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Conference Paper

Inter- And Intra-Regional Wage Inequalities In The Uk: An Examination Of The Sources Of UK Wage Inequalities And Their Evolution

40th Congress of the European Regional Science Association: "European Monetary Union and Regional Policy", August 29 - September 1, 2000, Barcelona, Spain

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Monastiriotis, Vassilis (2000) : Inter- And Intra-Regional Wage Inequalities In The Uk: An Examination Of The Sources Of UK Wage Inequalities And Their Evolution, 40th Congress of the European Regional Science Association: "European Monetary Union and Regional Policy", August 29 - September 1, 2000, Barcelona, Spain, European Regional Science Association (ERSA), Louvain-la-Neuve

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<p>40th ERSA European Congress Barcelona, Spain September 2000</p>

**INTER- AND INTRA-REGIONAL WAGE INEQUALITIES
IN THE UK: An examination of the sources of UK wage
inequalities and their evolution.**

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Abstract

Wage inequalities in the UK and elsewhere have increased substantially over the last two decades and have remained in historically high levels throughout the 1990s. In this paper we perform a number of decompositions of wage inequalities and their changes and try to locate the sources of these inequalities. By far, changes in returns to skills, towards more inequality, are the main determinant of the marked increase in wage inequalities. Nevertheless, more than two thirds of these inequalities are found to be located within the same region and gender and occupational group, with the implication that other factors, possibly education and experience, among others, determine the level of wage inequalities. However, cross-regional differences in wage inequalities are by lot determined by differences in the occupational composition of the work-force and in the returns to skills. International and macroeconomic factors offer little to the explanation of cross-regional wage inequalities and their importance for overall inequalities.

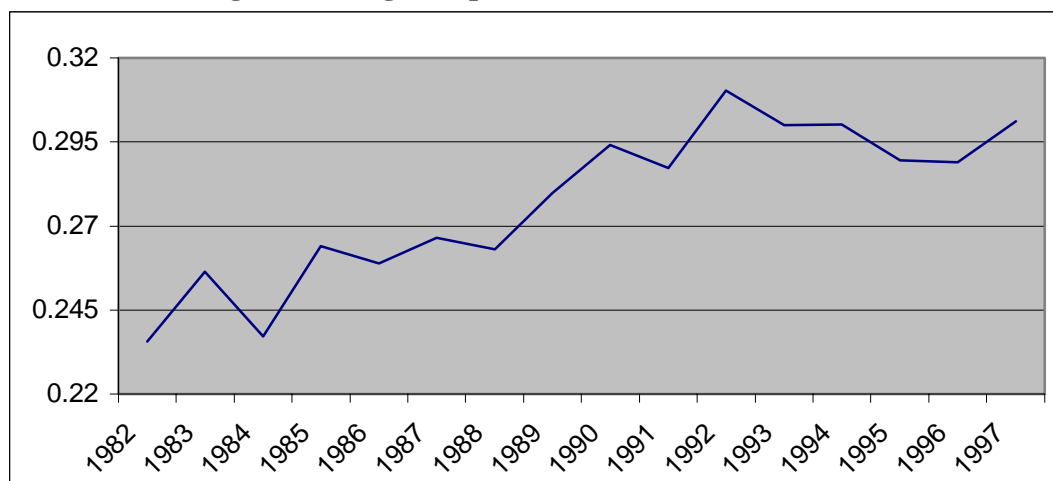
JEL Classification: J31, R11.

Inter- and intra-regional wage inequalities in the UK: an examination of the sources of UK wage inequalities and their evolution.

I. Introduction

Wage inequalities in the UK have followed an upward trend for more than two decades now. This increase in inequalities, however, is not a country-specific phenomenon. Rather, it is something experienced in many OECD and other economies (OECD, 1993; 1997). For the USA this trend is identifiable since the 1960s (Raj and Slottje, 1994) and it is connected to an absolute decline in real wages at the bottom of the wage distribution. In the UK wage inequalities were quite stable up until the 1970s, but have increased sharply since 1979 (Gregg and Machin, 1994; Gosling et al., 1996; Machin, 1996a and 1998). Figure 1 presents the standard deviation of wages in the UK for the period 1982-1997. There is a consistent upward trend for wage inequalities throughout the period 1982-1993. The mid-1990s seem to have seen a small decline, but in 1997 wage inequalities were moving upwards again. In any case, wage inequalities seem to be much higher today than they were twenty years ago.

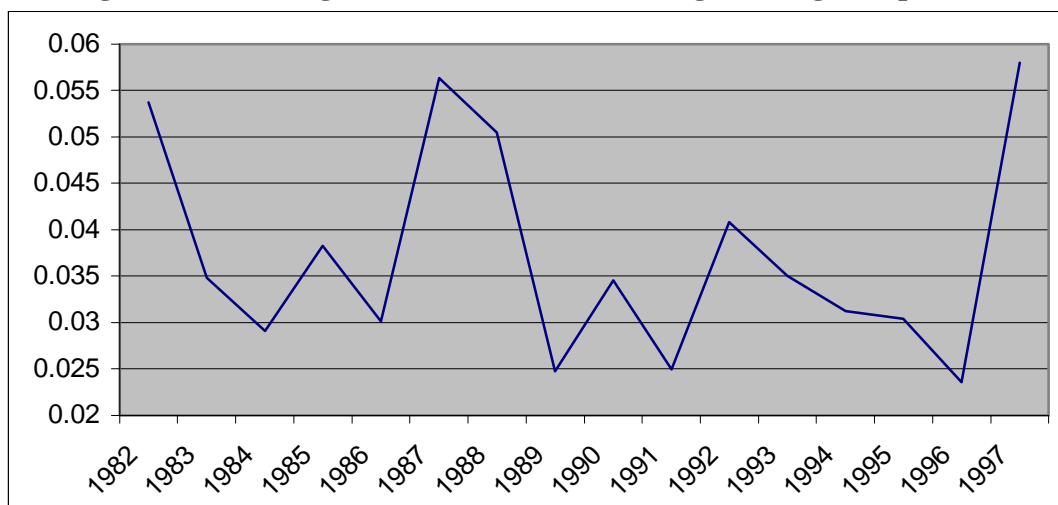
Figure 1: Wage inequalities in the UK, 1982-1997



