UNIVERSITY OF OXFORD
Department of Sociology

The Changing Structure of Occupations and Wage Inequality

The Polarisation of the British Labour Market, 1970s-2000s

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ABSTRACT

This thesis investigates the co-evolution of the changing structure of occupations and the growth in wage inequality in Britain since the 1970s and the subsequent stabilisation during the 2000s. Occupations provide the single most important unit of analysis for economic inequality in stratification research, providing the basis for socioeconomic status, prestige scales, job desirability scores, and social class schemas. Although there was a 'massive rise' in wage inequality, relatively little is known about the relationship between the occupational structure and the growth in wage inequality. Since sociologists tend to place a lot of emphasis on the role of occupations in structuring economic inequalities, we might expect them to play a key role in accounting for trends in overall wage inequality. More recent strands of sociological theory, however, argue that the link between occupations and economic inequalities might have been weakening over time.

This thesis assesses these claims in relation to the over time trends in between- and within-occupation-inequality. It finds that the growth in overall wage inequality was largely due to growing inequality between occupations, not within them. The growth in between-occupation inequality was largely due to higher-paying occupations receiving the largest wage gains. Furthermore, and perhaps surprisingly, only a handful of occupations account for the majority of the rise in wage inequality, indicating caution should be exercised in generating accounts about the role for occupations in accounting for overall inequality. Along the way, this thesis attempts to address the extent to which the structuring of the growth in wage inequality by occupations was due to the changing composition of incumbents within occupations (namely the rise in educational attainment), in spite of data limitations. Finally, this thesis takes to task what the implications of the 'massive rise' in wage inequality implies for the broader categories sociologists use to capture economic inequalities based on aggregations of occupations.

For my family

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INTRODUCTION AND LITERATURE REVIEW

"Possibly the most striking phenomenon in the British labour market over the last couple of decades has been the massive rise in wage inequality. Wage differentials have risen to a degree that pay inequality is now higher than at any time over the last century."

(Dickens 2000:27, cited in Atkinson 2008:371)

"If you had been reading only the flagship journals in sociology, you probably would not know about these trends. Sociologists have been strangely and remarkably silent on this issue."

(Morris and Western 1999:624)

INTRODUCTION

My thesis examines the relationship between the changing occupational structure and trends in wage inequality. I begin with two observations. Occupations provide the single most important unit of analysis for economic inequality in stratification research, providing the basis for socioeconomic status, prestige, and job desirability scales, as well as the basis for social

class schemas. Although there was a 'massive rise' in wage inequality in Britain, relatively little is known about the relationship between occupations and growing wage inequality. Since this area of research is relatively undeveloped, my thesis is primarily descriptive, and as such can be seen as an initial step in a promising area of research by establishing the basic facts.

Economists and sociologists have said very little about the relationship between the occupational structure and the most recent rise in wage inequality. Economists have been busy extensively documenting the growth of wage inequality focusing on the 'race between education and technology' but virtually ignored the role of technology on the occupational structure and wage inequality. Sociologists have "been strangely and remarkably silent" on the issue of wage inequality and instead "have continued to focus on the question of how people are allocated to positions in the earnings distribution rather than on the structure of those positions" (Morris and Western 1999:624). This omission is striking, given that elsewhere in the sociological literature occupations have been described as the most basic production unit, rent-seeking institutions, and act as proxies for employment contracts governing the employment relationship. Three recent papers by sociologists were published over the course of writing my thesis that seek to assess the role of occupations in structuring wage inequality in the United States (Weeden, Kim et al. 2007; Kim and Sakamoto 2008; Mouw and Kalleberg 2010). I am indebted to their contributions to the research field and also in shaping my approach.

Why are the basic facts regarding the relationship between the occupational structure and trends in wage inequality worth establishing anyway? Firstly, they could clarify debates in sociology regarding the structuring of overall inequality. To what extent did occupations structure the growth in overall wage inequality? Was the growth in wage inequality largely

between occupations or was the growth largely due to an increase in the dispersion of wages within occupations? Sociologists traditionally tend to think of occupations as salient positions in the stratification system; the default view would therefore expect that they did played a major role in the growth in wage inequality i.e. the majority of the growth in wage inequality was between occupations. More recent strands of sociological theory, however, suggest fundamental changes in the labour market mean that there has been widespread destruction in occupation-based 'rents' at all levels in the labour market, for instance, according to one notable theorist, "the result is less structure, meaning less positional inequality, but more inequality overall" (Sørensen 2000:1553). Under this view, the lumpy occupational categories used by sociologists no longer capture the shape of inequality. In other words, the majority of the growth in wage inequality was within occupations, not between them.

The above point is not a trivial one as it has implications for several strands of social science research that are not of direct concern to my thesis, for instance, in terms of the current debate regarding trends in social mobility in Britain. Sociologists define origin and destination in terms of social class positions (based on occupation data), whereas economists on the other hand, define origin and destination in terms of income groups. Recent research in Britain has found that mobility has declined slightly over the last few decades if income groups are used to define social groups (Blandon and Machin 2008), whereas research defining social groups in terms of social classes has found broad stability in mobility rates using the same data (Erikson and Goldthorpe 2007; Goldthorpe and Jackson 2007; Erikson and Goldthorpe 2010). Blandon, Gregg, et al. (2010) present evidence that the discrepancy in findings is likely due to the growth in income inequality *within* social classes as overall inequality grew (c.f. Erikson and Goldthorpe 2007; Erikson and Goldthorpe 2010). In examining the relationship between social classes and wages, my thesis will provide evidence on whether inequality in terms of

wages is mostly between or within social classes, and how this has changed over the period when mobility supposedly declined, using better quality data than that commonly used in mobility studies.

The second reason why the basic facts regarding the relationship between the occupational structure and trends in wage inequality are worth establishing is that the mechanisms by which wage inequality is said to have grown could be a direct result of changes in the occupational structure. As such, occupations could also point to alternative or complementary mechanisms to the education-focused skill-biased technological change thesis (hereon SBTC) that became the dominant explanation in economics, for instance, in terms of the creation and/or destruction of occupation-based rents. Education is a channelling mechanism into different sorts of occupations. Focusing only on education ignores the labour positions workers end up occupying. These positions can bring their own rewards and penalties in addition to a straightforward the rewarding of human capital. As the proportion of the labour force with degrees increases, looking at the changing structure of occupations and their associated (and changing) returns would provide a richer account of how wage inequality grew. In short, examining the relationship between occupations and wage inequality could provide a basis for future sociologically-grounded accounts for growing wage inequality.

Accounts of rising wage inequality could be enriched by adding in occupations. Since sociologists tend to place a lot of emphasis on the role of occupations in structuring economic inequalities, we might expect them to play a key role in accounting for overall wage inequality. More recent strands of sociological theory, however, argue that the link between occupations and economic inequalities might have been weakening over time – to the extent that traditional units of economic inequality no longer capture inequalities very well at all. I shall

assess these claims in relation to the over time trends between- and within-occupation-inequality in accounting for overall inequality.

Given this my thesis addresses three main questions:

1. Did occupations structure the growth in wage inequality? Was the growth in wage inequality largely between or within occupations?
2. To what extent is the structuring of the growth in wage inequality by occupations due to the changing composition of incumbents within occupations (namely the rise in educational attainment)?
3. What are the implications of the 'massive rise' in wage inequality for the categories sociologists use to capture economic inequalities based on occupations?

My thesis makes a contribution to these three questions in five main ways:

1. I begin by charting the changing structure of occupations and wages showing both evolved considerably over the last thirty years.
2. Provide a detailed disaggregation of such trends by establishing which specific occupations contributed to overall inequality, and how, in terms of the between-group/within-group framework.
3. I try to estimate the extent to which the observed trends in between-group/within-group wage inequality can be accounted for by other factors in the labour market namely rising incidence of and returns to degree-level education.
4. Evaluate the usefulness of 'social class' and 'occupation' as a category for capturing wage inequality by establishing whether the growth in earnings inequality has been mainly within- or between- social classes/occupations.

5. Finally, along the way, I shed some light on the more recent stabilisation/reversal in wage inequality, which has not yet been investigated in detail.

The occupational structure and wage inequality have both changed dramatically during the period under study, as detailed in the next chapter. The impact of the changing occupational structure on overall wage inequality has not yet been charted. As well as being an interesting endeavour in its own right, it has implications for several strands of economic and sociological theory which will be outlined in more detail in this chapter. The rest of this chapter is organised as follows: First, I outline what the literature says about the well-known descriptive trends in wage inequality. Second, I briefly outline some leading explanations and some evidence put forward as to why wage inequality grew (mainly from the economics literature) highlighting important issues relating to the possible and largely ignored role of occupations. Thirdly, I outline in more detail the possible role for occupations in the story of the rise in wage inequality, outlining three mechanisms that are central to Chapters 3 and 4. Finally, I outline the structure for the rest of my thesis.

WAGE INEQUALITY IN GREAT BRITAIN

During the 1960s and early 1970s there was essentially no change in the wage structure with sustained wage growth at all levels of the distribution. From 1972-5 relative differential narrowed slightly and when incomes policies were implemented and all wages began to fall, particularly those at the top 1975-7 (Gosling, Machin, and Meghir 1994, cited in Atkinson 2008:378). Once the social contract broke down with the election of the Conservative government in 1979, between the late 1970s and 1980s, wage differentials rapidly diverged again to levels witnessed the beginning of the century in just under a decade. The 1980s was

marked by an unprecedented and rapid growth in wage inequality. The United States experienced a similar if starker trend, labelled, after Kuznets' work, the 'Great U-Turn' (Harrison and Bluestone 1988). Wage inequality in Britain continued to grow throughout the early 1990s and then began to stabilise by the late-1990s. By the mid-2000s inequality had levelled out, yet not reversed, and is now stuck at a new higher level. Growing wage inequality during the 1980s and 1990s was not unique to Britain, yet the growth in British wage inequality stands out in its magnitude and speed. The growth in wage inequality in Britain is striking when compared to the experience of other advanced countries as Table 1 shows below (Katz and Autor 1999:1502; Atkinson 2008; Machin and van Reenen 2008; Brandolini and Smeeding 2009).

Table 1. Male 90/10 weekly wage ratios across selected OECD countries, 1980-2000

	1980	1990	2000	Relative change 80s-90s (%)	Relative change 90s-00s (%)	Relative change 80s-00s (%)
Finland	2.44	2.57	2.47[f]	5.33	-3.89	1.23
France	3.38	3.46	3.28[e]	2.37	-5.20	-2.96
Germany	2.53[b]	2.44	2.86[e]	-3.56	17.21	13.04
Italy	2.09[b]	2.38	2.44[c]	13.88	2.52	16.75
Netherlands	2.32[a]	2.48	2.83[f]	6.90	14.11	21.98
Sweden	2.11	2.07	2.35[e]	-1.90	13.53	11.37
United Kingdom	2.63[b]	3.24	3.40	23.19	4.94	29.28
United States	3.58	4.41	4.76	23.18	14.06	32.96

Notes: a – 1985; b – 1986; c – 1996; d – 1997; e – 1998; f – 1999.

Calculated from OECD data in Machin and van Reenen (2007:15).

EXPLANATIONS FOR THE RISE IN WAGE INEQUALITY FROM ECONOMICS

Sociologists generally have been silent on the issue and most of the explanations come from economics. Explanations in the economics literature focus on the increasing demand for 'skilled' labour relative to 'unskilled' labour for a given level of supply. The main piece of

evidence for demand-based explanations is that although the supply of skilled workers (defined empirically as graduates) has increased dramatically in the last twenty years or so. The premium for holding a degree continued to increase throughout the 1980s and 1990s, stabilising in the 2000s, suggesting that the pace of demand for graduates was outstripping the supply. For instance, in 1980, only one in twenty workers in Britain were graduates and they earned a 50 per cent premium, on average, relative to nongraduates. By 2004, one in five workers were graduates and they earned, on averaged, a 64 per cent premium relative to a nongraduate (Machin and van Reenen 2007). A similar trend in the graduate premium is found in the US even though they were starting from a higher base of graduates (from one in five in 1980 to one in three by 2004)(Machin and van Reenen 2007). Furthermore, in the US, the premium was exacerbated by a fall in the real wages of those with only high-school education. The differential between graduates and nongraduates is said to contribute to the increase in overall dispersion in wages. There are two main competing explanations as to why the demand for graduates relative to nongraduates has outstripped supply, providing two of the three main explanations for growing inequality.

The result of the disequilibrium between supply and demand for skilled labour led to rapid wage gains for the skilled labour relative to unskilled. There are three well-established categories of explanation in the economics literature behind the growth in demand for skilled labour relative to unskilled, mainly emanating from the US, but are said to be equally applicable to Britain (Machin and van Reenen 2007). They are (1) trade-based explanations; (2) skill-biased technological change (SBTC); and (3) institutional factors. The changing structure of demand derives from the first two sources – international patterns of trade and changes in technology. Their impact on inequality is mediated by the third set of factors, institutions. Taken together, these factors formed what became known as the supply-demand-institutions

framework (Katz and Autor 1999). When the rapid growth in wage inequality trend during the 1980s in the US was first noticed and verified in the early 1990s, initial explanations for the shift focused on trade. These since fell out of favour as growing inequality was observed in both the traded and nontraded sectors (Machin and van Reenen 1998). SBTC mediated by institutions became the dominant explanation. Each of these three categories of explanation shall be discussed in turn.

1. GLOBALISATION

In its most basic form, the idea here is that trade costs/barriers have been falling so that there has been a global equalisation in factor prices. For developed countries, this would mean a rise in the demand for skilled labour relative to unskilled labour as production is shifted toward skill-intensive industries since they would not be able to compete with the wages of low-skilled workers in less developed countries. Of course, unskilled labour in the developed countries is much cheaper than in the developed countries and so demand would fall for unskilled labour. The outcome would be a fall in the relative wages of unskilled workers and a rise in the relative wages of skilled workers, resulting in wage inequality.

Trade-based explanations for the increase in wage inequality are largely discounted or found to be insignificant relative to SBTC (Gregory, Zissimos et al. 2001; Machin and van Reenen 2007). Evidence from non-traded sectors shows that there has been a shift toward skilled-labour, whereas the 'globalisation' view would predict shifts in the traded sectors only (Machin 2001). A trade-based explanation would predict that there would be a shift towards less-skilled workers in nontraded industries as skilled labour is drawn towards traded industries and low-skilled labour is forced out of the traded sector. There is some evidence in the US, however, that wages for manual occupations have fallen in real terms over the 1980s. There is no

evidence of this in any other developed country, however. Furthermore, the 'globalisation' view might predict that skilled/unskilled wage differentials should fall in developing countries, as they have to effectively compete with skilled labour from developing countries. This has not happened.

Two main pieces of evidence have been put forward as to why the SBTC explanation might be more convincing than the trade-based one (Machin 1996). First, the trade-based explanation relies on the majority of the decrease in unskilled labour being due to the fall in demand for unskilled labour in manufacturing due to a fall in product demand in this sector. However, evidence shows skill demand has shifted within industries in the 1980s in a number of countries. Second, the within-industry increases in skilled labour are correlated positively with indicators of technological change. This seems to hold true when 'skill' and 'technologically advanced' are defined in different ways, for example, whether skill is specified in terms of educational qualifications or occupation and industry was specified as computer-use or R&D intensity (Machin and van Reenen 1998). If similar responses to changes in technology are being observed across countries, we might expect SBTC to be a robust mechanism for inequality as all advanced countries should have experienced a similarly timed exogenous shock. These pieces of evidence may be *consistent* with the predictions made by SBTC, but it is not *direct* micro evidence for it.

Another way 'globalisation' could have an impact on the wage structure is through immigration. There is a broad consensus that 'globalisation' entails a movement of labour (human capital) as well as physical capital. The rate of immigrant inflow has risen over the last decade or so in Britain. In 1995 the net inflow of immigrants was around 50,000 individuals. By 2005, this had risen to around 220,000 immigrants (Nickell and Saleheen 2008). By 2007,

around 13 percent of the working age population were born overseas (Manacorda, Manning et al. 2006). The evidence seems to show that the wage and employment impact of immigration are relatively small. Interestingly, newly arrived migrants bear disproportionately the cost of increased migration in terms of lower wages (Manacorda, Manning et al. 2006). The effect of immigration seems to be concentrated in specific occupations such as care homes, bars, shops, restaurants, and cleaning – in other words, sectors where there are already a large proportion of immigrants. According to one estimate, a 10 percentage point rise in the proportion working in semi/unskilled services leads to a 5 percent reduction in pay (Nickell and Saleheen 2008).

2. SKILL-BIASED TECHNOLOGICAL CHANGE

Perhaps the most commonly subscribed to and widely supported theory accounting for the growth in overall pay dispersion is what is referred to in the literature as 'skill-biased technological change'. Since this is the 'main' theory in the field, it is accordingly given more consideration than the others in this review. In its more basic form, the theory can be summed up as follows:

> "The skill-biased technology change hypothesis is founded upon the notion that employers' demand for more skilled workers has been shaped by the kinds of new technologies permeating into modern workplaces. The critical idea is that these new technologies lead to higher productivity, but only some workers possess the necessary skills to use them. As such, employers are prepared to increase the wages of the skilled workforce who are complements with the new technology. But at the same time less skilled workers do not possess enough skills to operate the new technologies and their wages are lowered or they lose their jobs. Relative wages/and or employment of the more skilled therefore rise" (Machin 2009:423).

The basic idea here is that technical change – namely the introduction of ICT into workplaces – is 'biased' in favour of 'skilled' workers (normally defined empirically as graduates) as they are somehow better placed than 'unskilled' workers (normally defined empirically as nongraduates) to take advantage of these technical changes in the workplace. Evidence supporting this theory mainly comes from the US context.

There appears to be three ways SBTC increased overall inequality in the US over time. The first predicts inequality stemming from inequality increasing between groups. Consistent with the supply and demand story, technological change has led to the demand for skilled workers outstripping supply, raising their wages at a faster rate than unskilled workers, especially given the slowdown in college attainment rates in the 1980s in the US. In other words, graduates are in a better position to use the productivity-enhancing new technology relative to nongraduates. This can be seen in the growing relative wage differential differentials between graduates and those with high-school education (Katz and Murphy 1992; Levy and Murnane 1992; Goldin and Katz 2008). The second way is increasing inequality *within* narrowly defined education and experience groups that was found with more sophisticated analysis as microdata became available, for instance Juhn, Murphy et al. (1993) and Acemoglu (2002). The growth in unexplained inequality is interpreted as rising returns to unobserved skills within educational groups. Residual wage inequality has been argued as supporting SBTC, and went on to become the consensus explanation in the 1990s in explaining the growth in US wage inequality during the 1970s and 1980s (c.f. Lemieux 2008). The growth in SBTC-induced residual wage inequality is said to be the main driver behind the surge in wage inequality in the 1980s. A third way, is due to relative sizes of different groups. According to this view, the labour market has become more polarised because of the decline in middle-paying routine jobs that are easily substituted by technology whereas high- and low-wage nonroutine jobs are complemented by

such changes. In other words, there are more jobs in which this new productivity-enhancing technology are complementary and fewer where new technology is a substitute. This later version of SBTC – where the focus is more on the structure of jobs than individual skills – has become the dominant view in explaining the continual growth in US wage inequality during the later period of 1990s and 2000s (Autor, Levy et al. 2003; Autor, Katz et al. 2006; Autor, Katz et al. 2008; Lemieux 2008).

Generally, these three mechanisms are seen as part of the wider technology hypothesis and not necessarily competing or mutually exclusive. Only the second way SBTC is said to have increased US inequality – by a growth in residual inequality – has been challenged. The 'revisionists' point to inconsistencies with SBTC theory and labour market evidence. First, there is the issue of timing. Card and DiNardo (2002) argue that technological advances continued to be made during the 1990s, yet the growth in wage inequality was tempered somewhat during this decade. Second, Lemieux (2006) concludes that the rise in residual inequality during the 1980s was an episodic event accounted mainly by the decline in the real minimum wage and especially due to demographic changes in the composition of the labour force at this time – and so unlikely due to rising returns to unobserved skills as the more recent SBTC proponents would have it. These two findings have, in turned, been challenged (Autor, Katz et al. 2008; Goldin and Katz 2008). Autor, Katz et al. (2008) argue that if one splits the distribution into 'upper-tail' (90/50), 'lower-tail' (50/10), and 'overall' (90/10) inequality, a different picture emerges. Changes in the upper-tail account for the growth in residual inequality so that a fall in the real minimum wage seems irrelevant. Furthermore, the growth in upper-tail inequality continued to rise during the 1990s indicating SBTC was still apparent. The slowdown in overall inequality stemmed from recovering lower-tail wage inequality, not from a reduction in upper-tail inequality.

In contrast to the above studies that infer the impact of implicit technical change on overall inequality from changes in the structure of wages and the labour market as a whole, there is a body of literature that attempts more direct micro assessments of the relationship between technology and wages. These studies use two kinds of evidence: estimates of the returns to computer-use with individual-level data and technology-intensity at the workplace-level. Taking the first kind of evidence, SBTC would predict a premium to using ICT and that graduates are more likely to use ICT at work. Many studies find a positive link between ICT-use and pay and there appears to be a bit of variation in what the literature says on the magnitude of the premium. Normally the ICT-premium is in the region of 7-37 per cent relative to not using a computer at work (Krueger 1993; Dolton and Pelkonen 2007; Green, Felstead et al. 2007). In Britain, computer-use is indeed becoming more and more common at work with the number of jobs using computers growing from two in five in 1986 to around three in four by 2006 (Green, Felstead et al. 2007:68). The proportion of employees reporting that using a computer is 'essential' for their job has risen from one-third in 1997 to one-half by 2006 (Green, Felstead et al. 2007:69).

Demonstrating the returns to computer-use is, however, not a straightforward task because workers that were first selected to use computers during the 'ICT revolution' were likely to be workers of high ability anyway or already in high-skill jobs so it might be difficult to separate out what is driving the return to computer-use[1] – it might be due to some unobserved characteristics correlated with computer-use. However, attempts have been made to overcome this. Green, Felstead et al. (2007) distinguish between three kinds methodological approaches to establish the link between computers and pay: First, those studies using a large number of

[1] This line of thought is predicted by SBTC – skilled workers are more likely to be selected or self-selected into using computers. The problem is isolating the 'effect' of ICT on pay. What is observed as a 'ICT-premium' might actually partially reflect rising returns to unobserved skills.

job characteristics to control for observed heterogeneity. The authors point out that this approach is rare due to the lack of appropriate data. Second, some studies use instrumental variables to control for endogeneity of computer usage. Third, others use panel data to control for unobservable (but fixed) heterogeneity. Studies using this latter view generally find small returns (<10 per cent). There are two further problems with panel estimates. First, panel estimates are often based on crude panel dynamic assumptions i.e. that computers boost pay immediately. This may not be the case as computing skills take time to acquire and the productivity benefits may take time to off-set the sunk costs of installing it, slowing down the feedback effect on wages. Second, they cite one study (Makepeace and Dolton 2004) that shows conventional fixed-effect panel estimators are flawed because they assume that the impact of computers is uniform across groups. This study finds that the premia associated with computers varies with when employees began using computers in their job.

Some authors have argued that the link between pay and computers cannot properly account for unobservable influences. DiNardo and Pischke (1997) found the returns to computer-use to be close to zero because of the 'pencil effect'. Using a combination of the above techniques to control for unobserved skills, they found a premium of about 12 per cent associated with pencils. They argue it seems implausible that the pencil differential is caused by unobserved skills linked to the introduction of computers in the workplace and argue that the finding casts doubt on how confident one can be in making interpretations about the returns to computer-use. In another study, Dickerson and Green (2004) were able to eliminate the 'pencil effect' when including a more detailed list of job characteristics implying it is other skills used in the job that are being rewarded, not computers. Handel (2007) was able to eliminate the effect of computers using seven detailed job tasks and pre-computing revolution occupational and industry mean wages in his regressions in the US. A final piece of evidence casting doubt on

the returns to computer-use is that the timing of the ICT revolution and the growth in pay inequality – the growth in computer-use and the growth in pay inequality do not coincide (Handel 2003). For the US at least, some authors have argued that although the growth in computer-use has been continuous, the growth in US wage inequality has been episodic, perhaps casting doubt on whether the two are as closely linked as much of the literature makes out (Card and DiNardo 2002). Against this, Machin and Van Reenen (2007) argue that SBTC is supposed to account for the longer-run pressure to increase skill demand and the SBTC thesis is about technological change being biased.

Other literature using the wage equation estimation approach finds a growth in the proportion of wages that cannot be explained by individual characteristics implying a growth in inequality *within* groups (Machin 1996; Prasad 2002; Machin 2003; Machin and van Reenen 2007). This is in turn has been interpreted as an increasing return to unobserved skills or characteristics. Some argue the supposed returns to unobserved skills is evidence in *favour* of SBTC (Prasad 2002; Autor, Katz et al. 2008), although one might expect that that SBTC predicts inequality between groups (skilled versus unskilled). This is because technical change is biased in favour of certain unobserved skills at all levels of skill (normally measured by education level). The sizable role found for within-group inequality could stem from the fact detailed groupings are rarely used. If a sizeable role remains even after defining groups in terms of detailed occupational categories then we can more confidently say that within-group inequality remains. If the role of within-group inequality is diminished after controlling for detailed occupational groups, then we can argue, alternatively, that one of the drivers for within-group inequality is due to people with similar levels of education being channelled into different occupations. The early SBTC literature used a simple two-factor measure of skill denoted by graduate and nongraduate. Education is more a rough indicator of the skill-level of the individual (human

capital), and the 'possible' occupations 'open' to a graduate relative to a nongraduate, than any meaningful indicator of the specific kinds of tasks performed in the job. Furthermore, research reveals there is an increasing mismatch between educational qualifications and skill-content of the job. Green and McIntosh (2007) find that there has been an increase in the proportion of workers reporting they are 'overqualified' in their job to around one in three in Britain. Felstead, Gallie et al. (2007) find that the increase in over-qualification was greatest amongst those holding level 4 qualifications i.e. degrees. This implies further that qualifications are an increasingly poor measure of skill used in the job. The more recent 'job polarization' literature which will be discussed in the next section marked a move away from the earlier human capital SBTC literature where the focus was very much on individual skills in the form of education or experience to skills used in the job in the form of occupation.

One study that uses workplace-level panel data of manufacturing firms in Britain 1984-1999 asserts that since wages are linked to productivity (at least in the long run) then if wages are becoming more unequal, this must be mirrored in an inequality in the distribution of productivity (Faggio, Salvanes et al. 2007). Since it is difficult to measure 'productivity' at the individual level, they use establishment level data. They show that the distribution of firm productivity has become more unequal for the years 1984-1999 between the least and most productive workplaces. Most of the inequality in productivity has occurred *within* industries, thus providing evidence against trade-based explanations for the productivity differential between firms. They conclude that it is difficult to estimate how important firm heterogeneity was for the overall increase in inequality. What is clear is that link between firm productivity and wages has strengthened. The dominant reason for the increase in the inequality in wages appears to be the growth of inequality between firms within industries. This could provide *prima facie* evidence for technological change within workplaces leading to the productivity gap.

It seems, therefore, that looking inside the workplace would provide a fruitful area for research in assessing the SBTC debate. The different responses of workplaces to technological change seem to be what matters for changes in productivity, not the industry. Since productivity differences are linked to wage differences, a logical step to see why some workplaces have become more productive even within industries. Workplaces and workplace organisation are largely ignored in the economics literature. Sociologists, however, have long noted the importance of the workplace in stratification research (Baron and Bielby 1980).

3. INSTITUTIONAL EXPLANATIONS

Institutions appear to play an important role in mediating wage inequality, especially in explaining between-country differences. During the 1980s a number of advanced economies failed to experience any significant growth in inequality such as France, Germany, and Japan. Moreover, countries where labour market institutions have declined the most are also the countries where wage inequality has grown the most (Machin and van Reenen 2007). Much of the rise in 1980s wage inequality in Britain can be attributed to institutional changes. Increases in wage inequality since then is harder to pin on institutional change, although they undoubtedly had an impact. The two most important institutions that crop up in the literature are trade unions and minimum wages. One historically important institution in Britain was the Income Policies of the late 1970s. They aimed to keep wage growth below the rate of inflation. Income policies are perhaps one overlooked feature in the growth in wage inequality in the literature during a period of skyrocketing inflation because the generally thought to have failed.

TRADE UNIONS AND THEIR DECLINE

Trade unions bargain for improved working conditions, including pay, for their members. There are several reasons why we might expect trade unions to reduce the dispersion in pay

relative to the nonunionised sector. First, trade unions bargain for a rate for the job, not the individual. Second, it is in their interest to compress the pay distribution at the establishment and industry level for solidarity reasons. Third, unions generally operate a *de facto* minimum wage policy (Metcalf, Hansen et al. 2001). The 'equalising' effect of unions on pay is backed up by the evidence with countless studies showing pay is more compressed in unionised firms than nonunionised firms (Blanchflower and Bryson 2003; Card, Lemieux et al. 2003). A series of reforms introduced in the 1980s in Britain by the Conservative government (previously mentioned) were designed to curb the power of trade unions and they were very successful in achieving this goal. Subsequently, union membership plummeted from a high point of 13.2 million by 5.5 million members over the next two decades with collective bargaining coverage falling by a similar magnitude (Metcalf 2003; Fernie 2005). The implications of the haemorrhage in membership and power undoubtedly contributed to some of the increase in overall pay inequality. Although it must be pointed out that the growth in the dispersion of pay predates the collapse of trade unions by several years suggesting other factors are at work. Studies typically find that around 20 per cent of the increase in inequality between the 1980s and 1990s can be attributed to the decline in unionization (Machin 1996). Estimates of variance explained are even higher, at around 30-40 per cent mark, when only looking at the rise in male inequality (Machin 1997; Gosling and Lemieux 2004). Unions seem to have less of an effect on female inequality as they do on male inequality (Card, Lemieux et al. 2003). Interestingly, countries that have experienced a similar magnitude in union decline (US and Canada), also show a similar rise in inequality as Britain, although most of the inequality occurred amongst men (Card, Lemieux et al. 2003).

WAGE COUNCILS AND MINIMUM WAGES

A second key institution in the literature is minimum wages. Since 1909, a large proportion of low paid had minimum wages set by wage councils, including hairdressing, catering and retail. The weakening of wage councils in the 1980s was found to account for between 9 and 20 per cent of the rise in dispersion in the low-paid sector (Machin and Manning 1994; Bell and Wright 1996). They were eventually abolished in 1993. Minimum wages affect overall dispersion as they set a floor on wages. Moreover, as we have seen, one of the reasons for the increased dispersion in wages has been that wages at the lower tail of the distribution have grown very slowly relative to the top. The New Labour government introduced the National Minimum Wage (NMW) in 1999. The impact of the NMW on overall employment and inequality has been small (Machin 1997; Dickens and Manning 2003; Machin, Manning et al. 2003; Stewart 2004; Metcalf 2007). Since the minimum wage covers so few workers (around 5 per cent when it was introduced) and most upratings of it are modest relative to changes in the average wage (at least up until 2003), that its impact on overall inequality must also be small. The differential between those at the middle and those in the bottom 10 per cent did not grow during the late 1990s (Machin 2003) which can be seen as evidence that the NMW tempered lower-tail inequality. Upratings since 2003 have been more ambitious than before such that the NMW has increased by 60 per cent in nominal terms since it was introduced whereas the average wage has risen by half that amount (Metcalf 2007). Thus the NMW must have raised the hourly pay of the lowest paid compared to what they 'might have got' in the absence of it. In the US, there was a *fall* in the real minimum wage in the 1980s and 1990s, and as a result, real wages of the lowest earners (especially low-paid men) actually fell in real terms contributing to overall inequality (Card and DiNardo 2002). It is not unreasonable to assume the same would have happened in the Britain had the NMW not been uprated frequently and above the average growth in earnings.

HOW DO OCCUPATIONS STRUCTURE WAGE INEQUALITY?

Following on from SBTC, there appears to be three ways occupations can increase overall wage inequality. As a starting point, I argue that occupations can structure overall wage inequality in three ways:

1. By changes in labour force shares of occupations
2. By changes in average wages of occupations
3. By changes in within-occupation inequality

Occupations are central to stratification research in sociology for two main reasons. First, occupations capture the *structure* of inequality as the labour market as "far from being a seamless and continuous distributions of incomes, is instead understood as a deeply lumpy entity, with such lumpiness mainly taking the form of institutionalized groups (i.e., "classes") that constitute prepackaged combinations of valued goods" (Grusky and Ku 2008:7). As such, "measurement strategies based on the income distribution impose an excessively abstract, analytic, and statistical lens on a social world that has much institutionalized structure to it" (Grusky and Ku 2008:7). Second, following on from the first point, they relate to a *source* of stratification. In a main reader in the field of stratification it is argued that "the main advantage of class-based measures, as argued by sociologists, is that conventional class categories (e.g., professional, manager, clerk, craft worker, laborer, farmer) are institutionalized within the labour market and are accordingly more than purely nominal or statistical constructions" (Grusky and Ku 2008:7). Sociologists generally have argued that economic inequalities, including wage inequality are structured in a lumpy way (e.g. Farkas, England et al. 1994). This represents the traditional 'structuralist view' that prevailed in sociology 1945-ca.1985 according to the main stratification reader (Grusky and Ku 2008:7-9).

There are two dominant structuralist accounts. Their main difference is in terms of preference given to the level of detail at which source and structure of inequality occurs. Sociologists have tended to focus on 'big classes' which are basically aggregations of detailed occupation codes. Although there are several approaches to big class theory, one that has achieved much dominance is the EGP or Goldthorpe schema (Goldthorpe 1997; Goldthorpe 2000). Goldthorpe (2000) posits that class (dis)advantage is rooted in employment relations. Broad class categories combine detailed occupational categories whose members experience supposedly fairly homogenous forms of regulation of employment in terms of their sources and levels of wages, their degree of economic security, and their chances of economic advancement. Attempts have been made to validate whether social class categories capture these broad kinds of employment relations (Evans 1992; Evans and Mills 1998; Evans and Mills 2000; McGovern, Hill et al. 2007). The other view attempts to move away from big classes nominalist categories to microclasses that attempt to provide a 'realist institutionalist' account of inequality (Grusky and Weeden 2001; Grusky 2005; Weeden and Grusky 2005; Grusky and Weeden 2008).

According to the main stratification reader, the more recent 'post-modernist' phase ca. 1995-2000s in sociology argued for a 'disorganized' account of inequality (Grusky and Ku 2008:11-12). This view posits that class or occupations, whether big or micro, no longer capture stratification very well due to fundamental changes in the social structure that mean traditional groupings no longer matter. The issue, then, is not one regarding classification. The main argument here is an 'individualization of inequality' (Pakulski and Waters 1996; Beck and Beck-Gernsheim 2001). A prominent example of such a theory is Ulrich Beck's 'individualization' thesis, The 'individualization' trend is should not be equated with a more equal society as Beck states "capitalism without classes does not mean less inequality in the

future, it will mean more" (Beck and Beck-Gernsheim 2001:207). The implications are similar to Sørensen's across-the-board rent-destruction.

The shift from structuralist accounts of inequality to a disorganised account in sociology is mirrored in the developments in economics that emphasise residual wage inequality. The structuralist view parallels older studies on wage inequality by institutional economists which focused on occupational differentials as a natural starting point (Phelps Brown and Hopkins 1955; Routh 1965; Phelps Brown 1977). One of the main findings in this line of research was the apparent remarkable stability in the occupational wage structure, paralleling the structuralist view in sociology. An extreme example such stability was observed by Phelps Brown. He observed that the ratio in day rates between a craftsman and a labourer in Southern England remained remarkably stable at about 3 to 2 for around 500 years prior to 1900 (Phelps Brown and Hopkins 1955). Phelps Brown asserts it must have been custom, a rule of thumb of 'half as much again' that set wages, rather than purely market forces. Perhaps because of this perceived stability in the occupation-wage structure, occupations as a unit of analysis since fell away in research by economists, for the interesting period when wage inequality took-off, as can be seen from the review of the wage inequality literature above, where, firstly, occupations are largely ignored and are only implicitly mentioned, and secondly, the dominant account stressed the growth in inequality within groups.[2]

If the occupational wage structure did change then this could be one then this could provide one route by which occupations affected overall inequality. However, even if the occupational

[2] One of the reasons why economists may have overlooked occupations is because it could be seen as a 'choice variable'. People self-select into occupations partly because of wages so occupations and wages are jointly determined (endogenous). However, the same could be said of education which has been at the centre for explanations of rising wage inequality in economics. Furthermore, focusing on occupations would shed light on the apparent rise in within-group inequality, pointing to specific occupations that played a role in the growth in wage inequality.

wage structure has remained remarkably stable, the occupational employment structure certainly has not, having an effect on overall inequality. It is likely that the occupational wage structure has not remained constant, for instance, it is likely technology has affected wages as well as employment. The rate of change of occupational wages is likely to be unequal across occupations. This provides a second route occupations affected overall inequality. As mentioned in the introduction, some strands of sociological theory have argued that there has been an increase in the dispersion of wages within occupational categories as productivity becomes increasingly tied to the individual. This provides a third route occupations affected overall inequality. For now, I shall leave this debate to the next section.

With regard to the first mechanism, changes in occupational employment shares, there have been important changes in the structure of the labour market. Technology-induced shifts in the demand for different kinds of labour affect the composition of the labour market as well as wages. Holding the occupational wage structure constant, a fall in the proportion of middle-wage occupations would polarise the labour market into high-wage and low-wage occupations, increasing overall inequality. With regard to the second mechanism, changes in occupational mean wages, the movements in the wages of occupations can influence overall inequality, even when holding the employment structure constant. Some occupations may have experienced large wage gains pulling away from the rest, whilst others may have even experienced a fall in real wages. With regard to the third mechanism, an increase in inequality between individuals within occupations will always increases overall inequality.

I shall outline each one in turn in the next section. In short, occupations can contribute to overall inequality by changes in their employment shares (quantity effect), changes in their mean wages (price effect), and changes in within-occupation inequality (residual effect). The

first two of these three mechanisms are between-occupation inequalities. If I find a growing role for inequality between occupations, this is indicative that occupations are an important driver for overall wage inequality, as the focus on occupations in stratification research would expect. If, on the other hand, the majority of the growth in overall inequality was due to inequality within-occupations – especially when defined at the most detailed level – then this supports the view that occupations are a rather obsolete category for examining the structure of economic inequality in the labour market – at least in terms of wages in cross-section, and explanation must reside elsewhere, perhaps at the workplace level (c.f. Kim and Sakamoto 2008). Chapters 3 and 4 of my thesis aim to provide an account of the extent to which in between- and within-occupation inequality contributed to the growth and subsequent stabilisation in overall inequality.

OCCUPATIONAL EMPLOYMENT AND JOB POLARIZATION

The first way occupations can contribute to overall inequality is by changes in their relative employment shares, even when holding their mean and variance in occupation-level wages constant. A strictly structuralist sociological account would predict that changes in wage inequality must stem from the employment structure as occupations are fairly homogenous and unchanging units. A recent literature has emerged in the economics literature that places occupations at the centre of a more 'nuanced view' of SBTC in terms of employment patterns and job tasks actually performed (Goos and Manning 2003; Autor, Katz et al. 2006; Goos and Manning 2007; Spitz-Oener 2007; Autor, Katz et al. 2008; Goos, Manning et al. 2009; Oesch and Rodriguez 2009). This marked a move away from the earlier human capital SBTC literature where the focus was very much on individual skills in the form of education or experience to skills used in the job. Goos and Manning (2007) find that, in Britain, there has

been a growth in high-paid paid jobs since 1979, but also a small but significant growth in low-paid jobs, a process they term 'job polarization' (defining the pay of an occupation by its 1979 median wage). They find that such employment patterns can account for between one-third and one-tenth of the growth in wage inequality between 1979-99. They explain this trend using the 'routinization hypothesis' developed by Autor, Levy et al. (2003), and argue this is evidence of a more nuanced view of SBTC leading to the growth in overall inequality. Computerisation is a good substitute for *routine* tasks – whether manual or nonmanaul such as repetitive assembly or record-keeping – but are a poor substitute for *nonroutine* tasks – whether manual or nonmanual such as a care assistant or housekeepers. Some have distinguished this process from SBTC by labelling it task-biased technological change (TBTC) (e.g. Machin 2009:2). Manning (2004) suggest that a complementary reason for the increase in the number of low-wage occupations such as gardeners, nannies and cleaners is because they result from the increase in high-wage people and dual-earner households demanding such low-skill in-person services.

As compelling as this literature seems for explaining employment patterns, there is one potentially major shortcoming of this literature in explaining changes in overall wage inequality as it does not consider the role of the other two mechanisms – changes in average wages of occupations and changes in inequality within occupations. The standard methodology in these papers is to rank occupations by their median or mean wage at the baseline period of then place each occupation into one of ten groups, each with approximately 10 per cent of total employment (or 20 per cent of total employment if only five groups are used), with the first group containing the highest-paid occupations, and the tenth (or fifth) group containing the lowest-paid occupations (Goos and Manning 2003; Goos and Manning 2007; Goos, Manning et al. 2009; Oesch and Rodriguez 2009). Simple shift-share analysis then shows how much of

a change in overall inequality is attributed to these employment patterns. To be a valid in assessing the link between employment patterns and wage inequality, the assumption that the occupational wage ranking at the baseline has to remain constant over the time period considered. None of the papers provide an empirical justification for this claim. One does state that this empirical strategy "reflects the well-known fact that there is very considerable stability in the occupational wage structure" (Goos and Manning 2007:122). The same paper does not provide any evidence for its claim. This approach obviously ignores over time changes in means and variance in occupational wages. Recent research has shown that the 'job polarization' is sensitive to whether the baseline year is used to rank occupations or an average across all years, suggesting that there the assumption of very considerable stability in the occupational wage structure is a strong one as a recent reanalysis shows (Holmes and Mayhew 2010).

OCCUPATIONAL WAGES, HUMAN CAPITAL, AND OCCUPATIONAL RENTS

Even if the wage-ranking of occupations stays stable over time, as the job polarization view posits, changes in their mean wages can have real impacts on overall wage inequality if some occupations' wages fall and others' wages pull away from the rest – even when holding the employment structure constant. Earlier SBTC theories posit that increasing returns to human capital stem mainly from graduates experiencing relative wage gains relative to nongraduates as ICT is a complement to higher-skilled work and a substitute for less-skilled work. Of course, this view rests on the dynamic interaction between supply and demand. In this scenario, wage premia should only emerge if the pace of demand for educated labour outstrips supply. One finding of that literature is that much inequality growth was actually *within* educational groups

as well as between them, at least in the US. Since within-group inequality is an important source of inequality, rising returns to education story can only be a partial explanation.

Measuring demand for different types of labour in the form of occupation rather than educational groups would therefore enrich explanations of growing wage inequality by more precisely pinpointing exactly which skills are complements to technological change, at least in terms of wage dynamics, rather than relying on increasing returns to unobserved skills as an explanation as some of the SBTC literature has since within-group inequality is found to be important when skill is defined as either graduate or not. One disadvantage of using occupations instead is that there are many of them, creating its own difficulties in presenting analysis and a simple narrative. More recent strands of the SBTC literature hypothesise that technological change can increase demand for certain *kinds* of occupations, however. Only the employment effect in terms of 'job polarization' has really been established for Britain (Goos and Manning 2007) but it is plausible mean wages of occupations can be affected by the same mechanisms behind employment changes.

The earlier SBTC focused on the changing rewards to individual human capital characteristics (e.g. education), and more recently, the changing employment structure of occupations in terms of TBTC. However, so far relatively little is known about the changing rewards t different occupational positions – which surely should be an important source of wage inequality. The changing rewards to occupations raises the sociologically interesting question regarding the extent to which possible wage gains of certain occupations are due to a rise in the general education premia or due to some other occupations-specific reasons such as 'occupation-based rents' of the kind for which microclass sociologists argue (Weeden 2002) and some sociologists like Sørensen argue are instead being destroyed (Sørensen 2000). Rents,

as defined by Sørensen, are essentially labour market rewards from nonmarket sources, which I interpret as rewards unexplained by individual (especially human capital) characteristics. In other words, rents may be defined as the proportion of changes in occupational mean wages, net of the well-known rising returns to education.

