Real Wages, Wage Inequality and the Regional Cost-of-living in the UK

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February 2010

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Abstract

University graduates in the UK are more concentrated in regions where the cost of housing is higher, implying that they face a higher cost-of-living that could possibly reduce the graduate real wage relative to other groups and carry implications for measures of wage dispersion.

This paper reassesses how estimates of wage inequality from 1997 to 2008 vary when regional differences in the cost of housing in the UK are taken into consideration. In order to do so, the real wage is deflated by a specially constructed regional Retail Price Index (RPI); this is a new measure of the cost-of-living that partially updates the national RPI with a regional housing index, therefore allowing the RPI to vary by regions.

Results show that the national RPI underestimates the cost-of-living of workers living in the most expensive regions (London, South East) and overestimates the cost-of-living for "cheaper" regions (Northern Ireland, Scotland). When deflating hourly wages by the regional RPI, the average level of wages is lower from 8% to 11% an hour for all workers in London and the South East, but is higher (from 2% to 9%) in the remaining regions; similarly the college –high school wage gap decreases form 6 to 13% in levels when deflating wages by the real regional RPI.

Key words: cost-of-living, wages, wage inequality, RPI

JEL Classification: E3, J31

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I am grateful to Jonathan Wadsworth for several suggestions and encouragement. I also would like to thank Ian Crawford, Jim O' Donoghue and Trudie Schills for fruitful discussions. My thanks to Enrico Moretti for providing me with his do file. I am also grateful to seminar participants at the RES Annual Conference 2011, WPEG Annual Conference 2011, 13th IZA/ESSLE and EALE Conference 2011 for comments and suggestions. Remaining errors are my own. The Expenditure and Food Survey, Labour Force Survey and the Family Resources Survey data are made available through the UK Data Archive (UKDA).

1. Introduction

The estimated wage returns to graduates have increased significantly in the UK over time (Card and Lemieux, 2001; Machin, 1998; Machin and Van Reenen, 2008; Schmitt, 1995); returns to graduate education were rising over the 1980s and were relatively stable in the 1990s (Machin, 2003); more recently the average returns to graduate education remain high (Sloane, 2003; Walker and Zhu, 2003) with their dispersion substantially increasing over the period 1994 to 2006 (Green and Zhu, 2010).

In a recent contribution Moretti (2010) questioned the relative real wage increases for US graduates between 1980 and 2000 by re-examining how wage inequality is measured. He demonstrates that existing estimates of wage inequality for the US change when accounting for differences in the cost-of-living across locations and the relative concentration of graduates in certain high cost locations. Using data from the US Census between 1980 and 2000, Moretti provides evidence that half of the documented increase in the return to college disappears when deflating wages by using a real local CPI that allows the cost of housing to vary across metropolitan areas.

In similar vein to Moretti (2010), Black et al (2010) question whether the return to education in large cities in the US is likely to be the same in locations characterised by differential price levels and find persistent and substantial heterogeneity in the return to a college degree, supporting the prediction that the local return to schooling is inversely related to housing prices. Building on Moretti's (2010) for the US, this paper aims to reassess how estimates of wage inequality in the UK change when accounting for the regional variation in the cost of housing.

Similarly to the US, over the past decades the increasing number of graduate workers in the UK has been distributed unevenly across the country; based on the Labour Force Survey (LFS) in 2008, nearly 38% of the UK graduate workers were concentrated in two regions: the London area (21.1%) and the South East (16.7%); these are also the British regions where households spend more on housing than the UK average, largely due to differences between regions in the average amount spent on rent and mortgages[1] (Family Spending, ONS 2009). The higher concentration of graduates in more expensive British regions implies that changes in house prices are likely to affect real wage levels of graduates more over time.

The existing literature investigating trends and causes of wage inequality in the UK usually measures wages in real terms by deflating nominal wages using the national Retail Prices Index (RPI). The RPI provided by the Office for National Statistics (ONS) is a fixed quantity price index:

[1] Since the late 1970s, there have been considerable variations in house prices both over time and across UK regions, with prices in London rising faster than other regions (Holly et al. 2010).

it measures the proportional change in the cost of buying some fixed bundle of goods as prices change (Blow and Crawford, 2001). However, the RPI does not account for differences in regional housing costs despite the fact that expenditure on housing represents the largest component of total household expenditure and varies considerably across regions in the UK.

The regional variation in inflation rate is an issue of importance because of the crucial role of the RPI that is in fact used by the government and businesses for a number of purposes including the calculation of various incomes and prices; the Government uses the RPI to set and up-rate the level of wages, tax allowances, and to regulate train fares as well as index-linked government bonds. Because the RPI does not reflect any regional variations, all decisions based on that will not account for the different "real" cost-of-living faced by individuals living in different UK regions. Likewise deflating the nominal wage by a national RPI that ignores those difference and that might fail in being fully representative at the regional level, could have implications on the level of real wages.

There is limited evidence addressing how accounting for regional variation of prices in the UK could reflect on the inflation measures as well as in different estimates of income or inequalities (Hayes, 2005; Henley, 2005; Duranton and Monastiritis, 2002). Borooah et al. (1996) show that relative expensiveness of Greater London and the South East, over the period 1979-1990, increased when housing costs were included; conversely, the inclusion of housing costs meant that Northern Ireland changed from being slightly more, to slightly less expensive than the UK average. Acknowledging the high degree of expenditure variation rates amongst different subgroups of the UK populations and households, Crawford (1996) and Crawford and Smith (2002) show that different subgroups experience different cost-of-of living due mainly to variations in housing tenure. Crawford and Smith (2002) analysing the impact of ignoring differential inflation on the measurement of income inequality, find that not allowing for differential inflation could lead to the annual growth rate in inequality being overstated or understated by as much as 6 percentage points[2].

Duranton and Monastiritis (2002) investigate regional inequalities in the UK from 1982 to 1997 and their evolution by examining labour market earnings pointed out that the rising average educational attainment in London and the South East relative to the rest of the country played a role in explaining the aggravation of regional inequalities.

[2] Crawford and Smith (2002) use a different definition of income than the one used to calculate official low-income statistics. They use household disposable incomes, after adjusting for household size and composition, as a proxy for material living standards. More precisely, it is a proxy for the level of consumption of goods and services that people could attain given the disposable income of the household in which they live. In order to allow comparisons of the living standards of different types of households, income is adjusted to take into account variations in the size and composition of the households in a process known as equivalisation.

Blanchflower and Oswald (2005) advocate the need for UK regionally-determined wage packages and argue that because the cost-of-living varies regionally, public sector workers should be paid differently according to where they work as the level of private sector wages varies dramatically across different parts of the UK.

A study of regional variations in the cost-of-living has several important implications; Borooah et al (1996) pointed out three: first, there is the adjustment of social security benefit levels to take account of regional differences in prices. Secondly, conclusions about the relative deprivation or prosperity of regions, as measured by real disposable income, could also be susceptible to change in the face of regional variations in the cost-of-living. Lastly, conclusions about the number of persons living in poverty could also alter when regional cost-of-living variations are allowed for.

This paper focuses on the implications of regional variations in the cost-of-living on wage and wage inequality in the UK; the current research also contributes to the existing literature by constructing a regional common price deflator for the longest and recent time period (1997-2008); the regional RPI is a new measure of the cost-of-living that partially updates the national RPI with a regional housing index, therefore allowing the RPI to vary by regions; additionally focusing on the individual hourly wage as a point in time measure of labour, this paper also investigates how regional variation of the cost-of-living can alter the real price for labour**.**

The empirical evidence reveals that the national RPI underestimates the cost-of-living of workers living in regions with more expensive housing (London and the South East) and overestimates the cost-of-living for "cheaper" regions (e.g. Northern Ireland and Scotland). When deflating hourly wages by the Regional RPI the average levels of wages is lower by 8% to 11% an hour for workers in London and the South East, whilst it is higher by 2% to 9% in the remaining regions. The use of a regional deflator decreases the college –high school wage gap by 6 to 13% in levels, though the changes over time are not statistically significant.

This paper is organised as follows: part two explains how the regional RPI is derived. Part three presents the econometric methodology; in part four the data sets used are discussed. Part five discusses the results, and part six concludes.