At the same period as the marked increase in wage inequalities, regional inequalities in average regional wages also increased (Cabinet Office, 1999). This is evident even after controlling for cross-regional differences in price levels. However, despite the apparent increase in wage inequalities, regional differences in wage inequality have, if anything, declined, although they have been very volatile at least over the last twenty years (see Figure 2). This observation poses a question on the role

of regions, as economic units, on the determination and evolution of overall (national, cross-person) wage inequality. Conceptually, wage inequalities can increase either because of increases in inequalities within regions, or because of increases in inequalities between regions (or, of course, both). What the evidence from the two figures presented tells us is that the between component has not been a major source of inequalities in the UK over the last two decades. Increasing wage inequalities seem to be more of a universal economic phenomenon, rather than the outcome of economic inequalities across economic entities (e.g. regions).

Figure 2: Cross-regional variance of within regions wage inequalities



Numerous explanations have been proposed to explain the international phenomenon of increasing wage inequalities. At the macroeconomic level, international trade, globalisation and the shift of production towards services (Lawrence and Slaughter, 1993; Borjas and Ramey, 1994; Borjas, Freeman and Katz, 1997 and, in a different context, Storper and Scott, 1990; Peck, 1992), skill-biased technological progress (Berman, Bound and Griliches, 1994; Machin, 1995) and increased female labour force participation (Topel, 1994) are the most prominent factors that have been proposed and investigated. At the microeconomic level, the main factors suggested are increases in the net demand for education and skills and a consequent increase in the returns to education and skills (Katz and Murphy, 1992; Murphy and Welch, 1993; Juhn et al., 1993; Machin, 1996b; Duranton and Monastiriotis, 2000). Additionally, a number of institutional factors related to labour market flexibility and deregulation have also been proposed as factors that have contributed to this increase in wage inequalities (Blau and Kahn, 1996; Gosling and Machin, 1993; Nickell and Bell, 1996; Fortin and

Lemieux, 1997; Nickel and Layard, 1998; Cheshire et al., 2000). Such factors include the decline in trade union densities, minimum wages and unemployment benefits. Despite the big number of empirical investigations trying to measure the contribution of the aforementioned factors on increased wage inequalities and the rigorousness of the econometric techniques employed there, much of the variation in wages is always left unexplained in a statistical sense (see also Davis and Haltiwanger, 1991; Bound and Johnson, 1992; Lawrence and Slaughter, 1993; Wes, 1996 and Krugman, 1996 for evidence against the significance of some of the proposed factors).

A few authors have deviated from the traditional econometric analysis and used a quite distinct methodology to help explain this phenomenon. Freeman (1980), Juhn et al. (1993), Blackaby and Murphy (1995) and Blau and Kahn (1996), for example, have used different or complementary decompositions in order to compute the contribution of different factors on increased wage inequalities. Such methodologies attempt to locate the sources of wage inequalities rather than to explain them. In this sense, they are complementary to the traditional analysis, which since Mincer's (1974) seminal work, is dominated by human-capital-type wage equations.

This paper utilises such decompositions and combines both methodologies in an attempt to put much of the evidence together and identify the main sources of UK wage inequalities. We use data for the UK over the period 1982-1997, derived mainly from the Family Expenditure Survey, which is a representative household survey conducted annually. Survey data are necessary in order to identify and take into account the characteristics of the wage-earners when analysing their differences in earnings. In the next section we decompose UK wage inequalities into a within and a between component by region, occupation and gender. Further, we proceed to identify and measure the composition and price effects, as defined there. These exercises reveal a bulk of information that we summarise in the same section. Section III focuses on the within-regions components of wage inequalities, which are found to be by far the most significant. For that, a different methodology is employed and a big number of regional wage regressions are estimated. Two hypothetical wage distributions are computed for each UK region as a means to control for regional differences in work-force characteristics. Finally, in section IV we focus on the cross-regional wage inequalities and their share to total (overall) inequalities and attempt to assess the role of a number of international and macroeconomic factors, as they have been suggested in the literature. The last section summarises the findings and concludes.

II. Decomposing UK wage inequalities

In order to isolate the different sources of inequalities, a first decomposition can be made by decomposing overall (national) inequality into a within and a between component. This methodology has been applied by Freeman (1980) and Blau and Kahn (1996) for the case of unionism and by Juhn et al. (1993) for the case of industry. The relevant formula is

$$v = \sum_{i=1}^n (s_i * v_i) + \sum_{i=1}^n (s_i * (w_i - w)^2) \quad (1)$$

where v is the overall (national) variance of log weekly wages for full time employees on adult rates, s is the share of each sub-group (i.e.: region, occupational class, gender, or other) to total sample population, v_i is the variance of wages within the sub-group i , w_i is the average wage within the same group and w is the national average wage.

Table 1: Regional decomposition of UK wage inequalities, 1982-1997

Year	Overall variance	Within component	Between component	Within%	Between%	Actual between
1982	0.2356	0.2268	0.0089	0.9624	0.0376	0.0089
1983	0.2564	0.2452	0.0111	0.9566	0.0434	0.0101
1984	0.2372	0.2358	0.0013	0.9944	0.0056	0.0018
1985	0.2640	0.2618	0.0022	0.9918	0.0082	0.0019
1986	0.2588	0.2574	0.0014	0.9944	0.0056	0.0013
1987	0.2665	0.2619	0.0045	0.9830	0.0170	0.0050
1988	0.2631	0.2603	0.0028	0.9895	0.0105	0.0025
1989	0.2798	0.2731	0.0067	0.9761	0.0239	0.0096
1990	0.2941	0.2931	0.0011	0.9964	0.0036	0.0018
1991	0.2872	0.2841	0.0031	0.9891	0.0109	0.0042
1992	0.3102	0.3065	0.0037	0.9881	0.0119	0.0033
1993	0.2999	0.2927	0.0072	0.9759	0.0241	0.0061
1994	0.3002	0.2966	0.0036	0.9879	0.0121	0.0031
1995	0.2895	0.2836	0.0059	0.9796	0.0204	0.0052
1996	0.2890	0.2849	0.0040	0.9860	0.0140	0.0036
1997	0.3012	0.2971	0.0041	0.9864	0.0136	0.0034
Average	0.2770	0.2726	0.0045	0.9836	0.0164	0.0045