If there were no rents attached to occupations we would expect most of the variation in occupational mean wages to be explained by differences in demographic factors, especially in terms of educational attainment, within narrowly defined occupational groups. In this scenario, some occupations' wages may rise faster than others' simply because the human capital of their incumbents increases faster than others'. To properly adjudicate between changes in the rewards to human capital and the destruction/creation of occupational-level rents in explaining divergence in occupational wages, a multivariate analysis on the mean wages of occupation unit group level must be employed. The rewards to human capital version of SBTC states that it is largely the rising returns to holding a degree that drove up wages of the upper-part of the wage distribution relative to the rest. If, upon controlling for other factors, namely changes in the level of educational attainment within occupations, the occupational effect disappears, this would suggest changes in occupational mean wages are driven by educational attainment. If, on the other hand, an occupation effect remains, this could be interpreted as rent-destruction/creation at the occupational-level, reinforcing the importance for occupations in structuring wage inequality.

Rents are the portion of an occupation-specific mean wage not attributable to rising human capital stock within that occupation. In this sense, they are empirically similar to the 'unobserved skills' posited by some economists but with a different interpretation because the level of analysis is different. They are the same in that it is essentially the variation in wages not

explained by standard wage equation variables. Whereas unobserved *individual* skills are inferred from the unexplained portion in variation in was between *individuals*, occupational-level rents may be inferred from the unexplained portion in the variation in occupational mean wages between occupations. Of course, some of the unexplained variation in occupational mean wages could be due to systematic differences in unobservable skills between occupations. We can only minimise this by defining groups as narrow as possible – some of the within-group inequality could simply have been that detailed occupation controls were not used – graduates work in an increasingly diverse set of occupations.

There are many routes from where an 'occupation effect' might stem. Wage-influencing institutions can include occupational institutions – such as professional bodies, certification, licensing, and the like – engaging in what Kim Weeden calls 'occupation closure' (Weeden 2002). Occupational licensing has been shown to have real controls over supply and receive larger wage increases than the same occupation in a state where it is not licensed or same-state comparable non-licensed occupations (Kleiner 2006). Not much literature exists on this form of rent-capturing in Britain. My thesis does not attempt to provide evidence for the mechanisms behind why an occupation effect may or may not exist. Rather, I aim to provide a descriptive account of the relationship between the changing structure of occupations and wage inequality.

Some preliminary evidence in the US finds that rent-creation might actually have played a role in growing inequality there. Lemiuex (2008:39-42) finds that the wages of some occupations that are predicted to have grown since the 1970s and 1980s by SBTC such as computer scientists and software engineers have actually experienced negative relative wage changes and it is 'professional' occupations that are able to sustain the biggest wage increases such as

doctors and lawyers. These cannot be rountinised or offshored (with offshoring explaining the discrepancy with computer scientists, software engineers, on the one hand, and 'in-person' services offered by doctors and lawyers on the other). Furthermore, they are highly regulated by their associated professional bodies that limit supply into the occupation to maintain minimum standards and keep wages high.

WITHIN-OCCUPATION INEQUALITY AND THE NEO-CLASSICAL SOUP

The final way in which occupations can contribute to overall inequality is by changes in inequality between individuals within occupations i.e. within-occupation inequality. An increase in within-occupation will always increase overall wage inequality. Since occupations have remained central to stratification research, we might expect them to still structure inequalities in the labour market. Based on this view, we would expect the majority of the rise in wage inequality to derive from growing inequalities between occupations and that inequality between individuals within occupations to play a smaller role. However, some more recent theories in the sociological literature, argue there has been an 'individualization of inequality' (Pakulski and Waters 1996; Beck and Beck-Gernsheim 2001). The shift from structuralist accounts of inequality to some 'disorganised accounts' in sociology is mirrored in the developments in economics that argue for residual inequality. Whereas sociologist interpret within-group inequality as evidence for an individualisation in the employment relationship where pay is increasingly tied to the individual, not the job and that 'structural holes' in the labour market are being eliminated (Sørensen 1996; Sørensen 2000), economists interpret it as rising returns to unobserved skills. The within-occupation component of overall inequality is essentially the result of an inequality between individuals within occupations. This provides evidence that wage determination stems from outside occupation, for instance at the

workplace-level, or perhaps that occupation classification systems are becoming increasingly antiquated in delineating certain occupations, and the so bundles of tasks that they represent which are rewarded in the labour market. Nonetheless, "it remains conventional for sociologists to describe stratification systems in terms of discrete classes or strata whose members are presumed to have similar levels or types of assets" (Grusky and Ku 2008:7).

The prediction of this for whether between- or within-occupation inequality is the main driver of overall inequality is that "consistent with the idea of a stronger link between wages and personal endowments, we also observe a marked increase in within-occupation inequality" and so "as inequality increased, structural locations seemed less relevant for explaining the variation in earnings" (Sørensen 2000:1552). In other words, inequality is increasing but taking on a more structureless form. Categories such as occupation or occupational class might make little sense in structuring economic inequalities if we are heading towards as Sørensen once put it, 'neo-classical soup' (Goldthorpe 2000:1581). Examining the growth in wage inequality is one way to assess the validity of these categories (this point will be discussed more below and is the subject of Chapter 5).

Sørensen argued that these processes apply equally to almost all parts of the labour market and that "the rent destruction in the labor markets, except perhaps for the highest paid managers, leaves a labor market more flexible and more fluid" (Sørensen 2000:1553). Sørensen did not really offer much evidence for his conjectures, nor did he give many reasons why rents in the labour market are suddenly being destroyed. The 'residual inequality' literature in economics interprets a rise in within-group inequality as rising demand for unobserved skills. An obvious institutional reason is the dismantling of trade unions that coincided with the rapid rise in wage inequality. As mentioned above, technology and changing management practices must both be

leading contenders at the workplace level. For employees to be paid by their productivity, monitoring of work must get easier with better technology. This is manifested in workplace activities such as performance related pay. Incentive pay or pay-related to appraisals – seem to be increasing in Britain. More than half of employees receive some element of their pay in the form of an incentive (whether at the individual, group or workplace level). The proportion of employees receiving individual performance-based incentives increased from 15 per cent in 1992, to 22 by 2000. The biggest increase, however, was in terms of team incentives with 5 per cent of employees participating in such schemes in 1992. By 2000, 17 per cent of employees were covered by them. There was little change in workplace-based incentives over this period (McGovern, Hill et al. 2007:167). Lemieux (2008:36) finds that the increase in the use of performance related pay incentives in the US contributed to 25 per cent of the growth in inequality between the 1970s and 1990s, and is particularly concentrated at the top-end of the distribution – accounting for 71 per cent of the 99/10 wage gap but only 3 per cent of the growth in the 80/10 wage gap. This latter finding highlights that these mechanisms might be more concentrated in and be more consequential for certain segments of the labour market more than others – known as class-biased institutional change.

IMPLICATIONS OF WAGE INEQUALITY FOR SOCIAL CLASS

The previous section examined how occupations, in various ways, might structure the growth in wage inequality. In this section I ask the reverse question: how did the growth in wage inequality structure occupations, more specifically with reference to social class? Social class categories are essentially aggregations of detailed occupation unit groups bundled into a smaller number of salient classes.

In my thesis, the bulk of my analysis focuses on detailed occupations rather than aggregated occupational classes (Chapters 2-4). This is not due to any major concern of mine in debates regarding 'realist' or 'normative' accounts of inequality (Grusky and Sørensen 1998; Grusky and Weeden 2001; Goldthorpe 2002; Weeden and Grusky 2005), but rather since the data are available at the most detailed occupational level, I can empirically investigate the growth in wage inequality from both perspectives and leave which is better as an empirical matter. These detailed occupation data are not always available and often when it is, sample sizes are too small for any meaningful or reliable analysis. Furthermore, having hundreds of categories can make presentation of results difficult, so sociologists have often focused on 'big classes' which are basically aggregations of detailed occupation codes. Although there are several approaches to big class theory, one that has achieved much dominance is the EGP or Goldthorpe schema (Goldthorpe 1997; Goldthorpe 2000). Goldthorpe (2000) posits that class (dis)advantage is rooted in employment relations. Broad class categories combine detailed occupational categories whose members experience supposedly fairly homogenous forms of regulation of employment in terms of their sources and levels of wages, their degree of economic security, and their chances of economic advancement. My thesis contributes to the big class versus micro class debates in leaving the extent to which the overall variation in wages is mainly due to variation at the big class or occupational level as an empirical question. A recent paper investigating the role of big class versus and micro classes and social mobility across four advanced industrial societies found "much of what shows up as big class reproduction in conventional mobility analyses is in fact occupational reproduction in disguise" (Jonsson, Grusky et al. 2009:977).

A third view suggest that class, whether big or micro, captures stratification very well than perhaps it once did due to fundamental changes in the social structure that mean traditional

groupings no longer matter. The issue, then, is not one regarding classification. One example of such a theory is Ulrich Beck's concept of 'individualization', similar to Sørensen's across-the-board rent-destruction. The 'individualization' trend is should not be equated with a more equal society as Beck states "capitalism without classes does not mean less inequality in the future, it will mean more" (Beck and Beck-Gernsheim 2001:207).

In a methodological paper, Western and Bloome (2009) note that since "sociological theory usually motivates hypotheses about between-group inequality", within-group inequality "is not treated as substantively interesting" (pp. 293-4). This is a serious omission, firstly, since as will be shown, a growing body of research by economists highlight the growing role for wage inequality within groups as overall wage inequality grows. The focus has been on inequality in the intergenerational transmission of social position rather than the distribution of inequality in cross-section. This is a big omission as it ignores the changing structure of social positions and the changing rewards attached to them both of which have implications for intergenerational mobility. Secondly, in focusing on between-group inequality, sociologists are missing what could potentially be a very important trend that demands further attention. More importantly, a rise in within-occupation inequality could have implications for the categories sociologists use to capture social positions. In other words, the shape of economic inequality is not well captured by nonoverlapping multidimensional categories (c.f. Grusky and Weeden 2008). I shall assess the extent to which the growth in overall wage inequality has led to a breaking down in big-classes, into micro-classes, or into smaller units in Chapter 5.

STRUCTURE OF THE THESIS

I begin from the twin observations that there has been a 'massive rise' in wage inequality in Great Britain since the late 1970s and that very little is known about the relationship between the changing occupational structure and wage inequality. Sociologists have a long tradition of focusing on occupations as the main unit by which the labour market is stratified. In my thesis, I ask how do occupations structure wage inequality and how has this changed over time? We know there has been structural change in the labour market, but the impact of this together with that of mean wages and within-occupational inequality for growing wage inequality in Britain is unknown. If occupations structured the growth in wage inequality, then we would expect to find the growth in overall wage inequality was due to inequality increasing between occupations. However, more recent strands of sociological theory such as that in the cited examples of Aage Sørensen and Ulrich Beck, suggest that, for various reason, inequality in the labour market is increasingly being driven by inequality within occupations. In addition to establishing the role of the changing occupational structure on wage inequality, my thesis seeks to establish what the implications are of the take-off in wage inequality on commonly-used categories by sociologists that are based on aggregated bundles of occupations. Does it mean that big classes no longer capture inequalities as well as they once did? Does it mean the labour market has fragmented into micro-classes? Or does it follow the extreme conjectures of Sørensen and Beck that neither big classes nor micro-classes capture wage inequality very well. Finally along the way, I shed light on the recent stabilisation in wage inequality, which has not been studied in-depth.

My thesis is structured as follows: The next chapter examines changes in the occupational structure and changes in wage inequality over the last 35 years. The third chapter examines the co-evolution of the occupational structure and wage inequality and establishes quantitatively the respective roles of between- and within-occupation inequality in driving overall inequality,

via the three mechanisms mentioned in this chapter: an employment effect, a mean wage effect, and a within-occupation inequality effect. The fourth chapter tries to establish to what extent the trends found in Chapter 3 can be accounted for by demographic changes within occupations, namely to what extent can they be accounted for by rising educational attainment within occupations. The fifth chapter takes up the issue of what the take-off in overall wage inequality implies for the categories sociologists commonly use in stratification research. The sixth and final chapter summarises and concludes.

– 2 –

THE CHANGING STRUCTURE OF THE LABOUR MARKET

"The pay of any two persons may differ for many reasons […] but the most conspicuous reason lies in differences of occupation. It is these that come first to mind as the source of systematic differences in pay."

(Phelps Brown 1977:28)

INTRODUCTION

My thesis examines the co-evolution of the occupational structure and the rise and subsequent stabilisation in wage inequality, 1970s-2000s. This chapter outlines some key basic theoretical and methodological considerations and establishes some of the basic facts upon which my thesis aims to elaborate. It begins with a clarification of the key concepts: wages, wage inequality, and occupations. Then I outline trends in wage inequality since the 1970s. After establishing the basic trends, I move on to outline changes in the occupational structure and

changes in the occupational wage structure. The final section of the chapter is devoted to outlining institutional and demographic changes related to the labour market.

INEQUALITY OF WHAT?

Before we even begin to assess the changing structure of pay, we first need to clarify what exactly is being examined. In one of the main readers in the wage inequality literature, Atkinson and Bourguignon (2000:34-40) outline three essential considerations:

1. *Recipient unit* – whether to analyse individuals or households, whether to include those with an income or to include those without an income. I focus on individuals in paid-employment. In my thesis, I do not include the self-employed as they are not in my main data source (for details of the New Earnings Survey/Annual Survey of Hours and Earnings (NES), see Appendix A).
2. *Definition of income* – Income is the total of which pay from employment is one element. Other sources of income include income from property, shares, investments, and the like. Another consideration is whether to calculate inequality using data gross or net of taxes and transfers. Since these change frequently over time and can make calculations quite complex, I shall focus solely on gross pay from employment in a respondent's primary job, excluding overtime payments. I focus on hourly wages, to standardise the unit that is being rewarded in the labour market across individuals, occupations, and time. Focusing on hourly wages also allows the inclusion of part-timers as many occupations are dominated by part-time workers. Wages are also deflated using the Retail Price Index so as not to confound real wage growth with inflation.
3. *Time dimension* – the time period can greatly affect what we are trying to explain, for

instance, if I defined the whole period for which I have data 1975-2008 as one period, then fitting a linear trend line in a statistical model would ignore the curvilinear growth and stabilisation in wage inequality. As I will show later on in this chapter, two distinct periods of inequality can be identified. One from 1975-1996 where wage inequality rapidly grew, and another from 1997-2008 when the growth in wage inequality stabilised at a new higher level. It is likely that processes underlying these two distinct periods are different, and so they are best examined separately. As will be shown, two distinct periods of inequality can be identified and I accordingly split the analysis in Chapters 3 and 4 into these two periods.

MEASURING WAGE INEQUALITY

Now the dependent variable – real hourly wages – has been defined, the next step is to choose a measure of inequality. Many measures and indices are routinely used in the literature. In my thesis, the main measure of inequality I use is variance of log wages. Perhaps the most commonly-used measure of inequality, for one reason or another, is the Gini coefficient. The Gini is a comparison of the actual distribution with what the distribution would look like if everyone were paid exactly the same. A Gini of 1 indicates perfect inequality, whereas a Gini of 0 indicates perfect equality. However, a major problem of the Gini coefficient is that it does not tell us *where* along the distribution inequality is changing and so the Gini can give different values for when changes occur at the top or at the bottom. This is a problem of all summary indices, including the variance of log wages. A second and more relevant problem for my purposes in selecting an appropriate measure is that the Gini does not lend itself to easily being decomposed by subgroup (Cowell 1995; Cowell 2000; Jenkins and van Kerm 2009).

Since my thesis examines the co-evolution in the structure of occupations and overall wage inequality, decomposability by subgroup is an essential criterion.

I measure inequality using the variance in log wages. It is perhaps the second-most commonly used measure. The variance for the population, *n*, is defined as:

$$V = \frac{1}{n}\sum_{i=1}^{n}[y_i - \bar{y}]^2$$

When finding the variance of the distribution it is important to either standardise V (the coefficient of variation) or look at the variance in terms of the logarithms of income. If V is not standardised or transformed, it would provide an unsatisfactory measure as it is sensitive to absolute changes in mean income. If we were to double everyone's income (i.e. double the mean), but leave the shape of the distribution unchanged, V would quadruple. An advantage of the variance, for my purposes, is that it easily lends itself to being decomposed (Cowell 1995; Cowell 2000). Another commonly-used measure of inequality is the Theil Index. It was employed in two of the papers by sociologists examining occupations and wage inequality mentioned in the previous chapter (Weeden, Kim et al. 2007; Kim and Sakamoto 2008). Since inequality measures are sensitive to changes along different parts of the distribution, the analyses presented in Chapters 3, 4, and 5, were run with the Theil Index and qualitatively similar results were found.

Unlike the Gini, both the variance of log wages and the Theil Index lend are easily decomposed by subgroup. One disadvantage of both the variance of log wages and the Theil, as well as all other summary measures including the Gini, is that it does not show where along the distribution inequality is occurring. However, the aim of my thesis is to examine the co-

evolution of the occupational structure and *overall* inequality. Therefore a single summary measure is suitable for my purposes.

WHAT ARE OCCUPATIONS?

Another issue to clarify is defining what occupations are. In one sense occupations, are an artificial construct developed by statistical agencies. In another, they represent real structures and boundaries in labour markets, as Grusky and other microclass advocates would argue. Generally sociologists, "think of detailed occupational groupings as clusters of jobs [and] it is the similarity in the work required by the jobs forming an occupational group, rather than the similarity in the personal characteristics of their incumbents, which delineates one occupation from another" (Acemoglu and Autor 2011:410) . Occupations, even at the most detailed, are bundles of jobs that are similar with respect to the commonly performed tasks. This definition also implies that the rewards attached to occupations are to some extent independent of the commonly measured individual characteristics of an occupation's incumbents such as education, for instance, in terms of 'occupation-based rents'. This line of thought investigated in Chapter 4.

To summarise, I take occupations to be a reliable proxy for the nature tasks, although it is likely there is some change over time for many occupations. In the main data source I use (NES), occupations are classified according to a coding procedure obtained from information based on job title and job description for each employee given by the employer, and so should reflect tasks in the job by design. Each job title is then manually classified into a detailed occupational schema with several hundred categories by a coder trained in how to do this. The

fact that occupation classification systems are so detailed allows for a very detailed level of disaggregation of the trends in overall inequality.

For Chapters 2 to 3, I use occupations at the most detailed level. The main reason for focusing on the relationship between detailed occupations and growing wage inequality as opposed to its relationship with sociology's favourite concept, social class, is not to do with me taking a particular position on how best to study inequality in terms of a 'nominalist' (big social class) categories or 'realist' (micro) categories. Rather, I aim to assess both their relationships with to growing wage inequality and leave how they their relationships differ as an empirical question, as is done in Chapter 5. In Chapter 5, I examine whether or not a rise in wage inequality implies a more fine-grained class structure at the most detailed possible level. Nonetheless, occupations at the most detailed level, although artificial constructs in one sense, are probably closer to the empirical reality than occupational class aggregations.

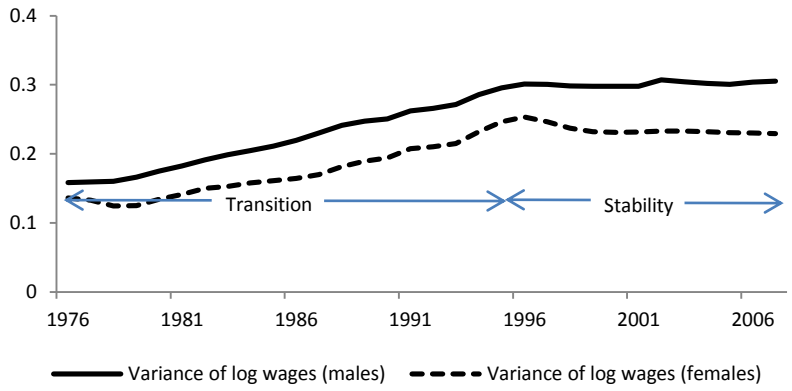
A final issue is that the classification of occupations changes three times in my main source of data and I develop a way to bridge the discontinuities (see Appendix B). Analysis with and without a consistent classification can test the impact of this data decision on substantive findings. A sensitivity analysis reveals the discontinuities in the occupational classification system do not alter my overall substantive finding that the majority of the growth in overall wage inequality was between occupations, and not within them.

TRENDS IN WAGE INEQUALITY 1970S-2000S

It is well established that the distribution of hourly earnings has become more unequal over the last thirty years or so in Britain, using various measures of inequality and various data sources (Machin 1996; Machin 2003; Kondylis and Wadsworth 2007; Machin and van Reenen

2007). Indeed, the inequality in pay is wider now than it was 100 years ago (Machin 1996). However, the pace at which inequality has grown has not been even across time and across different parts of the distribution as Figures 1-4 all show in different ways. Figure 1 shows trends in the variance of log wages, the main measure of inequality used throughout my thesis. From the mid-1970s to the mid-1990s, wage inequality grew rapidly and monotonically, representing a period of transition. , then stabilised at a new higher level after 1997 in the case of men, and even declined slightly for women. Following the election of New Labour in 1997, the growth in pay inequality was tempered, albeit not reversed. Figure 1 shows that two distinct periods of inequality can be identified: a period of rapid transition and a period of stability.

Figure 1. The variance of log real hourly wages, 1975-2008



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

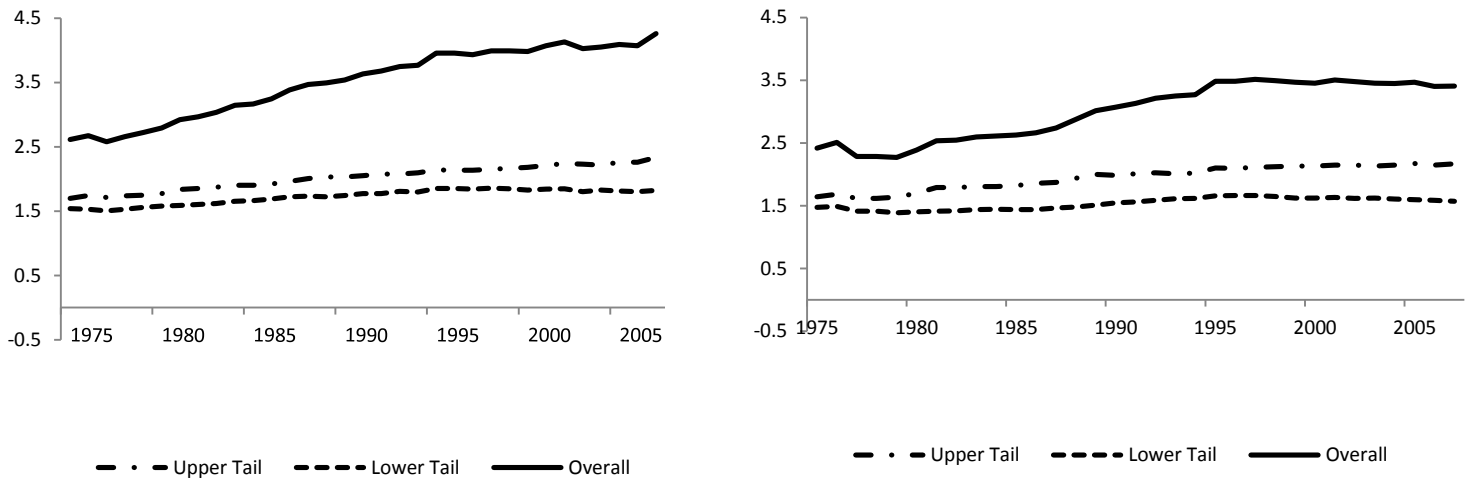
One simple commonly-used but effective way of illustrating trends wage inequality is by splitting the wage distribution for each year into deciles and tracing out the ratio of wages of between two different deciles, most commonly the ratio between wages at the bottom decile to the top decile (the 90/10 ratio, referred to in Figure 2 as overall inequality). Figure 2 shows that for men, wages for the top 10 per cent wages were 2.5 times as great as wages for the

bottom 10 per cent in 1975. By 2008, this ratio had widened to a factor of 4. For women, the 90/10 ratio was 2.5 in 1975 and had widened to 3.5 by 2008. The widening in wages between P90 and P10 grew rapidly between the 1970s and 1990s, when at around 1997, inequality seemed to stabilise. Corroborating Figure 1, where inequality is measured using my main measure of overall inequality (the variance of log wages), two distinct periods of inequality can be identified: a period from 1975-96 when inequality rapidly grew and a second period 1996-2008 when inequality stabilised at a new higher level.

Decile ratios can be used to show changes in inequality along different parts of the wage distribution. In addition to the 90/10 ratio, Figure 2 also shows the ratio of the 90th percentile to the median (the 90/50 ratio i.e. upper tail inequality) and the ratio of the 10th percentile to the median (the 50/10 ratio i.e. lower tail inequality). For men, upper tail inequality widened from just over 1.5 in 1975 to just over 2 by 2008. Lower tail inequality also widened but not quite as much, from just over 1.5 in 1975 to 1.8 by 2008. For women, upper tail inequality grew more than for men, from 1.5 in 1975 to just over 2 in 2008. As with the case of men, lower tail inequality widened slightly for women, from 1.5 in 1975 to 1.6 in 2008. The fact that upper tail inequality is greater than lower tail inequality and rose more steeply suggests that overall inequality was being driven by what went at the upper part of the wage distribution more than what went on at the lower part of the wage distribution.

Figure 2. Decile ratios of real hourly wages, 1975-2008

Men Women



Source: NES.

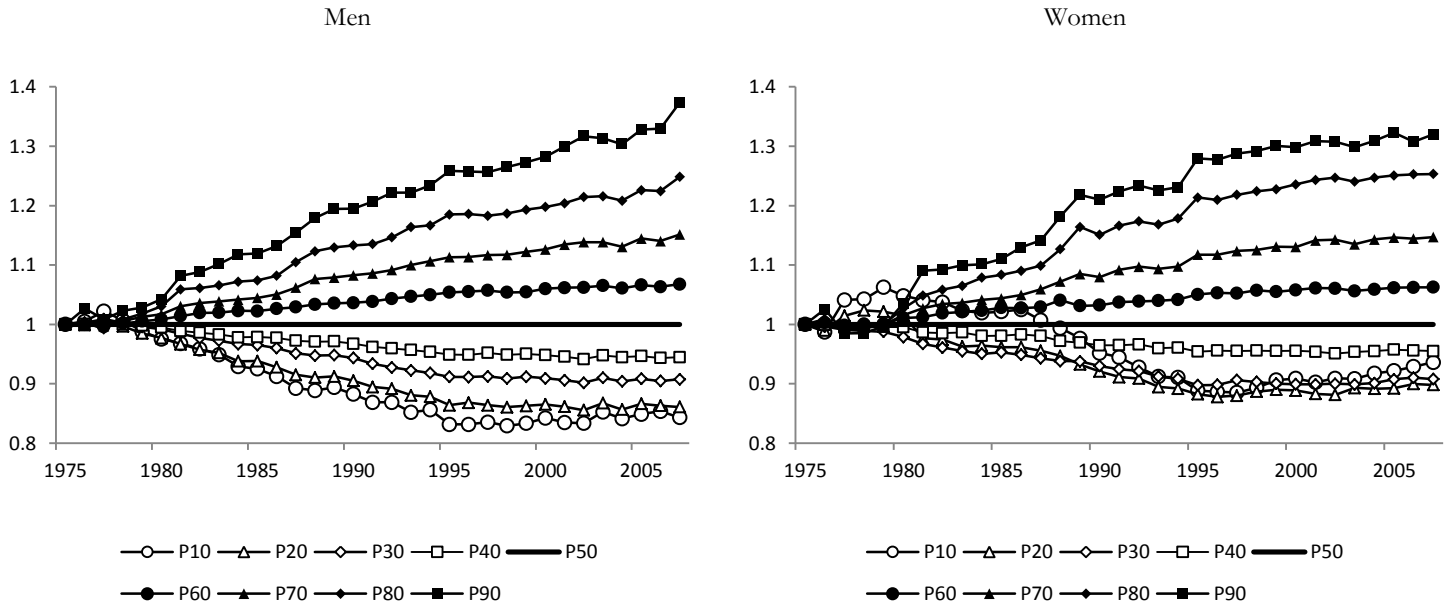
Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

Figure 3 presents a more detailed picture, this time focusing more on changes. Figure 3 shows changes in wages for each of the nine deciles relative to the median. Since each decile ratio is anchored to the median in a given year, Figure 2 shows changes in the relative positions of each decile. To further facilitate interpretation, each decile ratio series is indexed against its 1975 level (so each deciles' hourly wages relative to the median in 1975=1). This allows us to see the over time changes more clearly than in Figures 1 and 2. For men, the relative position of the 90th percentile has improved by two-fifths compared to its relative position in 1975, whereas the 70th percentile's position has grown by just over 10 per cent. Dispersion in the relative positions between deciles above median appeared to have grown more than the dispersion between the relative positions of deciles below the median. This suggests that the trend in overall inequality was driven largely at the top-end of the distribution, what has been labelled as the 'fanning out' of the top-end (Atkinson 2008:36-37).

The overall trend in fanning out of the upper part of the distribution is not uniform across time. The yearly changes in the relative positions of each decile appears to stabilise after

around 1997, with the exception of P80 and P90 in the case of men, whose change in relative positions compared to their 1975 levels continued to improve especially after 2004. Although changes in the relative positions of the deciles below the median have declined compared to their 1975 positions, fanning out downwards, the magnitude of their decline never exceeds the magnitude of the relative improvements of the positions of the top three deciles. In fact, changes in the relative positions of the bottom three deciles closely follow each other for both men and women. In the case of women, the relative position of the bottom decile actually *improves* compared to the changes in the relative position of the 20th and 30th percentiles since 1975.

Figure 3. Changes in real hourly wage deciles, 1975-2008



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

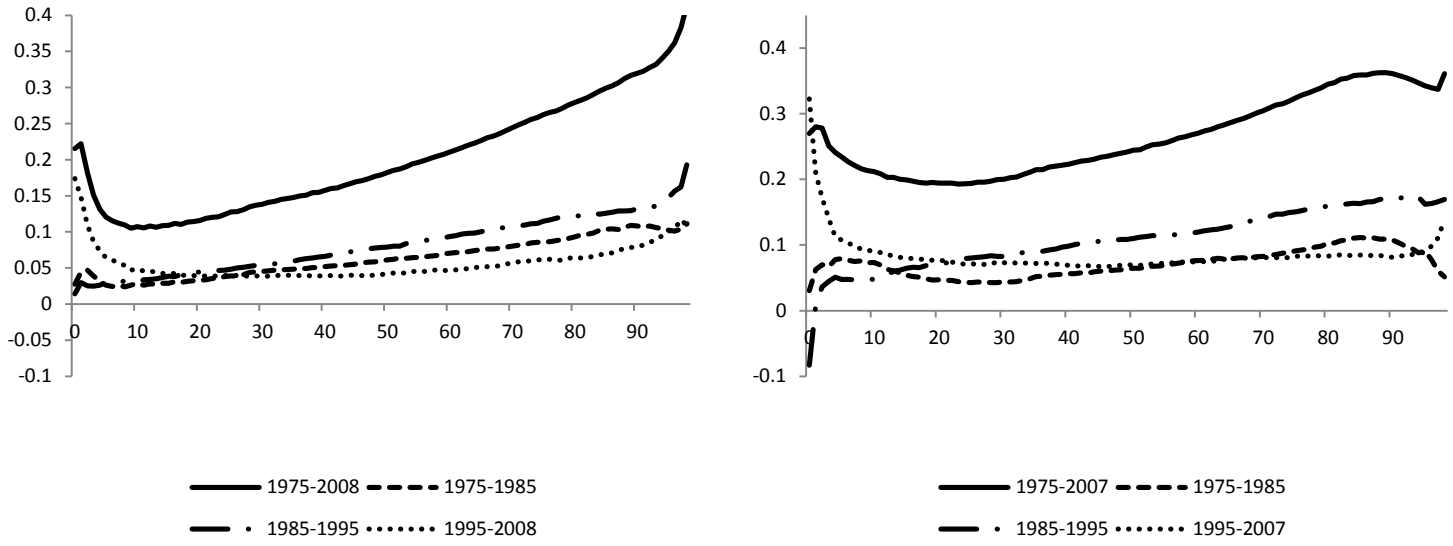
An even more detailed analysis is portrayed in Figure 4, showing wage changes across all parts of the distribution, this time using percentiles instead of deciles in order to examine wage

growth at all points of the wage distribution. Figure 4 shows the log change in real hourly wages for every percentile in the distribution (roughly equivalent to percentage changes) for four time periods: for the whole period under study 1975-2008, and further broken down for each of the three decades that make up the whole period under study.

Between 1975-2008, generally, the higher the percentile, the greater the relative wage gains for both men and women. This suggests growth in overall inequality stemmed from wages at the top of the distribution rising faster than the rest and not due to wages at the lower end of the distribution falling. There are two interesting caveats to this overall trend. First, for men, percentiles above the P90 seemed to receive much steeper relative wage gains. For women, the percentiles the between P85 and the P90 received smaller relative wage gains compared to those slightly lower down the distribution between the 80th and 90th percentiles, resulting in a hump shape at the upper end of the distribution (P75-P95). Second, for men both men and women, percentiles below P5 seemed to experience wage gains much larger than all other percentiles in the lower tail (<P50) of the distribution, with the lowest two percentiles receiving largest relative gains – equivalent to that of the P70. Figure 3 also breaks changes in real log hourly wages at each percentile in the distribution by decade. The relative improvement of wages below P50 seems entirely stem the period 1995-2008 when, the period when New Labour came into power and the introduction of the National Minimum Wage. In fact, the relative wage gains of this part of the distribution during this time were greater than at any other part of the distribution in any other decade.

Figure 4. Changes in log real hourly wages by percentile and decade, 1975-2008

Men Women



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

To sum up, Figure 4 shows that for the 1970s-1990s – a period of rapid rising inequality – generally, the higher up the distribution, the faster the wage growth. By the 2000s – a period of a tempering of inequality – wage growth for all parts of the distribution flattened out somewhat, with the notable exception of wages at the very lower end of the distribution, where wages seemed to grow quite rapidly.

THE CHANGING STRUCTURE OF OCCUPATIONS

The previous section established that wage inequality grew 1970s-2000s, with inequality rapidly growing 1970s-1990s and then stabilising 1990s-2000s at a new higher level. How did the occupational structure change 1970s-2000s? Table 2 shows estimates of employment levels and changes for 1979 and 2000 derived from the Labour Force Survey (LFS)[3]. The LFS includes population weights and so can provide reliable estimates of the numbers in different

[3] The baseline year for estimates using the LFS is 1979 rather than 1975 because occupation codes pre-1979 cannot be coded to SOC90 as no double-coded dataset exists to match the pre-1979 codes with SOC90. See Appendix A for more information regarding the data sources.

social classes, whereas the NES does not contain such weights. Another advantage of the LFS is that it does include self-employed workers, *small employers and own accounts workers*, which are not included in the NES data and allows the identification of *large employer and higher managerial occupations* as a separate category from *high professional occupations* as the LFS includes information on workplace size, whereas the NES has information only on organisational size. As is clear from Table 2, *small employers and own account workers* typically account for a sizable share of the labour force, typically one-fifth. For more information on the LFS, see Appendix A. Social class is defined in terms of the NS-SEC schema. Information on how occupations were coded to NS-SEC can be found in Appendix C.

Table 2. Employment change by social class, 1979-2000

	NS-SEC	Emp. level 1979	Emp. level 1990	Emp. level 2000	Percentage change 1979-1990	Percentage change 1990-2000	Percentage change 1979-2000
1.1	Large employers and higher managerial occupations	3,175,690	3,543,008	3,657,037	11.57	3.22	15.16
1.2	Higher professional occupations	1,027,870	1,621,484	2,149,527	57.75	32.57	109.12
2	Lower managerial and professional occupations	3,862,923	5,241,498	5,773,123	35.69	10.14	49.45
3	Intermediate occupations	2,515,204	2,785,704	2,692,727	10.75	-3.34	7.06
4	Small employers and own account workers	5,291,336	5,401,767	5,308,080	2.09	-1.73	0.32
5	Lower supervisory and technical occupations	3,208,873	2,860,695	2,607,233	-10.85	-8.86	-18.75
6	Semi-routine occupations	2,573,623	2,539,135	2,797,701	-1.34	10.18	8.71
7	Routine occupations	2,849,567	2,446,629	2,100,168	-14.14	-14.16	-26.3
	Total	24,505,086	26,439,920	27,085,596	7.90	2.44	10.53

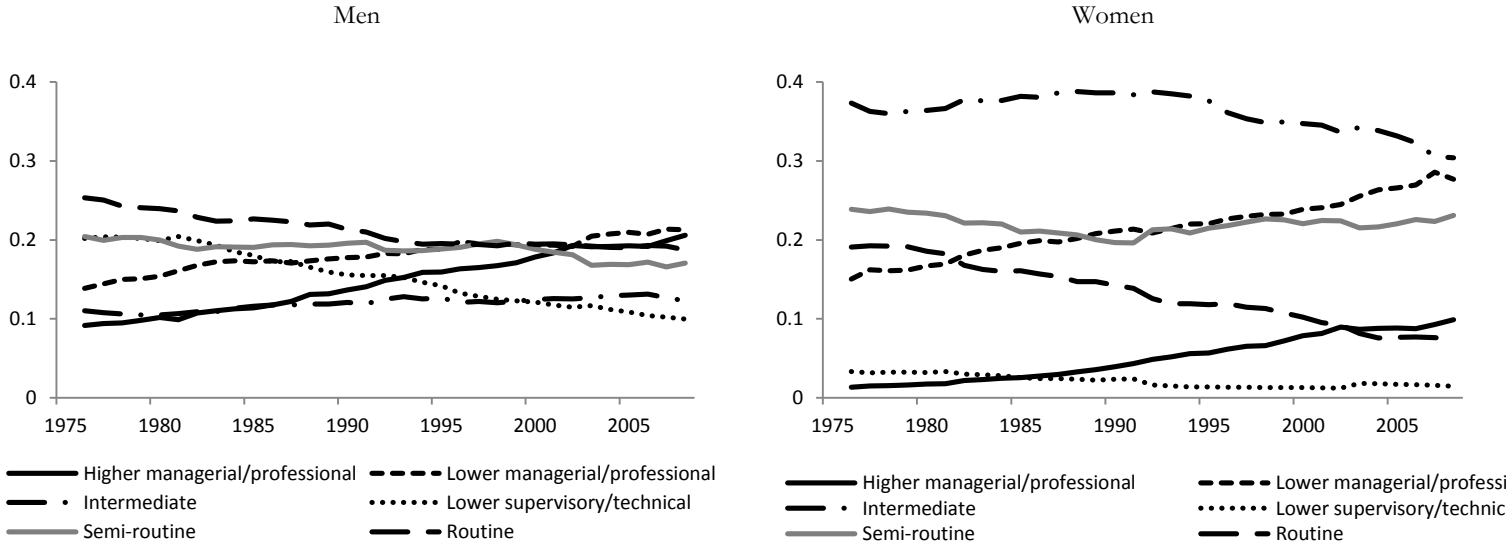
Source: LFS Full-time and part-time workers aged 18-65.

Notes: Full-time and part-time workers aged 18-65.

In absolute terms, *lower managerial and professional occupations* grew the most over the period 1979-2000, growing by nearly 1.9 million (a percentage increase of nearly 50 per cent). In relative terms, the occupational group that grew the most was *higher professional occupations*, more than doubling in size, with the majority of the growth coming in the 1980s. These also happened to be the highest-paying occupations, as Figures 6 and 7 in the next section shows. Workers in these two occupational groups are typically found in the upper-quartile of the wage

distribution. As these higher-paying occupational groups were expanding, there was a 19 per cent drop, equivalent to around 600,000 workers, in *lower supervisory and technical occupations*, typically falling between P50 and P55 – a middle-wage occupational group. In addition, there was a small but noteworthy expansion, mostly occurring in the 1990s, of *semi-routine occupations*, which are typically found in the bottom-third of the wage distribution. In summary, there was an expansion in higher-paying occupations, and a smaller expansion, occurring concurrently with a decline in middle-paying occupations. The net effect of such a change in employment, holding constant wage levels across occupational groups would be an increase in overall inequality. However, there was a sizable contraction in *routine occupations* of around 750,000 workers, a fall of about a quarter. Since *routine occupations* are a low-paying occupational group, typically in the bottom-third of the wage distribution, the overall effect on inequality would be to temper inequality caused by expansion in the higher-paying occupations.

Figure 5. Trends in employment shares by social class, 1975-2008



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

Figure 5 shows trends in employment shares by social class and gender. For men, *routine occupations* was the largest occupational group in the 1970s but was no longer the largest by the mid-1990s. During this time, there was a steady growth in both *higher managerial and professional occupations* and *lower managerial and professional occupations*. Overall, for men, employment shares appeared to become more equal in size over time, as shown by the convergence in trendlines in Figure 5. For women, a much weaker convergence in employment shares can be observed in Figure 5. There was a similar rise in both *higher managerial and professional occupations* and *lower managerial and professional occupations* and a fall in *routine* occupations. The main difference between male and female employment patterns is that there is a stand out group in terms of employment share: 30 per cent of women work in *intermediate occupations* (although their share of overall female employment has been declining since the mid-1990s), whereas male employment is more evenly distributed across social classes.

Moving onto the employment changes by detailed occupational unit-groups, Table 3 lists the top ten fastest growing and declining occupations 1979-2000. We see that there has also been spectacular relative employment growth in some occupations outside of *lower managerial and professional occupations* and *higher managerial and professional occupations*, such as amongst *housekeepers* and *care assistants*, both representing low-paid *semi-routine* occupations. There is some variation in trends in employment amongst detailed occupations within broad social classes. For instance, there has been a rapid expansion in *software engineer* presumably induced by the computer revolution that occurred over the period.

There has been a spectacular collapse in some occupations, most notably the two coalmining related occupations, *face trained coalmining workers* and *coalmine labourers*. The other occupations that dominate the list are ones that are were presumably destroyed by technological change

and the collapse in manufacturing, for instance *tracers, drawing office assistants* in the case of the former and *boring and drilling machine setters* in the case of the latter. These corroborate the rapid decline in their parent social class, routine occupations in Table 2 and Figure 5.

Table 3. Employment change for selected occupation unit-groups, 1979-2000

	SOC90	Emp. level 1979	Emp. level 1990	Emp. level 2000	Percentage change 1979-1990	Percentage change 1990-2000	Percentage change 1979-2000
Top 10							
1	Housekeepers (non-domestic)	1,517	5,743	15,690	278.50	173.20	934.07
2	Organisation and methods and work study managers	1,663	3,314	13,796	99.23	316.29	729.39
3	Other health associate professionals n.e.c.	3,922	10,831	31,132	176.17	187.43	693.80
4	General administrators; national government (Assistant Secretary/Grade 5 and above)	3,122	10,019	19,105	220.91	90.69	511.93
5	Software engineers	30,052	67,968	176,652	126.17	159.90	487.82
6	Care assistants and attendants	100,770	265,583	550,960	163.55	107.45	446.75
7	Actuaries, economists and statisticians	6,666	19,772	36,250	196.61	83.34	443.80
8	Educational assistants	44,473	59,347	216,431	33.45	264.69	386.66
9	Welfare, community and youth workers	45,089	77,586	194,295	72.07	150.43	330.92
10	Psychologists	3,509	9,215	15,088	162.62	63.73	329.99
Bottom 10							
1	Face trained coalmining workers, shotfirers and deputies	76,302	40,179	1,922	-47.34	-95.22	-97.48
2	Bus conductors	16,234	5,496	768	-66.14	-86.03	-95.27
3	Coalmine labourers	30,378	13,420	2,852	-55.82	-78.75	-90.61
4	Boring and drilling machine setters and setter-operators	39,482	8,667	3,796	-78.05	-56.20	-90.39
5	Tracers, drawing office assistants	3,345	4,506	421	34.72	-90.66	-87.41
6	Tannery production operatives	13,143	9,979	2,307	-24.07	-76.88	-82.45
7	Oilers, greasers, lubricators	11,319	7,207	2,022	-36.33	-71.94	-82.14
8	Rollers	6,133	5,662	1,119	-7.68	-80.24	-81.75
9	Grinding machine setters and setter-operators	48,920	21,677	9,778	-55.69	-54.89	-80.01
10	Electrical, energy, boiler and related plant operatives and attendants	38,570	29,697	8,229	-23.00	-72.29	-78.66

Source: LFS.

Notes: Full-time and part-time workers aged 18-65.