2 RPI and the cost-of-living

This section begins by discussing how the RPI is calculated by the ONS (section 2.1). The second part of this section describes how the Regional RPI used in the main estimates is derived.

2.1 National RPI: descriptions and drawbacks

The RPI is defined (ONS, 2007)[3]as an average measure of change in the prices of goods and services bought for the purpose of consumption by the vast majority of households in the UK. RPI Technical Manual (ONS, 2007) explains that the RPI is not intended to measure what people often refer to as "the cost-of-living"; a cost-of-living[4] index measures the average change in prices with reference, not to a fixed list of demands, but to a fixed standard of living (Crawford and Smith, 2002).

The ONS provides four different measures of inflation that differ in the exclusion or inclusion of housing costs: the RPI including all items (CHAW); the RPI excluding mortgage interest payments (CHMK); the RPI excluding mortgage interest payments and indirect taxes (CBZW) and the RPI excluding housing (CHAZ).

The RPI all items (CHAW) includes costs of housing at national level. Costs for home-owners are represented by nominal mortgage interest payments (MIPs). The RPI CBZW excludes these mortgage interest payments as well as indirect taxes and includes, as housing costs, national rent; information on rents comprising private sector, local authority and social landlord rent. The RPI CBZW also includes council tax and rates; water and other charges; repairs and maintenance charges and dwelling insurance. The RPI excluding housing (CHAZ) does not include any of the previous housing costs.

However in any of the measures of inflation available from the ONS there are two aspects that the RPI does not account for. The first one is the variation of housing related expenditure by region in the UK, the other one is the difference in the inflation rates that different household types experience across the UK. This paper focuses on the former.

2.2 Methodology: Constructing a Regional RPI

Throughout this paper the National RPI refers to the one provided by the ONS (CBZW) excluding mortgage interest payments and indirect taxes and including other national housing costs (gross rents); since the RPI/CBZW is the benchmark against which the derived Regional RPI is compared, both weights and the housing costs are derived by accounting for the housing components of the RPI/CBZW.

The Regional RPI refers to the one that is proposed as a new measure of the cost-of-living that accounts for regional differences in housing costs over time, whereas the National RPI/CHAZ is the one that excludes any housing costs and that is used as a base to construct the new measure.

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[3] Consumer Price Indices Technical Manual , page 3, 2007.

[4] Konus (1924) first defined a true cost-of-living as the minimum cost of achieving some reference welfare level when the price vector is p_t, relative to the minimum cost of achieving the same welfare with the price vector p_s.

The Regional RPI described in this section is essentially a new measure of the cost-of-living that partially updates the national RPI/CHAZ with regional housing index allowing therefore the original RPI to vary by regions. Housing cost is measured by price of gross rent[5] from 1997 to 2008, derived from the household data from FRS carried out jointly by the ONS and the National Centre for Social Research[6].

The categories of renters from which the cost of housing are derived, are very similar to those considered by the ONS, such as households renting from councils; those renting from housing associations; and those renting privately, in both unfurnished and furnished accommodation.

Wages are usually deflated using the national RPI which does not capture any regional variation in prices. The measurement of changes in real living standard requires nominal wages to be converted into real wages. To investigate the role of housing costs on wages of workers located in different parts of Britain, the measure used is the cost of housing, specifically gross rent faced by households in region r (r=1…12). In a similar vein to the methodology followed by Moretti (2010), the cost of housing used in this paper reflects the increase in the cost of housing experienced by individuals working in the same British region. Using gross rents has the advantage of being easy to measure and comparable to the ones used by the ONS in the construction of the RPI. To derive the regional RPI, the national RPI calculated by the ONS is partially updated by the cost-of-housing represented by gross rents, i.e. rent plus main charges.

To account for housing expenditure patterns in the 12 UK regions, the national RPI is re-weighted by appropriate regional plutocratic weights[7] based on the same data (FES) and the same housing expenditure classifications used by the ONS to derive weights for the National RPI. Therefore weights are derived as the share of the total housing expenditure in total consumption expenditure in region *r* at the household level; the total housing expenditure includes rent, rates, water, council tax and other regular housing payments such as central heating repairs and maintenance; the total consumption expenditure includes the total housing expenditure, fuel, light and power; food expenditure; alcoholic drinks, tobacco; clothing and footwear, households goods, services, personal goods and services and motoring.

Deriving regional weights represents an improvement with respect to the methodology followed by Moretti (2010) that in fact does not derive local weights but uses the same national weights used to derive the local CPI. In this paper, weights are derived by regions and for renters

[5] Consistently to the housing components for both the RPI/CBZW and the housing components used to derive the weights, gross rent includes council tax and rates, water and other charges, repair and maintenance and dwelling insurance.

[6] Because data do not exist before 1997, it has not been possible to extend the analysis to earlier time periods.

[7] The alternative approach is the democratic; democratic indices weight sample household equally and give straightforward means (arithmetic and geometric).

only; because the housing expenditure varies across regions so does the share of total expenditure. As underlined by the RPI technical manual (2007), "the RPI uses aggregate average expenditure to calculate weights implying that each index household contributes to the weights an amount proportional to its expenditure"; therefore the weights affect the different items in different ways, hence the distribution of weights will differ.

The cost of housing faced by a worker in a region is measured as the average of the weekly rent. The rationale for using rental costs is that rental costs are a better approximation of the user cost of housing; since houses are an asset, their prices reflect both the user cost as well as expectations of future appreciation (Moretti, 2010). The use of rents as proxy for housing costs is one of the approaches[8] to the treatment of durable goods in a consumer price index or an RPI (Diewert, 2003) and corresponds to the rental equivalence approach. This approach to the treatment of durables is conceptually simple: it values the services yielded by the use of consumer durable goods for a period by the corresponding market value for the same durable for the same period of time (Diewert, 2003).

In a similar vein to the ONS methodology, the weighted sum of the cost of housing is normalised to 100 in 1997 and non-housing consumption normalised to 100 in 1997. The final Regional RPI (RRPI) can therefore be written as:

1) $RRPI_{rt} = (NRPI*(WNH_{rt})) + (WH_{rt}* rent_{rt})$

where *r* corresponds to the 12 regions in the UK; (WNH_{rt}) captures the weight for non-housing consumption expenditure by region (*r*) and year (*t*), assuming that the cost of non-housing consumption is the same for all individuals in all regions. WH_{rt} captures the weight for housing consumption by region and year, and *rent* is the index used as a proxy for cost of housing.

Another aspect that differs from the methodology used by Moretti (2010) is that while he uses the price for rent considering the monthly cost of renting a 2 or 3 bedroom apartment paid on average by graduate or high school graduate workers, in this chapter the rent is used irrespective of skill groups[9], this is motivated by the idea to generate a house index that is more comparable to the one provided by the ONS that generates RPI irrespective of level of education or composition of the households. In order to compare consistently the price of rent across regions, average weekly rents derived are based on houses with 2 to 4 bedrooms.

Unlike Moretti, information for the price for rent is not based on individual data but is derived at household level. This is due to the lack of data at individual level; although potentially this could be

[8]See Diewert (2003) for a survey of alternative approaches.
[9] This means that the measure used by Moretti will possibly add more variation to the final estimates.

derived from the EFS/FES/LCF that contains information on the level of education of households as well as the size of housing, due to the small sample the disaggregation by region would lead to imprecise estimates[10].

3. Identification and estimation

Because the aim of this paper is to investigate if and how much regional variations in the cost-of-living can account for changes in both the graduate high school wage gap and the 90-10 wage gap between 1997 and 2008, the econometric methodology estimates both the conditional nominal and real wage difference between workers with a graduate and high school degree as well as the difference between workers with a college or more degree and a less than a high school degree. The baseline estimates are based on regressions of the log hourly wage, nominal and real separately, on a dummy variable indicator for graduates interacted with a dummy for each year.

Controls include race, gender, year dummies, and a cubic for potential experience. Other regressions are run adding regional fixed effects.

