey, Table 7.6

Employer-based training gap

There has been a significant general increase in the overall level of skill in the British workplace; however, the distribution of these increases in skills is uneven. In particular, the skill level of women part-time workers has not increased as much as much as that of male and female full-time workers, resulting in a growing gap between full-time and part-time workers. Several studies provide evidence to support this claim (Metcalf, 1997), the most robust of which derive from analyses of the Skills Survey of 2,467 people in 1997 which asked about the actual characteristics of their current jobs and those they held five years earlier (Felstead, Ashton and Green, 2000). Felstead et al report that those who moved from full-time to part-time working were especially likely to experience stagnation of their skills.

Spilsbury (2001), reporting on the Learning and Training at Work 2000 survey of 4,000 employers in England in 2000, found that 76% had provided training to their employees in the 12 months prior to interview, while 41% had provided off-the-job training and 66% on-the-job-training, at an estimated total cost of £23.5 billion per year.

Blundell, Dearden and Meghir (1996) found that the determinants and effects of employer-provided and work-related training courses leading to a formal vocational qualification is significantly gender-differentiated. Their findings are based on the analysis of 33 year olds in 1991 using longitudinal data from the National Child Development Study. Just over half this group had some work-related training leading to a vocational qualification between 1981 and 1991, but men had a substantially higher probability than women of under-taking such training, 64% as compared with 50%. The effect on earnings was an increase of 64% or 5.1% each year for the men, and an increase of 45% or 3.8% each year for the women. Among those who had undertaken off-the-job employer provided training courses with their current employer, men had seen an increase in their average real wages over ten years of 80%, while for women this was 70%.

Rix et al (1999) assess whether flexible workers, in exchange for flexibility, gain training as employers confer enhanced employability, or whether they are less likely to obtain training. They conducted a literature review, interviews with industry representatives and four case studies. They conclude that there is a bias towards training for traditional workers, that agency and contract workers receive less training, and that those in lower occupational groups, where much flexible working is concentrated, get less training than higher occupational groups. However, there is a trend towards increased training for part-timers. Overall, they confirm the thesis that training is concentrated among traditional, not flexible, workers, though with exceptions for the highest skill levels.

Data from the Labour Force Survey reports a different gender balance. Women appear to be slightly more likely to be receiving on the job training than men, 13.8% as compared with 12.6% of employees in 1998 (Labour Market Trends, 1998, Table 4, p. 586).

Thus, while most of the specialised in-depth surveys of employer provided training report that men obtain more training than women, the largest and most representative survey finds that women are slightly more likely to obtain training than men. It is possible that the apparently discrepant findings are due to different definitions of training. For instance, Blundell et al's (2000) survey is only of training sufficiently substantial to lead to a qualification, not a limiting requirement used in the Labour Force Survey. This may mean that women receive more short periods of training than men, but less of the type leading to a qualification. Further, women who work part-time are the least likely to be improving their skills in the workplace (Felstead et al, 2000).

Other learning initiatives

The adult and community learning (ACL) sector is significant, according to a review by Callaghan et al (2001), with between 1.6 and 2.5 million people in LEA provision alone. Women are the majority of those enrolled in the LEA sector. Callaghan et al (2001) state that one of the important benefits of the ACL sector is that it acts as a route back into more formal learning for those who would not initially enter such an environment. They note that while the quantification of its economic benefits is difficult many adults moved into employment from courses or progressed into more demanding jobs.

The nature and extent of education and training differences between men and women is complex. Women on average have fewer qualifications than men. This is partly a result of historically lower levels of school and university based qualifications, and partly the result of less on-the-job training of the kind that leads to qualifications. Some young women have closed the formal educational qualification gap up to first degrees. Women

engage in more on-the-job training and LEA run adult and community learning, but not of the kind that lead to vocational qualifications.

There is still a gap in the educational qualifications and training of the average man and woman. The exact size of this gap and the extent of its contribution to the gender pay gap, and it's implications for UK productivity, will be estimated in Section 3.

The nature and extent of labour market rigidities and failures

Labour market rigidities are a possible further reason for differentiation between women and men's pay and productivity. These may constitute market failures in preventing the best matching of a person to the most suitable job, although the extent to which this is the case in relation to specific practices has been subject to debate. One possible cause of labour market failure is the lack of information and appreciation by employers of the implications of their practices (Casey et al, 1997). Several different kinds of labour market failures have been suggested including:

- Insufficient flexibility to allow the effective combination of caring and employment, of work/life balance
- Occupational segregation by sex
- Discrimination

Insufficient flexibility and support to allow work/life balance

Introduction

The effective balancing of work and life is important to retaining labour market attachment. A key part of this is the combination of caring, especially of children, but also of the sick, disabled and frail elderly, with employment in a way that does not reduce productivity. Some women engage in childrearing in circumstances that do not affect their productivity in employment. For some other women caring seriously reduces their productive employment. This section explores the nature of the circumstances under which women can combine caring and employment without changing their engagement in the labour market in a way that has detrimental effects on their pay and productivity levels.

Caring can lead to interruptions in employment for short or long periods of time. Interruptions can lead to a reduction in productivity in two main ways. First, it will reduce levels of work experience compared to someone who has not taken time out of the labour market to care. This directly reduces productivity, since more work experience often increases relevant job knowledge. It also reduces the output of the economy, since less time is spent in employment. Second, the interruption in itself can reduce productivity, since the person will have to learn about a new job, and thus start at a lower level than the job that they left. Thus, practices which reduce interruptions to employment are likely to improve productivity.

Key among the factors that reduce such interruptions are appropriate working time arrangements. These take various forms. It includes the ability to vary working hours and also periods of working. The small scale variation of working hours is a key element in most employees' conception of flexibility. The ability to spend several months away from employment around the period of childbirth without losing employment entitlements is the principle behind maternity leave. The ability to spend a few days away from employment from time to time when children are young, without losing employment entitlements is the principle behind parental leave. The ability to work less than full-time hours of work on an extended basis without penalty is the principle behind the EU Part-time Workers Directive. The lack of widespread access to flexibility in working hours could be considered a market failure, especially if it is driven by a lack of knowledge and appreciation on the part of employers of the costs and benefits for their business of doing so. This may be causing staff, even those who are valued and valuable, to drop out of the labour market or change the nature of their engagement (i.e. change job/employer) with losses to themselves and the economy.

A further set of factors that reduce interruptions is the provision of alternative forms of care to the labour of women. This includes, for instance, subsidised care facilities for children, and also for the sick, disabled and frail elderly.

Interruptions

Interruptions in employment history for whatever reason receive a large wage penalty. At least some of this penalty may be due to the disruption of the acquisition of skills, depreciation of these skills and reduced labour market experience, especially that related to a specific employer. However, the scale of the penalty raises the question as to whether there is an additional penalty for women. Many women have interruptions in their employment histories as a result of care-work, often, that for young children.

The impact of a gap of one year appears to have a greater impact on women's earnings than on men's. Data from the British Household Panel Survey show that women who return to employment after a one year absence receive a wage which is on average 16.1% less than the one that they had before, and that this wage penalty is more than double that faced by men (Gregg, 1998). Gregg shows that when women re-enter the labour market after an interruption they take a job that pays on average 16.1% less than their former job, as compared with a drop of 6.5% for men. Those people (male and female) who are married suffer a bigger drop than those who are single, 19.8% as compared with 1.7%; those who are out of the labour market for longer lose more than those who are out for a shorter period, a 13.6% drop for those out more than 6 months as compared with 6.6% drop for less than a month. Gregg notes that the typical entry job pays £100 a week as compared with £260 for all jobs (in the period 1991-6).

Labour market discontinuity has a long term 'scaring' effect on employment histories, whether it is for reasons of unemployment or voluntary cessation of employment in order to have a baby. A period out of the workforce appears to have a disproportionately detrimental impact on a woman's employment history. The extent of the impact of interruptions on productivity, and the extent to which maternity contributes an additional penalty, is investigated in Section 3.

Interruptions for Family Care

Women who have continuous working histories either as a result of not having children or by having access to appropriate maternity and parental leave avoid the serious problems consequent on labour market discontinuity. However, those mothers who interrupt their labour market career and break their attachment to an employer and those women who return to work part-time do appear to suffer from lower wages, and, it is argued in this report, lower levels of productivity. This finding is robust across a series of studies using different statistical techniques and data sets (Dex, Joshi, McCran and McCulloch, 1998; Joshi and Hinde, 1993; Joshi and Paci, 1998; Joshi, Paci and Waldfogel, 1999; Joshi, Dex and Macran, 1996; Waldfogel, 1995; Waldfogel, Higuchi and Abe, 1998). This is also the finding in the survey reported in section 4 of this report. For example, Joshi and Paci (1998) compared those who have employment continuity around their first childbirth with those whose work histories are interrupted by at least a year. They find that those with labour force continuity, either because they had maternity leave or because they had no children, had higher wages (holding various other factors constant) than those who had a break, and that the maternity leavers and those without children were very similar to each other. Further, the Women's Unit (2000b) report on women's incomes over a lifetime shows how the much higher life-time earnings of those with a continuous rather than discontinuous employment history.

The use of maternity leave to maintain continuous employment means that in these circumstances motherhood itself does not reduce women's productivity.

Childcare

The maintenance of continuous employment logically requires that someone other than the mother is caring for children, especially pre-school age children. The provision of childcare thus is an important variable in the maintenance of mother's labour market productivity.

Increased childcare provision is widely held to increase the proportion of women returning to employment before their children are five. The significance of free or subsidised childcare is noted repeatedly in policy documents and studies about women returners (Association of London Authorities, 1989; Centre for Urban and Regional Development, 1991; Clayton et al, 1997; Davey and Davidson, 1994; Women's National Commission, 1991).

There is evidence of a substantial positive impact of the provision of publicly funded childcare on female labour supply (Duncan, Giles and Webb, 1995). Further evidence for the significance of childcare for maintaining mother's employment is made using comparative analysis with other EU countries, especially France and Sweden (Drew, Emerek and Mahon, 1998; Gregory and Windebank, 2000). The provision of quality childcare by the state correlates with higher levels of women in the labour market when their children are young. There is evidence of the positive effect of such provision on the female labour supply (Bradshaw et al, 1996; European Commission, 1998).

The provision of childcare is an important part of the decision of mothers to work. For instance, (La Valle et al, 2000) found that 66% of non-working mothers said that they would prefer to work or study if they had access to good quality, convenient, reliable and affordable childcare. Further, 31% of parents who were already using childcare said that there were times over the last year when they would have needed or liked more childcare and

were unable to get it. The cost of childcare was found to be a significant consideration. For instance, a decrease in the cost of childcare by 25% would encourage over a third of parents to use more childcare, with 12% saying they would use the time made available to do learning or training and 13% to work more hours or look for another job (La Valle et al, 2000). The high cost of childcare to parents was seen as the most significant barrier to the expansion of childcare by Callender (2000) in her study of 1,281 childcare providers.

Elder care

Children are not the only group of people for which women care. Looking after others, especially the frail elderly, but also disabled people (perhaps adult children), the sick, and husbands, also reduces a woman's tendency to be in employment. Caring for the elderly does have a significant impact on the employment rates of women in mid-life (Arber and Ginn, 1995). Of course, some older men are engaged in caring, especially for their wives (Arber and Gilbert, 1989), but not to the same extent as women. Arguably caring for the elderly may increase over time, as the proportion of frail elderly in the population grows. However, knowledge of the detailed impact of elder care on employment and the extent to which policy interventions ameliorate this is considerably less detailed than that available for childcare (Singleton, 2000).

Flexibility

The ability to maintain the continuous employment that protects mothers against drops in their pay and productivity depends upon flexibility in the workplace and upon a wider social infrastructure. The lack of these can constitute a market failure if, as shown below in terms of employers, they are not provided because of a lack of information and its appropriate assessment concerning their costs and benefits.

The importance of flexible arrangements by both employers and training agencies is widely repeated by those involved with women returners (Davey and Davidson, 1994; DfEE, 2000a; Women Returners Network, 2000; Women's National Commission, 1991). The DTI review of these policies will contribute to the development of the UK framework (DTI, 2000).

Evidence from a study by Bevan et al (1999) found that small and medium sized companies were able to identify several business benefits from implementing family friendly policies, such as flexible working, especially around the occasional needs of employees' dependants for unexpected care. These included reduced casual sickness absence, improved retention, improved productivity, improved recruitment and improved morale and commitment. In some cases it was possible to itemise these cost benefits, such as saving the cost of replacing a leaver, which was estimated at one-third of the recruit's first year salary.

Hogarth et al (2001) report on a baseline study of work-life practices and policies in a representative sample of 2500 workplaces with five or more employees, together with interviews in head offices of 250 companies and a survey of 7500 employees. This survey found support for work-life balance practices, but few examples of them in effect. They found that agreement with the statement 'everyone should be able to balance their home and work lives in the way they want' was given by 80% of employees and 62% of employers. Among employers, 43% thought work-life balance practices were unfair to some staff, while among employees, 26% thought that these practices were unfair to someone like themselves (though there was no difference between the views of people who had or did not have caring

responsibilities). In practice few flexible working-time arrangements were reported by the employers other than part-time employment, although 62% said that very occasionally they allowed staff to vary their usual hours of work.

Variations in the impact of children on women's employment

While care for children has been and continues to be an important issue in women's ability to effect a work/life balance which does not have a detrimental effect on where and how they are engaged in paid work, it is important to note that it is not a simple determinant, but rather is highly mediated in its impact. Women's pay and employment cannot be simply read off from the age and number of children that they have. There are factors that very significantly mediate the relationship between children and pay. Further, there are factors other than children that affect women's pay and propensity to be in employment, and by implication, may influence their productivity levels.

For example, women with children over 10 are more likely to be employed than women with no dependent children, albeit more in part-time than full-time jobs. Among women with children aged 11-15 78.3% are in employment, and among women with dependent children aged 16-18 80.0% are in employment as compared with only 75.3% of women with no dependent children. See Table 2.3. Further, among women with no dependent children, 32% work part-time; while among women who work part-time, 44% have no dependent children.

Table 2.3: Economic activity of women of working age, by age of youngest dependent child, 2000.

	All women	Women with dependent children					No dependent children	All men
	16-59	0-18	0-4	5-10	11-15	16-18	–	16-64
All in employment	11916	4864	1659	1597	1197	410	7052	15049
Full-time	6768	1959	584	562	590	223	4810	13827
Part-time	5146	2904	1075	1035	606	187	2242	1219
Activity rate	72.5	68.8	58.2	73.6	78.3	80.0	75.3	84.3

Source: Derived from Labour Force Survey, Labour Market Trends, August 2000, 364.

Tax/Benefit effects on women's participation in paid work

The tax/benefit system has effects on the propensity of women to be in employment. In particular, systems based on the household as a unit as compared with the individual are likely to create a relative disincentive for the second earner, usually the woman, to enter employment (Goode, Callender, and Lister, 1998)

All household, rather than individual, based tax/benefits reduce the propensity of second earners, largely women, to participate in the labour force. There is a problematic effect, not only on the immediate work incentives for such women, but also an impact on the long term productivity of the second earner, as a consequence of the reduction in their labour market experience, which impacts on their productivity when they do eventually re-enter the labour market either as a member of this household or as a lone parent (Women's Budget Group, 2000).

These effects are complex and 'modelling of labour supply responses to tax and benefit changes is notoriously difficult' (HM Treasury 1998b: 17, para 4.12), but there have been attempts to consider their effect. The Institute for Fiscal Studies (IFS) modelled the impact of the Working Families Tax Credit on labour supply (Blundell, Duncan, McCrae and Meghir, 2000). Using data from the Family Resources Survey and the IFS model tax-benefit model, TAXBEN, they conclude that the introduction of the WFTC is likely to decrease the participation rate for married women with employed partners by 0.57% removing 20,000 women from employment, while also raising the labour supply of single mothers by 2.2% adding 34,000 women to employment. With further positive effects on men and for women with non-working partners they estimate that the WFTC will raise overall participation by 30,000 people.

Employment is concentrated in working households. Women who do not have a working partner, either because he is unemployed or economically inactive, or because they do not have a partner, are less likely to be in employment than women who do. This is partly a tax/benefit trap, described above, in which there is discouragement of a second earner to enter the labour force because of the loss of tax credits/benefits, and partly an effect of regional/locality concentrations of unemployment, so that if a woman is living in an area of high unemployment, so also is her husband (Davies, Elias and Penn, 1994).

Ethnicity

The level of economic activity shows significant variations between women of different ethnic groups. In particular, women of Pakistani/Bangladeshi descent have very low rates of economic activity (though there is considerable diversity among young women here according to their level of education (Bhopal, 1998)). Unemployment rates among minority ethnic groups are about twice that for white groups, for both women and men. Ethnic differences may be the result of their interaction with other factors, such as level of education, or due to discrimination, or due to cultural choice (Mirza, 1997). See Table 2.2 below.

Table 2.4: Economic activity by ethnic group, Great Britain, 1999

	Economic activity rate 16-59/64		ILO unemployment rate 16+	
	Women	Men	Women	Men
White	74	86	5	6
All ethnic minority groups	57	77	13	14
Black	71	78	14	17
Indian	64	84	8	9
Pakistani/Bangladeshi	29	70	26	17
Chinese	59	77	*	*
Other origins	59	80	11	14

Source: derived from Labour Force Survey, Labour Market Trends, December 1999, 627.

Women's working time preferences

The extent to which women may be said to choose their position in the labour market and home has been subject to considerable debate on a number of levels. In practice there have been three main approaches. One approach is to treat statements women make as to their choices as if their preferences were the sole and original point of the determination of their labour market behaviour. A second approach is to delve into the complexity and operationalisation of these choices, for instance, by examining nuances and contradictions, and by investigating whether women follow through on their initially stated intentions. A third approach is to assume that, since women make choices within a set of options that are limited rather than infinite, it is necessary to investigate the circumstances that determine the choices that women make.

The first position is illustrated by Hakim who argues that women freely choose whether to be career women, housewives or adapters (Hakim, 1991, 1996). Hakim argues that the explanation as to why women become polarised into either career women or housewives depends critically on women's own attitudes and choices. Drawing on preference theory and concerns with women's agency, Hakim claims that heterogeneity among women is based on their choices. Hakim's work has been subject to considerable criticism, especially on the grounds that women make choices not from an infinite range of possibilities, but within a constrained range of options and that women's attitudes are significantly shaped by the circumstances in which they find themselves (Ginn et al, 1996).

Evidence from surveys contradicts Hakim's thesis since it suggests that most mothers wanted to take paid work when their children went to school and grew up, and that they did not have the polarised conception of themselves as either career women or housewives that Hakim attributed to them. Most (87%) mothers with pre-school or primary-aged children thought they were most likely to take paid work by the time their children reached secondary school age (52% part-time and 35% full-time), and only 9% would stay at home after the children had left school (Bryson et al, 1998: 114).

The second position is illustrated by McRae (1993) and Fagan (2001). McRae investigated the extent to which mothers followed through their intentions to either stay at home or continue employment after childbirth. She carried out a postal survey of 7600 women after the birth of a child during 1987 and 1988. She found that the women who were more likely to return were more likely to be in higher level non-manual and professional occupations than in other occupations. In particular, returners were more likely to be in receipt of maternity pay than those who did not. She considered the issue of women's intentions and choice and found discrepancies between behaviour and attitudes. She found that about 1 in 4 women at home after the birth of a new baby would have preferred to be at work, while about 1 in 4 mothers of new babies in work soon after the birth would rather have been at home. It appeared that it was easier to fulfil an intention to remain at home than to return to work. She found that only 11% of women who wanted to be at home did not achieve this, while 45% of those who had previously wanted to be in work were not. Those who did not achieve their intention to return were more likely to have had manual jobs, to have worked in the private sector, to have had shorter labour market histories, and not to have had a legal right to return. These disappointed would-be returners stated that the difficulty they had in finding a job, or one with suitable hours or location, and with finding and affording childcare, were more important in their being at home than any actual desire to be at home. The reluctant returners most frequently cited financial need as the reason for returning to employment when they did not want to, especially those women in less skilled work.

While much of the interest has been with women working less than full-time hours, there is also concern about the development of a long hours culture, in which men are more likely to engage than women. The greater likelihood of women having commitments outside of work makes it harder for women to access the most senior managerial positions in those circumstances where 'presenteeism' is rife (Rutherford, 2001).

The way that women who are at home are increasingly open to changes in their employment status is captured in responses to a survey that asked women of working age who were looking after the home about their thoughts on working over the past five years. During this five year period 41% of the women had actually had a job at some point, while 19% had seriously considered getting a job. Between 1986 and 1998 the proportion of such women who had answered this question by saying that they had not seriously considered getting a job had declined from 51% to 40%.

The third position examines the restriction on the options open to women to fulfil their preferences and is illustrated by Caputo and Cianni (2001) and Euwals (2001). Caputo and Cianni (2001) investigated the determinants of women in the US working part-time on a voluntary, as compared with involuntary, basis. While the two types of part-time workers were very similar, they did differ on one important characteristic. Those who were involuntary part-time workers had significantly more experience of unemployment. They suggest that involuntary part-time workers were

'settling' for what they could get. Euwals (2001) investigated the extent to which women were able to get the hours they wanted to work, either more or fewer. He found, in the Netherlands, that women were more likely to get adjustments to the hours they wanted to work by moving job than by getting a change within their existing job.

These studies suggest that women were significantly constrained in their choices. Women were often unable to follow through on their initial preferences. There is considerable fluidity in women's preferences in response to actual opportunities

Occupational and industrial segregation

Women and men typically do not work side by side but are concentrated in different occupations and industries. Occupational and industrial segregation might be forms of labour market rigidity in that they may interfere with the free mobility of labour. They can reduce the likelihood that the market will allocate the best person to a specific job. The concentration of women into a narrow range of occupations and industries limits the range of employment opportunities open to women to a greater extent than it does for men whose employment is dispersed more widely. Occupational segregation is not only a matter of women being absent from 'top' jobs, that is vertical segregation, but also one of concentration into particular kinds of ostensibly parallel jobs, that is, horizontal segregation. While there have been changes in the nature and extent of segregation, there remains a considerable degree of both vertical and horizontal segregation.