Table 1 presents the variance of log wages in the UK, over the period 1982-1997 (first column). Additionally, it presents the decomposition of this inequality measure into its within-regions and between-regions components. As it can be seen, wage inequalities increased over the 16 years of our sample by around 25%. This increase, however, is merely attributable to an increase in inequalities within each UK region. As the third and fifth columns of Table 1 show, cross-regional inequalities for the 12 SSRs (Standard Statistical Regions) of the UK have contributed on average by less than 2% to overall (nation-wide) wage inequality. We must note here that the measure of cross-

regional inequalities does not correspond directly to conventional measures of regional wage inequality (e.g.: variance or standard deviation of regional average wages), as the sample populations for each region have been used as weights for the calculation of the “between” inequality measure. For this reason, in the last column of Table 1 we report the actual (un-weighted) variance of real regional log wages. As it can be seen, the differences with the weighted (between) variance are extremely small, although the former tends to underestimate the real regional inequality in average wages.

Table 2: Occupational decomposition of UK wage inequalities, 1982-1997

Year	Overall variance	Within component	Between component	Within%	Between%
1982	0.2353	0.2030	0.0323	0.8627	0.1373
1983	0.2560	0.2172	0.0388	0.8485	0.1515
1984	0.2368	0.2015	0.0353	0.8508	0.1492
1985	0.2635	0.2222	0.0413	0.8431	0.1569
1986	0.2584	0.2215	0.0369	0.8573	0.1427
1987	0.2654	0.2431	0.0223	0.9159	0.0841
1988	0.2620	0.2389	0.0231	0.9120	0.0880
1989	0.2794	0.2250	0.0543	0.8055	0.1945
1990	0.2936	0.2374	0.0562	0.8086	0.1914
1991	0.2867	0.2285	0.0582	0.7970	0.2030
1992	0.3097	0.2411	0.0686	0.7785	0.2215
1993	0.2994	0.2262	0.0732	0.7556	0.2444
1994	0.2997	0.2385	0.0611	0.7960	0.2040
1995	0.2889	0.2192	0.0696	0.7589	0.2411
1996	0.2884	0.2288	0.0595	0.7936	0.2064
1997	0.3005	0.2343	0.0662	0.7798	0.2202
Average	0.2765	0.2267	0.0498	0.8227	0.1773

Tables 2 and 3 present the same decomposition for occupations and gender, while Table 4 presents a more refined decomposition, where each class represents people of the same gender, in the same occupation and region. In Table 2 overall wage inequality is decomposed into its within and between occupational classes components. The occupations used are professional, skilled and the rest (manual semi-skilled and unskilled).¹ As shown in Tables 2 and 3, both gender and occupational inequalities are a small source of overall wage inequalities, although they are more important than in the case of regional inequalities. On average (last row of Table 4), over the period of our study, almost 70% of wage inequalities in the UK were located within the same region, gender and occupational class. The tables show that although regional and gender inequalities declined over the course of time, occupational inequalities rose both in

magnitude and in importance (last column of Table 2).² This finding offers support to the thesis about skill-biased labour demand being one of the main determinants of wage inequalities. However, as shown in the “within” column of Table 4, the main area of increase in inequalities was within the same region, gender and occupation class (by almost one third in the 16-year period of our study!).

Table 3: Gender decomposition of UK wage inequalities, 1982-1997

Year	Overall variance	Within component	Between component	Within%	Between%
1982	0.2352	0.1950	0.0403	0.8289	0.1711
1983	0.2559	0.2147	0.0412	0.8390	0.1610
1984	0.2367	0.1980	0.0388	0.8362	0.1638
1985	0.2635	0.2191	0.0444	0.8315	0.1685
1986	0.2584	0.2204	0.0379	0.8532	0.1468
1987	0.2653	0.2220	0.0433	0.8368	0.1632
1988	0.2618	0.2247	0.0372	0.8581	0.1419
1989	0.2793	0.2427	0.0366	0.8688	0.1312
1990	0.2936	0.2611	0.0324	0.8895	0.1105
1991	0.2867	0.2550	0.0317	0.8894	0.1106
1992	0.3096	0.2816	0.0281	0.9093	0.0907
1993	0.2993	0.2734	0.0259	0.9134	0.0866
1994	0.2996	0.2753	0.0243	0.9188	0.0812
1995	0.2888	0.2625	0.0263	0.9089	0.0911
1996	0.2883	0.2666	0.0217	0.9247	0.0753
1997	0.3005	0.2801	0.0204	0.9320	0.0680
Average	0.2764	0.2432	0.0332	0.8774	0.1226

Table 4: Decomposition of UK wage inequalities by region, occupation and gender, 1982-1997

Year	Overall variance	Within component	Between component	Within%	Between%
1982	0.2372	0.1586	0.0785	0.6688	0.3312
1983	0.2581	0.1728	0.0854	0.6693	0.3307
1984	0.2389	0.1644	0.0745	0.6882	0.3118
1985	0.2658	0.1802	0.0855	0.6782	0.3218
1986	0.2608	0.1852	0.0756	0.7101	0.2899
1987	0.2722	0.2047	0.0675	0.7520	0.2480
1988	0.2686	0.2065	0.0621	0.7690	0.2310
1989	0.2816	0.1879	0.0938	0.6671	0.3329
1990	0.2964	0.2103	0.0861	0.7096	0.2904
1991	0.2894	0.2008	0.0886	0.6937	0.3063
1992	0.3124	0.2185	0.0939	0.6995	0.3005
1993	0.3021	0.2029	0.0992	0.6716	0.3284
1994	0.3028	0.2173	0.0855	0.7177	0.2823
1995	0.2921	0.1971	0.0950	0.6747	0.3253
1996	0.2915	0.2078	0.0837	0.7129	0.2871
1997	0.3036	0.2150	0.0886	0.7082	0.2918
Average	0.2796	0.1956	0.0840	0.6994	0.3006

To illustrate these changes better, in Table 5 we present the change of regional, occupational and gender wage inequalities (and their components) between the beginning (average of 1982 and 1983) and the end (average of 1996 and 1997) of the period under study. We also present this decomposition for sub-groups based on the interactions of the main three categories. This can help shed more light on the sources of overall wages inequalities.