As explained by Wooldridge (2006), when wages appear in logarithmic form and dummy variables are used for all time periods, the use of aggregate price deflators will only affect the intercepts but will make no difference for the slope estimates. In fact when the log wage is used as a dependent variable, provided that a year dummy is included in the regression, using real or nominal wages will only affect the coefficient of the year dummy[11] .

To classify education, the variable "age left full time education" is used. Following Manacorda, Manning and Wadsworth (2007), the main estimates are based on three education groups defining anyone who left full time education at the age of 16 or less as "less than high school"; anyone who left full time education between the ages of 17 and 20 as "high school graduate"; and anyone who left education at the age of 21 or later as "college graduate". In order to keep the analysis consistent and comparable with Moretti (2010), the sample for the baseline estimates includes all UK born workers, aged 25-60 working both full time and part time. However, additional specifications extend the analysis to all workers in working age population.

The baseline regression specification can be written as follows:

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[10] For example, in 2008 observations for graduate workers by regions ranged from 48 to 258.

[11] Following Wooldridge (2006) suppose to deflate wages of 2008 at 1997 denoting the deflator factor for 2008 wages P2008 (1.31 using RPI =100 in 1997) then the log of real wage for each individual in the 2008 sample can be written as: $\log(wage_i/P2008) = \log(wage_i) - \log(P2008)$.
Because wages differ across people but P2008 does not, the log(2008) will be absorbed into the intercept of 1985. However this conclusion will change if the RPI differs for people living in different parts of the country.

2) $\text{Log } w_{iT} = \delta_0 + X_{iT} + C*Y_t + Y_t + \varepsilon_{rT}$

Where w_{iT} is the nominal hourly wage for individuals *i* in year *T*; X_{iT} includes a set of controls such as cubic in potential experience, gender, race; C is an indicator for college interacted with each year; Y_t is a year dummies and ε is an error term.

The baseline specification for the real wage changes in the dependent variable that now can be written as the nominal wage divided by the RPI_r where r = 1,…..12, therefore the specification to estimate the conditional real wage difference between graduate workers and high school (less than high school) can be written as:

3) $\text{Log } (w_{iT}/RPI_{rT}) = \delta_0 + X_i + C*Y_t + Y_t + \varepsilon_r$

Additional specifications also add region fixed effects to the baseline regressions.

4. Data

The empirical analyses are based on the combination of three datasets covering the time period from 1997 to 2008: the Expenditure and Food Survey (EFS), (renamed Living Costs and Food Survey (LCF) in 2008 and formerly the Family Expenditure Survey (FES)) which provides the information to derive regional housing weights; the Labour Force Survey (LFS) which is the primary source for individual earnings and education and the Family Resources Survey (FRS) providing the information on housing price rents.

Spatial information is available at regional level in all data sets; region is determined according to the usual residence.

The EFS/FES/LCF is used to derive weights and is the same data source that the ONS uses to derive the RPI. The EFS/FES/LCF is a continuous cross-sectional survey that has been carried out by the ONS since 1957 and monitors the spending patterns of around 6,000 to 6,500 household across the country each year. The FES ran from 1957 to March 2001. From April 2001 onwards, the data continues to be collected in the EFS, formed by combining the FES with the National Food Survey (NFS). In the EFS/FES/LCF, households are sampled from randomly selected postcode sectors stratified according to region across the UK, car ownership and socio-economic status.

There are two major components to the survey. A two-week paper-based diary that records all expenditures and an interview that collects information on household demographics, income and some retrospective information on regular purchases (such as rent, mortgage payments and utility bills) and irregular, expensive purchases (such as durables and holidays). Expenditures are calculated and recorded as household-level weekly averages in a number of relatively disaggregate categories- for food there are around 100 such categories. Data is collected throughout the year to cover seasonal variations in expenditures. In addition to expenditure and income data, the EFS/FES/LCF collects information on socio-economic characteristics of the households, e.g. composition, size, social class, occupation and age of the head of household.

However the EFS/FES/LCF has a number of drawbacks. One is that it does not cover all households such as people living in retirement homes, military barracks or student halls of residence or residents in temporary homes. Another problem is mainly due to the response rate. Around one-third of those initially approached do not respond to the survey.

Established in 1973, the LFS is the largest survey of households living at private addresses and in NHS accommodation in the UK, conducted by the ONS. Since 1992, the LFS has been a rotating quarterly panel. Information is recorded in four quarters; each quarter's LFS sample of 53,000 UK households is made of five "waves" each of approximately 11,000 private households. Each wave is interviewed in five successive quarters, earnings information is only recorded in waves 1 and 5. A single stage sample of addresses with a random start and constant interval is drawn from the Postcode Address File (PAF) sorted by postcode. The LFS also contains information at regional level, where region is determined according to usual residence. The LFS identifies 20 regions[12]. These 20 regions are unified to be consistent with the 12 more limited regions identified in the EFS/FES/LCF. These comprise the North East, North West, Yorkshire, East Midlands, West Midlands, East, South East, South West, London, Wales, Scotland, Northern Ireland. The LFS contains detailed information on individual characteristics, age, marital status, migration status, job characteristics, wages and hours worked. It also contains information on the housing tenure of the individuals; giving on average 11000 observations of graduates reporting a non zero wage in each year and between 38000 and 58000 non-graduate workers with a positive wage.

The data used for the price of rents are based on the FRS from 1997 to 2008; the FRS is a continuous survey with an annual target sample size of 24,000 private households. Fieldwork is

[12] The 20 regions indicated in the LFS are the following: Tyne and Wear; Rest of North East; Greater Manchester; Merseyside; Rest of North West; South Yorkshire; West Yorkshire; Rest of Yorkshire & Humberside; East Midlands; West Midlands Metropolitan County ; Rest of West Midlands; East of England; Inner London; Outer London; South East; South West; Wales Strathclyde; Rest of Scotland, Northern Ireland.

carried out jointly by the Office for National Statistics and the National Centre for Social Research. The survey was launched in October 1992 to meet the information requirements of the Department for Work and Pensions (DWP) analysts. Households interviewed in the survey are asked a wide range of questions about their statuses, including receipt of Social Security benefits, housing costs, assets and savings. Before 2002 the survey for Northern Ireland was carried out for the Department for Social Development (DSD) by the central survey unit of the Northern Ireland Statistics and Research Agency (NISRA) of the department of finance and personnel.

The price for rent used to construct the regional RPI is the total amount of rent eligible for Housing Benefit paid by a household before the deduction of any housing benefits. In particular, the tenants used to derive information are only those renting privately, therefore tenants who are in rent free accommodation are excluded from the sample. Although these are rents for low income households and may possibly under-estimate the costs for graduates, they are very similar to the rents used by the ONS in the construction of the RPI (CBZW).

There are at least three other potential data sources that could be used as proxy for housing costs to construct a Regional RPI. The first one is the private rent available from the Department for Communities and Local Government based on the Survey of English Housing (SEH). The SEH presents a few limitations: first of all figures available are mean rents over two financial years, for example 1997 figures are a mean of the 1996-1997 and the 1997-1998 rents. Secondly, from 2008, information at regional level is no longer available; finally the SEH only covers English regions, therefore excluding Wales, Scotland and Northern Ireland for which there is no other comparable information on private rents.

The second possible data source is the regional housing price available from the Nationwide Building Society that covers quarterly house price changes from 1973 to 2008. The construction of a regional RPI requires data to be comparable with housing costs used by the ONS, however the housing prices available from the Nationwide are neither fully comparable to the RPI using mortgage interest or the RPI using rents. Moreover, the Nationwide definition of regions differs in significant ways from the ONS definition.[13]

The third possible data source available for the UK is the Registered Social Landlords (RSLs) and is equivalent to the local authority rents data. RSL rents are derived from the Regulatory and Statistical Return that the Tenant Services Authority (TSA) sends out once a year to all RSLs. One concern related to the use of the RSL rents is that they tend to be for low income households and are therefore likely to under-estimate housing costs, particularly in London.

[13] See Holly, Pesaran and Yamagata (2010) for details on difference in regional definitions.

Rents from the FRS are available for all 12 regions and they reflect the differences across UK regions and the increase over time; the FRS remains the more comparable housing cost with those used by the ONS for the construction of the national RPI.