Taken together, these employment changes detailed in Table 2 and 3 as well as Figure 5 seem to corroborate the nuanced view of skill-biased technological change whereby new technology can cheaply and easily substitute for routine tasks but not nonroutine tasks. In terms of aggregated social classes, there was a big fall in routine occupations, but a small rise certain

non-routine and low-paid occupations at the most detailed occupational level. There is a fall in demand for routine occupations but a rise in the demand for nonroutine managerial and professional occupations at one end of the wage hierarchy and a rise in, albeit a small one, for some semi-routine occupations, at the other end (Goos and Manning 2003; Autor, Katz et al. 2006; Goos and Manning 2007; Spitz-Oener 2007; Autor, Katz et al. 2008; Goos, Manning et al. 2009; Oesch and Rodriguez 2009).

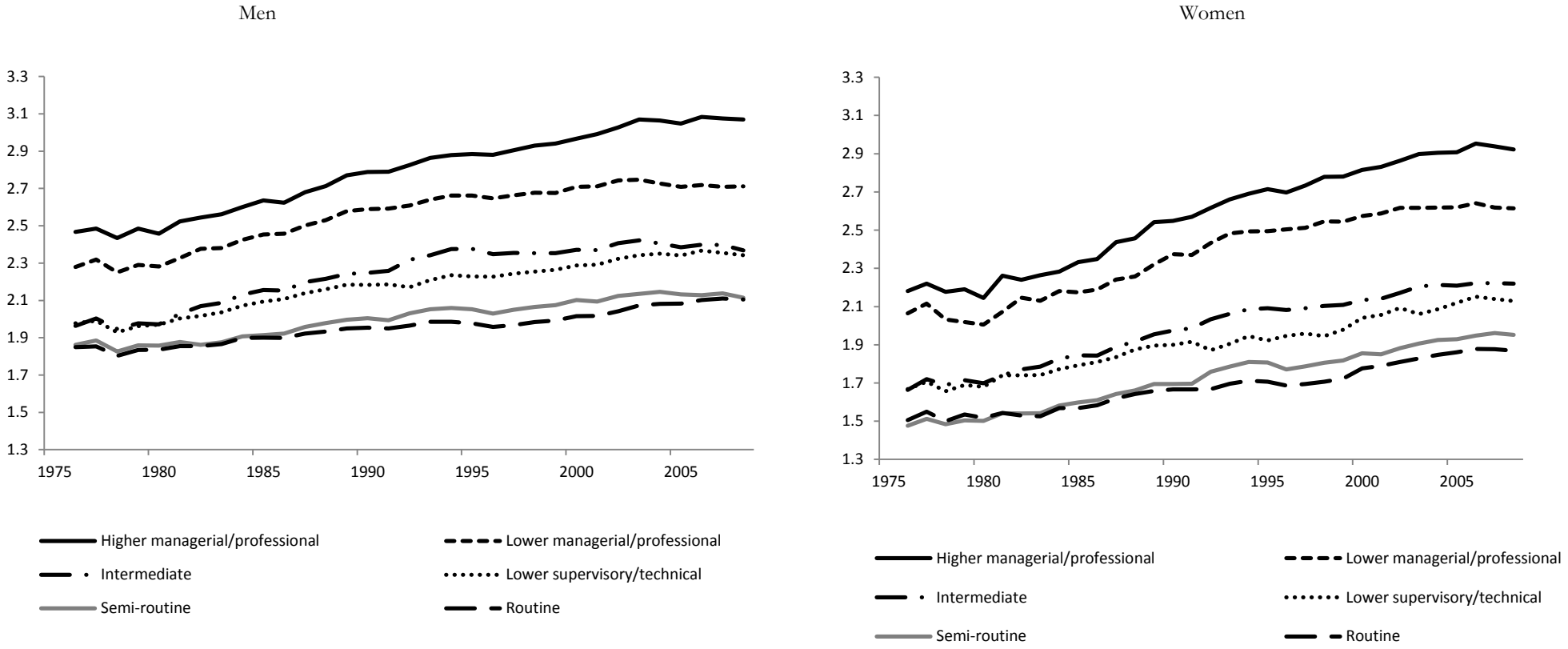
Employment change is but one mechanism by which the changing structure of occupations can influence wage inequality. As mentioned in the previous chapter, there are two further ways: by changes in their mean wages and by changes in inequality within occupational categories. In the next section, we turn to the issue of the changing structure of occupational wages.

THE CHANGING STRUCTURE OF OCCUPATIONAL WAGES

Figure 6 shows trends in wages over time by social class for both genders. Wages grew relatively uniformly across classes, although the higher classes received the larger wage gains. There is only weak evidence of the upper classes fanning out, with only a slight divergence between the top two classes and the rest.

In Figure 6, the distances between the average wages of classes seems to have changed. This can be visualised by observing the distance between the *higher managerial/professional* workers and *routine* workers as the start of the series in 1975 and the same distances at end of the period in 2008. The distances between average wages of classes appear to have widened for both men and women. All in all, changes in the average wages attached to different occupational groups seem likely to have had an impact on wage inequality as the class wage structure.

Figure 6. Trends in mean log real wages by social class, 1975-2008



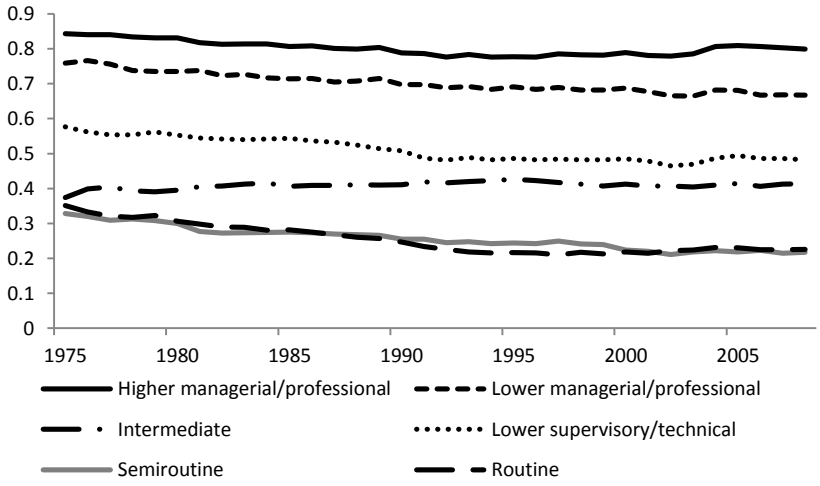
Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

No class 'overtakes' another class. This finding is reflected in Figure 7 which shows mean percentile positions by social class for both men and women combined. What is interesting about Figure 7 is the remarkable stability in the mean percentile positions of social classes.

Mean percentile positions for all classes seem to have fallen slightly, with the possible exception of *intermediate occupations*, perhaps indicating that there has been an increasing variation in percentile positions within classes i.e. a growth in inequality within-classes. On the face of it, Figures 6 and 7 shows classes accurately reflect social positions in terms of hierarchical ordering and that this ordering has remained constant over time. In terms of detailed occupations, there may be an increase variation in wages within classes around the class mean.

Figure 7. Mean percentile position by social class, 1975-2008



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

When we look at wage changes at the most detailed occupational level, substantial variation in wage growth can be found across occupations. Looking at averages by broad occupational aggregations such as social class could be misleading in examining the role of occupations in

structuring changes in overall wage inequality. *General managers of large organizations* received especially large wage gains, whereas some occupations actually saw their average wages fall such as *market and street traders* and *non-domestic housekeepers*. The top 10 list of occupational unit-groups that gained the most is exclusively dominated by managerial and professional occupations, which in fact seems to corroborate the findings for trends in their parent social classes.

Table 4. Wage changes for selected occupational unit-groups, 1979-2000

	SOC90	Mean log wages 1979	Mean log wages 2000	Log change in mean wages 1979-2000	Percentage change 1979-2000
Top 10					
1	General managers; large companies and organisations	2.491	3.896	1.405	0.564
2	Other financial institution and office managers n.e.c.	2.326	3.295	0.969	0.417
3	Judges and officers of the court	2.373	3.333	0.961	0.405
4	Treasurers and company financial managers	2.489	3.393	0.904	0.363
5	Aircraft flight deck officers	2.450	3.303	0.852	0.348
6	Managers in mining and energy industries	2.434	3.267	0.833	0.342
7	Barristers and advocates	2.403	3.207	0.804	0.335
8	Chartered and certified accountants	1.982	2.775	0.793	0.400
9	Solicitors	2.400	3.131	0.731	0.305
10	Medical Practitioners	2.457	3.178	0.721	0.293
Bottom 10					
1	Market and street traders and assistant	1.802	1.320	-0.481	-0.267
2	Housekeepers (non-domestic)	2.053	1.830	-0.223	-0.109
3	Medical secretaries	2.069	1.871	-0.199	-0.096
4	Driving instructors (not hgv)	2.135	1.984	-0.151	-0.071
5	Retail cash desk and check-out operator	1.856	1.714	-0.141	-0.077
6	Educational assistants	2.105	1.971	-0.134	-0.064
7	Nursery nurses	2.031	1.898	-0.133	-0.065
8	Veterinarians	2.641	2.513	-0.128	-0.048
9	Typists and word processor operators	2.028	1.917	-0.111	-0.055
10	Other childcare and related occupations	1.971	1.864	-0.107	-0.054

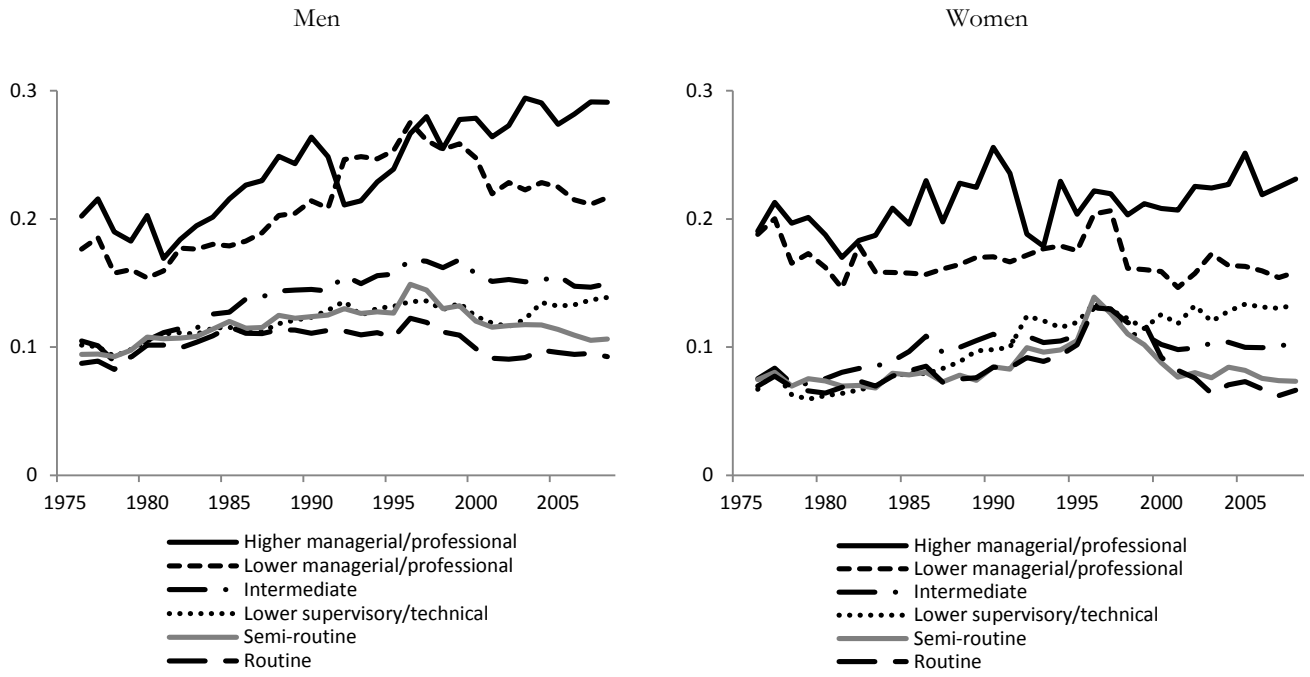
Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

Looking at just mean wages and mean percentile positions can be misleading in drawing conclusions about the relationship between the occupational wage structure and trends in overall wage inequality as averages are only averages. A growth in within-class inequalities always increases overall inequality. Trends in within-class inequalities need to be examined as well. There could be spectacular growth in the wages of certain segments within social classes.

Changes in mean wages at the level of social class could be due to some occupation within social classes pulling away from the rest.

Figure 8. Trends in the variance of log wages by social class, 1975-2008



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

Figure 8 shows that for men, within-class inequalities grew for all social classes 1975-95. After this point, within-class inequalities reversed and actually began to fall, with the exception *higher managerial and professional occupations*, where within-class inequality continued to rise. A similar pattern is found for women.

Within class wage inequality could either be attributable to a variation in mean wages of occupation unit-groups within social classes, but could also be due to variation in wages within these occupation unit-groups i.e. within-occupation inequality. When examining changes in within-occupation inequality at the most detailed occupational level, Table 5 shows occupations related to the arts, design, and sport dominate the top 10 occupations where

within-occupation inequality has grown the most, *clothing designers*, *professional athletes*, *musicians*, and *photographers*. Some occupations actually became more equal, with three of the top 10 occupations that became more equal being related to the legal profession, *barristers*, *judges*, and *legal secretaries*.

Table 5. Within-occupation inequality change for selected occupational unit-groups, 1979-2000

	SOC90	Within-occupation inequality 1979	Within-occupation inequality 2000	Change in within-occupation inequality 1979-2000
Top 10				
1	Clothing designers	0.168	0.705	0.538
2	Professional athletes, sports officials	0.292	0.692	0.400
3	Musicians	0.247	0.622	0.375
4	Management consultants, business analysts	0.182	0.533	0.351
5	Ophthalmic opticians	0.323	0.596	0.273
6	Goldsmiths, silversmiths, precious stone workers	0.152	0.392	0.240
7	General managers; large companies and organisations	0.302	0.541	0.238
8	Scrap dealers, scrap metal merchants	0.178	0.413	0.236
9	Other security protective service occupations	0.122	0.316	0.194
10	Photographers, camera, sound and video equipment operators	0.103	0.290	0.186
Bottom 10				
1	Hairdressers' and barbers' managers and proprietors	0.457	0.085	-0.372
2	General administrators; national government	0.350	0.021	-0.329
3	Barristers and advocates	0.500	0.191	-0.308
4	Chiropodists	0.285	0.017	-0.268
5	Dispensing opticians	0.380	0.123	-0.257
6	Bookmakers	0.348	0.127	-0.221
7	Undertakers	0.296	0.092	-0.204
8	Judges and officers of the court	0.352	0.180	-0.173
9	Legal secretaries	0.231	0.063	-0.169
10	Housekeepers (non-domestic)	0.298	0.142	-0.156

Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

These trends corroborate a recent research paper that found within-occupation inequality grew quicker in occupations where entry and internal labour markets have become more fluid, increasingly based on reputation, experience, and networks (Marsden 2010). The paper found that within-occupation inequality has grown much more slowly in occupations with structured entry ports and relatively stable and institutionalised internal labour markets. Perhaps one of

the reasons why inequality amongst *clothing designers*, *professional athletes*, *musicians*, and *photographers* has grown so much is due to the fact entry to these occupations have become more fluid and they have unstructured modes of career advancement. Perhaps one the reasons why inequality amongst *barristers*, *judges*, and *legal secretaries* has fallen is due to the fact the entry to these occupations is highly structured (receiving fairly standardised initial training and having to pass fairly standardised exams) and internal labour market is highly structured and stable (organisational structure and the structure of career advancement are fairly standardised across firms).

INSTITUTIONAL AND DEMOGRAPHIC CHANGES

The previous section established how occupations changed in terms of their labour force share, mean wages, and internal inequality. How have the characteristics of incumbents changed? Table 6 presents descriptive statistics for occupations. The data has not been weighted by occupation labour force share/size to allow interpretation of how occupations have changed on average.

The general trends in how the composition of occupations has broadly changed obviously broadly reflect wider changes in the demographic composition of the labour force 1979-2008 and can be summarised as follows: In terms of educational qualifications, occupations have become more educated reflecting the increasing share of graduates in the labour force. At the same time, the educational qualifications held by incumbents in occupations have become more diverse. In terms of industrial composition of occupations, occupations are less likely to be found in manufacturing in 2008 than in 1979, and now more likely to be found in services and finance. In terms of demographic composition of occupations, they are more likely to on

Table 6. Descriptive statistics for occupations 1979-2008

	1979			2008			Total 1979-2008		
	Mean (SD)	Min	Max	Mean (SD)	Min	Max	Mean (SD)	Min	Max
Mean wage	8.2382 (2.3901)	4.2008	18.6846	13.4469 (5.7077)	6.0803	46.6737	11.4524 (5.3790)	3.9597	89.5466
Mean log wage	2.0024 (0.253)	1.3363	2.7738	2.4422 (0.3392)	1.7795	3.6013	2.2810 (0.3657)	1.2932	4.2707
Within-occupation inequality	.14355 (.0831)	.0192	1.0424	.1539 (.0866)	.0228	.62240	0.1485 (0.0813)	.01110	1.0427
Employment share × 100	.2732 (.4688)	.0019	3.6700	.2732 (.6233)	.0016	.65420	.2732 (.5497)	.0000	.65462
Degree or more*	.0824 (.1282)	.0000	1.0000	.2310 (.1062)	.0000	1.0000	.1674 (.2471)	.0000	1.0000
Educational diversity*	.5516 (.1315)	.1300	.7358	.6922 (.0245)	.0000	.7396	.5886 (.0947)	.0000	.7399
Manufacturing	.4526 (.3242)	.0000	0.9729	.3337 (.3145)	.0000	.9385	.4020 (.3409)	.0000	1.0000
Services	.4529 (.3110)	.0046	1.0000	.5321 (.3183)	.0189	1.0000	.4906 (.3357)	.0000	1.0000
Finance	.06236 (.1045)	.0000	.8443	.1338 (.1661)	.0000	.9084	.0957 (.1457)	.0000	.9756
Collective bargaining	.4667 (.2084)	0.0370	.982	.3398 (.2098)	.0000	.9902	.4597 (.1921)	.0000	1.0000
Public sector	.3732 (.2798)	.01080	1.0000	.1995 (.2678)	.0000	.9981	.2790 (.3010)	.0000	1.0000
Female	.2783 (.2486)	.0008	.9544	.3289 (.2685)	.0000	.9875	.3000 (.2731)	.0000	1.0000
Part-time	.1058 (.1272)	.0001	.7706	.1685 (.1570)	.0000	.8128	.1300 (.1553)	.0000	.9539
Age > 45	.3243 (.1189)	.0433	.7730	.4053 (.1312)	.0741	.7888	.3950 (.3497)	.02454	.7895
Foreign-born*	.0510 (.0741)	.0000	.2560	.1088 (.0695)	.0000	.4407	.6047 (.0911)	.0000	.4407
N	366			366			4392		

Source: NES; *LFS.

Notes: Three-year moving-averages. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

average to employ a higher proportion of females, a higher proportion of part-timers, a higher proportion of workers over 45, and a higher proportion of foreign-born workers – all reflecting well-known trends in the changing composition of the labour market. In terms of institutional changes, the proportion of workers within occupations covered by collective bargaining has fallen from nearly 47 per cent on average to one-third on average. In terms of sector of employment, in 1979, a third of workers within a given occupation on average were in the public sector. By 2000, the average proportion of workers in the public sector in occupations had fallen to just under one in five on average, perhaps reflecting employment in

the public sector becoming more concentrated in a smaller set of occupations. The association between the changing composition of occupations and broad changes in occupational employment shares, mean wages, and within-occupation inequality is investigated in detail in Chapter 4.

SUMMARY

In this chapter I have established that my dependent variable is based on hourly wages and the main measure of inequality I employ is the variance of log wages. The reason for using hourly wages is to standardise earnings across workers and jobs and to allow the inclusion of part-timers. I chose to employ the variance of log wages as my main measure of as it is easily decomposed by subgroup and has been widely-used elsewhere in the wage inequality literature.

Wage inequality rapidly grew during the 1980s to the point by the 1990s, wage inequality was at its highest level for a 100 years. After about 1996, wage inequality then stabilised for men and slightly reversed for women throughout the 2000s. Generally, the growth in wage inequality appears to stem from higher points of the wage distribution receiving the largest wage gains, whereas wage gains at the lower-end of the distribution were smaller and grew at a slower pace but did not fall. However, the lowest points in the wage distribution caught up at a rapid pace in the late 1990s, perhaps picking up the effect of the introduction of the National Minimum Wage. In the 2000s, the stabilisation in wage inequality more than likely stems from the continual faster wage growth at the bottom of the distribution.

This chapter has presented evidence for all three mechanisms by which occupations shape overall wage inequality. First, in terms of changes in the occupational structure, there was a rapid expansion in managerial and professional occupations, which tend to be the highest-

paying occupations (Goos and Manning 2007)(Goos and Manning 2007)(Goos and Manning 2007)(Goos and Manning 2007). At the same time, there was a decline in occupations that are usually found in the middle of the wage distribution, and a small growth in some lower-paying semi-routine occupations. Second, this chapter demonstrated that wage growth was uneven across occupations. The extent to which wages diverged between occupations provides another key mechanism by which occupations could have structured the growth in wage inequality. The extent to which occupations structured the growth in wage inequality, whether due to the changing occupational structure or divergent occupational wage growth, depends on the extent to which the growth in overall inequality stemmed from inequality growing within occupations. Third, this chapter established that inequality did grow within occupations. The next chapter aims to quantitatively decompose the relative weights of each of the three mechanisms in accounting for the growth and subsequent stabilisation in overall wage inequality.

–3 –

THE STRUCTURE OF OCCUPATIONS AND WAGE INEQUALITY

INTRODUCTION

My thesis begins with two observations: that there was a massive rise in wage inequality in Britain since the 1970s and sociologists have very little to say about it. Occupations are central to stratification research, providing the basis for socioeconomic status, prestige scales, job desirability scores, and social class schemas. Although there was a 'massive rise' in wage inequality in Britain, relatively little is known about the relationship between occupations and growing wage inequality. This raises the three main questions that are central to my thesis: (1) Was the growth in wage inequality largely between or within occupations? (2) To what extent was the growth in wage inequality by occupation due to the changing composition of

incumbents within occupations? (3) What are the implications of the rise in wage inequality for the categories used by sociologists to capture economic inequalities based on occupations?

This chapter addresses the first of these questions by providing a descriptive account of how occupations at the most detailed level available (three-digit) structured the growth in wage inequality 1970s-1990s and the subsequent stabilisation 1990s-2000s by three mechanisms: by changes in the occupational employment structure, by changes in occupational mean wages, and by changes in inequality within occupations. Since two distinct periods in overall inequality can be identified, the analysis in this chapter is conducted separately by these two periods (see Figure 1). The analysis is also split by gender. I then go on to examine the role of specific occupations on trends in wage inequality. Three key findings emerge in this chapter. First, the rapid growth in wage inequality during the 1980s was *between* occupations, and not *within* them. This is in contrast to research findings by US sociologists where the majority of the growth in wage inequality was within occupations. Second, only a handful of occupations account for the majority of the growth in wage inequality. Third, I shed light on the hitherto little researched stabilisation in wage inequality during the 2000s. It appears the stabilisation is a result of countervailing forces. Overall wage inequality would have continued to grow had lower-paying occupations not received unprecedented wage gains during this time.

PREVIOUS RESEARCH

Two recent papers by US sociologists sought to establish the role of occupations in structuring the growth in wage inequality in the United States (Kim and Sakamoto 2008; Mouw and Kalleberg 2010). Notably absent, however, is a similar examination for Britain, where arguably, occupations have played an even greater role in the stratification of society and in stratification

research in general, especially in terms of aggregated occupational class schemas. Moreover, the rapid growth in wage inequality during the 1980s was more pronounced in Britain than the US, although overall levels of wage inequality have generally been lower.

Kim and Sakamoto (2008) examined the relationship between the growth in overall inequality and occupational structure using very detailed (but not quite as detailed as three-digit) occupation codes in the United States 1983-2002. They found that about three-quarters of the variation in wages is within-occupation and that occupations became slightly less predictive of wages as wage inequality grew over the period, indicating that within-occupation inequality became more important in accounting for trends in overall wage inequality. The role of between-occupation inequality is further diminished as in their multivariate analysis they find that mean wages across occupations are largely accounted for by the characteristics of individuals within those occupations. They argue their findings contradict the 'disaggregated structuration' view whereby occupations represent deeply institutionalised units with a collective identity that provide the basis for rent-seeking behaviour and so are central to stratification (e.g. Grusky and Sørensen 1998; Grusky and Weeden 2001; Grusky 2005; Weeden and Grusky 2005). In short, they find the explanatory power of occupations with regard to wages declined as overall wage inequality grew. They conclude by arguing their findings suggest a broader approach is needed for explaining inequalities in the 'New Economy' as factors other than occupation may structure inequality such as workplace characteristics or matching processes in labour markets.

Mouw and Kalleberg (2010) find broadly similar findings to Kim and Sakamoto in that between-occupation inequality did not play a significant role during the rapid rise in inequality during the 1980s. Mouw and Kalleberg (2010) find that between1983-1990, within-occupation

inequality accounted for a sizeable share of overall. They find the growth in wage inequality during the 1980s was mostly accounted for by individual-level variables, not occupation (80 per cent). However, they do find a large role for inequality between-occupations for the later period of 1992-2008, accounting for around two-thirds of the growth in overall wage inequality in this period, net of individual factors. Thus their findings indicate that occupations are structuring the continuing, albeit slower, growth in US wage inequality during the 1990s and 2000s. This is also consistent with recent findings by economists where job polarization is more pronounced in the 2000s than the preceding three decades in the US (e.g. Acemoglu and Autor 2011).

Taken together, the findings by sociologists and economists in the United States are broadly consistent. As to what happened in the 1980s, there is a bit of debate over the exact role of residual inequality in the economics literature. Some economists found a growing and substantial role for residual inequality during the 1980s (Juhn, Murphy et al. 1993; Acemoglu 2002; Autor, Katz et al. 2008). This is consistent with Kim and Sakamoto's finding of within-occupation inequality being the driver of overall inequality during the 1980s. The residual inequality thesis was challenged by some other economists who argued the finding can accounted for by changing demographics, for instance, in terms of rising race, gender, and age differentials (Card and DiNardo 2002; Lemieux 2006). Mouw and Kalleberg's finding that individual-level variables accounted for the lion's share of changes in overall inequality during the 1980s is more consistent with this latter view. Whether the more important factors in driving the rapid rise in wage inequality during the 1980s were a genuine rise in residual inequality or simply due to demographic factors, both views seem to suggest a minimal role for between-occupation inequality and so the possible role of occupations in structuring the rapid rise in wage inequality in the United States during this time. When we consider the slowing of

wage inequality from the mid-1990s onwards. only then does all the available evidence seems to point to an increasing role for occupations, even net of other factors, in structuring overall wage inequality as the employment structure began to polarise between high- and low-paying jobs (Autor, Katz et al. 2006; Autor, Katz et al. 2008; Mouw and Kalleberg 2010; Acemoglu and Autor 2011). In summary, in the United States, the majority of the rapid rise in inequality during the 1980s occurred within narrowly-defined groups and occupations. It was only after the 1990s, when the growth in inequality slowed, does evidence suggest a role for between-occupation inequality, as the labour market became more polarised into high- and low-paying jobs.

Tentative steps in examining the link between the occupational structure and the structure of wages have been made recently in the British context. Goos and Manning (2007) examine changes in the British occupational employment structure at the most detailed (three-digit) occupational-level and find that between 1979 and 1999 there was a simultaneous decline in middle-paying occupations with a small growth in low and a large growth in high-paying occupations. These employment changes are said to have led to a 'hollowing out' of the wage distribution, precipitating the growth in wage inequality. They find that job polarization can explain between 33 and 56 per cent of the growth in wage inequality 1976-1995. Their results lead them to call for a more nuanced view of skill-biased technological change as the conventional technological change argument would predict only a growth in high-paying occupations at the expense of low-paying occupations and some middle-paying occupations. Although their paper is very illuminating and thorough in highlighting the role of the occupational structure in changes overall wage inequality, they assume what they say is a "well-known fact that there is very considerable stability in the occupational wage structure" (Goos and Manning 2007:122). In effect, they only examine the impact of changes in employment on

the distribution of wages, holding constant occupational average wages. While it is accurate to suggest that in terms of the wage rankings of occupations, there has been remarkable stability (Williams 2008: 11-13; Holmes 2010: 25-6), a recent research paper found that the assumption of stability in the occupational wage structure in terms of the distance in wages between occupations can be questioned (Holmes and Mayhew 2010). Moreover, evidence presented in Chapter 2 also shows wage growth across occupations was very unequal and so could play a role in accounting for growing overall inequality in its own right.

There are two further ways occupations can contribute to overall wage inequality in addition to change in the occupational employment structure, pertaining to two strands of sociological theory which Goos and Manning do not examine. First, as just mentioned, even if the occupational employment structure never changed, there is plenty of scope for increasing distance in the average wage differentials between occupations, potentially increasing overall wage inequality. Second, even holding employment shares and average wages of occupations constant, an increase in wage inequality within occupations would increase overall wage inequality. The three mechanisms shall be outlined in turn in the next section.

One final piece of research relevant to this chapter is a paper by Brewer, Muriel et al. (2010) prepared for the recent report by the National Equality Panel (Hills, Brewer et al. 2010). In this paper, the authors seek to account for trends in income inequality(including household-level income and income from outside the labour market) in Britain since the 1968 by presenting numerous decompositions by various subgroups. They find that the majority of the change in overall inequality in between the 1970s and late 1980s can be accounted for by within-group inequality, whether examining occupation on its own, or alongside other factors (Brewer, Muriel et al. 2010: 46). That the report finds a large role for within-group inequality,

the report therefore paint a similar picture to trends in inequality in the United States. However, they find that amongst all the other factors they consider (e.g. sex, region, age), occupation is the most important contributing factor to levels of inequality at a point in time, aside from residual inequality (i.e. inequality unexplained by the independent variables they consider) which accounts for the largest share.

OCCUPATIONS AND WAGE INEQUALITY: SOME THEORY

There are three mechanisms by which occupations can affect overall wage inequality. They are summarized in the table below. The first mechanism is *by changes in the occupational mix*. Assuming mean occupational wages and within-occupation inequality remain roughly constant over time, a growth in high and low-wage occupations, a decline in middle-wage occupations, or both, will increase overall wage inequality. Such a scenario could emerge from 'job polarization' whereby a combination of technological change and offshoring leads to a decline in the demand for middle-paying *routine* occupations and an increase in demand for *nonroutine* occupations (which fall at both tails of the wage distribution) that cannot be replaced by machines or offshored (Manning 2004; Autor, Katz et al. 2006; Goos and Manning 2007; Goos, Manning et al. 2009). Evidence seems to support such changes in employment, for instance, between 1979-2000, the number of higher managerial and professional jobs doubled from 1 million to 2.1 million, and intermediate and semi-routine occupations jobs grew by a fifth from 4 million to 5 million, while the number of routine jobs shrank by a quarter from 2.8 million to 2.1 million (Table 2). However, shifts in the demand for different kinds of labour interact with supply of different kinds of labour and so would also affect wages as well as employment. The 'structuralist' view in sociology makes a similar assumption to 'job polarization' in that occupations are seen as relatively static and internally homogeneous units

and so changes in overall inequality largely derive from mechanical changes in the structure of employment. Therefore the contribution of the changes in the occupational mix would support the 'job polarization' SBTC in economics and a more extreme 'structuralist' account of stratification in sociology.

The second mechanism is *by changes in occupational mean wages*. Real wage growth is likely to vary by occupation: some will rise faster than others; some might even experience a fall. Relative gains may stem from the rising returns to certain skills, for instance, skill-biased technological change might predict that computer-related occupations experienced rapid wage growth during the 1980s. In addition to shifts in demand for various kinds of labour, the 'disaggregate structuration' view would posit that institutions provide a powerful source for wage gains/losses, for instance, low-wage occupations would have been affected by minimum wage upratings, or some occupations might become increasingly closed whereby supply of labour into them is rationed by a professional body, certification, licensing, or legal reasons raising wages relative to comparable occupations not covered (Weeden 2002; Kleiner 2006). The role played by mean wages net of changes in the employment structure and within-occupation inequality provides evidence for both the orthodox SBTC in economics and 'disaggregate structuration" in sociology whereby occupations are rent-seeking institutional units embedded in the labour market with differential abilities to capture and create rents.

The third mechanism is *by changes in inequality within occupations*. A rise in inequality within occupations (i.e. between individuals in the same occupation) will always increase overall wage inequality. As mentioned, economists have tended to find a role for within-group inequality, or what is known as residual inequality, especially during the rapid growth in US wage inequality during the 1980s. Traditional stratification research "usually motivates hypotheses

about between-group inequality", within-group inequality "is not treated as substantively interesting" (Western and Bloome 2009:293-4). However, more recent strands in sociological theory have emphasised the role of within-group inequality for accounting for growing overall inequality. Within-occupation inequality may stem from a general individualisation of the employment relationship brought about by wider institutional changes such as the fall in collective bargaining coverage as trade unions tend to bargain for rates according to the job, not the individual. Such changes would tend to destroy rents enjoyed by certain occupations meaning that wages are becoming to increasingly tied to individual productivity (c.f. Sørensen 1996; Sørensen 2000). Another source might be a rise in the returns to unobserved skills which by definition are not very well captured by occupation (residual inequality). Yet another source might stem from inter-workplace differences, for instance, it is a stylised fact that larger workplaces tend to pay more than smaller workplaces. Workplace factors such as whether the workplace is branch of a multinational firm, human resource management practices, and productivity are likely to lead to variation in wages even within narrowly-defined occupational categories. For instance, Faggio, Salvenes, et al. (2007) find evidence that a growth dispersion in productivity between British workplaces contributed to the growth in residual wage inequality. Wage inequality research by economists, however, tend to find a sizeable role for residual inequality (Prasad 2002; Brewer, Muriel et al. 2010) so it is of much substantive interest.

To sum up, if a substantial role for within-occupation inequality is found in accounting for changes in overall wage inequality, then the relationship between occupations and wages is weakening suggesting inequalities in the labour market arise from elsewhere, for instance, in terms of workplace-level factors such as quality of management practices or unobserved skills individuals such as ability and motivation. Wage inequality research in the US context has

found an increasing share for residual inequality in the growth in overall inequality, so we might expect the same in the British context. If the growth in inequality was largely due to between-occupation inequality, we can say that occupations did structure the growth in inequality.

Summary of mechanisms by which occupations structure wage inequality

	Mechanism	Sociology	Economics
1.	Changes in employment mix	Structural approach	Job polarization (SBTC)
2.	Changes in occupational mean wages	'Disaggregated structuration'/'micro classes'	Rising returns to skill (SBTC)
3.	Changes in within-occupation inequality	Individualization/neo-classical soup	Residual inequality (SBTC)

DATA

The data comes from *New Earnings Survey/Annual Survey of Hours and Earnings* (NES), creating a series covering the years 1975-2008. The survey contains the highest quality earnings data available covering such a span of time. Furthermore, sample sizes are large compared to other surveys containing earnings data covering a similar period e.g. *General Household Survey* or *Family Expenditure Survey*. More information on the data can be found in Appendix A. Large sample sizes are needed in order to obtain robust estimates at the occupation unit-group level of detail. Three consecutive annual samples were combined at a time, centred on a middle year to further increase sample sizes and reduce year-to-year variability in estimates. Hourly wages were calculated by dividing gross weekly pay excluding over time by normal basic hours per week. Hourly wage rates were used to standardise for differences in usual hours worked per week hours between individuals and occupations and to allow the inclusion of part-timers. Cases are then weighted by usual hours per week. This allows the inclusion of part-timers

without counting them as full-time workers. Thus the results pertain to inequality in wage rates across hours worked, not individuals. This means that individuals and occupations with longer hours are weighted proportionately more than individuals and occupations with shorter hours. On the whole, whether weighting by hours did not affect on the results in my thesis. Only one discrepancy was found, and it is mentioned in Chapter 5.

All wage data have been converted to 2008 prices using the Retail Price Index. The variance of log hourly wages is used as the measure of inequality as it has the valuable property of easily being decomposed. The NES contains unit-group level occupation information for each case. It is possible to use this information to construct a consistent occupation classification system at the unit-group level. Details on how occupation unit-groups were constructed are found in Appendix B. All in all, there are 366 different occupations. The sample in the analysis was selected as follows: Cases with missing earnings or occupation data were dropped, as were those where earnings were affected by absence and those that reported an hourly wage of zero. Cases with extremely high wages and extremely low wages were also dropped. These restrictions had barely any impact on the usable sample sizes (see Appendix A for full details of data decisions).

METHOD

The analysis proceeds in three steps. The first step decomposes wage inequality into the between- and within-occupation components for the whole period 1975-2008. In the subsequent two steps, the analysis is divided into two time periods: an earlier period of a rapid and secular growth in wage inequality (1975-1996) and a later period of stabilisation in wage inequality for men, or reversal for women (1997-2008). The second step decomposes *changes* in

wage inequality within the two periods into three components: a composition effect, a mean wage effect, and a within-occupation inequality effect. The third step identifies inequality-producing occupations for the two time periods. All analysis in this chapter was conducted separately by gender as trend in male and female wage inequality differ slightly and men and women occupational employment patterns are very different. Since men and women tend to work in different occupations, the analysis in this chapter is split by gender to see if indeed inequality-producing occupations do indeed vary by gender. The next chapter deals with occupational wage inequality in a multivariate way and so male and female labour markets are not treated as separate in that chapter: the gender composition of an occupation is treated as a source of variation in its own right.

DECOMPOSITION OF VARIANCE

It is possible to decompose changes in the variance of log wages into three components that capture each of the three mechanisms by which occupations can contribute to overall wage inequality: a composition effect, a mean wage effect, and a within-occupation inequality effect.

The general formula for the decomposition of variance is:

$$\mathrm{var}(y) = \mathrm{var}\big(\mathrm{E}(y|occ)\big) + \mathrm{E}\big(\mathrm{var}(y|occ)\big) \qquad (1)$$

where *y* refers to log hourly wages and *occ* refers to occupation. The total variance of log wages, $\mathrm{var}(y)$, is the sum of two components: the first term on the right side of the equation is the variance of conditional expected (mean) log wages given the occupational structure (i.e. between-occupation inequality) and the second term is conditional variance of log wages given the occupation structure (i.e. within-occupation inequality).

When applied to wage inequality equation (1) is more commonly re-written as (e.g. Jenkins and van Kerm 2009:57):

$$V = B + W$$
$$= \sum_j s_j r_j{}^2 + \sum_j s_j \sigma_j^2 \quad (2)$$

where V is the overall variance of log hourly wages is the sum of between-occupation inequality, B, and within-occupation inequality, W. Subscript j denotes occupation, s refers to employment share of occupation j, $r_j = (y_j - \bar{y})$ is the deviation of occupation j's mean wage from the overall mean wage, and σ_j^2 is the variance of wages within occupation j. The overall variance in log hourly wages in any given year is then the square of the weighted sum of deviations of occupational wages from the overall mean wage (first term) plus the sum of the weighted occupational-level variances (second term).

Much like overall inequality at a point-in-time (equation 2), changes in overall inequality between two time-points are also additively decomposable into between- and within-occupation components. The two time-points are denoted by subscripts b (referring to baseline year) and t (referring to b+1). Equation (3) shows that the change in the overall variance is the sum of the change in between-occupation inequality and the change in within-occupation inequality.

$$V_t - V_b = (B_t - B_b) + (W_t - W_b) \quad (3)$$

The change in the between-occupation component in equation (3) can be written as:

$$B_t - B_b = \sum (s_{jt} - s_{jb})\, r_j^2 + \sum s_{jb}(r_{jt}^2 - r_{jb}^2) \tag{4}$$

The first term is a composition effect: the change in between-occupation inequality due to changes in the employment shares of occupations. The second term is a wage effect: the change in between-occupation inequality due to changes in occupational mean wages.

The change in the within-occupation component in equation (3) can be similarly written as:

$$W_t - W_b = \sum (s_{jt} - s_{jb})\, \sigma_{jt}^2 + \sum s_{jb}(\sigma_{jt}^2 - \sigma_{jb}^2) \tag{5}$$

As with the change in between-occupation inequality (equation 4), the first term in equation (5) is a compositional effect and the second term is a wage effect.

The composition effect (changes in the relative sizes of high (low) mean wage (variance) occupations) can be separated out from the mean wage effect and a within-occupation effect (Western and Bloome 2009:309-10): Given equations (4) and (5), changes in the overall variance of wages can be written as the sum of three components:

$$V_t - V_b = \delta B + \delta W + \delta C \tag{6}$$

where δB is the between-occupation effect, δW is the within-occupation effect, and δC is the composition effect. In equation (6), the composition effect is separated out as a component in its own right instead of being two separate components with between- and within-occupation inequality parts, as it is in equations (4) and (5). The three components in equation (6) each capturing the three mechanisms by which occupations can account for changes in overall inequality.

The composition effect then is written as:

$$\delta C = \sum \left(s_{jt} - s_{jb}\right)\left(r_{jt}^2 + \sigma_{jt}^2\right) \tag{7}$$

The composition effect, δC, is derived from the left hand terms of equations (4) and (5) and captures change in overall inequality due to changes in the relative sizes of occupations i.e. growth/decline in high-/low-wage occupations and/or growth/decline in occupations with a high-/low-degree of within-occupation inequality.

The mean wage effect is written as:

$$\delta B = \sum s_{jb}\left(r_{jt}^2 - r_{jb}^2\right) \tag{8}$$

The mean wage effect, δB, is the second term of the change in between-occupation inequality equation (equation 4) and captures changes in overall inequality due to changes in the mean wages of occupations i.e. some occupations' mean wages might rise more than others and some might even fall in real terms.

Finally, the within-occupation inequality effect is written as:

$$\delta W = \sum \mathrm{s}_{jb}\left(\sigma_{jt}^2 - \sigma_{jb}^2\right) \tag{9}$$

The within-occupation inequality effect is the second term of the change in within-inequality equation (equation 5) and captures changes in overall inequality due to changes in the variance of wages within occupations i.e. a rise in within-occupation inequality always increases overall inequality.

