Institute for New Economic Thinking AT THE OXFORD MARTIN SCHOOL

SIFTING THROUGH THE ASHE: JOB POLARISATION AND EARNINGS INEQUALITY IN THE UK, 1975-2015

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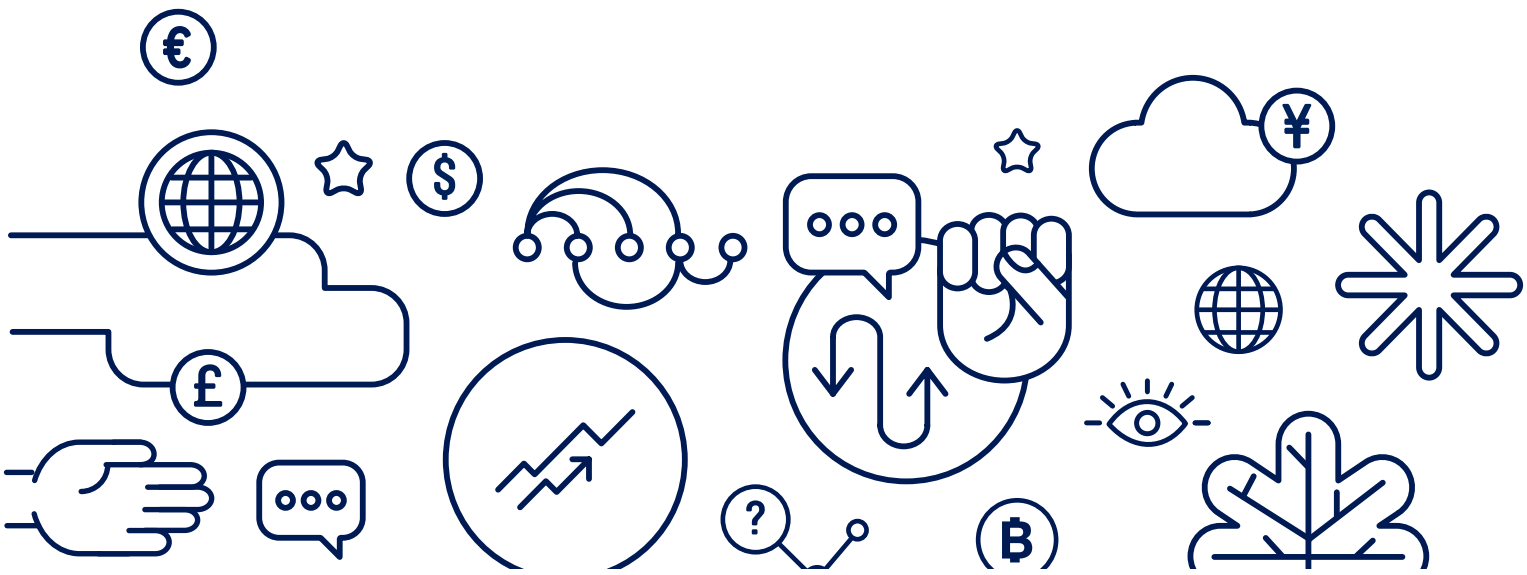

Sifting through the ASHE: Job Polarisation and Earnings Inequality in the UK, 1975-2015[1]

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1. Introduction and summary

In a historical perspective that spans the 20th century, great changes have taken place in the UK labour market in the industrial and occupational structure of employment, and of course in real earnings. As Newell (2007) points out, the percentage share of employment in broadly defined production industries fell from 51.1 in 1901, to 45.2 in 1950, 42.9 in 1965, 29.9 in 1980 and 16 in 2001, compensated by a large rise in employment in service industries. The percentage share of civilian workers in manual occupations and agriculture fell from 55 in 1951 to 52 in 1966, 38 in 1977, and 31 in 2003, while that in managerial, professional and technical occupations rose from around 9 in 1951, to 13 in 1966, 27 in 1977 and 40 in 2003. Gallie (2000) notes the increasing percentage rate of labour force participation of married women (and hence of women as a group) from 10 in 1911, 22 in 1951, 29 in 1961, 42 in 1971 to 53 in 1991. The percentage of women working part-time rose from 11 in 1951 to 25 in 1961, 40 in 1975 to 46 in 1998. Gallie also notes the precipitate decline in trade union density from a post-war peak reached in the late 1970s to the present.

Many older industries, i.e. agriculture, coal, iron and steel, mechanical engineering, especially shipbuilding and textiles, were in decline for much of the century. The employment share of manufacturing reached a peak in the late 1960s as other manufacturing industries including vehicles, aerospace, pharmaceuticals, electrical and electronic goods took the place of the older ones. However, from the late 1960s, the broad production sector, including manufacturing saw rapidly declining shares of employment. Many factors lie behind these structural changes, including skill-biased technical change,

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globalisation of trade and finance, changing patterns of household demand as real incomes rose, the rise in participation in higher education and political change. Similar trends operated in other countries, though somewhat less pronounced in some, such as Japan, Germany and Switzerland.

There is evidence that the changes that seem to have accelerated from the late 1960s led to job polarisation or the development of an 'hour glass' labour market in which the proportions of low and high earning jobs increase at the expense of jobs in the middle of the earnings distribution. In the important contribution by Goos and Manning (2007), UK jobs are ranked according to median hourly earnings by occupational group in 1979 using New Earnings Survey data. They demonstrate the percentage rise in employment up to 1999 in the bottom two and the top two job quality deciles, with a decline in the third to the eighth deciles. They emphasise the competing explanations of skilled biased technical change and the routinization hypothesis of Autor, Levy and Murnane (2003) and Autor, Katz and Kearney (2006). In Goos, Manning and Salomon (2009), they apply similar methods to European labour markets and in Goos et al. (2014) argue that routine-biased technical change and offshoring of jobs accounts for much of the job polarisation seen in Western Europe between 1993 and 2010. Acemoglu and Autor (2011) examine trends in job polarisation in US data from 1959 to 2007.

Holmes and Mayhew (2012, 2015) argue that education and trade union membership have played important roles in UK job polarisation and that job polarisation has not had the effects that might have been expected on the wage distribution if technology were the dominant driver. Salvatori (2015) revisits and updates the UK data and also emphasises the role of educational change, in particular the rise in graduate numbers, in explaining job polarisation in the UK. He agrees with Holmes and Mayhew in questioning the dominant role attributed to technology in accounting for job polarisation in the UK.

In the present paper, we re-examine the UK data using annual information for 1975 to 2015 from the Annual Survey of Hours and Earnings (ASHE), preceded by the New Earnings Survey (NES). ASHE is a survey based on a 1% sample of employee jobs taken from HM Revenue & Customs PAYE records; observations are approximately 300,000 per year, a relatively large number that allows investigation of job polarization at levels of disaggregation –gender, full/part-time, sector, region, birth-cohorts and their cross-classifications, which are precluded with smaller data sets, like the Labour Force Survey (LFS)[2]. In addition, having chained the various occupational and sector classification changes, as noted below, the dataset spans forty years and can thus consider long-term trends potentially related to other sources of sectoral changes such as changes in the migration regimes, the real exchange rate or in industrial policy.

[2] ASHE however does not cover the self-employed nor does it cover employees not paid during the reference period.

The main objective of this chapter is therefore to offer a finer descriptive picture, highlighting the important gender differences in labour market experiences. For men, the share of employment in the top two deciles has grown strongly since 1975, with loss of employment shares in deciles 2 to 7, but a notable increase in the share of employment in the bottom decile only after 1990, when the 'U-shape' of changes becomes clear. For women, the share of employment in the top three deciles has grown strongly since 1975, but the 'U-shape' seen for men is absent. Indeed, considering changes in decile shares of employment *relative to women's employment*, the fall in the share of employment for the bottom decile is as pronounced as for deciles 5 and 6. For women, the dominant trend thus seems much more one of upgrading than of hollowing out.

In terms of 5-year changes, after 2010, there is a notable reversal of previous increases in employment in the top 2 or 3 deciles, while closer examination of annual data suggests peak shares of the top groups were reached in 2008, linking the shift to the global financial crisis. At the same time, there was a substantial further rise in the share of men's employment in the bottom decile and of women's in the bottom 2 deciles, continuing trends apparent since 1990. Examining changes in employment shares for a bottom-middle-top occupational grouping, we find close parallels to a bottom 20, middle 50, top 30 decile groupings, especially for men.

A shift-share analysis of decade changes in deciles using the 1995 rankings of occupations, into 8 SIC industrial sectors, gender, north-south and bottom-middle-top occupational groups finds that the combination of occupational and SIC groups accounts for well over half of the changes in every decade. SIC alone accounts for between a third and a half. The implication is that, within broad industry groups and even within industry-broad occupational groups, there is considerable variation in employment shares across jobs ranked by earnings. Some of this probably has to do with increased routinisation. However, the decline in the broad industrial production sector from over 43% of employment in 1975 to around 13% in 2015 has a complex of factors behind it as noted above, implying that much more than routinisation is involved.

The cohort experience both for men and for women shows that for every cohort since the 1920-29 cohort, the employment share in the middle occupational group is lower for a given age than for the previous cohort. There is the opposite tendency for the employment shares in the top occupational group to rise between cohorts, with the stark exception of the 1980-89 cohort, which has clearly fared worse, though not for women. Moreover, for women, the gain in the share of top jobs between successive cohorts is larger than for men. For the bottom occupation group the experience of men up to age 40 and for women up to age 30 is that the employment share in the bottom occupational group is higher for a given age than for the previous cohort, and most strikingly so for the 1980-89 cohort for both men and women. At older ages, the picture is more mixed, with earlier cohorts sometimes

having higher employment shares in the bottom group, possibly reflecting improving educational levels in the later cohorts.

If the rising employment share of men in the bottom occupational group were a sym ptom of higher demand for such jobs, e.g. because of indirect demand effects of technology (Weiss, 2008), one might expect a positive association between the cohort employment shares and their relative earnings. Instead, the opposite is true: ever since the 1940-49 cohort, every successive male cohort has lower earnings relative to the median, at a given age than the previous cohort. The same is true for men in the middle occupational group, though there the cause could be on the demand side, since the employment share and relative earnings move in the same direction. Thus, both for relative wages and employment, these trends suggest a generational contraction of job opportunities for men not in top occupations. For men in the top occupational group, the 1980-89 cohort is clearly faring worse in relative earnings as well as in employment share. For the other cohorts, the association between relative earnings and employment share is much less clear, except for the 1920-29 and 1930-39 cohorts, suggesting that simple demand-side explanations may not be appropriate. Given the expansion of higher education, this should be no surprise.

For women, the association between employment share and relative earnings for the different cohorts is less clear than for men, also for the bottom and middle occupational groups. However, pre-war cohorts in top jobs do worse in relative employment as well as earnings, while baby-boom cohorts born between 1940 and 1959 fare particularly well in both dimension. For the 1980-89 cohort, relative earnings for women in the top occupations, but not relative employment, are lower than for the 1970-79 cohort. For middling jobs, despite a falling share of employment between successive cohorts, relative wages for more recent cohorts have held up well. One possible element in these differing gender patterns is that additional labour supply from women has contributed to lowering earnings of men relative to median earnings. Other factors could include equal pay legislation, immigration and the loss of union power.

For all three occupational groups, median earnings for men and women have moved closer together. Relative to median earnings for all employees, median wages for men and women in the top group rose strongly from 1975 to the early 1990s, then plateauing for women and declining for men. In the middle occupational group, relative earnings for women have trended up while those for men have declined, at least since the 2000s. The same is true for the bottom occupational group, except that the relative upturn for women is more recent.

For each gender there has been a substantial widening of inequality between the top occupational group, the middle and the bottom, at least until about the mid-1990s. This will have contributed to the trends in inequality of hourly earnings. Inequality increased both at the lower and the upper ends of the earnings distribution in 1975-85 and in 1985-95. Between 1995 and 2005, inequality at the top carried on rising but fell in the lower half, especially for the bottom decile, with the national minimum wage introduced in 1999

playing an important contribution. For the decade 2005 to 2015, inequality fell in the upper half of the earnings distribution, consistent with the fall in the employment share of top jobs. It also fell in the lower half of the earnings distribution, despite the evidence above of an increased employment share of bottom category jobs. However, this decline in overall earnings inequality has coincided with an intergeneration redistribution, as noted above, against the generation born since 1980. Though it is beyond the scope of this chapter, this has been exacerbated by higher housing costs, relatively high youth unemployment rates since the financial crisis and higher student fees.

2. The structure of the paper

Examining long historical data from the ASHE/NES electronic data base on the ONS Secure Data Lab requires considerable efforts in linking shifting classifications. Since 1975 there have been six changes in the standard occupation classification (SOC) and four changes in the standard industrial classification (SIC). Regarding SOC, we use the panel structure of the survey and information on panel members who did not change jobs between years when the job classification changed to construct a probabilistic conversion scheme from one classification to another.

The method is somewhat more sophisticated than methods used by previous authors, and takes gender and age into account. In 1991, SOC90 comes into force, with major changes in classification from around 500 to over 900 categories. In 2002, there is a switch to SOC00 and in 2011 to SOC2010. The ONS has produced what appear to be precise transformation matrices to link occupational categories in SOC90, SOC00 and SOC2010 to NS-SEC, the National Statistics Socio-economic Classification published in 2005 and linked to the SOC00 classification of occupations. However, applying these transformations leads to substantial and implausible jumps in the proportions of the sample in certain occupational groups at both transition points. Our method eliminates these jumps and makes occupational categories comparable from 1975 to 2015, converting other classifications to SOC90.[3]

Regarding SIC, we used SIC2003 as the reference classification and convert the rest using ONS conversion tables, as briefly described in section 5.

Figure 2.1 takes the 1995 ranking of occupations by median hourly earnings excluding over-time to show how job polarisation has occurred between 1975 and 2015 for selected intervening years. We select 1995 as reference year for the rankings as it is just half way between the beginning and end-points of our data. The bars in the chart show the cumulative change since 1975 in the share of total hours of work for each decile in the occupational earnings distribution. Hourly earnings are defined as weekly gross pay excluding overtime divided by normal hours, and total hours of work is the sum of normal hours over all employees. It shows a loss of employment shares for occupations ranked in

[3] For further details, see Cristini, Geraci and Muellbauer (2017).

deciles 3 to 7, with the exception of decile 4, and substantial gains in shares for the lowest decile and the top three deciles.

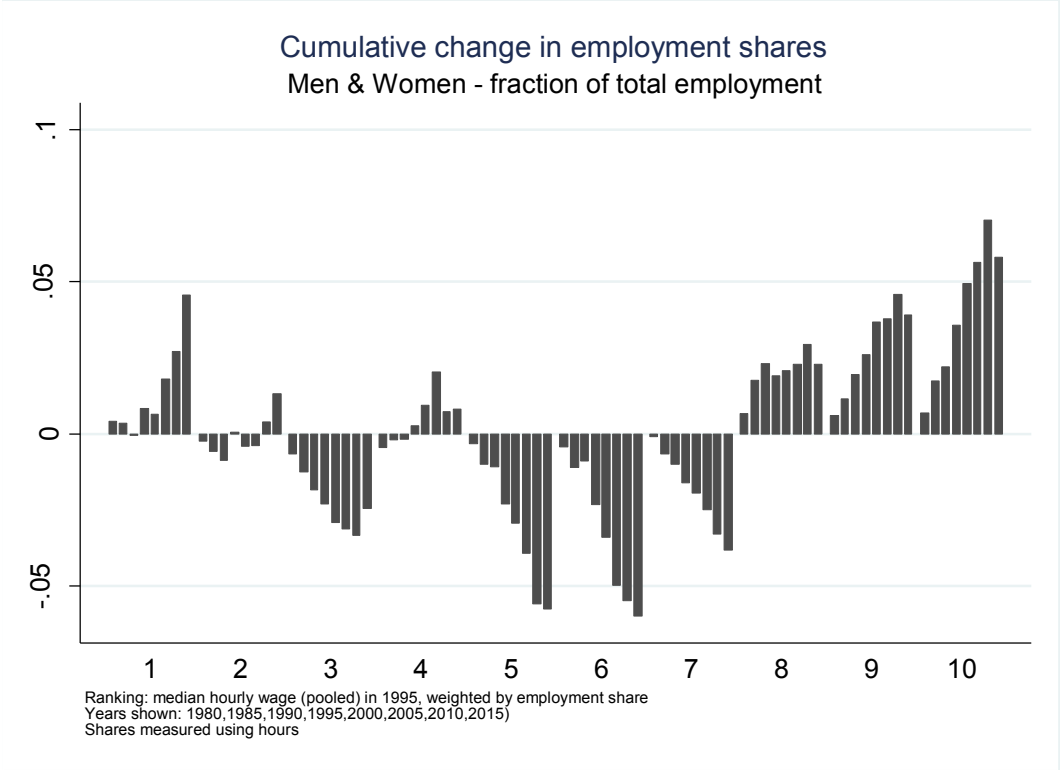

Figure 2.1: cumulative changes in employment shares, 1975-2015 in 5-year intervals, for 1995 deciles of soc90 3-digit occupations ranked by median hourly pay (excl. overtime)

It is also noteworthy that changes up to 2010 look mainly monotonic. However, just in the last 5 years, there appears to have been a reversal for the top three deciles with lower employment shares in 2015 than in 2010, while for the bottom decile there was a further sharp increase.

Another visualisation of the same information is to examine 10-year changes, see Figure 2.2.