The sample is based on men and women aged respectively 16-64 and 16-59, though the baseline estimations replicating Moretti's focus on individuals between 25 and 60; the analysis is limited to workers who are employees, both full time and part time; considering only their main job, and who report a positive wage. To limit the effect of outliers, following the existing literature in the UK (Manacorda, Manning and Wadsworth 2007) only observations with an hourly wage between one and a hundred pounds at 1997 levels are used.

5. Results

5.1 Descriptive statistics

This section begins with some descriptive evidence on the distribution of workers by level of education (graduate, high school and less than high school) across UK regions and over time followed by a discussion on the differences in levels and measures of dispersion of hourly and log wage.

Figure 1 describes the distribution across UK regions of workers by level of education in 2008 and shows that graduate workers are not evenly distributed across the British regions and are overrepresented in the South-East and in particular in London. In fact in 2008 about 38% of the National graduate work force was concentrated in two regions: London (21.1%) and the South East (16.2%). Northern Ireland and the North East hosted the lowest shares of graduate workers, 1.8% and 3.0% respectively. Only 6.2% of the "less than high school" workers are concentrated in London.

[Figure 1 about here]

Over the sample period the share of graduates in the UK population rose from 15% in 1997 to 23% in 2008, with an average increase over time of 56%. The higher concentration of graduate workers in London and the South East coupled with the fact that, as documented in Table 2, in the same time period the average cost of housing in the UK has been increasing by 79% with the increase being higher in London (89%) implies that graduate workers are more likely to face a higher cost-of-living and to experience relatively greater rises in housing related costs than other education groups.

Table 1 reports the percentage distribution of workers by level of education in the 12 UK regions in 1997 and 2008. In 2008 nearly 43% of the London work force had a graduate level of education compared to 29% in 1997; the South East is the second region with the larger percentage of graduates specifically 17% in 1997 and about 27% in 2008. On the other hand the North East reports the lowest share of graduates both in 1997 (10%) and 2008 (17%), while in 1997 about 71% of the North East working population had a less than high school level of education; almost double the share in London in 1997 (37%). Between 1997 and 2008 there has been a relative convergence in the level of graduate workers across the UK regions with the higher percentage increase experienced by Wales (76%), Yorkshire (64%) and North East (61%) and the lowest (39%) by the East Midlands. Despite the change in this relative concentration of graduate workers, the absolute concentration of them in specific regions (London and the South East) remains the major focus of this study because the absolute shares matter for housing calculation.

[Table 1 about here]

The picture painted about the distribution of workers by education across the UK regions implies that the greater part of graduate workers is concentrated in the more expensive regions: London and the South East.

Based on the FRS, Table 2 reports weekly nominal rental prices across British regions in 1997 and 2008, the increase from 1997 to 2008 (column 3) and the percentage increase relative to the national mean (column 4). The table documents that the populations of London and the South East experience higher rents compared to both the UK average and the remaining regions and this is persistent over time. In 2008 the average weekly rent was about £163 in London and £123 in the South East while the UK average rent equalled £92. Northern Ireland and Scotland remain the "cheapest" regions in terms of housing costs. Looking at the UK as a whole between 1997 and 2008, the nominal price for rent increased by about £41 with an average change of 79%; the increase in price for rents in London was 89% (£77) higher than the national one while in the North East the increase was about 28%, lower than that of the UK. These statistics coupled with those reported by Figure 1 suggest that graduate workers in London and the South East are more likely to have experienced both a higher cost-of-living and a more rapid increase in costs due to their higher housing expenditure over the sample period implying that the relative increase in their real wages might be smaller than those of counterparts living in less expensive regions.

[Table 2 about here]

To better understand if and by how much the national and regional RPI diverge, Figure 2 plots the trends of the two series (National RPI and Regional RPI) by region in the UK from 1997

to 2008. The figure clearly shows the remarkable differences between the two RPIs for London; the higher level of the regional RPI in London clearly illustrates that the actual cost-of-living in London is higher than what the national RPI demonstrates, other things equal (i.e. accounting for housing – but not other costs which may be higher (or lower) in London. These results are consistent with Borroah et al. (1996) who demonstrate that the relative expensiveness of London and the South East, over 1979-90, increased when housing cost was included. The Regional RPI in London is not only higher than the national one but is also the highest across the regions. The difference between the two trends can be interpreted as due to the (higher) cost of housing in London coupled with the higher share of housing expenditure over the total expenditure. The second region for which the regional RPI highly diverges from the national one is the South East; this is not surprising given that this is one of the regions with the highest price for housing.

The opposite is true for the remaining regions, particularly for Scotland and the North East that appear to face a lower cost-of-living than the one represented by the national RPI. Less difference between the two RPIs is found in the East and South East, where the gap is less evident.

[Figure 2 about here]

Table 3 reports real hourly wages for all workers, as well as men and women separately, in 1997, 2000, 2003, 2006 and 2008 when using different measures of inflation for the nominal wage deflator. Column one reports the nominal hourly wage; column two reports the hourly wage deflated by the National RPI provided by the ONS; column three reports the hourly wage deflated by the Regional RPI. The table documents that the real hourly wage deflated by the Regional RPI is lower than that deflated by the national one until 2000 but higher after 2000. As explained later this effect is likely to be due to the fact that until 2000 deflating wage by the Regional RPI generates average lower wage in all regions, however after 2000 this is only true for London and the South East with the remaining regions experiencing higher Real (Regional) wage that overcome the lower wage in London and the South East. In fact from 1997 to 2000 deflating hourly wages by the Regional RPI the real hourly wage for all workers decreases from 6 (8%) to 12 (13%) pence an hour with respect to the hourly wage deflated by the National RPI while after 2000 it increases from 10 (11%) to 27 (30%) pence an hour with respect to the hourly wage deflated by the National RPI. However, it is important to stress that the differences in the hourly wage deflated using the National RPI and the one deflated using the Regional one are not that great. On average men experience a higher loss in wages due to the regional cost of housing though the difference is negligible.

[Table 3 about here]

Because London and the South East are the most expensive British regions, it is reasonable to consider these regions separately in contrast to the other UK regions. Table 4 reports the hourly

wage deflated by using the National RPI and the Regional RPI from 1997 to 2008 for the whole of the UK, London, the South East and all the other remaining regions together. There is now a clear trend that better explains the decrease of regional wage up to 2000 and the decrease afterwards; in fact from 1997 to 2008 in London and South East the hourly wage deflated by the Regional RPI is always lower than that deflated by the National RPI but it is always higher in the remaining regions. The hourly wages deflated by the Regional RPI are particularly lower in London; on average the decrease in real hourly wage due to the cost of housing ranges between 1.10 (11%) to 2.18 (18%) pence in London and 0.22 (2%) to 0.57 (6%) pence in the South East[14]; by contrast in the remaining regions the hourly wage deflated by the Regional RPI is on average higher 15 (2.2%) to 81 (9.4%) pence. These figures imply that the National RPI is likely to underestimate the cost-of-living in London and the South East while overestimating it in the remaining regions.

[Table 4 about here]

To consider how different measures of inflation can also affect the measure of wage dispersion, Table 5 reports some common measures of wage inequality based on the log hourly wage for all workers for the years 1997, 2000, 2003, 2006 and 2008. Column 1 reports wage dispersion for wages deflated by the National RPI; column 2 reports similar measures for wages deflated by the Regional RPI, column 3 reports the difference between column 2 and column 1. The measures used are standard deviation, variance, the 90-50 gap, 90-10 gap and 50-10 gap.