Using these components it is possible to calculate the contribution of a specific occupation on overall inequality (Western and Bloome 2009; Mouw and Kalleberg 2010). A portion of overall inequality attributed to a specific occupation *i*. Occupation *i*'s employment share, mean wage, and within-occupation inequality are fixed at their baseline, *b*, levels, whilst allowing those for all the other occupations to take on their time *t* levels to create a counterfactual level of overall inequality for time *t*. The counterfactual can be thought of as what the change in overall inequality 'would have been' had occupation's *i*'s employment share, mean wages, and within-occupation inequality not changed. The counterfactual level of inequality is subtracted from the actual observed level at *t* to find out the contribution of each specific occupation to the change in overall inequality between the two time points. The calculation is given in equation (10). Similarly, the changes in one component of an occupation, say changes in occupation *i*'s mean wages, on overall inequality can be calculated by setting occupation *i*'s mean wage at its baseline level to create a counterfactual change in inequality which is then subtracted from the observed change in overall inequality to calculate the proportion of the change in overall inequality attributable to changes in the mean wage of a occupation *i*.

$$V_t - V_t|s_{it} = s_{ib}\,, \qquad y_{it} = y_{ib}\,, \qquad \sigma_{it}^2 = \sigma_{ib}^2 \tag{10}$$

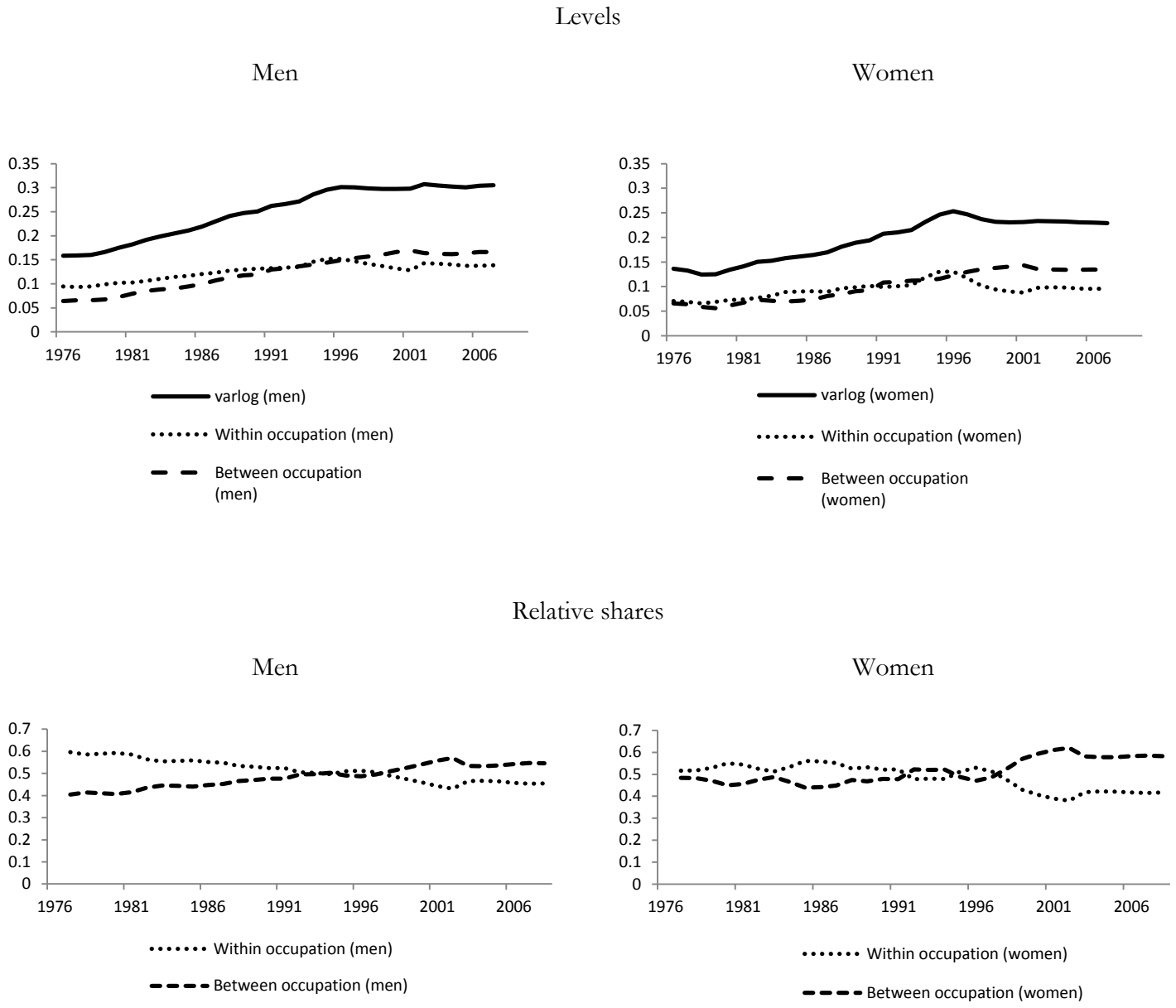
The calculation can be performed for each of the 366 occupations to generate a list of inequality-producing occupations. It must be noted that the sum of the adjusted variances for each occupation given by equation (10) will not necessarily equal the actual change in variance between *b* and *t* because changes in occupation employment share, *s*, and occupation mean wages, *y*, affect overall mean wages. However, such an exercise can be very informative.

RESULTS

Figure 9 presents trends in overall wage inequality using the variance of log wages. Between 1975 and 1996 the level of wage inequality doubled for men and grew by two-thirds for women. Thereafter, inequality trends halted. As can be seen, in terms of levels of overall inequality, two distinct periods can be identified for both men and women. The first period, 1975-1996, when inequality rapidly grew, and a second a second period, 1997-2008, when inequality stabilised or reversed. As such, the second set of decomposition results and sensitivity analysis are presented separately for both periods.

Figure 9 also presents results from a year-by-year decomposition of the overall variance in log wages separately for men and women using equation (2) into a between component, *B*, stemming from differences in mean wages across occupations and a within component, *W*, stemming from inequality between individuals within occupations. The upper panel of Figure 9 shows that when wage inequality was growing this stemmed from inequality increasing both within and between occupations. Across the whole period, the between-occupation component increased at a steeper rate than the within-occupation component. The trends in between- and within-occupation inequality is clearly linear for men but for women is bit bumpier. After 1997, wage inequality stabilised for men and reversed slightly then stabilised around the 1994 level for women. The upper panel of Figure 9 shows that in the case of men after 1997, between-occupation inequality continued to grow but its effect on increasing overall inequality was offset by a fall in within-occupation inequality resulting in a net effect of a stabilisation in overall inequality. For women after 1997, between-occupation inequality continued to rise whilst within-occupation inequality fell more steeply than it did for men, resulting in a net effect of a slight decrease in overall wage inequality during the late 1990s. Wage inequality then stabilised at this level during the 2000s.

Figure 9. Trends in the structure of wage inequality 1975-2008



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; hourly wages are weighted by usual hours per week.

The lower panel of Figure 9 shows the relative shares of overall wage inequality accounted for by the between- and within-occupation inequality components (i.e. 'the occupational R^2'). The

key and perhaps surprising finding is that, contrary to what we might expect from theories that posit occupations once better structured inequality in the labour market during a time of the presence of wide-spread coordinated wage-setting and a larger share of the labour force employed in occupations in the middle of the wage distribution, the majority of wage inequality actually occurred *within* narrowly-defined occupations in the late 1970s and throughout the 1980s. It was only when inequality reached its peak and started to stabilise that the majority of inequality was between occupations[4].

Over the whole period, the relative share accounted for by within-occupation inequality steadily fell whereas the share accounted for by between-occupation inequality steadily rose to the point that by 1997 the majority of wage inequality now occurred between occupations.

[4] There are several data objections to the finding of a growing (falling) relative share of the variance in wages that is between (within) is unlikely due to changes in the occupational classification systems. None of them appear to hold much weight. One possible objection to the finding is that earlier occupational classification systems delineated fewer occupations than later classification systems. By design it would therefore be logical to find a growing share of the (relative) variance between groups as the group portioning becomes more detailed over time. As Table A2 in Appendix B shows, the number of occupations in each of the three classification systems in the NES actually declines over time, with the latest system(2001-2008) delineating a fifth fewer occupations than the earliest classification system (!975-1990). Another possible objection is that the finding could somehow be an artifact of bridging three occupational classification systems. It is plausible that the basic result in Figure 9 could be partly attributable to the consistent classification system somehow converting within-occupation inequality into between-occupation inequality in the 1970s and 1980s as many occupations during that time were not properly delineated by the newer classification (SOC 90) to which they are converted. As Figure A1 in Appendix B makes clear, the basis result in Figure 9 is unaltered when the occupational classification system is allowed to vary. If anything, Figure A1 suggests the consistent classification system *underestimates* between-occupation inequality, indicating the results in this chapter are conservative estimates.

Contrary to the individualisation of pay hypothesis, the share of wage inequality accounted for by differentials between occupations grew, indicating that occupations are becoming a better, not worse, predictor of wages. This is in contrast to what we might expect from Aage Sørensen's 'neo-classical soup; assessment that "structural locations seemed less relevant for explaining the variation in earnings"(Sørensen 2000:1552) as inequality grew. The findings presented here suggest the opposite: occupations if anything have became more relevant in explaining the variation in wages as the variation in wages increased. McGovern et al. (2007:90-1) find similar results for Britain with respect to social class in wage equations. They find social class has generally become a better predictor of earnings between 1992 and 2000, again casting doubt on Sørensen's thesis.

To properly assess these claims, we need to separate out the effect of changes in the composition of the labour force as this is a source of change in inequality in its own right. When examining change in inequality between two time points, both changes in between-occupation and within-occupation inequality are functions of changes in the relative sizes of structural locations (i.e. the employment structure), for instance, it could be the case that the marginal associations between occupations and wages has not changed but what has changed is that there has been a growth in high-variance occupations resulting in an increase in overall wage inequality. In what follows, I decompose exactly why the increasing role for occupations in structuring wage inequality by decomposing changes in overall inequality into an employment effect, a mean wage effect, and the effect of inequality within-occupations. If we find that the latter component accounts for the majority of the rise in inequality at the most detailed occupational level possible with available data, can we confidently assert that structural locations seem less relevant in explaining the variation in wages.

OCCUPATIONS AND THE GROWTH IN WAGE INEQUALITY 1975-1996

Using a simple variance decomposition (equation 6), changes in overall wage inequality are decomposed into three components relating to the three mechanisms outlined above: a composition effect, δC, deriving from changes in the occupational structure; a between-occupation effect, δB, deriving from changes in the mean wages of occupations relative to the overall mean; and a within-occupation effect, δW, deriving from changes in within-occupation inequality.

Table 7 shows the majority of the growth in overall wage inequality 1975-1996 derived from the second mechanism, changes in mean wages between occupations. For men, such changes accounted for 48.5 per cent (.0729/.1503). For women, such changes accounted for 45.7 per cent (.0605/.1324). This is in contrast to the US experience where the majority of the rise in inequality during the 1980s was within-occupations and builds upon the more limited existing British evidence which examines only the changing structure of occupations Table 7 suggests that the growth in wage inequality was mainly due to the polarisation of the British labour market in terms of the distance in average wages between occupations and in terms of polarised employment changes. The graphs presented below further unpack what these numbers mean.

Table 7. Decomposition of change in variance of log hourly wages 1975-1996

	Total $V_t - V_b$	δC	δB	δW
Men	.1503	.0645	.0729	.0130
Women	.1324	.0356	.0605	.0363

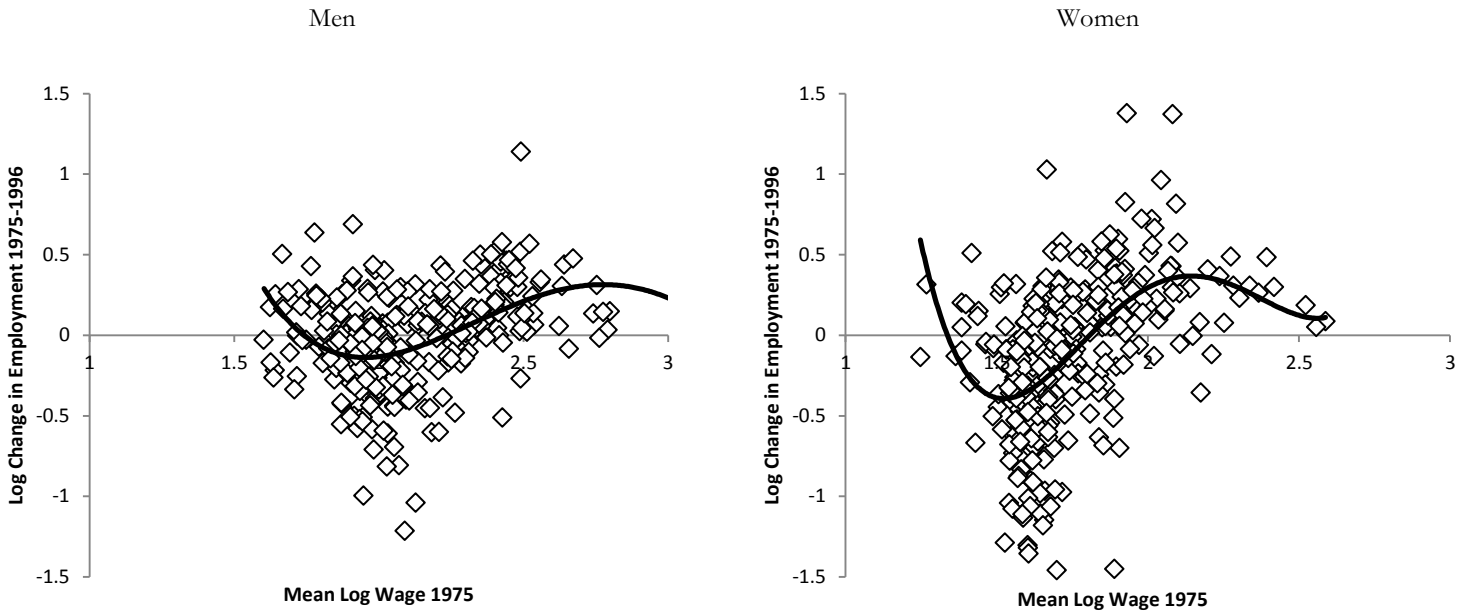
Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; hourly wages are weighted by usual hours per week.

The changing structure of occupations (δC) affects overall inequality in two ways: by changes in the share of high/low wage occupations and by changes in the share of high/low variance occupations. These are charted in Figures 10 and 11 respectively. The changing structure of occupations played a large role for the growth in male wage inequality, accounting for 42.9 per cent (.0645/.1503) (Table 7). Figure 10 indicates that this stems from the already established 'hollowing out' of middle-paying occupations with a simultaneous large growth in high-paying occupations and small but noticeable growth in some low-paying occupations. Male 'job polarization' is demonstrated quite clearly by the u-shape of the fitted line, which takes into account occupation size. Changes in employment can also influence overall wage inequality by an increase in the proportion of the labour force moving into (away from) more unequal (equal) occupations. Figure 11 shows that there was a decline in the share of the more equal occupations and an increase in the share of many more unequal occupations, contributing to a rise in overall male wage inequality. More equal occupations tend also to be the middle-wage occupations that disappeared over the period. Decomposition results (not shown) indicate that the decline in middle-paying occupations were more important for the male compositional effect than the shift in employment to more unequal occupations / shift in employment away from more equal occupations.

Compositional change played a smaller role for women than men, accounting for around a quarter of the growth in female wage inequality (.0356/.1324) (Table 7). The evidence seems too support female 'job polarization' (Figure 10). As with the case of men, there was a decline in middle-paying occupations, and a growth in high-paying occupations. However, the growth in low-paying employment is much more pronounced indicated by the steeper tail of the initial 'u'. The growth in the highest-paying occupations was slightly less pronounced for women indicated by a second and inverted 'u' in the trend line.

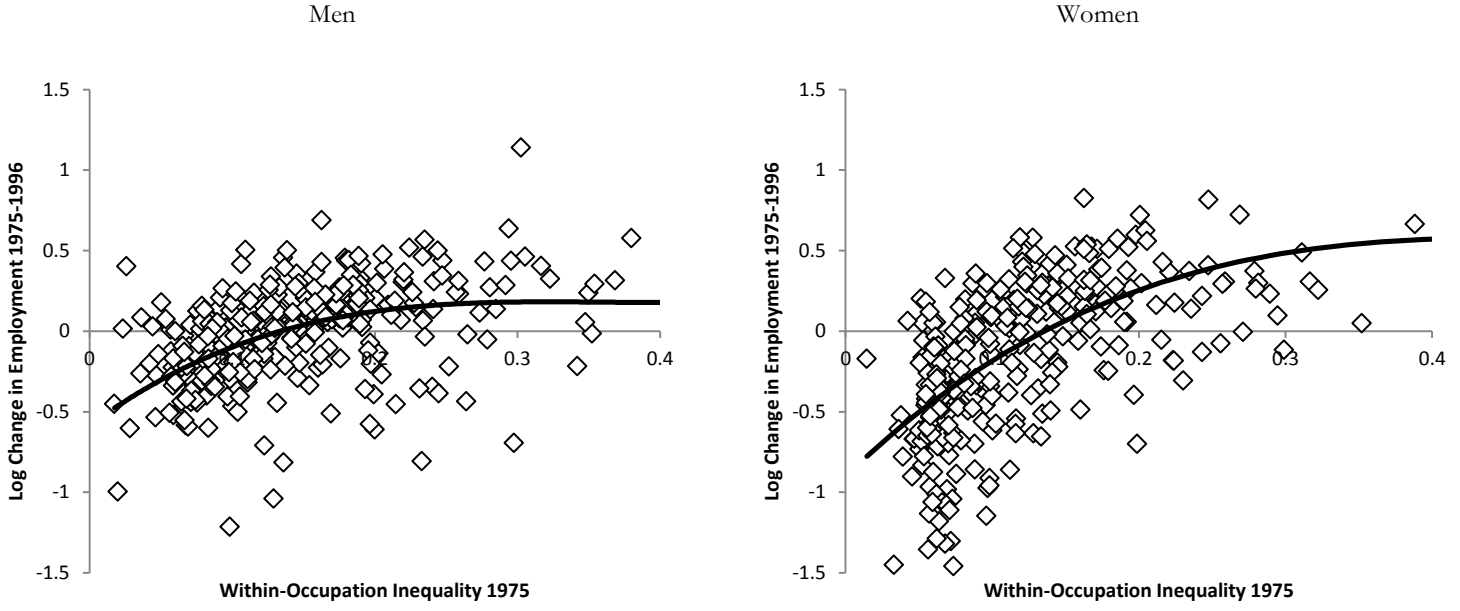
Figure 10. Occupational mean wages and log employment change 1975-1996



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week. Trendline weighted by occupation size in 1975.

Figure 11. Within-occupation inequality and log employment change 1975-1996

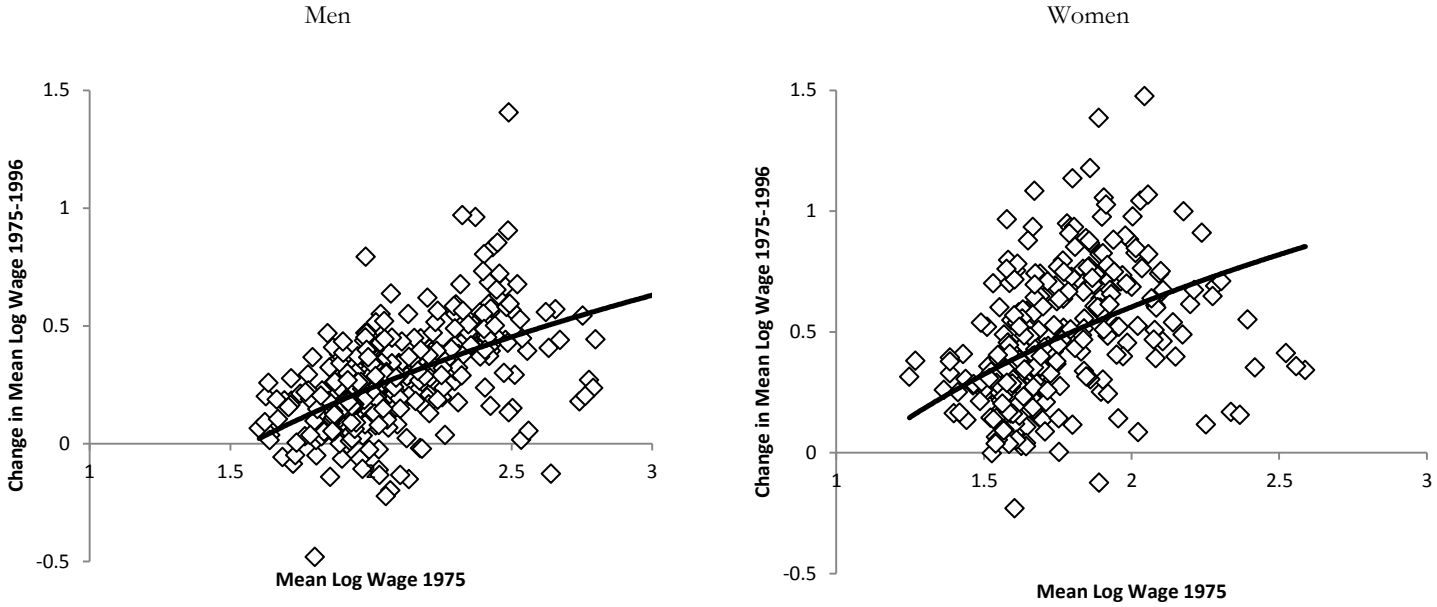


Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week. Trendline weighted by occupation size in 1975.

Figure 11 shows that the employment change into unequal occupations was greater for women than men. This was compounded by an employment change out of low-variance occupations. Decomposition results (not shown) indicate that the dual effects of women moving into more unequal occupations and women moving into higher-paying occupations account for roughly equal shares of the composition effect – as higher-paying occupations also tend to be the most unequal.

Figure 12. Occupational mean wages and relative wage growth 1975-1996



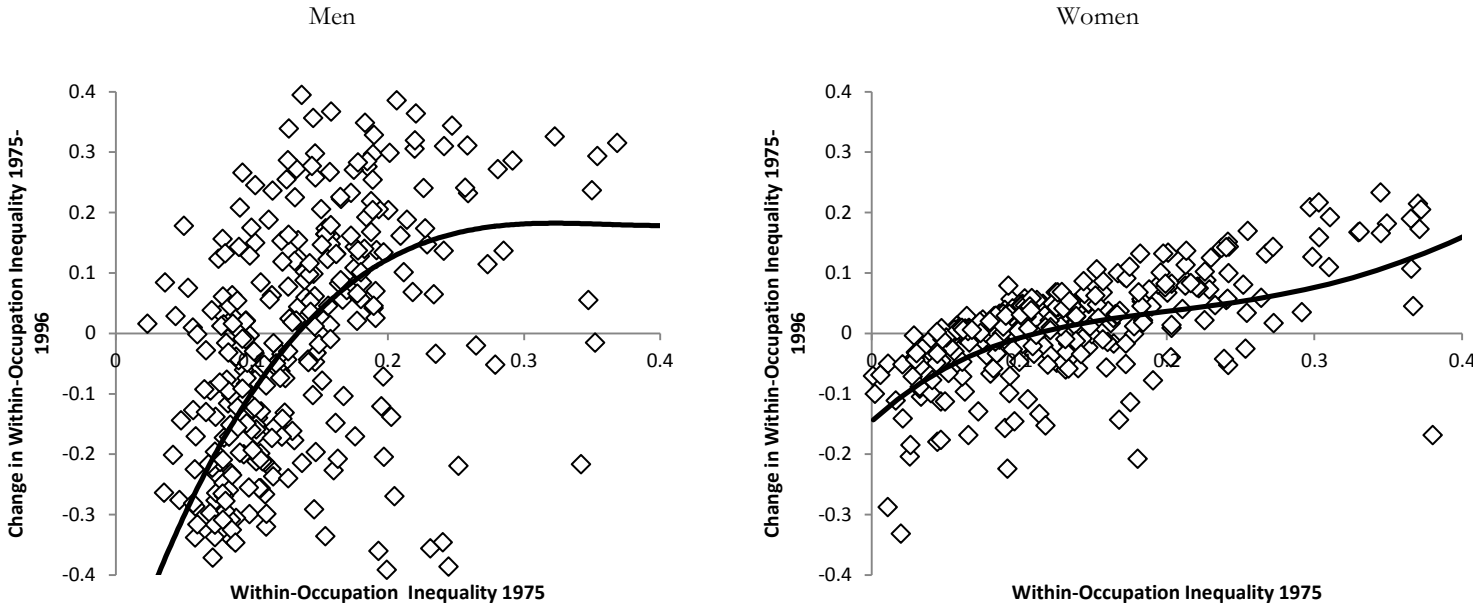
Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week. Trendline weighted by occupation size in 1975.

Figure 12 plots changes in occupational mean wages between 1975-1996 against occupational mean wages in the baseline period. Figure 12 indicates that, for men and women, the growth in the mean wage effect (δB) stems from already high-paying occupations experiencing the

largest wage gains and a slight fall in real wages for some middle-paying occupations. This is consistent with standard skill-biased technological change arguments whereby exogenous technological change increases the demand for nonroutine jobs faster than the supply of labour into them, resulting in a wage rise. There seems to be little evidence for a fall in real wages of the lowest-paying occupations, which we might also expect from such an argument and from American evidence that finds just this. Again this might contradict a rent-destruction-type argument for those occupations at the bottom. However, there does seem to be a sizeable bunch of middle-paying occupations that suffered a slight real wage decline for men. What seems more apparent is some kind of rent-creation at the top.

Figure 13. Within-occupation inequality and within-occupation inequality growth 1975-1996



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; hourly wages are weighted by usual hours per week. Trendline weighted by occupation size in 1975.

Within occupation-inequality (δW) accounted for about a quarter of the growth in female inequality (.0363/.1324) (Table 7), but played a relatively minor role for men, accounting for less than ten per cent (.0130/.1503) (Table 7)[5]. Figure 13 sheds some light on this finding. For men, already unequal occupations became more unequal. At the same time, more equal occupations also became more equal, offsetting the growing inequality within already unequal occupations, resulting in a relatively small net overall effect of within-occupation inequality. For women, however, the trend is remarkably linear: already high-variance occupations became more unequal with a much smaller offsetting effect of the low-variance occupations becoming more equal. This is likely due to the fact that fewer women than men worked in high-variance occupations in the initial period. It could also be due to the occupation categories poorly capturing distinctions among female occupations as well as for men's.

To sum up, of the three mechanisms by which occupations contribute to the rapid rise in overall wage inequality 1975-1996, a sizeable role was found for employment changes, more so for men than women. The most important mechanism of all in explaining the growth in overall wage inequality during this time was changes in mean wages between occupations. Already high-paying occupations experienced the largest wage gains. There is some evidence that many of the declining middle-paying occupations also experienced a decline in their average wages, but there is little evidence of a decline in real wages for the lowest-paying occupations. Overall wage inequality rose partially as a result of men and women moving into higher-paying occupations and (especially for women) moving into lower-paying occupations too. Coupled with a collapse in middle-paying employment, the labour force became more polarized into those working in low-paying and high-paying occupations. The interaction

[5] It is likely, however, that these are overestimates of the actual role of within-occupation wage inequality as Figure A1 in Appendix B suggests the consistent classification understates between-occupation inequality, especially for women.

between the mean wage effect and employment effect (i.e. the between occupation effect) explain the overwhelming majority in the rise in wage inequality between 1975-1996 – 93.6 per cent (45.1 + 48.5) for men and 72.6 per cent for women (26.9 + 45.7). As for within-occupation inequality, for women, this mechanism seemed to play a relatively important role compared to men where its role was very minor. For women, this stemmed from already unequal occupations becoming even more unequal. Within-occupation inequality for men, however, accounted for only a small fraction of the growth in overall inequality. This finding is contrary to the findings of economists that as inequality rapidly grew during the 1980s, the majority was within demographic groups, however defined. The contradiction could arise from that fact I define groups in very narrow way. Logically, the narrower the partition used, the lesser the extent of within-group inequality and the greater the extent of between-group inequality. However, a similar finding emerges in Chapter 5 when applying a broad social class categorisation of occupations (six categories). As will be shown below, caution must be exercised when describing the general role of occupations or social class in relation to wage inequality, as the inequality-producing effects of occupations are concentrated.

OCCUPATIONS AND THE STABILISATION IN WAGE INEQUALITY 1997-2008

As mentioned, trends in wage inequality were quite different in the second period than the first. For both men and women, overall wage inequality was rather stable, as can be seen in Figures 1 and 9. Between 1997 and 2008, wage inequality increased very slightly for men by about 5 per cent and declined slightly for women by about 8 per cent. The apparent small growth reflects the different baseline period being 1997. This section contributes to the main question this chapter seeks to address by examining how occupations contributed to the stabilisation in wage inequality.

Table 8. Decomposition of change in variance of log hourly wages 1997-2008

	Total $V_t - V_b$	δC	δB	δW
Men	.01610	.0301	-.0338	.0198
Women	-.01970	.0210	-.0339	-.0066

Source: NES.

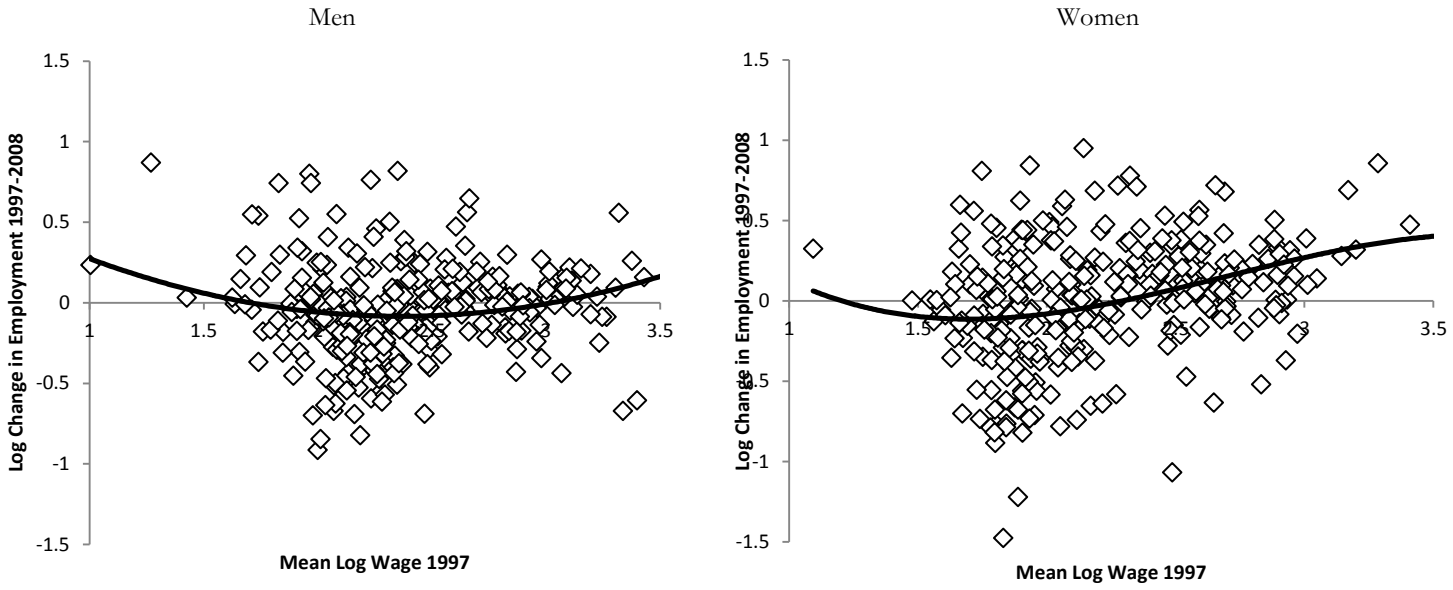
Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week.

Table 8 presents the decomposition results of the changes in wage inequality into the three components separately for men and women for the period 1997-2008. For men, the small growth in overall wage inequality stemmed mainly from the changing structure of occupations and also from an increase in inequality within occupations. The effect of these two components was tempered by an equalizing (negative) mean wage effect. The numbers in Table 8 indicate that the small growth in wage inequality would have been around three times higher than what is observed had there not been an equalising (negative) mean wage effect (.0301+0.0198/.0161=3.1). For women, the small decline in overall wage inequality stemmed mainly from a similar equalising mean wage effect, but in contrast to men, an equalising within-occupation effect. Combined, these two equalising effects more than offset a disequalising composition effect. The numbers in Table 8 indicate that the small decline in wage inequality would have been twice as great as the observed decline had there not been a disequalising composition effect (-.0339 + -.0066/-.0197=2.1). As in the previous section, the numbers from the decompositions can be fleshed out by examining graphically changes in the three components at the occupation-level.

The changing structure of occupations (δC) was the biggest contributor to the small growth in male overall wage inequality 1997-2008. It was the only component to increase female

inequality although its overall effect was offset by negative mean wage and within-occupation effects. As with the earlier period, the subcomponent of composition effect attributable to changes in the shares of high/low variance occupations is small compared with the subcomponent attributable to changes in the shares of high/low wage occupations. For men, the composition effect depicted in Figure 14 accounts for 80 per cent of this effect and 61 per cent for women. For both men and women, then, the composition effect seems to be driven by a continued 'hollowing out' of middle-paying occupations, a growth in higher paying occupations, and a small growth in some low-paid occupations. Overall, the polarizing effect seems to be less stark than in the earlier period, indicated by the relatively flat trendlines.

Figure 14. Occupational mean wages and log employment change 1997-2008



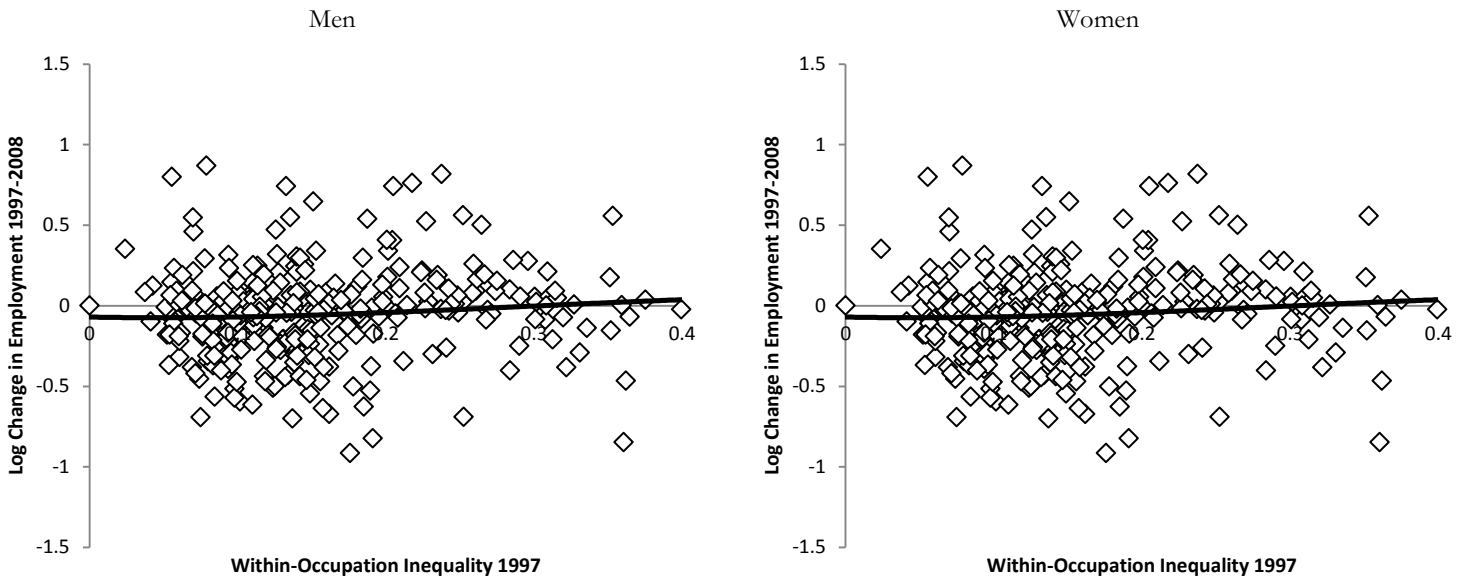
Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week. Trendline weighted by occupation size in 1997.

Figure 15 shows that for men, there was virtually no overall trend in the relative shares of unequal occupations. For women, however, some there is evidence for a small decline in low-

variance occupations and an increase in high-variance occupations. As mentioned, this aspect of employment change was not as significant as the continued 'hollowing out' of middle-paying occupations for both men and women.

Figure 15. Within-occupation inequality and log employment change 1997-2008



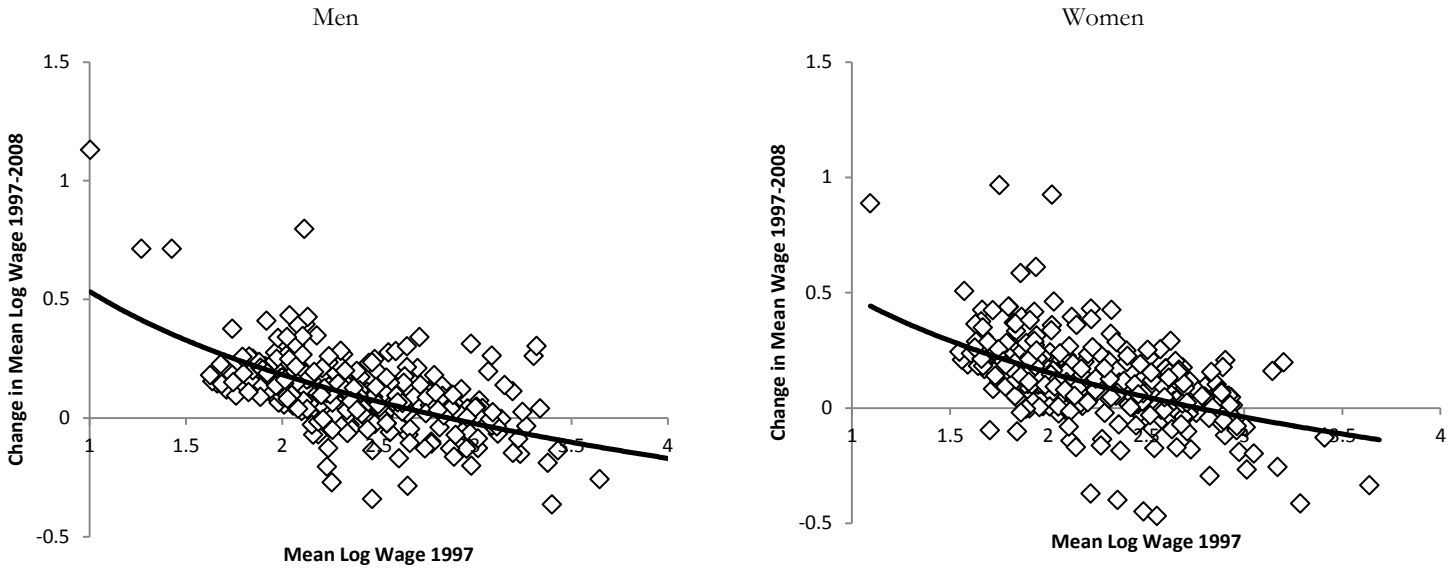
Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week. Trendline weighted by occupation size in 1997.

Figure 16 plots changes in occupational mean wages between 1997-2008 against occupational mean wages in the baseline year. Figure 16 indicates that, for men and women, the equalising mean wage effect (δB) stems from the faster wage gains of the lower-paying occupations relative to the higher-paying occupations. This trend is the opposite to mean wage effect in the earlier period where it was the highest-paying occupations that received the greatest wage gains and as such the mean wage effect accounted for most of the rise in overall inequality. The faster wage growth of the lowest-paying occupations 1997-2008 could be evidence of the equalising impact of the introduction in the National Minimum Wage in 1999 and subsequent upratings that have raised the pay of the lowest-paid at a faster rate than the median year-on-

year during the 2000s coupled when there was a general slow-down in wage growth (c.f. Figure 4).

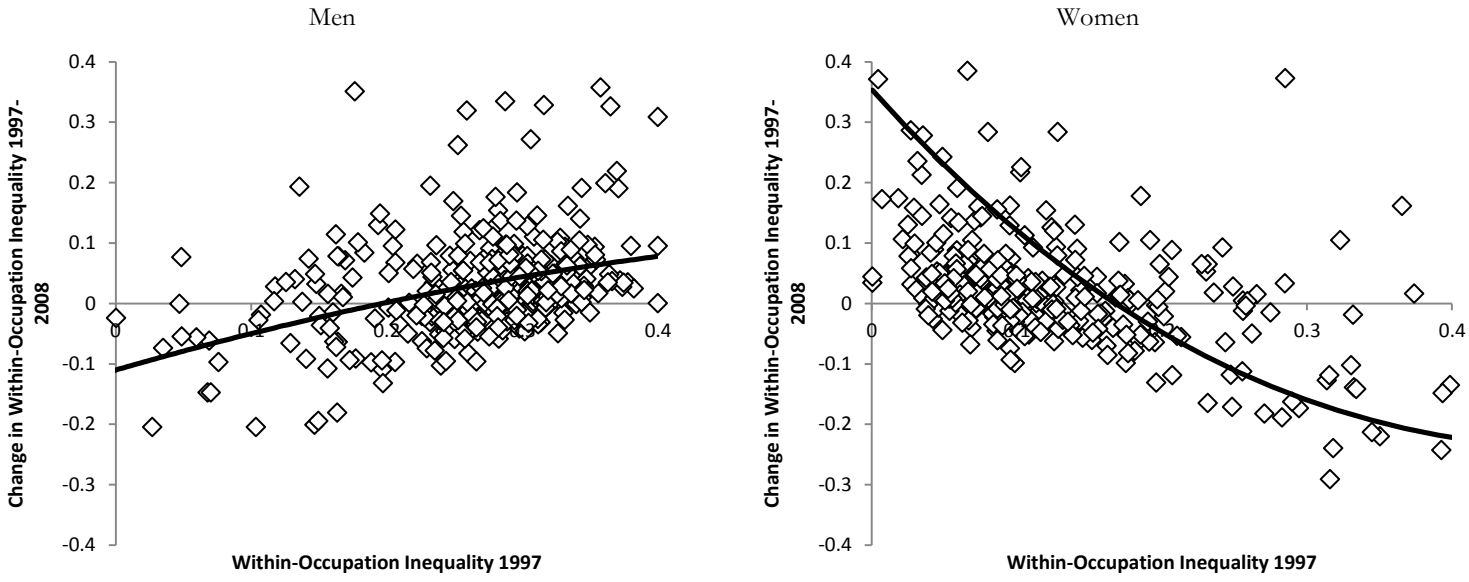
Figure 16. Occupational mean wages and relative wage growth 1997-2008



Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week. Trendline weighted by occupation size in 1997.

For men, within-occupation inequality (δW) contributed to the small increase in overall male inequality 1997-2008, but for women this component decreased overall female inequality. Figure 17 shows that for men, the positive within-occupation inequality effect stemmed from the already high-variance occupations becoming more unequal, indicated by the upward sloping trendline. For women, the small but equalising effect of within-occupation inequality stemmed from low-variance occupations becoming more unequal and high-variance occupations becoming more equal, resulting in a net effect of a negative effect on the change in overall inequality.

Figure 17. Within-occupation inequality and within-occupation inequality growth 1997-2008



Source: NES.Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week. Trendline weighted by occupation size in 1997.

INEQUALITY-PRODUCING OCCUPATIONS 1975-1996

One advantage of constructing a consistent classification of occupations is that it allows for a disaggregation of into the role of *specific* occupations into the growth in overall wage inequality instead of merely the *general* role of occupations. Such an exercise, of course, would not be possible with a regression-based decomposition that allowed the classification of occupations to vary. The impact for each occupation on the growth in overall inequality is calculated by fixing a specific occupation's labour force share, mean wage, and within-occupation inequality at their baseline levels, while allowing the values of these three components to change for every other occupation. A counterfactual level of overall inequality can then be calculated equivalent to 'what would the level of inequality be if this specific occupation was held constant but everything else was allowed to change'. The difference between the calculated 'counterfactual' level of inequality and the actual observed level of inequality equates to the

contribution to overall inequality of that specific occupation. More than 300 of these counterfactuals were calculated separately for men and women (one for each occupation). The results were then tabulated and sorted by contribution to overall inequality (whether positive or negative). Table 9 lists the top 20 inequality-producing occupations 1975-1996 for men and Table 10 lists them for women.

A key finding here is that the majority of the growth in male and female wage inequality is accounted for by only a handful of occupations. For instance, just 10 occupations account for over half the growth in overall male wage inequality 1975-1996. The top 20 combined account for over two-thirds of the growth in overall inequality and cover just one-quarter of the 1996 labour force (16 per cent of the 1975 labour force). For women, a similar finding emerges. Just 12 occupations account for over half the growth in overall inequality, and cover less than one-third of the 1996 labour force. The top 20 combined account for nearly two-thirds of the growth in overall inequality and cover just over 40 per cent of the 1996 labour force (and 33 per cent of the 1975 labour force).

For men, the top four inequality producing occupations are all managerial occupations in finance (*marketing and sales managers*; *other managers and administrators n.e.c*; and *underwriters, claims assessors, brokers*; *treasurers and company financial managers*). Four other managerial occupations in finance can be found in the top 20: *general managers; large companies and organizations*; *bank, building society and post office managers*; *other financial institutions and office managers n.e.c*; and *management consultants, business analysts*. This highlights important role of these kinds of occupations as a major driver in overall inequality. The computer revolution's impact can be seen in the growth of overall male wage inequality: two computer-related occupations are featured in the top 20 (*computer systems and data processing managers*; and *software engineers*). Two are professional

occupations*: medical practitioners and university and polytechnic teaching professionals* – both contributing mainly by their expansion. Three are low-paid nonroutine service occupations: *sales assistants*; *kitchen porters, hands*; and *bar staff*. The final two are middle-paying occupations: *drivers of road goods vehicles*; and *storekeepers, warehousemen*.