There is considerable debate as to the exact nature, extent, causation and impact of such labour market rigidities (Cotter et al 1997). In particular, there is concern over the manner and extent to which 'choice' by either employers or women workers is involved. If occupational segregation is best understood as a result of women's free choices, then the argument that it constitutes a form of market failure is weakened. One of the complexities in this analysis is that some of these labour market rigidities may be unintentionally reproducing historic discriminatory practices in the present, especially in patterns of segregation or of pay structure, by occupation, industry or full-time/part-time divisions. That is, women may 'choose', but not under circumstances of their making. While there has been considerable effort to de-regulate the UK labour market in order to produce greater flexibility on some dimensions of employment (Dex and McCulloch, 1997), there is concern as to continuing gendered labour market rigidities (Humphries and Rubery, 1995). The analysis of these labour market rigidities has often involved comparisons over time, or with other countries (O'Reilly and Fagan, 1998).

The segregation of women into lower paid atypical employment is key to the low pay of women throughout Europe. A high proportion of women in employment does not necessarily mean that there will be less segregation, as comparative analysis across Europe demonstrates (Rubery, Smith and Fagan, 1999). That is, occupational segregation is a feature of labour markets that is not reducible to other dimensions of gender inequality in the sexual division of labour.

There has been debate as to whether, or the extent to which, occupational segregation should be regarded as due to discrimination by employers or the choice of women employees. Mincer and Polachek (1974) argued that women restricted themselves to those occupations that were compatible with a break for motherhood. However, England (1982) demonstrated that this was incorrect by showing that the occupations in which women were

crowded did not penalise motherhood (in terms of pay) less than those in which women were few.

While there is still substantial occupational segregation, there have been some changes. First, women have increased their presence in management and professional jobs, thereby reducing the segregation of these important areas of work. However, women are typically not in the top levels of these occupations. Second, there has been a decline in jobs which had been almost entirely male, such as those in coal mining and iron and steel (Walby, 1997). Segregation has been a significant factor behind some of the regional and local unevenness in women's employment (Bagguley et al. 1990).

The nature and measurement of changes in occupational segregation have been subject to debate. For instance, Reskin and Roos (1990) investigated the movement of one gender into occupations that had been primarily composed of the other gender, concluding not that this was a move to equality, but that women were moving into downwardly mobile occupations. Jerry Jacobs (1989) suggested that there was considerable individual movement between jobs, but that this was between segregated segments of the labour market. In contrast Sheila Jacobs (1995) found that there were a limited number of points of occupational movement in a person's occupational career – first job and first re-entry job. There is considerable debate as to the measurement of occupational segregation and in particular whether a single index is suitable (Jacobs, 1993; Siltanen, 1990; Watts, 1990). Much of the complexity of the debate is a result of contrary trends in different sectors of the workforce, which are differentially captured by the different methods of measurement. In particular, the polarisation between full-time and part-time sectors is widely noted (Hakim, 1992; Robinson, 1988; Jacobs, 1995).

It is perhaps more appropriate to note that occupational segregation has a complex origin which includes historical discriminatory practices at times when these were legal, which have lingering effects because of deeply rooted practices, such as pay structures which reflect traditional rather than contemporary valuations of skills and performance, and notions of cultural appropriateness of particular kinds of work (Walby, 1988). The conflict between historic and contemporary valuation of different kinds of skills and work emerges in the effort to revise pay systems using new job evaluation schemes. Modern schemes attempt a technical, neutral, even-handed evaluation of skills traditionally differentially associated with men and women. Difficulties in effective implementation of these schemes are associated with the disruption of traditional valuations of gendered skills (Acker, 1989; Evans and Nelson, 1989). The balance of evidence and argumentation assessed here suggests that occupational segregation does limit women's potential in the labour market.

Part-time working

Women working part-time have only 61% of men's productivity and wages, as compared with 82% for full-time women (New Earnings Survey 2000). Part-time work is a large sector of the UK economy, containing 23% of employees in 1999. Nearly half of women workers are in this low skill part-time sector. This is likely to be a major contributory factor to the low productivity of the UK economy. The explanation of the size and poor productivity in this sector is key to understanding the poor productivity of the UK economy as a whole.

While there appears to have been a significant increase in the productivity of women working full-time, with a significant narrowing of the pay gap

between women and men working full-time, from 66% to 82% of men's hourly wages between 1974 and 2000 (New Earnings Survey, 1974, 2000), this has not happened in the part-time sector, where the wages gap has remained around 60% of men's hourly wages for the last two decades.

The UK labour market has a significant division between the types of jobs that are available full-time and those that are offered as part-time employment. Working-time preferences are constrained by these rigidities. Women who wish to work fewer hours find that there is a restricted range of opportunities available to them. Part-time jobs are more often found in the low skill, low pay sectors, and as such constitute a significant part of the low productivity parts of the economy.

The majority of jobs that are available part-time are to be found in the lesser skilled parts of the occupational structure, especially cleaning and shop work. The occupational structure of the part-time sector is heavily skewed to the lower level occupations for both women and men. There are far fewer part-time jobs available within professional and managerial employment than in the less skilled occupations. Among women, 17% of professionals worked part-time as compared with 85% of those in unskilled occupations (Labour Market Trends, September 1999, p. 449).

Further, those working in part-time jobs have traditionally been often offered significantly fewer fringe benefits and than those accorded to full-time workers, especially those which secure more continuous employment, such as lesser entitlement to maternity leave and protection from unfair dismissal. This lesser entitlement will change when the regulations based on the EU Directive on Part-Time work are more fully incorporated into practice (DTI, 2000, though see Education and Employment, 2000), but there are long term effects of this earlier treatment on those who have worked part-time.

How is the low pay of the part-time sector to be explained and why do so many women work there? Why is part-time work on average less well-paid than full-time? Why do so many women work part-time in the UK? Why is the UK different from other countries in having such a large and low paid part-time sector? What are the implications of this for UK productivity?

A significant component of the wages gap between part-time and full-time women workers is due to the lesser human capital of part-time workers than full-time workers (Joshi and Paci, 1998).

Several writers have found a specific wage penalty for working part-time in the UK. This appears to be in addition to the lower wages paid as a result of lower human capital and additional to the standard gender penalty (Joshi and Paci, 1998). This is evidence of a lower rate of return to women's human capital in the part-time sector than the full-time sector. This might be taken as indicative of crowding in this section of the labour market, as women seek family-friendly working hours, and/or of possible discrimination. Some women seeking part-time work may be faced by monopsony, in which there is a monopoly employer prepared to offer work on part-time hours to those with limited geographical mobility as a result of their domestic situation and transport difficulties (see Anderson et al, 2001). This effect of these characteristics of part-time work has been described as the 'part-time penalty' (Joshi and Paci, 1998; Women's Unit 2000b). However, analyses which found a specific effect for part-time working have not included many other variables to capture the effects of occupational and industrial structuring of the labour market. We need to investigate whether this additional effect is still present when a wider range of variables is included in the model.

Many women enter part-time work after having children and suffer downward mobility. Women who return to employment after having children tend to return to jobs at a lower level than the one that they had prior to childbirth. This finding is reported from several analyses of longitudinal data. An early example was the analysis of the Women and Employment Survey from 1980 (Martin and Roberts, 1984). Joshi and Hinde (1993) found that this effect was common not only among women who gave birth in 1946 but also to the generation of their daughters. In each case 36% of women returning to employment after a period out of the labour market for childbirth and childcare did so to a job at a lower level. Blackwell (2001) in her analysis of linked longitudinal data from the Census in 1971, 1981 and 1991 also found that significant numbers of women shifted down occupationally after childbirth if they also moved to part-time working. Blackwell argues that it was the transition between full-time and part-time work rather than motherhood itself that generated this downward occupational shift. She found that 29% of women who moved from full-time to part-time work between 1971 and 1981 suffered downward occupational mobility. Blackwell found that some women were able to recuperate and later had a shift back from part-time to full-time work, which was correlated with an upward occupational shift into less feminised occupations. However, this was a smaller group, 2909, than those who had made the downward shift, 3893.

Some women take part-time jobs as the only viable solution to balance work and family life in the absence of a supportive social infrastructure. Women often initially choose part-time work when their children are very young as part of a strategy to balance working and family life. Women trade off working-time preferences with job-level preferences. Inflexibility in the labour market means that women who prioritise short hours in order to balance work and care may be unable to utilise their training and education to the full. The absence of part-time work throughout the economy means that some mothers will be working at levels beneath their qualifications.

While many women enter part-time employment in order to achieve work/life balance when they have young children, some women stay in part-time employment even after their children have grown up. Among women who work part-time 44% do not have dependent children, while 32% of women with no dependent children work part-time (calculated from Labour Force Survey data in Labour Market Trends, August 2000, p. 364). The 'choice' of part-time working by this group of women cannot be attributed to wanting to stay at home with children, since they have left home. Possible reasons for continuation of part-time employment in these circumstances, such as lack of access to the training needed for higher paid employment, are investigated in the survey reported in Section 4.

Thus there are several components in the explanation of the low pay, and by implication, low productivity, of part-time employment in the UK. These include elements of both human capital and of labour market failure.

Employers' views on working time

Employers' preferences on working-time arrangements are important in shaping the range of options available to women. Casey, Metcalf and Millward (1997) consider employer's views on part-time working and other working-time practices using qualitative data drawn from case studies. This study included an investigation into employers' perceptions of the advantages and disadvantages of part-time as compared with full-time working. They found that employers rarely considered part-time working unless the jobs being considered employed women. The limited number of

exceptions that included male part-time working were predominantly the employment of students by hotels, and professionals who wanted to combine two jobs, for instance, hospital doctors who took a University research position in addition to hospital employment. They concluded that the extent it was women's rather than men's jobs that were considered for part-time working was evidence of prejudiced attitudes. The views of employers were of three main kinds. First, some employers pragmatically balanced disadvantages and advantages of part-time working according to the particular circumstances at hand. Second, some employers (especially in the health service, but also one in clothing manufacture) did not have negative views of part-time working; this happened largely when labour shortages had led them to review their positions. A third group of employers had only negative views of part-time working. This group contained all the employers of predominantly male work-places, and some of those of mixed sex or female majority workforces.

While only some employers saw any advantages, all saw at least some disadvantages. The advantages of part-time working were seen to include: reducing cost, so as to enable paying wages for only that part of each day when there was a need; cost, where there was less work than for a full-time person; labour supply, so as to attract women workers; labour supply, so as to attract higher quality female workers, especially those who had previously worked for that employer; cost and flexibility, because of the ability to expand working hours without paying over-time premia. The disadvantages of part-time employment were seen as: a lack of commitment from part-time workers leading to poorer quality of work and higher turnover; additional administration and management, such as payroll and training; flexibility and control, in that it was harder to arrange shift times with part-timers than full-timers; the cost of additional liaison time between professional workers if there were more of them because there were part-time rather than full-time workers.

Casey et al asked for employer perceptions of job sharing separately from part-time working. Job sharing was utilised where employers felt that the need for liaison between the two parts of a job precluded the possibility of part-time working. While the health sector cases had a general policy allowing job sharing, in others it was confined to administrative and managerial work. Apart from the health sector, job-sharing was introduced reluctantly and sometimes in the face of hostility from line managers. The disadvantages seen by employers included: the cost of recruiting two people to work together; the cost of the liaison between the two job-sharers. Advantages of job sharing were only identified in the health sector, where the disadvantages were outweighed by three benefits: labour supply, that is, the ability to recruit or retain good workers; the skill and experience of two workers combined was seen as greater than that of one; the dedication of the job sharers was thought to be greater than that of a single full-timer, for instance, together they put in more hours of work than a single person.

The study asked employers about their views on term time only working, treating it as if it were a special form of part-time employment. It was found in only a few of the cases, especially in health, in the context of severe labour shortage. Its sole advantage was the ability to recruit or retain good workers. Generally it was seen to have disadvantages, in particular that it did not suit the pattern of their need for labour.

While formal flexitime was not common and found only in the health sector, informal flexibility was very common. In most instances it was, however, relatively minor, such as an hour difference in starting and finishing times, and tended to be found predominantly among administrative, managerial and professional staff. The restriction to these

grades was considered to be related to issues of control and monitoring, which were widely thought to be problems in the formal flexitime systems.

Casey et al (1997) concluded that different pressures led to the changes in working time patterns in some workplaces and not in others. These include: management preferences, which are for full-time workers on straight shifts; cost pressures leading to a closer matching of working time with labour demand; demand fluctuation; quality concerns favouring permanent multi-skilled employment; and labour shortage, leading to job-sharing, part-time working, term-time employment and flexitime. In considering the source of innovation in working-time practices more generally they note the importance of practices spreading from 'leading edge' firms and note that some practices were not widely adopted because managers knew little about them.

Sticky floor

There is evidence that part-time working may function as a 'sticky floor' trapping women into low paid and low productivity employment long after their original reasons for selecting this work are over. Of the women who make the transition from full-time work to part-time work, not all of them make the reverse transition when their children have grown up and left home. Not all women who work part-time do so because they have young children. 44% of part-time workers do not have dependent children, according to our calculations from the Labour Force Survey 2000. Indeed 32% of women with no dependent children work part-time.

Of course, this category of women working part-time with no dependent children contains some who are carers of elderly, sick or disabled people. However, the size of the group suggests that while this may be relevant for some, this is not a sufficient explanation for all who experience this pattern of working.

International comparisons

The UK has a larger part-time sector than is typical in comparable countries, such as those in the OECD. In particular, it is much larger than that in the US and Germany which are countries with higher productivity than the UK (see Table 2.5). While the traditionally greater regulation of the German labour market may mean that the small size of the part-time sector there is no surprise, the small size of the part-time sector in the US is more interesting. Indeed the US has one of the smallest part-time sectors in the OECD and one that is declining (from 15% in 1983).

Table 2.5: Part-time as percentage of employment, international comparisons, 1999

U.S.	13
Germany	17
Ireland	18
Sweden	15
U.K.	23

Source: OECD 2000

The part-time sector contributes significantly to the greater gender gap in wages in the UK as compared with other EU countries. When both part-time workers and full-time workers are included the UK has the largest gender pay-gap in the EU. When only full-time workers are considered, the UK ranks 12th out of 15 countries. This means that the low rates of pay of part-time workers in the UK are significant for the overall location of the UK in this league table. See Table 2.6 below.

Table 2.6: Gender pay gap for employees, EU, 1995

Country	Full-time workers		All workers	
	%	Rank	%	Rank
Belgium	83.2	4	80.4	6
Denmark	83.1	5	84.2	3
Germany (West)	76.9	7	75.0	8
Germany (East)	89.9	1	87.1	1
Greece	74.9	10	75.0	9
Spain	74.1	11	72.5	11
France	76.6	8	73.2	10
Italy	76.4	9	76.6	7
Luxembourg	83.9	3	81.1	5
Netherlands	70.6	15	68.9	14
Austria	73.5	13	71.7	12
Portugal	71.5	14	71.6	13
Finland	81.5	6	81.3	4
Sweden	87.0	2	84.4	2
United Kingdom	73.7	12	66.4	15
E14	75.0		72.7	

Note: no data for Ireland. EU 14 treats Germany as one country. Data refer to hourly earnings including overtime. Data for NACE C to K.
Source: Grimshaw and Rubery (2001).
Original data from EU Structure of Earnings Survey 1995.

The particular construction of the part-time sector is unique to the UK (Fagan and Rubery, 1996; Gornick and Jacobs, 1996; O'Reilly and Fagan, 1998; Rosenfeld and Birkelund, 1995). The UK not only has one of the highest rates of part-time working, but also poorer rates of pay and conditions than in other EU countries. In other EU countries, the distinction between the terms and conditions of part-time and full-time work has always been much less marked than has been the case in the UK. For instance, in Sweden part-time work is usually performed under the same conditions as full-time work, only for slightly fewer hours per week. In such countries the productivity gap between part-time and full-time workers may be expected to be much lower. Gornick and Jacobs (1996) further argue that differential regulation of part-time work is an important part of

the explanation of the lower rates of pay of women who work part-time in the UK as compared with Canada and Australia.

This construction of part-time work in the UK is a legacy from the time when there was historic discrimination against married women workers, who disproportionately worked part-time, and who were excluded from many rights and fringe benefits. At the time that part-time work developed and was built into the institutional structure of the British labour market it was considered legal to treat married women as secondary workers (Walby, 1997). Part-time work grew in the UK economy as a less regulated form of work without many of the protections developed for full-time workers, a division which does not always occur elsewhere. While it is now illegal to treat part-time workers worse than comparable full-time workers as a result of EU rulings newly incorporated into UK law, the sector is still structured around its origins as a low-skill, flexible, low security segment of the labour market. Legal definitions of equal treatment have changed, but the institutional structure is changing only very slowly. Only since a legal case in 1995 under sex discrimination laws and with the even more recent implementation of the EU Part-time Workers Directive has it become illegal to treat part-timers worse than full-timers. It is not inevitable that part-time work should be a large, low skill, low-pay, low-productivity sector, since this is not the case in other countries.

Discrimination

Discrimination is a form of market failure that reduces productivity because it blocks the most efficient distribution of workers to jobs. That is, discrimination is a form of market failure. Discrimination contributes to the crowding of women into a limited range of occupations. Discrimination prevents the proper functioning of the market to allocate labour to its most productive location. Any such obstacle to women realising their potential in the labour market will reduce their likelihood of labour force participation. Discrimination artificially lowers women's wages, which depresses women's participation rates, as well as reducing the likelihood of women acquiring skills and preventing the most productive allocation of women's labour.

Forms of discrimination are diverse. The treatment of part-time workers, and of occupational segregation discussed above includes some elements of discrimination. There may be discrimination during processes of recruitment and promotion. Complaints about illegal and discriminatory dismissal on pregnancy constitute the largest part of the complaints with which the EOC is asked to assist (Wild, 2001). There may be indirect discrimination as a consequence of working time-related clauses in professional codes of practice (Women Returners Network, 1999, 2000). Sexual harassment also constitutes a form of sex discrimination (Decker, 1997).

Many studies have found that discrimination has a measurable effect on women's wages (Dolton et al, 1996; Harkness, 1996; Humphries and Rubery, 1995; Jones and Makepeace, 1996; Joshi and Paci, 1998; Wright and Ermisch, 1991; Women's Unit, 2000b; Zabalza and Tzannatos, 1985). However, in these studies, which use statistical techniques to decompose the gender wage gap into its constituent elements, it is hard to disentangle the effect of discrimination from that of unobserved forms of heterogeneity, such as motivation and effort. Typically these studies are able to report on the extent to which there is a factor, over and above levels of human capital, which is associated with gender, that is also associated with lower pay. While early studies described this factor simply as discrimination, more recent studies have used a different terminology, such as 'gender penalty' (Rake et al, 2000), in order to acknowledge the inclusion of elements

additional to discrimination in this factor. The continuing existence of significant levels of discrimination against women in the labour market was the conclusion of the Equal Pay Task Force (2001), and has been consistently demonstrated in studies of gendered wages in the UK (Grimshaw and Rubery, 2001; Harkness, 1996; Wright and Ermisch, 1991). The removal of discrimination could potentially be significant in raising productivity, as well as wages, since it could result in better job match (Cotter, et al, 1997).

Historically, reducing discriminatory barriers in the UK has led to both an increase in women's wages and an increase in their propensity to be in employment (Dolton et al, 1996). Zabalza and Tzannatos (1985) estimated that the effect of the 1970 Equal Pay and 1975 Sex Discrimination Acts was to raise women's employment by 12% and relative pay by 15%. That is, by raising women's wages the reduction in discrimination raised women's labour supply.

Pérotin and Robinson (2000) investigated the impact of equal opportunities and employee participation policies in improving workplace productivity. They used the British Workplace Employee Relations Survey of 1998, which contained data on the prevalence of these policies and a management assessment of their level of labour productivity compared with other workplaces. They conclude that there is strong evidence that equal opportunities practices improve productivity overall. They note that this effect gets stronger when there is a larger proportion of female and minority ethnic employees, although there are negative short-term initial effects in segregated workplaces.

Discrimination is a continuing and important contributor to the lesser productivity of women than men because it interferes with the functioning of the labour market preventing the allocation of the best worker to a particular job. It is a labour market failure.

Regional, industrial, firm and sectoral structuring of the labour market

In addition to the more obviously gendered issues discussed so far, there are further factors that might indirectly affect the pattern of wage distribution. These include unionisation, whether the employer is in the public or private sector, industrial sector, firm size, and region. These issues may contribute to deviations between the level of a person's productivity and their pay.

Unionisation

Nowadays unionisation may reduce the gender pay gap, not least because women are now almost as likely to be a members of a union as men. However, traditionally unionisation has been considered to produce a wage premium for unionised men, although since skilled workers are more unionised than unskilled workers, there has always been a question as to the extent of its independent effect. The issue of the impact of unionisation on women's wages is complex, indeed Anderson et al (2001), in their review of the evidence, suggested that it was unclear as to whether unions closed the gender pay gap or not. Historically, some unions have not been as eager to organise and raise the wages of women as they have been of men, however, there have been recent changes in many unions (Gallie and Rose, 1996). While there has been a decrease in union membership over the last 20 years, the proportion of women has increased (Hicks, 2000). Some of these changes have entailed greater prioritisation of equalities issues in the bargaining agenda (Ellis and Ferns, 2000; Ledwith and Colgan, 2000). Further, it is necessary to make a distinction between the potential impact

of general levels of unionisation and the potential implications it may have for individuals who may or may not be members of unions. It may be that unions will raise the pay of those women who are members of unions, but since slightly fewer women are members of unions than men, this would mean that unionisation overall results in higher wages for men than women. Unionisation has rarely been included as a factor in recent gendered decompositions of wage differences in the UK.

Public sector

The division between public and private sectors may have implications for the gender pay gap for a number of reasons. First, the public sector has a more centralised bargaining structure than the private sector in the UK, and this is a factor associated with a narrower wage dispersion, which is associated with a smaller gender pay gap (Grimshaw, 2000). Further, there are some indications that the development of equal opportunities and work-life balance policies has proceeded further in the public than the private sector. Swaffield (2000) found that women working in the private sector had a pay penalty of 3 to 5 percent relative to women working in the public sector, in comparison with men who were found to benefit from working in the private sector. However, Swaffield's analysis did not at that point allow for occupations, which may be correlated with the division between public and private sector, so the question as to the impact of the public sector, after taking account of other factors, remains.

Industrial sector and firm size

There are significant differences in wages between firms of different sizes and firms in different industry sectors (Benito, 2000). These may stem from one or several different causes, including differences in ability to pay due to differences between firms in different sectors. These in turn may stem from a variety of factors, including profitability and productivity (Barrell and te Velde, 1999; Mayes, 1996; Oulton, 1998). Carruth et al (1999) note that inter-industry wage differences are usually used to indicate the existence of non-competitive explanation, that is, as a critique of human capital theory, though they do not agree with such an interpretation. But are these industry differences connected to differences in gender? If the nature of industrial segregation were to follow the pattern found in occupational segregation, with labour market rigidities preventing effective worker movement, then there may be a gender effect. If, however, labour markets are constituted primarily at the level of occupations rather than industries, then industrial structure in itself should not have a gender effect.