There are a few aspects that are worth noting. When using a regional deflator, there are hardly any changes with respect to the national one; in fact using the Regional RPI the average changes in wage inequality from 1997 to 2008 decreased from 0.006 to 0.016 log points with respect to the national deflator, using as a measure of dispersion either the standard deviation or the variance. The differences are slightly more notable when looking at the 90-50, 90-10 and 50-10 wage gap, though still not striking. Using the difference between the 90^{th} and 50^{th} percentile as a measure of dispersion, when deflating wages by the regional RPI, the difference decreases from 0.011 to 0.019 log points with respect to the national deflator; the difference for the 50-10 gap ranges between 0.005 and 0.021 log points and while this is notable, slightly more difference can be seen in the 90-10 gap. Using the regional RPI to deflate wages, the 90-10 wage gap decreases from 0.019 to 0.033 log points with respect to the national deflator. However the differences are not substantial. For example, in 2006 the 90-10 wage gap for all workers was equal to 1.349 when using the national deflator and decreases to 1.316 when using the regional one. Panel B of table 5

[14] Leunig and Overman (2008) provide the theoretical justification to this explaining that in terms of living standards there exists an optimal city size: in practice if cities are larger or smaller than the optimum then productivity, wages and employment will be lower than they could be.

also reports the changes in wage inequality from 1997 to 2008; the panel documents that from 1997 to 2008 LFS estimates of wage inequality in the UK decreased. This is true for all measures used except for the 90-50 for which there has been almost no change. For example, over the time period analysed, the standard deviation decreases by 0.021 log points, while the highest decrease can be observed for the 50-10 wage gap (-0.051). Using the regional deflator does not make much difference to those measures both in terms of sign and in terms of magnitude.

[Table 5 about here]

Because the 90-10 gap can be used as a proxy for the graduates-less than high school gap, given that the number of graduates is concentrated in areas (London and the South East) that are more expensive and therefore as shown in Table 4, those are the areas whose costs are likely to be underestimated by the current RPI provided by the ONS. This raises the question on whether the construction and therefore the use of a regional RPI would be more appropriate and representative of the real cost-of-living.

Table 6 compares regional changes in the level of the real hourly wage from 1997 to 2008 for all workers, when deflating wages by respectively the National RPI and the Regional RPI. The table demonstrates two main facts: the first is the variation in changes in real hourly wages within UK regions. Based on the national RPI, column 1 documents that when deflating the real hourly wage by the national RPI London experienced the highest increase (£2.43) corresponding to 53% higher than the national one (£1.59) while the East Midlands experienced the least growth (£1.15) in real hourly wages corresponding to 28% less than the average increase in real hourly wages. Column 2 shows how those changes vary when deflating the real hourly wage by the appropriate Regional RPI that accounts for different levels of rent. Although the within variation by region in changes remains, there are two main new trends: in regions where the cost of housing is typically higher (i.e. London and the South East) the estimated changes in regional real hourly wages over time become smaller. In London the real hourly wage increase is £1.37 compared to £2.43 based on the National RPI and is now 29% lower than the average UK increase (£1.93); similarly in the South East the real hourly wage change (£1.61) is now 17% lower than the UK average. This implies that because graduates are more concentrated in those two regions, and due to the higher rises in living expenses, their real hourly wages have been increasing by less than the UK national average rate.

The opposite occurs for the rest of the regions. When accounting for regional specific rents the change in real hourly wages between 1997 and 2008 is higher. Scotland is now facing the highest gain (61 pence) with respect to the UK average, corresponding to a real hourly change between 1997 and 2008 32% higher than the UK.

[Table 6 about here]

These findings confirm that the national measure of inflation that does not account for regional variations in the cost-of-living can affect estimates of real wage growth in local areas. The previous description about how level of wage changes depending on the measure of inflation used (i.e. regional or national) suggests that the actual National RPI provided by the ONS may not reflect the actual level of prices and therefore the actual cost-of-living faced by differently skilled workers of different British regions.

To document this, Table 7 shows the average weekly rent for 1997 and 2008 by level of education for the UK, London and the South East. In both years considered, graduate workers paid a higher weekly rent than the high school graduate and less than high school graduates. For example, in 1997, graduates' weekly rent equalled £98.31, while high school and less than high school workers were paying respectively £65.77 and £46.30, when looking at graduates in London the rent rises to £112.40. Similarly in 2008, graduates in the UK were paying an average weekly rent of £164.39, higher than both the high school (£105.72) and less than high school (£84.58). When focusing the analysis on graduates located in London, these differences are amplified with graduate weekly rent now being around £244.2, almost double that of the less than high school graduates in the same area. As explained in the data section, those rents are the total amount of rent eligible for Housing Benefit paid by a household before the deduction of any housing benefits. The tenants used to derive information from are only those renting privately, those renting from Landlord Associations and from Councils, however tenants who are in rent free accommodation are excluded from the sample. The last three columns of table 7 report the percentage increase for graduate, high school and less than high school respectively in the UK, London and the South East. The table documents that graduate workers in London experienced the highest increase in weekly rent (117%) from 1997 to 2008, compared to the average percentage increase for all graduates in the UK (67%).

[Table 7 about here]

The relationship between increasing share of graduates and increasing price for rent is shown in figure 3 reporting the average rent by region and year from 1997 to 2008 in the horizontal axis and the share of graduates per region and year from 1997 to 2008 on the vertical one. The positive relationship indicates that regions that have experienced the largest increase in the share of graduates are the regions where the average cost of housing is higher and increased the most.

[Figure 3 about here]

The trends and levels of the hourly wage for graduates and high school when using the National or Regional RPI are better understood from figures 4a and 4b that display the time series

of the real hourly wage respectively for graduate and high school for all workers by regions from 1997 to 2008. For each region, the real hourly wage deflated by the national RPI is graphed alongside the real hourly wage deflated by the Regional RPI. Although graduate workers in London earn on average more than other graduates in the rest of the UK they also clearly face a higher cost-of-living than the one reported by the National RPI earnings, therefore a lower wage in real terms. This difference is persistent and increasing over time due to the increasing cost of housing affecting real wages in London more than it does in other regions. Similarly, for workers in the South East, the real wage is lower than the national real wage. Graduate workers in Scotland have the advantage of a lower cost of housing and so experience a higher real wage than the one actually determined by the ONS. While there is not much difference for the East Midlands, West Midlands and South West, in the remaining regions graduate workers earn more. The difference between real wages deflated by the National and Regional RPI is qualitatively similar when looking at the high school workers (figure 4b), though the gap is lower.

[Figure 4a and Figure 4b about here]

Figure 5 plots the wage difference between graduates and high school and graduates and less than high school for all workers in the UK using the National RPI and the Regional RPI. The dashed navy line plots the wage gap when using the regional RPI; the figures show that both graduate-high school and graduate-less than high school wage gaps decrease over time and are lower when using the regional RPI that accounts for the housing-cost-of-living compared to the gap based on the National RPI.

[Figure 5 about here]

5.2 Estimation results

This section presents the estimates of to what extent accounting for these spatial issues affects estimates of the changing returns to education, beginning with an exploration of how much of the changes in nominal wage differences between graduates and high school are due to regional differences in the cost of housing in the UK. Table 8 replicates table 4 of Moretti (2010). Model 1 estimates the conditional nominal wage difference between college graduate workers and high school. All estimates are from a pooled sample containing observations from 1997 to 2008 based on a regression of the log nominal hourly wage on an indicator for college interacted with a indicator for each year, year dummies, a cubic in potential experience, and dummies for gender and race. In order to compare the estimates with those of Moretti, the sample includes workers aged 25-60, who are UK natives working both part time and full time. The coefficients given in the table are the

college-year dummy interaction terms from 1997 and 2008 and represent the conditional wage difference for a given year.

[Table 8 about here]

In 1997, the nominal wage gap is 6 % higher than the real one and 9% higher in 2008. The decreases are slightly lower than those documented by Moretti who shows that between 1980 and 2000 the nominal wage gap decreases in levels from 5 to 12%. Column 3 reports the difference in the estimates between 1997 and 2008, and indicates that the conditional nominal wage difference between workers with a high school degree and workers with college or more has decreased by 0.018 log points over the period. The conditional difference between the wage of graduates and high school graduates decreases by an additional 0.010 log points when using the regional deflator[15]. However this fall is not statistically significant. While the decrease in the level of the conditional wage gap between workers with a college degree and those with a high school is consistent with the main results documented for the US by Moretti, there are some differences when looking at the change over time that in fact are not statistically significant; the main estimates of Moretti (table 4, 2010) report that in the US between 1980 and 2000 the conditional nominal wage difference between workers with a college degree and a high school degree decreased by 25% when the local CPI is used as a deflator.