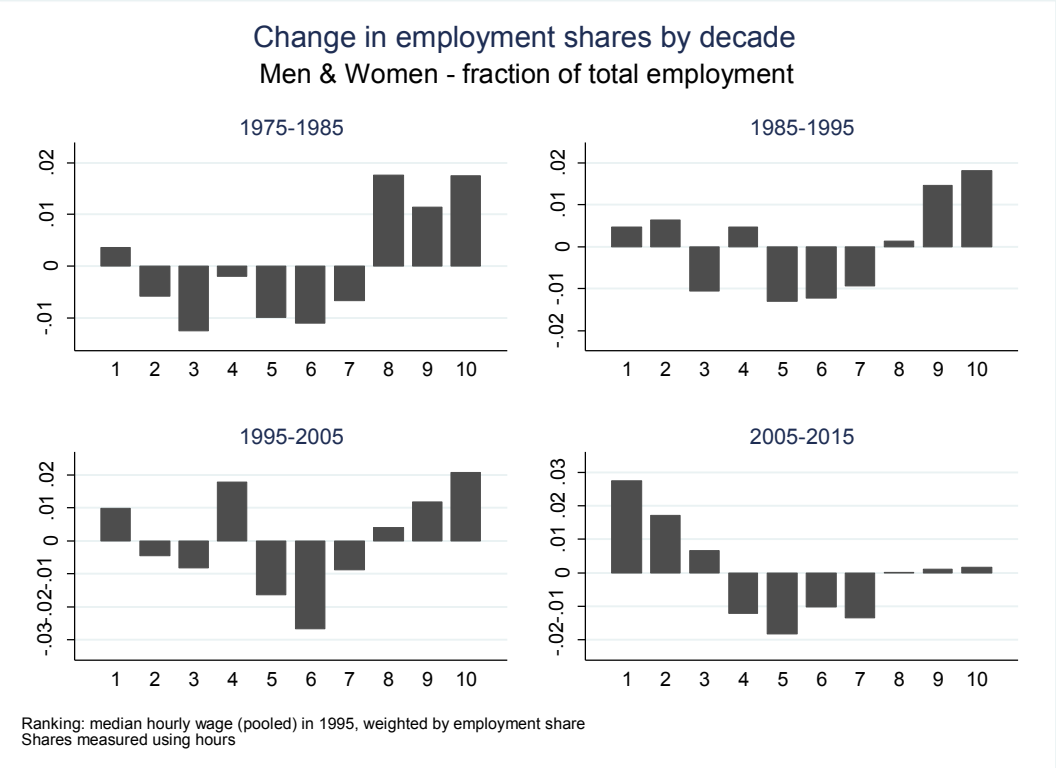

Figure 2.2: 10-year changes in employment shares for 1995 deciles of soc90 3-digit occupations ranked by median hourly pay (excl. overtime).

Figure 2.2 suggests considerable differences in patterns of polarisation in different decades. For example, gains in employment by the top three deciles came to a halt in 2005-15 (and as we just saw, reversed in 2010-15). Gains for the 8th decile were largest in 1975-85 and small thereafter. The very middle, the 5th and 6th deciles, lost employment shares in every decade but most dramatically between 1995 and 2005, a period coinciding with China's entry into the WTO in 2001 and other increases in the global supply chain, as well as with the rise and burst of the dotcom bubble. Between 2005 and 2015, the period after the opening of the UK labour market to immigrants from the EU accession countries in 2004 and 2007, and including the global financial crisis, the employment share of the bottom three deciles grew, especially for the bottom decile.[4] Another way of looking at the information in Figure 2.1 is to examine cumulative proportional changes relatively to the base year 1975. This makes clear that the proportion of employment in the top decile of jobs has approximately doubled since 1975, increased by about one half in the 9th decile and decreased by close to one half in the 5th and 6th deciles.

[4] The more erratic behaviour of the employment share in the 3rd and 4th decile is also worth noting. Since 2005, the 4th decile seems to be following the 'hollowing out of the middle' pattern, but not so before 2005. For the 3rd decile the opposite appears to be true.

Continuing the post-war trend noted above, one of the major structural changes in the UK labour market since 1975, has been the rise in the share of total hours worked by both full-time and part-time women, and the corresponding decline in the share of full-time men, from just over two thirds of total hours to half. Part-time work has also increased as a share of all hours. In 2015, 18% of all hours were part-time compared with 8% in 1975, with women accounting for 14% of 2015 hours, and men 4%. Men's share of total part-time hours has gone from 10% in 1975 to 24% in 2015.

Section 3 examines the substantially different patterns of job polarisation by gender. Goos and Manning (2007) used one year's job ranking to examine employment changes, for example, by deciles between 1979 and 1999 using Labour Force Survey data on employment and hours, and between 1976 and 1995 using New Earnings Survey data on employment and hours. One question which arises is how robust are their conclusions on job polarisation to taking rankings of jobs by median hourly earnings for other years. The rank correlation between median hourly earnings by occupation in 1975 and, for example, 1990 is lower than one might have expected which might raise doubts about the robustness of relying entirely one specific year's rankings. We conclude section 3 by comparing job polarisation measures using different years' rankings as a check on robustness and find some differences.

In Section 4, to better understand which occupations have been affected by these changes in labour market structures, we divide occupations into three groups, broadly on the lines of the three groups used by Acemoglu and Autor (2011). The three groups also accord with groupings of the nine first digit SOC90 groups grouped by median earnings rank. Examining job polarisation between these groups with recognisable job labels adds more context to labour market changes.

There have been major changes in the sectoral structure of employment, with a decline in the employment share of industry (broadly defined to include manufacturing, mining, agriculture, fisheries and water and energy supply) from 43% in 1975 to 13% in 2015, and corresponding gains in service sectors. The shedding of men's jobs in industry is an important part of the story of job polarisation for men. Section 5 examines these sectoral shifts.[5]

At this stage, a shift-share analysis becomes a useful analytical tool and this is the topic of Section 6. One can ask the question, if one held constant the share of employment for different categories of employees, how important are changes within the categories in

[5] Another element concerns comparisons between regions – the Greater South (GS), which includes London, East, South East and South West vs the rest of the UK. Cristini, Geraci and Muellbauer (2017) discuss to what extent the growth of employment in the top two deciles is more of a southern phenomenon, where earnings are on average higher and with an increasing share of total employment.

accounting for shifting employment shares by deciles of jobs ranked by median earnings. For example, one can cross-classify employees into gender x occupation group x sector x region (2 x 9 x8 x2 with the 9 SOC90 1st digit groups, or 2 x 3 x8 x2 with the broader three-fold SOC90 occupational groups). If the answer is that the within variation is very small, once one has accounted for these groups, then the between group changes in shares are the key factors to consider in understanding drivers of job polarisation. If this is the case for the full classification, one can then ask if the same is true if one distinction is removed. For example, one can ask whether removing region or gender or indeed SIC sector makes much difference to the within group variation in the groups that remain.

Another possible comparison is between age or birth cohorts, the topic of Section 7. The age composition of the workforce has altered over the years. If the age profiles of earnings were stable, one might expect employment shares by earnings rank to have altered with age composition, see Autor and Dorn (2009) for age effects in the US. One can also ask whether the experiences of those born before 1950, and from 1980 and in the decades between are very different. The large size of the ASHE/NES sample makes such comparisons meaningful.

Finally, Section 8 examines the linkage between job polarisation and changes in earnings inequality and we trace out these changes by plotting decile to median ratios from 1975 to 2015 for all jobs and by gender and occupational sub-divisions of employees.

3. Gender employment differences

As noted in the introduction, the gender dimension is a crucial part of changes in UK labour market structure and in job polarisation. Figure 2.1 showing polarisation for all jobs can be additively decomposed into Figure 3.1 for men and Figure 3.2 below for women. The sums of shares for each decile for men and women add up to the shares shown in Figure 2.1. Figure 3.1 shows a rather more striking pattern of hollowing out in the middle for men than for men and women combined, and the increase in employment shares is in the top two deciles, rather than in the top three.

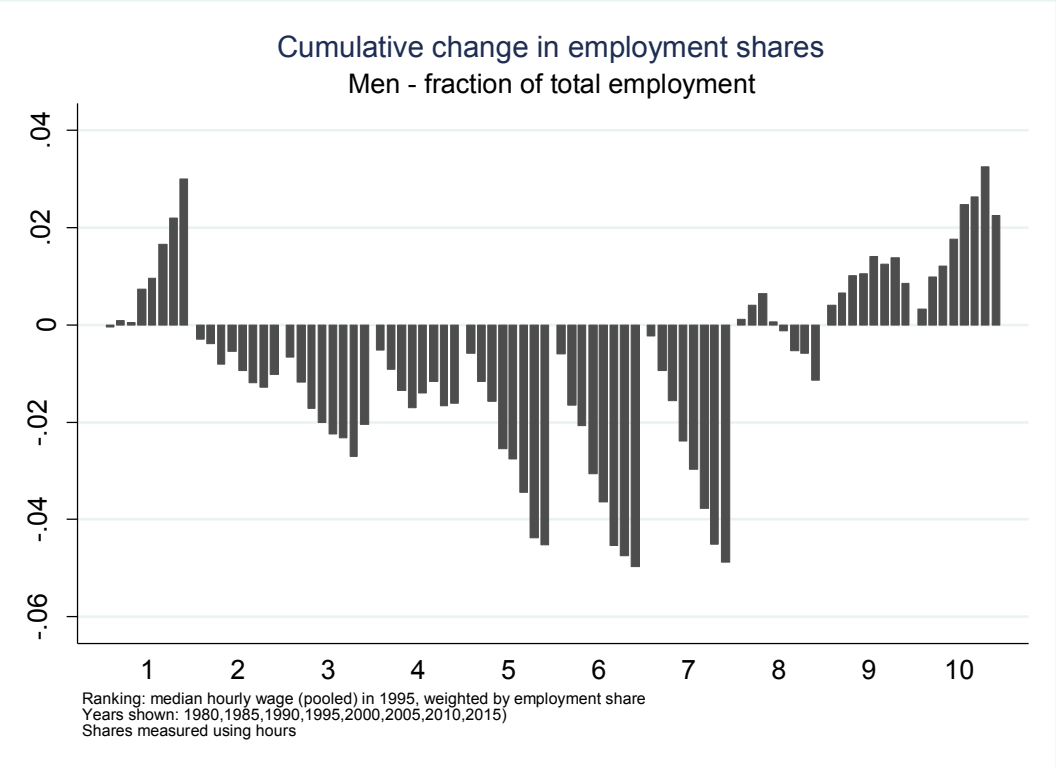

Figure 3.1: cumulative changes in men's employment shares out of all employees, 1975-2015 in 5-year intervals, for 1995 deciles of soc90 3-digit median hourly pay (excl. overtime).

Examining cumulative changes in decile shares of men's employment relative to total hours for men, thus looking at polarization within men employment, would give a broadly similar picture (not shown). One difference is that the changes in the share of the 8th decile look more similar to the top two deciles, while losses of employment shares in deciles 2 to 4 look less pronounced, given the increased share of women in these job deciles.

We now examine the corresponding graphics for women. Figure 3.2 shows cumulative changes in women's employment shares for job deciles out of total hours of employment.

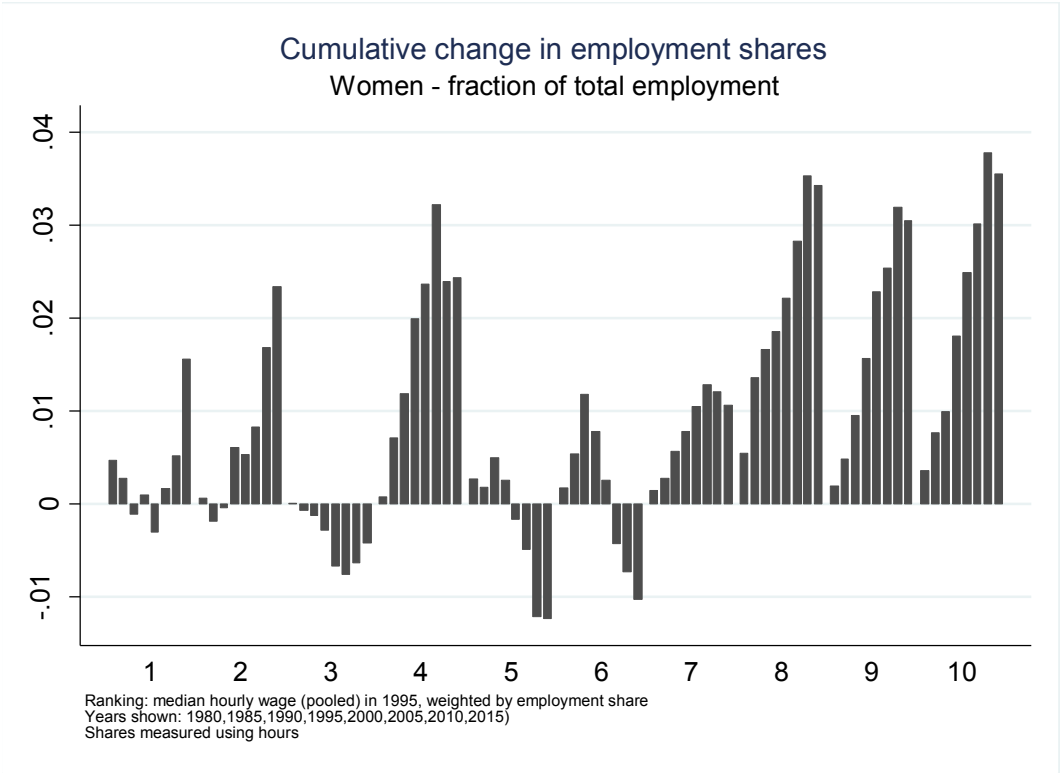

Figure 3.2: cumulative changes in women's employment shares out of all employees, 1975-2015 in 5-year intervals, for 1995 deciles of soc90 3-digit median hourly pay (excl. overtime).

The contrast between women and men in the cumulative changing shares out of total hours is striking comparing Figures 3.1 and 3.2. For women employees there is little[6] hollowing out as a percentage of total hours from the 2nd to the 7th deciles of the job distributions. Indeed, for jobs ranked in the 4th decile, the share of women has risen substantially. Major rises also occurred in the top four deciles (compared with the top two for men), and some rises occurred in the bottom two (compared to just the bottom decile for men). A major reason why this hollowing out picture differs by gender is the rising share of total hours worked by women, though this has clearly not been equally distributed across the job rankings.

The data in Figures 3.1 and 3.2 can also be considered in 10-year changes (not shown), which display large contrasts between different decades, especially for women. For women, there has been little hollowing out until 1995, and employment gains in the top three deciles have occurred in every 10-year period since 1975. The rise in the employment share of middle low positions corresponding to the fourth decile, which was clear in Figure 2.2 in the two middle decades, is entirely due to women in the decade 1985-95 and largely due to women in 1995-2005. The employment share in the bottom two deciles has been increasing since 1995, and most pronounced since 2005. Indeed, since 2005, there has been what

[6] The slight exception is in the 5th and 6th deciles from 2000.

looks like conventional job polarisation: increasing employment shares in the bottom three deciles, losses in deciles 4 to 7 and gains in the top three. For men, decade contrasts are smaller. The share of employment in the bottom decile has risen in every decade, though the size of the increase has been larger every decade. Hollowing out of the middle has been a feature of every decade, though somewhat less pronounced since 2005. The top two deciles have gained employment share in every decade until 2005, see section 4 for further discussion and graphics for broader decile groups.

Looking at cumulative changes in employment shares of job deciles relative to women's employment in Figure 3.3 below gives a rather different picture than in Figure 3.2: while there has been hollowing out relative to women's employment, in parts of the middle, i.e. in deciles 3, 5 and 6, in this respect more similar to men, the share in the bottom two deciles has also fallen, very different from men's experience. Thus, in Figures 3.2 and 3.3 the 'hour glass' or U-shape of Figure 2.1 and of the male Figure 3.1 is absent. Patterns of cumulative polarisation are quite different for men and women.

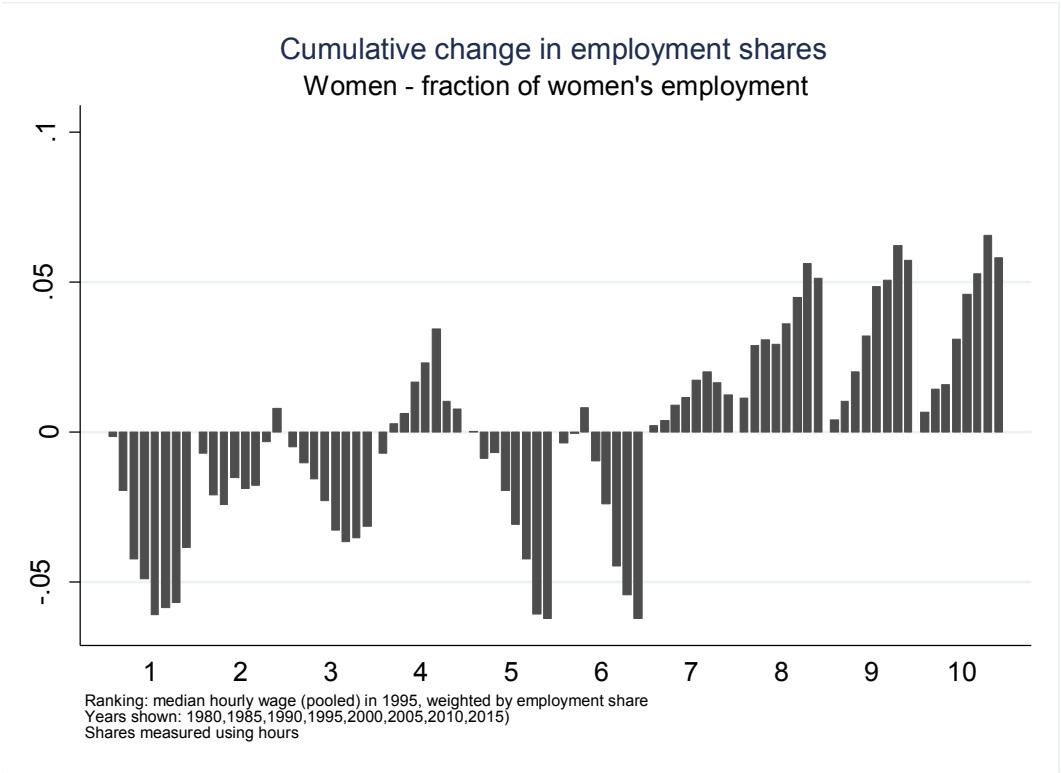

Figure 3.3: cumulative changes in women's employment shares out of women's employment, 1975-2015 in 5-year intervals, for 1995 deciles of soc90 3-digit median hourly pay (excl. overtime).