Region

Spatial factors may be implicated in gendered wage gaps for several reasons. There is evidence that women's lesser commuting than men is associated with slightly lower wages (Anderson et al, 2001). There have been, historically, significant regional differences in female rates of employment (Bagguley et al 1990). There are currently significant differences in wages between regions, especially higher wages in London, partly due to 'London allowances', and in the South East. These regional differences in pay may indicate rigidities in the labour market possibly related to the difficulties of geographical mobility, but there is a question as to whether or not these, any longer, have a specifically gendered dimension.

Returners: A key group with low pay and productivity

Returners are a key group with low productivity. Here many of the aspects of lower productivity, separately analysed in the sections above, come together in one group.

Returners are those who are re-entering, or have recently re-entered, the labour market after a period of intensive caring. They have typically been out of the labour market because they were caring for young children, but some have been caring for the frail elderly, or sick or disabled people. The European Social Fund defines a 'returner' as 'someone returning to the labour market after a period of discharging "domestic responsibilities", which refers to raising children or other domestic or caring responsibilities' (DfEE, 2000a: 3). Returners are overwhelmingly women because in the UK today it is women who are usually the main carers in households, but the term does not exclude those few men who left the labour market in order to take a primary caring role. Returners may often remain on the margins of the labour market for some time before becoming fully re-incorporated. Indeed the rules of the EU NOW scheme recognise this by including those who have already returned and are working 16 hours or more per week in a role which does not offer significant training or career prospects (DfEE, 2000a: 3). Most women working part-time were once returners and their continuing lack of integration into mainstream conditions of employment is one of the issues of concern here. That is, the analysis of returners needs to address the long-term effects of being a returner such as those relating to part-time employment.

Returners will typically re-enter the labour market into low productivity jobs, as discussed above. It is the result of the intersection of: the nature of the skills and qualifications of such people; the way that education and training can be accessed; the nature of the UK labour market, especially, the structuring of part-time work; and state policy regulating these relationships.

Women who take a break from the labour market when they have children, that is women who become 'returners', already, on average, have fewer qualifications than other women. They are already more likely to be in lower socio-economic positions than those women who have continuous employment. Women with higher education are much more likely to be employed than women with no qualifications: 81% as compared with 51% in 1996 (ONS, 1998a). The gap is especially large during the years when women are having and bringing up children, their 20s and 30s. Among women in their 20s, only 7% of those with higher education are 'inactive' as compared with 58% of those with no qualification, while in their 30s, 16% of those with higher education are 'inactive', as compared with 47% of those with no qualifications (ONS, 1998a). (The main reason that women in their 20s and 30s are economically 'inactive' is because they are hard at work raising children.)

Among women with very young children, that is, under 5, mothers in the higher socio-economic groups (SEGs) are more likely to be employed than those in the lower socio-economic groups. Among mothers of under-fives, 64% of the top SEG 1 women are working for pay as compared with 34% in the lower SEG 4 and 50% in the lowest SEG, 5 (ONS, 1998a). The Women's Unit (2000b) report on women's lifetime earnings further demonstrates that it is women with lower levels of skills who take the most time out of the labour market when they have children and that they forego large amounts of potential income as a consequence.

The conclusion here is that the mothers who take the longer breaks from the labour market when their children are young are very significantly poorer, less qualified, and in lower socio-economic groups than those who take shorter breaks or none at all.

Gender and class: The notion of the 'bourgeois housewife' is an outdated myth. At one time, years ago, it was middle class women who tended to be housewives, while working class women were more likely to take paid employment as well as look after the home. But those days are long gone. Joshi and Hinde (1993) compare two cohorts of mothers, one group who gave birth in 1946 and the daughters of these women. While for the older generation having a better off middle class husband increased the length of time they spent at home having children, this effect had significantly shrunk for their daughters' generation. That is, the income effect, of a partner with higher earnings, weakened during the 1950s and early 1960s.

Today, it is poorer, less well qualified women who are more likely to be at home when their children are small, and better off, well-qualified women who are more likely to be near-continuously employed. Indeed, this pattern of women's employment can exacerbate class inequalities between households, with two income middle class households having a much higher standard of living than single income working class households.

The reasons for this pattern are complex. Part of the reason is that low wages do not encourage women to stay in the labour market. Another key reason is the cost of childcare. Only women with good salaries can afford to purchase the childcare needed for near-continuous employment. Women on low wages can only access quality childcare with the assistance of state subsidies. Women on low wages will not find it worthwhile staying in work unless childcare is subsidised.

The gap in qualification level between women in employment and at home is further compounded by the period of absence from the labour market, since employers are an important source of training after people are older than 21. Education is most often achieved when one is young. The institutional supports are in place for this. Accessing skills training and education when older is more difficult. Crucially, while education up to 18 is usually free, that undergone as an adult either requires a sponsor, such as an employer, or requires individuals to pay fees. The DfEE report by Callender and Kemp (2000) has shown the difficulty that lone mothers have in accessing University education for financial reasons. Many adults who obtain training and education do so 'on the job', with the employer footing the bill for the cost of the training as well as paying a wage (Blundell, et al 1996; Spilsbury, 2000). Adults outside the labour market lack such sponsors. Thus women returners miss out on an important route to training. Those in part-time employment are less likely to gain access to employer-sponsored training than those who are in full-time employment. Women returners often work part-time. Hence they have less access to training than the average worker. There are some special kinds of training requirements for returners. Sometimes these may be for professional up-dating so as to enable highly qualified women to return to jobs that utilise their hard won skills (Shaw, Taylor and Harris, 2000; Women Returners Network, 2000; Women's National Commission, 1991). In addition reviews of policy measures for women returners often note the need for confidence building measures (Shaw, Taylor and Harris, 2000; DfEE, 2000; Women's National Commission, 1991). Returners fall through the gaps in many forms of policy provision, especially for training. They are unsupported by employers and do not have the disposable income to invest in themselves.

Further, women who are in households that have been dependent, at best, on one wage, are unlikely to have the disposable income needed to invest in one's own training and education. Households that are lone mother households have even less disposable income. Further, in poor households it is unlikely that priority will be given to investing in the education and training of women when there are so many immediate and urgent calls on the money. So the route of self-improvement through training is hardest of all for women re-entering the labour market, even thought they might be considered to need it the most.

Continuity of employment is a very important element in maintaining and improving human capital, especially that which is employer-specific. Anyone who has a period out of employment, for whatever reason, experiences difficulties when they are returning to it. This is because a significant amount of job progression and promotion is within the same employment unit, with the same employer. In a complex economy it takes a while to learn how to do most jobs effectively and how to perform well in a particular context. Entry level wages are thus lower than average wages.

This problem of labour market structure is compounded by the entry of most returners to the part-time sector. Many women returning to employment after a period of intensive childcare do so part-time.

Most mothers are 'returners' at some point in their lives, since most still take a break from employment in order to care for their young children. The process of their re-integration into the labour market can be a key moment in shaping their position in the labour market, with implications for pay and productivity. Women's own perspectives on this are reported in Section 4.

The Business Case and the Whole Economy Case

The positive effects of improving women's position in the labour market are relevant at a number of levels. It is relevant for the specific business that employs them; relevant for the economy as a whole; and relevant for the country as a whole.

Sometimes the focus of equal opportunities practitioners has been in making the 'business case' for fair treatment. This is important, especially in the development of workplace based policies for work/life balance and for equal treatment. Studies have indeed demonstrated that, at the level of the workplace, equal opportunities policies correlate with higher levels of productivity. However, there are limitations to the 'business case' approach to women and productivity. The focus of such a perspective can be narrow, prioritising the interests of a particular group of employers rather than the economy as a whole. Some business driven initiatives have 'shown a greater concern for the glass ceiling than the "sticky floor"' (Dickens, 1999). Some forms of 'flexible' working may be profitable for some specific employers, but they may not be good for the economy as a whole, in that they act to sustain a low-wage, low-skill, low-productivity economic system (Bruegel and Perrons, 1995; Colling and Dickens, 1998; Perrons, 2000).

A more important focus is that on the whole economy. The ability of businesses to employ people at very low rates of pay, short hours and poor conditions can mean that the tax payer has to contribute to the support of these people later if, for instance, they have not earned enough for an adequate pension or if their children are at risk of poverty. It is helpful to take a life-time perspective on earnings (Women's Unit 2000b) since this better illuminates the way that the whole economy picture involves transfers though taxes and benefits. The consideration of the productivity

of the economy as a whole requires that we look at the issue of life-time working patterns. Such a perspective is also consistent with the commitment to ensure that the rewards of economic growth are fairly distributed. Higher productivity is in the interests of the whole economy. Sectors of low productivity, while possibly being in the short-term interests of a few employers, are not in the interests of the economy as a whole.

The analysis of gendered economic issues has traditionally been conducted within a framework led by concerns of social justice. This is a framework that, for instance, conceptualises the infrastructure that assists parents of young children to be in employment as welfare; a framework within which equal treatment at work is a question of rights. The analysis here does not deny the significance and fruitfulness of such orienting frameworks. But they are not the only ones. The framework adopted here is that of the productivity of the whole economy. It is based on the assumption that an increase in productivity is an important element in the increase in social well-being. The focus is on the economy as a whole, broadly defined, rather than on the interests of any particular section of the country. Within this framework, public services, such as education, which are essential for the development of human capital, are conceptualised as investment rather than as consumption or as welfare.

Decomposing the pay gap, and understanding the implications for productivity

Several studies have attempted to disentangle the effects of the varied components of the pay gap. These have often used a statistical method to decompose the size of the various components of the wage gap, following work by Blinder (1973) and Oaxaca (1973). This statistical method is designed to distinguish between two kinds of elements: personal characteristics, which are primarily those of human capital, especially education, training and employment experience; and unequal returns to these characteristics for men and for women, which is regarded primarily as discrimination. However, this is a technique that has a number of limitations, which are explored in detail in Appendix 4. Of course, as in any statistical analysis of variance within a population, there are additional factors that are not captured in the model.

There are a number of issues on which the subsequent analyses vary. First, they vary in how they capture the extent of employment experience. Early studies which used data from cross-sectional studies of the population at one moment in time did not have data which enabled a direct measure of this variable, so had to estimate its probability using other information. Later studies used data from longitudinal surveys that contain data on employment experience enabling both more direct measurement and also increasingly sophisticated nuances such as interruptions as well as total length. Second, the conceptualisation and measurement of the main variables has increased in sophistication. While early studies focused on human capital and discrimination, later studies made a multiplicity of distinctions within these concepts and their measurement. The more detailed models were able to account for a higher proportion of the variance within the population. Third, while the early models focused on characteristics of individuals, later models attempted to capture variables that had a more collective meaning. So early models focused on issues such as individual education and employment experience. Later models have attempted to include issues such as segregation and characteristics of the employing firms.

In early analyses of the pay gap it was found difficult to obtain actual data on the length of labour market experience, so it was sometimes proxied using age. This proxy led to a significant loss of information. More recent analyses have used data on actual labour market experiences derived from either work/life-histories or longitudinal data. In the UK this means that the use of the Labour Force Survey has given way to the utilisation of one of five longitudinal surveys. First, the Women and Employment survey of 1980 (Martin and Roberts, 1984). Second, the Medical Research Council's National Survey of Health and Development (MRC), of a cohort born in a week in March 1946, last surveyed in 1978 at age 32. Third, the National Child Development Study (NCDS), of a cohort born in a week in March 1958, last surveyed at age 33 in 1991. Fourth, the Office for National Statistics Longitudinal Survey (ONS LS), which is a 1% population sample of linked records drawn from the Census in England and Wales in 1971, 1981 and 1991. Fifth, the British Household Panel Survey, which has longitudinal data from 1990-1999 together with work/life history data for the whole working life. Wright and Ermisch have used the Women and Employment survey. Joshi and Hinde (1993) use the MRC. Joshi and Paci (1998) and Joshi, Paci and Waldfogel (1999), use data from MRC and NCDS. Dex, Joshi, Macran and McCulloch (1998) use the NCDS. Women's Unit (2000b) uses data from the NCDS and the 1994 sweep of the BHPS. Waldfogel, Higuchi and Abe (1998) use the Labour Force Survey and the NCDS. Blackwell (2001) uses the ONS LS.

Much of the work reported below has relied on the second of these surveys, the NCDS, sometimes in comparison with the first, the MRC. Today, these two surveys have the disadvantage of being conducted rather a long time ago, since the data was collected eleven years ago in 1991. The Women and Employment Survey is also rather old now, with data collected in 1980. The ONS LS has the advantages of a large sample size, about 500,000, but the disadvantages of rather limited information, and of the last available data (in 1991) being a decade old. This makes the data from the BHPS, currently, the preferred data source since the data is more recent and more comprehensive.

One of the earliest concerns was to identify the extent of the pay gap that was due to discrimination from that which was due to human capital differences between men and women. Wright and Ermisch (1991) estimated the discrimination component as between 22% and 24%. Harkness (1996) estimated the discrimination gaps as variously: for full-timers in 1973, as 40%, in 1983 at 27%, and in 1992 at 22%; for part-timers in 1973 as 53%, in 1983 as 52%, and in 1992 as 40%.

There is considerable diversity of view as to the extent to which occupational segregation is causative of wage differences. These range from: most gender differences in earnings when the macro level is considered (Cotter, et al, 1997), to 35% if women were to have the same occupational distribution as men (Treiman and Hartmann, 1981), to 19% (Goldin, 1990), and 2 to 11% when fixed effects models are used (England, 1992; Macpherson and Hirsch, 1995). The direct effect of occupational segregation is not included in many of the UK analyses described below, though some portion of it may be indirectly included in the component due to segregation into a part-time sector and that due to discrimination.

More recent work in the UK has made a series of further distinctions. This has led the pay gap to be decomposed into human capital differences, the female penalty, and an additional penalty for part-time working.

While the human capital differences constitute a considerable part of this gap, it is noteworthy that there is a lower return to human capital in the part-time than the full-time sector (Joshi and Paci, 1998; Women's Unit, 2000). Joshi and Paci (1998) estimated that one-third of the wages gap between men and women working full-time may be attributed to human capital differences in 1978, with the remainder attributed to unequal rewards to these characteristics (p.63). By 1991 the overall wages gap had halved; only one fifteenth was attributed to human capital differences; the remainder to the unfavourable treatment of women working full-time (p.64). They suggest that gender discrimination in 1991 is not on average worse than in 1978 (p.67). According to Joshi and Paci (1998) the larger pay gap between men and women working part-time rather than full-time is predominantly due to human capital differences, and only secondarily due to additional discrimination against part-time workers. Among women working part-time, Joshi and Paci found that there had been a slight widening of the pay gap between women working part-time and men working full-time between 1978 and 1991. The increase in the gap was due equally to differences in characteristics (from 15% to 19%) and to differential rewards to those characteristics (from 21% to 25%)(Joshi and Paci, 1998: 66).

Joshi, Paci and Waldfogel (1999) found that 70% of the pay penalty to mothers as compared with childfree women was due to differences in human capital, that is education and work experience, and the remainder due to the differential reward to part-time working. In the early period the human capital difference was primarily one of education, while in the latter period it was due to differences in employment experience. Between 1978 and 1991 the penalty attached to working part-time increased. This penalty attached whether the part-time worker had children or not. They compared the position of mothers who worked continuously and full-time with childless women and found no significant differences. This means that mothers who were able to work continuously and full-time, perhaps because they were able to avail themselves of maternity leave and 'family-friendly' policies, had the same pattern of pay as childless women. However, this is a minority and other mothers faced a motherhood penalty in which they were paid around 20% less. However, this group did not escape a gender penalty, since they still earned significantly less than men with the same characteristics, 18% in the case of non-mothers and 23% in the case of mothers. Women's Unit (2000b) found reductions in the human capital component of a slightly smaller pay gap resulting from using 1994 data from the BHPS.

Much of the early work on the decomposition of the pay gap has focused on the issue of the extent to which the pay gap between men and women can be attributed to either human capital characteristics or to discrimination. This was understood as a clear dichotomy. The developing literature on gendered employment introduced a complex of additional analytic elements to the explanation of gender relations in employment. These include: characteristics of the firm (Anderson et al 2001; Paci and Joshi, 1998); region (Anderson et al 2001); occupational segregation (Cotter et al, 1997; Treiman and Hartmann, 1981); attitudinal differences (Swaffield, 2000); and differential commuting times (Anderson et al 2001). Each of these has been found to contribute something to the explanation of the pay gap.

The decomposition of the pay and productivity gap produced in Section 3 builds on these studies. It seeks to develop them further so as to produce a decomposition using the factors that were seen in earlier sections of the report as most pertinent to an analysis in terms of productivity.

Key elements in the gender pay gap and their implications for productivity

This literature review is a key component in the building of our statistical model to decompose the pay gap, reported in Section 3, and then to attempt to draw conclusions relating to UK productivity levels. The variables to be included in our decomposition of the productivity and wages gap were selected on the basis of: the review of the factors found to be associated with the productivity and wages gap in the literature; an appreciation of the differing underlying causal models developed in the literature as to the relationship of gender and employment; a review of the variables used in previous attempts at decomposition. We included variables to capture the following elements:

Formal education and training. Education and training are a key element in human capital. We wanted to investigate the level and impact of educational qualifications.

Length of employment. Many studies have shown that the length of employment is relevant to the measurement of human capital. This may vary by whether it is full-time or part-time employment.

Occupational segregation. The relative concentration of women in a relatively narrow range of occupations has often been noted as a labour market rigidity that is detrimental to women's productive employment.

Interruptions to care for family members. The literature on unemployment and the literature on women's employment suggested that a single variable to capture the length of employment is insufficiently nuanced. Work on unemployment has noted the scarring effect an interruption to employment can have on future wages. Hence we decided to investigate whether there was an effect of interruptions for maternity and the care of family member over and above its effect on employment experience.

Part-time employment. A division between the part-time and full-time sectors of the labour market has been widely noted in the literature, though the extent to which this is really the result of other factors that contingently cluster around part-time work means that this merits further investigation.

Discrimination and other factors associated with being female. We investigate the extent to which factors associated with being female including discrimination affected the pay and productivity of women.

Section 3: Quantifying the pay gap and examining the implications for productivity

Introduction

This section provides estimates of the size of the components of the gendered pay gap and the possible implications of this for productivity.

The data used in these estimations is drawn from the British Household Panel Survey, which has interviewed around 10,000 people each year for a decade. The BHPS data used here relate to the reference date of December 1999, with recall over the 12-month period preceding that date as well as retrospective life-history data culled from previous years' data for the respondents.

Analysis of the components of the pay gap

There are several complex factors behind the pay gap, with differing implications for productivity changes, as indicated by the analysis in Section 2 of the report. A targeted approach to understanding the nature of the gender pay gap requires the separate specification of the relative importance of these different factors. The purpose of the next section is to quantify the significance of these different factors.

The core technique used in the statistical analysis is that of regression, because it enables the assessment of the significance of several factors. The regression equations were estimated for three categories of people: first, for all women who are or could be employed; second, all men who are or who could be employed; third, all those who were employed, or could be employed. The analysis takes account of the differential likelihood of entering employment, as well as the determinants of wages. The details of these equations are provided in Appendix 1, while the output from the main regressions is provided in Appendix 3.

The data presented in this section also draw on the technique of simulation. This allows for the change in the level of one or more components affecting the level of pay/productivity in the equation. This provides a sophisticated analysis of the significance of potential sources of change.

The British Household Panel Survey

We use data from the British Household Panel Survey (BHPS) as the basis of this analysis. This is a survey of around 10,000 people who have been interviewed every year for a decade. This longitudinal survey includes data on the length of employment and the nature of interruptions to employment. Employment duration is one of the important factors associated with variations in current labour market position, especially for women. For this reason the BHPS is preferable to the Labour Force Survey, despite the larger sample size of the LFS, which is primarily a cross-sectional survey at one moment in time and thus does not contain this work/life history data. As compared with other longitudinal and cohort studies, the BHPS provides more up-to-date data – the latest being 1999 – for instance, the NCDS last interviewed respondents in 1991. Also, unlike the cohort studies, such as the NCDS, which follow through people all born in the same year it has the advantage of a representative sample of all ages. This is

important since the employment patterns of women in their early 30s are quite different to those of women of different ages. Further, the BHPS contains data on a very extensive range of variables.

This survey is carried out within Great Britain, and data from Northern Ireland are incomplete, so the following results are strictly about the British rather than UK population. This report is based on results using personal respondent weights, which raise the BHPS respondents disproportionately in 1999-2000 to levels that are representative of the population in that year (hence we will refer to BHPS 2000).

Selection and Definition of Variables

We investigated the extent to which a variety of factors were associated with the gendered patterns of pay. The decision to consider variables for analysis was made on the basis of the review of the existing literature in Section 2. The review examined three dimensions: factors found to be associated with the wages gap; the differing underlying causal models developed in the literature as to the relationship of gender and employment; and the variables used in previous attempts at decomposition. The construction of our variables also took into account the availability of data in the British Household Panel Survey. At various times additional variables were constructed and tested for significance and abandoned if they were either found not significant or to be lacking in meaning. For instance, whether the employer provided training, either on-site or by paying fees, did not add any significant explanatory power to our models. (7% of employees had such training in the 12 months preceding the survey in 1999.) The final selection of variables was the outcome of a fragility analysis and correlation analysis, which investigated the extent of collinearity and significance of variables when used together and separately.

The following is a description of the reasoning behind and nature of the variables we used in the analysis. Table 3.7 which follows reports on the average value of the variables used in the analysis together with some of the demographic variables which help to describe the characteristics of our respondent population.

Hourly Wages

The focus of the analysis is to explain differences in wages. We use wages per hour as the basic unit of the analysis. In the discussion of the results, we then draw out the implications for UK productivity levels and growth. For technical reasons related to the pattern of the distribution of earnings, the dependent variable that is used in the equations is the log of the hourly wage. This is 'lnhourly'.

Education and Training

Education and training have been found to be positively associated with pay, and a source of productivity growth, in a wide range of studies. They are a key component of human capital. We used two different modes of analysis in order to construct variables for analysis. One was a scale, in which a single point is roughly equivalent to one year's education. The other was a set of dummy variables each of which was a particular level of educational achievement.