The fact that the decrease in the estimates for the UK is lower than the decrease in the estimates for the US can be explained by any differential regional changes that jointly affect the final national estimates. Specifically the reasons can be related to the combination of three elements: the different concentration of graduate/non graduate workers across less and more expensive regions; the difference in the regional RPI; the difference in the hourly wage of workers in more expensive regions with respect to less expensive regions; additionally the current research focuses on a time period during which wage inequality did not increase much.

While Moretti (2010) reports that in 2000 in some of the US metropolitan areas the largest share of workers with a graduate degree among their residents was 58%, this was about 5 times the fraction of the college graduates in cities with the lowest share. Based on the LFS in the same year, 2000, London is the only area with the highest share of graduate workers (about 32%) which is on average only twice the share of graduates in any other region. The share of graduates in London has

[15] Because the within-group variance explains the most part of the increase in wage inequality it is also relevant to analyse the inequality in the within-group. Estimates from model 2 based on the Nominal wage show that the within-group variance increased from 0.234 in 1997 to 0.249 in 2008 with a difference of 0.015; when looking at the within-group derived by the model 2 that accounts for the Regional cost-of-living the level of the within-group variance increased from 0.228 in 1997 to 0.244 in 2008 ; though the level is slightly lower there is not much difference in the increase, and unlike the other measures of inequality presented earlier and in the estimates, the within-group variance has been increasing over time.

increased over time (reaching 43% in 2008) but so did the share of graduates in all regions. Similarly, the relative shares of UK graduates concentrated in London remained relatively constant over the sample period, at around 20%.

Another aspect that could help to explain the difference between the UK and US estimates can be related to the cost-of-living. Moretti documents that between 1980 and 2000 the housing costs, measured by the monthly rent, for graduate and high school workers increased by 147% and 127% respectively. Data based on the FRS shows that between 1997 and 2008 in the UK the housing costs, measured by weekly rent, for graduates and high school graduates increased on average respectively by 67% and 61% for the whole UK and by 117% and 87% for London, while it increased more (83%) for less than high school workers in the UK and 84% for those in London. This will result in a smaller difference between the National and the Regional RPI and therefore will reflect in a smaller effects of the regional deflation.

Additionally, data for the price of housing based on Nationwide shows that the increase in price of housing between 1980 and 2000 has been higher (245%) than the similar increase between 1997 and 2008 (185%), implying that the time period analysed by Moretti because characterised by a higher increase in price of housing, will also reflect in a bigger difference between the national and the regional measures of inflation. Another element that may have a role for the estimates can be related to the relatively small difference between the real hourly wage of workers, particularly graduates, in London and the rest of the country. The wage gap of graduates to high school workers decreased by 0.21 pence an hour (5%).

It is likely that the picture for the US as painted by Moretti may rely on the existence of more variation for the rental prices and a higher proportion of graduates in more expensive areas that will affect the final estimates. For the UK, the more expensive areas made up only the 25% of the sample used, while for the remaining 75% the use of the Regional RPI translates into an increase rather than a decrease in real wage. This might possibly explain the fact that deflating wage by regional RPI makes lower difference to the estimates of the relative wage gaps of graduates versus high school workers compared to the US.

Another reason may be related to the fact that the cost of housing used in the construction of the index here may not fully capture differences in regional prices in the UK. London, together with the South East, is the region experiencing the higher share of weekly expenditure and higher costs not only for housing but also for transport and recreation (Family Spending 2009, ONS). Baran and O'Donoghue (2002) report that in 2000, London prices and services were, on average, respectively 6.8 % and 13.0 % more expensive.

This confirms that a more appropriate RPI should be constructed based on the regional figures rather than the national one.

The estimates reported in columns 4 and 5 include region fixed effects to control for unobserved regional heterogeneity. The estimates on the college-year interaction terms are not statistically different from the specifications that exclude regional fixed effects. The table shows that when using the regional real wage as the dependent variable, the conditional real wage difference between graduate and high school is smaller in real terms than in nominal in both 1997 and 2008; though the changes are not significantly different from zero.

As discussed by Moretti (2010), there are at least two aspects that might bias the estimates of the return to education and related wage differentials. The first concern might be related to unobserved differences in worker quality. The unobserved ability of graduates and high school graduates may vary differentially across regions and this could bias the estimates of the conditional wage differences between graduates and high school. Specifically what may be more important is the change over time in the average ability of college graduates relative to high school graduates in a given region is systematically related to changes over time in housing prices in that region. In particular if average unobserved ability of graduates relative to high school graduates grows more (less) in expensive regions compared to less expensive regions, then the real graduates returns are biased downward (upward) (Moretti, 2010). Similarly Duranton and Monastiriotis (2002) suggest that the unobserved ability component that usually is included when measuring return to education, will not matter provided that there is no spatial bias in the distribution of unobserved abilities[16]. They argue that the most likely spatial selection is probably to be about higher unobserved abilities in London, any failure to correct for this when London stands out as being "more expensive" may lead to overestimates of the true regional inequalities.

The second element that might be a source for bias of the estimates relates to the unmeasured quality differences in housing; in fact the different cost-of-living faced by workers of different levels of education could also reflect differential changes in quality of housing (Moretti, 2010); for example the relative increase in the cost of housing experienced by college graduates may be overestimated if apartments rented by graduates are subject to more quality improvements than apartments in regions with many high school graduates. If these features have improved more in cities with many graduates, the estimates may be overestimating the relative increase in cost-of-

[16] Duranton and Monastiriotis (2002) explain that this bias selection problem can take three forms: First unobserved regional fixed-effects could lead to different educational choices for youngsters of similar abilities (or different participation choices for females); a second type of bias could be due to the migration patterns leading to an uneven spatial distribution of unobserved abilities; third unobserved ability may affect the probability of being in full-time employment. For example if the probability to find a full time job differs across regions, the distribution of unobserved characteristics for individuals at work across regions will be different.

living experienced by college graduates. The lack of attention towards the quality change of goods in any measure of inflation is a well known bias in the cost-of-living literature (Diewert, 1993). Hausman (2002) explains that the "constant basket" approach ignores, among other aspects, the quality change in existing goods and that a use of a cost-of-living index based on utility (or expenditure functions) allows estimation of each of the effects of substitution, new goods and quality change. To estimate these effects, both price and quantity data are needed, unfortunately the latter are usually not available to the researcher.

Following Moretti, Table 8 restricts the analysis to UK born only workers though they are included in the additional specifications; excluding immigrants in the baseline regressions can be motivated by fact that in the US context immigration is often viewed as a proximate cause of the rising wage gap between high and low skilled workers (Card, 2009). Though the skills composition of migrants in the UK is different from that of the US, Manacorda et al. (2007) provide evidence that the native-immigrants wage differential is sensitive to the share of immigrants in the working age population; in fact they show that a 10% rise in the population share of immigrants is estimated to increase native-migrant wage differential by 2%.

Immigrants, defined as workers born outside the UK, represent an increasing part of the working population (about 14% in 2009, Wadsworth 2010). In addition, the share of immigrants with a graduate level of education has been increasing over time. Another relevant reason to include immigrants in the estimations is motivated by the fact that the concentration of immigrants in London and the South-East has been increasing over time, for example in 2010about 40% of the London population was made up of foreign-born people (Rienzo and Vargas-Silva, 2011). Table 9 extends the analysis to immigrants. The returns to education are now slightly lower (columns 1 and 2) than when immigrants were excluded; the nominal wage gap in 1997 was about 8% higher than the real one and 11% higher in 2008. The decrease in both the nominal and real conditional difference between wage of graduate workers and high school between 1997 and 2008 is higher (respectively 0.026 and 0.038) but still not statistically significant.

[Table 9 about here]

Table 10 reports similar estimates separately for men and women aged 25 to 60, only UK born, working both part time and full time. The returns to graduate education are higher for women than men in any time period. Deflating by the regional RPI decreases the level of nominal wage difference from about 6 to9% for women and from 9 to 13% for men; though the changes over time are not statistically significant.

[Table 10 about here]

6. Conclusion

The existing literature investigating the trends in and causes of wage inequality in the UK usually measures wages in real terms by deflating nominal wages using the national Retail Prices Index (RPI). However the RPI does not account for differences in regional housing costs. Expenditure on housing is the largest component of total household expenditure and varies considerably through regions in the UK. Over time, housing costs have grown differentially across regions. Moreover, graduate workers appear to be more concentrated in more expensive British regions and increasingly so over time.