Wage inequalities as measured by the variance of log wages have increased by 0.049 points (19.9%) over the sample period.³ Cross-regional and cross-gender inequalities declined substantially (by around 60% and 50%, respectively –but see footnote 2), but the impact of this movement on overall wage inequalities was minor, due to the small effect of between inequalities on overall inequalities. On the contrary, between occupations inequalities increased substantially. For occupations the “between” effect increased 7.5 times faster than the “within” effect. Between-occupations change in inequalities explains around 56% of the overall increase in wage inequalities. Of the three main components presented in Table 5, the returns to occupational status is the only factor that seriously affected the change in wage inequality in the UK between 1982 and 1997.

**Table 5: Change in UK wage inequality and its components, 1982-1997:
the within-group and between-group effects**

Disaggregation		Overall	Within	Between
Region	Change	0.0491	0.0550	-0.0059
	%change	19.9%	23.3%	-59.4%
Occupation	Change	0.0488	0.0215	0.0273
	%change	19.9%	10.2%	76.8%
Gender	Change	0.0488	0.0685	-0.0197
	%change	19.9%	33.4%	-48.3%
Region - occupation	Change	0.0493	0.0277	0.0216
	%change	20.0%	13.7%	48.2%
Region - gender	Change	0.0494	0.0764	-0.0270
	%change	20.1%	39.5%	-51.1%
Occupation - gender	Change	0.0489	0.0398	0.0091
	%change	19.9%	22.9%	12.7%
Region - gender - occupation	Change	0.0499	0.0457	0.0042
	%change	20.1%	27.6%	5.1%

Note: The within and between percentages for each category do not sum up to the figure of overall percentage change for this category. This is because the reported percentages of change refer to the rate of change of each factor over time and not to their contribution to the overall percentage change. The figures of change in overall inequality are not identical due to rounding errors.

The second part of Table 5 offers deeper insights about the evolution and the sources of UK wage inequalities. Around 90% of the increase in wage inequalities was contained within the same region and the same gender and occupational group. In this respect, cross-group changes in inequalities were of minor importance. Of them, cross-region/occupation and cross-region/gender inequality changes were far the most dramatic, moving though in opposite directions and, hence, almost cancelling each other out. Inequalities between regions and occupational groups almost doubled, while inequalities between regions and gender groups more than halved.

A further decomposition of Table 5 is possible. Both the within and the between components of change can be further decomposed into a composition effect and a price effect. In other words, both within-groups and between-groups inequalities may have changed due to changes in the group population shares (i.e.: the weights in (1)), in the within-group inequality per se, or in the between-group inequality per se. We present this decomposition for the three main disaggregations presented above (regions, occupations and gender), in Table 6. Each cell shows the contribution of a different factor to the overall change in the variance of log wages in the UK between the years 1982-83 and 1996-97.

Table 6: Change in UK wage inequality and its components, 1982-1997: further decomposition of the factors of change

Disaggregation		Overall effect	Within composition effect	Between composition effect	Within price effect	Between price effect
Region	Change	0.049	-0.0013	0.0001	0.0564	-0.0060
	%change	19.9%	-0.45%	3.24%	23.91%	-63.29%
Occupation	Change	0.049	0.0030	-0.0278	0.0186	0.0552
	%change	19.9%	1.33%	-30.73%	8.85%	155.88%
Gender	Change	0.049	-0.0041	0.0017	0.0727	-0.0214
	%change	19.9%	-1.50%	9.00%	35.53%	-52.53%

As it can be seen, the composition effects (of changes in the shares of the group populations) have had only a minor contribution to overall change in wage inequality, with the exception of the case of the between effect in the occupational class. For the latter, a higher concentration of employment (to occupations with closer to average wages but more unequal wage distributions) has contributed substantially to the containment of increased wage inequality. Should these shifts in occupations had not occurred, wage inequalities would have increased even faster. Regarding the price

effects, in accordance with what was shown in Table 5, changes in the gender and regional wage gaps helped narrow overall wage inequalities, but changes in the occupational wage gaps increased substantially.

Before closing this section we want to emphasise some of the findings we have obtained so far. Note that these findings are related to robust stylised facts rather than to statistical inferences, based on econometric manipulations and, hence, subject to econometric errors. Over the period 1982-1997 wage inequalities were by far contained within the same region and gender and occupational group. Especially for the latter, for which a rather big literature exists, the result is very informative. Inequalities between occupations were contributing to overall wage inequalities by no more than 20%. However, if we turn to the change in wage inequalities over time, it is striking how substantial an effect did between occupations wage inequalities had. Around half of the increase in overall wage inequalities is directly attributed to an increase in the between occupations component. Moreover, the decomposition of Table 6 reveals that the dynamics have been much more dramatic. The 156% increase in the returns to skills over the period under study can explain 123% of the overall increase in wage inequalities. Other factors (mainly the decline in the between occupations composition effect, but also some regional effects) have helped contained some of this increase. But the interesting conclusion is that although the main source of wage inequalities is in fact inequalities within occupations, the main source of the increase in wage inequalities between 1982 and 1997 has been the unprecedented increase in the returns to skills.

III. The sources of within-regions wage inequalities

As discussed in the previous section, wage inequalities between occupations are by far the most significant elements of overall wage inequalities and their increase over the last two decades. However, almost all of the inequality in wages is contained within regions. Hence, we now turn to a more detailed analysis of the sources of wage inequalities and their changes, within regions.⁴ A further analysis of the determinants of the between regions wage inequalities is presented in the next section.