Table 9. Top twenty inequality-producing occupations 1975-1996 (men)

Occupation	Overall contribution (%)	Total $V_t - V_b$	δC	δB	δW	Labour force share 1996
Marketing and sales managers	9.83	.014782	.010976	.002780	.001026	.027549
Other managers and administrators n.e.c	6.50	.00977	.008338	.000583	.000849	.023114
Underwriters, claims assessors, brokers, investment analysts	5.67	.008534	.007049	.001048	.000437	.009276
Treasurers and company financial managers	5.57	.008372	.006431	.001678	.000262	.006933
Sales assistants	4.74	.007132	.003936	.003703	-.000508	.021575
General managers; large companies and organizations	4.21	.006333	.005949	.000344	.00004	.002311
Drivers of road goods vehicles	4.04	.006071	-.000043	.00463	.001484	.035956
Production, works and maintenance managers	3.61	.005436	.00233	.002228	.000877	.021166
Kitchen porters, hands	2.96	.00445	-.000513	.004374	.000588	.012191
Computer systems and data processing managers	2.35	.00353	.002641	.000814	.000075	.005928
Security guards and related occupations	2.33	.003497	.001983	.001284	.000231	.011087
Bank, building society and post office managers	2.31	.003475	.002323	.001173	-.000021	.006253
Other financial institutions and office managers n.e.c.	2.27	.003416	.002058	.001255	.000104	.011760
Medical practitioners	2.10	.003158	.00249	.000719	-.000051	.004694
Computer analyst/programmers	1.84	.002772	.002591	.000065	.000116	.012845
Bar staff	1.83	.002746	.001696	.001251	-.000202	.005112
Storekeepers, warehousemen	1.79	.002686	.000076	.00247	.00014	.029510
Software engineers	1.32	.001982	.001598	.000093	.000291	.005063
Management consultants, business analysts	1.26	.001901	.001373	.000258	.00027	.002110
University and polytechnic teaching professionals	1.22	.001834	.001744	.000168	-.00008	.004018

Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week.

By and large, the occupations in Table 9 contributed the rise in wage inequality mainly by their expansion, not their mean wages. Although by and large growing male inequality 1975-1996 stemmed from mean wages effects (Table 7), the specific occupations that increased inequality the most mainly did so because of their composition effects. Moreover, 12 of the top 20 occupations are *Higher Managerial and Professional Occupations* (NS-SEC Class 1). The importance of relative growth in high-paying occupations for overall inequality is again highlighted in Chapter 5 at the level of social class, where the relative growth in *Higher Managerial and Professional Occupations* is found to be the most important reason in accounting for growing between-class wage inequality.

For women, low-wage nonroutine service occupations dominate the top 20. The top three inequality-producing occupations are *cleaners, domestics; sales assistants*; and c*are assistants and attendants*. Combined, just these three accounts for more than 20 per cent of the growth in overall female wage inequality 1975-1996. *Cleaners* and *sales assistants* are the two largest female occupations, with cleaners accounting for 7 per cent of female employment and sales assistants accounting for 6 per cent. Five other low-paying nonroutine service occupations can be found in the top 20: *other childcare and related occupations*; *counterhands, catering assistants*; *kitchen porters, hands*; *bar staff*; and *waitresses*. As with men, managerial occupations in financial services played a role in the growth in female wage inequality, although accounting for a smaller share of the labour force, five make it to the top 20: *marketing and sales managers*; *other financial institutions and office managers n.e.c*; *other managers and administrators n.e.c*; *underwriters, claims assessors, brokers*; and *treasurers and company financial managers*. Four professional occupations are in the top 20, mainly due to their expansion: *nurses*; *medical practitioners*; *solicitors*; and *chartered and certified accountants*.

The final two are middle-paying routine clerical occupations: *other secretaries, personal assistants*, *typists, word processor operators n.e.c.*; and *clerks (n.o.s.)*.

Table 10. Top twenty inequality-producing occupations 1975-1996 (women)

Occupation	Overall contribution (%)	Total $V_t - V_b$	δC	δB	δW	Labour force share (1996)
Cleaners, domestics	10.03	.013284	-.004974	.013539	.004718	.054607
Sales assistants	7.00	.009264	.002032	.004399	.002833	.072423
Care assistants and attendants	5.74	.007605	.004573	.001564	.001468	.031591
Clerks (n.o.s.)	5.09	.006739	.003855	.000425	.00246	.074508
Marketing and sales managers	4.23	.005608	.004248	.001114	.000245	.009849
Other financial institutions and office managers n.e.c.	3.38	.004472	.003146	.001043	.000283	.012713
Other managers and administrators n.e.c	2.74	.003627	.002929	.000482	.000216	.010015
Nurses	2.69	.00356	.001669	.002373	-.000482	.046497
Other childcare and related occupations	2.54	.003359	.001446	.001436	.000477	.011890
Counterhands, catering assistants	2.43	.003221	-.001181	.003516	.000885	.016275
Medical practitioners	2.10	.002779	.001906	.000836	.000037	.002550
Kitchen porters, hands	1.88	.002489	-.002079	.003699	.000868	.009484
Bar staff	1.84	.002433	.001303	.001353	-.000223	.009422
Underwriters, claims assessors, brokers, investment analysts	1.79	.002373	.00172	.000464	.000188	.003965
Treasurers and company financial managers	1.75	.002319	.001728	.000465	.000127	.002330
Waitresses	1.56	.002059	.000854	.001157	.000048	.007085
Other secretaries, personal assistants, typists, word processor operators n.e.c.	1.53	.00203	-.001556	.000446	.00314	.048055
Higher and further education teaching professionals	1.50	.001987	.002534	-.000382	-.000166	.007715
Solicitors	1.42	.001882	.001669	.000253	-.00004	.002692
Chartered and certified accountants	1.40	.001857	.001033	.000733	.000091	.003924

Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week.

INEQUALITY-PRODUCING/REDUCING OCCUPATIONS 1997-2008

As with the analysis for the previous period, adjusted variances were calculated to the examine the effect of individual occupations on the small growth in overall inequality in the case of men and the small decline in overall inequality in the case of women. As before, the occupation-specific contributions to the small growth/decline in overall inequality were calculated. Table 11 lists the top 20 inequality-producing occupations for men while Table 12 lists the top 20 inequality-reducing occupations for women. Tables 11 and 12 list the top 20 inequality-producing occupations by magnitude of their contribution to overall inequality, regardless of the sign of the effect. As Table 8 shows, between 1997-2008 overall inequality increased slightly for men and decreased slightly for women. As such, an occupation that has an overall contribution with a positive sign mean that it increased inequality for men whereas for women, an occupation with a positive sign indicates that it reduced inequality. Unlike Tables 9 and 10, the top 20 occupations in Tables 11 and 12 contain occupations that both increased and decreased inequality indicating, along with Table 8, that the stabilisation in overall inequality was the net result of countervailing forces offsetting one another.

For men, 14 of the top 20 increased overall inequality, accounting for a 245.14 per cent of the observed growth in overall inequality, while the other six occupations had an equalising effect on overall inequality, accounting for 83.12 per cent of the equalisation. For women, 10 of the top 20 reduced overall inequality, accounting for 119.36 per cent of the decline, while the other 10 occupations had an inequality-producing effect, accounting for106.21 per cent of an increase in inequality. Again, as with the earlier period, the inequality-producing dynamics were concentrated in a small portion of the labour market: for men the top 20 employed just over a

quarter of the 2008 labour force, while for women the top 20 twenty employed just over 40 per cent of the 2008 labour force.

Table 11. Top twenty inequality-producing/reducing occupations 1997-2008 (men)

Occupation	Overall contribution (%)	Total $V_t - V_b$	δC	δB	δW	Labour force share (2008)
Sales assistants	48.39	.007508	.00898	-.001508	.000037	.044374
Clerks (n.o.s.)	40.30	.006253	.005383	-.000434	.001303	.039012
Other managers and administrators n.e.c	-27.64	-.004289	-.003338	-.000935	-.000016	.016366
Medical practitioners	22.63	.003511	.001626	.00151	.000375	.005932
Production, works and maintenance managers	20.75	.00322	.001455	-.000035	.0018	.024256
General managers; large companies and organizations	18.45	.002863	.005557	-.002944	.00025	.004739
Retail cash desk and check-out operators	13.79	.002139	.002563	-.000317	-.000107	.008397
Underwriters, claims assessors, brokers, investment analysts	-13.71	-.002128	.000624	-.002527	-.000225	.010132
Drivers of road goods vehicles	-13.47	-.002089	-.0002	-.001243	-.000646	.034957
Company secretaries	11.75	.001822	.001353	.000431	.000039	.002777
Solicitors	11.04	.001713	.001474	.000149	.00009	.004178
Managers in building contracting	10.58	.001641	.000675	.00051	.000456	.008378
Storekeepers, warehousemen	10.20	.001582	.000509	.001064	9.0e-06	.031691
Motor mechanics, auto engineers (inc. road patrol engineers)	-10.09	-.001566	-.00102	-.000394	-.000151	.008144
Software engineers	9.80	.00152	.002179	.000177	-.000836	.011241
Aircraft flight deck officers	9.71	.001507	.001327	.000132	.000048	.001159
Higher and further education teaching professionals	-9.47	-.00147	-.000934	-.000337	-.000199	.003307
Computer systems and data processing managers	9.32	.001446	.002414	-.000871	-.000098	.002777
Farm workers	-8.73	-.001355	-.000817	-.000547	9.9e-06	.002596
Accounts and wages clerks, book-keepers	8.43	.001308	.000054	-.00015	.001404	.011786

Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week.

Table 12. Top twenty inequality-producing/reducing occupations 1997-2008 (women)

Occupation	Overall contribution (%)	Total $V_t - V_b$	δC	δB	δW	Labour force share (2008)
Primary (and middle school deemed primary) and nursery education teaching professionals	24.6034	-.004854	-.000526	-.004418	.000091	.025378
Care assistants and attendants	16.7934	-.003313	.000669	-.001952	-.00203	.038131
Medical practitioners	-15.8804	.003133	.003003	-.000038	.000167	.00490
Secondary (and middle school deemed secondary) education teaching professionals	15.5001	-.003058	.000181	-.003407	.000168	.019415
Clerks (n.o.s.)	-14.2124	.002804	.001838	.000382	.000584	.090545
Solicitors	-14.0499	.002772	.002414	.000177	.00018	.005397
Other secretaries, personal assistants, typists, word processors operators, n.e.c.	13.7941	-.002721	-.002333	-.000328	-.00006	.028286
Production, works and maintenance managers	-11.9767	.002363	.002201	-.000011	.000172	.006053
Higher and further education teaching professionals	11.6714	-.002302	-.001058	-.000796	-.000448	.004661
Sales assistants	-10.0421	.001981	.002885	.000386	-.001291	.086277
Educational assistants	-9.8633	.001946	.002042	.000125	-.000221	.026947
Marketing and sales managers	-8.7626	.001729	.003187	-.001616	.000158	.016791
Sewing machinists, menders, darners and embroiderers	8.6941	-.001715	-.001091	-.000369	-.000255	.001467
Treasurers and company financial managers	-8.2657	.001631	.002681	-.001	-.00005	.006494
Retail cash desk and check-out operators	-7.8275	.001544	.001149	.000555	-.00016	.017821
Bar staff	7.8256	-.001544	-.000812	-.000451	-.000281	.004188
Accounts and wages clerks, book-keepers	7.8159	-.001542	-.001323	9.0e-06	-.000228	.029988
Packers, bottlers, canners, fillers	6.4684	-.001276	-.001266	.000332	-.000342	.004965
Counter clerks and cashiers	6.1944	-.001222	-.000849	-.000061	-.000312	.021695
General managers; large companies and organisations	-5.3295	.001051	.001419	-.000408	.00004	.001334

Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases weighted by usual hours per week.

CONCLUSIONS

There was a 'massive rise' in wage inequality in Britain during the 1980s. Although occupations are central for stratification research, little is known about how they relate to the trends in wage inequality. In this chapter three key findings emerge with respect to trends in wage inequality and occupations.

First, I found a growing role for between-group inequality in accounting for overall wage inequality for both men and women to the extent that between-occupation inequality accounts for the majority of overall wage inequality by the 2000s. In terms of changes in inequality, the 'massive rise' in wage inequality between 1975 and1996 seems to be accounted for mainly by changes in occupational mean wages: the highest-paying occupations received the highest wage gains. Almost as important was the changing occupational structure. During this time there was a 'hollowing out' of middle-paying occupations coupled with a strong growth in high-wage occupations and a small growth in low-paying occupations indicating the structure of the labour market became more polarised, as previous research has shown. This chapter adds to the polarisation story by adding in wage changes attached to occupations as being a quantitatively more important driver.

The main finding of this chapter is that the British labour market polarised during the 1980s in two ways that increased overall wage inequality: the polarisation of employment into high- and low- paying occupations and the polarisation of wage growth with high-paying occupations receiving the largest gains. This is in contrast to predictions made by Aage Sørensen's predictions of a 'neoclassical soup' as, if anything, occupations seem to becoming a better, not worse, predictor of wages. It is also indicates the British story differs from United States story where the majority of the growth in wage inequality during the 1980s occurred within

occupations. The findings presented here as also in contrast to the empirical finding of a recent British study for National Equality Panel that the "main story through the 1980s […] is the increasing within-group inequality, with almost all occupation groups experiencing increasing inequality over this period" (Brewer, Muriel et al. 2010: 46). Although I do find evidence for increasing within-group inequality, for women more than men, the main story appears to be one of increasing between-group inequality as the more important factor; at least when groups are defined narrowly in terms of detailed occupation unit-groups. Chapter 5 investigates whether a similar finding emerges when occupations are defined in terms of more commonly-used social class aggregations.

A second key finding, however, is that caution should be exercised when generating accounts regarding the role of occupations in structuring wage inequality as the overwhelming share of inequality is concentrated in only a handful of occupations, especially managerial occupations in finance in the case of men. The fact that changes in wage inequality appear to be concentrated in so few occupations provides further impetus for examining the 'coherence' of more commonly-used social class categories in terms of capturing inequality dynamics which is the subject of Chapter 5.

A third key finding is that during the 2000s, wage inequality would have continued to grow had the wages of several low-paying occupations not experienced unprecedented wage gains, as shown by the inequality-producing occupations exercise for this period. From 1997-2008 overall wage inequality stabilised. At the time of writing, not much is known about why wage inequality stabilised during this time. The stabilisation appears to stem from occupations structuring wage inequality in countervailing ways: some occupations had inequality-producing effects, whereas others offset what might have been a continual rise in inequality. There was a

continual, albeit weaker, polarisation in the structure of occupations. This inequality-producing effect was offset by low-paid occupations receiving larger wage gains relative to high-paid occupations, perhaps indicating a minimum wage effect.

This chapter has charted the trends and contributions in the three mechanisms by which occupations can account for the growth in overall wage inequality in a descriptive way. The next chapter shall attempt to examine the sources of changes in the three components by fitting multilevel growth models to a specially constructed longitudinal occupation-level dataset. The construction of this dataset allows the inclusion of key covariates that might be driving the trends in occupational wage inequality outlined above, especially with regard to the well-documented rising returns to degree-level and above education, not to mention other significant labour market changes such as the collapse of collective bargaining coverage and the rise of part-time employment. Furthermore, I combine men and women so the gender composition of occupations can be examined as another source of change in the three components. The approach taken in the next chapter allows for a fully multivariate analysis.

– 4 –

SOURCES OF OCCUPATIONAL WAGE INEQUALITY

Occupations are "a hotel ... which are always occupied, but always by different persons."

(Schumpeter 1953:171, cited in Grusky and Ku 2008).

INTRODUCTION

The growth in overall wage inequality since the 1970s was structured by occupations. Occupations can structure changes in overall wage inequality in three main ways: by the occupational structure, by the occupational wage structure, and by inequality within occupations. On the face of it, the accounting exercises in the previous chapter squarely contradict the conjecture that "structural locations seemed less relevant for explaining the variation in earnings"(Sørensen 2000:1552) as inequality grew. Rather than slipping into a 'neo-classical soup', the growth in overall wage inequality appeared to be highly structured by occupations, and if anything, occupations seem to be becoming a better, not worse, predictor

of wages. Having established the growth in overall wage inequality was largely between occupations, another set of questions emerge: Why did some occupations grow and others decline? Why did some occupations' mean wages rise faster than others? Why did some occupations become more unequal? In other words, what are the sources of variation in changes in employment levels, mean wages, and wage inequality, across occupations? In addition to these questions, the more important question is to what extent was the structuring of the three mechanisms by occupations due to the changing composition of incumbents within them or due to some occupation effect, unexplained by the observed characteristics of occupants? In short, this chapter investigates sources of variation in occupational employment, mean wage, and internal inequality growth rates, and more importantly, the extent to which each of these was due to other labour market factors. Only by assessing the extent to which the mechanisms by which occupations account for growing overall inequality not due to other labour market factors, namely the rising returns to education, can we confidently take issue with Sørensen's claim that structural locations are becoming less relevant in explaining the variation in wages.

The previous chapter was rather descriptive. Although a descriptive analysis of the relationship between occupations and wage inequality is an interesting endeavour in its own right in establishing *how* occupations structured the growth in overall wage inequality, in order to properly assess the *why* occupations structured the growth in overall wage inequality, a fully multivariate analysis is needed. It is highly plausible, for instance, that the prominent role of the mean wage effect found in the previous chapter in structuring the rapid growth in wage inequality 1970s-1990s is largely due to the educational upgrading of those occupations. For instance, in their investigation into the relationship between the occupational structure and wage inequality in the United States, Kim and Sakamoto (2008:152) conclude that "the

reduction in the explanatory power of occupation is especially obvious after controlling for education". Furthermore, the comparatively smaller rise in within-occupation inequality might be due demographic changes such as the rise in part-time work resulting in a polarisation within occupations between full-time and part-time workers. Previous research in the United States shows a possible role for demographic changes in explaining most of the rise in residual wage inequality (Lemieux 2006). In this way this chapter will indicate the effect of specific labour market changes within occupations with a fully multivariate analysis of the three components, separately for the two time periods.

Given the questions set out at the beginning of this chapter, I seek to (1) identify sources of variation in occupational size growth, occupational wage growth, and occupational-level inequality growth and (2) establish to what extent the structuring of wage inequality by occupations was due to the changing composition of incumbents within occupations. In short, this chapter seeks to substantiate the trends in growth rates of occupation-specific labour market shares, mean wages, and within-occupation inequality, with a fully multivariate analysis. It deals with the first issue by investigating the roles of four categories of independent variables on sources of variation in occupational employment, wages, and inequality trends. They are: rising skill-levels, institutional change, sectoral change, and demographic change. The second issue is dealt with by quantifying the extent to which the changing characteristics of workers within 'occupational hotels' can explain trends in the three components of wage inequality and to what extent is due to occupations themselves. In dealing with this latter issue, this chapter will quantify the extent to which occupations themselves 'explain' the growth in the three components of wage inequality, net of their changing composition. At this point, it must be noted that, with the data at hand it is impossible to adjudicate between what could be driving the occupation-level trends 'unexplained' by labour market changes, whether some

occupation-level institutional effect of the kind posited by Grusky and collaborators, or some other unobserved variables, such as that of unobserved skills as posited by some economists. Nonetheless, this chapter will provide evidence on the extent to which there is an 'occupation effect' net of commonly-used independent variables, but the findings are subject to the same disclaimer as nearly every other wage inequality study that there is always unobserved heterogeneity. I leave attempts for a causal account to future research. The aim here is a rather modest one: to establish the hitherto unknown trends.

SOURCES OF CHANGE IN BETWEEN- AND WITHIN-OCCUPATION WAGE INEQUALITY

In this section, factors correlated with occupational employment growth, occupational mean wages, and within-occupation inequality, that have known to have changed over the period under study shall be outlined. The factors are: rising educational attainment, education polarisation, trade union decline, the shift away in employment away from manufacturing to the service sector, the changing composition of public sector employment, the rise in part-time work, increased share of women in the labour force. Each one shall be discussed in turn in relation to their possible role for between- and within-occupation wage inequality. These seven variables can be classified into four broad bundles, each representing a line of explanation as to why wage inequality has changed.

1. Rising returns to skill (rising educational attainment; educational diversity)
2. Sectoral change (decline in manufacturing; changing composition of public sector)
3. Institutional change (decline in collective bargaining coverage)
4. Demographic change (rising female labour force participation; part-time work).

The categories, variables, and prediction by growth rates in occupational shares, occupational mean wages, and occupational inequality are summarised in the table at the end of this section.

1. RISING RETURNS TO SKILL

Rising levels of degree-level attainment is likely to be a key variable in accounting for why some occupations have grown at a faster rate than others and some have declined. More importantly, education is likely to be a key variable in explaining the rapid rise in mean wages of certain occupations, that in turn has led to a rise in between-occupation inequality and so overall inequality. Human capital theory would predict higher mean wages for those occupations where investment in a degree is common and is increasing. The popular SBTC explanation in economics argues rising wage inequality stems from increasing returns to skill induced by technological change reflected in the rising returns to holding a degree.

Table 13. Earnings and employment of graduates relative to nongraduates 1980s-2000s

	Graduate share of employment	Relative weekly wage
1980	5.0	1.48
1985	9.8	1.50
1990	1.2	1.60
1995	14.0	1.60
2000	17.2	1.64
2004	21.0	1.64
Changes		
1980-2004	16.0	.16
1980-1990	5.2	.12
1990-2004	7.0	.04
2000-2004	3.8	.00

Notes: Full-time workers aged 18-64 only, wage ratios derived graduate dummy coefficient of semi-log earnings equation controlling for age and gender.

Source: Machin and van Reenen (2008), derived from General Household Survey and Labour Force Surveys.

As Table 13 above shows, the proportion of the labour force holding a degree quadrupled from 5 per cent in 1980 to 21 per cent in 2004. Table 13 also makes clear that the premium for holding a degree relative to not holding a degree continued to rise with supply, indicating that demand outstripped supply, at least up until the 2000s when the premium began to level out.

The increasing proportion of the labour market with degree-level education (Machin 2009:422) coupled with the rising (but stabilising) returns to holding a degree (Machin 2003:198-199) are well-known. These two forces could account for much of the apparent rise in between-occupation wage inequality observed in the previous chapter, especially in those occupations where the proportion holding a degree increased the most.

Education is likely to have an effect on within-occupation inequality too, for example instances where there is a growing divide between those who hold a degree and those who do not within an occupation. To try and capture such a mechanism, I employ the Simpson's diversity index applied to education qualifications, as do Kim and Sakamoto (2008). Educational diversity within an occupation is captured using the Simpson's Index[6]. The formula is given by $1 - \sum(n_k/N)^2$ where n_k refers to the number of individuals with a given level of educational qualification k within an occupation divided by the total number of individuals within that occupation. Educational qualifications are aggregated into four levels in order to make them consistent over the full span of years: (1) High (degree or higher); (2) medium (A-levels, teaching qualification, nursing qualification, BTEC, HND); (3) low (GCSEs, other vocational qualifications); and (4) no qualifications[7]. The diversity index ranges from 0 to 1 with 0 representing no diversity and 1 representing infinite diversity.

2. SECTORAL CHANGE

Whereas occupations relate to the tasks an employee regularly performs in their job, the sector relates to the product market of the final goods and services produced by a workplace (industrial sector) and also its ownership (whether public or private sector). Previous research

[6] Essentially the same measure of diversity has been implemented before in sociology under the name of the Blau Index, and in economics under the name Hirschman-Herfindahl Index.
[7] I acknowledge the help of the files made available by LSE Research Laboratory in classifying educational qualifications in a consistent way 1979-2008.

has found that even when controlling for other factors including education and occupation, industry wage differentials persist (Benito 2000; Taylor 2006). For instance, a secretary working in the finance industry will be paid more, on average, than a secretary working in the hotel industry, all else equal.

Industrial change was central to some of the initial accounts of growing wage inequality (Harrison and Bluestone 1988). In particular, the collapse in the demand for manufacturing employment led to the wages of some unskilled and semi-skilled occupations to fall, or at least fail to keep up with the overall average growth rate, as the manufacturing sector supported such occupations. We would expect this trend to increase between-occupation inequality as unskilled and semi-skilled occupations shift from the declining manufacturing sector to the growing service sector where they are likely to be lower paid. As for inequality within occupations, the manufacturing sector generally has a relatively compressed wage distribution compared to the service sector. A decline in manufacturing workers in a given occupation should increase inequality in that occupation.

Previous research has shown that, on average, public sector wages are higher than private sector wages, all else equal, although the differential has narrowed somewhat over the last 30 years. The public sector premium does vary by occupation, however. For instance, male managers and professionals in the public sector receive a 3 and 10 per cent penalty respectively relative to their private sector counterparts, whereas male drivers and caretakers receive a 7 and 5 per cent premium respectively (Dolton and McIntosh 2003:221). Nonetheless, we would expect that generally a decline in the proportion of public sector employees within an occupation would increase between-occupation wage inequality. The distribution of wages in the public sector is more compressed than in the private sector hence we would expect a

decline in public sector employment within an occupation would be associated with an increase in within-occupation inequality.

3. INSTITUTIONAL CHANGE

One extremely important institutional change in the labour market is the decline in trade unions. A series of reforms introduced in the 1980s were designed to curb the power of trade unions and they were very successful in achieving this goal. Subsequently, collective bargaining coverage collapsed from 7 in 10 at its zenith in the mid-1970s to 3 in 10 by the 2000s (Metcalf 2003; Fernie 2005). Historically, being a member of a union paid. Throughout the 1980s and 1990s the premium associated with being union member was in the region of 10 per cent when controlling for other factors (Blanchflower and Bryson 2003). By the 2000s, the premium, for males on average was zero (Metcalf 2003). We would expect trade unions to increase between-occupation inequality as the mean wages of occupations covered by collective bargaining coverage would increase relative to those that are not covered. We would also expect their effect to decline over time and perhaps be non-existent after the late 1990s.

With regard to within-occupation inequality, there are several reasons why we might expect trade unions to reduce the dispersion in pay relative to the nonunionised sector. First, trade unions bargain for a rate for the job, not the individual. Second, it is in their interest to compress the pay distribution at the establishment and industry level for solidarity reasons. Third, unions generally operate a *de facto* minimum wage policy, truncating wage dispersion (Metcalf, Hansen et al. 2001). The 'equalising' effect of unions on pay is backed up by the evidence with countless studies showing pay is more compressed in unionised firms than nonunionised firms (Blanchflower and Bryson 2003; Card, Lemieux et al. 2003).

4. DEMOGRAPHIC CHANGE

Aside from structural change, the labour force has changed dramatically over the period in terms of its demographic composition. Four demographic components shall be considered. The first is the rise in female labour market participation. Some occupations are female dominated, some occupations are male dominated. We would expect that an occupation experiencing an influx of female workers would grow. Generally, female occupations are more likely to have below average wages. The increase of females into an occupation should reduce the mean wage of an occupation and increase between-occupation inequality. Women also tend to get paid less than men for a given set of characteristics, even within an occupation. The increase in the proportion of females within a given occupation should increase within-occupation inequality too.

Second and relatedly, there has been an increase in part-time work. Part-time work is generally less-well paid than full-time work in terms of hourly wages, even when controlling for other factors, including occupation. As part-time work has been growing, we would expect a growth in part-time work within an occupation would increase the size of that occupation. An increase in the proportion of part-time workers within a given occupation should reduce its mean wage relative, resulting in a growth in between-occupation inequality. We would also expect an increase in the proportion of part-time workers to increase within-occupation inequality as part-time workers are paid less for a given set of characteristics, even within an occupation, than full-time equivalents.

Summary of variables and hypotheses

Source of variation	Prediction for occupational employment growth	Prediction for occupational mean wages	Prediction for within-occupation inequality
Rising returns to skill			
Proportion with degree or higher	+	+	+
Educational diversity	?	?	+
Sectoral change			
Proportion in manufacturing	–	+	–
Institutional change			
Proportion covered by collective bargaining agreement	–	+	–
Proportion in public sector	+/–	+	–
Demographic change			
Proportion female	+	–	+
Proportion part-time	+	–	+

DATA

The main data source used in this thesis is the *New Earnings Survey/Annual Survey of Hours and Earnings* (NES). The main advantages of these data is that they contain high quality wage data, detailed occupation information, large enough sample sizes to disaggregate by occupation unit-groups, and they cover the period since the mid-1970s when wage inequality rapidly took-off. One disadvantage, however, is that they do not contain education data. In assessing the role of occupations in structuring wage inequality, education is perhaps the most important variable. This weakness rules out multivariate decomposition techniques that require individual-level data. It rules out using occupational fixed effects models whereby the effects of occupation and control variables such as education on overall inequality are estimated simultaneously at the individual-level of the kind in the recent paper by Mouw and Kalleberg (2010). Instead, I follow the occupational-level multilevel growth model approach, as in Kim and Sakamoto (2008) as education-by-occupation data is available in other data sources. Data from multiple sources can then be merged to investigate relationships between the changing composition of occupations and changing occupational outcomes. Although modelling inequality at the individual-level would be the preferred approach, using an occupational-level approach should

not affect the substantive findings as research in the US using both an occupational-level approach and in individual-level approach with occupation fixed effects found broadly similar findings (Kim and Sakamoto 2008; Mouw and Kalleberg 2010)[8].

This chapter investigates three dependent variables: occupational labour force share, mean occupational hourly wages, and the variance of log hourly wages within occupations. Occupational shares are simply the share of total hours worked in a given year accounted for by hours worked in each occupation. Hourly wages were calculated by dividing gross weekly pay excluding over time by normal basic hours per week. Growth rates in mean wages across occupations captures between-occupation inequality to the extent between-occupation inequality is a result of differences in wage growth across occupations. Growth rates in the variance of log wages within occupations captures within-occupation inequality.

An 'occupation dataset' was constructed. Occupational mean wages and within-occupation inequality came from the NES. Data on education and the proportion born overseas within occupations came from successive *Labour Force Surveys*. Data for all other independent variables came from the NES. As with the previous chapter, three consecutive annual samples were combined at a time, centred on a middle year to further increase occupation sample sizes and reduce year-to-year variability in the occupation-level dependent and independent variables.

[8] Mouw and Kalleberg's findings (using an individual-level approach with occupation fixed effects) do differ slightly to Kim and Sakamoto's approach (using a very similar approach to the occupation-level approach in this chapter). The conflicting findings are most likely due to the differing treatments of missing wage data and not due to the differing methodologies (Mouw and Kalleberg 2010: 411-4). Kim and Sakamoto use the hotdeck imputed wage values in already their data as provided by the Census Bureau. However, the wage values are imputed using one-digit occupation codes, thus converting between-occupation inequality into within-occupation inequality (underestimating the former and overestimating the latter), as for instance, "the wages of a nuclear engineer are imputed using the wages of a podiatrist – provided they had the same raced, gender, age, and education" (Mouw and Kalleberg 2010: 413). Mouw and Kalleberg experiment with dropping cases with missing wages and performing their own multiple imputations based on three-digit codes. They find that the differences in their descriptive findings with Kim and Sakamoto's are due to the how the missing wage data is imputed and the growing share of missing wages over time. Fortunately, the NES does not suffer from a large degree of missing wage data.

More detailed information on the data can be found in Appendix A. Details on how occupation unit-groups were constructed in the NES and LFS can be found in Appendix C.

The information derived from these two sources was combined to make a pooled time series cross-section dataset with occupations in a given year as the rows and occupational characteristics (e.g. occupation-specific mean wage, variance in log wages, proportion with a degree, proportion female) as columns (in STATA long format). The diagram below illustrates the data format.

Illustration of data format

SOC90 code	Occupation label	Survey year	Mean log wages	Variance in log wages	Labour force share
100	general administrators; national govern	1979	3.17593	.34995	.000161
100	general administrators; national govern	1980	3.19302	.35031	.000169
--	--	--	--	--	--
100	general administrators; national govern	2008	3.64206	.021095	.000278
101	general managers; large companies and	1979	2.49105	.302481	.000168
101	general managers; large companies and	1980	2.50526	.320584	.001730
--	--	--	--	--	--
101	general managers; large companies and	2008	3.89586	.540808	.002311

All in all, since there are 366 occupation categories × 30 time points = 10,980 cases[9]. In the analyses presented in this chapter, consistent with the previous chapter, the whole period

[9] Creating the occupation dataset also means we lose a few years of data. We lose 1975-1978 as there is no double-coded file with the occupation codes used in these years in the LFS with SOC90. We also lose 1980 and 1982 as the LFS was biannual until 1983. For these missing cells, an average of proportions of degree holders and average proportions born overseas are taken from neighbouring years is used to bridge them. From 1992 onwards, when the LFS became quarterly, only one quarter from the LFS is used – the January-April calendar quarter – as this covers the period that our NES data covers. Finally, there is no occupation data in the first quarter for 1992, so for this year April-June quarter is used.

1979-2008 is divided into the two sub-periods of, first, a period of steeply rising inequality 1979-1996, and second, a period of levelling-out in inequality 1997-2008. For the first period inequality 1979-1996, there are 366 × 18 time points = 6,588 cases. For the second period of inequality 1997-2008, there are 366 × 12 time points = 4,392 cases. In the analyses, occupations units are treated as longitudinal units and their employment shares, mean log wages, and within-occupation variances growth rates are modelled separately conditional a common set of independent variables.

METHOD

Since the main data source does not contain education data, most multivariate regression-based decomposition methods that require individual-level data are ruled out (e.g. DiNardo, Fortin et al. 1996; Fields 2002; Lemieux 2002; Autor, Katz et al. 2008; Firpo, Fortin et al. 2009; Western and Bloome 2009). For instance, Mouw and Kalleberg (2010) simultaneously model the effect of individual-level variables and occupation fixed effects on log wages to calculate portions of changes in overall wage inequality due to occupational mean wages and within-occupation inequality net of individual-level controls such as education. In this chapter, multilevel growth models are employed to examine the sources of variation in between- and within-occupation inequality at the occupational, not individual, level in order to utilise education data from another source. Multilevel growth models were fitted separately for all three dependent variables and separately for the two periods of inequality, conditional on a common set of independent variables.

In the first step, an unconditional model was estimated, with time, as its only independent variable.[10] This baseline model is written as:

$$Y_{jt} = \alpha_j + \beta_j T_{jt} + \varepsilon_{jt}$$

and

$$\alpha_j = \alpha + u_{1j} \qquad (1)$$

$$\beta_j = \beta + u_{2j}$$

where subscript *t* refers to time-points nested within occupation *j*, Y_{jt} refers to the dependent variable (for illustrative purposes, let's refer to Y_{jt} as the occupation-specific mean wage, but the model is essentially the same for modelling trends in occupation employment shares and within-occupation inequality). The year variable, T_{jt}, is coded 0, 1, 2, 3… *k* so that the intercept, α_j, as stated, refers to the initial occupation-specific mean wage, and the slope estimates of $\beta_j T_t$ refer to the rate of change in occupation-specific mean wages from T_{jt}= 0 to $T_{jt} = k$. Growth in occupational mean wages, Y_{jt} , is a function of the initial occupation-specific mean wage, α_j, and its yearly change, $\beta_j T_{jt}$, and an error term, ε_{jt} . The initial occupation-specific mean wage and its yearly change are specified as random variables and so are allowed to vary across occupations. The second and third lines of equation (1) show that the initial occupation-specific mean wage and yearly slope changes each consist of two parts: the first terms (α and β) are fixed parts referring to the grand means of occupation-specific mean wages and the second terms ($u_{1j}$and u_{2j}) are random parts referring to deviations from the grand mean of occupation-specific mean wages of occupation *j*.

[10] The method employed in this chapter is drawn from Kim and Sakamoto (2008), Singer (1998), and Singer and Willet (2003).

By adding independent variables to the baseline model, we can examine the relationship between independent variables and variation in the intercepts and the slopes. The baseline model is extended by adding three sets of independent variables given below:

$$Y_{jt} = \alpha_j + \beta_j T_{jt} + \gamma X_{jt} + \delta\left(T_{jt} \times \overline{X}_j\right) + \zeta \overline{X}_j + \varepsilon_{jt} \qquad (2)$$

The first set, X_{jt}, are the changes in the proportions of the independent variables. The independent variables are the occupation-period-specific proportions of the following characteristics: degree level education or higher; educational diversity (measured by Simpson's index); employment in manufacturing; employment in the public sector; collective-bargaining coverage; female employment; and part-time employment. The coefficient,γ, indicates the effect of a one per cent change in the proportion of an independent variable on occupation-specific rate of growth in occupational mean wages. The second set, $\left(T_{jt} \times \overline{X}_j\right)$, are interactions between time and the occupation-specific means of the independent variables (means of proportions). The coefficient, δ, indicates the change in the effect of an independent variable net of compositional change. The third set, $\overline{X}_j$, are the occupation-specific means of the independent variables (means of proportions). By definition, these are time invariant. Including group-means in the models provides a way of removing possible residual correlation between the random effects and independent variables, which are occupation-specific. Hausman tests statistics show that the null hypothesis that the random effects are uncorrelated with the independent variables cannot be rejected. The coefficient, ζ, shows the relationship between occupation-specific mean wages and groups of workers given by the independent variables (e.g. manufacturing workers) in a specific year. The model given in equation (2) is further expanded by including theoretically important interaction terms between independent variables in separate models. For each dependent variable and time

period, several theoretically important interactions were tested. In order to maintain parsimony, only the statistically significant ones are reported in the results section.

The full model of equation (2) is given by equation (3):

$$Y_{jt} = \left[\alpha_j + \beta_j T_t + \gamma X_{jt} + \delta\left(T_t \times \overline{X}_j\right) + \zeta \overline{X}_j\right] + \left[u_{1j} + u_{2j} T_{jt} + \varepsilon_{jt}\right] \quad (4)$$

where,

$$\varepsilon_{jt} \sim N(0, \Sigma) \text{ and } \begin{bmatrix} u_{1\mathrm{j}} \\ u_{2\mathrm{j}} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{21} & \sigma_2^2 \end{bmatrix}\right)$$

The structural components are $\left[\alpha_j + \beta_j T_{jt} + \gamma X_{jt} + \delta\left(T_{jt} \times \overline{X}_j\right) + \zeta \overline{X}_j\right]$. The growth rates of the dependent variables are assumed to be normally distributed over time, conditional on the independent variables. The stochastic element of the intercepts u_{1j} (variability in the intercepts across occupations) and the stochastic element of the slopes u_{2j} (variability in growth rates of occupation-specific mean wages over time) are assumed to be jointly normally distributed with zero means and a given variance-covariance matrix. The level-one error component, ε_{jt}, is assumed to have a mean of zero and a variance of Σ. Another assumption is that there is a zero correlation between occupations. To empirically test this assumption, I also estimated a panel-corrected standard error model using the same data and variables and found substantively similar results. A final assumption is that basing estimates on three-year moving averages of the original data does not introduce autocorrelation in the errors. Durbin-Watson statistics and Breusch-Godfrey tests both indicate this is indeed the case for all models. The analysis was split into two time periods since trends in overall inequality can be divided into two distinct episodes.

RESULTS

The results section is organised as follows: Multilevel growth estimates for occupational employment shares shall be discussed, followed by estimates for occupational mean wages, then estimates for within-occupation inequality. For each multilevel growth model, the explanatory power of each variable in each model is also reported and discussed to try to ascertain the relative weight of each variable in explaining the observed trends. Consistent with the previous chapter, the analysis is separated by the two time periods, with multilevel growth models for the earlier period being presented and discussed first.

1979-1996

The previous chapter found that the labour market 'hollowed out' whereby there was a decline in middle-paying occupations 1975-1996 and that this employment change alone accounted for between one-quarter (for women) and 40 per cent of the growth in overall wage inequality (for men). The Baseline in Table 14 shows the results from equation (1) with occupational employment shares × 100 1979-1996 as the dependent variable where time is the only independent variable and is specified as a random variable. Model 1 presents the full model of equation (2). Model 2 extends Model 1 by including substantively interesting interaction terms between the independent variables. To maintain model parsimony, in what follows only statistically significant interactions are reported.

In Model 1, only two variables appear to be statistically significantly associated with the growth rates in employment shares of occupations. The first is education. A one per cent increase in degree-holders within an occupation is associated with an increase the employment share of that occupation, net of other variables. This indicates that a growth in education within an

occupation is associated with an occupation growing[11]. The second statistically significant independent variable is public sector employment. A one per cent increase in public sector employment is associated with a decrease in the employment share of an occupation over this period.

Table 14. Multilevel growth estimates of occupational employment shares 1979-1996

	Baseline	Model 1	Model 2
Intercept	2.7325***	2.5457***	2.5464***
Year	-.0064	-.0062	-.0056
Slope change by change in proportion			
Degree-level education		.1312*	.1246*
Educational diversity		.0001	.0001
Manufacturing		.2922	.2818
Public sector		-.2278**	-.236**
Collective bargaining		-.0651	-.0142
Female		.0744	.1575
Part-time		.2626	-.0448***
Collective bargaining × mid-wage			-.2878***
Part-time × low-wage			1.9286***
Yearly slope change by group mean			
Year × degree-level education		.1488	.1434
Year × educational diversity		.1784	.1545
Year × manufacturing		-.4625***	-.4631***
Year × public sector		.0073	.0105
Year × collective bargaining		.1022	.1003
Year × female		.1133	.1047
Year × part-time		.5031**	.51920**
Effect of group mean			
Degree-level education		1.5474	1.5381
Educational diversity		.4558	.3994
Manufacturing		1.4386	1.4412
Public sector		.8675	.8863
Collective bargaining coverage		1.6698	1.6927
Female		-6.9362	-6.9217
Part-time		6.3343*	6.3291*
σ_t^2	.00157	.00144	.00142
σ_{int}^2	2.19000	2.17000	2.15010
$\sigma_{\text{int},t}$	.00415	.00291	.00290
σ_e^2	.00818	.00816	.00815
r_t^w		.08281	.09554
r_{int}^w		.00913	.01826
-2LL	-84015.08	-83826.98	-83547.16
AIC	-85356.98	-84003.09	-83471.15
BIC	-83962.33	-83819.27	-83213.07
N	6588	6588	6588

Source: NES and LFS.

[11] An interaction term (not shown) between proportion with degree-level qualifications and a high-wage dummy was not statistically significant indicating that education is associated with occupational expansion no matter how well-paid an occupation is.

Notes: Dependent variable is occupational employment share × 1000. Estimations are based on three year moving averages centred on a middle-year to increase occupation sample sizes and reduce the influence of year-to-year variability in trends. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

* p <.05; ** p<.01; *** p<.001 (two-tailed).

Model 2 extends Model 1 by including interactions between dummy variables indicating whether an occupation is low-wage, middle-wage, or high-wage. High- and low-wage occupations are defined as those occupations with an average mean wage above or below the overall grand mean of occupational mean wages 1979-1996. High-wage occupations are defined as occupation whose overall mean wage across all time points is one standard deviation *above* the overall grand mean of wages across all occupations and time points. Similarly, low-wage occupations are defined as occupation whose overall mean wage across all time points is one standard deviation *below* the overall grand mean of wages across all occupations and time points. Those occupations that are neither high-wage nor low-wage are defined as middle-wage occupations. Two of these interactions were statistically significant and so were retained in Model 2. In addition, interactions with dummies indicating whether an occupation is low-variance, middle-variance, or high-variance were included in earlier models(defined in the same way as one standard deviation above or below the overall grand mean). None were statistically significant and so were not retained in model two.

Several different substantively interesting combinations of interaction terms were experimented with. First, the interaction term between collective bargaining and middle-wage occupations is negative. When this interaction term is added to the model, collective bargaining remains statistically insignificant. However, the interaction itself is statistically significant and negative, indicating that an increase in the proportion of workers covered by collective bargaining amongst middle-wage occupations is associated with shrinkage in the

employment shares for such occupations. This indicates that middle-wage occupations that experienced a growth in non-covered employees / decline in employees covered by collective bargaining experienced a decline in employment. This finding provides tentative evidence that one of the factors associated with why some middle-wage occupations declined. Note also that slope change by proportion for manufacturing is not statistically significant, nor was its interaction with wage dummies (dropped from the final version of Model 2 and so are not shown). However, the slope change by group mean for manufacturing is negative and statistically significant, indicating that the share of the total labour force employed in manufacturing declined over this period, but since its slope change in proportion for manufacturing is insignificant, we cannot conclude anything about whether a decline in manufacturing within an occupation decreases its overall share in the labour force.

The second statistically significant interaction term is between part-time employment and low-wage occupations. The main effect for the slope change by proportion in part-time employment becomes statistically significant in Model 2 and negative, indicating that an increase part-time employment within an occupation reduces its overall employment share. The interaction term, however, is strongly positive. The magnitude of the interaction coefficient is not offset by the negative main effect, suggesting that the increase in part-time employment amongst low-wage occupations, and only low-wage occupations, is in fact associated with a growth in the employment shares for such occupations (1.9286 - 0.0448 = 1.9734). In other words, an increase in the proportion of part-time employment in a low-wage occupation is associated with a 0.0197 per cent increase in its employment share on average. The group mean by time interaction for the proportion of workers that are in part-time employment is statistically significant and positive in both models. This suggests that

occupations with a high proportion of part-time employees generally grow quicker than those with a low proportion of part-time employees.