This paper has shown that when accounting for regional differences in the cost of housing the most common measure of UK inflation, the RPI, appears not to fully represent the cost-of-living in the various British regions. The national RPI underestimates the cost-of-living of workers living in the regions with the most expensive housing (London and the South East) and overestimates the cost-of-living for "cheaper" housing regions (Northern Ireland, Scotland). This inevitably has some implications when using the National or regional RPI to deflate the hourly wage.

When deflating hourly wages by the regional RPI, the average level of wages is lower by 8% to 11% an hour for all workers in London and the South East, whilst it is higher by 2% to 9% in the remaining regions. However, though the use of a regional deflator decreases the levels of the graduate high school wage gap from 6 to 13%, the changes over time are not statistically significant.

This paper shows how a regional deflator could be used in principle and further work could be based on extending this. The use of deflators and their measures are crucial in terms of policy decisions: since the decisions about how we compute inflation statistics can have a direct impact on policy decisions (Checchetti, 2007). Acknowledging the regional disparities in the cost-of-living in the UK also means that a study of regional variations in the cost-of-living has several important implications; Borooah et al (1996) pointed out three: first, there is the adjustment of social security benefit levels to take account of regional differences in prices. Secondly, conclusions about the relative deprivation or prosperity of regions, as measured by real disposable income, could also be susceptible to change in the face of regional variations in the cost-of-living. Lastly, conclusions about the number of persons living in poverty could also alter when regional cost-of-living variations are allowed for. Moreover, future research should also look at how differences in the

regional cost-of-living should be taken into account to set minimum wages at a regional basis rather than at a national one.

As pointed out by Meullbauer and Murphy (2008), housing, location and demographic choices are closely connected. Housing markets are crucial for understanding regional evolutions and regional disparities in economic activities and living standards. Moreover, migration between regions plays a role in the working of regional housing and labour markets. House prices and the related cost-of-living have several effects on the labour-market and on the choices made by households for household formation and location.

The failure of the National RPI to appropriately reflect the real cost-of-living of different UK regions suggests the need for regional specific studies and related policy to address the existing regional differences in the labour market and standards of living; the persistence in regional unemployment rates is perhaps one symptom of those differences. The attention to more regional oriented analysis is also motivated by the fact that London, for example, is the most unequal region in the UK; although it has the highest proportion of households in the top tenth of income nationally, it also has the highest rate of income poverty of any region in England, with the highest proportion of people of all ages living below the poverty rate (Inman, 2009).

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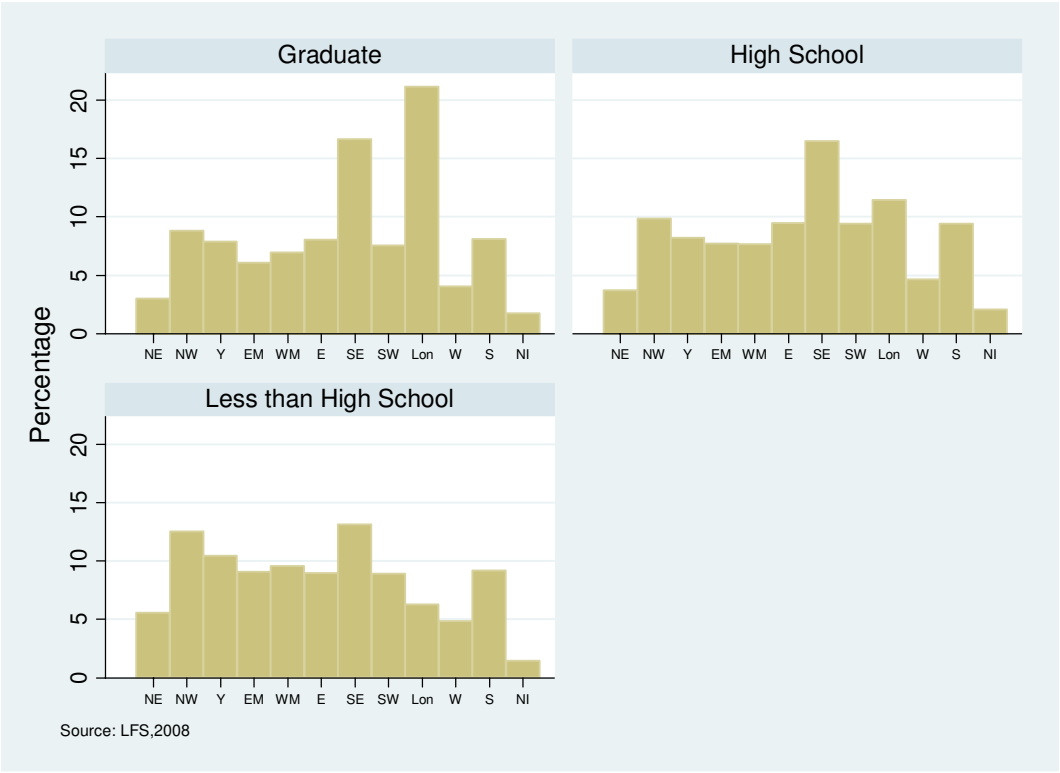
Figure1: Distribution of Workers by Education Within Region, All Workers, 2008



Notes: NE= North East; NW=North West; Y=Yorkshire; EM=East Midlands; WM=West Midlands; E=East; SE=South East; SW=South West; Lon=London; W=Wales; S=Scotland; NI=Northern Ireland. Sample is based on men (16-64) and women (16-59) working full time and part time, employees and main job only. Graduate refers to anyone who left full time education at 21 or later; "High school graduate" refers to anyone who left full time education between the ages of 17 and 20; "less than high school" refers to those who left education at age 16 or less.

Table 1: Distribution of Workers by Education, UK Regions 1997-2008

Region	1997			2008		
	Graduate	High School	Less than High School	Graduate	High School	Less than High School
North East	10.3	19.5	70.2	16.6	26.5	56.8

North West	13.1	22.2	65.1	19.4	28.5	51.7
Yorkshire	12.7	21.9	65.7	20.8	28.0	51.0
East Midlands	13.5	24.6	62.3	18.7	30.3	51.0
West Midlands	13.6	23.4	63.4	20.1	28.6	51.2
East	14.1	28.4	57.9	21.5	33.1	44.9
South East	17.5	31.6	51.3	26.7	34.3	38.8
South West	14.6	29.8	55.9	20.8	33.6	45.5
London	28.9	33.2	37.5	42.9	31.5	25.1
Wales	12.2	28.0	59.8	21.5	31.6	47.1
Scotland	14.0	26.4	59.8	21.7	32.6	45.5
Northern Ireland	17.2	30.1	53.1	24.8	37.6	37.8

Notes: Based on the LFS. Sample is based on men (16-64) and women (16-59) working full-time and part time, employees and main job only. Graduate refers to anyone who left full time education at 21 or later; "High school graduate" refers to anyone who left full time education between the ages of 17 and 20; "less than high school" refers to those who left education at age 16 or less.

Table 2: Price for Rent by Regions, 1997-2008

Region	**1997**	**2008**	**1997-2008 weekly rent change**	**% change to the UK increase**
North East	42.50	71.78	29.28	-28.1
North West	48.86	83.53	34.67	-14.9
Yorkshire & The Humber	43.20	78.64	35.44	-13.0
East Midlands	44.58	81.31	36.73	-9.8
West Midlands	48.46	84.39	35.93	-11.8
East	56.89	100.38	43.50	6.8
South East	69.87	123.88	54.01	32.5
South West	56.28	103.17	46.89	15.1
London	86.10	163.22	77.12	89.3
Wales	46.41	77.37	30.96	-24.0
Scotland	37.96	69.68	31.72	-22.1
Northern Ireland	35.93	68.63	32.70	-19.7
UK	**51.42**	**92.17**	**40.75**	

Source: Based on Family Resources Survey.