We return to gender differences of job polarisation in the UK later. As we shall see, the changing occupational and sectoral composition of employment is an important factor in

these developments. Sectors and occupations where women have accounted for a higher share of employment have tended to grow disproportionately.

In terms of cumulative proportional changes, the differences between women and men are even more striking. Given the under-representation of women in the upper echelons of job rankings in 1975 and the gains in their overall employment share, there were dramatic proportional increases in the top four deciles, particularly in the top two: the employment share in decile 10 doubled and almost quadrupled in decile 9. The share of women in top decile occupations remains however low, as it increased from…in 1975 to… in 2015.

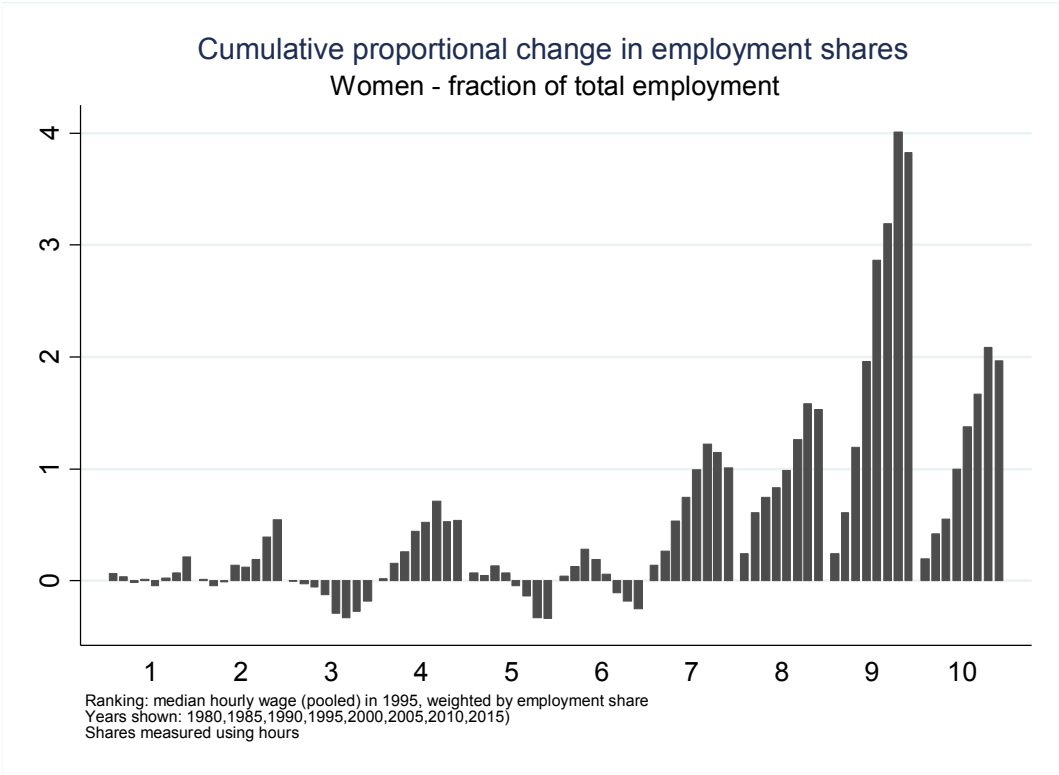

Figure 3.4: cumulative proportional changes in women's employment shares out of all employment, 1975-2015 in 5-year intervals, for 1995 deciles of soc90 3-digit median hourly pay (excl. overtime).

The figures shown so far are all for 1995 job rankings. One question must be whether shifts in occupational structure and the associated earnings have altered significantly the picture of job polarisation. The literature suggests that the occupational ranking does not appear to be significantly dependent on the base year. For the US, Acemoglou and Autor (2011) using data from 1979 to 2007, rank occupations using wages in 1980 and state that the specific choice of the base year does not change the occupational rankings in any significant way. Bàràny and Siegel (2017) also on US data, use 1980 wages for comparison, though their time period stretches from 1950 to 2007; they compare results using ranking based on 1950

wages and obtain distinctively different pictures.[7] For the UK Salvatori (2015) compares 1979 and 1993 rankings and argues that the U-shaped polarization is independent of the reference year. We find some sensitivity to the date of ranking. Because earnings rankings are affected by the major shifts in the gender composition of employment that have occurred, the sensitivity is more noticeable when looking at fractions of total employment. For employment shares relative to each gender's total employment, there is more consistency, though still considerable fanning out depending on the date of the ranking, see Figure 3.5 for men and 3.6 for women. All dates of rankings agree on job gains for men in the bottom 20% and losses for women in the bottom 20% until about 2000, after which low-wage jobs taken by women also increased, and gains for both in the top 30%, though these gains reversed after about 2010. The 1995 choice of reference year is typically in the middle - a good compromise between alternative reference years for wage ranking.

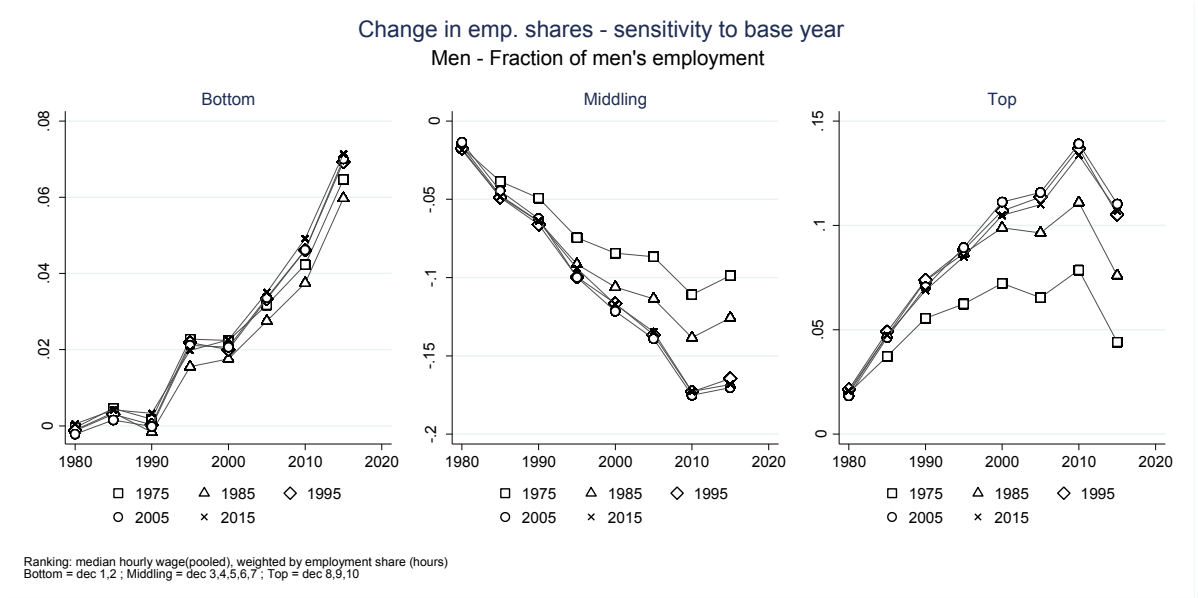

Figure 3.5: sensitivity of changes in men's cumulative employment shares for bottom 20%, middle 50%, top 30% out of men's employment to dates of the rankings.

[7] For example, based on the 1980 wage ranking, there were losses of employment share between 1970 and 2000 for all jobs below about the 60th percentile and gains above this level, with the largest gains at the top of the wage ranking. Based on the 1960 wage ranking (Figure 10 in their paper), between 1970 and 2000, the employment share of the bottom 20% and the top 70% increased, with falls in the middle. The 1950 wage ranking shows a much more pronounced *fall* in 1950-1980 in the employment share of the bottom 20% than does the 1980 wage ranking. For 1980-2007, the 1980 ranking shows a conventional hollowing out of the middle, while the 1950 ranking shows an increased employment share for about the bottom 30% and no gains except at the very top of the wages ranking. At any rate, the different rankings agree that changes in employment shares are far from homogeneous for different 30-year comparisons.

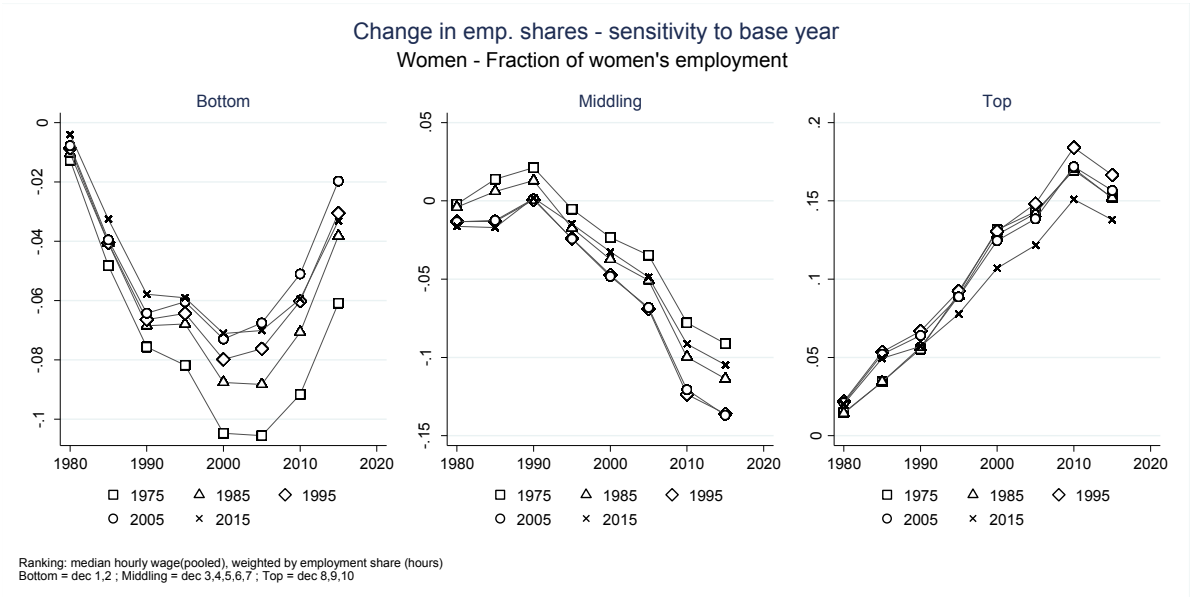

Figure 3.6: sensitivity of changes in women's cumulative employment shares for bottom 20%, middle 50%, top 30% out of women's employment to dates of the rankings.

4. Labour market polarisation by decade for broad occupational groups

The broad grouping of deciles into the bottom 20%, the middle 50% and the top 30% using the 1995 job rankings produces a clear pattern of polarisation. There has been a pronounced and steady fall in the fraction of men employed in the middle 50% of wage-ranked occupations until around 2010. The fraction in top jobs has risen steadily until about 2000, but has declined since 2010, while the fraction in the bottom 20% of wage-ranked jobs has risen since about 1990.

While ranking of the 350 or so occupations in the SOC90 classification by median earnings is interesting, it is quite anonymous. It is therefore interesting to take broad groups of occupations to see whether similar patterns of polarisation occur there. Our top group consists of the top three occupations at the first digit level: 1. Managers and administrators, 2. Professional occupations, and 3. Associate professional and technical occupations. Our middle group consists of 4. Clerical and secretarial occupations, 5. Craft and related occupations, and 8. Plant and machine operatives. The bottom group consists of 6. Personal and protective service occupations, 7. Sales occupations, and 9. Other occupations. These choices were based on rankings of earnings in 1995. For all hours of employment, around 23% were in the bottom group, 45% in the middle and 32% in the top group in 1995.

The RHS of Figure 4.1 for men for these three occupational groups shows a remarkably similar picture to the LHS.

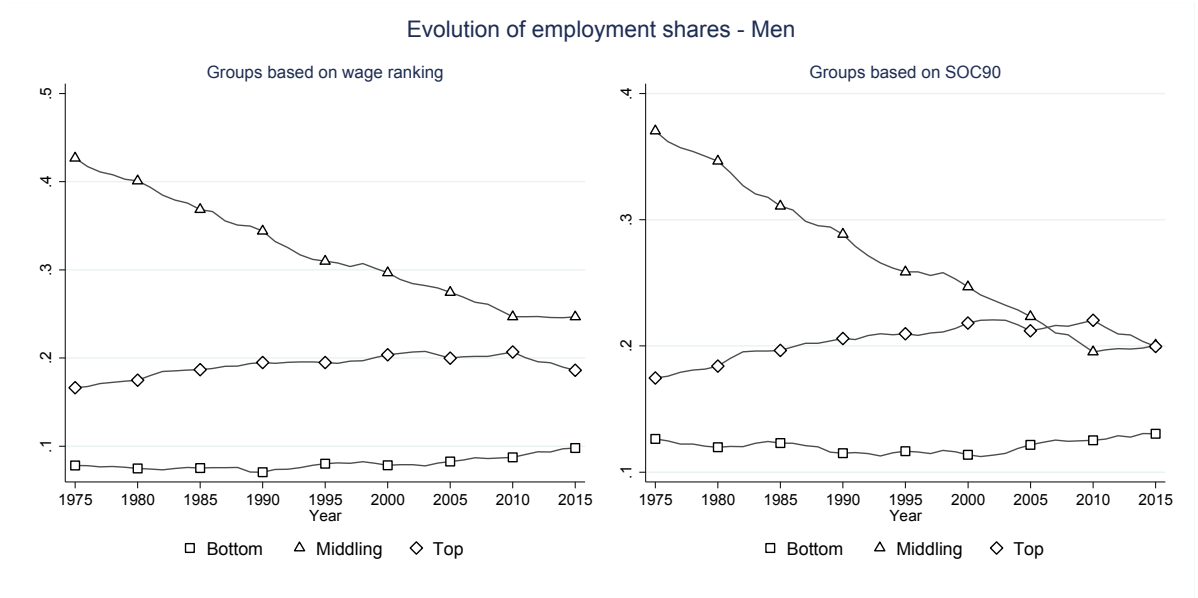

Fig 4.1 Men's employment shares relative to total employment by broad decile groups and by broad occupational groups.

For women, the corresponding picture in Figure 4.2 shows somewhat less consistency between broad decile and broad occupational groups than for men: after 1990, there is a more pronounced loss of employment share for women in middle jobs defined by SOC groups than by wage rank, and a more pronounced increase in employment share for those in the bottom occupational group defined by SOC group. Both definitions show a strong rise until 2010 in the fraction of women in top jobs.

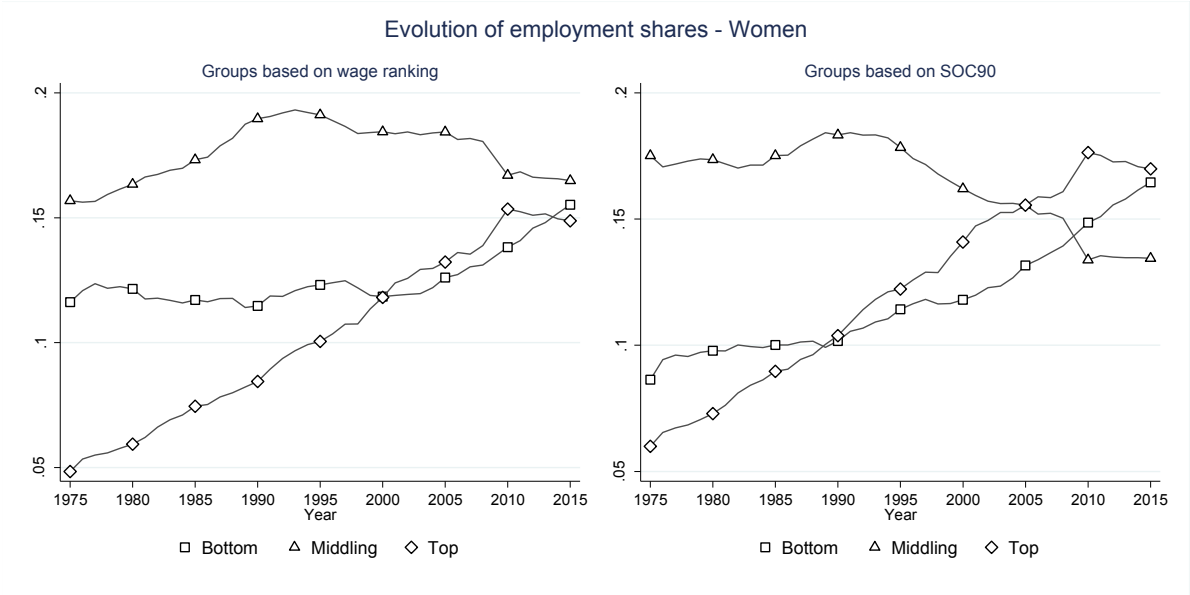

Fig 4.2 Women's employment shares relative to total employment by broad decile groups and by broad occupational groups.