To investigate the sources of wage inequalities within groups (in specific, within regions), a more appropriate decomposition method can be employed. We follow Blau and Kahn (1996) and estimate one Mincer (1974) type wage equation for each region and for each sample year. These equations include a gender dummy (one if female), years of full-time continuous education, potential labour market experience and its

square as dependent variables. The dependent variable is the log of real gross weekly earnings.⁵ The obtained residuals from each regression are decomposed into an iid ($N \sim (0,1)$) component and their standard deviation:

$$e_{ij} = \sigma_j * \theta_{ij} \quad (2)$$

where e_{ij} is the residual corresponding to individual i in the regression of region j , σ_j is the standard deviation of the residuals in the j^{th} regression and θ_{ij} are the iid residuals. With this information, we can calculate two theoretical wage distributions as follows:

$$\begin{aligned} w1_{ij} &= B'_b * X_{ij} + \sigma_b * \theta_{ij} \\ w2_{ij} &= B'_j * X_{ij} + \sigma_b * \theta_{ij} \end{aligned} \quad (3)$$

where i indexes individuals, j indexes regions, b indexes the base region (South East⁶), B' is a vector of estimated coefficients from the original wage equations and X is a vector of human capital characteristics (sex, education, experience and experience squared). Further, we proceed in calculating the differences in standard deviation of log wages between the base region and each one of the other regions (symbolised with p). By simple manipulations it can be seen that this difference is

$$p_b - p_j = (p_b - p1_j) + (p1_j - p2_j) + (p2_j - p_j) \quad (4)$$

As discussed in Blau and Kahn (1996), each bracketed term measures a different component of the between-regions difference in wage inequality. The first term constitutes the effect of differences in measured characteristics. The second term measures the effect of differences in the returns to measured characteristics. The last term is a residual effect, consisting of unmeasured price and composition effects (and, unavoidably, measurement errors). Tables 7 and 8 present this decomposition for 1982 and 1997 (the first and last years of our sample), respectively.

As Table 7 shows, wage inequalities are higher in the South East (excluding London) than in any other British region. On average (last row), this is largely due to regional differences in measured human capital characteristics. The latter alone explains 51% of the un-weighted average difference in wage inequality between the South East and the rest of the Britain and 98.8% of the same difference between the South East and the rest of the UK (including N. Ireland). Price effects play on average a less important role. However, significant differences exist between regions, as illustrated by the substantial difference between the GB and UK results. Just to highlight these differences, it is interesting to focus on the case of London. Between London and the rest of the South East, all of the difference in wage inequality is attributed to differences

in the returns to human capital characteristics (price effect). In other words, compared to South East, the price structure of London in 1982 was creating less inequality. Should the price structure in the South East region was the same as in London, wage inequalities in the former would be even lower than in London. The latter is the only region in which the distribution of measured human capital characteristics generates higher inequalities than the equivalent distribution in the rest of the South East.

Table 7: Decomposition of regional differences in wage inequalities, 1982

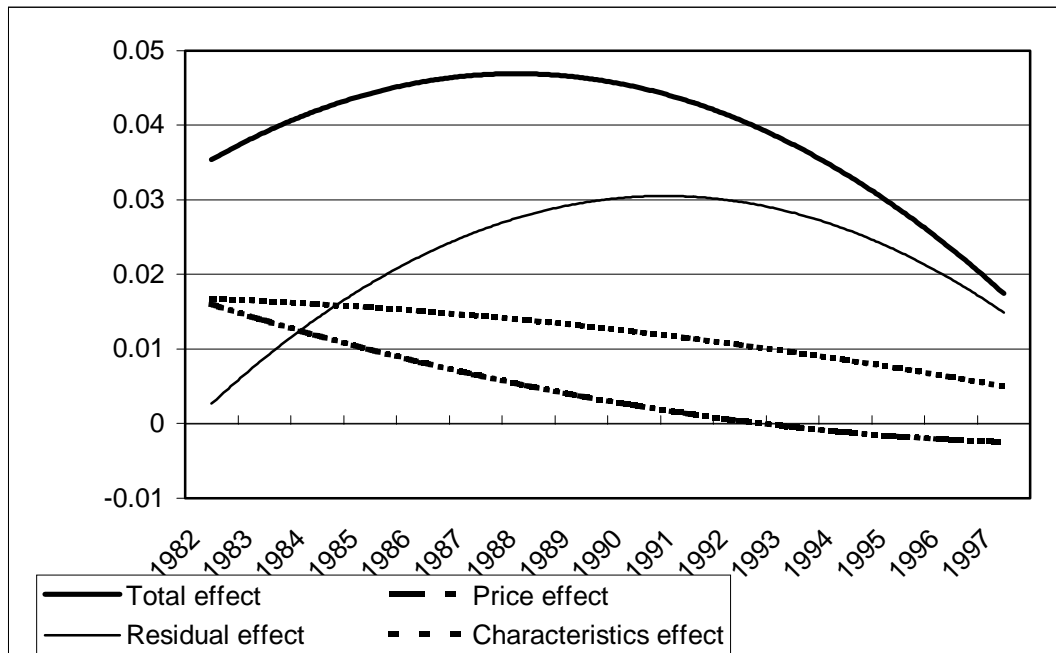
Regions	Overall difference ($p_b - p_j$)	Measured char/stics effect ($p_b - p_{1j}$)	Price effect ($p_{1j} - p_{2j}$)	Residual effect ($p_{2j} - p_j$)
North	0.0357	0.0256	0.0100	0.0002
York/Humber	0.0115	0.0133	0.0046	-0.0064
North West	0.0216	0.0245	0.0022	-0.0051
East Midlands	0.0400	0.0198	0.0195	0.0006
West Midlands	0.0461	0.0258	-0.0083	0.0286
East Anglia	0.0173	0.0144	0.0016	0.0012
London	0.0584	-0.0070	0.0642	0.0011
South West	0.0624	0.0215	0.0058	0.0350
Wales	0.0280	0.0087	0.0195	-0.0003
Scotland	0.0011	0.0179	-0.0124	-0.0044
N. Ireland	-0.1429	0.0125	-0.0470	-0.1084
Average (unweighted)	0.0163	0.0161	0.0054	-0.0052
Unw. Average (excl. N. Ireland)	0.0322	0.0165	0.0107	0.0051