The index of education levels was constructed using a points system approximating one point per year of full-time education. 8 points were assigned for those who left school at the minimum leaving age without qualifications, and 8.5 points for those who received City & Guilds

certificates, a clerical or commercial qualification, or had completed an apprenticeship. The scale awarded 10 points for CSEs and SCEs, 11 points for GCSEs at any level and for GNVQ (no level is specified in the BHPS so a level is assumed, equivalent to GCSE). There are 13 points for A-levels, 16 points for a University degree, and 17 points for a higher degree. In addition, if a person had a nursing qualification (but no degree), a university Diploma (but no degree), or a teaching qualification without a degree, they were given 14.5 points. This scale tends to distribute older people toward the lower end, because educational levels are higher among those educated as young people recently, but is distributed fairly symmetrically. This is 'edscale'.

A second way of considering education was to produce a 'dummy' variable for each level of education. Thus variables were created for having: a degree, other higher qualifications, A levels, O levels, CSE, other qualifications. This enables the relative importance of specific levels to be made clear, rather than averaged as in a scale. We used this set of variables on levels to explore the implications of each level of education.

In the main regression equations we used the scale rather than the several variables for specific levels in order to be able to estimate the implications of a typical extra year of education. Table 3.1 below is a summary of the scale that we used and its relationship to the highest qualifications dummy variables.

Table 3.1: Summary of the Education Scale (Approximating Years of Full-Time Education)

Highest Qualification	Points Assigned in the Scale:
Percent Having Degrees	Higher Degree 17; Degree 16
Percent Having Other Higher Qualifications	Teaching, Nursing, and Other Higher 14.5
Percent Having A-Levels	A-Levels 13
Percent Having O-Levels	O-Levels 11
Percent Having CSE Exams	CSE 10
Percent Having Other Qualification (e.g. Apprenticeship)	Apprenticeship 8; Commercial 8.5; Other qualification 8; Still in School (but working) 8
Percent Having No Qualification	No Qualifications 8

Length of Employment

Longer labour market experience has often been found to be positively associated with productivity. It is the second major element of human capital to be captured in this model. However, there is some complexity here in that there is not a simple steady increase in wage and, by implication in productivity, for each and any additional year of employment. We thus made two adjustments, one to deal with the decreasing returns to a year's employment experience after a certain point, the other to deal with the different implications of working full-time as compared with part-time. We thus have three employment variables. The first and most important is a simple variable of the number of years worked full-time. This is 'fullyrs'. The second is devised in order to capture the pattern that, after a certain number of years, there is a decrease and ultimately a negative impact of further additional years worked on wages. This is captured by the standard practice of a variable that is equal to the square of the number of full-time years worked. This is 'fullyrsq'. The third variable is for the number of years worked part-time. This is 'partyrs'. Unlike the number of years worked full-time, the number of years worked part-time was found to be negatively correlated with wages for women. Under some specifications of our models it had an unstable effect. This is due to collinearity with the variable 'part-time', that is, currently being employed part-time, and also with being female. This means that while extra years working full-time often had a positive correlation with increased wages, extra years worked part-time had a negative effect.

Interruptions: Family care leave and unemployment

The total length of time employed is insufficient to capture some of the nuances in the extent of working experience which impact significantly on wages and productivity. In particular, relatively short periods of interruption to employment can have quite a marked impact on wages and productivity.

In order to define a period of time as an 'interruption', in each case the spell of non-employment must be placed directly before a spell of employment, defined as an 'episode' as described by Halpin (2000), while the following employment episode must be of either employee or self-employed status. There are several reasons for interruption, including: unemployment periods; maternity leaves; family care periods; periods of long-term sickness or disability; other periods of absence from work not specified. We grouped these into two kinds: first, interruptions due to family or maternity care; second, those due to unemployment, sickness and other reasons. The value of the variable is the sum of the number of months of interruptions ever reported to the survey for these reasons.

We constructed the variable for the months of family care leave to investigate whether an interruption for this reason led to an additional wage and productivity effect beyond that of reducing full-time employment. This is 'famlyyrs'. The family care variable is defined as an episode out of employment in order to care for children or for another household member. It was initially calculated in months and is then expressed in our equations as the total number of years absence from the labour market in order to care for a family member. This is usually, but not necessarily, children. These carers were most often women, but since we did not restrict the variable to women there are some male carers in our sample.

The second variable used for interruptions in our final analysis is that of the total number of years of absence from employment for reasons of unemployment, sickness or other reason. This is 'unempyrs'. More men than women are found in this category, but both are represented in the sample.

Segregation

Segregation by sex is widely understood to have a negative impact on women's employment, so we built a variable to capture this. Segregation is really a collective rather than an individual attribute, in that it does not make sense outside of a group context, but the statistical techniques we are using only capture characteristics at an individual level. Hence we constructed a variable to measure the extent to which an individual was experiencing segregation. We took this to mean the extent to which a person was employed in an occupational group that was more or less peopled by men. The higher the proportion of men in the occupational group in which our individual respondent was employed, the greater the value of the segregation variable. This was then applied to both men and to women. This is 'segpoint'.

Segregation is measured as the percent of men in that occupational grouping. We use the two-digit level of the Standard Occupational Classification. The level of segregation of a particular occupation was calculated from the LFS 2000 and then applied to the individual. This ratio is designed to capture a specific dimension of segregation, that is, the extent to which men are predominant. We used data from the Labour Force Survey rather than the BHPS in order to discover the level of segregation because the larger size of the LFS makes this more reliable. Details of the classification and their association with different wage levels are provided in Appendix 2.

Part-time

Women employed part-time have, on average, much lower rates of wages than women employed full-time. This may be due to the characteristics of the women who are employed part-time as compared with those working full-time or it may be due to the very specific characteristics of working part-time. In order to examine whether there is an additional effect of working part-time which depresses the wages and productivity of part-time workers over and above the characteristics of the women and the jobs, we introduced a variable to capture whether or not someone worked part-time. We constructed a simple Boolean variable, measuring whether individuals (men and women) were employed full-time (30 or more hours per week) or part-time (less than 30 hours per week). This is 'parttime'. This takes a value of 1 if someone is working part-time. While a lot of women work part-time, very few men work part-time. In the BHPS sample the few men working part-time were unrepresentative of British male part-timers. In larger surveys such as the Labour Force Survey and the New Earnings Survey, the wages of men working part-time are lower than men working full-time. In the BHPS sample the part-time men reported higher rates. We draw no conclusions about men who work part-time in this report.

London and Southeast

Wages vary by regions within the UK. We investigated the effects of all the regions and found that only London and the Southeast were significant. We have included London and Southeast as dummy variables in the main regressions.

Industry effects

We have included dummy variables for 10 industries in the analysis. Several of these were significant in accounting for variance in wages, but industry was not significant for the gender gap in wages. Hence we use industry simply as a control in the analysis.

Size of firm

We have included a threefold categorisation of firm size, since this is associated with variance in wages. These are: a base case of size 0-9; a middle case of 10 to 49 employees; and one for 50 or more employees.

Trade union representation

We introduced two dummy variables for trade union representation. The first, being a member of a union, was found to be significant and is included in our regressions. The second, being in a workplace in which there was a union, was found not to be significant and is therefore not included.

Public/private sector

We introduced a dummy variable for whether the respondent was employed in the public sector or private sector.

Female

Finally we introduced a variable as to whether the person was a woman or a man. This is 'female'. This would show the extent of the correlation of wages with gender that was not explained by the other variables. It should not be automatically assumed that this is the same as discrimination, since there may be unobserved heterogeneity, such as motivation and effort, or some other unspecified gender-specific factor. However, it is probable that a significant component of this variable is related to discrimination.

Values of Variables

The average values of each of the variables in our data set are provided in Table 3.2. For some issues we simply wanted to test whether a factor was present or not. For these we constructed Boolean variables that take a value equal to 1 if the characteristic is present. The extent to which a variable is present in the population is measured as a percentage. Missing data for certain variables, which meant that that case could not be used, are the reason for the difference between the two tables.

Table 3.2: Means of Explanatory Variables

Factor	Men	Women
Education scale (years)	12.59	12.19
Degree	0.152	0.125
Other higher education	0.303	0.265
A levels	0.133	0.116
O levels	0.167	0.234
CSE	0.054	0.042
Other Education	0.019	0.046
Years in full-time employment	17.85	10.16
Years in part-time employment	0.3	3.9
Years in current job	8.23	8.20
Gender-segregation index (percent male in occupational group)	73.2%	48.1%
Total length of interruptions of employment for family care in years	.056	4.37
Total length of interruptions of employment for unemployment, sick or other in years	1.15	0.71
Works part-time	3.7%	35.1%
In public sector	0.311	0.548
In union	0.253	0.226
Firm size 50 plus employees	0.639	0.606
Firm size 10-49 employees	0.207	0.237
Age in years	39.07	38.77
Children in household	0.363	0.429
Children under 2 in household	0.072	0.077
Whether caring for other person (unremunerated)	12.9%	16.8%
Household income	£30,468	£28,413
London (inner or outer)	11.4%	11.2%
Southeast	20.0%	20.8%
SIC 1	0.014	0.004
SIC 2	0.024	0.005
SIC 3	0.036	0.012
SIC 4	0.115	0.026
SIC 5	0.096	0.044
SIC 6	0.059	0.007
SIC 7	0.09	0.03
SIC 8	0.132	0.106
SIC 9	0.309	0.595
SIC 0	0.014	0.004

Note: The means in this table refer to employees and potential workers.
See Equation 1 of Appendix 3 for the regression equation corresponding to these means.

Decomposition of gender differences in pay, and the implications for women's productivity

We ran regressions in order to discover whether these potential components of gendered wage determination were significant and to establish the relative strength of their association with the level of pay. We then sought to draw some conclusions relating to women's productivity. There are three equations, one for women, one for men and one for men and women combined. These enable us to establish the effects of various factors separately for women and men, as well as their effect for both women and men together. These equations are presented in Appendix 3.

We consider the returns to factors to embody potentially discriminatory elements. Here we decompose the gender wage gap using a method that gives the gross effect of each underlying factor as seen in the combined-sex data set. In other words we treat men and women as if they both belonged in the labour market, and we use the labour-market coefficients for each explanatory factor to decompose the gender wage gap. However we define the gross components as the product of a change in a factor among women (bringing it up to men's average level) and the marginal productivity impact of that factor (i.e. its coefficient in the wage regression reported in Appendix 4). Table 3.5 describes the gender differential in each underlying factor as well as showing the pay and productivity impact of each factor. For instance, each year of education has a .075 impact on the wage rate (logged), and being in London has a .198 impact. However for the decomposition we merely control for residence in London and the Southeast and instead concentrate on the policy-relevant factors.

The main point of this analysis is to establish what would happen if specific elements of the wage gap were to change and the potential implications of this for productivity. Using the data from the regressions, we simulate the impact of raising each of the components of the pay gap for women to the male level. That is, if there were to be a reduction in the differences in the various drivers of the pay and productivity gap between women and men, what are the implications for the size of the gap? The findings from this simulation are presented in Table 3.3 and in Figure 3.1.

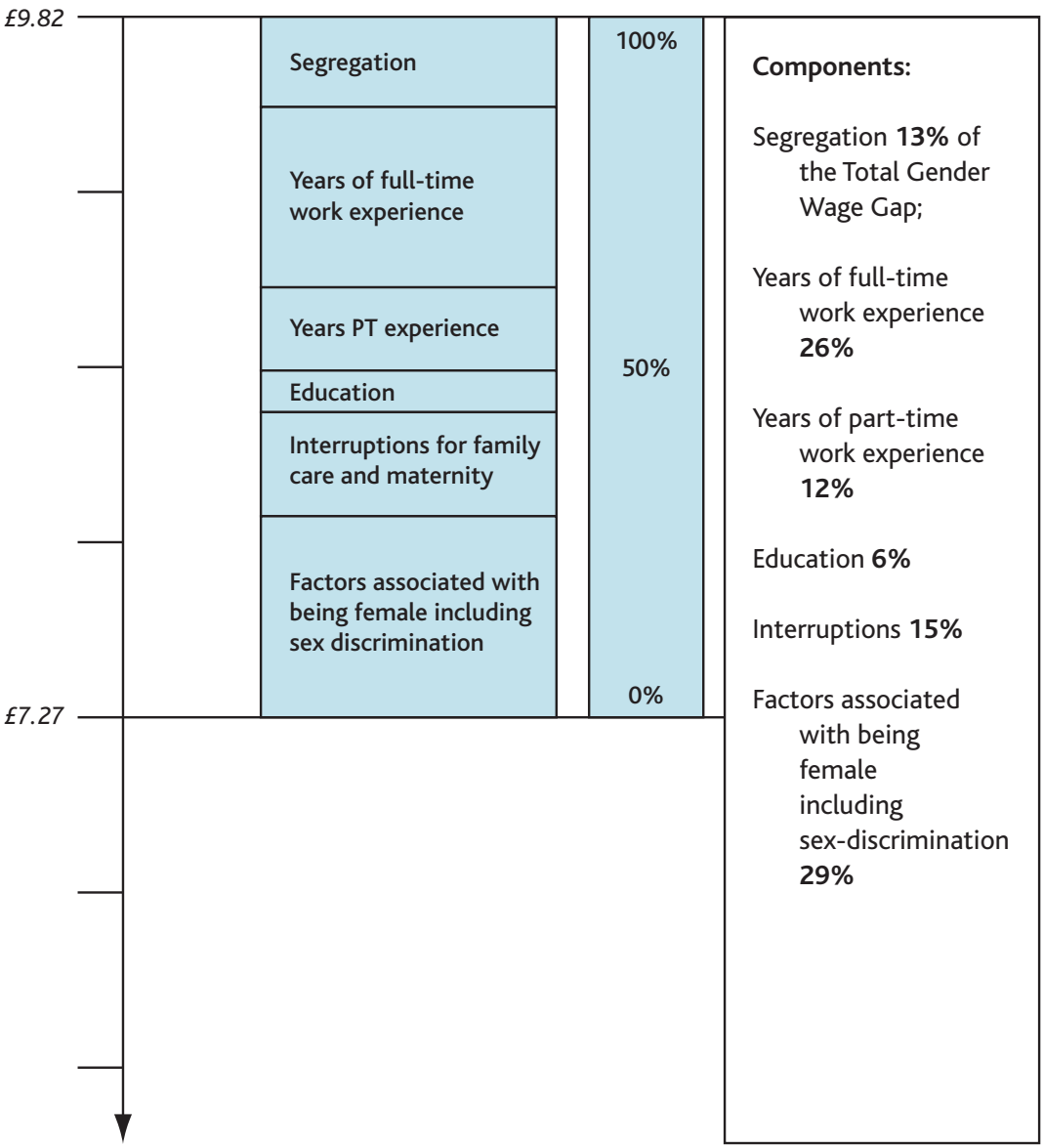
Table 3.3 Simulated Changes Which Bring Women's Levels up to Men's Levels of each Factor

	Men's average	Women's average	Change	Overall men's & women's coefficient	Gross effect	% of Gross effect		Absolute equivalent
Education (Scale Approx. Yrs.)	12.8	12.5	0.30	0.0625	0.0187	6%	6%	£0.16
Years Full-Time Work Exp.	18.15	10.89	7.7	0.01849	0.1294	32%	26%	£0.67
Years FT Experience Squared			59	-0.00049	-0.0240	-6%	(adjusted for curvature)	
Years Part-Time Work Exp.	0.267	4.367	-4.10	-0.011394	0.0467	12%	12%	£0.00
Years Unemployed	0.553	0.374	No change	-0.03291		0%	0%	£0.00
Years Doing Family Care & Maternity	0.035	3.229	-3.194	-0.01856	.0593	15%	15%	£0.38
Indicator: Whether Part-Time	0.033	0.357	-0.324	-0.00486	0.0016	0%	0%	£0.0
Segregation ((Male/Total)x10)	7.022 [70% male]	3.379 [34% male]	2.62	0.019782	0.0519	13%	13%	£0.33
Female	0	1	1	0.118569	0.1186	29%	29%	£0.75
SUM:					0.537	100%	100%	£2.55

NOTE: The base wage for the calculation of variations is £9.82, the men's mean wage.

Employees without missing data are used in this regression. Each case is weighted by IXRWGHT, making a representative 1999-2000 sample.

Figure 3.1 Components of the Gender Wage Gap



The most important factors associated with the gender gap in productivity and wages are:

- Length of time spent working full-time;
- Interruptions to employment for family care;
- Occupational segregation
- Educational qualifications;
- Working part-time
- Sex discrimination.

Education: If women's education were to be raised to the average level of education among men the effect would be to reduce the gap by 6% or 16p per hour.

Length of full-time work-experience: If women's years of full-time work experience were to be raised from 10.9 years to the average among men of 18.2 years, and the extent to which this effect tails off with age (years squared) were to be allowed for, the effect is to raise women's wages by a £0.67 rise in the hourly wage, constituting a 26% reduction in the gender pay gap.

Family care leave: If the years that women spent out of employment for maternity and family care were brought down from 3.2 years to the level among men, i.e. 0.04 years, the effect would be an improvement of £0.38 per hour, or 15% of the pay gap.

Part-time working: If the number of years women spent working part-time were to be brought down from 4.4 years to the 0.3 years found among men, the effect would be an improvement in hourly pay of £0.30, or 12% of the pay gap.

Segregation: If occupational segregation were to be reduced so that men and women each worked in occupations which were 50:50 male:female, the effect would be to raise women's wages by £.33 per hour, or 13% of the overall pay gap.

Sex discrimination and other factors associated with being female: Currently factors associated with being female, which include sex discrimination and unobserved heterogeneity such as motivation and effort, account for 29% of the wage gap (see Appendices 3 and 4 for details). If it were to cease completely, that is, if the factors associated with being a woman rather than a man were to be reduced to zero, the effect would be equivalent to 29% of the hourly pay gap, or £0.75 per hour.

Other elements: We have ignored elements where women are advantaged as compared with men, which include being less unemployed than men and working in the public sector. Being in London and being unemployed have insignificant effects for women, so are ignored here. It does not make sense to bring women's unemployment experiences up to the level of men's because unemployment of women has so often been masked as 'family care and maternity' interruptions. More importantly, we are interested in how women's productivity can be increased in line with men's not how men's can be reduced to women's levels.

Additive Separability

The conventions used in the decomposition of the gender wage gap make the assumption that the components are separate from each other and can be added together (a brief Glossary is provided in the appendix). In practice, the categories used in the analysis do overlap to some extent. This further compromises the assumption that they can simply be added together. However when tests were run for interaction effects among the factors, no discernible effects were found. Instead, the various factors we include have separate associations with the wage rate. The analysis thus conforms to the convention of additive separability, though there are limits to which this is realistic.

Many previous analyses of the gender wage gap have been able to make easy assumptions that all the factors under consideration contributed to the gap. Our analysis of more recent data has found a more complex picture, in which some components favour women and some components favour men. The net effect of these positive and negative factors is, of course, still that a wage gap exists between men and women. But its make-up is less simple than anticipated. Indeed for some elements we found that while the extent of the possession of the attribute favoured one sex, the returns to that attribute were balanced more in the favour of the other sex. We have added up the positives and negatives, of both attributes and the returns to the attributes, and produced a more complex set of findings than is usual.

Discussion of the decomposition of the components of the gender pay gap and implications for productivity

These gendered pay gaps are primarily associated with human capital deficits and with labour market failures, though there may be additional factors. The gendered pay gaps constitute a strong signal as to sources of lower productivity.

Education

That higher levels of education increase wages is consistent with other findings. Women have slightly less education than men. In order to raise the average employed woman to the educational level of the average man, she would need the equivalent of 0.3 years of education. However, younger people have higher levels of educational qualifications than older people do. The gap in educational qualifications between women and men is much greater among people in the second half of their working life than among people in the first half of their working life.

Table 3.4 below reports on the education levels in the BHPS.

Table 3.4 Summary of education levels in British Household Panel Survey 1999/2000.

Highest Qualification	Men				Women				Overall		
	FT	PT	*All Potential Workers	All of Working Age	FT	PT	*All Potential Workers	All of Working Age	FT	PT	All
Percent having Degrees	16	15	15	15	16	11	12	13	16	11	14
Percent Having Other Higher Qualifications	33	20	30	29	31	24	26	25	31	23	28
Percent Having A-Levels	13	21	13	14	13	11	12	14	14	12	12
Percent Having O-Levels	17	23	17	18	23	25	23	23	19	25	20
Percent Having CSE Exams	5	6	5	5	2	5	4	4	4	5	5
Percent Having Other Qualification e.g. Apprenticeship	2	0	2	3	4	4	5	5	3	4	3
Percent Having No Qualification	11	8	14	16	8	18	14	16	9	17	15
Mean of Education Scale	12.8	13.1	12.6	12.6	12.6	12.0	12.2	12.1	12.8	12.0	12.0

All percentages are column percentages.
BHPS data 1999/2000 are weighted by IXRWGHT.
*All potential workers includes FT and PT employees plus potential workers, but excludes the self-employed, retired, and students.

These gendered differences constitute a strong signal as to the effect of human capital differences between men and women on their productivity levels. The gender education gap is largest among people in the second half of working-life. This group includes in particular those women who have taken a break from employment for motherhood. Investment in greater access to education and training for mothers returning to the labour market may increase the productivity of this group.

Length of Full-Time and Part-Time Employment

The longer a person has been employed, the more productive and highly paid they will be in general. This apparently clear and robust finding must be qualified in two major ways. First, there is a limit to the extent to which additional years of employment add to productivity and wages. As a person gets older the increase per year gets smaller. Second, only full-time employment has this effect; part-time employment does not. Additional years of part-time employment for women were associated with lower wages. It was not that the effect was simply half the effect of positive full-time working, but rather that it was associated with lower earnings. It means that while those people who are employed full-time are adding to

their human capital (up to a point), people who are employed part-time are not. This is consistent with the literature, which suggests that part-time workers are less likely to have access to employers' training, but is perhaps a stronger differentiation between full-time and part-time than has previously been noted. The part-time sector is nearly a quarter of the workforce and nearly half of women workers, and predominantly employs women. These differences in the effects of the years spent employed full-time and the years spent employed part-time on pay are an important finding.

It appears that part-time employment has a cumulative negative impact on women's lower pay. Women working part-time for many years experience a larger negative effect on their pay than those working part-time for a short period. It is probable that one reason for this is the lower level of training typically offered to part-time employees as compared with full-time employees. While a short period of lack of development of human capital has a small effect, those who do not renew and increase their human capital for several years suffer a large negative effect. This relative lack of training is probably a key factor linking together lower pay and lower productivity among part-time employees. The implication is that women employed part-time constitute a major group of UK workers that is lacking in training relative to other employees. Improvements in provision and access to training for part-time employees might be an issue for further consideration.