One can also break down the same information into 10-year changes, see Figure 4.3 for men and 4.4 for women.

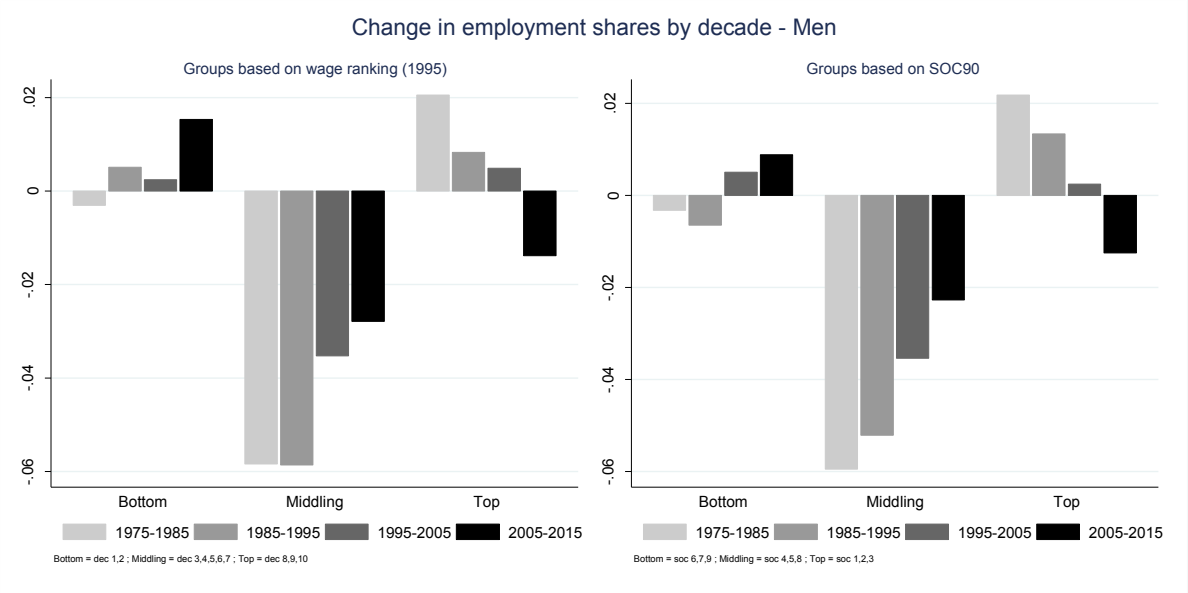

Figure 4.3: decade changes in men's employment shares relative to total employment by broad decile groups and by broad occupational groups.

Figure 4.3 confirms the similarity of the two groupings for men. The main slight difference is that the share of employment in the bottom decile group rose marginally in the 1985 to 1995 period while falling marginally in the bottom occupational group, while since 2005 the rise was a little larger for the bottom decile group.

For men relative to men's employment (not shown), the hollowing out of the middle is confirmed but shows a much stronger U-shape, with larger increases in employment share at the bottom and the top.

For women changes in employment shares relative to total employment are shown in Figure 4.4:

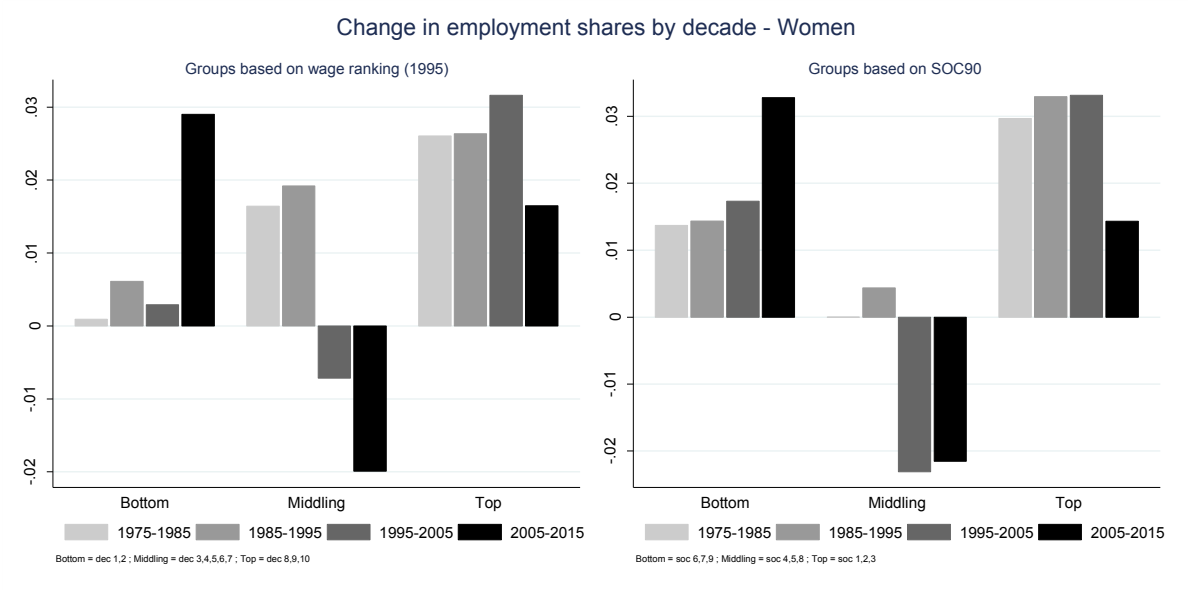

Figure 4.4: decade changes in women's employment shares relative to total employment by broad decile groups and by broad occupational groups.

As noted above, there is rather less consistency between broad decile and broad occupational groups than for men: the U-shape is considerably more pronounced for occupational groups except for the 2005-2015 period when the two groupings show very similar changes.[8]

For a more granular picture for occupational groups, we examine cumulative changes in overall employment shares for three decile groups, bottom 20%, middle 50% and top 30%, cross-classified by the 9 SOC90 1-digit occupations.

For the top three occupations, 1. Managers and administrators, 2. Professional occupations, and 3. Associate professional and technical occupations, there have been pronounced employment gains concentrated in the top 3 job deciles for men and for women. In other words, the decile and occupational job classifications tell a very similar story. For the middle three occupations, 4. Clerical and secretarial occupations, 5. Craft and related occupations, and 8. Plant and machine operatives, the fit between the decile and occupational classification is not quite so good. For the middle 5 deciles, there has been a pronounced fall in groups 5 and 8 but not in 4 (Clerical and secretarial occupations). For the bottom three occupations, 6. (Personal and protective service occupations), 7. (Sales occupations) and 9. (Other), groups 6 and 7 have increased employment shares for men and women in the bottom two deciles, while the employment share of group 9 has fallen, especially for women in the bottom two job deciles but also in the middle five deciles.

Finally, we examine changes for part-time workers. As we saw, there has been an increase in the share of total hours of employment both by part time women and by part time men. Figure 4.5 shows the decade distribution of these changes by broad occupational groups. For all part-time employees, the increase in the share of hours in the bottom occupational group has been large and a feature of every decade since 1975. The increase in the share of employment in the top occupational group has also been a feature of every decade. However, for the middle ranked occupations, the hollowing out pattern seen for all employees whether full-time or part-time only applied in 1975-85 and 2005-15 and on a small scale. The overall growth of part-time employment between 1975 and 2015 dominates, even in the middle ranked occupational group. Indeed, for men, there has been growth of their employment share relative to total hours for all occupational groups and in every decade. Since part-time women substantially outnumber men, the picture on the extreme right of Figure 4.5 is fairly similar to the overall picture on the extreme left.

[8] Differences between the decile and occupational grouping are preserved when shares relative to women's employment are considered. For 2005-2015, the loss of employment share of women in middle occupations and increase in the bottom occupations is then more pronounced.

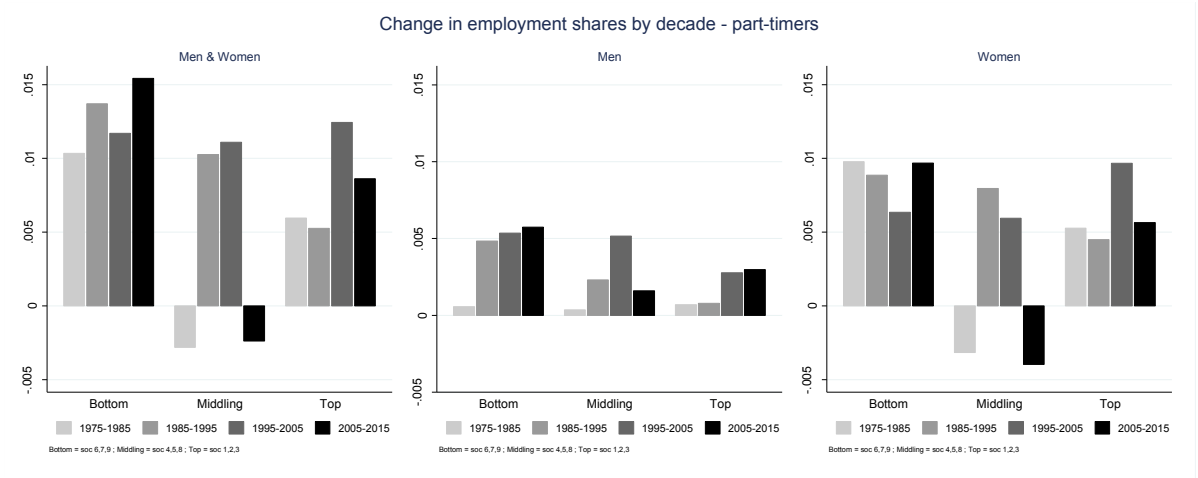

Figure 4.5: decade changes in employment shares relative to total employment for all part-time employees and divided by gender and by broad occupational groups.

Looking at the same information relative to part-time hours, there seems to be a more pronounced hollowing out in the middle for all part-time employees and for women. However, for women the fall in the share of part-time hours in the bottom group between 1985 and 2005 means that for 1975 to 2015, there was an overall fall, while for men there was an increase.

5. The role of sectoral changes

The introduction and summary provided some historical perspective to sector and occupational changes before the beginning of our ASHE data set which tracks further some of the dramatic changes in the UK's employment composition. Since 1975, the SIC classification changed four times, in 1982, 1996, 1999 and 2007. The corresponding five SIC classifications (SIC68 for 1975-1981, SIC80 for 1982-1995, SIC92 for 1996-1998, SIC03 for 1999-2010 and SIC07 for 2008-2015) that are present in NES-ASHE have an increasing degree of detail.

We consider eight sector groups from the aggregation of originally twelve sector groups based on SIC03:

A+B: agriculture, forestry and fishing; C+D: mining and quarrying and manufacturing; E: electricity, gas etc. supply and water supply; F: construction; G+H: wholesale and retail; repair of motor vehicle and other households goods; hotels and restaurants; I: transport, storage and communication; J+K: financial intermediation, real estate, renting and business activities; L+Q: public administration and defence; compulsory social security; extra-territorial organizations and bodies; M: education; N: health and social work; O: other community, social and personal services activities; P: private households with employed persons.

The linking of these 12 sector groups across SIC classifications has been obtained by recoding the activities within each classification on the basis of activities' descriptions, median wage and hours of work.

Figure 5.1 shows employment shares for 8 SIC groupings. The top line gives the overall picture. Most striking is the enormous but steady decline in the share of the industrial sector (A+B+C+D+E) from over 45% to about 12% of employment and the rises in the retail and hospitality sector (G+H), and in education (M), health and social work (N), in other community, social and personal services activities(O) and in financial intermediation, real estate, renting and business activities (J+K) combined with public administration etc. (L+Q), though the employment share of the latter sector has not risen since the mid 1990s.

Figure 5.1 also shows how the occupational structure of employment has evolved for each of the eight sectors. For the once large industry sector (manufacturing etc.), the decline in the share of jobs in the economy in the middling occupations has been particularly sharp, though the share of jobs in the bottom occupational group has also fallen sharply, though from a low base. For construction, sector F, there has also been a small decline in the share of jobs in the economy in middle and bottom ranking occupations. In proportional terms, these changes are far less striking than for industry.

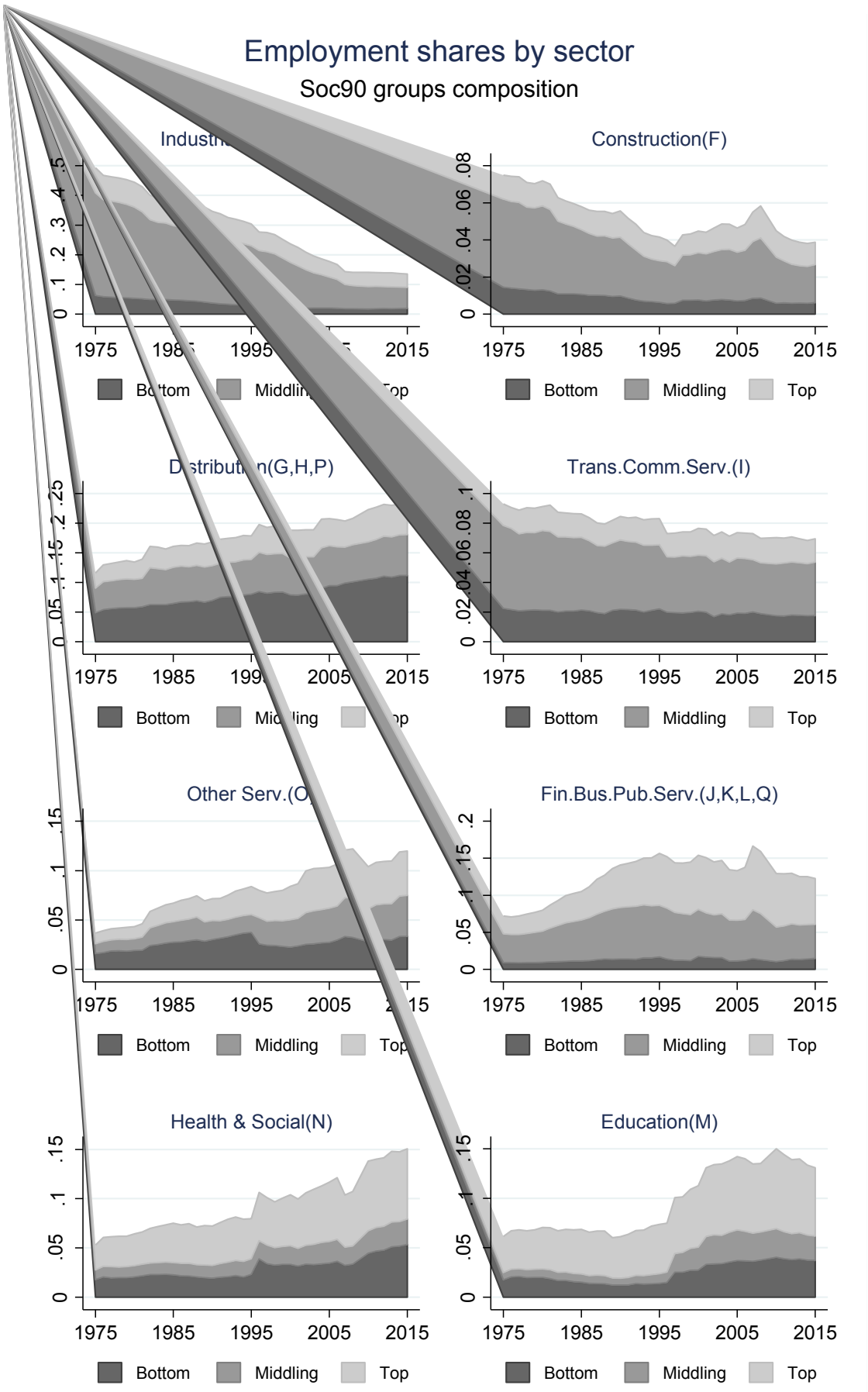
Employment shares by sector
Soc90 groups composition
Construction(F)
Trans.Comm.Serv.(I)
Other Serv.(O)
Fin.Bus.Pub.Serv.(J,K,L,Q)
Health & Social(N)
Education(M)
1975
1985
1995
2005
2015
Bottom
Middling
Top

Figure 5.1: employment shares for each sector by broad occupational groups

The only other sector with a notable proportional decline in middle ranked employment is transport and communication, sector I. Increases in the employment share of top occupations have been particularly strong for financial services and public services etc., sector J+K+L+Q, but also in the other service sectors M (education), N (health and social work) and O (other community, social and personal services activities).

6. Shift-share analysis

One can ask the question, if one held constant the share of employment for different categories of employees, how important are changes within the categories in accounting for shifting employment shares by deciles of jobs ranked by median earnings, see Appendix 3 for an explanation of shift-share analysis. For example, one can cross-classify employees into gender x occupation group x sector x region[9] (2 x 9 x 8 x 2 with the 9 SOC90 1st digit groups, or 2 x 3 x 8 x 2 with the broader three-fold SOC90 occupational groups). If the answer is that the within variation is very small, once one has accounted for these groups, then the between group changes in shares are the key factors to consider in understanding drivers of job polarisation. If this is the case for the full classification, one can then ask if the same is true if one distinction is removed. For example, one can ask whether removing region or gender or indeed SIC sector makes much difference to the within group variation in the groups that remain.