Table 8: Decomposition of regional differences in wage inequalities, 1997

Regions	Overall difference ($p_b - p_j$)	Measured char/stics effect ($p_b - p_{1j}$)	Price effect ($p_{1j} - p_{2j}$)	Residual effect ($p_{2j} - p_j$)
North	0.0668	0.0166	-0.0079	0.0581
York/Humber	0.0495	0.0133	-0.0119	0.0481
North West	0.0671	0.0143	0.0021	0.0508
East Midlands	0.0251	0.0086	-0.0016	0.0181
West Midlands	0.0281	0.0044	0.0066	0.0172
East Anglia	-0.0123	0.0012	-0.0282	0.0147
London	-0.1073	-0.0036	-0.0003	-0.1034
South West	0.0482	0.0154	-0.0005	0.0334
Wales	-0.0745	0.0162	0.0102	-0.1009
Scotland	0.0776	-0.0002	0.0192	0.0586
N. Ireland	0.1254	0.0168	0.0045	0.1040
Average (unweighted)	0.0267	0.0093	-0.0007	0.0181
Unw. Average (excl. N. Ireland)	0.0168	0.0086	-0.0012	0.0095

These conclusions change when we look at the same picture in 1997. As the first column of Table 8 shows, in 1997 South East was not any more the region with the most unequal wage structure in Britain. Rather, London and to a lesser extent Wales and East Anglia were the most unequal regions. Inequalities within Northern Ireland declined substantially. What is very important to note is that measured characteristics do not seem to be playing as a crucial role in 1997 as in 1982. By far, the most important element is now the residual effect (unmeasured price and composition effects). This is consistent with the results obtained earlier, about occupational characteristics being the most important source of wage inequalities in the UK and of their increase over the last 16 years. When occupational dummies were included in the estimating regressions, the importance of the residual effects in 1997 fell substantially. For example, the relevant values for London were 0.0013, -0.036 and -0.072 for the measured characteristics effect, the price effect and the residual effect, respectively. In other words, when the occupational dummies were included in the regressions, the significance of the estimated price effect for London increased by 140 times (-0.036 compared to -0.00026 in Table 8). These results suggest that changes in the returns to occupation are the most significant determinant of the evolution of wage inequalities in the UK.

Figure 3: The evolution of wage inequality differences (GB, 1982-1997)



To present a continuous picture of change, in Figure 3 we sketch evolution of the un-weighted average difference in wage inequality and its three components between the South East and the rest of Britain (excluding N. Ireland) over the period of our study.⁷

Interestingly, the trend behaviour of what we call the total effect (average difference in inequality between the South East and the other British regions) has followed a declining path over the last ten years. This is quite informative in terms of the debate over the North-South divide and the wider regional inequalities in the UK. Although regional inequalities in the first moment (average wages) have widened and, as shown in Figure 2, regional inequalities in the second moments (variance of regional wages) have not declined, Figure 3 reveals a picture of real convergence, at least as far as the North-South divide is concerned. British regions are somewhat converging towards the South East returns to and distribution of labour force characteristics, although this convergence is co-existing with increasing overall and between regions wage inequalities. Hence, while some intensification of the North-South divide may be observed, a consistent trend towards equalisation of returns to -at least some- labour force characteristics and their distribution is undoubtedly present.

Turning to the different components of the total effect, Figure 3 reveals that this regional convergence in wage structures encompasses all three decomposed elements. Nevertheless, as it can be easily seen, not all components have followed the same pattern of evolution. The measured characteristics and price effects have followed a stable declining path. However, the importance of measured characteristics (gender, education and experience) in the determination of cross-regional differences in within-regions wage inequalities (as measured by the distance of the characteristics effect curve to the horizontal axis, relative to its distance to the total effect curve) was the same in 1982 as in 1997 (around 51%), despite the fact that in the late 1980s and early 1990s the effect of measured characteristics was much smaller. On the other hand, the path that the residual effect has followed over the period seems to suggest that other characteristics (possibly occupational but also industrial or other) and their prices have been gaining significance in the determination of cross-regional differences in within-regions wage inequalities. In view of the results presented and discussed earlier, this is yet another piece of evidence confirming the robustness of our earlier conclusion that occupational characteristics and their prices are by far the more important determinants of the increasing trend of wage inequalities in Britain over the last two decades.

IV. The determinants of cross-regional wage inequalities: time-series analysis

The analysis of the previous sections has showed that cross-regional wage inequalities are not related to the increase in overall wage inequalities in the UK over the last two decades. Not only have cross-regional differences in average wages actually declined, but also their contribution to overall wage inequality has been surprisingly low (below 2% on average) throughout the period of our study. However, the question as to what drives (and eliminates) regional inequalities in wages is a very interesting one. Moreover, the decompositions performed here can help investigate the determinants of regional wage inequalities from a macroeconomic perspective. In what follows we undertake an econometric analysis to relate aggregate macroeconomic variables to the level of regional wage inequalities, as well as to their share to overall (national) wage inequalities. In the absence of theory,⁸ the selection of the explanatory variables is a practical and intuitive issue. We have chosen to focus on a number of macroeconomic factors that have been suggested in the literature of cross-personal wage inequalities. Hence, we introduce in our regressions variables like the national shares of agriculture, manufacturing and services in total employment, the national unemployment and inflation rates, and variables measuring openness to trade, trade union density and female labour force participation. With these variables we try to proxy for factors like (skill-biased) labour and product demand (the employment shares), the gender composition of the labour force (female labour force participation), the volume and intensity of international trade (openness to trade), labour market institutions (unionism) and the wider economic conditions in the country (inflation and unemployment).

Table 9 presents a set of regressions of the above variables on the standard deviation and the variance of regional average wages, as well as on the share of regional wage inequalities to the national wage inequality. When we tried to fit a full model, only the share of agriculture to total employment was significant, with a robust positive impact on regional inequalities. All the other estimated coefficients were positive but insignificant. The bad performance of the rest of the variables is largely due to multicollinearity, as otherwise the fit of the estimated regressions is satisfactory (as shown in the last four rows of Table 9). Small sample size (16 observations) is an additional problem, preventing us to employ more thorough regression specifications. Hence, in Table 9 we also report three bi-variate regressions, as they were selected with a forward stepwise selection procedure.