Part-time

Women who work part-time on average have significantly lower wages than women who work full-time. This affects a lot of people since nearly half of women work part-time, that is, nearly a quarter of the workforce. A small number of men work part-time. Unfortunately our BHPS sample of men who work part-time was small and unrepresentative. The lower wages among part-time workers correlates very highly with other characteristics. In particular, it correlates with low levels of education, a high level of interruptions, a low number of years spent working full-time, and, of course, being female. As a consequence of this overlap, any independent effect of working part-time today over and above these factors was not always significant in the equations. It appears that the specific effect of being employed part-time is encompassed by the number of years spent working part-time (as noted above), rather than simply indicated by current part-time status. A large number of years spent working part-time has a cumulative negative effect while a short period working part-time has a smaller effect. Perhaps the best conclusions to draw are that, while there is a specific cumulative negative effect of being employed part-time for several years probably associated with lower levels of training (as discussed above), part-time work is also an employment location where many of the factors that produce disproportionately low productivity among women are clustered.

The implications are that, if there are to be interventions to address the gendered productivity gap, part-time work would constitute a key site because it is where so many aspects of disadvantage are clustered.

Interruptions

Interruptions to employment have a detrimental effect on pay over and above the effect that they have in reducing the number of years of full-time employment. For men, the most significant interruptions are for unemployment. For women, the most significant interruptions are for

maternity and to care for family members, especially but not only young children. The overall months spent out of employment for all these reasons put together is much greater for women than for men. This means that interruptions to employment are a significant element in the gender pay gap. Those women who are able to maintain continuous employment while having children have higher pay than women who do not.

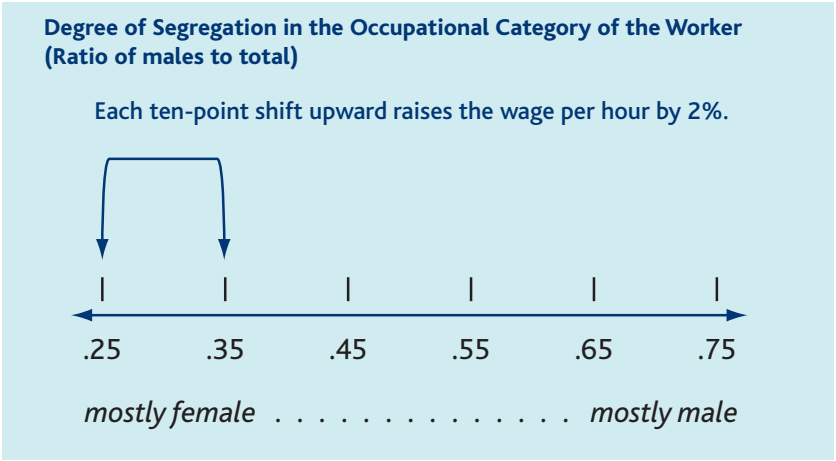
There is probably a link between pay and productivity here because of the importance of job and employer specific knowledge over and above generic qualifications. Disruption of the connection with a specific employer means that both the woman and her employer lose her specific knowledge of the company and of her job within it. This is a loss additional to the loss due to the time the woman does not accumulate human capital through training and on-the-job experience.

The development of policies to promote flexibility and work/life balance, including extensions to maternity, parental and paternity leave, reduce the pressure on a woman to interrupt her employment for motherhood, and hence potentially contribute to the productivity of the UK economy.

Segregation

Occupational segregation by sex has an effect on wages. The higher the proportion of men in an occupation the higher are the wages. This effect is present even when holding constant other variables, such as education, length of full-time employment, and length of interruptions. This might be a form of labour market rigidity that contributes to the gendered wages gap.

Figure 3.2 Impact of a Change in Gender Segregation



Thus, as shown in Figure 3.2, the shift from the women's mean segregation level of .34 to a situation where there were no segregation would imply an increase in women's wages of 13%. This simulation avoids the unrealistic hypothetical situation in which women are raised to the male proportion of workers of .70 overall. These predictions arise from the overall regression equation in which both men's and women's current wages are included.

Occupational segregation by sex is potentially linked to reduced productivity on those occasions when it limits the range of employment taken by women, resulting in a mismatch between a worker's potential and their actual job. Such limitations may be a result of inaccurate information and out-dated expectations which may be embedded in institutional practices. Policies to facilitate changes in out-moded expectations and practices may reduce such mismatch and thus improve UK productivity.

Being Female: Sex discrimination and unobserved heterogeneity

The analysis considered two different ways of conceptualising the direct effect of gender on wages and productivity. The approach we report here is to have a single regression equation for both women and men and to introduce a variable 'gender', in order to see how much of the variance is captured by 'gender' as compared with the other variables. Our findings concerning the other approach (Oaxaca-Blinder) are reported in Appendix 3. We found that gender alone accounted for 29% of the gross wage level in the sense that men's wages are expected to be 29% higher than women's even when all other factors are taken into account. In Figure 3.1 this component is shown to be equivalent to 29% of the wages gap. Of course, while some of the wage variance associated with gender is likely to be due to sex discrimination, there may be some that is due to unobserved heterogeneity such as motivation and effort, or some other unmeasured factor.

This might be interpreted as suggesting that 29% of the overall wage gap is associated with sex, of which a significant component is due to sex discrimination.

Discrimination can reduce productivity by interfering in the best allocation of workers to jobs. Policies to reduce discrimination may thus improve the productivity of the UK economy.

Disaggregating the Components of the Gender Pay Gap

If the size of the pay and productivity gap between women and men is taken as 100%, then the size of the components associated with it are as follows. The gap between women's and men's education is associated with 6% of the gap. Occupational segregation is associated with 13% of the gap. This involves comparing a situation of no occupational segregation with the current level of segregation. Factors associated with being female are associated with 29% of the gap. This is a mixture of sex discrimination, unobserved heterogeneity, and possible misspecification bias. The difference between the length of women's full-time work experience and that of men, 10.9 years as compared with 18.2 years is associated with 26% of the gap. The greater interruptions to women's employment due to family care as compared with those of men were associated with 15% of the gap. Women's greater part-time employment experience than men, 4.4 years as compared with 0.3 years was associated with 12% of the gap. See Table 3.5 below.

Table 3.5 Components of the Pay and Productivity Gap

Component	Women's levels compared to men's	% of gap
Full-time employment experience	-7.7 years	26
Interruptions due to family care	+3.2 years	15
Part-time employment experience	+4.1 years	12
Education	-0.3 years	6
Segregation	.34/.70*	13*
Discrimination and other factors associated with being female		29*
Total		**100**

*The percentage gap for segregation is if there were no segregation.
The percentage gap for discrimination is if there were none.

Making the link between pay and productivity: what this analysis of pay might be able to tell us about women's productivity levels and the implications for the Government's productivity agenda

Pay is a strong signal for productivity, although it is not a direct measure. The different size of the components of the gender wage gap provide some indication of the direction and scale of the factors associated with lower productivity among employed women. Higher levels of productivity are associated with higher levels of human capital and with well-functioning markets for labour.

There are gender differences in the acquisition and development of human capital. These are particularly associated with the lower levels of education among those women who completed their education more than a decade ago, and who have lower levels of educational qualifications than men of their age group, and with spending many years either out of employment or in part-time employment for childcare resulting in less of the training and on-the-job experience that is associated with full-time employment.

The effective functioning of the labour market can be reduced by failures due to lack of information and the appreciation of its significance for business performance. Some aspects of occupational segregation by sex, interruptions to labour market attachment, and discrimination may be regarded as labour market failures.

UK productivity may be increased if the human capital deficit and labour market failures associated with gender were to be addressed.

Section 4: Survey of women's occupational mobility surrounding childbirth and circumstances under which they would choose more training, education and employment

Introduction

The report has identified interruptions to women's employment as an issue of considerable significance as a cause of women's lower pay and productivity and the failure of labour market mechanisms to resolve the issues of work/life balance which lead to such interruptions. It has also identified the problematic role of low human capital among specific groups of women, especially those who are older and who have experienced interruptions to their employment, further contributing to women's lower levels of productivity.

This section of the report draws on original findings from a specially commissioned survey to investigate specific dimensions of these questions. In particular, it investigates:

- Women's occupational mobility over childbirth and childcare;
- The circumstances under which women who work part-time or are not working would be more likely to undertake either training and education or (more) employment.

The focus is on two groups of women, both of working age, one of which is employed part-time and the other of which is not employed, though at various points it has been useful to make comparisons with women employed full-time. Women who are employed part-time have been found to have low rates of pay largely because of a clustering of problematic factors among women workers in the part-time sector. These include low levels of educational qualifications, fewer years in full-time employment, long interruptions to employment, and high degrees of segregation. Women who are not employed may well have interrupted their employment to care, but they also have disproportionately low levels of human capital as well as facing difficulties in combining employment and home.

The data used in this analysis are drawn from a specially commissioned survey of a nationally representative sample survey conducted during November and December 2001. The survey interviewed women of working age (15-59), among whom 1124 were working full-time, 829 were working part-time; and 960 were not working. Details of the survey and the characteristics of the sample are to be found in Appendix 6.

Women's Occupational Mobility Surrounding Childbirth

For some women childbirth leads to an interruption in employment that is then followed by lower levels and rates of employment. For other women there is continuity of employment and occupational level over maternity. The nature, extent, associations and causes of such interruptions are the focus of the analysis here.

It is important to note that these three statuses – working part-time, working full-time and not working – while appearing to be stable groups from the point of view of a cross-sectional analysis, are in fact categories through which many women pass in sequence. A typical life-course involves a woman, after completing her education, entering the labour market full-time, then taking a break over childbirth and initial childcare, then returning to the labour market part-time, with some later regaining full-time employment. A source of great variation between women in Britain as regards to their work history is the nature and length of the break for childbirth and childcare. Some will have continuous attachment to the labour market, utilising maternity leave from a specific employer to which they remain attached, while others take a break from the labour market itself for a period longer than maternity leave. Over time, the former group has been growing while the latter group has been shrinking.

Those who remain attached to a particular employer over the period of maternity are likely to stay in the same occupational category. A significant proportion of women who take a break from the labour market suffer downward mobility on re-entry to the labour market after childbirth/care (see Table 4.1). This group of women is thus working below their previously achieved skill level and represents a waste in productive capacity for themselves, their employers and the economy as a whole. The extent and nature of this downward mobility is investigated in the survey.

We asked mothers working either part-or full-time for their current occupation and for the best occupation (full-time only) that they had been in before childbirth. Occupational mobility is defined using the conventional hierarchy of occupations. Tables 4.1 and 4.2 show the extent and nature of the occupational mobility of women between their best jobs before they had children and their current employment. We found that 28% of mother had suffered downward mobility between their best job before having their children and their current job. It is possible that these figures underestimate the extent of downward mobility on return to employment, since the current job may be better than the job taken immediately on return.

Table 4.1 Occupational mobility between best job before having children and current job.

Best job before children	Occupation currently held: Manager	Prof	Ass. prof	Secretary	Skill man	Pers. Serv.	Ret. sales	Operator	Un-skill	Total
Managers	**62**	*16*	*6*	*13*	*3*	*9*	*7*	*1*	*3*	120
Professional	5	**159**	*6*	*5*	*3*	*6*	*2*		*3*	189
Assoc. prof.	5	10	**79**	*6*	*2*	*6*	*8*	*1*	*4*	121
Secretarial	27	13	17	**163**	*12*	*41*	*30*	*5*	*37*	345
Skilled manual	5	6	4	2	**34**	*17*	*14*	*2*	*18*	102
Personal services	5	2	5	1	4	**62**	*6*	*3*	*10*	98
Retail sales	8	2	8	13	8	25	**56**	*6*	*30*	156
Plant or machine op.		2	5	1	3	16	10	**12**	*15*	64
Other unskilled	1	3	2	3	3	12	8		**46**	78
Total	118	213	132	207	72	194	141	30	166	**1273**

Numbers: These are the raw numbers. Percentages are provided in Table 4.2 below.
Bold: The figures in bold are those women who have retained their occupation.
Italics: The figures in italics are those women who have had downward occupational mobility.

Table 4.2: Occupational mobility over childbirth

Best job before having children	% Retained occupation	% Downward	% Upward
Manager or administrator	52	48	-
Professional	84	13	3
Associate professional	65	22	12
Secretarial	47	36	17
Skilled manual worker	33	50	17
Personal services	63	19	18
Retail sales	36	23	41
Plant or machine operator	19	23	58
Other Unskilled	59	-	41
Total	53	28	19

The experience of downward occupational mobility between the job they held before they had children and their current job is a common, but not universal experience, for mothers. Women who stay with the same employer are very likely to retain their occupation over the period of maternity. Indeed 53% of our mothers retained the same occupational grouping that they had before childbirth. Women who have different occupations before and after maternity are more likely to suffer downward occupational mobility than to gain upward mobility.

There is a further group of women in our survey who were employed before childbirth and who are currently not employed. Women who are not employed are less well educationally qualified than women who are working either full-time or part-time. Among those not employed only 10% had continued their education until or beyond the age of at least 21 as compared with 21% of those working full-time and 15% of those working part-time. Among those not working, 58% had completed their education by the age of 16, as compared with 45% of those working full-time and 51% of those working part-time.

The patterns of occupational mobility vary between those starting out in different occupations. There are some occupationally specific factors in the mobility pattern of women over maternity, as well as some that are common to many mothers.

Of those women who had been managers before they had children only 52% were still managers and 48% had suffered downward mobility. The pre-childbirth managers now held the following jobs: 13% professional, 5% associate professional, 11% clerical, 3% skilled manual, 7% personal service, 6% retail sales, 1% machine operators, 3% unskilled manual.

Of those who had been professionals before childbirth, 82% were still professionals and, while 3% were managers, 15% had suffered downward mobility to the following jobs: associate professionals 3%, clerical 3%, skilled manual 2%, personal service 3%, retail sales 1%, unskilled manual 2%.

Of women who had been associate professionals before childbirth, 65% retained their occupation, 22% had suffered downward mobility, while 12% had managed upward mobility. Of women who had been clerical workers before childbirth, 47% retained their occupation, 36% suffered downward mobility, while 16% managed upward mobility. Of women who had been skilled manual workers before childbirth, 33% retained their occupation, 50% suffered downward mobility, while 17% managed upward mobility.

A further picture of relative downward mobility after maternity can be gained by considering the pre-childbirth occupations of those currently in unskilled manual jobs. The pre-childbirth occupations of women who are currently unskilled manual workers were: managers 3%, professional 2%, associate professional 3%, clerical 11%, skilled manual 18%, personal service 10%, retail sales 19%, machine operator 23%, while only 59% had previously held unskilled jobs. That is, 41% of women working as unskilled manual workers had held higher level jobs before childbirth.

While the picture for the average woman was either retention of occupational category or downward mobility between the pre-childbirth occupation and the current one, it is worth noting that some women have retained their pre-childbirth occupation and that among the considerable overall amount of job mobility between these two points in time, there is some which is in the upward direction.

The occupational group that has been most resilient is that of professionals, in that a higher proportion of women reports this occupational category pre-childbirth and currently than any other occupational group. This may be associated with the acquisition of skills and qualifications that are more transferable between employers than those of other occupations together with the growth of this occupational category over time.

The skilled occupational category that has the least retention is that of skilled manual workers, with half of these workers suffering downward mobility. The occupational category with least retention of all is that of machine operators, where only 19% retained their occupational category and 59% of workers suffered downward mobility into unskilled manual labour. The poor retention in these two occupations may be associated with the decline of the manufacturing sector in which these jobs are concentrated. The downward mobility may be associated with the low levels of education typically acquired by these workers combined with the lack of transferability of their skills.

In addition to these occupation specific considerations of the mobility of particular groups of women after maternity, there are some explanations that are common to all women. These include: the extent to which women were able to stay with their employer over maternity and thus to keep their occupational position; the occupational distribution of full-time and part-time jobs.

Staying with an employer over maternity

Women vary significantly in the extent to which they remain attached to the same employer over the maternity period.

Women working full-time were more likely to stay attached to the same employer over maternity than those working part-time. Of those currently working full-time 22% were currently with the same employer as before they had children as compared with only 15% currently working part-time. Of course, since these figures relate to current employment rather than necessarily to their immediate post-childbirth employer, they are an underestimate of the extent of employer continuity.

Women who are more educated are more likely to be employed and employed full-time than women who are less educated, as noted above.

We asked women currently employed if there some practices which would have made it more likely for them to have stayed with the same employer when they had children. The availability of more flexible hours and conditions of work and the possibility of working fewer hours were the circumstances that were most frequently cited as making the most difference to mothers' decisions as to whether they would have stayed or left their employer when they had children. The availability of longer or better paid maternity and parental leaves would have made a difference to a smaller number of women's decisions. See Table 4.3.

Table 4.3 Circumstances under which women would have stayed with the same employer over childbirth

Circumstances	Full-time	Part-time	Total
If the hours and conditions of the job had been more flexible	21	24	23
If able to reduce the number of hours worked (e.g. move to part-time)	13	19	16
If the maternity and parental leaves had been longer	6	5	6
If the maternity and parental leaves had been better paid	5	3	4

The question asked for circumstances under which the respondent 'would have been more likely to stay with the previous employer when you had children'.

The employment statuses are the current employment status.

If the hours and conditions of the job had been more flexible then 21% of current full-timer women workers and 24% of current part-timer workers said they would have been more likely to stay with their employer when they had children. If they had been able to reduce the number of hours they had worked then 13% of current full-timers and 19% of current part-timers would have been more likely to have stayed with their employer when they had children. If the maternity and parental leaves had been longer 6% of current full-time workers and 5% of part-time workers said that they would have been more likely to stay with their employer when they had children. If the maternity and parental leaves had been better paid at the time 5% of current full-timers and 3% of part-timers said that they would have been more likely to stay with their employer when they had children.

The occupational structure of part-time employment

There are several reasons why women in part-time employment are in lower levels of occupations than those in full-time employment. One of these is that there is a more limited range of higher level jobs currently available to those working part-time as compared with those working full-time. While 14% of women full-time workers are found in managerial occupations, only 5% of women working part-time are found in these occupations. While 18% of women full-time workers are found in professional jobs, only 13% of women working part-time are found in these occupations. While among women full-time workers 14% are found in associate professional occupations, only 7% of women working part-time are found in these occupations. In contrast, among women working full-time 7% are in unskilled manual jobs, while among women working part-time 20% work in these occupations.

The gap between the occupational level of full-time and part-time jobs is greater in the private sector than in the public sector. In particular, in the public sector 28% of full-time jobs and 21% of part-time jobs are professional as compared with the private sector where 12% of full-time jobs and only 7% of part-time jobs are professional. However, this comparison should not be overdrawn, since in both public and private sectors the proportion of women in part-time management occupations is only one third of those in full-time occupations.

Reasons for working part-time

The most frequently cited reason for working part-time provided by mothers themselves was that of looking after children, which was mentioned by 42% of the respondents. Two percent expressly stated that inability to find or afford suitable childcare was the reason that they were working part-time. Further reasons given by respondents for working part-time were: preference 35%, looking after the home 11%, in education or training 10%, financially secure enough not to need to 9%, can't find a suitable full-time job 4%, own illness or disability 3%, partner prefers it 2%, looking after the elderly 1%, looking after a sick or disabled person 1%. These reasons were not necessarily mutually exclusive. See Table 4.4.

Table 4.4 Reasons given by women for working part-time

Reasons for Working Part-Time	Percent Giving This Reason
Undergoing education or training	10
Own illness/disability	3
Looking after children	42
Looking after elderly	1
Looking after sick/disabled	1
Looking after home	11
Can't find a suitable full-time job	4
Can't find/afford adequate childcare	2
Can't find/afford care for elderly/sick/disabled	0
Partner prefers it	2
Prefer working part-time	35
Financially secure enough to only need to work part-time	9

Among those working part-time 57% had children in the household, while 32% of women working full-time had children in the household. This suggests that while the presence of children in the household was a reason for some but far from all women to work part-time. Women with higher levels of education were more likely than those with lower levels of education to be employed when there were children in the household. Among women working full-time 10% had children under 5 in the household, as compared with 21% of those working part-time and 30% of those not working. Among women working full-time 32% had children present in their household as compared with 57% of those working part-time and 51% of those not working.

Circumstances under which women would take more paid work

Women were asked about the circumstances under which they would be more likely to enter employment or move to full-time employment. A significant number of women who were not working or who were working part-time would enter employment or move from part-time to full-time employment if circumstances were different. The most important of these were better pay and more flexible working conditions, followed by more affordable, flexible, better quality childcare, and by better public transport and better support services for the elderly, sick and disabled.

The circumstances under which women said that they were likely to take (more) paid work are presented in Table 4.5. Women employed part-time were asked about the conditions under which they would choose full-time employment, while those not employed were asked about the circumstances under which they would choose either part-time or full-time employment.

Table 4.5 Circumstances under which women would take (more) employment

Options	From part-time to full-time employment	From not-employed to full-time work	From not-employed to employed part-time
Better pay	25	26	28
More flexible working hours and conditions	25	22	31
More affordable childcare	13	14	17
More flexible childcare	9	9	11
If the tax/benefit system worked differently	7	10	12
Better quality childcare	7	9	10
Better public transport	4	9	10
Better support services for elderly/sick/disabled	2	6	7

Women were allowed to select more than one option, though they did not always do so.

The high priority attached to better pay as the circumstance under which women would be most likely to take more employment is striking. This suggests that economic factors are key to women's decisions, at the margin, as to their preferred balance between home and employment. Of course, better pay would mean that women would be better able to choose the childcare practices that they preferred.

These women who are working part-time or who are not employed have low levels of human capital, such as educational qualifications. This low level of human capital means that they would be unlikely to be able to command high wages. One of the most significant ways in which these women could improve the wages they might be offered would be if they were to acquire more educational qualifications.

Barriers to Training and Education

We asked how hard it was to access training and education and what circumstances would make this easier. We focused on two groups, women working part-time and women not working. These groups have greater potential for productive employment than others and are also important because of their greater likelihood of being in poverty together with their children and are among the groups with the lowest educational qualifications. Of course, some of these issues of access to training and employment may also apply to men, but men are not the focus of this report.