We examine these questions both graphically and in terms of numerical summaries. Figure 6.1 shows the most disaggregated shift-share analysis in terms of 10-year changes for the ten deciles. For 1975 to 1985 the between-cell changes dominate the within-cell changes with the exception of the sixth decile. For 1985 to 1995 the between-cell changes are less dominant: the within-cell changes for the 2nd, 4th, 5th and 6th deciles are substantial and mostly larger than the between-cell changes. The same is true for 1995 to 2005, with the 3rd, 4th, 6th, 9th and 10th deciles experiencing larger within-cell than between-cell changes. For 2005 to 2015, between-cell changes again dominate. Generally speaking, the direction of change is similar for the within and between-cell changes. In other words, when the share of employment of a particular job decile falls (rises), it is usually the case that both the within and the between-cell contributions fall (rise). There are only a few exceptions, for example the 8th decile in 1985-95, 1995-2005, and 2005-2015.

[9] There are notable differences between regions in the evolution of the occupational structure of employment. For men and women combined, the share of employment in the middling group of occupations falls below the share in the top group by the mid-1990s in the South, but only in about 2010 in the North. This is the result of a higher share and more rapid growth in the share of the top group, and lower employment shares in middling occupations in the South. Hence it is worth considering whether regional factors contribute to job polarisation in the UK.

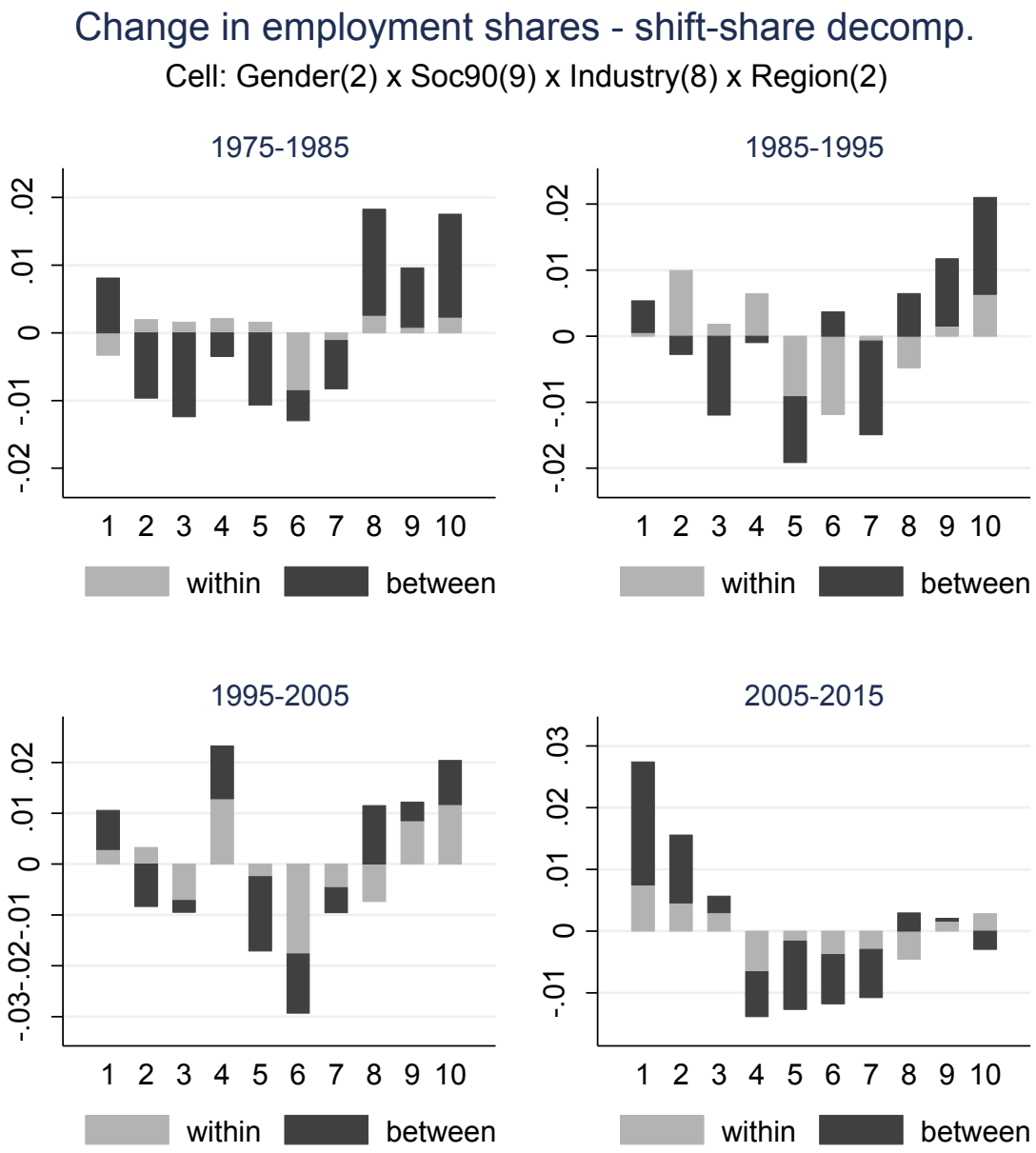

Figure 6.1: shift-share analysis for the full gender x region x SOC x industry decomposition.

For a numerical summary of the information in Figure 6.1, we can calculate the ratio of the absolute value of the between-cell variation to the sum of the absolute values of the between and within-cell variation aggregated over the ten deciles. With values of 0.786, 0.600, 0.516 and 0.655 for the four decades, this confirms the relative importance of the between-cell variation, particularly in 1975-85 and 2005-15. Table 6.1 provides a summary of how the picture alters if one or more of the factors is omitted. Comparing the first with the second column, in which region is omitted, suggests that the proportion of variation explained by between-cell changes hardly changes, implying that region is not important, once occupational group, industry and gender have been controlled for. Comparing the fifth column in which gender has been omitted, with the first one, suggests, perhaps more

surprisingly, that once occupational group, industry and region have been accounted for, gender does not matter very much except perhaps for the 2005-2015 period. Omitting region as well as gender in the column labelled 'si' suggests a similar ratio to the first column for between to total variation for 1975-85 and 1985-95, somewhat higher for 1995-2005 and somewhat lower for 2005-2015.

Table 6.1: ratio of the absolute value of the between-cell variation to the sum of the absolute values of the between and within-cell variation aggregated over the ten deciles.

	10 deciles											
decade	**gsir**	**gsi**	**gsr**	**gir**	**sir**	**gs**	**gi**	**si**	**s**	**i**	**g**	**r**
1975-1985	0.786	0.788	0.766	0.470	0.781	0.771	0.463	0.783	0.742	0.471	0.192	0.035
1985-1995	0.600	0.593	0.567	0.352	0.608	0.560	0.356	0.602	0.541	0.314	0.229	0.014
1995-2005	0.516	0.517	0.444	0.513	0.569	0.447	0.510	0.566	0.464	0.536	0.116	0.002
2005-2015	0.655	0.656	0.545	0.312	0.620	0.548	0.316	0.622	0.508	0.299	0.121	0.028

gsir = Gender x Soc90 x Industry x Region	sir = Soc90 x Industry x Region	s = Soc90
gsi = Gender x Soc90 x Industry	gs = Gender x Soc90	i = Industry
gsr = Gender x Soc90 x Region	gi = Gender x Industry	g = Gender
gir = Gender x Industry x Region	si = Soc90 x Industry	r = Region

Results for the third decade, 1995-2005, are rather different from those of the previous and subsequent decades: the within component remains high independently of the number and types of dimensions accounted for and all dimensions appear to be equally relevant.

For 1975-1995 and 2005-2015, the 4th and 7th columns, which omit SOC, show an almost halved value of the share of the between variation, suggesting that SOC is actually the most important dimension to be accounted for. These findings are confirmed by the last four columns, showing the contribution of each of the four factors taken by themselves: SOC is the single most important factor, followed by sector and then gender. Region by itself explains little, but this may be partly because only a North-South distinction has been examined.

While the three SOC groupings attach meaningful labels to the types of occupations in each, the employment proportions in these groups are of course not in themselves exogenous. Nor are the proportions in the different SIC sectors. Both proportions have responded to the underlying economic changes discussed in the introduction and summary. They are useful summaries of groups of influences.

7. Job and wage polarisation by age and cohort

We consider decade long cohorts beginning with 1920-29 and ending with 1980-89 and consider how employment shares of bottom, middling and top groups, defined by SOC90 categories[10], have evolved at each age and for each gender. For example, for men, on the extreme left of Figure 7.1, the 1980-89 cohort for the bottom occupational group has a higher employment share at each age than earlier cohorts. The fact that the shares decline with age up to about age 30 is likely to be related to career progression with age, with some individuals moving out of occupations classified in the bottom 20% of 1995 earnings. The fact that the age profiles are progressively lower for earlier cohorts is consistent with a successive narrowing of opportunities between cohorts for access to middling jobs as is confirmed by the middle panel of Figure 7.1, showing the lowest position for the 1980-89 cohort and the highest for the earliest cohorts.

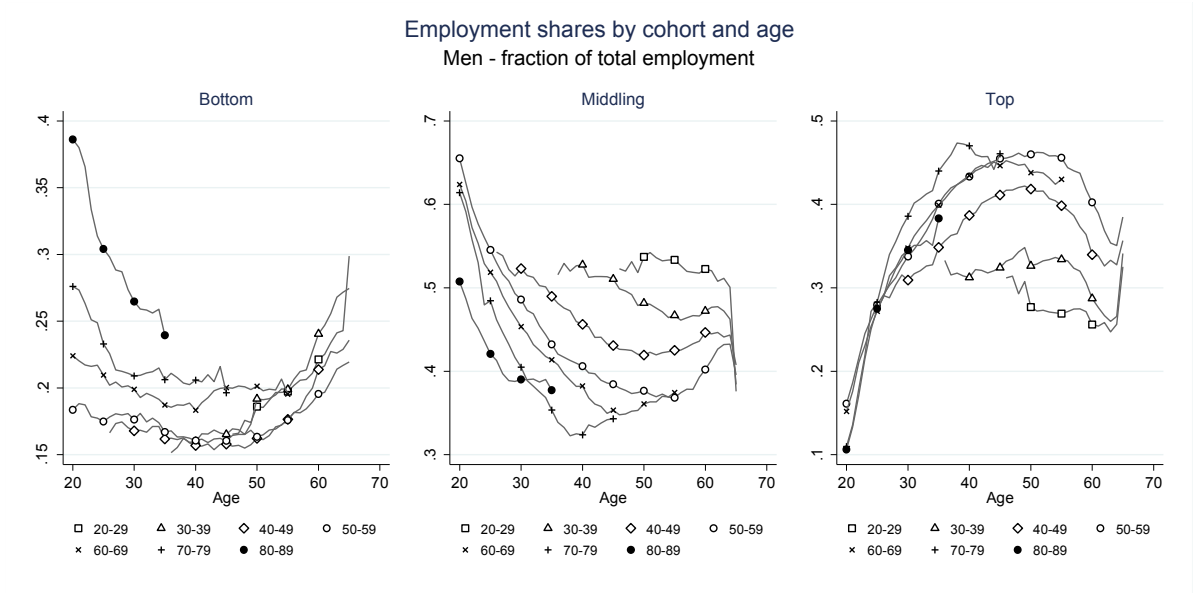

Figure 7.1: employment shares of occupational groups defined by SOC90 for men relative to total employment by age for cohorts from 1920-29 to 1980-89.

[10] Very similar patterns emerge for the bottom 20%, middle 50% and top 30% groupings by 1995 earnings rank.

The decline with age in the age profiles for middling occupations is also partly the result of career progression of some individuals into the top occupational group (as reflected in the rising profiles with age of the top group. However, as can be seen from the rising age profiles in the bottom occupational group, there is also migration from the middling to the bottom group.

The age profiles for the top occupational group show little differences between cohorts up to an age of about 25. Probably increasing lengths of education and training up to the age of about 25 are offsetting the expansion of employment opportunities for these occupational categories. Above about age 25, the 1970-79 cohort diverges above the others, consistent with the rising employment share over time of the top occupational group especially until 2005. In contrast, by the age of 30 the employment share in top occupations of the latest cohort is below those of the previous three cohorts. The earliest cohort has the lowest shares of employment. However, there are indications that the maximum employment share of those in the top occupational group is being reached at an earlier age for the 1970-79 and 1960-69 cohorts than for earlier ones. Correspondingly, for the middling group, the share trough is being reached at an earlier age for the 1970-79 and 1960-69 cohorts than earlier ones.

For women, see Figure 7.2, there are some striking differences. For the bottom occupational group, while there are relatively small difference for men between profiles by cohort above the age of 40, these differences are much larger for women and the employment shares of older women are much higher than for men, and especially for earlier cohorts. However, for the youngest ages, as for men, the age profiles for women are systematically higher for recent cohorts than for earlier ones.

For the middling occupational group differences between cohorts for women are similarly pronounced as for men[11] and the upturn in employment shares at higher ages is missing: employment shares continue to decline with age for all cohorts.

For the top occupational group, differences between cohorts are larger than for men. The little upturn in employment shares for men aged over around 62 or 63 is missing for women, probably because of the lower retirement age for many women. Also different from men, the employment share of the latest cohort tracks well the share of the previous cohort.

[11] The differences are much less pronounced for the middle group of women defined by earnings rank, not shown. This is part of the reason, which explains the apparent contradiction of 'less hollowing out of the middle' for women in Figure 3.2 with the evidence of clear hollowing out for successive cohorts in Figure 7.2. The other reason is that Figure 7.2 is visually dominated by the last 20 years for each cohort, and as Figure 4.2 showed, the last 20 years have seen strong falls in women's employment shares in the middle group defined by SOC90.

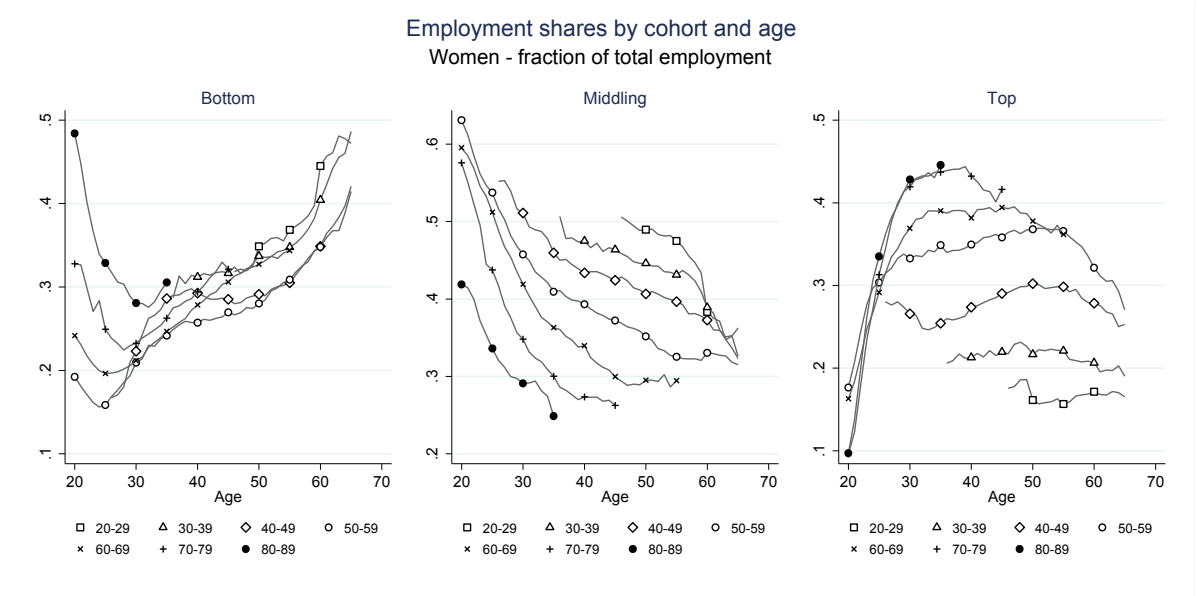

Figure 7.2: employment shares for groups defined by SOC90 for women relative to total employment by age for cohorts from 1920-29 to 1980-89.

To summarise, the cohort experience both for men and for women shows that for every cohort since the 1920-29 cohort, the employment share in the middle occupational group is lower for a given age than for the previous cohort. There is the opposite tendency for the employment shares in the top occupational group to rise between cohorts, with the stark exception of the 1980-89 cohort, which has clearly fared worse, though not for women. Moreover, for women, the gain in the share of top jobs between successive cohorts is larger than for men. For the bottom occupation group the experience of men up to age 40 and for women up to age 30 is that the employment share in the bottom occupational group is higher for a given age than for the previous cohort, and most strikingly so for the 1980-89 cohort for both men and women. At older ages, the picture is more mixed, with earlier cohorts sometimes having higher employment shares in the bottom group, possibly reflecting improving educational levels in the later cohorts.

Partly to illuminate connections between the occupational polarisation and the earnings distribution, the cohort analysis now turns to earnings. Figure 7.3 shows log median real earnings profiles for men by age for the same seven cohorts. It shows the 1980-89 cohort doing worse, except at the youngest ages for all three occupational groups. Because average real earnings are increasing over time, there is a tendency for later cohort's earnings profiles to lie above those of earlier cohorts, at least until the 1950-59 cohort. At ages above about 50 this is no longer generally true for the 1960-69 cohort.