The results reported in Table 9 are not very significant, but they are nevertheless, rather interesting. There is a robust effect of agricultural employment increasing cross-regional inequalities. This is of course due to the fact that the agricultural sector is on the one hand a low productivity (low wage) sector and on the other a rather region-specific sector. The decline in the significance of agriculture as an employer has had a positive impact on the average wages of all regions, but more importantly of the most backward ones. Hence, with the decline in agricultural employment regional average wages converged. Female labour force participation rates are again positively related to regional wage inequalities. Again, this relationship is most likely due to a composition effect. Duranton and Monastiriotis (2000) present evidence of a strong convergence in female labour force participation rates across UK regions during 1982-1997, the same period as the one studied here. As participation rates for women increased faster in low wage regions, average wages fell relative to the average wages in high wage regions. This of course had a positive effect on regional wage inequalities.

Table 9: The determinants of regional inequalities in OLS regressions

Regional inequality measures	Variance of average wages	Variance of average wages	Standard deviation of avg. wages	Standard deviation of avg. wages	Share to overall inequality	Share to overall inequality
Constant	-0.443 (0.33)	-0.124* (0.06)	-3.939 (2.39)	-1.007** (0.43)	-1.678 (1.19)	-0.451* (0.21)
Agriculture	1.71* (0.81)	1.541** (0.54)	13.9** (5.86)	11.753** (4.00)	6.76** (2.91)	6.199*** (1.98)
FLFPRate	0.453 (0.77)	0.223* (0.11)	4.901 (5.51)	1.917** (0.82)	1.580 (2.74)	0.782* (0.41)
Inflation	0.026 (0.04)	-	0.157 (0.28)	-	0.11 (0.14)	-
Unempl.	0.001 (0.001)	-	0.009 (0.006)	-	0.004 (0.003)	-
Unionism	0.003 (0.002)	-	0.020 (0.013)	-	0.011 (0.007)	-
Openness	0.082 (0.06)	-	0.684 (0.46)	-	0.333 (0.23)	-
Prod/vity	0.001 (0.003)	-	0.007 (0.02)	-	0.005 (0.01)	-
R ² -bar	0.15	0.33	0.19	0.32	0.31	0.43
DW	2.98	3.03	3.13	3.05	2.98	2.98
Het. Test ⁻	0.20	0.91	0.22	0.97	0.22	0.83
Normality ⁺	0.26	0.62	0.31	0.79	0.28	0.76

Notes: *, ** and *** show significance at the 1%, 5% and 10% levels of significance, respectively. Standard errors in parentheses. ⁻: Significance levels from White's F-test for heteroskedasticity; ⁺: Significance levels from the Jarque-Bera test for normality. DW is the Durbin-Watson statistic. All regressions have been estimated with OLS.

No one of the other right hand side variables (with the exception of productivity, which is highly and positively correlated with female labour force participation) is significant at any acceptable level. Despite their insignificance -or, more precisely, because of that- these results have a rather important implication. Inflation, unemployment, unionism and openness to trade are not responsible for regional inequalities in wages. In other words, national and international economic conditions contribute little, if at all, to these inequalities. It is interesting to note that the results are very robust across different specifications. Specifically, they do not change when a lagged value of the dependent variable is included, or when the dependent variables are replaced by their deviations from their mean values. Moreover, the results are effectively the same when we use overall wage inequalities as the dependent variable (results are not presented here but are available upon request), for which different theoretical insights about their relation to the aggregates listed above have been offered in the literature. If national and international economic factors are not statistically related to cross-regional (and cross-personal) wage inequalities, then national policies must have a regionally even impact on the regional economies. This conclusion is consistent with the stylised fact that the UK regions follow a common path throughout the period of our study in most economic indicators.

Hence, it must be that regional wage inequalities in the UK are determined by region-specific factors. This supports the view of UK regions as mini-economies with a common trend but rather distinct steady-states. Further, by implication it provides a justification for devolution policies and the turn of interest from the national government to local institutions as the main factors of economic development and convergence.

V. Conclusions

This paper has attempted a thorough investigation of the sources and determinants of UK wage inequalities, with a special focus on the regional dimension of the issue. The analysis employed relies less on hedonic wage equations and econometric estimations and more on actuarial identities and decompositions based on such identities. This methodology allows a confident computation and account of stylised facts and offers useful and rather strong insights about the nature and sources of these inequalities. As the latter have substantially increased over the last two decades in the UK and elsewhere, the decompositions performed here shed light not only on the

significance of each element on overall inequalities but also on the contribution of each element to their increase.

As expected, these decompositions revealed a bulk of information that we tried to summarise and organise in a discussion attempting to reveal some systematic trends. Our main conclusions can be summarised as follows. Wage inequalities have increased substantially over the period 1982-1997, by as much as 25%. Regional differences, as well as gender and occupation effects, are of minor importance, as they explain less than 30% of the average wage inequalities over this period. Especially for regions, our decompositions suggest that their share to overall inequality was never above a “significant” 5%, with an average value just above 1.6%. On average, 70% of overall inequalities were contained within the same region and within the same gender and occupational group. From the determinants of the increase in wage inequalities, inequalities between occupations were the most significant. Moreover, this effect was not spatially even, as changes in inequalities between regional/occupation groups contributed by 20% less to the overall increase in inequalities than the increase in inequalities between occupational groups alone. Of the occupational effect, by far the most significant element was the returns to occupation. In fact, employment movements between occupations would have narrowed the distribution of wages if changes in inequalities between occupations (in terms of returns to occupation: the between price effect) were not so dramatic.