The collective explanatory power of the independent variables should not be overemphasised. The collective explanatory power of the independent variables, its 'pseudo *R*- squared', r_t^w, is the difference in the variation in occupational employment growth rates between the Baseline and Model 1 expressed as a proportion of the variation in occupational employment growth rates in the Baseline. In other words, r_t^w shows the reduction in the variation in occupational employment growth rates across time due to the inclusion of the independent variables into the model. The r_t^w is calculated by subtracting the time random effect, σ_t^2 , in the Baseline by the time random effect in Model1, and dividing this by the time random effect for the Baseline i.e. $(\sigma_{t\,\text{Baseline}}^2 - \sigma_{t\,\text{Full Model}}^2)/\sigma_{t\,\text{Baseline}}^2$. The r_t^w for Model 1 in Table 14 is 0.083, indicating that over 90 per cent of the variation in growth rates in occupational employment shares remains unexplained by the independent variables.

Table 14 shows that over this period an increase in the proportion of employees with degree-level education within an occupation is associated with an increase its overall employment share at all wage levels and that an increase in public sector employment is associated with a contraction in an occupation's overall employment share. The increase in low-wage employment in the previous chapter is appears to stem from an increase in part-time employment within such occupations. The fact that the coefficient for slope change in the proportion of female employment within occupations indicates that part-time is more important for the growth in low-wage occupations, and so overall wage inequality. Table 15 shows the explanatory power of each variable in Model 1 in explaining occupational employment shares over the period. The explanatory power for each independent variable is

calculated by excluding an independent variable from Model 1 and re-estimating it. The explanatory power is the difference between the time random effect in the full version of Model 1 and the time random effect re-estimated model as a proportion of the time random effect in the Baseline i.e. $(\sigma^2_{t\ \text{Re-estimated Model 1}} - \sigma^2_{t\ \text{Full Model 1}})/\sigma^2_{t\ \text{Baseline}}$. For instance, the explanatory power for the proportion with a degree or higher in accounting for variation in occupational employment shares is calculated by $(0.00146 - 0.00144)/0.00157 = 0.01274$. The single most important variable is proportion in covered by collective bargaining, but even this only explains just over 2.5 per cent in the variation in growth rates.

Table 15. Explanatory power of predictors on the variation in growth rates of occupational employment shares 1979-1996

	Variation	Change in variation	Proportion explained
Baseline model	.00157		
Full model	.00144		
Rising returns to skill			
Proportion with degree or higher	.00146	.00002	.01274
Educational diversity	-.00132	-.00012	-
Sectoral change			
Proportion in manufacturing	.00145	.00001	.00690
Proportion in public sector	.00146	.00002	.01381
Institutional change			
Proportion covered by collective bargaining agreement	.00148	.00004	.02548
Demographic change			
Proportion female	.00145	.00001	.01031
Proportion part-time	.00145	.00001	.01273

Source: NES and LFS.

Notes: Results obtained by excluding each individual variable from Model 1 in Table 14.

The second way occupations can contribute to overall wage inequality is in terms their mean wages. Table 16 presents multilevel growth estimates of occupational mean log hourly wages for the period 1979-1996 using the common set of independent variables. In the Baseline, the year variable is positive and statistically significant indicating that occupational wages generally grew over the period in real terms. However, we know from the previous chapter that occupational wage growth rates varied across occupations, and this was in fact the main contributor the unprecedented growth in overall wage inequality. This is indicated by the

random intercept being positive and statistically significant i.e. occupations with higher mean wages experienced a greater rate of change. To help facilitate interpretation between high- and low-wage occupations, Model 2 includes several interactions with high- and low-wage dummies[12]. Jointly, all the explanatory variables do a reasonable job in explaining the variation in growth rates of occupational mean log wages over the period, explaining nearly 29 per cent of the variation across occupations.

Table 16 shows that an increase in the proportion of degree-holders is associated with an increase in mean wages, supporting the earlier SBTC view that wage inequality stems from the rising returns to education. The magnitude of a one per cent change in the proportion of degree-holders within an occupation on occupational mean log wages is small, however, when compared to a one per cent change in all other statistically significant variables. Degree-level education explains why generally some occupations pay more than others, as shown by the positive effect of its group mean. Further supporting the earlier SBTC view, the interaction between the group mean for degree-level education and time indicates that the wage premium for education increased 1979-1996, net of compositional change.

Perhaps surprisingly, the slope change by change in proportion in manufacturing is not statistically significant in Model 1, although the effect of the manufacturing group mean is positive, indicating that there is a wage premium for an occupation having a large share in manufacturing. However, the interaction between the group mean and year is not statistically significant, indicating not much can be said as to whether the manufacturing premium increased or decreased over this time period.

[12] Several substantively interesting middle-wage interactions were included in other models, but were never statistically significant and so were not retained in Model 2 in order to maintain model parsimony.

Table 16. Multilevel growth estimates of occupational mean log wages 1979-1996

	Baseline	Model 1	Model 2
Intercept	2.02032***	1.94902***	1.95119***
Year	.02022***	.02045***	.02071***
Slope change by change in proportion			
Degree-level education		.00487***	.00581***
Educational diversity		.01672*	.01230
Manufacturing		.00476	-.01063
Public sector		.13158	.12717
Collective bargaining		.01480***	.02224***
Female		-.22794***	-.22201***
Part-time		-.35749***	-.34493***
Collective bargaining × low-wage			.14455***
Collective bargaining × high wage			-.15226***
Services × high-wage			.19055***
Finance × high-wage			.32705***
Services × part-time			-.47039***
Yearly slope change by group mean			
Year × degree-level education		.04283***	.03981***
Year × educational diversity		.01863***	.01742**
Year × manufacturing		.00817	.00756
Year × public sector		-.02642***	-.02506***
Year × collective bargaining		.03348***	.03214***
Year × female		.05200***	.04954***
Year × part-time		-.00853	-.00059
Effect of group mean			
Degree-level education		.82703***	.38737***
Educational diversity		.59177***	.49111***
Manufacturing		.45378**	.46209**
Public sector		.27710*	.15418*
Collective bargaining coverage		-.11424*	.10459
Female		-.21415***	-.21442***
Part-time		-.56182***	-.36760***
σ_t^2	.00142***	.00102***	.00092***
σ_{int}^2	.05966***	.01784***	.01802***
$\sigma_{\text{int},t}$	.00162***	.00005**	.00004*
σ_e^2	.00181***	.00160***	.00157***
r_t^w		.28671	.35664
r_{int}^w		.70097	.97531
-2LL	-20458.76	-20334.36	-19347.25
AIC	-20382.76	-20270.37	-19335.25
BIC	-20124.67	-20053.03	-19294.49
N	6588	6588	6588

Source: NES and LFS.

Notes: Dependent variable is occupational mean log hourly wages. Estimations are based on three year moving averages centred on a middle-year to increase occupation sample sizes and reduce the influence of year-to-year variability in trends. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases are weighted by occupation size.

* p <.05; ** p<.01; *** p<.001 (two-tailed).

Collective bargaining appears to be an important variable in explaining variation in wage growth across occupations. Model 1 shows that a one per cent increase in the coverage of collective bargaining within an occupation is associated with a 0.0148 point increase in

occupational mean log wages. However, the association between mean wages varies by occupation. Model 2 shows that the interaction term between bargaining coverage and a low-wage dummy results in an even stronger positive effect amongst low-wage occupations, with a one per cent increase in bargaining converge being associated with a 0.0222 + 0.1446 = 0.1668 point increase in mean wages for low-wage occupations. For high-wage occupations, on the other hand, collective bargaining coverage has a negative association with wage growth. Amongst high-wage occupations, a one per cent increase in bargaining coverage reduces occupational mean wages 0.0222 – 0.1523 = -0.1301 points. These two interaction effects indicate that wage inequality might have been reduced had collective bargaining not declined as much as it did, although over the period the wage premium associated with collective bargaining declined shown by the negative sign of the interaction term between bargaining group mean and year. In fact, as Table 17 shows, collective bargaining appears to be the most important variable in explaining variation in growth rates, explaining 9 per cent of the variation.

An increase in female employment within an occupation is associated with a reduction in mean wages. Females are generally paid less than males as indicated by the negative sign for the effect of the female group mean. However, the female group mean interaction with year shows that generally female wages increased over the period. Table 17 shows that female employment explains nearly three per cent of the variation in mean wage growth rates across occupations.

Part-time employment is the only other independent variable to have a negative effect on mean wage growth, i.e. increasing part-time employment in an occupation is associated with a slowing in wage growth. A one per cent increase in part-time employment within an occupation is associated with a -0.0357 point change in mean log wages growth, stronger in

magnitude than the effect of female employment. The reduction in mean wage growth of an occupation associated with an increase in part-time employment is particularly severe amongst the service occupations, as the interaction in Model 2 indicates. A one per cent increase in part-time employment amongst service occupations is associated with 0.3449 + 0.4704 = 0.8153 point reduction in mean wage growth. Patterns in part-time employment explain around 3 per cent in the variation in wage growth across occupations.

Table 17. Explanatory power of predictors on the variation in growth rates of occupational mean log wages 1979-1996

	Variation	Change in variation	Proportion explained
Baseline model	.00142		
Full model	.00102		
Rising returns to skill			
Proportion with degree or higher	.00109	.00007	.05411
Educational diversity			-
Sectoral change			
Proportion in manufacturing	.00105	.00003	.02841
Proportion in public sector	.00107	.00005	.03458
Institutional change			
Proportion covered by collective bargaining agreement	.00116	.00014	.09087
Demographic change			
Proportion female	.000105	.00003	.02864
Proportion part-time	.000106	.00004	.03099

Source: NES and LFS.

Notes: Results obtained by excluding each individual variable from Model 1 in Table 16.

The third way occupations can contribute to overall inequality is by an increase in inequality within occupations. The previous chapter showed, within-occupation inequality grew over this period, but its relative share in accounting for overall inequality declined. The results for multilevel growth estimates of within-occupation inequality 1979-1996 are presented in Table 18. Degree-level education is associated with an increase in within-occupation inequality. Furthermore, wage inequality is generally greater amongst degree-holders, but this has been declining over time as indicated by the interaction between the degree-level education group mean and year. As indicated by the negative sign of the interaction between education and service occupations in Model 2 suggests inequality-producing effect of education is less in

service occupations than non-service occupations. The evidence here suggests that if degree-level education is a measure of the skill of the individual, the rising returns to skill even within

Table 18. Multilevel growth estimates of within-occupation inequality 1979-1996

	Baseline	Model 1	Model 2
Intercept	.16115***	.13795***	.13831***
Year	.00381***	.00214***	.00172***
Slope change by change in proportion			
Degree-level education		.00823***	.01280***
Educational diversity		.01477**	.01368**
Manufacturing		.06186***	.04797***
Public sector		-.04263***	-.03687***
Collective bargaining coverage		-.04472***	-.04382***
Female		.03135***	.01353***
Part-time		.05440***	.22057***
Education × services			-.09251***
Part-time × services			-.09133***
Yearly slope change by group mean			
Year × degree-level education		-.00157	-.00242
Year × educational diversity		.00123	.00111
Year × manufacturing		.00185	.00428
Year × public sector		-.00344	.00038
Year × collective bargaining		-.08158*	-.01275***
Year × female		.00533*	-.00423
Year × part-time		-.00021	.01075
Effect of group mean			
Degree-level education		.21721***	.32435***
Educational diversity		.14614***	.13138***
Manufacturing		-.00163***	-.14669***
Public sector		-.09511***	-.07432***
Collective bargaining		-.04637***	-.07193***
Female		.57401***	.36727***
Part-time		-.01901***	-.26806***
σ_t^2	.00178***	.00150***	.00148***
σ_{int}^2	.00632***	.00336***	.00334***
$\sigma_{\text{int},t}$	-.00015***	-.00012***	-.00011***
σ_e^2	.00079***	.00071***	.00068***
r_t^w		.15730	.16854
r_{int}^w		.46773	.47152
-2LL	-26529.86	-26426.98	-25716.50
AIC	-26461.87	-26294.43	-25704.49
BIC	-2623.95	-26090.67	-25663.73
N	6588	6588	6588

Source: NES and LFS.

Notes: Dependent variable is the variance of occupational log hourly wages. Estimations are based on three year moving averages centred on a middle-year to increase occupation sample sizes and reduce the influence of year-to-year variability in trends. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases are weighted by occupation size.

* p <.05; ** p<.01; *** p<.001 (two-tailed).

narrowly-defined occupations increases overall wage inequality. The increase in within-group inequality is part of the residual wage SBTC hypothesis in economics. Table 19 shows the combined proportion of variation explained by both degree-level education and educational diversity is over 5.4 per cent.

Table 19. Explanatory power of predictors on the variation of growth rates in within-occupation inequality 1979-1996

	Variation	Change in variation	Proportion explained
Baseline model	.00178		
Full model	.00150		
Rising returns to skill			
Proportion with degree or higher	.00158	.00008	.03350
Educational diversity	.00154	.00004	.02220
Sectoral change			
Proportion in manufacturing	.00153	.00003	.01658
Proportion in public sector	.00154	.00004	.01964
Institutional change			
Proportion covered by collective bargaining agreement	.00157	.00007	.03906
Demographic change			
Proportion female	.00149	.00001	.00562
Proportion part-time	.00176	.00002	.01097

Source: NES and LFS.

Notes: Results obtained by excluding each individual variable from Model 1 in Table 18.

Although the manufacturing sector is more equal than other sectors, as indicated by the negative sign of the group mean, perhaps surprisingly, an increase in the proportion of manufacturing employment within an occupation is associated with an increase within-occupation inequality. This is likely to be due to the fact that there is a general wage premium associated with manufacturing employment (as Table 16 indicates), creating a polarisation between those employed in the manufacturing sector and those in the nonmanufacturing sector within an occupation.

As we might expect, an increase in the proportion of employees within an occupation covered by collective bargaining, is associated with a decline in within-occupation inequality. Collective bargaining seems to be the most important predictor of a growth in within-occupation

inequality, explaining nearly 4 per cent of the variation in growth rates. Jointly, the impendent variables in Model 2 explain nearly 16 per cent in the growth rates of within-occupation inequality.

1997-2008

As the previous chapter showed, overall wage inequality stabilised in the later period 1997-2008. The structure of the labour market continued to polarise into high- and low-paying occupations, and there was a further decline in middle-wage occupations. The effect of the polarising structure of the labour market on overall wage inequality was offset by a faster growth in wages for low-paid occupations relative to other occupations. Within-occupation inequality grew slightly for men, and declined slightly for women.

In terms of changes in occupational employment shares, the independent variables do an extremely poor job in explaining the variation in growth rates. The r_t^w for Model 2 in Table 20 shows that less than one per cent of the variation of the growth rates in occupation employment shares is explained by the common set of independent variables, and so the explanatory power of the individual independent variables are not reported. However, the two statistically significant independent variables in Models 1 and the one statistically significant interaction in Model 2, are worth a mention. Model 1 shows that an increase in part-time employment within an occupation is associated with an increase in the employment share of an occupation and the interaction between collective bargaining and whether an occupation is mid-wage indicates that an increase in collective bargaining coverage amongst low wage occupations is associated with a decline in the employment share growth of an occupation. A final noteworthy finding is that the interaction between year and the group mean for public

sector employment is statistically significant and positive, indicating that public sector employment expanded over this period.

Table 20. Multilevel growth estimates of occupational employment shares 1997-2008

	Baseline	Model 1	Model 2
Intercept	2.73170***	2.65340***	2.64940***
Year	.00170	.00183	.00181
Slope changes by change in proportion			
Degree-level education		-.01896	-.18280
Educational diversity		.00388	.0209
Manufacturing		-.26051	-.12304
Public sector		-.03253	-.38210
Collective bargaining		-.00027	.04510
Female		-.00139	.00288
Part-time		.05840**	.63460**
Collective bargaining × mid-wage			-.47320**
Yearly slope change by group mean			
Year × degree-level education		-.00011	-.00010
Year × educational diversity			
Year × manufacturing		.00739	.00685
Year × public sector		.00014***	.00014***
Year × collective bargaining		-.00009	-.00255
Year × female		.00025	.00038
Year × part-time		-.00038	-.00038
Effect of group mean			
Degree-level education		.00502	.00503
Educational diversity		.00304	.00301
Manufacturing		-.23904	-.22956
Public sector		.00340	.00333
Collective bargaining coverage		-.00265	-.00255
Female		-.01205	-.01207
Part-time		.00226	.00231
σ_t^2	.00289	.00287	.00287
σ_{int}^2	2.83000	2.75000	2.75000
$\sigma_{\text{int},t}$	-.02320	-.02340	-.02350
σ_e^2	.00697	.00713	.00712
r_t^w		.00692	.00692
r_{int}^w		.07810	.08414
-2LL	-55294.44	-53539.46	-53470.48
AIC	-55282.45	-53475.45	-53394.49
BIC	-55244.12	-53271.83	-53152.69
N	4389	4389	4389

Source: NES and LFS.

Notes: Dependent variable is occupational employment share × 100. Estimations are based on three year moving averages centred on a middle-year to increase occupation sample sizes and reduce the influence of year-to-year variability in trends. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence.

* p <.05; ** p<.01; *** p<.001 (two-tailed).

In terms growth rates in occupational mean log wages, Table 21 shows that year variable is statistically significant and positive, indicating that generally occupational wages grew over this

Table 21. Multilevel growth estimates of occupational mean log wages 1997-2008

	Baseline	Model 1	Model 2
Intercept	2.35755***	2.17226***	2.09148***
Year	.01030***	.00960***	.01112***
Slope changes by change in proportion			
Degree-level education		.15143***	.13618**
Educational diversity		.06754*	.03653*
Manufacturing		-.05707	-.19593
Public sector		.11882***	.09485***
Collective bargaining		.08836***	.08281***
Female		-.22437***	-.20416***
Part-time		-.03428	-.05932
Public sector × low-wage			.69420***
Female × high-wage			-.44826**
Part-time × low-wage			.37927***
Yearly slope change by group mean			
Year × degree-level education		-.00899	-.00887
Year × educational diversity		-.00518	-.00517
Year × manufacturing		.00613	.00440
Year × public sector		-.00199	-.01320
Year × collective bargaining		.00293	.00360
Year × female		.01098	.03061
Year × part-time		.02400***	.02099***
Effect of group mean			
Degree-level education		.59919***	.52573***
Educational diversity		.09529	.07369
Manufacturing		-.14988	-.156803
Public sector		.21873	.11050
Collective bargaining coverage		.16630	.12905
Female		-.20033***	-.15703***
Part-time		-.15465***	-.16925***
σ_t^2	.00219***	.00159***	.00156***
σ_{int}^2	.16132***	.13822***	.13408***
$\sigma_{\text{int},t}$	-.00350***	-.00409***	-.00394***
σ_e^2	.00156***	.00132***	.00132***
r_t^w		.27397	.28767
r_{int}^w		.14319	.16886
-2LL	-13048.208	-12964.63	-12331.84
AIC	-12972.21	-12894.63	-12319.84
BIC	-1273.41	-12671.92	-12281.52
N	4389	4389	4389

Source: NES and LFS.

Notes: Dependent variable is occupational mean log hourly wages. Estimations are based on three year moving averages centred on a middle-year to increase occupation sample sizes and reduce the influence of year-to-year variability in trends. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases are weighted by occupation size.

* p <.05; ** p<.01; *** p<.001 (two-tailed).

period. However, as was shown in the previous chapter, wage growth between occupations was unequal: occupations with mean wages towards the lower end of the distribution experienced wage gains greater than those for higher-paying occupations. The interactions in

Model 2 provide some evidence to this finding. The interaction between a low-wage dummy and public sector employment is statistically significant and positive. Similarly, the interaction between a low-wage dummy and part-time employment is statistically significant and positive, perhaps indicating a National Minimum Wage (NMW) effect. This therefore provides some indirect evidence for possible reasons behind the unprecedented wage growth at the lower-end of the wage distribution during the New Labour period, which, as the previous chapter demonstrated, was one of the main reason why wage inequality stabilised during this time. Furthermore, the interaction between year and part-time employment group mean in both Models 1 and 2 is statistically significant and positive, indicating that wages for part-time work generally grew 1997-2008. The introduction of the NMW in 1997 only affected handful of occupations that have a high concentration of part-time workers (Stewart 2004; Metcalf 2008). Model 2 also provides some evidence as to why the wage growth of higher-paying occupations was slow compared to other occupations: the interaction between a high-wage dummy and female employment is negative, indicating that the negative of effect on wage growth of a one per cent change in female employment is even greater in magnitude amongst high-wage occupations compared to the main effect for all other occupations.

A one per cent increase in the proportion with a degree, the proportion covered by collective bargaining, the proportion in public sector employment, are all associated with a statistically significant increase in occupational mean wage growth. Interestingly, an increase in one unit of diversity in educational qualification within an occupation also has statistically significant positive effect on occupational mean wage growth, albeit only at the 5 per cent level. Collectively, the independent variables do a relatively good job in accounting for differences in mean wage growth rates, explaining around (the r_t^w in Model 2 Table 21 is 28.8 per cent). Specifically, Table 22 shows that just over a quarter this accounted for by growth rates in part-

time employment patterns (7 per cent), 6 per cent by the proportion holding a degree, 5.8 per cent by the proportion female, and 5.5 per cent by the proportion in public sector employment.

Table 22. Explanatory power of predictors on the variation in growth rates of occupational mean log wages 1997-2008

	Variation	Change in variation	Proportion explained
Baseline model	.00219		
Full model	.00159		
Rising returns to skill			
Proportion with degree or higher	.00173	.00014	.06392
Educational diversity	.00161	.00002	.01005
Sectoral change			
Proportion in manufacturing	.00159	.00000	-
Proportion in public sector	.00171	.00012	.05480
Institutional change			
Proportion covered by collective bargaining agreement	.00163	.00004	.01912
Demographic change			
Proportion female	.00172	.00013	.058264
Proportion part-time	.00175	.00016	.072192

Source: NES and LFS.

Notes: Results obtained by excluding each individual variable from Model 1 in Table 21.

In terms of growth rates in within-occupation inequality, the collective explanatory power, r_t^w, of the independent variables in Model1 in Table 23 is poor, explaining just over 2 per cent of the variation in within-occupation inequality growth rates across occupations. The explanatory power of individual variables is therefore not reported. The year variable is statistically insignificant indicating that there was no statistically significant general trend in inequality within-occupations over this period. One noteworthy finding emerges. The previous chapter showed within-occupation inequality increased for male high-variance occupations but decreased for female high-variance occupations. This is corroborated by the statistically significant and negative interaction between the proportion of female workers and a high-variance dummy in Model 2. The other statistically significant interaction in Model 2 is the negative association between a one per cent increase in part-time employment and within-occupation inequality.

Table 23. Multilevel growth estimates of within-occupation inequality 1997-2008

	Baseline	Model 1	Model 2
Intercept	.18499***	.14497***	.15023***
Year	.00232	.00178	.00163
Slope change by change in proportion			
Degree-level education		.04213**	.02008**
Educational diversity		.00467	.00452
Manufacturing		-.90212	-.77658
Public sector		-.00918	-.03927
Collective bargaining		-.06273***	-.05961***
Female		-.01955	-.05739
Part-time		.03188	.01239
Female × high-variance			-.03151***
Part-time × high-variance			-.02579***
Yearly slope change by group mean			
Year × degree-level education		-.00425	-.00380
Year × educational diversity		-.00663	-.00574
Year × manufacturing		.00203	.08869
Year × public sector		.00083	.00864
Year × collective bargaining		.00599	.00822
Year × female		.02981	.01036
Year × part-time		-.00925	-.00925
Effect of group mean			
Degree-level education		.20499***	.25669***
Educational diversity		.09116	.04367
Manufacturing		.87206	.55322
Public sector		-.09606	-.04764
Collective bargaining coverage		-.19798***	-.15579***
Female		-.02852*	-.02442*
Part-time		-.02968	-.02962
σ_t^2	.00043***	.00042***	.00042***
σ_{int}^2	.00628***	.00394***	.00237***
$\sigma_{\text{int},t}$	-.00165***	-.00132****	-.00095***
σ_e^2	.00590***	.00547***	.00518***
r_t^w		.02326	. 02326
r_{int}^w		.372611	.622611
-2LL	-17524.70	-17367.15	-17523.13
AIC	-17512.70	-17455.13	-17297.15
BIC	-17474.38	-17238.80	-17074.46
N	4389	4389	4389

Source: NES and LFS.

Notes: Dependent variable is the variance of occupational log hourly wages. Estimations are based on three year moving averages centred on a middle-year to increase occupation sample sizes and reduce the influence of year-to-year variability in trends. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; cases are weighted by occupation size.

* p <.05; ** p<.01; *** p<.001 (two-tailed).

CONCLUSIONS

Wage inequality took off between 1975 and 1996. Its growth slowed and stabilised thereafter. The previous chapter showed that between 1975-1996, the labour market 'hollowed out' whereby there was a decline in middle-paying occupations and a growth in high- and low-paying occupations. The employment effect alone accounted for between one-quarter (for women) and 40 per cent of the growth in overall wage inequality (for men) during this time. This chapter found the decline in middle-wage occupations is partially associated with collective bargaining coverage. The simultaneous growth in low-wage employment can also be partially attributed to an increase in part-time work. Collectively, the independent variables explain around 8-9 per cent of the variation in growth rates in occupational employment shares.

The previous chapter found that the main way occupations contributed to the rapid rise in wage inequality was by already high-paying occupations receiving the largest wage gains accounting nearly half the growth inequality for men and just over 45 per cent for women. This chapter found that the independent variables explain around 29-36 per cent of the variation in the growth of mean log wages across occupations over the period 1975-1996. The most important variable in explaining the variation in occupational mean wages is collective bargaining coverage, explaining 9 per cent. Interaction effects reveal that collective bargaining coverage raises the mean wages of low-wage occupation and lowers the wages of high-wage occupations, indicating that the decline in collective bargaining coverage was a key driver in the mean wage effect. The increase in degree level education was found to increase occupational mean wages, supporting the SBTC view that one of the main drivers for wage inequality has been the growth in degree-holders. However, the relative weight of the proportion with a degree in explaining differences in mean wage growth is smaller than that for collective bargaining, explaining 5 per cent.

In terms of within-occupation inequality, the previous chapter showed that it played a small relative role in the growth of overall wage inequality 1975-1996, accounting for less than ten per cent for men and a quarter for women. The independent variables explain around 9 per cent in the variation of within-occupation inequality growth across occupations. Two variables are found to contribute to most of the explained portion: An increase in degree-holders within an occupation is positively associated with an increase in within-occupation inequality and accounts for 5.4 per cent in the variation of within-occupation inequality growth rates across occupations. Collective bargaining coverage is associated with decrease in within-occupation inequality growth rates and accounts for 4 per cent of the variation in growth rates across occupations.

From 1997-2008 overall wage inequality and inequality growth remained broadly flat for the whole decade. The structure of the labour market continued to polarise by a continual decline in middle-paying occupations with a simultaneous growth in high- and low-paying occupations. This effect of the occupational structure on changes in overall inequality was offset by a faster growth in wages for low-paid occupations relative to other occupations. This chapter finds that an increase in public sector and part-time employment is positively associated with wage growth in low-wage occupation, perhaps indicating a minimum wage effect and a general expansion in public sector employment which tend to fall in the middle of the wage distribution. On the whole, then, it appears that New Labour helped temper wage inequality. Generally the independent variables do a good job in explaining variation in occupational mean wages, explaining between 27-29 per cent, but do an extremely poor job in explaining variation in occupational employment share growth rates, explaining less than 1 per cent and less than 2 per cent for within-occupation inequality growth rates.

Aside from the specific sources of variation in sources of occupational wage inequality, a key finding of this chapter is that generally most of the variance in occupational employment growth, mean wage growth, and internal inequality growth, are unexplained, especially for employment shares and within-occupation inequality, by conventional independent variables. This suggests that most of the variation is due to occupation-specific factors and not due to the changing composition of incumbents within occupations. In other words, the independent variables presented in this chapter, which provide the basis for standard accounts for wage inequality, do not explain away the 'occupation effect' on wage inequality. These occupation-specific factors could include institutional factors at the occupational level such as occupational closure, unobserved ability / selection into occupations, and workplace- level factors correlated with occupation. In short, this chapter has demonstrated that although changes in the composition of incumbents within occupations has had some effect on how occupations structured the growth in wage inequality, their overall effect is limited, suggesting occupations themselves really did structure the growth in wage inequality. Coupled with the findings of key occupations inequality-producing occupations in the previous chapter, the fact that commonly-used independent variables do little in explaining away occupation effects provides a fruitful avenue for further research as to why specific occupations, or perhaps specific kinds of occupations, contribute to overall wage inequality. These two findings point toward explanations in the literature such as 'occupation-based rents', that is, not due to observable human capital characteristics, as the earlier SBTC literature suggested. The next chapter takes a very preliminary step in this direction by grouping occupations into social classes and then examines the relationship between these broad groupings – which are supposed to proxy employment relations – and trends in overall wage inequality.

DESCRIPTIVE STATISTICS TO FACILITATE INTERPRETATION OF MULTIVARIATE MODELS

Table 24. Descriptive statistics for occupations 1979-1996

	1979			1996			Total 1979-1996		
	Mean (SD)	Min	Max	Mean (SD)	Min	Max	Mean (SD)	Min	Max
Mean wage	8.2382 (2.3901)	4.2008	18.6846	12.1182 (6.0303)	4.8027	60.7437	10.3525 (4.311)	3.9602	60.7436
Mean log wage	2.0024 (0.253)	1.3363	2.7738	2.3299 (.3982)	1.4327	3.8590	2.1920 (.3376)	1.2935	3.8503
Within-occupation inequality	.14355 (.0831)	.01921	1.0424	0.1484 (0.0845)	.02123	.54338	.15536 (.07920)	.01124	1.0421
Employment share × 100	.2732 (.4688)	.0019	3.670	.2732 (.5306)	.0024	4.891	.2732 (.4922)	.0009	4.8911
Degree or more*	.0824 (.1282)	.0000	1.0000	.1683 (0.2358)	.0000	.9867	.1363 (.2043)	.000	1.000
Educational diversity*	.5516 (.1315)	.1300	.7358	.5722 (.1338)	.0009	.7299	.5711 (.1252)	.0009	.7454
Manufacturing	.4526 (.3242)	.0000	0.9729	.3988 (0.3614)	.0000	1.0000	0.4257 (0.3416)	.0000	1.0000
Services	.4529 (.3110)	.00462	1.0000	.4970 (0.3651)	.0000	1.000	0.4722 (.3340)	.0000	1.0000
Finance	.06236 (.1045)	.0000	.8443	.0976 (0.1622)	.0000	.9445	.0827 (.1335)	.0000	.9756
Public sector	.3732 (.2798)	.0108	1.0000	.2379 (0.3016)	.000	.9966	.3285 (.3042)	.0000	1.0000
Collective bargaining	.4667 (.2084)	0.0370	.982	.3318 (0.2129)	.01111	.9812	.3885 (.2417)	.0000	1.0000
Female	.2783 (.2486)	.0008	.9544	.2977 (.2999)	.0000	.9984	.2914 (.2663)	.0000	1.000
Part-time	.1058 (.1272)	.000191	.770583	.1352 (.1712)	.0000	.8937	.1153 (.1445)	.0000	.9540
Age > 45	.3243 (.1189)	.0433	.773	.3317 (.1102)	.0369	.7623	.32103 (.1097)	.02702	.7849
N	366			366			6588		

Sources: NES and LFS (*).

Table 25. Descriptive statistics for occupations 1997-2008

	1997			2008			Total 1997-2008		
	Mean (SD)	Min	Max	Mean (SD)	Min	Max	Mean (SD)	Min	Max
Mean wage	12.2326 (6.4925)	4.3592	79.5681	13.4469 (5.7077)	6.0803	46.6737	13.1034 (6.3186)	4.3592	89.5466
Mean log wage	2.3426 (0.3948)	1.4997	4.0847	2.4422 (0.3392)	1.7795	3.6013	2.4142 (0.3668)	1.4997	4.2707
Within-occupation inequality	.1397 (.0827)	.0200	.6001	.1539 (.0866)	.0228	.6224	.1395 (.0836)	.0177	.9057
Employment share × 100	.2732 (.5357)	.0025	5.0760	.2732 (.6233)	.0016	6.5420	.2732 (0.5791)	.0011	6.5420
Degree or more*	.1628 (.2390)	.0000	1.0000	.2310 (.1062)	.0000	1.0000	.202 9(.1702)	.0000	1.0000
Educational diversity*	.5367 (.13354)	.0000	.7167	.6922 (.0245)	.0000	.7396	.6481 (.0994)	.0000	.7493
Manufacturing	.3989 (.3584)	.0000	1.0000	.3337 (.3145)	.0000	.9385	.3664 (0.3367)	.0000	1.0000

Services	.5005	.0000	1.0000	.5321	.0189	1.0000	.5182	.0000	1.0000
	(.3569)			(.3183)			(.3364)		
Finance	.1006	.0000	0.9298	.1338	.0000	.9084	.1152	.0000	.9362
	(.1590)			(.1661)			(.1604)		
Public sector	.2133	.0000	1.0000	.1995	.0000	.9981	.2049	.0000	1.0000
	(.2949)			(.2678)			(.2801)		
Collective	.3555	.0333	1.0000	.3398	.0000	.9902	.3097	.0000	1.0000
bargaining	(0.1924)			(.2098)			(.1921)		
Female	.2983	.0000	1.0000	.3289	.0000	.9875	.3130	.0000	1.0000
	(.2985)			(.2685)			(.2826)		
Part-time	.1387	.0000	.8929	.1685	.0000	.8128	.1521	.0000	.9166
	(.1732)			(.1570)			(.1679)		
Age > 45	.3357	.0343	.7308	.4053	.0741	.7888	.3722	.0343	.7916
	(.1122)			(.1312)			(.1164)		
N	366			366			4392		

Sources: NES and LFS (*).

– 5 –

SOCIAL CLASS AND WAGE INEQUALITY

"[D]ecades of class analysts have been pursuing what amounts to minor class variation on an occupational theme."

(Grusky and Weeden 2002:233)

"Grusky's [...] concentration on the occupational level leads to a neglect of what [...] members of different occupational groupings have in common."

(Goldthorpe 2007b:152)

INTRODUCTION

One of the most striking trends in the British labour market over the past thirty years or so was the considerable growth in wage inequality. Despite the significance of this trend, relatively little attention has been paid to it by sociologists. Whereas the previous chapters examined the relationship between occupations at the most detailed level and how they shaped

trends in wage inequality, this chapter seeks to provide a descriptive account of the reverse question, how did the growth in wage inequality play out in terms of social class? Social class is perhaps the most commonly-used and well-known category in stratification research. What exactly social class means and how it is to be operationalised are quite contested issues (for example, see Wright (2005) for a comprehensive overview of the main contemporary theoretical strands in approaches to class analysis). In this chapter, I take social classes to denote broad bundles of detailed occupations, grouped in accordance to their similarities in underlying employment relations.

Chapter 3 established that the growth in wage inequality 1975-1996 was largely between occupations in the main due to the highest-paying occupations receiving the greatest wage gains and the collapse in the employment of middle-paying occupations. Furthermore, Chapter 3 also established that the dynamics of changing wage inequality were concentrated amongst a few occupations with no definite indication that certain broad kinds of occupations were behind wage inequality trends implying occupational employment and wage dynamics might be highly fragmented in terms of wage inequality. This might further imply that wage inequality dynamics at the detailed occupational level mean broader occupational groupings such as that of social class may be doing an increasingly poor job of capturing stratification in the labour market as occupations pull apart meaning class inequalities are becoming less organised along conventional class lines, but more along detailed occupational lines. On the other hand, occupational movements could be moving in a fairly uniform way that actually strengthens class inequalities, not captured in Chapter 3.

Since social class is so fundamental to stratification research, it is necessary to determine how the growth in wage inequality played out in terms of social classes as well as detailed

occupations. The purpose of this chapter is to empirically assess one main question coming out of the findings in the previous chapters where the focus was at the detailed occupational level: Does a growth in wage inequality imply a strengthening or weakening of the big class structure?

Before the above can be addressed, it is first necessary to outline the two competing contemporary conceptualisations of social class – big classes and micro classes – and another third viewpoint that dismisses social class as a category for contemporary research altogether. Whether or not social class could be said to be an 'explanation' in some sense for levels or changes in wage inequality or wages in general is not so much the focus of this chapter. This is consistent with the view of class as 'nominalist' categories whereby they are abstractions of reality rather than representing real structures in the labour market. The focus of this chapter is on examining social class as a category for research in relation to a fundamental dimension of economic inequality, that of wages, and how the well-known growth in wage inequality has played out in terms of social class. The next three sections outline three possible relationships between growing wage inequality and social class.

1. BIG CLASS ANALYSIS

The most commonly applied conceptualisation of social class is in terms of big classes. In fact, there is a whole industry based around social class – especially the influential Goldthorpe schema – and its close relatives. It has been used extensively for many years in many fields such as education stratification, social mobility, employment, cultural consumption, identity, and health inequalities. Yet sociologists have not extensively studied class in relation to wages which may seem surprising given the most influential view of the basis of big classes states that

social class is rooted in the labour market, specifically in terms employment relations (Goldthorpe 2000:206-229) which also determine wages and bargaining power.

Although there are several approaches to big class theory, one that has achieved much dominance is the EGP or Goldthorpe schema (Goldthorpe 1997; Goldthorpe 2000). Goldthorpe (2000) posits that class (dis)advantage is rooted in employment relations. Broad class categories combine detailed occupational categories whose members experience fairly homogenous forms of regulation of employment in terms of their sources and levels of income, their degree of economic security and their chances of economic advancement. More generally, class categories combine members who experience fairly homogenous location within the systems of authority and control governing the process of production in which the engaged, and hence their degree of autonomy in performing their work tasks and roles. Goldthorpe (2000: 213) draws upon transaction cost economics to explain why different forms of relationships exist in terms of sources of 'contractual hazard'. There are two main dimensions. First, the degree of difficulty involved in monitoring the work performed by employees. Second, the degree of specifity of the human assets/capital possessed by the employee in relation to the employer.

Three main kinds of employment relations emerge from this 'contractual hazard': a service relation (salariat/white-collar), a labour contract (working class/blue collar), and a mixed form (intermediate). The service relationship is characterised by a mutual dependence between the employer and employee as the employee embodies valuable firm-specific knowledge and the work is difficult to monitor. As such the service relationship is characterised by career advancement, being salaried rather than hourly-paid, and a high degree of autonomy over the work process. The labour contract, by contrast, is characterised by relatively easy to monitor

work and little firm-specific knowledge is required to do the job competently. Thus the labour contract is characterised by a short-term time horizon, where discrete amounts of effort is exchange for discrete amounts of pay. The mixed form describes employment relations that fall somewhere between these two extremes. NS-SEC, the variant of the Goldthorpe class schema that is adopted in this chapter, has been reasonably validated in relation to the two underlying sources of 'contractual hazards' in a recent study (McGovern, Hill et al. 2007:72-80). Earlier versions of Goldthorpe's conceptualisation of social class categories have been validated too (Evans 1992; Evans and Mills 1998; Evans and Mills 2000). However, none of the validations have consistently examined the over time dimension.

Tåhlin (2007) recently challenged this theory of big classes by arguing that social class categories actually represent skill groupings rather than dependence relations, presenting evidence with Swedish data for his case. Whether or not the basis of social class reflects employment relations or skill content of the job is not really the issue here. Rather, the main implication from these theories for chapter's purposes is that a small number of clear-cut big classes can be identified and that they are internally 'fairly homogonous', implying growing wage inequality should be between classes.

2. *MICRO CLASS ANALYSIS*

Kim Weeden, David Grusky, and collaborators, writing in the American context, suggest that stratification might be better captured by a more fine-grained notion of class. Big classes, it is argued, obscure much inequality within them to the extent there might be more inequality within big classes than between them. This is because advantage of particular classes occurs at the occupational level rather than the big class level and Weeden, Grusky and collaborators use the 'closure movement' or 'professionalization' as examples of this (e.g. Grusky and Weeden

2001; Weeden 2002; Weeden and Grusky 2005; Weeden, Kim et al. 2007). Growing wage inequality might be a direct result of such occupational-level rent creation within social classes. This chapter contributes to the big class versus micro class debates by leaving the extent to which the overall variation in wages is mainly due to variation at the big class or micro class level as an empirical question. A recent paper investigating the role of big classes versus and micro classes in accounting for trends in social mobility across four advanced industrial societies found "much of what shows up as big class reproduction in conventional mobility analyses is in fact occupational reproduction in disguise" (Jonsson, Grusky et al. 2009:977).

Although primarily concerned with how social class research should be conducted in general, a trend argument could be made for micro class analysis specifically with reference to the EGP schema. Difficulty of monitoring could be getting easier given technological changes for some occupations more than other or that asset specificity matters less than it once did for some occupations such as those that are project-based where an employee is tied to a particular expertise rather than a firm. This does not necessarily imply an across-the-board 'rent destruction' (Sørensen 2000) but could indeed be class-biased at the big class or micro class level. The upshot of micro class arguments for this chapter is that as overall wage inequality grew, the growth mainly stemmed from between occupations within social classes moving apart.

3. POST CLASS ANALYSIS?

A third view suggest that class, whether big or micro, no longer captures stratification very well as it once did due to fundamental changes in the social structure. One example of such a theory is Ulrich Beck's concept of 'individualization'. In short, 'individualization' means traditional groupings such as social class no longer matter for inequality. In terms of rewards

in the labour market such as wages, the supposed 'individualization' trend should not be equated with a more equal or homogenised society, as Beck states "capitalism without classes does not mean less inequality in the future, it will mean more" (Beck and Beck-Gernsheim 2001:207). One could interpret this as a prediction of increased within-class inequality whereby inequality between individuals is more pronounced than inequality between classes, at whatever level of aggregation they are defined. By extension, such theories would also predict that the growth in wage inequality was within big classes as well as within occupations. The issue, then, is not one regarding classification whereby classes could capture inequalities if they were redrawn. Similar theories were encountered in previous chapters that suggest the growth in wage inequality was within occupations due to destruction of rents in the labour market (Sørensen 2000).

Interestingly, in one of the few attempts to test the 'individualization' thesis, Heath et al. (2007) found that most people in Britain still identify with a social class and this has stayed relatively stable over time. Interestingly for this chapter, further research on social class and identity, Heath finds although most people in Britain still define social class in terms of occupation, the relative share reporting that they define it in terms of income has doubled (Heath unpublished) while the proportion stating that they define social class in terms of occupation is steadily declining. This trend could be reflecting a real growth in within-class inequality.

In the economics literature, the main explanation put forward for the long term secular rise in wage inequality is skill-biased technological change. In brief, SBTC refers to the long-term secular trend of technological change benefiting the 'skilled' relative to the 'unskilled'. SBTC generally predicts within-group inequality, especially for skilled workers, as the returns to

unobserved skills rises with technological change[13]. Residual inequality is generally found to be more important in accounting for overall inequality than by observed factors, even in Britain (Prasad 2002). A more recent theory of class categories posits that they more or less represent skill-requirements for the job (Tåhlin 2007) and so results can be read-off in terms of skill-groups rather than different big classes of differing employment relations, bringing the interpretation of results more in line with SBTC-type debates.