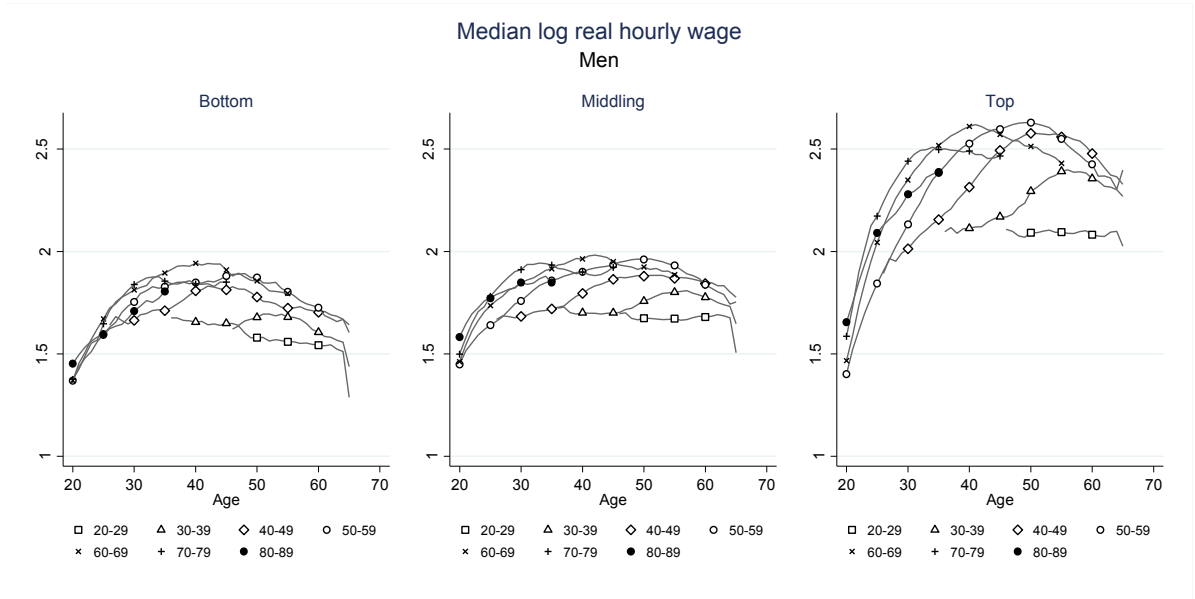

Figure 7.3: log median real earnings profiles for men by cohort for three occupational groups defined by SOC90.

Comparing Figure 7.3 for men, with Figure 7.4 for women the picture is slightly worse for men in all three occupational groups, where median real earnings for the 1980-89 cohort are below those of the 1970-79 cohort, which above age 35 are below those of the 1960-69 cohort. For women, these recent cohorts do not fare quite so badly.

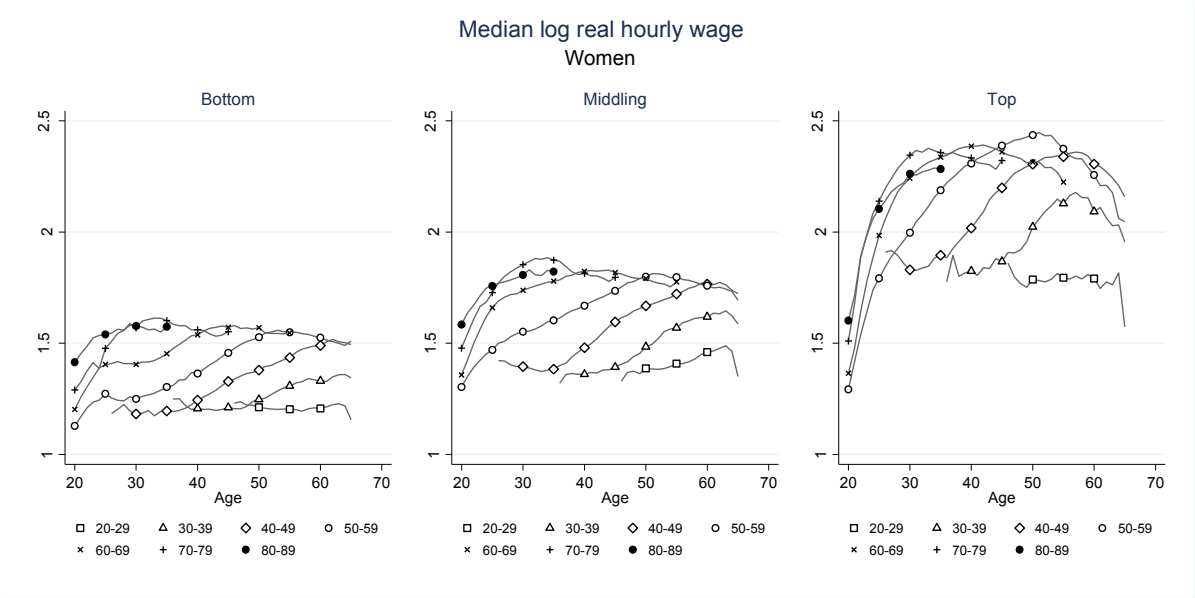

Figure 7.4: log median real earnings profiles for women by cohort for three occupational groups defined by SOC90.

In order to correct for the impact of varying average real earnings, we deflate median earnings for each group in each year by median earnings for all employees in that year. Figure 7.5 shows the inferior position for men in the 1980-89 cohort for all three

occupational groups. For the bottom and middle groups, there is a tendency for more recent cohort profiles, especially at younger ages, to lie below earlier cohorts.

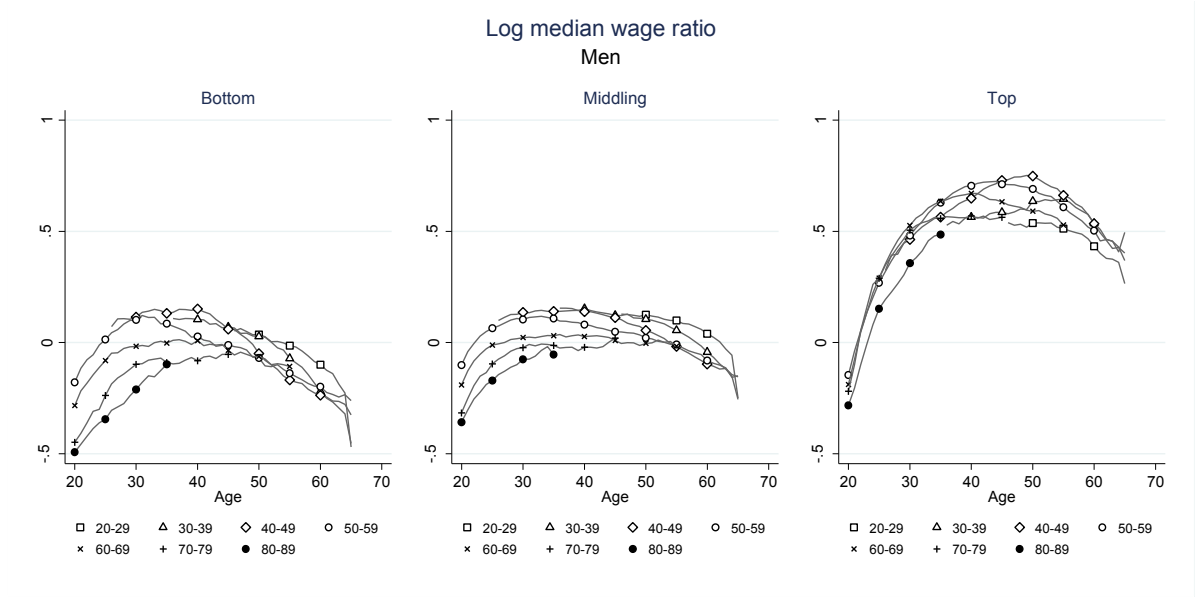

Figure 7.5: log median group earnings ratios for men relative to median earnings by all employees by cohort for three occupational groups defined by SOC90.

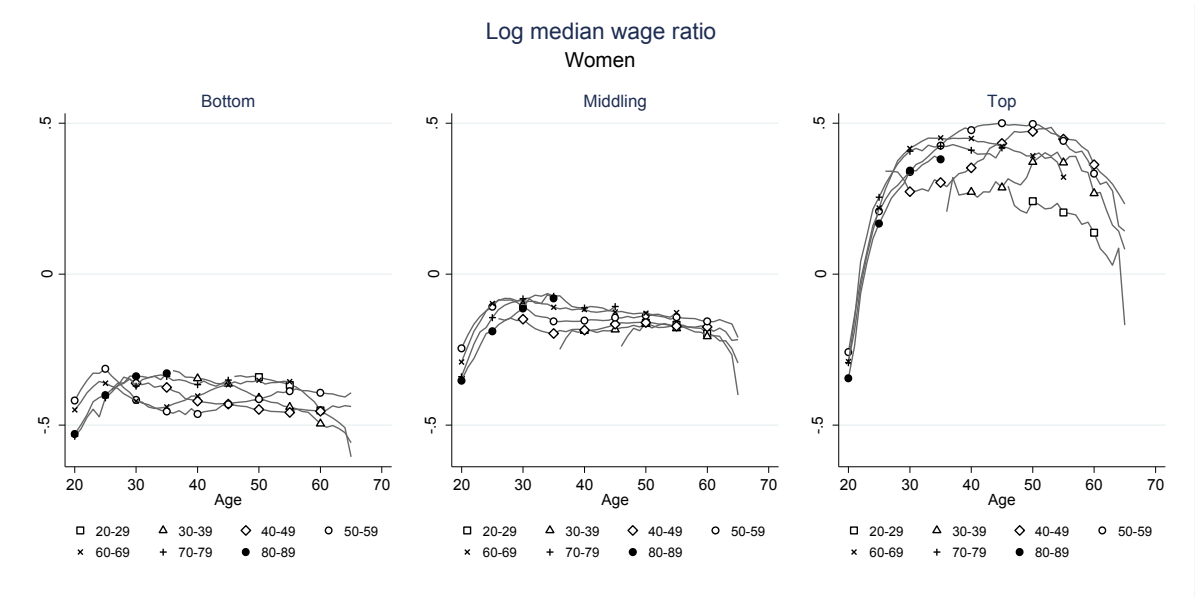

Figure 7.6: log median group earnings ratios for women by cohort for three occupational groups defined by SOC90.

To summarise, if the rising employment share of men in the bottom occupational group were a symptom of higher demand, e.g. because of technology, for such jobs, one might expect a positive association between the cohort employment shares and their relative earnings. Instead, we have seen that the opposite is true: ever since the 1940-49 cohort, every successive male cohort has lower earnings relative to the median, at a given age than the

previous cohort. The same is true for men in the middle occupational group, though there the cause could be on the demand side, since the employment share and relative earnings move in the same direction. Thus, both for relative wages and employment, these trends suggest a generational contraction of job opportunities for men not in top occupations. For men in the top occupational group, the 1980-89 cohort is clearly faring worse in relative earnings as well as in employment share. For the other cohorts, the association between relative earnings and employment share is much less clear, except for the 1920-29 and 1930-39 cohorts, suggesting that simple demand-side explanations may not be appropriate. Given the expansion of higher education, this should be no surprise.

For women, the association between employment share and relative earnings for the different cohorts is less clear than for men, also for the bottom and middle occupational groups. However, pre-war cohorts in top jobs do worse in relative employment as well as earnings, while baby-boom cohorts born between 1940 and 1959 fare particularly well in both dimension. For the 1980-89 cohort, relative earnings for women in the top occupations, but not relative employment, are lower than for the 1970-79 cohort. For middling jobs, despite a falling share of employment between successive cohorts, relative wages for more recent cohorts have held up well. One possible element in these differing gender patterns is that additional labour supply from women has contributed to lowering earnings of men relative to median earnings. Other factors could include equal pay legislation, immigration and the loss of union power.

So far, we have not exploited the panel dimension of the ASHE-NES data, though the panel structure does reduce the noisiness of the cohort median information so far shown. By examining 3-year growth rates of real earnings for the same individuals, we can use the panel information. There is some attenuation in the data, partly because there is not a 100% response rate from employers, but the 3-year time span keeps this at reasonable levels. Figure 7.7 shows the picture for men and Figure 7.8 for women. All the pictures confirm the worse experience of the two most recent cohorts, and even the 1960-69 cohort does less well after the age of about 40 for all three occupational groups. It seems that weaker real earnings growth in the last decade has been an economy-wide phenomenon, affecting both genders and all three occupational groups. The 3-year wage growth rate also shows two other patterns: starting from the cohort born in the fifties onwards, for all three broad occupational groups, the age profile of the wage growth is declining and, for a given age, it decreases from older to younger cohorts. For cohorts born before 1950, the age profile is rising or constant and the wage rate increases, for a given age, from older to younger cohorts. Such an evolution could be linked to shifts in productivity growth and probably with declining union power.

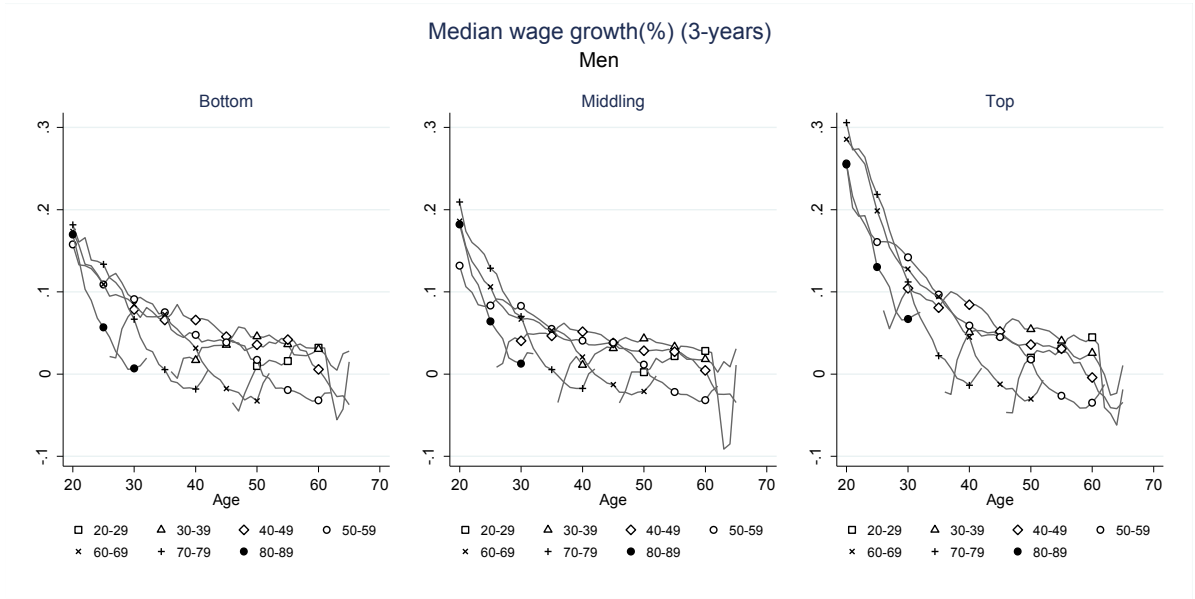

Figure 7.7: 3-year growth rates for median real earnings for men by cohort for three occupational groups defined by SOC90.

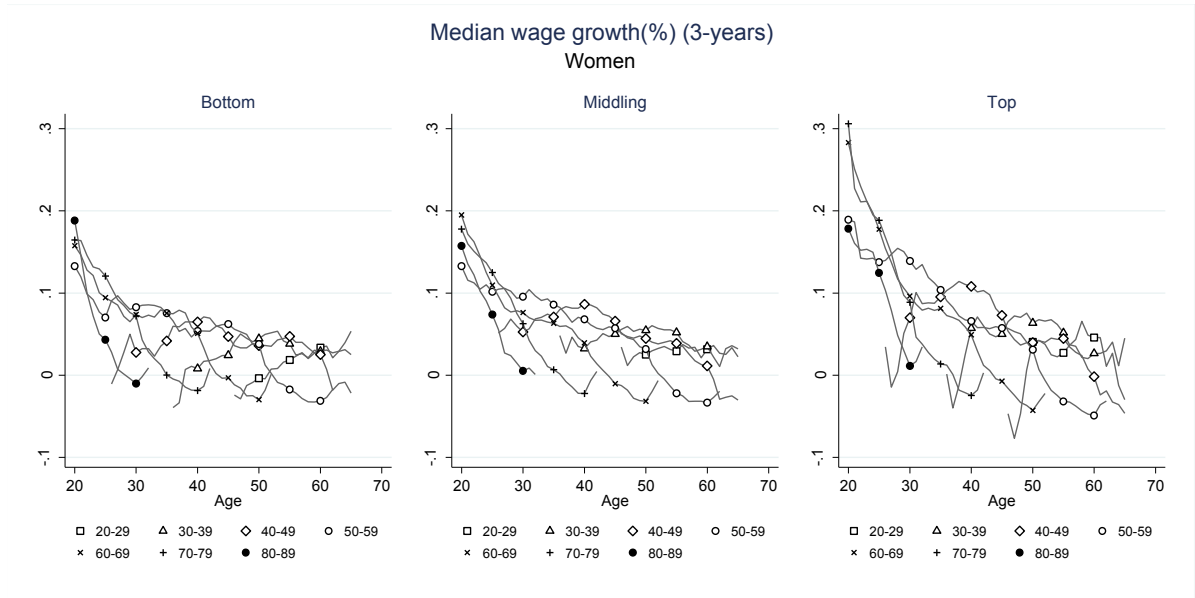

Figure 7.8: 3-year growth rates for median real earnings for women by cohort for three occupational groups defined by SOC90.

8. Inequality and job polarisation

Section 3 showed a picture of polarisation in terms of changes in employment shares of three broad occupational groups: an increased employment share of the bottom and top occupational groups and a fall in the middle occupational group. In terms of total

employment, the loss of employment share by men in the middle occupation group was most pronounced combined with the gain in share by women in the top occupational group. One can now ask how relative earnings in each of the gender-occupational groups have evolved. Figure 8.1 shows median earnings for each occupational group relative to median earnings for all employees for women.