We found that around two-thirds of those working part-time or not working would consider undergoing more education or training. The overwhelming finding is that money is felt to be a major barrier to undergoing education and training, and that making such courses free would be a very great help.

These two groups were asked if they wanted to undergo further training or education how easy or difficult they would find it to pay for it themselves. Among those working part-time 53% said it would be quite or very difficult while only 25% thought this would be quite or very easy. Among those not working 63% said that this would be quite or very difficult and only 16% quite or very easy.

Those working part-time were asked whether they thought how easy or difficult it would be to get their employer to pay for such education or training. Forty-six percent said this would be quite or very difficult and only 29% quite or very easy.

We asked how many would consider undergoing more training or education. Sixty-six percent of those working part-time and 63% of those not working said that they would consider this.

They were asked how helpful they would find various kinds of support for this training or education. The results are provided in Table 4.6.

Table 4.6 Circumstances under which women would take up training or education

Circumstances	Part-time employed	Not employed
If it were free	79	79
If there were grants to support you while you did it	73	74
If the fees were lower or subsidised	72	71
If it were more flexible in terms of time and location	71	68
If it were to come with ideal and affordable childcare or care for the elderly, sick or disabled	50	54
If there were loans to pay for it	33	39

This gives the percentage of respondents who said that this circumstance would be 'very helpful' or 'quite helpful' rather than those that said that it was not of help to them. Those who did not answer each question are included in the calculation of the percentage.

Women find finance the greatest barrier to taking up training or education. The free provision of courses was considered the most helpful thing that could be done in providing the circumstances under which they would choose to do additional training or education. While the provision of support for caring was also considered important, the financial barriers were considered the most important.

Conclusions

The research review identified two major factors which negatively affect the labour market position of British women and have implications for UK productivity: failures in the labour market especially around maternity and work/life balance; low levels of human capital among the least employed women.

Interruptions to employment constitute a major factor in women's lower pay and productivity. This has an impact not only directly in removing women from the labour market or in their working fewer hours, but also has a significant impact on occupational level. A considerable proportion of women return to employment after a period of maternity to jobs that are below their previously achieved skill level. This is a considerable waste to the women themselves in lost pay, to their employers in lost skills, and to the economy as a whole in lost productivity and lost output. The downward occupational mobility of women after maternity is a serious failure in the workings of the labour market.

Low levels of education are significantly associated with lower levels and amounts of employment. The majority of our respondents were interested in undergoing more training or education. Financial constraints were the most frequently cited obstacle to achieving this. Current low levels of human capital are holding back women's employment, despite the willingness of women to undergo more education and training.

Our respondents named specific circumstances under which they would have been more likely to have stayed with their employer over the maternity period, more likely to return to employment, more likely to move from part-time to full-time employment, more likely to undergo training and education.

Better pay and more flexibility in employment were the top concerns. Respondents were also concerned with more affordable, more flexible, better quality childcare and, to a lesser extent care for the sick, elderly and disabled. Better public transport was also mentioned.

Two-thirds of our respondents who were employed part-time or not employed were prepared to consider undergoing more training and education. Financial concerns were a major obstacle to the achievement of this. The single most important measure likely to increase uptake of education and training would be the elimination of fees.

Appendix 1: Data, definitions and equations

Data source

The data for the statistical analysis was the British Household Panel Survey.

Work histories

While the survey is now being conducted in annual waves, the information about each individual's work was primarily collected in two of the waves in the early 1990s. In Wave 2, respondents were asked about the employment status throughout their life, using broad categories. In Wave 3, respondents were asked in more detail about their specific occupations and terms of employment. The Wave 3 data was used to augment and update the Wave 2 work-history. These two long-term recall interviews were then up-dated with more recent information collected in each subsequent wave (Halpin, 1998a, 1998b; 2000; Taylor et al, 2001). The work-history data collected in each annual Wave includes details of each employment episode over a 12-month period, plus the date of beginning the last of those employment episodes. New entrants to the survey thus give a work-history going back to the beginning of their most recent employment episode. This provides information on episodes of different kinds of work — notably employment and self-employment — and episodes out of the labour market for different reasons. These were originally collected at a very detailed level and these data are then grouped into categories meaningful for our analysis. Brendan Halpin kindly provided the most recently updated work-history dataset covering respondents through the 1999/2000 Wave 9 reference period.

Weights and checks for bias

The data arise from three main sources. Firstly, the work-histories of BHPS respondents were scanned to find the length of each person's full-time work history (as well as their part-time work duration, their unemployed periods' duration, and their family-care and other forms of leave from work, all measured in months and then converted to years). A check for bias arising from the availability of work-histories of different quality for different sub-cohorts of respondents was conducted. We tested the impact of allowing for the unavailability of respondents in successive waves (details are in Appendix 3 at sections Id, IId, and IIId). A dummy variable, HAVELRWT, takes the value 1 if the respondent has a longitudinal (or "cross-wave") weight of more than zero. Respondents are given a cross-wave weight of zero if they were unavailable for a Wave within the series of years for which they were BHPS enumerated targets. The dummy variable did not have a significant coefficient and its presence did not influence the other regression coefficients.

Apart from this test, the report is based on personal 'respondent weights', which raise the BHPS respondents disproportionately in 1999-2000 to levels that are representative of the population in that year. The sample used is not meant to represent either the 1992 population nor the population over the life-courses ofall respondents.

The weights have been adjusted for several factors. Firstly, they are adjusted for the clustered multi-stage sampling that is intrinsically part of the BHPS survey design. Secondly, they are adjusted for personal non-response. Thirdly, they are adjusted for household-level non-response, and in both

the latter cases the adjustment allows for only respondents actually interviewed to be included in the Report's data. (Proxy interviews are not accepted here as valid data, although BHPS offers proxy data as an alternative for those wanting a larger raw data set.)

The factors considered in setting the weights each year include the following: region, housing tenure, affluence, number of eligible persons in household, marital status, employment status, age, sex, and their interaction (BHPS User Manual, p. A5-5). Adjustments for attrition across waves are not relevant to the analysis of 1999-2000 respondents that is conducted in this Report.

Heckman: Potential sample selection bias stems from the inclusion only of those who have already made the decision to be employed. We handle this issue through the use of Heckman's procedure. We report two stage Heckman results using STATA software in Appendix 3. In the first stage there is an equation that estimates the likelihood of being selected into the group of those who are employed, and the coefficient from this, lambda, is then applied in the second stage, which estimates the coefficients of the factors affecting the wage rates. It is of course the case that when Heckman (1979) devised his procedure in the 1970s far more women than men were out of employment, while in 2002 the difference is much less great, hence the importance of the inclusion or non-inclusion of women who are not employed is much smaller. Hence some recent studies have found, unsurprisingly, that lambda is not significant. Faced with a choice as to whether to apply the weights correcting for the bias of the BHPS away from the population or whether to utilise the Heckman procedure, because of limitations in available software, we made a judgement that correcting for the bias in BHPS was more important than correcting for the very slightly smaller larger of women than men who were not employed.

The male BHPS respondents who reported being employed part-time are not typical of men who work part-time in the general population in that they are paid on average more than men employed full-time. This is probably due to a problem of sample selection among a very small group. We investigated the categories of more marginal male employees (such as students) further, in order to see if we had omitted some low paid male part-time workers, but this made little difference. These men working part-time are so few in number that it is unlikely that they significantly biased any of the other findings. Further, we draw no conclusions about this group for our analysis.

Measurement of Hourly Earnings

Individuals report their gross earnings over a one-week, one-month or one-year period. If individuals only reported their usual gross weekly earnings, this figure was substituted for exact gross weekly earnings. We included only earnings, and did not include unearned sources of income, such as benefits and other transfers, investment income and profits. If there were overtime or bonus payments from employment, the gross earnings include them. The measure of hours worked was that of hours usually worked, and to this was added the figure for usual paid overtime hours.

Taking the natural logarithm of the hourly wage for each individual gives a symmetrically distributed variable whose mean is shown in Table A1.1 below.

Table A1.1: Hourly Wages and Log of Hourly Wages Among Employees and Potential Workers, and Average Net Household Income

Category	Mean Wage in £/Hour, (and Standard Deviation)	Median Wage (£/Hour)	Mean of Log of Wages (and its Standard Deviation)	Number of Respondents*
All Employees	£8.53 (6.0)	£6.98	1.98 (.56)	4118
Male Employees	£9.80 (7.0)	£7.99	2.12 (.56)	2028
Female Employees	£7.30 (4.34)	£6.20	1.85 (.52)	2090
Females Working <30 Hours Per Week (Part-Time)	£6.45 (4.23)	£5.00	1.71 (.52)	722
Males Working Part-Time	£12.67 (19.61)	£5.53	2.01 (0.90)	69
Females Working 30 Hours or More Per Week (Full-Time)	£7.83 (4.3)	£6.76	1.93 (.52)	1150
	Per year (and standard deviation)	Per year	–	–
Average Net Household Income	£29,373 (20,058)	£26,474	–	5680

* Only respondents for whom data on both parts of the ratio were available are included here. The data are weighted by IXRWGHT.
@ The discrepancy between data on the mean wages between this table and one used elsewhere is due to missing data for some cases. In this table, the wage rates of few women who reported wage rates but not hours of work are included in the average.

The numbers in the regression estimates fall below the number of cases in Table A1.1 since sometimes other data are missing among the independent variables.

In addition, those few respondents who did not give data on their educational qualifications were omitted, and those whose data were offered by proxy were omitted. After testing various combinations of variables, as illustrated in Appendix 3, we finalised the models. Table A1.2 shows the mean and median wages for the respondents for whom full data were available.

Table A1.2 Weighted Average Wages Including Median Wages

Category	Mean Wage (£/Hour)	Median Wage (£/Hour)	Number of Respondents*
Male Employees	£9.82	£8.00	1900
Male Part-Time Employees	£11.62	£5.45	66
Male Full-Time Employees	£9.87	£8.08	1834
Female Employees	£7.27	£6.21	1842
Females Working Part-Time	£6.40	£5.00	655
Females Working Full-Time	£7.75	£6.70	1186

Note: The data are weighted using cross-sectional respondent weights so that they are representative of the UK 1999-2000.

Respondents included

We included in the data set all respondents who were potential employees, even if they were not employees at the time they responded to the survey. This means that we included not only those who were current employees, but also: those who were working on government training schemes, those who were unemployed or seeking work, those whose employment status was long-term sick or disabled, those who were on maternity leave, those who were not employed and caring for family members, and those whose employment status (IJBSTAT) was 'something else'. Excluded were those who, in 1999, were self-employed or retired. Students in employment, or who had work histories, were considered to be potentially workers. Students and others without any work history (i.e. who had never registered as unemployed nor been either employees or self-employed) were excluded from the data set. We did not restrict our sample to those who responded at the filter stage (IJBSTAT) with a working category, but additionally investigated any respondent who reported working and a wage. This search beyond the IJBSTAT filter led to the addition of a few persons, who were disproportionately students.

Because of the importance of the data on work histories most of the analysis is performed only using those respondents who had provided histories of their life and work careers and were included as cross-sectional respondents in the BHPS 2000. Thus dropouts from BHPS over the years 1992-1998 were omitted, and those who did not provide any work career (e.g. new entrants to BHPS who were also not in work during 1999) were omitted. There were 2028 men who reported hourly wages, and 2090 women. The absence of data on some independent variables has caused estimates of specific equations to be done on somewhat fewer cases. The proportion of people working as employees (not self-employed) and the numbers of respondents who were included in the analysis is shown in Table A1.3 below.

Table A1.3 Proportions Who Were Employees in 1999 (Weighted)

Category	Number of Employees	Proportion Employees	Number of Respondents
Males	1900	76%	2505
Females	1842	68%	2719
All	3742	72%	5224

Note: The table shows the weighted number of respondents to the BHPS in 1999 among our potential employees group ("number of respondents"), and then shows the number of them who were recorded as having either fulltime or part-time working hours ("number of employees").

The table below gives the values of the explanatory variables in the wider data set. A table of the values in the subset of respondents for whom complete data was available and who were used in the simulation analysis reported in the main text is included in Section 3.

Table A1.4: Explanatory Variables Among Employees and Potential Workers

Factor	Mean of Continuous Variables		Percent For Indicator Variables		
	Men	Women	Men	Women	Overall
Education scale (years)	12.6	12.1	–	–	12.4
Years in full-time employment	17.8	10.2	–	–	13.8
Years in part-time employment	0.3	3.9	–	–	2.2
Gender-segregation index (ratio of male to total employees in soc group)	.73	.48	–	–	.60
Total length of interruptions of employment for family care in years	0.05	4.3	–	–	2.3
Total length of interruptions of employment for unemployment, sick or other in years	1.2	0.7	–	–	0.9
Total length of interruptions of employment	1.2	5.0	–	–	3.2
Works part-time	–	–	4%	35%	19%
Age	39.1	38.8	–	–	38.9
Household income	£30,468	£28,413	–	–	£29,399
Log of household income	10.13	10.03	–	–	10.08
London (inner or outer)	–	–	11%	11%	11%
Rest of the Southeast Region	–	–	20%	21%	20%
Whether caring for other person (unremunerated)	–	–	13%	17%	15%
Whether a Child(ren) Under 16 Lives in the Household	–	–	36%	43%	40%
Whether a Child(ren) of Age 0-2 Lives in the Household	–	–	7%	8%	7%

Note: The data are weighted using cross-sectional respondent weights so that they are representative of the UK 1999-2000. (See also Appendix 5 for further background details.)

Variable construction

We provide here some information additional to that reported in Section 3 about the process of variable construction.

Regions:

We tested for regional associations both in STATA and in MLWIN. A multilevel model showed that the use of 'region' as an explanatory level did not contribute in a statistically significant way to improving the model we already have. This test uses a chi-squared test on the change in the log likelihood for the two models, using an identical range of cases but with region entered. Results from the MLWIN multilevel model tests are available from the authors but are omitted here. The wages in the 'rest of southeast' region are noticeably higher (t-statistic 4.8) but there is no other region (e.g. Wales, Scotland, East Midlands etc., using 18 district indicators) with a t-statistic whose absolute value is over 1.2. We therefore include a London dummy and a 'Rest of the Southeast' dummy in the main regressions.

Industry: We have included dummy variables for 10 industries in the analysis. Several of these were significant in accounting for variance in wages, but industry was not significant for the gender gap in wages. We investigated whether industry had a gender effect by creating a variable, SICpoint, defined by the gender composition of each of the 10 industry sectors. We included this in a regression, which showed that it was not significant. Hence we used industry simply as a control in the analysis.

SIC % Male	(LFS Data 2000)
0 Agriculture, Forestry and Fishing	79%
1 Energy and Water Supply	78%
2 Minerals, Chemicals	76%
3 Metal goods, Engineering, Vehicles	81%
4 Other Manuf.	67%
5 Construction	91%
6 Distribution, Hotels, Catering	49%
7 Transport & Communication	75%
8 Banking, Financial, and Insurance	57%
9 Other Services	35%
Overall	56%

The percent of workers falling in each category (LFS 2000) were 1, 1, 2, 8, 7, 7, 20, 7, 14, and 32% respectively.

Collinearity

We tested for collinearity at various stages. A correlation coefficient matrix summarising the cross-association between variables was examined in order to finalise the choice of control variables.

There is some collinearity between two particular variables: how many years were spent working part-time (PARTYRS), and being currently employed part-time (PARTTIME). These are both associated with being female. The vast majority of part-time employment in the BHPS sample was undertaken by women. The inclusion of years of part-time employment tends to reduce the level and significance of the gender dummy variable. Without PARTYRS, our regressions in the revised report showed a tendency for a residual GENDER effect of -.17 on the wage. With PARTYRS, this figure falls to about -.11. This instability is clear evidence of multicollinearity. However, we follow other researchers in allowing the years of part-time work experience to show up as it belongs among the human capital effects, which are strongly expected to have a positive effect on wages. For women, its effect (or, more correctly, its association) is observed here to be negative. The reverse causation or spiral of causation in which women who work part-time for a period then get lower wages in future years may be productivity-related. We therefore do not want to simply label it as gender discrimination (by putting it in the residual). Our efforts have consistently aimed at reducing the error in the equation and finding out the causes of the gender residual. This is why PARTYRS is an important explanatory variable, even in the presence of some multicollinearity. We used a permutations test to examine other possible sources of multicollinearity, running successive regression and scrutinising the resulting changes. None of the other changes were as substantial as those that followed from this particular interaction.

Equations Estimated

Two estimation methods were used. Firstly, a pair of equations were estimated in a single Heckman maximum likelihood procedure using STATA software. Secondly, multiple linear regression was used to look at hourly wage rates alone.

In the pair of equations, which is reported first (see Appendix 3), the main equation has log of hourly earnings as its dependent variable. The second (embedded) equation is the probability model of being employed on a wage. The independent variables included in the two equations overlap. The strengths of each effect varies depending on whether men, women, or all respondents are included. In general we retain non-working potential employees when estimating these equations.

A prediction for wages can thus be based on an embedded prediction for the probability of that person actually getting a job. A change in education levels, for instance, affects both one's predicted entry into employment and one's predicted wage level. Demographic effects and household income are revealed to be important factors associated with women having employment in the BHPS 2000. However, the Heckman pair of equations are not used for our simulations and decompositions. The data were weighted to reflect the frequency of missing cases, proxy data, and over- or under-representation of particular types of household and persons in the BHPS, and once weights are used the available computer software cannot calculate Heckman equations.

Weighted least-squares multiple linear regression was therefore used for each sample: for all respondents with employment; for women with employment; and for men with employment (Appendix 3).

The recorded hours usually worked are used to move from hourly wages to total gross individual weekly or annual earnings when such aggregation is required in the main Report.

The Heckman equations shown here are similar to those that can be seen in Joshi and Paci (1998) and in the Stata manual (StataCorp, 1999). However we do not use a multinomial probit model for women's participation as part-time or full-time workers, as Joshi and Paci (1998) did.

Regression Table

The main regression equations, reproduced in Appendix 3, show the relative significance of various factors for gender-specific wages. The first estimation (for all respondents who were employed) includes a variable 'female'. This indicator variable is highly significant although its coefficient declines as other factors are introduced into the model. The second and third estimations (for women and for men, respectively) do not have this indicator variable since the sexes are separated at this point.

Decomposition

Figure 3.1, in Section 3, shows the results of a decomposition of the factors associated with differential gender wages. Figure 3.1 is based on the weighted regression for all employed respondents.

Nielsen (2000) interpreted the gender discrimination index's decomposition based on the two-equation model. However allowance is not usually made for selectivity bias in discussions of the Heckman model such as Joshi and Paci (1998). The selectivity bias refers to which women or men enter the labour market at the point in time when the cross-sectional data were collected. The first equation in the two-equation Heckman set-up gauges the factors associated with labour market participation. Then the second equation measures the factors associated with higher wages for each individual. As an indicator of personal productivity, these equations are well accepted. Madden (2000), for instance, estimates the two-equation model using data from Great Britain in 1995 (Family Resources Survey). He found that after allowing for the impact of selectivity bias, no substantial change in the decomposed coefficients of wage differences was revealed. In his estimates, the effect of one year of education on the logged wage was similar to that observed by us using BHPS 2000: 0.47 for men and 0.46 for women. Other coefficients in his equation had signs similar to those observed here. However, Madden argues that it is still possible for selectivity bias to affect the results considerably.

We have decomposed of the factors associated with differential wages by gender using a modified version of the procedure developed by Oaxaca (1973) and Blinder (1973) and referred to by Joshi and Paci (1998). The equation for the gender wage gap (or, as interpreted here, the proxied gender productivity gap) is assumed to take the form:

Men's wage rate relative to women's wage rate = human-capital effect + a residual discrimination effect.

This assumes that the percentage wage gap is the sum of the two types of effects. The first is that if a factor emerges as substantially different between men and women, as for instance, the amount of education, then there is a chance that this factor may be the key to the different wage rates for men and women. The second effect is where women have a factor that either does not appear for men, such as maternity leave, or where women's and men's wage rates are affected differentially by the same factor, giving a different regression coefficient or 'slope' for the two sexes. Thus the percentage wage gap is the sum of the two types of effect (see also Monk-Turner and Turner, 2001). Even if other factors besides human capital are allowed to enter the equation, the principle is still applies that there is an explained part of the gender wage gap and an unexplained part.

The first effect, seen above as a parallel upward shift among men relative to women, is due to men's higher education level overall. Such effects are often assumed to be human-capital related, whereas any slope difference is assumed to be residual discrimination. It is possible that the same factor may appear in both effects. For instance, women and men have different amounts of education (human capital effect) and have different rewards to any one unit of education (discrimination effect). In our view the use of the term 'discrimination' for the second type of effect is misleading, since discrimination may be spread across both effects and is not the only reason for slope differences. Instead, we call the second type of effect a 'returns' effect, while we call the first effect a 'levels' effect. Both are estimated in Appendix 3.

In our research we found several factors besides human capital to be relevant. Therefore our expanded equation allows for:

Men's wage rate relative to women's wage rate =

various human-capital effects +

effect of occupational segregation +

effect of being in London +

impact of interruptions to the work career +

a residual discrimination effect.

In this procedure, the total discrimination ratio is expressed by:

$\ln w_m - \ln w_f$ (Eq. A1)

where w_m is men's hourly wage rates and w_f is women's hourly wage rates.

This ratio, when exponentiated, gives the ratio of men's to women's wage rates. As it rises above 1 the percentage can be examined, decomposed, and observed over time.

Decomposing the difference to focus primarily on factors influencing women's wages, one would have:

$$D_f = \{\exp[(\beta_m - \beta_f)\underline{\underline{X}}]-1\}*100 \quad \text{(Eq. A2)}$$

where $\underline{\underline{X}}$ refers to the mean of X, and the ßs are vectors of independent variables suitable for the men's and the women's wage equation, respectively. Exp is simply the inverse of the logarithmic function, translating the D_f measure into the space of percentages of actual wages rather than log-wages.

The formula for D_f assumes that the effects on wage rates are additively separable. We discuss this assumption briefly in Appendix 3.

The distinction between those factors that are human-capital related and those that are discrimination-related is too simplistic. 28 years ago, when the procedure was being developed, this distinction was state-of-the-art. This is no longer the case. Today, the analysis of factors is more subtle and much more complex. For instance, there are factors which do not fall clearly into one side or other of this dichotomy, such as interruptions for family based childcare in the absence of publicly based childcare.

The decomposition of effects on the total gender productivity gap is discussed further in Appendix 4.