A MODEL FOR INVESTIGATING EARNINGS INEQUALITY AND THE SOCIAL STRUCTURE

Theoretically, it is not clear-cut whether a growth in wage inequality strengthens big classes or weakens them. The growth in wage inequality can be big class strengthening *or* big class weakening, representing something of a 'class conundrum'. This can be demonstrated using a diagram illustrating two hypothetical situations (Weeden, Kim et al. 2007:706-7). In Figure 18, for simplicity, suppose there are only three big classes. Nested within each big class, BC, there are three micro classes, MC (i.e. occupations). In turn, nested within each micro class are individuals (represented by the dots). The vertical axes represent log wages. The transition from Time 1 to Time 2 in Panel A shows a situation where the between-class component is growing, and the between-occupation component is trivial. This would be class strengthening as the distance between big classes in terms of their log pay would be growing and occupations

[13] Several technology-related reasons have been put forward for why this might be so, for instance more skilled workers are in a better position to make-use of new technology such as computers and receive a premium (e.g. Krueger 1993); technology depresses the wages of unskilled workers relative to skilled workers as technology can replace routine jobs but not nonroutine jobs (e.g. Autor, Katz, et al. 2006); higher-skilled workers are sorted into more productive workplaces and it is the growing inequality in firm between-firm productivity related to adoption of new technology that partially accounts for the increasing unexplained (by observed individual factors) variance in wages (e.g. Faggio, Salvanes et al. 2007; Lane 2009).

within big classes are tightly bunched together. The transition from Time 1 to Time 2 in Panel B shows a situation where the between-occupation component is more dominant than the between-class component, to the extent that there considerable overlap between the big classes. Panel B therefore shows a case where the three big social classes have become less distinct, and there are essentially nine micro classes instead. This would therefore represent a situation where big classes have weakened and as such wage inequality would better be captured by a more fine-grained class schema based around micro classes. Both Panel A and Panel B show situations where overall inequality has widened both having different implications for the coherence of big classes in relation to wages. This chapter seeks to address whether Panel A or Panel B best represents what happens to big classes when inequality rises using Britain as a critical case.

Following on from the theoretical model represented in Figure 18, it is possible to answer the first question posed earlier by apportioning the growth in earnings inequality into the following three categories:

i. *Between class* – inequality occurring between big classes.

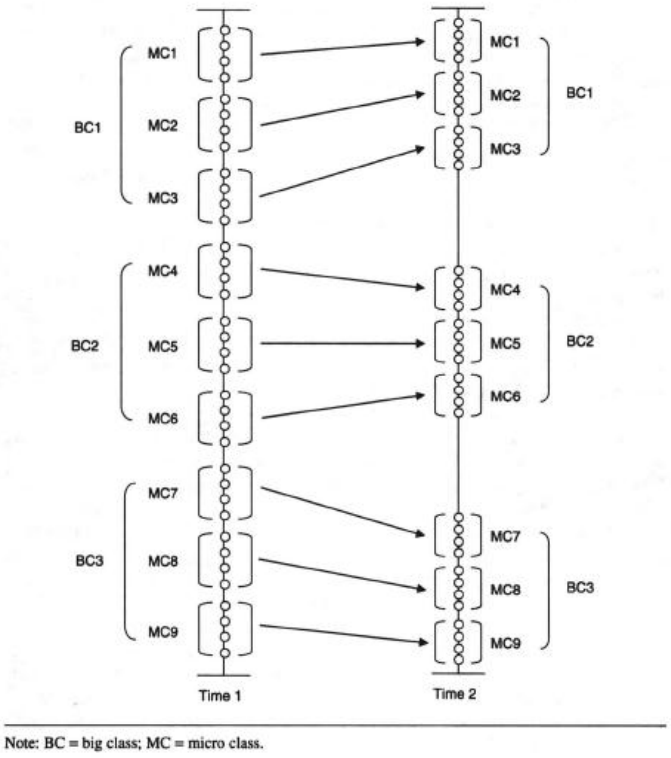
ii. *Within class/between occupation* – inequality occurring between the detailed occupations that make up the aggregate big classes.

iii. *Within occupation* – inequality occurring between individuals within detailed occupations.

Investigating what a growth in wage inequality implies for the class structure is an interesting endeavour in its own right. Investigating the relative and absolute proportions of inequality occurring within these three categories sheds light whether or not a growth in wage inequality implies stronger big classes, or a more fine-grained stratification in the labour market.

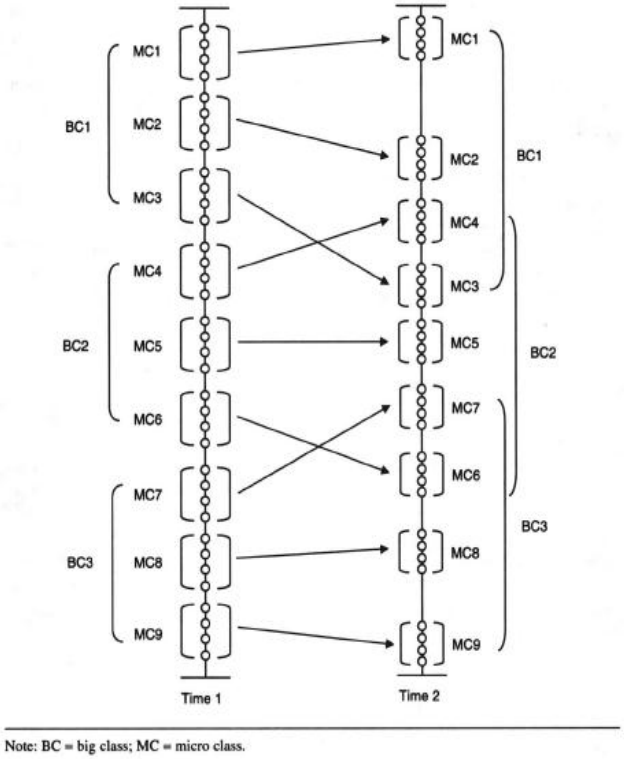
Figure 18. Hypothetical class regime transitions

Panel A: Transition to a big-class regime



Note: BC = big class; MC = micro class.

Panel B: transition to a micro-class regime



Note: BC = big class; MC = micro class.

From Weeden, Kim et al. (2007:706-7).

DATA

The data comes from *New Earnings Survey/Annual Survey of Hours and Earnings* (NES), creating a series covering the years 1975-2008. The surveys cover the years 1975-2008 – the period when wage inequality really 'took off' 1980s-1990s – which is important given the questions set out in the introduction. Furthermore, the large sample sizes of *NES* allow a disaggregation of inequality at the most detailed occupational level – a luxury not afforded by any other survey

with wage data spanning so many years. Samples were constructed in the same ways as in the previous chapters. More information on the data source can be found in Appendix A.

CLASSIFYING OCCUPATIONS

Occupations are classified according to a coding procedure obtained from information based on job title and job description for each employee given by the employer. Each job title is then manually classified into a detailed occupational schema with several hundred categories by a coder trained in how to do this. The fact that occupation classification systems are so detailed allows for a very detailed level of disaggregation of the variance in overall inequality. In this way, it is possible to examine whether or not a rise in wage inequality implies a more fine-grained class structure at the most detailed possible level. However, a potential drawback of this strategy is that the occupation classification system changes three times in the NES 1975-2008. In this chapter, only the results obtained allowing the occupation classification system to change are reported. In the end, whether using this consistent classification is used or allowing the system to change had no substantial impact on the qualitative findings. Using the consistent classification overestimates within occupation inequality but the overall trends are the same when it is allowed to vary. See Appendix B for a comparison of allowing the classification system to vary versus a consistent classification in terms of trends in between-occupation inequality.

Nonetheless, there might be theoretical reasons for allowing the occupation classification system to change. For one, it more accurately reflects the changing underlying composition of social classes. Each new occupational classification system is an improvement on the last, for instance bringing a better demarcation of boundaries between occupations, than earlier

schemas, and so could underestimate between occupation inequality (overestimate within occupation inequality) if a later schema is applied to earlier years or vice versa.

CAPTURING SOCIAL CLASS

Social class is captured using the National Statistics Socio-Economic Classification (NS-SEC). Many social class schemas and occupational hierarchies exist. One that has proved to be very influential across European contexts is the Erikson-Goldthorpe schema and its variants (Erikson and Goldthorpe 1992:35-47). The schema used here is a condensed version of the twelve occupational groups defined by the Office for National Statistics (ONS) in the National Socio-Economic Classification (NS-SEC) (Rose and Pevalin 2003). Six different NS-SEC class categories are used in the analysis and their correspondence to the Goldthorpe schema are given in Table 26. NS-SEC is more or less based on the later variants of the Goldthorpe class schema (Goldthorpe 1997). These later variants more explicitly relate social class to underlying components of employment relations mentioned in the introduction (Goldthorpe 2000:206-229).

In the dataset, class categories are constructed from the detailed occupation categories. This means they do not correspond exactly to NS-SEC – as strictly speaking, other information aside from occupation is need such as supervision duties, which is simply not available in the data. Instead, a next best alternative is used – an occupation recode identical to the one in Goldthorpe and McKnight (2006) – where each KOS/CODOT and SOC90 codes are classified into one of the six NS-SEC categories. A similar reclassification of SOC2000 codes to the NS-SEC categories was conducted for this chapter and cross-checked with a wave of the Labour Force Survey that had been manually double-coded with both SOC2000 and NS-SEC (with the extra requisite information) by a coder and showed consistent results. Only six

of the seven NS-SEC categories are used – all but *employers in small organisations, own accounts workers* – primarily because the self-employed are not sampled in the NES. As Table 2 shows, this category typically accounts for around one-fifth of the labour force. As such, the results presented here pertain to employees only.

Table 26. Correspondence of the Goldthorpe Class Schema and NS-SEC with common descriptive terms

Goldthorpe Schema		NS-SEC		Common Descriptive Term
I	Professional, administrative, and managerial employees, higher grade**	1	Higher managerial and professional occupations*,**	Salariat (or service class)
II	Professional, administrative, and managerial employees, lower grade** ; technicians, higher grade	2	Lower managerial and professional occupations **	
IIIa	Routine nonmanual employees, higher grade	3	Intermediate occupations	Intermediate white collar
IV	Small employers and self-employed workers	4	Employers in small organisations, own account workers	Independents (or petty bourgeoisie)
V	Supervisors of nonmanual workers; technicians, lower grade	5	Lower supervisory and lower technical occupations	Intermediate blue collar
VI	Skilled manual workers	6	Semi-routine occupations	
IIIb	Routine nonmanual workers, lower grade	7	Routine occupations	Working class
VII	Semi- and unskilled manual workers			

Notes:

* Includes 'large' employers.

** Includes independent professionals.

From Goldthorpe and McKnight (2006:110).

Due to the nature of how NS-SEC is supposed to be constructed – using several pieces of other information in addition to occupation in arriving at which social class a particular individual is classified – there is potential for a given occupation to be classified into more than one social class category. In this chapter, each occupation is nested within one social class

only. This strategy should make the decomposition results easier to interpret and is more in line with the model presented in Figure 1 where both big classes and micro classes are non-overlapping.

METHOD

The measure of overall inequality used is the variance of log wages, as in the previous chapters. Given the innumerable of inequality measures (e.g. Cowell 1995) the variance of log wages offers several useful properties in that it is intuitively interpretable and that it is easily (additively) decomposed into the three components outlined above. The total variance in log hourly wages for each year is decomposed into between and within big classes by fitting two models: one where log wages are regressed on big class categories, and another where log wages are regressed on occupational categories[14].

The proportion of inequality occurring between big classes (the BC component) is calculated by subtracting the variance of the residuals 'explained' by big classes in the regression from the total variance in log wages. The remaining variance – the component 'unexplained' by big class categories – is the proportion of total inequality occurring within classes. The proportion of inequality occurring within occupations (the WO component) is the variance of the residuals from regressing occupation on log wages. The within class/between occupation component (WC/BO) is calculated by subtracting the variance of the residuals from both regressions. Thus, in effect, the total proportion of inequality occurring within big classes is divided between two sub-components: within class inequality occurring between occupations and within occupation inequality.

[14] The regressions were performed using the –areg– command in STATA

The decomposition procedure for each component can be formalised, following Weeden, Kim et al. (2007:715):

$$Var_{BC} = \frac{\sum(y_i - \bar{y})^2}{N-1} - \frac{\sum\left((\hat{y}_i|c_i - y_i) - \overline{(\hat{y}_i|c_i - y_i)}\right)^2}{N-1} \quad (1)$$

$$Var_{WC/BO} = \frac{\sum\left((\hat{y}_i|c_i - y_i) - \overline{(\hat{y}_i|c_i - y_i)}\right)^2}{N-1} - \frac{\sum\left((\hat{y}_i|o_i - y_i) - \overline{(\hat{y}_i|o_i - y_i)}\right)^2}{N-1} \quad (2)$$

$$Var_{WO} = \frac{\sum\left((\hat{y}_i|o_i - y_i) - \overline{(\hat{y}_i|o_i - y_i)}\right)^2}{N-1} \quad (3)$$

where c_i and o_i are vectors of dummies indexing the big class and occupation respectively of individual *i*, and *N* is the sample size. The decompositions are presented separately for men and women.

To maximise sample sizes given that several small occupations have less than ten observation per year (e.g. *piano tuners*), three-year moving averages are used. This involves pooling waves of data together, centring on the middle year. This also has the effect of smoothing out the observed trends by reducing year-to-year variability, making longer-term trends easier to interpret. Furthermore, each case is weighted by the usual number of hours worked per week. Thus the results should be interpreted accordingly representative of the hours worked in the economy rather than the rewards employed individuals receive. Weeden, Kim et al. (2007:713) state that weighting by hours "may be understood as a compromise between excluding part-

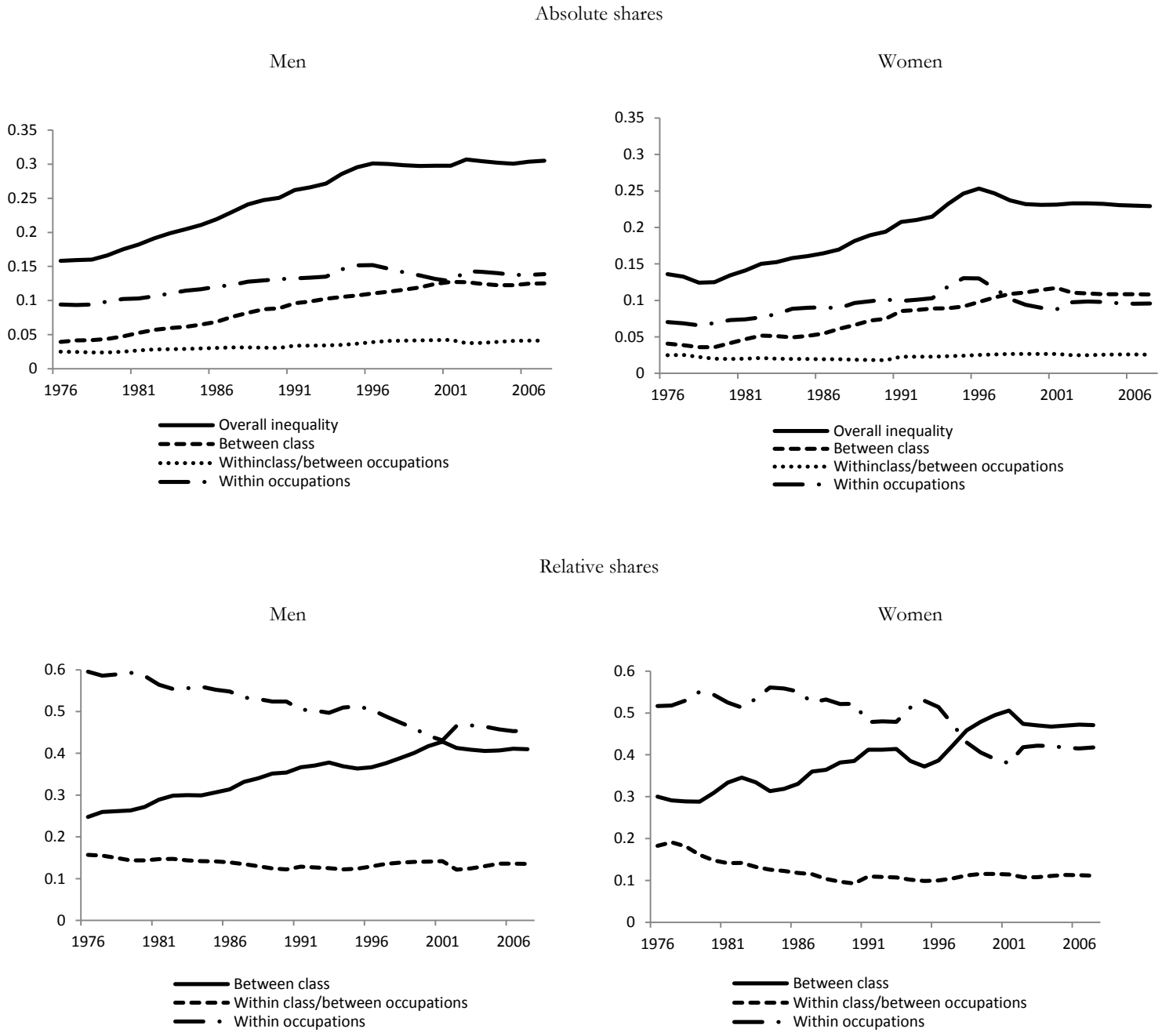
time workers and simply ignoring the distinction between part-time and full-time work". Analysis was conducted with and without weighting by hours. No major differences occurred when using the weights or not – any noticeable differences between the two are reported in footnotes.

DISCUSSION OF RESULTS

As Table 1 in Chapter 1 shows, there has been a 30 per cent rise in the ratio between the top and bottom decile 1980s to 2000s. This change was large relative to other OECD countries over the same period. The absolute levels are also greater in Britain than most other European countries. By the 2000s, the 10^{th} percentile would expect to be paid 3.4 times less than the 90^{th} percentile.

Figure 1 in Chapter 2, using a different inequality measure – the variance of log wages – the measure that is presented in the model above – shows that over the period 1975 to 2000, there are two distinct trends in wage inequality for both men and women. A 'transition' period spanning 1975 until 1996 can be identified as there was a sharp and sustained secular rise in inequality. As Table 1 shows, this rise in the 1980s was not only sharp within the years considered but also relative to other advanced industrial societies. After this point, during the period 1997 to 2007, inequality remained relatively stable for men, and indeed, declined in the case of women. For convenience, these two sets of years can be referred to respectively as 'transition period' and 'period of stability' in terms of wage inequality. It is important substantively to make this distinction, for as Figure 1 in Chapter 2 shows, the trends in wage inequality for both men and women was episodic. The 21-year period 1975-1996 accounts for 96 per cent of the growth in overall inequality 1975-2008 for men and more than 100 per cent

Figure 19. Decomposition of overall wage inequality into BC, WC/BO, and WO components, 1975-2008



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; hourly wages are weighted by usual hours per week.

for women as inequality subsequently declined 1996-2008 in their case by around 10 per cent. It should therefore be noted that when decomposing the *growth* in wage inequality, one should really refer to the period when wage inequality grew most sharply as a distinct period, in addition to examining the period as a whole, as ignoring the episodic nature of wage inequality and assuming a constant linear trend might lead to a different conclusion.

This section discusses the results of the decompositions, showing the absolute change in wage inequality decomposed into shares accounted for by each of the three components – between-class, within class/between occupation, and within occupation – separately for men and women. The upper panels of Figure 19 (Panels A and B) show the absolute shares accounted for by each component. The absolute shares in inequality are obtained directly from the results of the decomposition. Because the variance of log wages is additively decomposable, the sum of the three components in any given year is equal to the variance in log wages that year. Thus the relative share accounted for by each component is calculated by setting overall inequality in every year to 1. What is in effect achieved by doing this is the R^2 in explaining overall inequality in that year. The relative shares are shown in the lower panels (Panels C and D).

When considering the absolute trends, the main thing to note in assessing how well social class captures wage inequality in general is that in terms of relative shares for both men and women, the majority of inequality occurred within classes, not between them (where within class inequality is simply the sum of the WC/BO and WO components). On average, 65.1 per cent of inequality occurred within classes for men, and 60.9 per cent for women. However, the WO component accounts for, on average, 51.5 per cent of inequality for men and 48.7 for women suggesting that much of the variance is between individuals within occupations – not between them. In other words, within class inequality is largely within detailed occupations. Since we

have no prediction or benchmark *a priori* by which to judge how well class, by whichever conceptualisation, should account for wage inequality, in order to investigate what the take-off in wage inequality implies for the class structure, we must compare the *changes* in the three components with each other in relation to the growth and timing of wage inequality. The trends in each component are now considered in turn.

1. *BETWEEN-CLASS TREND*

In terms of the main component of interest, the BC component, although not accounting for the majority of inequality in absolute terms, interestingly, it is the only component to have has its share monotonically rise over time. This trend is more pronounced in Panels C and D showing its relative share. As inequality took off in the 1980s, so did between-class inequality. As overall inequality stabilised in the late 1990s/2000s, the BC component also seemed to slow and also stabilise slightly at a new higher level. By the 2000s, for men, in absolute terms, the BC component accounted for almost as much as the WO component. By the 2000s, for women, during the period of stability, BC inequalities accounted for a larger share of overall inequality than the WO component, as the WO component started to fall during this time.

The finding that as inequality grew, the BC component grew faster than the WO has implications for the recent debate regarding trends in social mobility in Britain. Sociologists define origin and destination in terms of social class positions (based on occupation data), whereas economists on the other hand, define origin and destination in terms of income groups. Recent research in Britain has found that mobility has declined slightly over the last few decades if income groups are used to define social groups (Blandon and Machin 2008), whereas research defining social groups in terms of social classes has found broad stability in mobility rates using the same data (Goldthorpe and Jackson 2007; Goldthorpe and Mills

2008). Blandon, Gregg, et al. (2010) present evidence that the discrepancy in findings is likely due to the growth in income inequality *within* social classes as inequality whereas Erikson and Goldthorpe (2007) maintain that the income data in Blandon and Machin use is of poor quality and should not be trusted. The findings presented here, using the most reliable wage data available, show that, if anything, although inequalities within social classes grew, the relationship between class and wages (if wages are to be taken as a proxy for family income) has strengthened as inequality grew.

2. *Within Class/Between occupation Trend*

We might expect difficulty of monitoring and asset specificity – and their associated employment relations – to have become more heterogeneous within big classes (Breen 1997). Direct measures of the dimensions underlying different employment relations are hard to come by – especially for such a span of years. If a rising share of inequality is found to be occurring in the WC/BO component, then changing underlying dimensions of social class would present itself as a potential explanation. However, the WC/BO component, accounted for the smallest proportion of variance in earnings out of the three components, for both men and women. As overall inequality began to rise, this component showed a very gradual and hardly noticeable rise for men. This component remained pretty much stable for women. In terms of its relative share, for men it fell three percentage points and seven for women 1975-2008. This suggests that occupational differentials within classes are insensitive to the growth in inequality, meaning that in a sense, classes have remained fairly homogeneous over time. In this sense, decomposing the growth in wage inequality into purely between and within occupation components adds little to the story told here compared to if it is decomposed into between and within big class components. The relative share of the WC/BO component fell over time for men and for women suggesting that occupation differentials within classes

became less relevant in explaining variation in wages between individuals as overall inequality grew. In short, the findings presented here echo Goldthorpe's assertion that adding in detailed distinctions between occupations within big classes into the analysis provide "a source of occupational variation on a class theme" (Goldthorpe 2002:213).

3. WITHIN OCCUPATION TREND

As for the WO trends, even though the WO component generally accounts for the largest share in overall inequality, its relative share has steadily declined over time, as inequality rose during the whole 'transition' period until about 1996. As overall inequality began to level-out during the 2000s, the WO component actually declined in both absolute and relative terms as between-class inequalities became more pronounced. Given the previous literature in economics that attributes much of the rise in wage inequality to be within skill groups and that this share increased as overall inequality grew, one might have expected the share of overall inequality accounted within occupations to also have rose. Yet this is not the case. Instead, it is found that as inequality rose, it is the share attributed to big social classes, not within occupations, that rose.

INTERPRETING THE RISE IN BETWEEN-CLASS INEQUALITY

How do findings of the decompositions fit in with the models of class regimes illustrated in Figure 19? Although most inequality still occurs within occupations (and so within big classes) over the period as a whole, the BC component rose and stabilised in tandem with the growth in earnings inequality. In short, to return to the main question this chapter seeks to address, a growth in wage inequality implies a strengthening, not weakening, of the big-class structure. As inequality rose, the role played by occupations within big classes (WC/BO component)

became less relevant in explaining overall inequality. As inequality began to stabilise, the BC and WO components also started to stabilise in absolute terms and fell in relative terms, accounting for similar shares of overall inequality for men, with the BC component accounting for more inequality than the WO component for women. Thus by the 2000s, most inequality was occurring between classes for women. The growing importance of this form of between-group inequality is counter to what some of the literature suggests about the nature of wage inequality where the main finding is a growth in within-group inequality in both the US (Juhn, Murphy et al. 1993; Acemoglu 2002; Autor, Katz et al. 2008) and Britain (Prasad 2002; Brewer, Muriel et al. 2010).

The above decompositions only show the general role of between class inequalities and could mask substantively important differences in the role of individual classes. In the decomposition model presented in the equation, it is not possible to distinguish the role of individual big classes. As was demonstrated in Chapter 3, only a handful of detailed occupations did most of the work. The same could be the case in terms of big classes. For instance, it might be that only one class contributes to the growing between-class component whereby it pulls away from the rest in terms of its mean wages. Thus it is helpful to conduct an additional analysis that disaggregates the big class components further into class-specific components. The question then becomes, not merely what does growing wage inequality imply for the class structure in general but what does the class structure imply for wage inequality. These issues are explored below by first outlining how classes have individually changed in terms of employment, mean wages, and within-class inequality.

Over the period 1975-2008, Figure 5 in Chapter 2 shows there had been a steady rise in the proportion of the hours worked that were in nonmanual occupational categories and a steady

decline in the proportion of the hours worked in manual occupations. A notable exception to this is the rise in the proportion of women employed in routine work, presumably a large share of which s part-time. As Figure 6 in Chapter 2 shows, the log mean wages of classes shows a clear ordering that does not overlap for both men and women, although the bottom four class in the figure to come close by the late 2000s for men. The graph shows that mean log wages have grown across-the-board, and that the relative differentials between classes have not changed much either. This suggests between class inequality has remained stable and thus, the rising BO component is not being driven by mean wages between classes. If we consider the changes in class composition presented in Figure 5 in Chapter 2 –the growth in nonmanual employment and decline in manual employment – this could result in an increase in the relative share of between class inequality in explaining overall inequality as the share of people working higher-wage classes has increased (higher and lower managerial and professional classes) relative to other classes. Thus we have a situation where more people are working in the highest-paying class increasing between-class inequality, even though the relative differential between them has remained fairly constant.

Turning to within class inequality, Figure 6 in Chapter 2 shows that the highest paying classes are also the most unequal and the ordering of classes in terms of the variance in log wages does not change over time. However, levels of inequality do change for all classes. For both men and women, within class inequality rose for all classes during the transition period and levelled or started to fall during the period when total inequality stabilized at its new higher level. The two exceptions to this are *higher managerial/professional occupations* for men and *lower supervisory/technical* class for women where within class inequality continued to rise throughout the 2000s.

The main story presented in this chapter is that as inequality grew, the share accounted for by the BC rose faster than the other two components. The next step is to, first work out the extent to which different classes contributed to this trend, and second, work out how they contributed to this trend – by changes in their mean wages or by changes in their employment levels (Equation 4 in Chapter 3). The extent to which different classes contributed to the trend in the BC component is calculated in a similar way to how the contributions of individual occupations to changes in wage inequality in Equation 10 in Chapter 3.

The between-class component is made up of two components (Equation 4 in Chapter 3). The class-specific contribution to changes in BC component is calculated by setting one class' labour force share, *s*, and mean wage, *y*, at its baseline level, whilst allowing all other classes' labour force shares and mean wages to change (Equation 11 below). To calculate the contribution of individual classes' change in labour force share to the change in the BC component, an individual class' labour force share is set at its baseline level while the labour force shares of all other classes are allowed to vary. Similarly, to calculate the contribution of individual classes' change in mean wage to the change in the BC component, an individual class' mean wage is set at its baseline level while the mean wages of all other classes are allowed to vary.

$$B_t - B_t|s_{it} = s_{ib}\,, \qquad y_{it} = y_{ib} \tag{11}$$

Table 27 shows the changes in the BC component for the transition period, the period of stability/decline, and the whole period – for both men and women – decomposed into composition and wage effects. Only the between-class components are shown as it is the rise in the between-class component that we are seeking to elaborate on. The composition effect refers to the amount of change in the BC component attributable to shifts in the class

structure. For instance, overall inequality might have grown due to a contraction in the employment of medium-paying classes, holding class mean wages constant. The wage effect refers to the amount of change in the BC component attributable to changes in class mean log wages. For instance, the BC component might have grown due to the mean wages of the higher-paying classes growing relative to the rest, holding the class employment structure constant.

Generally, wage effects seem to be more important than changes in the composition of the class structure in accounting for the rise in between-class earnings inequality. During the transition period, 1975-1996, wage effects accounted for most of the change in the between-class inequality – 78 per cent (0.06005/0.07666 = 0.78332) of the growth for men and 74 per cent (0.04821/0.06500 = 0.74169) for women. However, in the period when wage inequality stabilised 1997-2008, it was shifts in employment that drove inequality, albeit the change in overall wage inequality in this period was very small for men, and slightly negative for women. Taking the period as a whole, 1975-2008, wage effects accounted for 73 per cent (0.06976/0.09518 = 0.73293) of the rise in between-class inequality for men, and 72 per cent (0.04990/0.06924 = 0.72068) for women. This means that, generally, it was changes in class wages driving the growth in between-class inequality 1975-2008 rather than shifts in employment.

Table 27 shows the individual class contributions to between-class inequality. During the transition period 1975-1996, just one class – the *higher managerial/professional* class – accounted for 39 per cent (0.03017/0.07666) of the growth in the BC component for men. For women, the *higher/managerial professional class* accounted for around 33 per cent (0.02139/0.06500) for the growth in the BC component 1975-1996. Although in general, wage effects seemed more

important than composition effects in accounting for the growth in between-class inequality, composition effects account for a larger fraction of the *higher managerial/professional* class' contribution to between-class inequality for men and women. Thus the growth in *higher managerial/professional* class accounts for 29 per cent of the growth in between-class inequality for men and 31 per cent for women 1975-1996. As Figure 5 shows, this class has the highest-wages but it was its expansion that contributed to the growing inequality between classes.

For men, *routine occupations* accounted for the next-largest share in the growth in BC component over the transition period, accounting for 30 per cent. This was almost entirely due to a wage effect. For women, *routine occupations* accounted for 25 per cent of the growth in between-class inequality, most of which was a wage effect. For both men and women, the *lower supervisory/technical and intermediate* class played a very small role in the growth in between-class inequality. Taken together, these findings suggest that the growth in between- class inequality was due to (1) a large shift in employment to the highest-paying *higher managerial/professional* class and (2) the mean wages of the lower-paying classes growing more slowly relative to the higher paying classes (see Figure 5 in Chapter 2). This corroborates the findings in Chapter 3 but at the big class level of analysis.

In terms of the small growth in the BC component for men 1997-2008, seems mostly to stem from a composition effect. In terms of individual specific class contributions, *higher managerial/professional class* accounted for almost the entire rise in the BC component over this period (particularly in terms of its expansion rather than wage effect). The rise in the BC component was partially offset by two classes that had an equalising effect changes in the BC components, *lower managerial and professional occupations* and *routine occupations*. In terms of the small decline in the BC component for women 1997-2008, two classes contributed to almost

Table 27. Individual class contributions to between-class wage inequality, 1975-2008

	NS-SEC category						Total
	1	2	3	5	6	7	
Men							
Between-class 1975-1996							
Composition	0.02206	0.00529	0.00000	-0.00093	-0.00088	-0.00893	0.01660
Wage	0.00810	0.00271	-0.00020	0.00241	0.01499	0.03204	0.06005
Total	0.03017	0.00800	-0.00020	0.00147	0.01411	0.02311	0.07666
Between-class 1997-2008							
Composition	0.01294	0.00084	0.00003	-0.00055	-0.00390	-0.00079	0.00856
Wage	0.00408	-0.00855	0.00176	0.00099	0.00940	-0.00046	0.00722
Total	0.01702	-0.00771	0.00179	0.00044	0.00550	-0.00125	0.01579
Between-class 1975-2008							
Composition	0.03843	0.00363	0.00019	-0.00222	-0.00477	-0.00984	0.02541
Wage	0.01135	-0.00352	0.00145	0.00424	0.02469	0.03156	0.06976
Total	0.04978	0.00010	0.00164	0.00201	0.01992	0.02172	0.09518
Women							
Between-class 1975-1996							
Composition	0.01998	0.01246	-0.00001	-0.00049	-0.00173	-0.01343	0.01679
Wage	0.00141	-0.00145	0.00018	0.00082	0.01786	0.02939	0.04821
Total	0.02139	0.01102	0.00017	0.00033	0.01613	0.01596	0.06500
Between-class 1997-2008							
Composition	0.01232	0.00415	-0.00036	0.00006	0.00053	-0.00745	0.00925
Wage	-0.00235	-0.01714	0.00240	-0.00005	0.00418	0.00102	-0.01193
Total	0.00998	-0.01300	0.00205	0.00001	0.00471	-0.00643	-0.00268
Between-class 1975-2008							
Composition	0.03228	0.01180	-0.00055	-0.00062	-0.00102	-0.02255	0.01934
Wage	0.00134	-0.01104	0.00294	0.00109	0.02282	0.03274	0.04990
Total	0.03362	0.00076	0.00239	0.00048	0.02180	0.01019	0.06924

Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; hourly wages are weighted by usual hours per week.

all of the reduction in BC component, *lower managerial/professional occupations* and *routine occupations*. *Lower managerial/professional occupations* reduced the BC component because they both expanded rapidly (Figure 5) and experienced almost zero wage gains (Figure 6). *Routine occupations* reduced the BC component because they both expanded rapidly (Figure 5) and experienced fairly rapid wage gains (Figure 6).

CONCLUSIONS

This chapter started out by asking does a growth in wage inequality imply a strengthening or weakening of the big class structure. The answer is that a growth in wage inequality seemed to strengthen the big class structure in that as wage inequality grew, the component of the overall variance in log wages attributable to between class inequalities also grew, and grew much more steeply than the WO component and WC/BO. The WC/BO component accounts for the smallest share of overall inequality, and declined in relative terms as inequality grew, suggesting that as inequality grew, overall, micro classes became less relevant in explaining overall wage inequality. This suggests that growth in wage inequality can be captured well by differences in the rewards to broad *kinds* of employment rather than very specific occupations. However, with regard to the big class versus micro class strengthening debate, it must be mentioned that for the most part, most of the overall variance in log wages occurs within classes rather than between them – most of which is within occupations themselves. In short, adding in detailed occupations adds little to explaining the overall variation in wages, especially when the overall variation in wages grew.

This chapter then moved on to answer what is the role of individual classes for the strengthening or weakening of the big class structure. It seems that only one class, the *higher/managerial professional* class, accounted for the growth in the BC component 1975-

1996. This was mainly due to its relative expansion in terms of employment. This accords with the findings in Table 3 in Chapter 2 – that although generally the mean wage effect was most important in accounting for changes in overall inequality 1975-1996, in terms of the occupations that increased inequality the most for men – the main reason for this was their composition effect.

The next biggest contributor to the trend in the BC component were *routine occupations*, mainly due to their wages not keeping pace with the other classes. In short, the BC component of overall inequality rose because of more people working in the higher-paid *higher/managerial professional* and those working in the lower-paid *routine occupations* experiencing slow real wage growth during the this period.

The continual growth in the BC component for men 1997-2008 was mainly due to the wages of the *higher/managerial professional* class pulling away from the rest, and it was also continued to expand in relative size quicker than other classes. However, the rise in the BC might have been greater had it not been partially offset by two classes having an equalising effect changes in the BC component, *lower managerial and professional occupations* and *routine occupations*. For women, the BC component actually fell slightly in absolute terms, and this was mainly due to high-paying *lower managerial/professional occupations* both expanding rapidly and experiencing almost zero wage gains and low-paying *routine occupations* both expanding and experiencing fairly rapid wage gains.

– 6 –

SUMMARY AND CONCLUSIONS

INTRODUCTION

My thesis has provided an in-depth and primarily descriptive account of the relationship between the changing occupational structure and trends in wage inequality 1975-2008. I began with two observations regarding the state sociological literature, particularly in Britain. Occupations provide the single most important unit of analysis for economic inequality in stratification research, providing the basis for socioeconomic status, prestige, and job desirability scales, as well as the basis for social class schemas. Although there was a 'massive rise' in wage inequality in Britain, relatively little is known about the relationship between occupations and growing wage inequality. Since this area of research is relatively undeveloped, my thesis had been primarily descriptive, and as such can be seen as an initial step in a promising area of research by establishing the basic facts. In this chapter, I first provide a recap of the main questions my thesis has addressed. I then summarise the main theories and how they might relate to my key empirical findings, before moving on to suggest some areas for future research and offering some wider reflections.

RECAP OF THE KEY QUESTIONS

We know there has been a 'massive rise' in wage inequality but we do not know how this relates to the occupational structure. Both have changed considerably during the period under study, but how did they co-evolve? My thesis has addressed three main questions:

1. How did occupations structure the growth in wage inequality?
2. To what extent is the structuring of the growth in wage inequality by occupations due to the changing composition of incumbents within occupations (namely the rise in educational attainment)?
3. What are the implications of the 'massive rise' in wage inequality for the categories sociologists use to capture economic inequalities based on occupations?

THEORETICAL BASES AND EMPIRICAL FINDINGS

In this section, the theoretical bases underpinning each of the three questions are summarised, followed by a summary of the relevant empirical findings.

1. HOW DID OCCUPATIONS STRUCTURE THE GROWTH IN WAGE INEQUALITY?

Sociologists have used occupation as the basic unit in stratification research for two main reasons (Grusky and Ku 2008:7). First, occupations are supposed to capture the *structure* of inequality. The first question sought to address this aspect of why sociologists engage in stratification research focus on occupations. The second reason why sociologists have used occupation as the basic unit of analysis is that they are supposed to be a *source* of stratification in themselves, in that they are proxies for mechanisms by which (dis)advantage is generated in the labour market, for instance in terms of skill requirements, employment relations, and occupational closure.

Sociologists have generally ignored the unprecedented trend of growing wage inequality, especially in Britain, and given the importance of occupations in sociology, the purpose of the first question was to establish the basic trends in the relationship between the changes occupational structure and changes in wage inequality as this has not been done before. I identified several strands of theory from both sociology and economics that implicitly or explicitly make predictions about how occupations should have structured wage inequality. The main group of theories seeking to explain trends in wage inequality are found in the economics discipline, namely skill-biased technological change (SBTC), which comes in various guises. I derived three mechanisms from sociological and economic theory and empirical research by which SBTC may have worked through the occupational structure in accounting for trends in wage inequality:

1. By changes in the structure of occupations
2. By changes in average wages of occupations
3. By changes in within-occupation inequality

With regard to the first mechanism, there have been important changes in the structure of the labour market. A strictly structuralist sociological account would predict that changes in wage inequality must stem from the employment structure as occupations are viewed as fairly homogenous and unchanging units. In the economics literature, a more recent body of the SBTC literature used occupations at as a proxy for job tasks. Technology-induced shifts in the demand for different kinds of labour affect the composition of the labour market, predicting a decline in the labour force share of middle-paying routine occupations, and a rise in the labour force share of high-paying occupations. *I find evidence that a hollowing out of middle-paying occupations – perhaps caused by technology increasingly substituting routine tasks but not nonroutine tasks – contributed to the 'massive rise' wage inequality during the 1980s. Specifically, the polarising of employment in the labour market into high- and low-paid occupations*

– and the collapse in middle-paying occupaitons – accounted for 43 per cent of the growth in male wage inequality 1975-1996 and about a quarter of the growth in female wage inequality 1975-1996.

With regard to the second mechanism, the movements in the wages of occupations can influence overall inequality, even when holding the employment structure constant. Some occupations may have experienced large wage gains pulling away from the rest, whilst others may have even experienced a fall in real wages. *I find that changes in occupational mean wages were quantitatively the most important mechanism by which occupations contributed to the growth in overall wage inequality. The mean wage effect stemmed mainly from already high-paying occupations receiving the largest wage gains during the 1980s. Specifically, differential wage growth between occupations accounted for 49 per cent of the growth in male wage inequality 1975-1996 and 46 per cent of the growth in female wage inequality 1975-1996.*

With regard to the third mechanism, an increase in inequality between individuals within occupations always increases overall inequality. Some sociologist argue within-group inequality has grown due to across-the-board destruction in rents as there has been a gradual individualisation in the employment relationship where pay is increasingly tied to the individual. Economists interpret within-group inequality as the rising returns to unobserved skills related to technological change. The within-group inequality hypothesis has played a prominent role in accounts of the rise in wage inequality in the US, and more recently in Britain, such as the National Equality Panel (NEP) report. *I find a small role for changes in within-occupation inequality in accounting for the growth in male wage inequality, but a relatively important role for it in accounting for the growth in female wage inequality, as quantitatively important as the polarisation in female employment. Specifically, I find that changes in within-occupation inequality accounted for a quarter of the growth in female wage inequality 1975-1996, and less than a tenth for men 1975-1996*. The fact that previous research, such as the NEP report find a prominent role for growing inequality when groups are defined quite coarsely, whereas I

find that when examining occupations at the most detailed level, instead between-group inequality seems central further suggests that research examining the mechanisms by which occupations generate inequality is needed to fully understand the findings that I find.

A key finding in my thesis, pointing towards areas for future research, is that the majority of rapid rise in wage inequality during the 1980s was concentrated in a minority of the labour market. In fact, *just 20 occupations employing just 16 per cent of the 1975 male labour force account for over two-thirds of the growth in male wage inequality 1975-2008. Similarly, for women, just 20 occupations employing just one-third of the 1975 female labour force account for nearly two-thirds of the growth in overall female wage inequality.* One key finding is that very few ICT-related occupations were found to make the top 20 inequality-producing occupations in accounting for changes in overall inequality 1975-1996. Instead, it was the growth in several professional and managerial occupations, corroborated in Chapter 5 when occupations were defined in terms of social class, that played a key role in accounting for changes in overall inequality. Although in general, changes in occupational mean wages was the most important reason in accounting for changes in overall inequality 1975-1996, amongst these top 20 in particular, it was their *growth* that accounted for the majority of their contribution to changes in overall inequality. This therefore points to a 'complementarity of technology thesis' causing these highest-paying occupations to grow, and so increasing overall inequality as middle-paying occupations declined at the same time.

In the case of women, a key finding is that several low-paying occupations made the female top 20, such as cleaning, whereas very few appear for men. Rising employment in low-paying occupations is not inconsistent with the later versions of SBTC that make the conceptual distinction between routine and nonroutine jobs. However, it does not specify why we might see a growth in low-skilled nonroutine occupations, only that they will not

be destroyed by technology. Surely there are other variables likely to very important to this trend not considered in my thesis which surely matter for the growth in female wage inequality such as patterns of household consumption and changes in the household structure and division of labour.

From 1997-2008 overall wage inequality stabilised. *The stabilization in wage inequality appears to stem from occupations structuring wage inequality in countervailing ways: some occupations had inequality-producing effects, whereas others offset what might have been a continual rise in inequality. There was a continual, albeit weaker, polarisation in the structure of occupations. This inequality-producing effect was offset by low-paid occupations receiving larger wage gains relative to high-paid occupations*, perhaps indicating a minimum wage effect and a general slowdown in wage growth of high*er*-paying, although not the high*est*-paying, occupations.

The fact that inequality was tempered overall, and fell slightly for women in particular at the time when New Labour was in power could provide a *prima facie* case that they were good for the working class. Certainly, the timing of the unprecedented wage gains of the lowest part of the distribution seems to fit with the introduction of the National Minimum Wage in 1998 (seen most clearly in Figure 4 in Chapter 2). Furthermore, the upratings in the minimum wage level generally became more ambitious during the 2000s – what is known as the minimum wage 'bite' (uprating relative to average wage growth). However, the role of the minimum wage and subsequent upratings should not be overemphasised as similar trends in the lower part of the distribution have been found in other countries where policy has not been so favourable to the lowest earners. For instance, the 50-10 gap stagnated for women and actually fell slightly for men in the US over this same time period (Lemieux 2011). The Federal minimum wage in the US is relatively lower than the NMW in Britain relative to the median (about one-third in the US compared to about two thirds in Britain) and upratings during this time certainly have not been as ambitious in the US as

in Britain. Perhaps one part of the explanation might lie in the expansion in public sector employment at the low-end of the distribution, a trend witnessed in both the US and Britain. Thus the low-paid sector may have been partially upgraded – low-paid work is likely to be pay more than low-paid work in the private sector. The by positive interaction between mean wage growth and low-paid employment 1997-2008 in Table 20 in Chapter 5 would certainly suggest public sector employment has something to do with the sudden improvement in wages for the low-paid in Britain. Therefore, in a sense, New Labour could have helped the working class by providing better low-paid employment than the private sector would otherwise offer. Although it is still low-paid work, and so mobility prospects out of it are likely to be limited. In terms of overall inequality, the fact that top wages continued to rise during the 2000s show that even if the improvements in the wages of the low-paid sector were down to New Labour, the government did little to slow down steady and sharp growth in top wages (seen most clearly in Figure 3 in Chapter 2). If anything, wage growth for those lucky enough to be in the top 10 per cent grew faster during the 2000s than during the 1980s when overall inequality exploded.