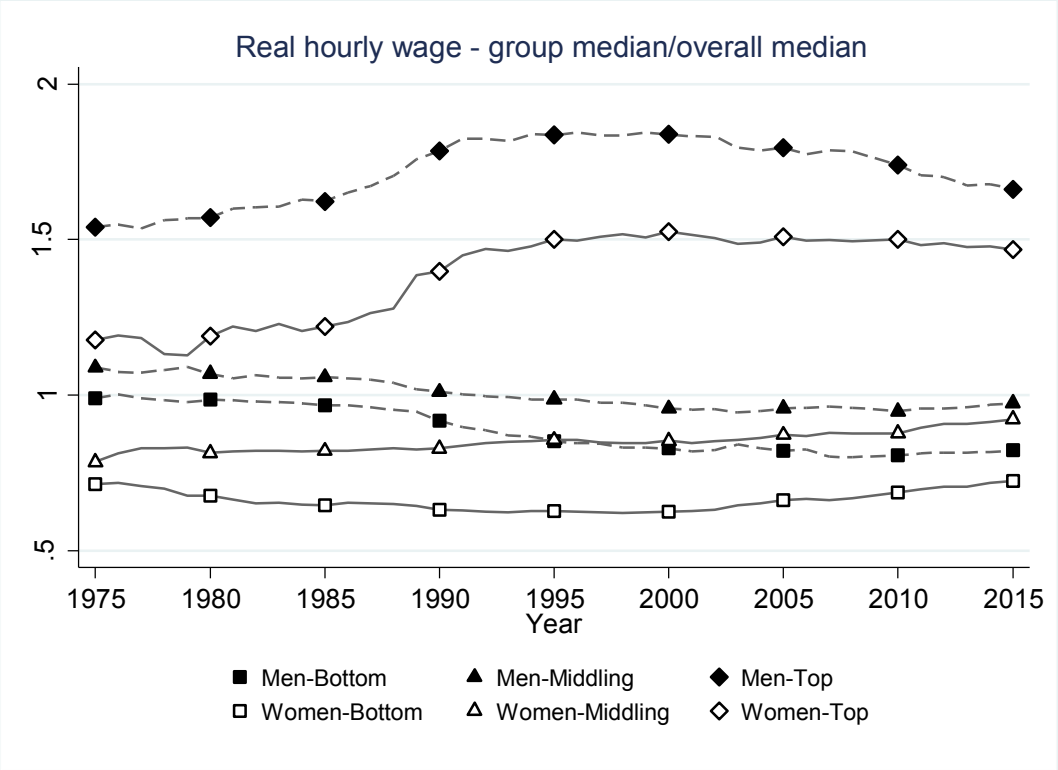

Figure 8.1: median earnings for occupation x gender groups relative to median hourly earnings for all employees.

There is a striking increase in relative median earnings of men in the top group from 1975 to about 1990 and for women till about 2000, and a narrowing gap between men and women in the top group. For men in the middle ranked occupations, relative median earnings have declined until about 2005, paralleling the sharp loss of employment shares, but for women in middle ranked occupations, relative median earnings have risen over the whole period, sharply narrowing the gap with men. Men in the bottom occupational group have suffered a decline in relative median earnings till about 2007. For women, there was also a decline till about 1995 but a rise in the 2000s, resulting in a sharp narrowing of the gap between men's and women's median earnings in the bottom occupational group.

One can also examine the wage gap between men and women more directly by comparing the ratio of median earnings of women to median earnings for men for each occupation. Doing so for each of the 350 or so occupations in the 3-digit SOC 90 classification, and weighting by the employment share of each in each year, we obtain the information, broken down into the three broad occupational groups, shown in Figure 8.2. The wage gap is

highest for top jobs, and lowest for bottom jobs, and was so in 1975 as well as in 2015. However, for all three groups of jobs, the gap has narrowed sharply, particularly so between 1985 and 1995 for top jobs.

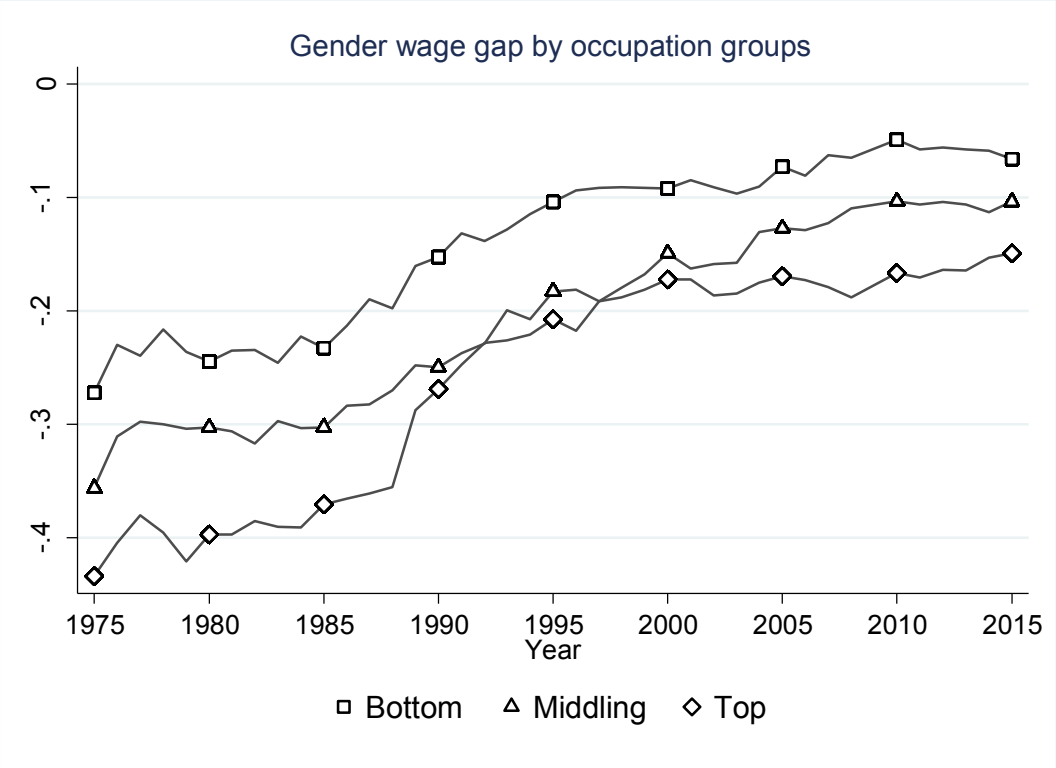

Figure 8.2: log ratios of median earnings for women relative to men for 3-digit SOC 90 occupations, weighted by employment in each occupation.

One way to picture changes in the distribution of hourly earnings between two years is to compare the ratio to the median for each percentile, a scaled 'parade of dwarves and giants'. Figure 8.3 shows the 1975 and 2015 parades on the LHS. Relative to the median, above median earnings have tended to rise: there has been a substantial increase in inequality, most strikingly near the top. Below the median, the 2015 line is below the 1975 line down to about the 20th percentile, indicating higher inequality, but then crosses over, so that at the bottom of the distribution of hourly earnings inequality has fallen.

The RHS of Figure 8.3 shows the composition in terms of the six gender-occupational groups of the earnings deciles in 1975 and in 2015. Starting with the top decile, shares are dominated by men in the top occupational group. However, there has been a dramatic rise in the share of women in the top occupational group and a fall in the share of men, particularly from middling occupations. A similar pattern holds for the 9th decile, though by 2015 the share of women from the top occupational group is only slightly below the share

of men from the same occupational group, after a dramatic fall in the proportion of men from middling occupations. Falls in the proportion of men from middling occupations are also dramatic, more than halving in deciles 7 and 8, and falling more moderately in deciles 4 to 6, and with little change in the bottom three deciles. For women in middling occupations, falls in proportions of employment in lower deciles are offset by rises in middle and higher deciles. For women in the bottom occupations, there have been increases in employment proportions throughout the distribution but most pronounced at the lower deciles.

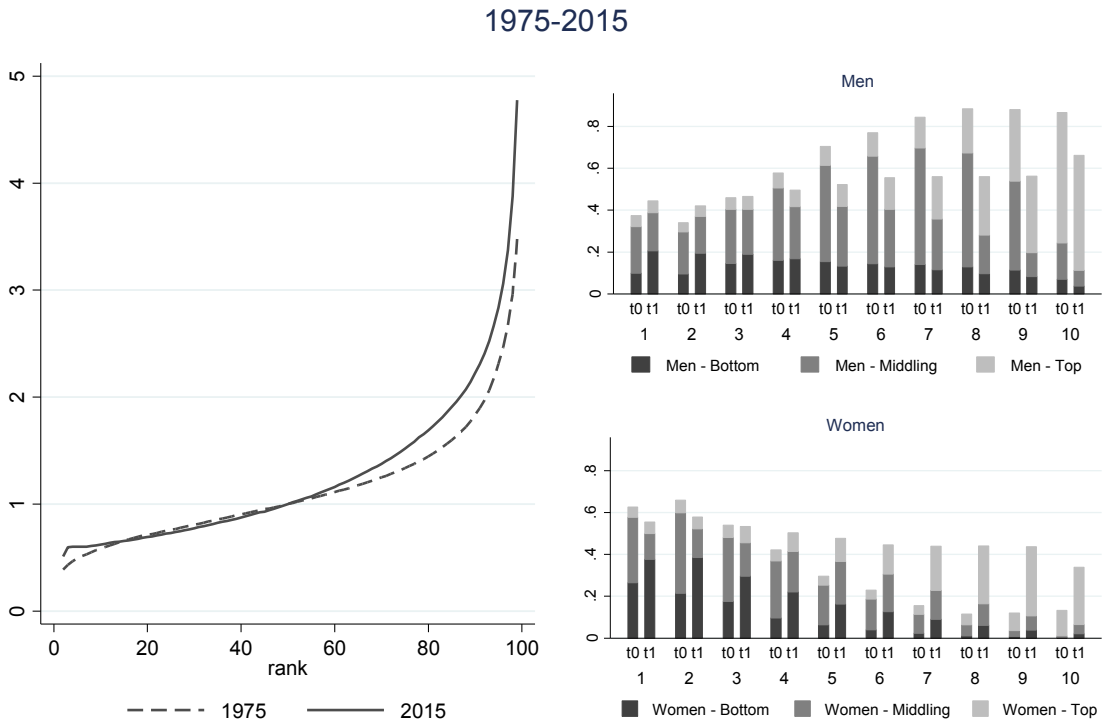

Figure 8.3: ratios of ranked earnings relative to the median and gender x occupational group decile composition, 1975 and 2015.

To examine changes the earnings distribution over decade intervals, we can take the ratio of the parades for the first and last years of the decade. Figure 8.3 does this for 1985 and 1975 and shows a general increase in inequality, except around the 10thpercentile: the ratio to the 1985 median is lower than the ratio to the 1975 median for almost all earnings below the median and higher for earnings above the median. Broadly speaking, the higher the earnings rank above the median, the greater the increase in inequality.

The RHS of the figure shows, for each decile how the composition in terms of men and women, classified into the three broad SOC90 occupational groupings has changed during the decade. We know from section 3 that the employment share of men in middle occupations fell in this decade while that of women in top occupations rose, and rose also in

the low occupational group. Figure 8.3 shows the fall for men in middle occupations was particularly pronounced in the 5th to the 9th deciles, the same deciles in which the share of women in top occupations but also in middle occupations rose. Overall, the small change in the employment share of women in middle occupations is reflected in the fact that the increases in the 5th to 9th deciles, were offset by falls in the bottom and especially the second decile. The increased employment share of women in the bottom occupational groups shows up most in the 2nd decile.

A general feature of Figure 8.3 and of the analogous figures for later decades is the spread across deciles of the occupational groups: for example, men in middle ranking occupations experienced substantial losses of employment share in the 9th decile and even some in the top decile, while women in the top occupational group experienced gains in employment share not just in the top three deciles, but also in lower deciles. This suggests that there is considerable heterogeneity within the broad occupational classification, and overlap between categories.

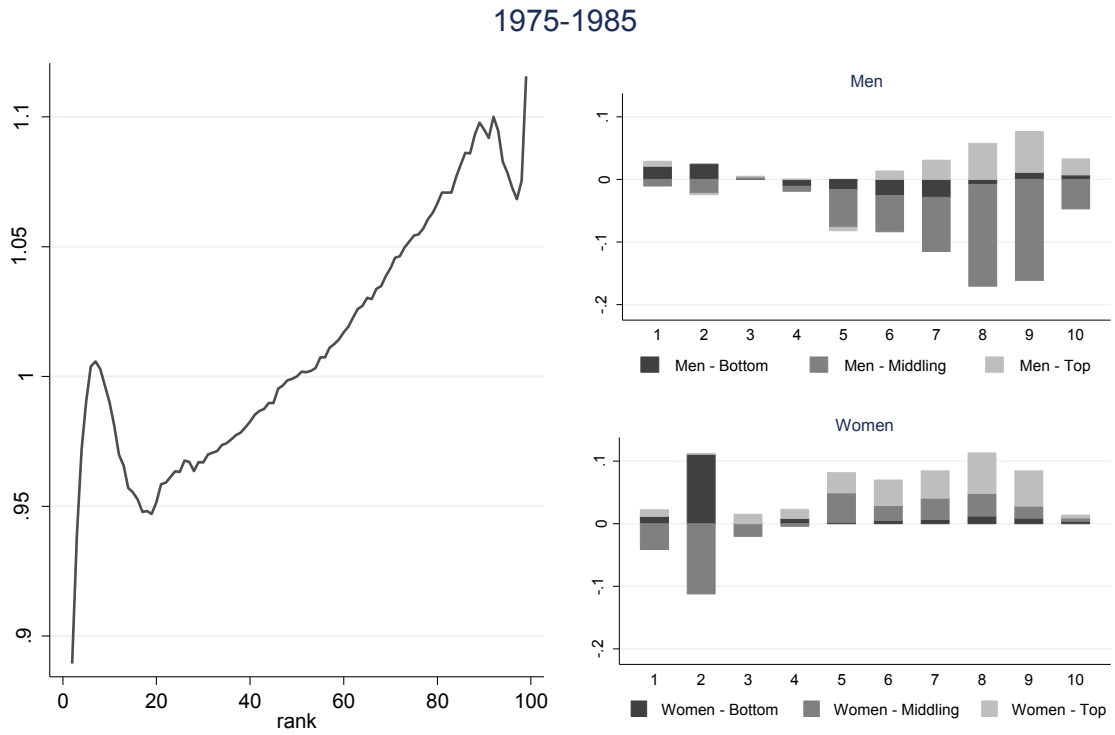

Figure 8.4: ratios of ranked earnings relative to the median, 1985 relative to 1975 and changes in gender x occupational group decile composition between 1975 and 1985.

Figure 8.4 compares 1985 and 1995. The LHS shows an even more monotonic rise in inequality than was the case for the previous decade: for almost every percentile, the shift in the ratio of hourly earnings to the median is increasing in the rank position.

On the RHS, the gain in employment share in the top 3 deciles by women in the highest occupational group exceeds that by men and is offset mainly by the loss of employment share by men in the middle occupational group spread across the upper half of the distribution. It is men who are bearing the brunt of employment declines for middle ranking occupations. The increased share of employment by women in the lowest occupational group seen in Figure 3.3 is concentrated in the lowest decile. For men, though in this decade there is no fall in the employment share of the lowest occupational group, Figure 8.4 shows increases in the bottom two deciles offset by falls in the upper half of the earnings distribution.

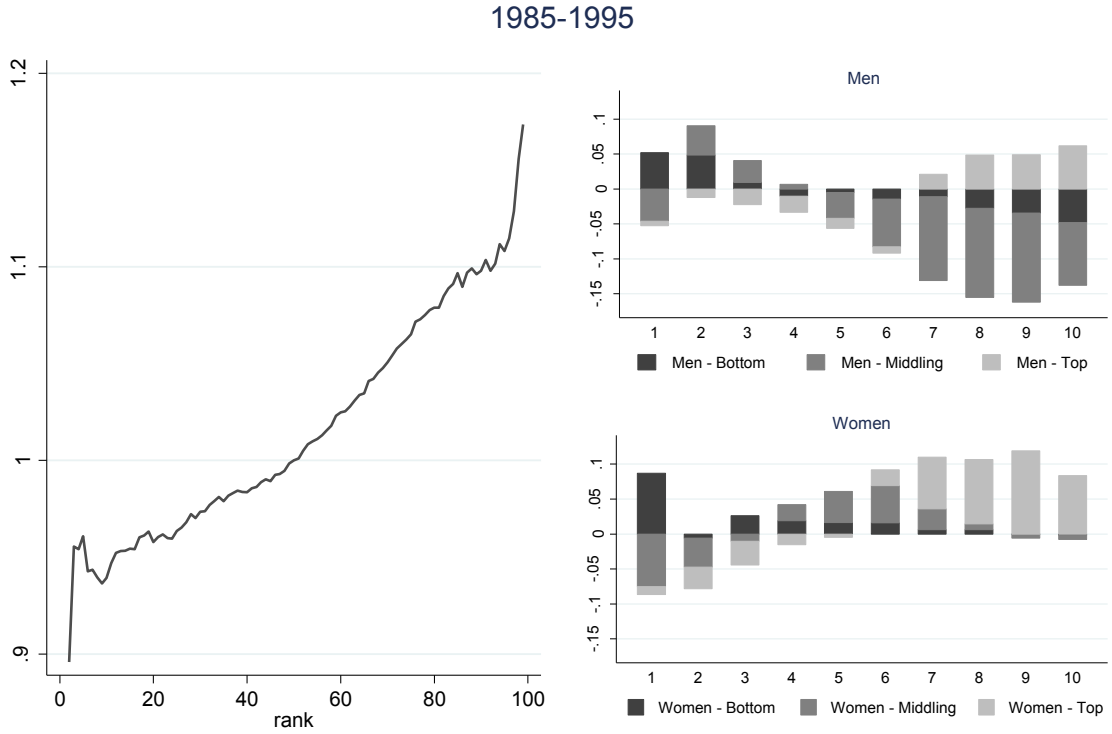

Figure 8.5: ratios of ranked earnings relative to the median, 1995 relative to 1985 and changes in gender x occupational group decile composition between 1985 and 1995.