The full decomposition of the wage gap equation is offered by:

$$\ln w_m - \ln w_f = (\underline{\underline{X}}_m - \underline{\underline{X}}_f)\,\beta_m + (\beta_m - \beta_f)\underline{\underline{X}}_f \quad \text{(Eq. A6)}$$

where the $\underline{\underline{X}}_i$s refer to the mean for men and women of each variable. The β_i are the slope coefficients for the men and women respectively.

$$\text{Hence } w_m/w_f = \exp[(\underline{\underline{X}}_m - \underline{\underline{X}}_f)\,\beta_m + (\beta_m - \beta_f)\underline{\underline{X}}_f\,] \quad \text{(Eq. A7)}$$

Glossary of Relevant Terms:

additive separability

The terms in the decomposition equation can be added up to give the total discrimination. Their separability allows one to interpret terms as percentages of the total wage gap. Their additivity also allows us to see some anti-discriminatory factors as negative elements to be subtracted.

decomposition

To decompose something means to break something up into the component parts. The decomposition used here is of the factors that comprise the gender wage gap expressed in logs.

equation specification

An equation specification is a list of variables that enter into an analysis of what explains an outcome. In the present case the outcome is hourly wage rates. The equation for wage rates can be mis-specified if it omits any important factor. Mis-specification can occur because of a lack of data or if some data exist at a unit of analysis, such as the firm, which is not well represented in the present BHPS data set.

gender wage gap

The wage gap is expressed here as a percentage of the male mean wage in pounds.

logarithm or log

The logarithm is a transformed number that represents a number which originally had a skewed distribution. For instance the 'log of £10.60' is 2.36 and the 'log of £7.51' is 2.01. The log of the means of wages is not equal to the mean of the log of wages because of the change in skewness that logs cause. In statistics the transformation is an advantage because the log of wages has an unskewed, well-distributed normal distribution.

residual discrimination

The residual discrimination factor can only be seen when male and female wages are put together in one equation. We report on this in Figures early in the report. The word residual refers to the remainder after allowing for all available explanatory factors.

segregation or gender segregation by occupational category

The new variable (SEGPOINT) offered here examines each person's occupational category such as 'teaching professional', 'secretary', or 'manager'. Within that category, using the national Labour Force Survey data set, we measured the ratio of male employees to total. Then each person was assigned a 'segregation index' value corresponding to the male-predominance in their particular occupational category. (SICPOINT made a similar sex-segregation index for each Standard Industrial Category at 1-digit level . However SICPOINT was found to have no substantial association with the gender pay gap.)

sex discrimination

The measurement of sex discrimination is fraught with competing possibilities. Instead of examining the gender wage gap we look at the causes of the gap. The remaining gender wage difference that exists after all other factors have been allowed for is the sex discrimination. The measurement obtained changes, depending upon what other gendered factors have been allowed for.

Appendix 2: Gender segregation and associated wage/productivity levels

In Table A2.1 we present a two-digit Standard Occupational Classification (SOC) (Taylor, 2001) and the percent of respondents in the BHPS life-histories study who were male within each category. The Table also shows the percentages male using Labour Force Survey 2000, which we consider to be a more authoritative estimate because LFS is a larger sample survey. The LFS data were used as the basis of the calculation of the segregation index, which was then applied to individuals in the BHPS data set. We also present the actual BHPS mean and median wage (unweighted, using all employed respondents) in each category. Women's wages are generally lower than these means for both sexes. These figures give an indication of the role that gender segregation is playing as it ranges from 0% for all-female occupations to 100% for all-male occupations across the people in the BHPS.

Figure A2.1 shows the overall association between gender segregation and average wage rates for that occupational grouping.

Table A2.1 Gender Segregation and Wages

Occupational category, Two-digit level	Percent Male in LFS 2000	Mean Wage £	Median Wage £	Percentage of Employees With Main Jobs in This Category (LFS 2000)
10 General managers, administrators	68.3%	£20	£17	1.2
11 Production managers	93.3%	£13	£12	2.1
12 Specialist managers	65.3%	£15	£14	4.7
13 Financial and office managers	42.9%	£13	£11	2.3
14 Transport managers storing	85.5%	£15	£11	.8
15 Protective service officers	95.0%	£15	£14	.2
16 Farming managers	93.5%	£15	£9	.1
17 Managers in service industries	58.3%	£7	£6	2.7
19 Managers, administrators not elsewhere covered	52.7%	£13	£11	1.2
20 Natural scientists	66.6%	£14	£12	.5
21 Engineers and technologists	92.7%	£14	£12	2.3
22 Health professionals	54.6%	£14	£13	.6
23 Teaching professionals	35.9%	£13	£12	4.6
24 Legal professionals	49.5%	£17	£15	.4

Occupational category, Two-digit level	Percent Male in LFS 2000	Mean Wage £	Median Wage £	Percentage of Employees With Main Jobs in This Category (LFS 2000)
25 Financial professionals	65.7%	£16	£14	1.1
26 Architects and surveyors	86.2%	£13	£13	.5
27 Librarian	39.9%	£7	£7	.2
29 Professional occupations n.e.c.	40.3%	£9	£10	.7
30 Technicians	74.0%	£10	£9	1.0
31 Draftspersons	90.0%	£10	£11	.3
32 Computer programmers	78.5%	£13	£13	1.3
33 Ship and aircraft officers	87.5%	£16	£14	.1
34 Health professionals	13.0%	£10	£10	2.9
35 Legal associate professionals	33.0%	£10	£10	.1
36 Business associate professionals	61.1%	£14	£12	1.4
37 Welfare associate professionals	23.8%	£8	£8	1.0
38 Unspecified professionals	65.0%	£9	£9	1.1
39 Associate professional n.e.c.	48.2%	£11	£10	1.1
40 Administrative/clerical in govt.	27.4%	£8	£7	1.5
41 Numerical clerks and cashiers	24.0%	£8	£7	4.0
42 Filing clerks	25.4%	£7	£6	1.5
43 Clerks (not otherwise specified)	21.3%	£8	£6	2.9
44 Storekeepers	81.4%	£7	£6	1.9
45 Secretaries	1.1%	£8	£7	2.4
46 Receptionists	10.4%	£5	£5	1.4
49 Clerical occupations n.e.c.	43.4%	£8	£7	.6
50 Construction	98.8%	£9	£8	1.1
51 Metal machining	98.4%	£10	£9	1.8
52 Electrical/electronic	96.6%	£9	£9	1.9
53 Metal forming	98.7%	£9	£10	1.1
54 Vehicle trades	98.9%	£7	£7	.8
55 Textiles	40.1%	£5	£6	.6
56 Printing	73.1%	£9	£8	.5
57 Woodworking	99.3%	£8	£8	.7
58 Food preparation	80.1%	£6	£6	.3

Occupational category, Two-digit level	Percent Male in LFS 2000	Mean Wage £	Median Wage £	Percentage of Employees With Main Jobs in This Category (LFS 2000)
59 Other craft occupations n.e.c.	89.1%	£7	£6	.9
60 Armed services	96.8%	£5	£3	.3
61 Security	83.4%	£10	£9	1.9
62 Catering	38.7%	£5	£4	2.5
63 Travel attendants	34.1%	£6	£7	.3
64 Health	12.4%	£6	£5	3.2
65 Childcare	1.8%	£6	£5	2.3
66 Hairdressers	6.0%	£5	£4	.5
67 Domestic staff	46.4%	£5	£5	.6
69 Personal and protective n.e.c.	58.4%	£5	£4	.3
70 Brokers	59.6%	£8	£7	.3
71 Sales representatives	66.5%	£11	£10	1.4
72 Sales assistants	25.7%	£5	£5	6.6
73 Travelling salespersons	70.6%	£6	£6	.1
79 Sales occupations n.e.c.	28.3%	£7	£6	.6
80 Food and drink operatives	58.7%	£7	£6	.7
81 Textiles operatives	65.3%	£6	£7	.1
82 Chemicals process operatives	85.2%	£10	£8	.8
83 Metal making process operatives	93.7%	£13	£14	.1
84 Metal working operatives	89.7%	£7	£7	.4
85 Assemblers/lineworkers	61.8%	£7	£6	.9
86 Other routine process operatives	50.9%	£6	£5	1.3
87 Road transport operatives	96.3%	£7	£7	2.6
88 Other operatives	97.6%	£9	£9	.9
89 Machine operatives n.e.c.	94.4%	£9	£9	.9
90 Other occupations in agriculture	81.3%	£6	£6	.4
91 Other mining/manufacture occs.	80.3%	£7	£6	.3
92 Other construction occupations	99.3%	£7	£7	.6

Occupational category, Two-digit level	Percent Male in LFS 2000	Mean Wage £	Median Wage £	Percentage of Employees With Main Jobs in This Category (LFS 2000)
93 Other occupations in transport	99.6%	£7	£7	.4
94 Other communication occups.	81.6%	£8	£8	.9
95 Other sales/service occupations	28.7%	£5	£4	4.7
99 Other occupations n.e.c.	94.8%	£10	£10	.4
Overall Average	56%	–	–	100%

Note: n.e.c. = not elsewhere covered

Figure A2.1: Association Between Wage Rates and Gender Segregation in Occupations

Appendix 3: Regression equation details

This appendix contains estimates of the association of various factors (listed below) with the hourly wage rates of English, Welsh and Scottish respondents to the British Household Panel Survey 1999/2000. Before presenting the results we explain the sample selection criteria, the variables used and their abbreviations, and the specifications of the equations used.

Sample selection:

Respondents without any work history were omitted from consideration. Those with experience as self-employed, employed, government training scheme, or armed forces service were included in the overall sample. Men aged 16-64 and women aged 16-59 were included. Students were eligible for inclusion either if they were working or if they had given a work history.

Subsample 1 is women, including those employed and those who were on sick or disabled leave, unemployed, family care or maternity leave, or otherwise not working. In other words it excludes self-employed and retired women.

Subsample 2 is men, including those employed and those who were on sick or disabled leave, unemployed, family care leave, or otherwise not working. In other words it excludes self-employed and retired men.

Equations 1, 2 and 3 include all cases, equation 4 covers the women-only subsample, and equation 5 is for the men-only subsample. The entire sample and equation 3 are used for the gross decomposition.

Note that the estimated equations are also labelled as follows:

Equation 1: Heckman estimation with educational indicator variables. Equation 1a is the wage equation. Equation 1b (seen below the first) is the labour-market participation equation.

Equation 2: Linear regression estimation with educational indicator variables and an interaction effect for the combined association of gender and education (scaled) with the log of the wage.

Equations 3, 4, and 5: Linear regression with an educational scale variable, with cross-sectional weights for 1999, referring to all cases, women's cases, and men's cases respectively. The regression in Equation 3 includes an interaction effect for the combined association of gender and education (scaled) with the log of the wage.

Variables used:

Dependent variable:

lnhourly: the log of the hourly wage.

The wage rate is calculated using the following data: Weekly earnings in the past week (or, if this is not available, then in a usual week), gross and inclusive of paid overtime, divided by the hours worked in a usual week, inclusive of paid overtime.

Independent variables:

age: age of respondent.

agesquar: square of age

alevels: indicator variable for A-levels

cse: indicator variable for those with CSE exams as their highest qualification

degree: indicator variable for those with degrees and/or higher degrees

doesaid: indicator variable showing whether the respondent did unremunerated caring work in the home or for another person

edfem: interaction effect multiplying the gender indicator by the education scale. This interaction effect was not highly significant, but evidence from the education indicator variables suggested a difference in the curvature of the men's slope compared with the women's slope, taking the logwage by education level. Therefore the interaction effect was retained when the two sub-samples were combined.

edscale: scale of education levels, approximating years. It begins at 8 years and runs up to 17 years for higher degrees

emtrain: indicator variable showing whether the employee had received training either in the workplace, or in a former workplace [but within the past 12 months], or in the employer's training centre, or through the employer paying fees for a course of training, all within the last 12 months prior to the interview.

familyrs: years of interruptions for family care and maternity leave

female: indicator variable showing 1 if the respondent was female

firmMidl and firm50: indicator variables showing whether the firm employing the respondent had 10 to 49 (FIRMMIDL), or 50+ (FIRM50) employees. The base case is 0-9 employees.

fulltime: indicator variable showing whether the employment was for 30 hours or more, or not

fullyrs: number of years of full-time work experience

fullyrsq: square of fullyrs

hadunion: indicator variable showing whether workplace had a staff association or union

haskidu2: whether the household has a child under age 2

hourswrk: hours worked in a usual week, including paid overtime

inunion: indicator variable showing whether respondent was a member of the staff association or union

kidinhs: whether there are kids (age 0-16) living in the household

lambda: This is the inverse Mills ratio variable showing the impact of sample selectivity upon the wage equation

London: Indicator variable showing 1 for inner or outer London

lnhhy: log of household total income

lnhhysqu: log of household total income, squared

lnyrjob: the log of the number of years worked in the current job

monthslv: number of months of work-history interruptions including unemployment, maternity leave, sick leave, disability interruption, and family care interruption.

olevels: indicator variable for O-levels

othered: indicator variable for those with other qualifications (e.g. apprenticeships)

otherhi: indicator variable for those with other higher qualifications

partyrs: number of years of part-time work experience

segpoint: segregation index. In the equations, the points are set at 10 times the ratio of men to total employees. Thus if 45% of employees are male, segpoint is 4.5

SIC1is0 to SIC1is9: indicator variables showing the category of Standard Industrial Classification (SIC) at one-digit level, as shown below. The last category, '9', contains approximately 32% of the cases because of the rise in new service-sector categories of employment in recent decades.

SIC1is0 to SIC1is9 are defined as:

0 Agriculture, forestry & fishing
1 Energy & water supplies
2 Extraction of minerals & ores other than fuels; manufacture of metals, mineral products & chemicals
3 Metal goods, engineering & vehicles industries
4 Other manufacturing industries
5 Construction
6 Distribution, hotels & catering (repairs)
7 *Transport & communication* (Base category)
8 Banking, finance, insurance, business services & leasing
9 Other services

sicpoint: An index of the gender segregation at SIC1 level of industrial classification. In tests, it was shown not to add significantly to the explanatory power of the regressions.

southest: Regional indicator signifying the 'rest of the southeast' beyond London.

unempyrs: years of unemployment, sick, disability, or other interruption of the work career

yearsjob: years in the current job.

Region: Wages in the 'rest of southeast' region are noticeably higher (t-statistic 4.8 using MLWIN) than elsewhere, but there is no other region (e.g. Wales, Scotland, East Midlands etc., using 18 district indicators) with a t-statistic over 1.2. We therefore include a London dummy and a 'Rest of Southeast' dummy in this Report.

Regression results for women and men combined

Equation 1: Heckman Results

Heckman selection model -- two-step estimates
Number of observations = 5595
(regression model with sample selection)
Censored observations = 1545
Uncensored observations = 4050
Wald chi2(31) = 1824.97
Significance of Wald Chi-Squared =0.0000

	Coef.	Std. Err.	z	Significance
Equation 1a)				
degree	.524019	.0413295	12.679	0.00 ***
otherhi	.2122969	.0344079	6.170	0.00 ***
alevels	.1471177	.0345386	4.260	0.00 ***
olevels	.1002594	.0281439	3.562	0.00 ***
cse	.0286112	.0383282	0.746	.23
othered	.0860439	.045037	1.911	.03 **
edfem	.0058547	.005555	1.054	.15
fullyrs	.0399457	.0022605	17.671	0.00 ***
fullyrsq	-.0007312	.0000582	-12.556	0.00 ***
public	.0453626	.0247391	1.834	.03 **
london	.2124115	.0253577	8.377	0.00 ***
southest	.1071397	.0176027	6.087	0.00 ***
unempyrs	-.0212484	.0053762	-3.952	0.00 ***
famlyyrs	-.0077494	.002062	-3.758	0.00 ***
parttime	.0661741	.0210973	3.137	~0.00 ***
segpoint	.0204651	.0031078	6.585	0.00 ***
inunion	.073467	.0172797	4.252	0.00 ***
firm50	.1152269	.0189919	6.067	~0.00
female	-.1751727	.0753478	-2.325	0.00 ***
firmmidl	.0248321	.0203386	1.221	~.22
yearsjob	.0001727	.0007209	0.240	~.81
partyrs	.0005204	.0018176	0.286	~.76
sic1is1	.116576	.0606107	1.923	.03 **
sic1is2	.1080553	.0481867	2.242	.01 **
sic1is3	.1006775	.0356681	2.823	0.00 ***
sic1is4	-.0260975	.0357568	-0.730	.23
sic1is5	.0536102	.0460527	1.164	.12
sic1is6	-.0799004	.0319431	-2.501	.01 ***
sic1is8	.200522	.0333084	6.020	0.00 ***
sic1is9	.0368869	.033645	1.096	.14
sic1is0	-.1336596	.0664527	-2.011	.02 **
_cons	1.452069	.0588391	24.679	0.00 ***

Equation 1b)

lnhhy	2.064466	.4068855	5.074	0.00 ***
lnhhysqu	-.0816594	.0208793	-3.911	0.00 ***
haskidu2	-.1231467	.068951	-1.786	~0.07
kidinhs	-.2580722	.0444858	-5.801	~0 ***
age	.0607627	.0114995	5.284	0.00 ***
agesquar	-.0009289	.0001478	-6.284	0.00 ***
doesaid	-.2687872	.0519199	-5.177	0.00 ***
edscale	.0371822	.0072414	5.135	0.00 ***
_cons	-12.99449	1.992257	-6.522	0.00 ***
mills				
lambda	-.5079184	.0528179	-9.616	
rho	-0.94766			
sigma	.53596916			
lambda	-.50791839	.0528179		

*** 1% significance, ** 5%, * 10%, one-sided test; ~ two-sided test.

Equation 2: Weighted Linear Regression

Number of observations = 4052
Population size = 3677
F(36, 4016) = 82.98
Significance of F = 0.0000
R-squared = 0.4742

lnhourly	Coef.	Std. Err.	t	Significance
degree	.6288287	.0404481	15.547	0.00 ***
otherhi	.3214648	.031374	10.246	0.00 ***
alevels	.280109	.0334666	8.370	0.00 ***
olevels	.1932005	.027628	6.993	0.00 ***
cse	.1028103	.0382664	2.687	0.00 ***
othered	.1078485	.0380194	2.837	0.00 ***
edfem	.0059876	.0055358	1.082	.14
fullyrs	.0209648	.0029196	7.181	0.00 ***
fullyrsq	-.0005058	.0000697	-7.255	0.00 ***
public	.0462393	.0256739	1.801	0.03 **
london	.2107663	.0252978	8.331	0.00 ***
southest	.1272755	.0177141	7.185	0.00 ***
unempyrs	-.0322675	.0096682	-3.337	0.00 ***
famlyyrs	-.0163719	.0022306	-7.340	0.00 ***
parttime	-.0086784	.0248354	-0.349	~.73
segpoint	.0188223	.0031349	6.004	0.00 ***
inunion	.0731622	.0168969	4.330	0.00 ***
firm50	.1354107	.0190354	7.114	~0 ***
female	-.1625556	.0768762	-2.115	.02 **
firmmidl	.0246054	.0208423	1.181	~.24
yearsjob	.000341	.0007769	0.439	~.66
partyrs	-.0094024	.0023216	-4.050	~0.00 ***
kidinhs	.0161993	.0167195	0.969	~.33
age	.0559305	.0064717	8.642	0.00 ***
agesquar	-.000558	.0000829	-6.727	0.00 ***
doesaid	-.0294345	.0222327	-1.324	.09 *
haskidu2	.0237292	.0268429	0.884	~.38
sic1is1	.184094	.0573846	3.208	.0 ***
sic1is2	.1490547	.0469457	3.175	0.00 ***
sic1is3	.1317597	.0384633	3.426	0.00 ***
sic1is4	.0038174	.0405261	0.094	.46
sic1is5	.1046828	.0453721	2.307	.01 **
sic1is6	-.0457105	.0359643	-1.271	.10
sic1is8	.231402	.0385227	6.007	0.00 ***
sic1is9	.0438955	.0358083	1.226	.11
sic1is0	-.1047399	.0651117	-1.609	.06 *
_cons	.0978955	.1136629	0.861	.18

*** 1% significance, ** 5%, * 10%, one-sided test; ~ two-sided test.

Equation 3: Weighted Linear Regression With an Education Scale

Number of observations = 4052
Population size = 3677
F(31,4021) = 87.73
Significance of F = 0.0000
R-squared = 0.4599

	Coef.	Std. Err.	t	Significance
kidinhs	.0088815	.0167007	0.532	~.60
age	.0592744	.0064116	9.245	0.00 ***
agesquar	-.0005802	.0000826	-7.029	0.00 ***
doesaid	-.0331443	.0223992	-1.480	.07 *
haskidu2	.0330693	.0273662	1.208	~.23
edscale	.0625224	.0043716	14.302	0.00 ***
edfem	.0028892	.0056111	0.515	.30
fullyrs	.0184849	.002903	6.367	0.00 ***
fullyrsq	-.0004899	.0000701	-6.987	0.00 ***
public	.0621065	.0259597	2.392	.01 **
inunion	.0702715	.0170629	4.118	0.00 ***
firm50	.1352883	.019365	6.986	~0.00 ***
female	-.1185686	.0774309	-1.531	.06 *
london	.224294	.0252826	8.871	0.00 ***
southest	.1276312	.0180576	7.068	0.00 ***
unempyrs	-.0329121	.0097751	-3.367	0.00 ***
famlyyrs	-.0185626	.0022331	-8.313	0.00 ***
parttime	-.0048612	.0250129	-0.194	~.85
segpoint	.0197824	.0031435	6.293	0.00 ***
firmmidl	.0227539	.0210917	1.079	~.28
yearsjob	.0003018	.0007883	0.383	~.70
partyrs	-.0113938	.0023109	-4.931	~0.00 ***
sic1is1	.1768643	.0589595	3.000	0.00 ***
sic1is2	.1650955	.0479271	3.445	0.00 ***
sic1is3	.1436407	.0394116	3.645	0.00 ***
sic1is4	.0149781	.0411638	0.364	0.36
sic1is5	.1107231	.0462292	2.395	0.01 **
sic1is6	-.0374247	.0365761	-1.023	0.15
sic1is8	.2546465	.0390429	6.522	0.00 ***
sic1is9	.0541264	.0365306	1.482	.06 *
sic1is0	-.0913698	.0667057	-1.370	.08 *
_cons	-.4883745	.116171	-4.204	0.00 ***