2. *TO WHAT EXTENT IS THE STRUCTURING OF THE GROWTH IN WAGE INEQUALITY BY OCCUPATIONS DUE TO THE CHANGING COMPOSITION OF INCUMBENTS WITHIN OCCUPATIONS?*

Most of the variation in occupational employment growth, mean wage growth, and internal inequality growth, are unexplained, especially for employment shares and within-occupation inequality, by conventional independent variables such as holding a degree and demographics. This suggests that most of the variation is due to occupation-specific factors and not due to the changing composition of incumbents within occupations. The independent variables presented that commonly provide the basis for the standard earlier accounts for wage inequality, do not explain away the 'occupation effect' on wage inequality. In short, the key finding from the multivariate

analysis is that although changes in the composition of incumbents within occupations has had some effect on how occupations structured the growth in wage inequality, their overall effect is limited, suggesting occupations themselves really did structure the growth in wage inequality and so occupations still represent structural locations in explaining patterns of inequality.

The earlier SBTC literature only made reference to rising returns to human capital, in particular the rising returns to education. Wage growth might vary across occupations because new technology raises the demand for labour for those can more readily use it. One way to find evidence is to examine the wage dynamics of technology-intensive occupations such as computer programmers. Later SBTC literature shifted focus towards the changing structure of occupations, but did not make reference to the changing structure of rewards to occupations, rather choosing to focus on the relative sizes of different groups. Wage growth might vary across occupations due to shifts in supply and demand for detailed categories of labour, but also the ability to extract rents. Some sociological literature, associated with the work of David Grusky and Kim Weeden, argues occupations represent rent-seeking entities engaging activities such as occupational closure. I do not find any systematic evidence that occupations directly related to the ICT revolution contributed to changes in inequality the most, which we might expect given the focus of new technology in raising wages in the earlier SBTC literature. In fact, I find professional occupations such as judges, barristers, solicitors, and managerial occupations, experienced the largest relative wage gains (Table 4). This selection of occupations seems more consistent Grusky and Weeden's claims that rent seeking is a potential explanation for the growth in inequality as these occupations are not new occupations brought about by technological change. In the case of legal-related occupations, they are highly regulated with the supply of labour, and so wages, controlled by rigid professional bodies.

Future research must try and pin down why an occupation effect remains after controlling for human capital and demographic change within occupations. Earlier SBTC literature that tried to explain growing inequality during the 1980s focused on the (in)balance in the supply and demand for graduates relative to nongraduates – the race between education and technology. The results presented here suggests that this is only a partial explanation, and ultimately not very insightful, since people with similar levels of education, but working in different occupations, experienced quite different wage gains. Research must try to pin down why some occupations grew, and why people in certain occupations, such as professional and managerial occupations experienced faster and greater wage gains than the rest of the labour market. The fact I do not find that increasing variation in occupational mean wages is largely *not* attributable to general rising returns to education – and other major demographic changes for that matter – further suggests that there is something going on at the occupational level, for instance, in terms of occupational closure in the case of legal professions, or rising returns to those at the top of their profession or organisation in the case of managerial occupations, provide fruitful areas for further research in explaining growing British inequality.

3. *WHAT ARE THE IMPLICATIONS OF THE 'MASSIVE RISE' IN WAGE INEQUALITY FOR THE CATEGORIES SOCIOLOGISTS USE TO CAPTURE ECONOMIC INEQUALITIES BASED ON OCCUPATIONS?*

Although the bulk of my thesis has focused on detailed occupations, sociologists tend to use occupations in their theory and research in terms of social class. Social class categories are basically aggregations of detailed occupation codes. Growing wage inequality might imply that that big classes no longer capture inequalities as well as they once did because perhaps the labour market has fragmented into micro classes, or perhaps neither big classes nor micro classes capture wage inequality very well. A growth in wage inequality could be

big class weakening or strengthening, depending on which one of the three components below is found to be quantitatively more important.

i. *Between class* – inequality occurring between big classes.

ii. *Within class/between occupation* – inequality occurring between the detailed occupations that make up the aggregate big classes.

iii. *Within occupation* – inequality occurring between individuals within detailed occupations.

My thesis contributes to the big class versus micro class debates in leaving the extent to which the overall variation in wages is mainly due to variation at the big class or occupational level as an empirical question. *I find that a growth in wage inequality implies a strengthening, not weakening, of the big-class structure. As inequality grew the role played by occupations within big classes became less relevant in explaining overall inequality, echoing Goldthorpe's assertion that that adding in detailed distinctions between occupations within big classes into the analysis provide "a source of occupational variation on a class theme" (Goldthorpe 2002:213).* As inequality began to stabilise, between class inequalities and within-occupation inequality components also started to stabilise in absolute terms and fell in relative terms, accounting for similar shares of overall inequality for men, with the between class inequalities accounting for inequality more than the within-occupation inequalities for women. Thus by the 2000s, most inequality was actually occurring between classes for women. The growing importance of this form of between-group inequality is counter to what some of the literature suggests about the nature of growing wage inequality, particularly Sørensen's conjecture regarding the structure of rents in the labour market, and much previous empirical findings in both the US and Britain. Coupled with the relative lack of importance of demographic trends in explaining wage gains between different detailed occupations, the relatively smaller role of

within-occupation in accounting for trends in overall wage inequality, both point towards more research being focused on pinning down exactly for what occupations proxy.

SOME MORE DIRECTIONS FOR FUTURE RESEARCH

There are at least three ways to corroborate and extend the analysis presented in my thesis. First, my findings could be corroborating with other data sources. It is not clear what form this might take given available data sources. The *General Household Survey* (GHS) is a government-sponsored survey of randomly selected household, dating back to 1972. It contains useful information on gross pay and socioeconomic characteristics of individuals, including education and also occupation information, which in some years is at the unit-group level. However, one major problem of the GHS is that the wage data is not consistent over time. Information of hours worked is not available for many years. Weekly wage data include overtime payments, however weekly hours worked data, when it is available, excludes overtime before 1997 and includes it afterwards. The *Family Expenditure Survey* (FES), for which data for 1968 onwards is publicly available, would be a better option. However, it lacks detailed unit-group occupation information. Nonetheless, since I find a declining portion of the relative share of overall wage inequality attributable to variation between occupations within classes, this would provide a worthwhile route to assess the relative importance of occupations in accounting for trends in overall inequality relative to other factors such as education or demographic factors. A recent paper for the National Equality Panel Report (Brewer, Muriel et al. 2010), using the FES, employed a multivariate decomposition method, the Fields decomposition method (Fields 2002), to decompose changes in wage inequality since 1968 into various subcomponents. Their key finding is that most of the growth in inequality is within groups. However, out of the ten

factors they consider, the share of inequality accounted for occupation is the largest (second to within-group inequality) and is the only factor to have grown in size over time.

The second way the analysis in my thesis could be extended is by using alternative methods. The equations in Chapter 3 do not require a regression framework – the variance of log wages is easily decomposed into between-group and within-group components using simple arithmetic. The only requirements are that we have means and variances of log wages for each cell and the sample sizes of each cell are large enough to obtain reliable estimates. This cell-based approach could be extended to define groups in even more fine-grained ways, for instance, into occupation-age-gender cells. But this would certainly leave some very sparsely populated cells and is therefore not feasible.

The ideal would be to extend the analysis presented in my thesis by employing a fully multivariate decomposition analysis, for example by fitting occupational fixed effects models whereby the effects of occupation and control variables such as education on overall inequality are estimated simultaneously at the individual-level of the kind in the recent paper by Mouw and Kalleberg (2010).

A regression framework would offer several advantages over the simple cell-based approach used in my thesis (Western and Bloome 2009:311). First, a regression-based approach would allow the inclusion of covariates and, crucially, would allow the examinations of the effects of changes in individual covariates, *ceteris paribus*. The analysis in my thesis is either bivariate (Chapters 3 and 5) or examines the relationship between demographic trends and growth rates in the three components of overall inequality separately (Chapter 4). Second, a regression-based approach can be used to impute and smooth the mean and variances of sparse, empty, or outlying cells. Third, a regression-based approach can be extended to include Bayesian posterior simulation so confidence

bounds can be placed on decomposition estimates, whereas at present, I do not provide any.

Adequate data for a multivariate regression-based approach is not an option with the NES because it lacks education data – a key covariate – hence the need to construct the occupation dataset in Chapter 4 and therefore fit multilevel growth models. The data is available to extend my analysis in another way. My main dependent variable is the variance of log wages, which provides a summary statistic of inequality. The simple decomposition analysis presented in Chapter 3 could be further extended by employing a quantile regression technique (e.g. Firpo, Fortin et al. 2009) to decompose how changes in the occupational structure contributed to changes in inequality at different parts of the wage distribution in a bivariate way. Furthermore, composition, mean wage, and within-group effects could vary at different points in the distribution. For instance, Lemieux (2006) found that residual inequality is relatively higher at the top-end of the wage distribution in the US and has been growing, whereas it has actually been falling for non-college educated workers. Similarly, the analysis in Chapter 5 could be extended by examining how movements in wages at different points in the distribution imply for the big class and micro class structures.

SOME WIDER REFLECTIONS

My thesis has provided a descriptive account of rising inequality in Britain. Here I reflect on some potential explanations for the main trends I observe. To summarise, the main trends I observed for how inequality grew 1975-1996 are:

- Growth in high-paid and low-paid occupations (polarisation of the labour market).
- Mean wages of high-paying occupations generally growing faster than the rest.

- In particular, professional and managerial occupations were the most important in accounting for growing inequality during the 1980s, especially for men.

The technology-related explanations referred to throughout my thesis have been put forward by others to explain rising inequality, with some degree of success, within English-speaking countries. The more recent technological change theories state technology is biased in favour of nonroutine work and unfavourably with routine work, resulting in a poliarised labour market. We would expect that some of the growth in mean wages at the top is due to an imbalance in supply and demand for these kinds of skills, although some extra is likely to be rents through restrictive practices such as occupational licensing. However, the facts that (a) such long-run and large-scale technological changes are not unique to Britain and other English-speaking countries and (b) trends in wage inequality vary widely between industrialised countries (see Table 1 in Chapter 1) suggests that technology must be at best, a very partial explanation. I find that trends in each of these are not very well explained by education supply, or other demographic factors, suggesting that explanations should relate more to what is going on in terms of occupations and workplaces than to a general rise in human capital within occupations if we are to explain these trends more precisely.

My contribution to the technological change literature is that technological change seems to be biased in favour of certain kinds occupations rather than the individuals within them. Technological change seems a good explanation for why some occupations grow and others decline. The job polarisation literature makes predictions of the effect of technology and my thesis finds broad support for these predictions. Thus, technological change, in its more nuanced form making the distinction between routine and routine jobs, seems very adept at accounting for the changing structure of the labour market, which has been very important in explaining the growth in overall inequality in Britain 1970s-1990s

However, it does not make predictions as to why the wage dynamics of occupations – and this is the one area I would highlight as a key place for future research in terms of pay-setting mechanisms – might be an important source of wage inequality. The theory does not necessarily say anything about wage changes, only which kinds of occupations are likely to grow and which are likely to decline in terms of employment. It does not state that growing occupations will generally receive greater wage gains than stable ones, or that declining occupations will experience falling wages. Indeed, one recent paper found evidence that labour markets were polarising in several European countries during the 1990s to differing degrees (Goos, Manning et al. 2009) but wage inequality growth trends across these countries seemed unrelated to polarisation. Thus technological change might work through the occupational employment structure – since all countries experience technological change – but the fact that not all countries experienced the same wage inequality trends suggests something else is at work. Why then might polarising changes in the occupational structure not necessarily lead to growing inequality? As revealed in this thesis, wage changes are often not uniform across occupations, and are indeed a more important source in explaining trends in overall inequality in Britain, and maybe for other countries too.

What else, aside from technology, might explain why some occupations, for instance professional and managerial occupations, have been very successful in securing wage gains that increase overall inequality? Several theories have been put forward but direct empirical test are difficult for these. One promising area of research is occupational licencing. These relate to the sociological literature that tries to explain occupations as a site of inequality in terms of rent-seeking and institutionalised units. Not much research to date exists, but the research that has been done suggests licensing must be important for explaining inequality in wages. Previous research has found a definite premium in the US and tentatively

suggests this is due to control of supply (Weeden 2002; Kleiner 2006). A recent paper examining occupational licencing in Britain found that proportion of the labour force covered by an occupational licence will soon be greater than the proportion covered by collective bargaining, making licensing a quantitatively more important labour market institution than unions. Moreover, this research also shows that the occupational licence premium for nonmanagerial occupations is about 13 per cent, which is greater than the 6 per cent premium associated with union membership (Humphris, Kleiner et al. 2011). Perhaps, then, licensing could provide some explanation why some occupations' wages grew faster than others', for instance the legal occupations which I found to be quite important for the growth in male wage inequality 1970s-1990s are highly regulated. Furthermore, perhaps licensing could add to a comparative explanation for levels of inequality in the US and Britain being higher than in economies where the coordination in the labour market is not as fragmented or where unions have not declined as much and so there is less internal demand for such rent-seeking institutions that do not share gains very widely in the labour market.

It is likely, however, that these kinds of occupational institutions which micro class theorists argue are characteristics of *all or most* occupations as this institutional form is essentially what delineates micro classes from one another, is only really applicable to more professional occupations. Indeed, the recent research on occupational licensing in Britain supports this rather obvious point. It reveals that a premium is only obtained in occupations that require high levels of education and training, and not low-skilled and low-wage occupations, where there is no premium associated with being licenced (Humphris, Kleiner, et al. 2011).

A few other, more general, potential explanations for growing wage inequality are summarised in Anthony Atkinson's *The Changing Distribution of Earnings in OECD Countries*,

where he mentions three theories that deserve more attention – particularly in trying to explain why inequality grew so much more in countries like Britain but not as much in other countries that experienced similar technology trends (Atkinson 2008). The first is that rising top wages could be attributable to the 'superstar' phenomenon, an idea formalised by Rosen (Rosen 1981), based on the writings of Alfred Marshall. The basic idea is that the rewards to the 'best' people in a given occupation should increase with technological advancement. Using the example of opera singers, Rosen posits in the days before broadcasting, people had to make do with local opera singers. With the advent of broadcasting, the 'reach' of the best opera singers was widened, in turn raising the fees they could command for performances relative to the next best. In the context of my thesis, the 'superstar' phenomenon would lead to an increase in within-occupation inequality where a small elite within occupations receive rewards disproportionate to the rest as the geographical scope of some occupations has widened. The basic logic, however, could be extended to the occupation-level – the geographical labour market could have widened for many occupations but not others, perhaps internationally, for instance managerial and professional occupations, raising the mean wages of most people within these occupations. In other words, some 'superstar occupations' could be emerging, especially in areas where Britain has a comparative advantage such as in the finance sector being located in the City of London. Technology and trade lead could to a concentration of superstars in terms of individuals and occupations, increasing overall inequality. Another dimension to consider, particularly in the case of managerial occupations, is at the organisational-level – perhaps superstars could emerge within organisations rather just than across geographical locations – in the form of steeper pay scales in organisational pyramids (for instance CEO pay). This is the second line of explanation suggested by Atkinson.

The basic idea, as advanced by Simon (1957) and Lydall (1959), is that organisations have a pyramidal employment structure whereby pay rises at constant increments the further one moves up the organisational hierarchy so that pay ends up depending on the number of subordinates beneath ones' rank. Atkinson posits that one reason why inequality may have increased in many countries is due to increasingly steep pay hierarchies within pyramidal organisations. Some of the evidence I have presented in this thesis is consistent with this view: the fact that managerial occupations are on occupational group that experienced relatively large wage gains when inequality rapidly grew during the 1980s. My findings also suggests a possible extension to this: many of the male inequality producing occupations were found to managerial occupations and their main contribution to changes in inequality was actually due to their expansion, perhaps suggesting organisations may have become *more* pyramidal by having *more* general managers than they did previously.

The third explanation that Atkinson suggests should warrant more attention is that of pay norms. This starts from the premise that "supply and demand only place bounds on the market wage, allowing scope for bargaining for the division of the surplus" (Atkinson 2008:72). One way of deciding on the division of the surplus, Atkinson suggests, is due to a social code. The social code limits the extent to which different categories of labour are paid according to their productivity. Atkinson states that "such a policy involves a degree of redistribution and lower productivity workers can be expected to subscribe to the pay norm. But workers will only accept it, even where they could be paid more if they broke the norm, since – if they believe in the norm – by deviating they would suffer a loss of reputation" (Atkinson 2008:73-4). Thus reputation seems important for general conformity to the code. He then goes onto suggest that 'external shocks' could lead to either higher or lower levels of conformity to such norms. Atkinson suggests two such external shocks. First, "there could be a change in the political climate, perhaps influenced by events in

other countries, causing a reduction in the degree of worker support for a redistributive pay norm" (74). Second, changes in corporate governance, for instance, could lead "employers attach more weight to short run profits and less weight to reputation, which is a long run investment" (74). Even if countries experience relatively similar shocks, the fact they start from different initial conditions in terms of the proportion of workers that conform to the norm and the proportion of jobs that pay according to the norm, there is room for endogenous readjustment in this explanation, making it useful for cross-country comparisons in long-run inequality trends. A breaking down in pay norms could imply both an increase in between- and within-occupation inequality. More permissive pay norms could imply an increase in between-occupation inequality in that occupational pay is no longer benchmarked against 'comparable' occupations – some occupations are allowed to earn ratios many more relative to other occupations than they once did. More permissive pay norms could also imply an increase in within-occupation inequality as individual pay is no longer benchmarked against the average for a given occupation – some individuals are allowed to earn much more than occupational average than they once did.

Of course, trying to empirically find evidence for pay norms is difficult to do outside a laboratory since norms are a rather intractable, but presumably important, concept. However, one possible way with survey evidence would be the battery of questions contained in the ISSP Social Inequality modules 1987-2009 that ask respondents to estimate how much a small set of occupations earn but also how much the respondent thinks each one *should* earn. These specific data are available for around a dozen countries in a consistent way, including Britain and the US. Pay norms could be captured by the extent of agreement between respondents within countries in permitted differentials between the set of occupations – but also the level of agreement within each occupation too – relating to the two ways mentioned above about how pay norms could breakdown –

both between and within occupations. Also ignorance in pay structures across occupations could be ruled out by controlling for respondents' estimates in how much each occupation *actually* earns. The analysis could be extended to see if breaking down in pay norms move in step with actual movements in inequality within countries over time since the data are over time.

All in all, there are many mechanisms by which wage inequality has grown – and continues to grow – and the story is a complicated one with no single overarching story. We know technology and institutions surely have something to do with it. A lot remains to be done. My thesis adds to this story by examining the role of the changing structure of occupations in growing British wage inequality which have been oddly overlooked, even though occupations, as Phelps Brown put it, are 'the most conspicuous reason' that first spring to mind when considering differences in pay. My thesis has established that a between-group story is the more accurate one when we define groups in terms of detailed occupations, in contrast with the main findings in the literature including the recent report for the National Equality Panel that concluded "the inequality growth of the last forty years is mostly attributable to growing gaps within social groups, however those groups are defined" (Hills, Brewer, et al. 2010:1). This should be good news for policy makers as it gives them something tangible to work with if tempering growing inequality is to be a policy goal. Furthermore, my thesis has pointed to the highly concentrated nature of growing wage inequality and to particular sections of the labour market that warrant further investigation. More generally, the focus on occupations and the finding of between-occupation inequality being central to the story is that surely the next step is to examine particular pay-setting mechanisms.

– A –

DATA APPENDIX

THE NEW EARNINGS SURVEY / ANNUAL SURVEY OF HOURS AND EARNINGS

The wage data in this thesis comes from the *New Earnings Survey/Annual Survey of Hours and Earnings* (hereon referred to simply as the NES). The surveys are based on a 1 per cent sample of employees in Britain (therefore excluding Northern Ireland) with individual respondents being selected on the basis of their National Insurance (NI) number. The NES therefore provides a random sample by default due to the way in which NI numbers are assigned. Data is collected directly from employers in around April. This dataset was used for three main reasons. First, it is a long time series (data files available for 1975-2008, although the survey has been running since 1968) covering the most recent secular take-off in earnings inequality. Second, it contains high quality earnings data: there is no top-coding; information is collected directly from employers, reducing measurement error associated with poor recall and proxy responses; there are high response rates due to completion of the questionnaire by employers being compulsory under the Statistics of Trade Act, and

also low item non-response; and since the sampling frame is based on National Insurance numbers ending in 14 and the way in which they are assigned, means the sample is essentially random, sampling employees of all occupations, industries, and workplace sizes. Furthermore, other comparable datasets with large sample sizes covering the period when earnings inequality took off contain no earnings data until the 1990s (the *Labour Force Survey*). Finally, the NES has large enough sample sizes with detailed occupation information ensuring reliable estimates at the most detailed occupational level can be made.

However, a couple of shortcomings of the NES should be noted. First, it does not cover workers that fall below the pay-as-you-earn (PAYE) threshold in terms of total earnings. Thus very low-paid part-timers and people working in 'mini-jobs' are likely to be underrepresented. Second, there is a period of a month between when employees are sampled and employers located, meaning there is a month window in which if an employee leaves their employer, the employer will have no earnings information for the reference week. This means individuals and occupations involve frequently churning might be undersampled. The NES was replaced by ASHE in 2004. The movement to ASHE supplemented the NES sampling frame with these kinds of underrepresented workers. For consistency, I retain the NES sampling frame throughout, using a file prepared by the Office for National Statistics.

To further increase detailed occupation sample sizes, yearly samples are combined into three-year samples, centred on a middle year. This also has the added advantage of reducing year-to-year variability in trends. Earnings refer to hourly wage rates (gross weekly wage excluding overtime divided by usual number of hours per week). These were then deflated to 2008 prices using the Retail Price Index. The sample includes all workers, full-time and part-time, aged 18-65, whose earnings were not affected, with nonmissing

items. The reason for including part-timers is that they make up an increasing share of the labour force and this could add another source of variation in trends in earnings inequality, thus warranting investigation. The data are trimmed dropping those with very high and very low hourly earnings, as this could be due to measurement error. Very low earnings are defined as 25 per cent of the median and very high earnings are defined as ten times the median. In practice, taken together, adding these restrictions makes very little difference to the raw sample sizes and the achieved sample sizes, as shown in Table A1.

THE LABOUR FORCE SURVEYS

The *Labour Force Survey* (LFS) is a face-to-face interview household-based survey that has been conducted by the Office for National Statistics since 1973. The survey was biennial until 1983 when it became annual. From 1992, the LFS became a quarterly survey, introducing a panel element, where households are followed for five consecutive waves. The key strengths of the LFS for this thesis are the rich set of individual socioeconomic and demographic information it contains – especially education. The LFS cannot be used as an alternative to the NES as the LFS does not contain any earnings data until 1993, when gross weekly wages began being recorded for the fifth waves in the survey. From 1996, wage data were collected twice for each household, for the first and fifth waves. The quality of the earnings data are not of the same quality as the NES, however. Typically, item non-response for earnings is high – around one-third. Furthermore, around half the respondents to the LFS are by proxy (and this is increasing) i.e. the information is filled out by someone in the household other than the person to which the observation refers (see Ma, Roberts et al. 2006).

It is likely that this will introduce more measurement error in earnings – but not much affect the key variables for which this thesis uses the LFS i.e. occupation and education.

The LFS provides a good source for education information by occupation. It offers large sample sizes (roughly 60,000 individuals per year) allowing accurate estimates of the proportion within detailed occupations holding a degree or above. Data prior to 1979 is discarded as no double-coded file with both SOC90 occupation codes and the classification system employed in these years (CODOT) exists – so a consistent classification could not be made for these years, but could be made for years after 1979 when the occupation classification system changed to CO80. Values for 1980 and 1982 education are imputed by the average proportions of the neighbouring years for each occupation since the LFS was biennial then and data for these years are therefore missing. For the years where the LFS is quarterly (after 1992), the January-April quarter only is used as this covers the reference period to which the NES data refers (except for 1992 where April-June quarter is used) and also not all quarters contain occupation or education information.

Table A1. New Earnings Survey/Annual Survey of Hours and Earnings

Year	Total N of cases	Proportion women	Proportion missing hourly wage	Proportion missing hourly wage + restrictions
1975	157,069	0.36	0.17	0.17
1976	169,276	0.38	0.16	0.16
1977	172,150	0.38	0.17	0.17
1978	172,793	0.38	0.18	0.18
1979	173,426	0.39	0.18	0.18
1980	172,936	0.39	0.18	0.18
1981	173,071	0.4	0.20	0.20
1982	168,178	0.4	0.18	0.18
1983	163,623	0.41	0.17	0.17
1984	161,969	0.41	0.18	0.18
1985	158,212	0.42	0.19	0.19
1986	161,319	0.42	0.17	0.17
1987	165,831	0.43	0.19	0.19
1988	171,704	0.43	0.18	0.18
1989	170,792	0.44	0.18	0.18
1990	174,373	0.45	0.19	0.19

1991	173,090	0.46	0.18	0.18
1992	167,161	0.46	0.19	0.19
1993	160,584	0.47	0.18	0.18
1994	162,014	0.47	0.18	0.18
1995	159,780	0.48	0.11	0.11
1996	160,540	0.48	0.12	0.12
1997	151,644	0.48	0.10	0.10
1998	158,571	0.48	0.11	0.11
1999	158,528	0.48	0.11	0.11
2000	153,120	0.48	0.10	0.10
2001	155,637	0.49	0.11	0.11
2002	158,031	0.49	0.11	0.11
2003	160,382	0.49	0.11	0.11
2004	160,081	0.50	0.08	0.08
2005	162,170	0.50	0.05	0.05
2006	163,475	0.50	0.05	0.05
2007	132,673	0.50	0.04	0.05
2008	142,454	0.50	0.05	0.05
Total	5,526,657			
Mean	162,549	0.445	0.145	0.145

– B –

BRIDGING OCCUPATION CLASSIFICATION SYSTEMS

One common data difficulty encountered when examining occupations over a period of decades is that the classification system is updated every so often. Generally, this is not so problematic when creating a highly aggregated classification of a handful of categories and is a relatively straightforward task of simply manually recoding each detailed occupation code under the different classification systems into a common aggregated version based on the occupation title (for instance this is one way in which occupations were assigned NS-SEC categories in Chapters 2 and 5). Creating a consistent classification of occupations at the most detailed (unit-group) level is more difficult as there is no one-to-one mapping between systems.

Employees in the NES sample are assigned to an occupation category by a professional coder based on the job title and a brief description of work given by the employer. However, the occupation classification system used by the coders changes three times over the period under consideration.

From 1975 to 1990 occupations were coded to the Key Occupations for Statistical Purposes (KOS) system which classifies jobs into over 400 occupations based on the Classification of Occupations and Directory of Occupational Titles (CODOT) of around 3,800 individual detailed occupations which is in turn based on 12,000 job titles. According to a document by the then Department of Employment "the basic principle of the CODOT is the classification by work content or job activity. Occupations are defined according to what the worker does, and are grouped according to similarity of the work done" (Department of Employment 1972a:3, cited in Gregory and Thomson 1990). Occupations are included in KOS based on "their importance to statisticians, policy-makers and organizations consulted over the composition of the key list" (Gregory and Thomson 1990:442). The KOS list normally comprises of 404 occupations but was expanded for the NES to include 442 occupations (although only 438 consistently appear). The NES is the only major survey to have implemented this classification of occupations.

From 1991 to 2001, occupations were coded to the Standard Occupation Classification 1990 (SOC90). The SOC90 classification system was the most common classification system in other social surveys at this time. As with the KOS/CODOT classification, the system is based on the job title and description of the work, and does not make direct reference to skill content, employment status or other factors in arriving at the appropriate category for a given respondent, although in generating the categories, specific reference to educational and training requirements was made (Thomas and Elias 1989). For more information on SOC90 see OPCS (1991). From 2002 to 2008, occupations were coded to the Standard Occupation Classification 2000 (SOC2000). The move to the newer classification was primarily to update SOC90 to include more refined categories for managerial, computer-related, and remote service occupations. Despite being based on similar underlying principles, being developed in a similar way and by some of the same

people that developed SOC90, the two schemas are not comparable at the unit group level. These two classification systems are standardised with other major surveys, including the LFS. For more information on SOC2000 see ONS (2000).

One of the main reasons for introducing a new classification system is to take into account the changing occupational structure. Some occupations are further sub-divided in later classifications as an occupation evolves, for instance to take into account technological change, or the general growth in certain occupations so that they warrant a category in their own right. In the SOC90 classification, for example, there is one category for 'occupational and speech therapists, psychotherapists, therapists n.e.c.' (SOC90, code 347). In SOC2000, this composite category is coded as three separate categories: 'occupational therapists' (SOC2000, code 3222), 'speech and language therapists' (SOC2000, code 3223), and 'therapists n.e.c.' (SOC2000, code 3229). Another reason is that inadequacies are found in older systems, and the newer systems attempt to refine the classification, for instance, one of the aims of SOC2000 was tighten definitions of managerial occupations. Another inadequacy found was the lack of 'conservation associate professionals' occupation categories in older systems.

Of course, a big disadvantage of such changes is that it makes long-run analysis at the occupation unit-group level difficult as the systems are not directly comparable. Although the classification systems do not vary much in the principles by which jobs are classified into occupation categories – they are all based on job content – and the information used to assign individuals to occupation categories – they are all based on job title and description – the actual categories in each of the three systems are quite different. The following table illustrates the indirect correspondence between the different occupation classification systems in the NES and the LFS. Few occupations map one-to-one across systems, with each KOS/CODOT occupation mapping into more than 30 different

SOC90 codes in average, and SOC 2000 occupations mapping into 25 different SOC 90 codes on average, with several KOS/CODOT and SOC2000 codes mapping into more than 100 SOC90 codes.

Table A2. The correspondence of KOS/CODOT and SOC2000 with SOC90

Years covered	Occupation classification system	Number of categories	Mean N SOC90 codes each occupation code maps	Standard deviation	Minimum	Maximum
1975-1990	Key Occupations for Statistical Purposes (KOS/CODOT)	438	31.09	30.52	1	192
1975-1990*	Condensed CO80 (CO80)	164	3.81	2.83	1	16
1991-2001	Standard Occupation Classification 1990 (SOC90)	369	-	-	-	-
2002-2008	Standard Occupation Classification 2000 (SOC2000)	350	25.10	24.58	1	165

*LFS: From 1975-1990 the LFS uses condensed CO80 codes. From 1991-2008 the LFS uses the same classifications as the NES.

These results are based on double-coded files from several sources, see text.

For this study, it seemed sensible to obtain a consistent classification of occupations by converting occupations in both the KOS/CODOT and SOC2000 waves to SOC90 as SOC90 falls in the middle of the period under study. There are several ways in which this might be done. The eventual approach was chosen according to the accuracy of results and feasibility, both in terms of cost but also in terms of availability of the requisite data.

APPROACHES TO BRIDGING OCCUPATION CLASSIFICATION SYSTEMS

A consistent classification of occupations across all the years in the NES and LFS is desirable so that the changing occupational structure and occupational earnings at the most detailed level can be charted. The ideal method would be to have a team of trained coders

go back to the original survey responses and code the original information on job titles and descriptions provided by respondents to a single occupation classification system across the whole series. This is, of course, extremely expensive and not feasible: it would be a massive exercise involving manually coding over 5.5 million survey responses for the NES alone! There are several ways in which researchers have attempted to get around this. In the main, they involve using data from waves that have been double-coded to both the new and old occupation classification systems, and extrapolating information on how the different systems map into one another to obtain a bridged classification system. These are summarised in Table A3.

A second-best method to going back to the original survey responses would be to multiply impute occupation codes. This treats the bridging of two or more occupation classification systems as a missing data problem – where the occupations of those under the old scheme (i.e. KOS/CODOT in this case) are treated as missing. An imputation algorithm is implemented to code them to the newer occupation codes (i.e. SOC90) using other information in the dataset such as earnings, industry, age, gender, and their old occupation A big advantage of this approach is that several occupation codes are imputed for each case and thus the uncertainty in the imputation procedure is taken into account. However, there are two reasons why it is not applicable to the NES. One key covariate – education – is lacking in the NES, making multiply imputing occupation codes a moot option. Furthermore, the double-coded KOS/CODOT-SOC90 files contained only occupation information not linked to full cases. As such, a third-best method that has been used in the 'micro-class' literature is taken. This is outlined in the next section.

THE APPROACH TAKEN

The method used in this chapter to obtain a consistent occupation classification of occupations is essentially a sophisticated recode that codes all occupations to SOC90 as this scheme fell in the middle of the data series and so is likely to be more representative of the whole period than either of the other two. It was conducted using double-coded waves, one file coded to both KOS/CODOT and SOC90 and another file containing cases coded to both SOC2000 and SOC90. For each, a mapping matrix is constructed by mapping the proportions of each occupation in one scheme, say scheme SOC2000 that map into SOC90. The mapping is based on the observed frequencies between old and new codes taken from the dual coded sample (the mapping matrix). Where an entire category in one classification is repeated in the other classification, then codes can be directly mapped one-to-one. However, this rarely occurs with any occupation, with many mapping into multiple codes.

It is possible to bridge the classification systems at the unit-group however. This explanation draws on the work of Kim Weeden. Weeden (2005a) and Weeden (2005b) should be consulted for information and syntax on implementing this algorithm. A large sample of records with occupations coded to different occupation classification systems is needed. The following double-coded files were used in this thesis:

- KOS/CODOT to SOC90 (needed for NES only) – this is special NES file constructed by an Office for National Statistics project whereby the 1990 NES wave (originally coded to KOS/CODOT) was manually coded to SOC90 too by a team of coders using job title and job description information responses. This was kindly provided by Peter Elias. The file contains 173,458 double-coded cases.

Table A3. Summary of approaches to bridging occupation classification systems at the unit-group level

Method	Description	Advantages	Disadvantages	Examples of application
Recode based on job titles	This approach attempts to recode each occupation code into a new consistent classification based on the title of the occupation codes, grouping similar occupations together. Therefore, this method works better when the unit-group level occupations are being allocated to aggregated composite occupation categories, as the changes between systems at the unit-group level are so great.	• No need for a double-coded look-up table.	• Occupation classifications very rarely neatly map into one another (see Table A2). • Not really suitable for obtaining information at the unit-group level of detail – which is what is needed. • Ignores how occupations actually map into one another (if known). • Time consuming.	Davies and Jones (2005).
Multiply impute occupation codes	Occupation codes under the old/new system are treated as a missing data problem. As such, an occupation code can be imputed using an imputation algorithm using information on their old/new occupation code and demographic information to draw several codes for each respondent from the posterior distribution. In this way, the uncertainty in the imputation process can be taken into account in analyses.	• Takes into account uncertainty in the assigning of occupation codes on standard errors. • Appears to be reliable at the unit-group level.	• A decent set of predictors are lacking in the NES. • The KOS/CODOT-SOC90 double-coded files contains no other information aside from occupation. • Requires substantial computing power.	Clogg, Rubin et al. (1991); Schenker, Treiman et al. (1993); Schenker (2005).
Random allocation	Using the information from a mapping matrix containing the proportions of each occupation in one scheme that map into each occupation in another, new occupation codes are randomly allocated to old codes preserving the proportions observed in the double-coded sample. For example if code Y (i.e. KOS/CODOT or SOC2000 codes) mapped into codes A, B, and C (i.e. SOC90 codes), and the proportions were .25, .40, and .35 respectively, then a random draw of 25 per cent of code Y cases would be recoded to code A, a random draw of 40 per cent would be recoded to code B, and 35 per cent to code C – preserving the overall proportions observed in the double-coded sample.	• Easily implemented.	• Performs poorly with occupations that map into many codes and the number of respondents in the occupation is small.	Goos and Manning (2007); Nickell and Saleheen (2008).
Modal allocation	As above, a mapping matrix is used, but instead of randomly allocating cases to preserve overall proportions, each case is allocated the modal category. So using the example above, all code Y cases would be recoded to code B.	• Easily implemented.	• Not really suitable for obtaining information at the unit-group level of detail where occupations map into many occupations and modal values can be low (e.g. <10%).	Oesch and Rodriguez (2009).

- Condensed CO80 Labour Force Survey to SOC90 (needed for LFS only) – the publically available 1991 file is double-coded and this was used to construct a mapping matrix. The double-coded sample size is 70,288 cases.

SOC90 to SOC2000 (both LFS and NES) – use job stayers that appear before and after the classification system changes. In the LFS, a double-coded sample can be obtained from job stayers that appear both in the last quarter of 2000 and first quarter of 2001 (when the system changes), resulting in a sample of 38,347 (this only possible with seasonal quarters, not calendar). In the NES, a double-coded sample can be obtained from job stayers that appear both in 2001 and 2002 (when the system changes), resulting in a larger sample of 112,302.

The double-coded samples are used to make proportional mapping matrices – look-up tables showing how many SOC90 codes a given KOS/CODOT or SOC2000 code maps into and the proportion of people with a given KOS/CODOT or SOC2000 code mapping into a particular SOC90 code. In this way, an observation in the dataset can be expanded N times and assigned N SOC90 codes, where N is the number of occupations that the respondent's KOS/CODOT or SOC2000 code maps into. All the respondent's (expanded) observations are then weighted according to the proportions given in the mapping matrix. Thus the actual sample size is recovered once weights are applied. So, for example, consider a 2000 code Y that drew from three 1990 codes, A, B, and C. Code A contributed 35 per cent of the cases in the 2000 Code Y, Code B contributed 50 per cent, and code C contributed 15 per cent. For each person in the data file with 2000 code Y, three records will be created with the following information:

ID	SOC2000	SOC90	Weight
1	Y	A	.35
1	Y	B	.50
1	Y	C	.15

Occupation sample sizes have to be sufficiently large to provide reliable estimates – especially when the analysis is split by gender. Furthermore, the Office for National Statistics' disclosure rules (which are a necessary condition to access the NES) state that cell sizes must have N>10. To enable this and reduce year-to-year variability that is typical with earnings data, three waves at a time are combined centred on a middle year to give three-year moving averages.

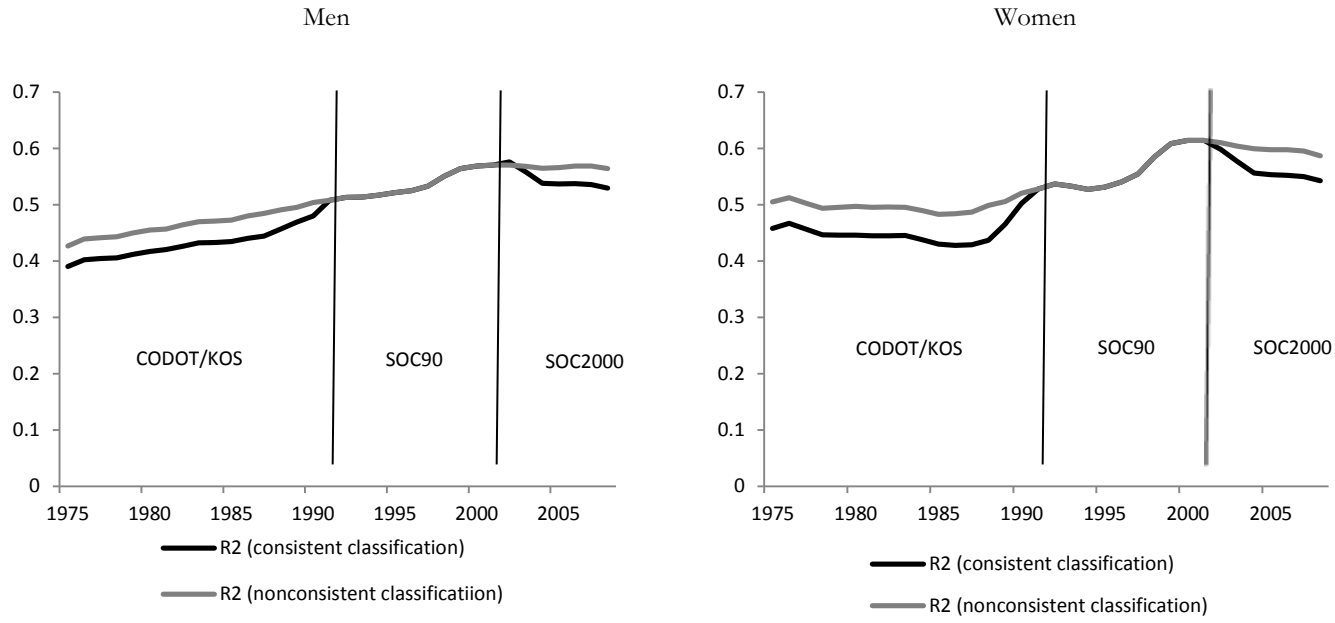
The average sample size for all occupations and years is 725.78 for men and 850.39 for women, with standard deviations of 1160.98 and 2186.77 respectively. When three waves are combined at a time, centred on a middle year, the minimum value of any occupation in any given year for either gender is 30 cases, with a maximum of 9,172 cases for men and cases 17,490 for women.

Some occupations in the SOC90 occupation classification scheme are not included in the analysis: code 600 NCOs and other ranks, UK armed forces (not sampled in NES); 601 NCOs and other ranks, foreign and Commonwealth armed forces (not sampled in NES); and finally, 999 All others in miscellaneous occupations n.e.c. (for some reason does not appear in the years 1991-1996 so is excluded).

THE IMPACT OF CHANGES IN OCCUPATIONAL CLASSIFICATION

To examine the impact of changes in the occupational classification system on my findings, I ran two separate OLS regressions with log hourly wages as the dependent variable and three-digit occupation as the only covariate for each year. One used the consistent classification of occupations (and applied appropriate weights as described in the above section), while the other allowed the occupation classification system to change three times as it does in the data. The R^2 from these regressions are plotted separately for men and women in Figure A1. The R^2 from these regressions can be interpreted as between-occupation wage inequality i.e. the proportion of variance in log wages 'explained' by occupation. Essentially, the nonconsistent lines are the same as the between-occupation trend in the lower panel of Figure 9 in Chapter 3. Reassuringly, this robustness check shows that whether the consistent or nonconsistent classification is used, both show the same trend – a growth in the between-occupation component – indicating that as best as we can possibly measure them, occupations are becoming a better predictor of wages over time. However, the nonconsistent classification seems to underestimate between-occupation inequality suggesting that findings underestimate between-occupation inequality.

Figure A1. The changing proportion of the variance in log hourly wages accounted for by occupation: consistent classification vs. nonconsistent classification



Source: NES.

Notes: Three-year moving-average. Full-time and part-time workers aged 18-65 whose earnings were not affected by absence; hourly wages are weighted by usual hours per week.

– C –

CODING OCCUPATIONS TO NS-SEC CATEGORIES

The KOS codes and SOC90 codes were manually coded in line with the theory and advice from John Goldthorpe by Abigail McKnight, who kindly provided the look-up files. This is the same coding used in their examination of social class and economic security (Goldthorpe and McKnight 2006). The construction of the look-up table involved assigning each 3-digit code of both classification systems to one of the 25 NS-SEC sub-categories. These sub-categories were then aggregated up to the six broad NS-SEC categories. For the years 2002-2008 (when the occupation classification system in the NES changes from SOC90 to SOC2000), I had to construct my own look-up table, as Goldthorpe and McKnight did not examine the years after 2002. I manually coded each SOC2000 occupation title to what I felt was the appropriate NS-SEC sub-category. As a robustness check, the SOC2000-NS-SEC look-up table was compared to an LFS wave (January-April 2004 – as it fell in the middle of

the time span that needed to be coded) that contained both SOC2000 and NS-SEC codes for each employee coded by a trained coder and also based on the other information that should be taken into account – if it was available in the NES – in assigning an NS-SEC code such as whether or not an employee has managerial duties. The modal NS-SEC category for each SOC2000 code from both the manually coded look-table and LFS-based look-up table were compared and they agreed on the appropriate modal NS-SEC category for every single SOC2000 code showing that my coding was reliable. The .do files for the 2002-2008 procedure are available on request whereas the 1975-2001 code is not publicly available.

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