In Figure 8.5, we turn to a comparison of 2005 with 1995 and find a radically different picture: a further increase in inequality at the top of the earnings distribution is now accompanied by a substantial reduction in inequality at the lower end, most strongly for the

bottom 5% or so. This is partly but not entirely the result of the introduction of the national minimum wage in April 1999. Comparing 1999 with 1998 shows about an 8% gain relative to the median at the 5th percentile and relatively little change above about the 12th percentile. It seems likely that not all the benefits to lower wage workers of the national minimum wage accrued in 1999, see Butcher (2005). It is possible that changes in the design of the ASHE in 2004, compared to the NES in 2003, might have had an effect on the recorded data. A similar comparison of 2003 and 2004 suggested an increase of around 2% in the 5th percentile relative to the median but that seem explicable in terms of the increase in national minimum wage rates between 2003 and 2004.[12] Thus it is unlikely that the NES to ASHE shift made much difference.

The RHS of Figure 8.5 again shows gains in employment shares for women in the top occupational group, and concentrated in the top four deciles, displacing men in the top two and especially the top decile. Hollowing out of jobs for men in middle ranking occupations was spread out from the 2nd to the 9th decile, and most pronounced in the 6th to 8th deciles. For women in these occupations there was also a substantial fall in their employment share but largest in the bottom two deciles. In this decade, there was a substantial increase in the share of employment of women in the bottom occupational group but quite spread out over earnings deciles from the bottom to the 7th. A smaller increase in the employment share of men in the bottom occupational group was more concentrated in the 1st and 2nd deciles.

[12] At the upper end of the distribution, the comparison of 2004 and 2003 suggests a slight reduction in inequality, and this might be connected with differences in the design of the ASHE and the NES. But the differences are small by comparison with the changes between 1995 and 2005 shown in Figure 9.6.

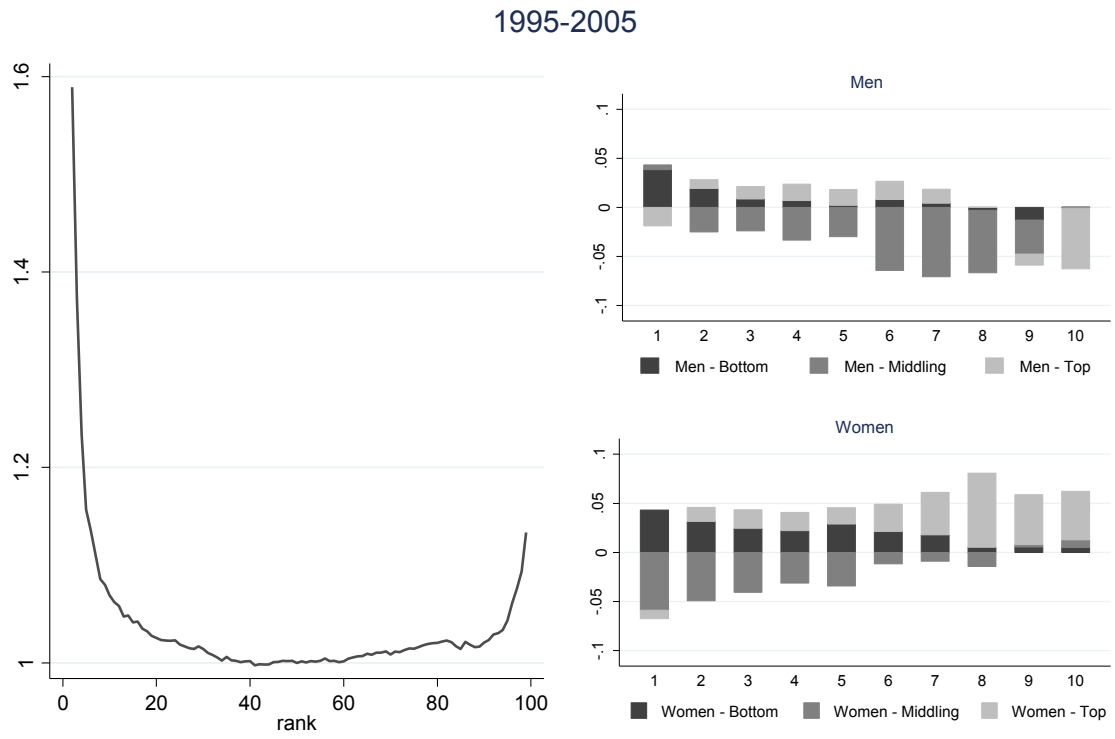

Figure 8.6: ratios of ranked earnings relative to the median, 2005 relative to 1995 and changes in gender x occupational group decile composition between 1995 and 2005.

Comparing 2015 and 2005 in Figure 8.6, there was a further slight reduction in inequality of hourly earnings for about the bottom 30% of the distribtuion, and for the first time in these decadal comparisons, a small reduction in inequality for the top 30% and especially the top 5% or so.

The RHS of Figure 8.6 suggests an association between the fall in inequality at the top and the falling employment share of men in the top occupational group, and most pronounced in the top two deciles. For women in the top occupational group, by contrast, there were small gains in employment shares in the top two deciles. Overall, there were falls in the employment shares of both men and women in the middling occupations, spread across the earnings distribution from the 2nd to the 7th decile. For the bottom occupational group, there was an increased employment share for women, but not in the lowest decile, and otherwise spread out across the distribution.

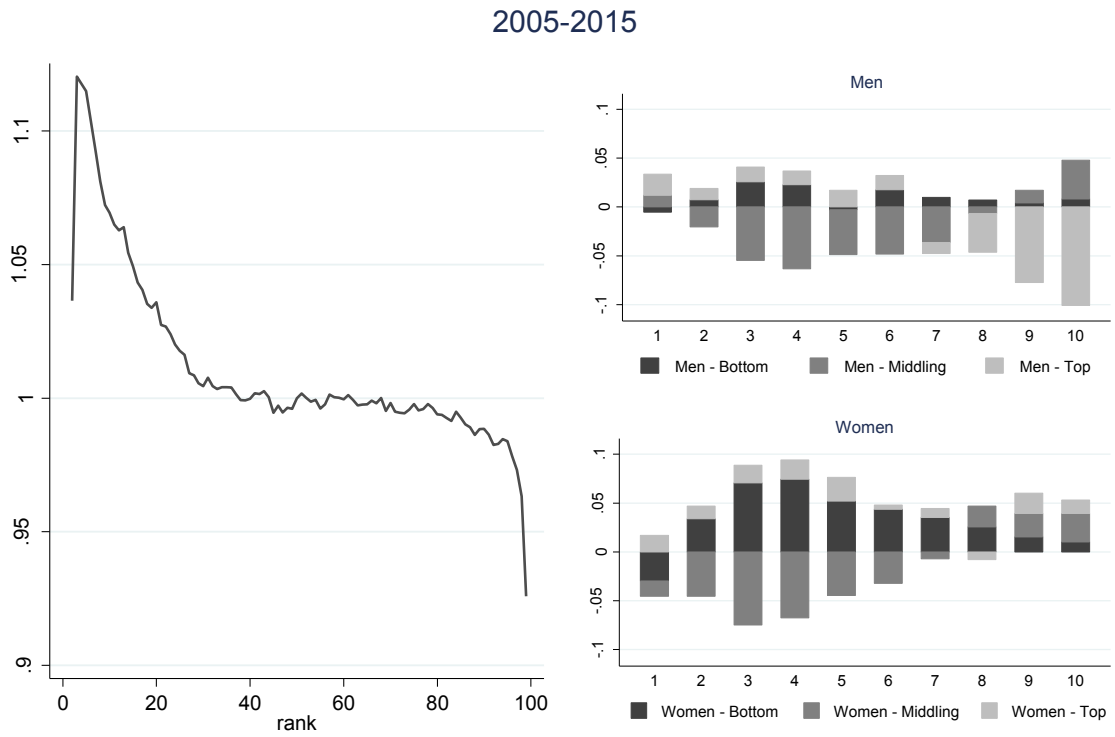

Figure 8.7: ratios of ranked earnings relative to the median, 2015 relative to 2005 and changes in gender x occupational group decile composition between 2005 and 2015.

Finally, the shifts in distributions examined here need to be put into the context of overall real earnings growth. Nominal hourly earnings are deflated by RPIX for April of the respective year. Figure 8.8 shows mean log median real earnings for men, all employees and women on the right and median log real earnings on the right. The figure shows a narrowing of the men-women differential for both measures, and a decline in real earnings after 2008. The mean lies above the median throughout because of inequality.

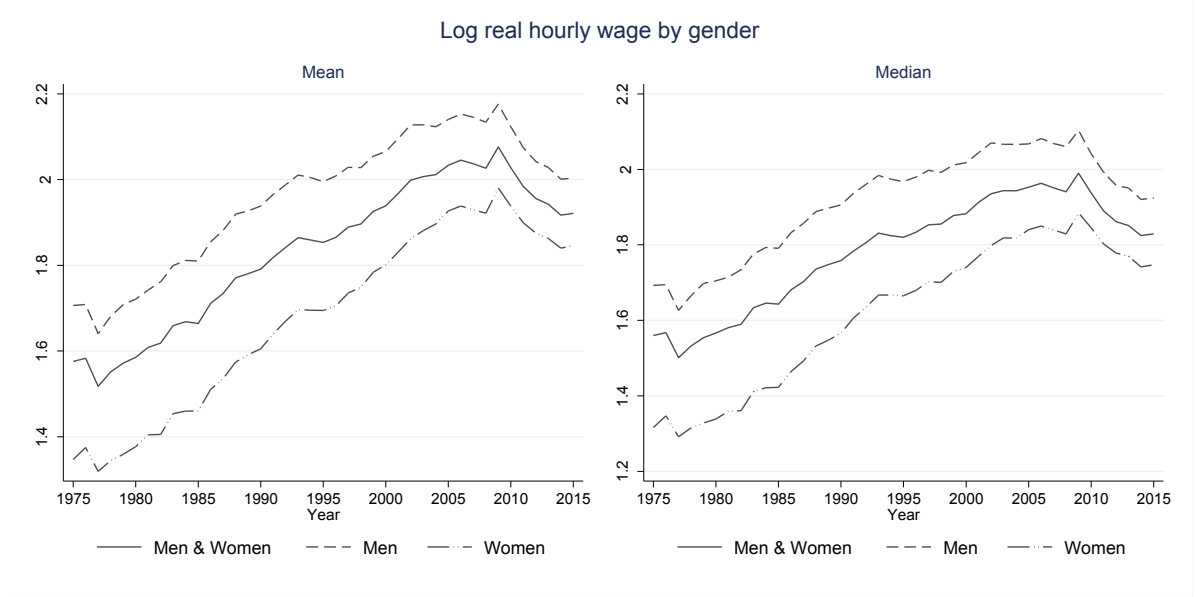

Figure 8.8: Mean and median log real hourly earnings between 1975 and 2015.

To summarise, for all three occupational groups, median earnings for men and women have moved closer together. Relative to median earnings for all employees, median wages for men and women in the top group rose strongly from 1975 to the early 1990s, then plateauing for women and declining for men. In the middle occupational group, relative earnings for women have trended up while those for men have declined, at least since the 2000s. The same is true for the bottom occupational group, except that the relative upturn for women is more recent.

For each gender there has been a substantial widening of inequality between the top occupational group, the middle and the bottom, at least until about the mid-1990s. This will have contributed to the trends in inequality of hourly earnings. Inequality increased both at the lower and the upper ends of the earnings distribution in 1975-85 and in 1985-95. Between 1995 and 2005, inequality at the top carried on rising but fell in the lower half, especially for the bottom decile, with the national minimum wage introduced in 1999 playing an important contribution. For the decade 2005 to 2015, inequality fell in the upper half of the earnings distribution, consistent with the fall in the employment share of top jobs. It also fell in the lower half of the earnings distribution, despite the evidence above of an increased employment share of bottom category jobs. However, this decline in overall earnings inequality has coincided with an intergeneration redistribution, as noted above, against the generation born since 1980.

9. Conclusions.

Close examination of annual data from ASHE confirms a continuous loss of jobs for men in the middle and gains at the top, before the financial crisis. Since 1990, the proportion of jobs for men in about the bottom decile of jobs has risen. Moreover, the latter occurred at

the same time as median wages for bottom jobs fell relative to those for other jobs. For women, the story is far more positive: larger gains in employment shares for top jobs and evidence that increases in the share of employment in bottom jobs is a more recent phenomenon than for men. Comparing cohort experiences highlights gender differences. The weak position of the youngest cohort is revealed by the evolution of the ratio of their earnings to the median, which lies below the ratios of the previous cohorts, irrespective of the type of job being in low, middle or high occupations. Again, this is especially the case for men as women of the youngest cohort do not fare as badly compared to the previous cohorts.

These different developments across gender and cohorts changed the overall pattern of the wage distribution through time. Specifically, between 1975 and 2015, wages of workers in middling and bottom jobs were squeezed below the median, while the wages of top occupations increased especially until the nineties. Both developments however hide significant gender differences. Below the median, there has been an improvement of the pay of bottom and middle jobs held by women and a worsening for those held by men; above the median, the wages of women holding top jobs rose closer to those of men, which instead have been slightly declining since the early 2000's.

Hence, while gender pay inequality was reduced, overall pay inequality rose until about 1995. In the last twenty years of the period, from 1995 to 2015, inequality reduced, only below the median, from 1995 to 2005 and both below and above the median from 2005 to 2015. These findings then accord with those reported by Holmes (this volume) according to which after 2007 overall inequality declined in most countries, reflecting a fall at both ends of the distribution.

The most important limitation of our analysis is that the data-set we used, the NES-ASHE, includes only employees. We then miss those parts of the story related to workers with different employment status, namely the self-employed, and to people unemployed or inactive, both of which we expect to be particularly crucial to the inequality issues.

Three of the four decades we considered comprise periods of high unemployment, which picked in 1984, 1994 and in 2012. Holmes (this volume) argues, for example, that for younger cohorts the probability of falling into unemployment after being displaced from routine jobs is higher than it was for older cohorts at the same age. While this agrees with the historically high rate of youth unemployment, the last recession has also seen a surge in self-employment. Since 2009, when this phenomenon started to increase in importance, it became clear that it also was intrinsically polarized. Forty percent of its growth, corresponding to over 60% of the workers involved, has been in precarious, low paying, manual service sectors, with jobs largely held by young, low educated workers. The remaining part of the growth in self-employment has been in privileged sectors like health, consultancy, IT, law and finance. Here jobs are highly-paid and usually held by older and graduate workers (Tomlinson and Corlett, 2017). On the whole, both missing parts are likely

to amplify the polarization of earnings and of work opportunities against the young generation that we have documented in this chapter.

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Appendix 1: imputing missing values for normal hours

In 2004 the ASHE replaced the NES. In ASHE, in contrast to the NES, no missing values are recorded either for total weekly or for normal hours. NES data for 1998-2003 were reworked by ONS to make them more consistent with ASHE and reported missing values for normal hours are of the order of 1 or 2 percent. However, before 1998, NES records missing values for around 5 or 6 percent of the sample, and often over 15% for total hours. There is evidence that missing values are more frequent at the bottom tail of the weekly earnings distribution and in the upper quartile. Another difference is that in ASHE around 0.6% of the sample are recorded as having zero hours, while weekly pay is not zero. In NES, it appears that such observations were treated as missing.

To improve comparability with later ASHE data, we have imputed normal weekly hours to the NES data using a regression method. For each year, normal hours, where recorded, are regressed on a gender dummy, age dummies for the under 35s, those aged 35 to 49 and the over 50s, a part-time dummy, occupational classification dummies, sectoral dummies and weekly earnings. The R-squared is typically over 80% and equation standard errors are around 2 for mean normal hours of about 37. For consistency, we have also imputed normal weekly hours to the ASHE observations where zero hours are recorded, using a similar method.

Without such imputation, comparisons of distributional information using the hourly earnings including overtime measure hexo provided in the ASHE-NES panel data would show spurious shifts in 1998 and 2004 when the percentage of missing hours data jumps.

Appendix 2: shift-share analysis

Take the bottom 10% ranked, say in 1995. Let w(t,j) be the share of sector j employees in the bottom 10% and s(t,j) be the employment share of all employees in sector j. Then s(t,j) w(t,j) is the employment share of all employees in the bottom 10% who work in sector j. Let the sum across sectors T(t,t) = $\sum s(t,j)w(t,j)$. This is the employment share of all workers in the bottom 10%. Hollowing out in 2015 compared to 2005 for the bottom decile is then measured by T(2015, 2015) – T(2005, 2005). The between-sector change can be defined as the weighted average of the changes in the s's using the average of the w's in 2005 and 2015; the within-sector change can be defined as the weighted average of the changes in the w's, using the average of the s's in 2005 and 2015.