These results have been obtained in the absence of controls for differences in human capital characteristics (other than gender and occupation) for members within each one of these groups. Hence, a further decomposition was employed in order to look at the effects of gender, education and experience on wage inequalities, using the regions as our unit of analysis. This analysis does not refer to regional differences per se, but to regional differences in within regions inequalities. In other words, an analysis of what can be called the second moments of regional wage inequalities was undertaken. Admittedly, the use of a different unit of analysis (probably the occupational classes) could be equally appealing, but we decided to stay in line with the original focus of the paper. Future research should definitely be directed towards the investigation of the sources of wage inequalities between and within occupations and educational clusters. For as much as the cross-regional comparisons are concerned, the results show a relative convergence in inequalities of both human capital characteristics and the returns to these characteristics. As discussed in the third section, when

occupations are not taken into account, most of the differences in wage inequalities among regions are due to regional differences in unmeasured characteristics. The distribution of and the returns to gender, education and experience are pretty much the same across the UK regions and they moreover, tend to converge further. Specifically, when not controlling for occupations, a decline in regional inequalities in measured characteristics (by one forth) and in regional inequalities in the prices of these characteristics (by half) is observed. This, despite the overall increase in wage inequalities by more than a fifth. However, when occupational characteristics are taken into account, by far the most important element of the differences in wage inequalities across regions is the price effects. This finding reinforces the earlier conclusion that occupational inequalities are by far the most significant source of wage inequalities and their increase.

To conclude, the analysis undertaken in this paper has shown that although little of the overall wage inequalities can be attributed to differences in wages between regions, occupations and gender groups, the substantial increase in wage inequalities over the last two decades is almost merely attributable to increases in the differences in returns to occupation across different occupational groups. This finding is in line with the analysis that identifies labour demand and technological factors as the main forces behind the increased dispersion of earnings. However, some strong evidence of regional convergence has been found for the distribution of characteristics like gender, education and experience, and the returns to such characteristics. Despite that, the widened gap of returns to skills (as proxied by the occupational status) has not allowed this tendency for convergence to actually take place. To us, this implies that a further regional convergence, in real wages and, consequently, in real incomes and living standards, will only be facilitated when the substantial increases in the occupational wage gaps are tackled.

DATA APPENDIX

The national data used in the time-series analysis were obtained from various issues of the OECD Main Economic Indicators and the on-line services of the ONS (<http://www.statistics.gov.uk>). Data on regional prices are from the Reward Group Ltd (<http://www.reward-group.co.uk>). All other data used in this study come from the Family Expenditure Survey. From the FES datasets, the sample that we actually used was consisting of males and females of 16-65 years of age that were self reported to be in full-time employment. Because of known problems about self-reports on employment status (Poterba and Summers, 1995), we excluded cases that were reported to work less than 30 hours a week. Further we excluded cases for people earning hourly wages outside a “reasonable” range (£1-£200 in 1990 UK prices), to avoid extreme cases and apparent data-input mistakes. As data on years of education and labour market experience were not readily available, we calculated these variables as follows:

$$\text{Education} = (\text{Age}) - (\text{Age left continuous full time education}) - 5$$

$$\text{Experience} = (\text{Age}) - (\text{Age left continuous full time education})$$

For the skill dummies (“professional”, “skilled” and “unskilled”) we grouped together some more detailed categories of occupational status. The following table presents our classification together with the two FES occupational status frames.

Our classification	FES Coding Frame 9	FES Coding Frame 8
Professional	Professional	Professional workers – self employed
		Professional workers – employees
	Employers and managers	Employers – large establishments
		Managers – large establishments
		Employers – large establishments
		Managers – large establishments
Skilled	Intermediate non manual	Ancillary workers and artists
		Foremen and supervisors – non manual
	Junior non manual	Junior non manual workers
	Skilled manual and own account non professional	Foremen and supervisors – manual
		Skilled manual workers
		Own account workers (non professional)
Unskilled	Semi-skilled manual and personal service	Farmers – own account
		Personal service workers
		Semi-skilled manual workers
	Unskilled manual	Agricultural workers
	Armed forces	Unskilled manual workers
Unoccupied	Retired	Members of armed forces
	Unoccupied	Retired
	Inadequately described	Unoccupied
		Inadequately described and not stated

ENDNOTES

¹ See Data Appendix for a definition of the occupational classes and other data used.

² The decline in cross-regional wage inequalities in respect to 1982 is in fact conditioned on the very unstable values of the early 1980s and the decrease in regional wage inequalities during the middle of our study period. During the second half of the 1980s cross-regional inequalities in real wages rose by around 15%.

³ The difference between the figures in Table 5 and Tables 1-4 are due to the fact that for the former we have used the average values of 1982-1983 and 1996-1997. This, of course, results to an underestimation of the actual increase in wage inequalities, but avoids the potential impact of cyclical factors on the calculated figures.

⁴ Readers interested in more thorough investigations in the same spirit and methodology as the one employed in this paper of the sources of within and between occupational inequalities in wages, as well as on the role of education, which has not been discussed here, are referred to a follow-up study which is under progress (drafts available upon request).

⁵ For data description see Data Appendix.

⁶ The South East was selected as our base region mainly due to the fact that it offers probably the highest living standards in the UK. This, as it combines high levels of per capita real income, high levels of education (average years of schooling), close proximity to the Capital and the Continent and the socio-economic and cultural amenities therein, and relatively low rates of unemployment and urban deprivation (Green, 1994; Department of the Environment, 1995; DETR, 1998) with relatively few disamenities, at least compared to London, the other candidate base region. In the absence of some strong policy-related reasons, we selected the South East effectively in line with a personal preference on location. However, the analysis that follows justifies our selection as it reveals very interesting pieces of information and challenges our very optimistic view of the socio-economic conditions in the South East. In any case, the selection of a base region is not particularly important as it only serves the need to facilitate regional comparisons.

⁷ Instead of the actual figures, trend-lines fitted as third order polynomials are presented in Figure 3, to avoid complications in exposition and interpretation due to cyclicalities.

⁸ This is not to undermine the existence of a substantial body of literature, encompassing a variety of economics sub-disciplines, offering theoretical insights on the existence of regional inequalities (for surveys and discussions see Williamson, 1966; Richardson, 1973; Smith, 1987; Hunt, 1989; and Armstrong and Taylor, 1993). Much less, however, is written on the determinants of cross-regional wage inequalities in specific. In any case, our remark on “the absence of theory” relates to the fact that we do not draw on any theory and we do not pre-assume any structural relationships.

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