*** 1% significance, ** 5%, * 10%, one-sided test; ~ two-sided test.

Regression results for women only

Equation 4: Weighted Linear Regression With an Education Scale

Number of observations = 2060
Population size = 1811.6287
F(29,2031) = 51.95
Significance of F = 0.0000
R-squared = 0.4675

lnhourly	Coef.	Std. Err.	t	Significance
kidinhs	-.0383323	.0225432	-1.700	~.09 *
age	.0597183	.007979	7.484	0.00 ***
agesquar	-.0006408	.0001009	-6.351	0.00 ***
doesaid	-.0045309	.026737	-0.169	.43
haskidu2	.0780521	.0395859	1.972	~.05 **
sic1is1	.1843771	.076313	2.416	.01 ***
sic1is2	.135491	.0804334	1.685	.04 **
sic1is3	.0420293	.0701552	0.599	.25
sic1is4	-.1063277	.0651292	-1.633	.05 *
sic1is5	.0896309	.1028597	0.871	.19
sic1is6	-.1107396	.0530386	-2.088	.02 **
sic1is8	.1661412	.0548153	3.031	0.00 ***
sic1is9	-.017671	.0530531	-0.333	.36
sic1is0	-.0865306	.1001178	-0.864	.19
edscale	.0608386	.0041325	14.722	0.00 ***
fullyrs	.022142	.0039743	5.571	0.00 ***
fullyrsq	-.0005459	.0001107	-4.931	0.00 ***
public	.1119139	.0329246	3.399	0.00 ***
inunion	.0998169	.0221388	4.509	0.00 ***
firm50	.1645398	.0264677	6.217	~0.00 ***
london	.2430416	.0352345	6.898	0.00 ***
southest	.1091989	.0229932	4.749	0.00 ***
unempyrs	-.0142511	.0124362	-1.146	.12
famlyyrs	-.014807	.0023894	-6.197	0.00 ***
parttime	-.0212796	.0244277	-0.871	~.38
segpoint	.0321172	.0045035	7.132	0.00 ***
firmmidl	.0669237	.027884	2.400	~.02 **
yearsjob	.0007493	.0010888	0.688	~.49
partyrs	-.0078698	.0026732	-2.944	~0 ***
_cons	-.5439686	.1550922	-3.507	0.00 ***

*** 1% significance, ** 5%, * 10%, one-sided test; ~ two-sided test.

Regression results for men only

Equation 5: Weighted Linear Regression With an Education Scale

Number of observations = 1992
Population size = 1865
F(29,1963) = 41.48
Significance of F = 0.0000
R-squared = 0.4120

	Coef.	Std. Err.	t	Significance
kidinhs	.0565708	.0248121	2.280	~.02 **
age	.064918	.0110513	5.874	0.00 ***
agesquar	-.0006192	.0001446	-4.281	0.00 ***
doesaid	-.0631964	.0368384	-1.716	.04 **
haskidu2	-.0008295	.0385471	-0.022	~.98
edscale	.0622991	.0047164	13.209	0.00 ***
fullyrs	.0164723	.0049651	3.318	0.00 ***
fullyrsq	-.0004733	.0001193	-3.969	0.00 ***
public	-.0167353	.0408379	-0.410	.34
inunion	.0498241	.0253672	1.964	.02 **
firm50	.0952743	.0280597	3.395	~0.00 ***
london	.202787	.0356538	5.688	0.00 ***
southest	.1487229	.0268256	5.544	0.00 ***
unempyrs	-.0464818	.0125984	-3.689	0.00 ***
famlyyrs	-.035038	.0052216	-6.710	0.00 ***
parttime	.1842027	.1008197	1.827	~.07 **
segpoint	.009145	.0045746	1.999	.03 **
firmmidl	-.0379589	.0322614	-1.177	~.24
yearsjob	-.0001872	.0011118	-0.168	~.87
partyrs	-.0231465	.0089587	-2.584	~.01 **
sic1is1	.1796324	.0712264	2.522	.01 ***
sic1is2	.1559379	.0583726	2.671	0.00 ***
sic1is3	.1652467	.0472339	3.498	0.00 ***
sic1is4	.0475922	.0513607	0.927	.17 ***
sic1is5	.1351289	.0524758	2.575	0.00 ***
sic1is6	-.0312846	.050186	-0.623	.25
sic1is8	.2763951	.0523617	5.279	0.00 ***
sic1is9	.070879	.0490087	1.446	.07 *
sic1is0	-.1018954	.0837887	-1.216	.11
_cons	-.4980281	.1738581	-2.865	0.00 ***

*** 1% significance, ** 5%, * 10%, one-sided test; ~ two-sided test.

Permutations

We examined the changes in coefficients and in the overall level of explanatory power when different sets of factors are allowed for. Apart from looking at raw correlation coefficients, we also examined the impact of removing specific variables on the levels of other coefficients. The purpose of looking at these permutations was to test the varying effect of part-time working hours and a few other factors. Part-time working hours are negatively associated with wage rates, especially among women. However in the mixed-sex sample, this effect disappears when other factors that are concurrently associated with part-time hours are brought in. 'Partyrs' (years of part-time work experience) is of this type, and we chose to highlight part-time working hours as an alternative to using the 'partyrs' variable. Unemployment has a varying effect with a more significant coefficient for men than among women.

The table of correlation coefficients showed that the levels of multicollinearity are large only in cases where a curvature effect has been intentionally introduced. (E.g. Age and Age-squared are collinear.) In the equations, the square of Age and the square of FULLYRS (years of full-time employment) were inserted to allow for curvature. We avoided taking the log of FULLYRS and PARTYRS because they took the value zero in some cases. If we let these cases drop (due to non-existence of the log of zero) we would lose valuable cases in which either FULLYRS or PARTYRS was zero but the other was non-zero. A requirement for inclusion in the dataset was that either one of these had to be non-zero.

Appendix 4: Decomposition of the gender pay gap

There are two different methods of decomposing the gender wage gap. Both methods adjust for the overall level of differences between men and women in the economy, and the first method, using simulation, is reported in Section 3 of the main report as well as in this appendix. This is based mainly on the main regression using both men and women, along with simulation. We term it the 'gross decomposition'. The second method, based on the Oaxaca-Blinder approach, is more complex and, though often used, is in our view flawed. Using the Oaxaca-Blinder decomposition approach the relative impact of each factor is broken into two components, which are discussed below. We concluded from our analysis of both methods that there were strong reasons for preferring the 'gross' approach.

In the Oaxaca approach sex discrimination is spread across the decomposed factors, rather than being seen directly as in the simulation approach. In the simulation approach the decomposition is by gross components with the b's (slope coefficients) arising from the overall regression. By contrast in Oaxaca, the decomposition is by 'net components', with men and women having b measured separately; here we use bm and bf to refer to the slope coefficients for each gender.

Regression Results

The regression using all employed respondents gave the results shown in Equations 2 and 3 of Appendix 3, summarised below. The indicator variable has 'no qualifications' as its base case.

Table A4.1 Regression Results with Education Categories (See Equation 2)

R-squared=47%

	Coefficient	T-Statistic	Significance
degree	0.6288	15.547	0.00 ***
otherhi	0.3214	10.246	0.00 ***
alevels	0.2801	8.37	0.00 ***
olevels	0.1932	6.993	0.00 ***
cse	0.1028	2.687	0.00 ***
othered	0.1078	2.837	0.00 ***
edfem	0.0060	1.082	0.14
fullyrs	0.0210	7.181	0.00 ***
fullyrsq	-0.00051	-7.255	0.00 ***
public	0.0462	1.801	0.03 **
london	0.2108	8.331	0.00 ***
southest	0.1273	7.185	0.00 ***
famlyyrs	-0.0164	-7.34	0.00 ***
parttime	-0.0087	-0.349	~0.73
segpoint	0.0188	6.004	0.00 ***
inunion	0.0732	4.33	0.00 ***
firm50	0.1354	7.114	~0.00 ***
female	-0.1626	-2.115	0.02 **
firmmidl	0.0246	1.181	~.24
yearsjob	0.00034	0.439	~.66
partyrs	-0.0094	-4.05	~0 ***
kidinhs	0.0162	0.969	~.15
Age	0.0559	8.642	0.00 ***
agesquar	-0.00056	-6.727	0.00 ***
doesaid	-0.0294	-1.324	0.09 *
haskidu2	0.0237	0.884	~0.38
Sic1is1	0.1841	3.208	0.00 ***
Sic1is2	0.1491	3.175	0.00 ***
Sic1is3	0.1318	3.426	0.00 ***
Sic1is4	0.0038	0.094	0.46
Sic1is5	0.1047	2.307	0.01 **
Sic1is6	-0.0457	-1.271	0.10
Sic1is8	0.2314	6.007	0.00 ***
Sic1is9	0.0439	1.226	0.11
Sic1is0	-0.1047	-1.609	.06 *
_cons	0.0979	0.861	0.18

*** 1% significance, ** 5%, * 10%, one-sided test; ~ two-sided test.

Table A4.2 Regression Results with Education Scale (Years) (See Equation 3)

R-squared = .46%

Indep. Var.	Coefficient	T-Statistic	Significance
kidinhs	0.008882	0.532	~0.60
age	0.059274	9.245	0 ***
agesquar	-0.00058	-7.029	0 ***
doesaid	-0.03314	-1.48	.07 *
haskidu2	0.033069	1.208	~0.23
edscale	0.062522	14.302	0 ***
edfem	0.002889	0.515	.30
fullyrs	0.018485	6.367	0 ***
fullyrsq	-0.00049	-6.987	0 ***
public	0.062107	2.392	.01
inunion	0.070272	4.118	0 ***
firm50	0.135288	6.986	~0 ***
female	-0.11857	-1.531	0.06 *
london	0.224294	8.871	0 ***
southest	0.127631	7.068	0 ***
unempyrs	-0.03291	-3.367	0 ***
famlyyrs	-0.01856	-8.313	0 ***
parttime	-0.00486	-0.194	~0.85
segpoint	0.019782	6.293	0 ***
firmmidl	0.022754	1.079	~.28
yearsjob	0.000302	0.383	~.70
partyrs	-0.01139	-4.931	0 ***
sic1is1	0.176864	3	0 ***
sic1is2	0.165096	3.445	0 ***
sic1is3	0.143641	3.645	0 ***
sic1is4	0.014978	0.364	.34
sic1is5	0.110723	2.395	.01 ***
sic1is6	-0.03742	-1.023	.15
sic1is8	0.254647	6.522	0 ***
sic1is9	0.054126	1.482	.07 *
sic1is0	-0.09137	-1.37	.09 *
_cons	-0.48837	-4.204	0 ***

*** 1% significance, ** 5%, * 10%, one-sided test; ~ two-sided test.

The decomposition of the gap is calculated using the formula $\beta^*(\Delta X_i)$ where ΔXi is the difference which would improve women's position by taking its level up to that of men for each variable X_i. The β used is that calculated when using both men and women. In each case, this β is effectively a weighted average somewhere between βm and βf.

Table A4.3 Gross Decomposition Details

Simulated Changes Which Bring Women's Levels up to Men's Levels of each Factor

	Men's Avg.	Women's Avg.	Change:	Overall Men's & Women's Coefficient*	Gross Effect	Percent of Gross Effect		Equivalent £/hr.
Education (Scale Approx. Yrs.)	12.81668	12.5174	0.299	0.062522	0.0187	5%	***5%***	£0.12
Years Full-Time Work Exp.	18.1452	10.8897	7.256	0.018485	0.1341	33%	***27%***	£0.68
Years FT Experience2	490.2797	109.944	52.642	-0.00049	-0.0258	-6% (adjusted for curvature)		
Years PT Experience	0.267	4.367	-4.100	-0.01139	0.0467	12%	***12%***	£0.29
Years in Current Job	8.392	8.236	0.156	0.000302	0.0000	0%	***0%***	£0.00
Education Interaction Effect		6.516	0.156	0.002889	0.0005	0%	***0%***	£0.00
Years Unemployed	0.553	0.374	No change	-0.03291	0.0000	0%	***0%***	£0.00
Years Doing Family Care&Matern.	0.035	3.229	-3.194	-0.01856	0.0593	15%	***15%***	£0.37
Indicator: Whether Part-Time	0.033	0.357	-0.324	-0.00486	0.0016	0%	***0%***	£0.01
Segregation ((Male/Total)x10)	7.0224	3.3789	2.621	0.019782	0.0519	13%	***13%***	£0.33
Female	0.000	1.000	-1.000	-0.11857	0.1186	29%	***29%***	£0.75
Indicator: Whether Public-Sector	.2006	.4026	No change	0.062107				
Indicator: Whether In the Union	.3082	.3062	No change	0.070272				
Indicator: Firm Size 50+	.5887	.4783	No change	0.135288				
Indicator: Firm Size 10-49	.2351	.3118	No change	0.022754				
SIC0	.0172	.0053	No change	-0.09137				
SIC1	.0273	.0068	No change	0.176864				
SIC2	.0404	.0163	No change	0.165096				
SIC3	.1393	.0360	No change	0.143641				
SIC4	.1132	.0563	No change	0.014978				
SIC5	.0613	.0083	No change	0.110723				
SIC6	.1462	.2254	No change	-0.037425				
SIC7			No change	Base Case				
SIC8	.1524	.1363	No change	0.254647				
SIC9	.2065	.4687	No change	0.054126				
London (Indicator)	.1043	.1126	No change	0.224294				
SouthEast (Indicator)	.2166	.2177	No change	0.127631				
DoesAid (Carer)	.1080	.1676	No change	-0.033144				
KidinHs (Child 0-16)	.3856	.4289	No change	0.008882				
HasKidU2 (Child 0-2)	.0786	.0772	No change	0.033069				
Age	38.576	38.769	No change	0.059274				
Age Squared	1623.801	1631.621	No change	-0.00058				
Constant								
				SUM:	0.3962	100%	100%	£2.55
NOTE: The base wage for the calculation of variations is £9.82, the men's mean wage.	Men's: £9.82						Women's GAP:	£7.27 £2.55
[Constant:]				-0.488375				

* men and women combined; see Appendix 3.

Measuring the Gender Gap using Oaxaca-Blinder

The alternative Oaxaca-Blinder approach spreads the sex discrimination across the various sources of wage differentials. In the Oaxaca-Blinder approach, each factor such as education can contribute to the gender wage gap through its impact on men's and women's wages. The effects are normalised into comparable units, and can then be viewed as percentages of the total gender wage gap. Our calculations enabled us to work out the size of these components as wage differentials per hour, and the biggest one is 'years of full-time work experience'. For men this is a major source of wage differentials compared with women. This effect works mainly through men's different level of full-time work experience, which is much higher than women's.

In the traditional Oaxaca-Blinder approach to decomposition one presents separately the factors resulting from human capital and from discrimination. It is assumed that the slope effect can be separated from the effect of 'endowments' (Oaxaca and Ransom, 1999), ie productivity (Oaxaca and Ransom, 1994). The slope and endowment components would be labelled more appropriately as *returns* and *levels* components, and they must be weighted to allow for male-female differences. The breaking up of the gender wage gap into such components has been criticised by Oaxaca and Ransom for making an arbitary reference point of the male (or the female) wage equation (1994). In 1988 they offered a new way to break up the components involving three terms: the male wage advantage term; the female wage disadvantage term; and the overall impact of levels on wage outcomes (Oaxaca and Ransom, 1988). Neilsen (2000), utilising this technique, further argues that the impact of each set of dummy variables can be interpreted using a new formula to adjust the choice of a reference case. In their autocritique Oaxaca and Ransom were aware that the choice of a reference group when there are multiple categories (e.g. highest level of education) is arbitrary.

We would go further than these critiques, however. By separating the levels from the returns components, which sometimes have opposite signs, the Oaxaca interpretation makes it difficult to see the overall effect of each variable on the wage gap. The gross decomposition provides a summation that does not presume a distinction between the *levels* and *returns* components of the decomposition. These can be added up horizontally to give the gross effect of each factor. Whilst it is possible to present the three-term Oaxaca analysis or otherwise to analyse the individual contributions of each variable's levels and returns effects, our view is that the simulation approach better meets the needs of this Report.

There are four main problems with the Oaxaca-Blinder approach. First, it is not well adapted to use on factors that do not take a clear human capital form, such as segregation and union membership. This is because the decomposition assumes that the individual is the focus of analysis. Yet, as the results from the regressions indicate, such social structural variables account for a considerable amount of the variance in wage rates. Second, the model assumes additive separability, while several of the factors in the model are overlapping. This is, of course, a common problem with 'general linear reality' (Abbot, 2001), and not specific to this analysis.

Third, the model is unsatisfactory when a variable has a significant presence and impact in the equations for one sex but is not significant for the other sex. Fourthly, and perhaps most importantly, the logic behind the separation of the women's and men's equations is problematic. By making this separation, women are compared with women and men compared with

men. The factors that increase wages are only considered in relation to people of the same sex. The choice of comparator group, women or all people, has a critical impact. An example of the problems generated by the standard two-term Oaxaca method is shown in the impact of the segregation index. Unsurprisingly, working in a male dominated occupation is associated with higher wages. For men compared with men, the impact is not so great, as would be expected since it is common for men to work in the same occupations as men. However, for that minority of women who work in the male dominated occupations, the association with higher wages, in comparison with other women, is great. Using the Oaxaca decomposition would lead to the curious conclusion that women overall benefit from segregation (even though it is only a benefit for some women compared to other women). This is because working in a high paid male occupation is associated with an increase in the average woman's wages more than it is associated with an increase in the average man's wages. It is therefore inappropriate, when attempting to assess the extent of discrimination, to separate the men and the women, generating separate regressions, which compare only men with men and women with women. Hence we sought an alternative method of decomposition from the traditional Oaxaca-Blinder method.

The association between education and wages is, at an aggregate level, positive and robust. However, it interacts in complex ways with gender. The findings from the separate regression equations for women and men appear to show that a rise in a unit of education is associated with a greater increase in women's wages than men's wages. However, it is probably misleading to focus on the comparison of the coefficient obtained in the regression equations separately for men and women, since this result does not mean that at equal levels of education women get paid more than men. There is, in the regression predictions, a kinked and gendered association between human capital and education for all, for men and for women. For each education level women are paid less per hour than men.

The association between education and wages is further clarified in Table 7 below, which shows the wages associated with each level of education and the relative proportion of women's to men's wages at each educational level. At low levels of qualifications the gap between women and men's wages is larger than at higher levels of qualifications. According to our predictive equations (using Equation 1), women with no qualifications earn 71% of the wages of men with no qualifications, while women with first degrees earn 82% of the wages of men with degrees. At higher levels of education, the wages gap between men and women is smaller than at lower levels. This is indicative of the larger returns to education for men as compared with women. Thus when women are compared with women, and men with men, it can appear that women obtain better rewards to an increase in their education than do men. However, women's average earnings are always less than men's average earnings at each level of education. Women with degrees earn on average £5.78 more an hour than women with no qualifications, while men with degrees earn on average £6.20 more an hour than do men with no qualifications. Hence the conclusion should rather be that although the increase in women's wages associated with an increase in one unit of education is larger when women are compared with other women, women are not better rewarded for a unit increase in education than men are.

Table A4.4: Predicted mean wage for education qualifications, men and women

Level of Qualifications	Predicted Women's Wage	Predicted Men's Wage	Women's as Percent of Men's
No Qualif. (School-Leaver)	£4.51	£6.37	71
Other Qualif.	£5.71	£8.41	68
Commercial & Secretarial Qualif.	£4.82	£6.23	77
O-Levels	£5.78	£7.39	78
A-Levels	£6.12	£8.10	76
Other Higher	£7.09	£9.20	77
Degree	£10.29	£12.57	82
Higher Degree	£11.14	£13.49	83

These wage predictions are the antilog of the predicted log wage and they are unweighted means among employees. They are based on Heckman equations with dummy variables for 6 of the educational levels; see Equation 1 of Appendix 3. Note that Degree and Higher Degree were included in one dummy. The differentiation between them in these predictions arises from the presence of the education-gender interaction factor in the wage equation. Education was present as a scale for the interaction effect. The base case for the equation is school-leaver status. The predictions allow for an interaction effect between years of education and being female. They also use a set of indicator variables for the 'highest qualification obtained'. The figures are in pounds per hour and are centred on the mean wage among employees, £8.53.

Conclusion

We consider the Oaxaca approach to be flawed by its concentration on comparisons of women with women separate from comparisons of men with men instead of comparisons across men and women jointly. For these reasons we prefer the gross approach, using simulation, reported in the main report.

Appendix 5:
Describing the BHPS data and variables

In this appendix additional descriptive data is provided as background.

Table A5.1
Summary of Occupational Gender-Segregation, Education, Unionisation, Sector and Average Interruptions to the Work Career

	Men		Women		Overall
	Fulltime Hours, Including Overtime	Parttime Hours, Including Overtime	Fulltime Hours, Including Overtime	Parttime Hours, Including Overtime	All, including potential workers if they reported each variable:
Segregation (Male/Total)	71%	49%	37%	28%	60%
Education (Mean of Scale)	12.8	12.8	12.8	11.9	12.4
Whether In Union	31%	9%	34%	22%	24%
Whether in Public Sector	19%	20%	39%	42%	43%
Years of Family Care Interruptions	0.0	0.0	2.3	4.9	2.3
Years of Unemployment Interruptions	0.5	1.0	0.4	0.4	0.9

Appendix 6: Polling data

Data Collection

The data were collected by BMRB within an omnibus survey. This survey is of a nationally representative random sample survey of approximately 2,000 persons per weekly sweep. The data provided to us was the summation of data collected in three consecutive sweeps during November and December 2001. The questions were provided to the company, which re-wrote them for the format for their survey instrument. The survey company provided data in SPSS format and was analysed by Dr Olsen and Prof Walby. The efficient and helpful assistance of Charanjit Lotay at BMRB in the provision of this service is gratefully acknowledged.

Sample

The analysis is only of women of working age 15-59 and is sub-divided into three categories: working full-time (N=1124); working part-time (N=829); and not working (N=960).

Age

The age distribution of the sample is shown in the Table A5.1 below. The age profile of women who are working full-time and those working part-time is very similar, with those working part-time very slightly older on average. In larger random sample surveys it is usual to find women working part-time on average older than women working part-time to a slightly greater extent than is found in this survey. Women not working are more heavily represented in the youngest age group 15-24 (half of whom were in education) and in the oldest age group 55-59.

Education

Among those in our sample who were still in education most were 15-24 and not working, though a significant number were 15-24 and working part-time.

Preferences

In the questions involving choosing between options interviewees were offered a wide selection of possible responses. In some questions respondents were able to choose only one answer, in others they were able to select more than one.

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