Table 3: Mean of Hourly Wage

Year		Nominal Wage	Real wage (National RPI)	Real Wage (Regional RPI)
1997	All workers	7.65	7.65	7.59
	Men	8.69	8.69	8.61
	Women	6.51	6.51	6.49

2000	All workers	8.86	8.42	8.31
	Men	9.97	9.47	9.35
	Women	7.63	7.25	7.16
2003	All workers	10.05	8.85	8.95
	Men	11.2	9.86	9.96
	Women	8.8	7.75	7.84
2006	All workers	11.33	9.3	9.57
	Men	12.48	10.24	10.53
	Women	10.07	8.27	8.54
2008	All workers	12.15	9.25	9.52
	Men	13.39	10.19	10.48
	Women	10.79	8.22	8.47

Notes: Based on the LFS. Sample is based on men (16-64) and women (16-59) working full-time and part time, employees and main job only. Wages are deflated at 1997 level.

Table 4: Real Hourly Wage by Aggregate Regions, 1997-2008

	UK		London		South East		Rest of the UK	
Year	N. RPI	R. RPI	N.RPI	R. RPI	N. RPI	R. RPI	N. RPI	R. RPI
1997	7.65	7.58	9.58	8.47	8.58	8.17	7.17	7.33
1998	7.87	7.76	9.97	8.79	8.93	8.36	7.32	7.47
1999	8.09	8.00	10.23	9.13	9.10	8.59	7.53	7.69
2000	8.42	8.31	11.01	9.60	9.41	8.96	7.80	7.97
2001	8.74	8.72	11.59	10.13	9.71	9.18	8.07	8.39
2002	8.8	8.86	11.46	10.16	9.89	9.46	8.15	8.52
2003	8.85	8.95	11.63	9.90	9.97	9.45	8.19	8.70
2004	9.02	9.17	11.66	9.87	9.97	9.47	8.41	9.00
2005	9.20	9.43	11.99	10.27	10.11	9.67	8.58	9.26
2006	9.30	9.57	11.92	10.41	10.20	9.79	8.70	9.39
2007	9.33	9.63	11.96	10.13	10.37	10.15	8.71	9.45
2008	9.25	9.52	12.02	9.84	10.22	9.78	8.60	9.41

Notes: Based on the LFS. Sample is based on men (16-64) and women (16-59) working full-time and part time, employees and main job only. Wages are deflated at 1997 level. N. refers to National, R: refers to regional.

Table 5: Measures of Wage Dispersion and Changes over Time, Log Hourly Wage

Year	**All workers**	**Real wage RPI (National)**	**Real Wage RPI (Regional)**	**Difference**
Panel B:			**Wage Dispersion**	
1997	Standard Dev.	0.588	0.582	-0.006
	Variance	0.346	0.339	-0.008

	90-50	0.766	0.750	-0.016
	90-10	1.396	1.375	-0.021
	50-10	0.630	0.625	-0.005
2000	Standard Dev.	0.580	0.572	-0.009
	Variance	0.337	0.327	-0.010
	90-50	0.760	0.749	-0.011
	90-10	1.370	1.351	-0.019
	50-10	0.611	0.602	-0.009
2003	Standard Dev.	0.557	0.546	-0.011
	Variance	0.310	0.298	-0.012
	90-50	0.768	0.749	-0.019
	90-10	1.351	1.320	-0.031
	50-10	0.583	0.571	-0.012
2006	Standard Dev.	0.561	0.553	-0.009
	Variance	0.315	0.306	-0.010
	90-50	0.763	0.752	-0.011
	90-10	1.349	1.316	-0.033
	50-10	0.585	0.564	-0.021
2008	Standard Dev.	0.567	0.557	-0.010
	Variance	0.321	0.310	-0.011
	90-50	0.767	0.751	-0.016
	90-10	1.347	1.326	-0.021
	50-10	0.579	0.575	-0.005

Panel B: 1997-2008 Change in Wage Dispersion

	National RPI	Regional RPI	
Standard dev.	-0.021	-0.025	-0.004
Variance	-0.025	-0.029	-0.004
90-50	0.001	0.001	0.000
90-10	-0.049	-0.049	0.000
50-10	-0.051	-0.050	0.001

Notes: Based on the LFS. Sample is based on men (16-64) and women (16-59) working full-time and part time, employees and main job only. Wages are deflated at 1997

Table 6: Changes in Real Hourly Wage by Region, 1997-2008

Region	Based on National RPI (1)	Based on Regional RPI (2)
North East	1.18	2.10
North West	1.28	1.99

Yorkshire	1.37	2.07
East Midlands	1.15	1.78
West Midlands	1.47	2.13
East	1.54	1.99
South East	1.64	1.61
South West	1.50	1.80
London	2.43	1.37
Wales	1.54	2.32
Scotland	1.65	2.54
Northern Ireland	1.74	2.39
UK	1.59	1.93

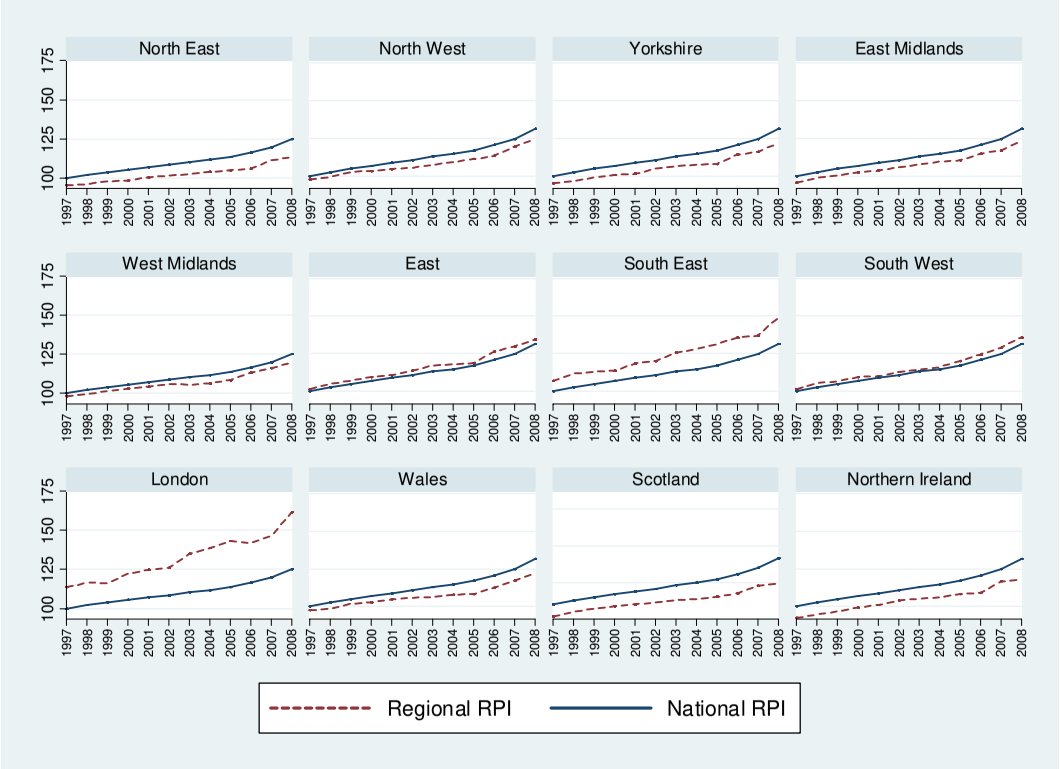
Notes: Based on the LFS. Sample is based on men (16-64) and women (16-59) working full-time and part time, employees and main job only. Wages are deflated at 1997 level.

Table 7: Changes in Weekly Rent, by Education Group

	1997		
	UK	**London**	**South East**
Graduates	98.31	112.40	118.62
High School	65.77	85.27	78.59
Less than high School	46.30	61.03	58.25
	2008		
Graduates	164.39	244.28	187.44
High School	105.72	160.84	134.61
Less than high School	84.58	112.32	101.21
	1997-2008 Percentage Increase		
Graduates	67.2%	117.3%	58.0%
High School	60.7%	88.6%	71.3%
Less than high School	82.7%	84.1%	73.7%

Based on the FRS.

Figure 2: National and Regional RPI, UK 1997-2008

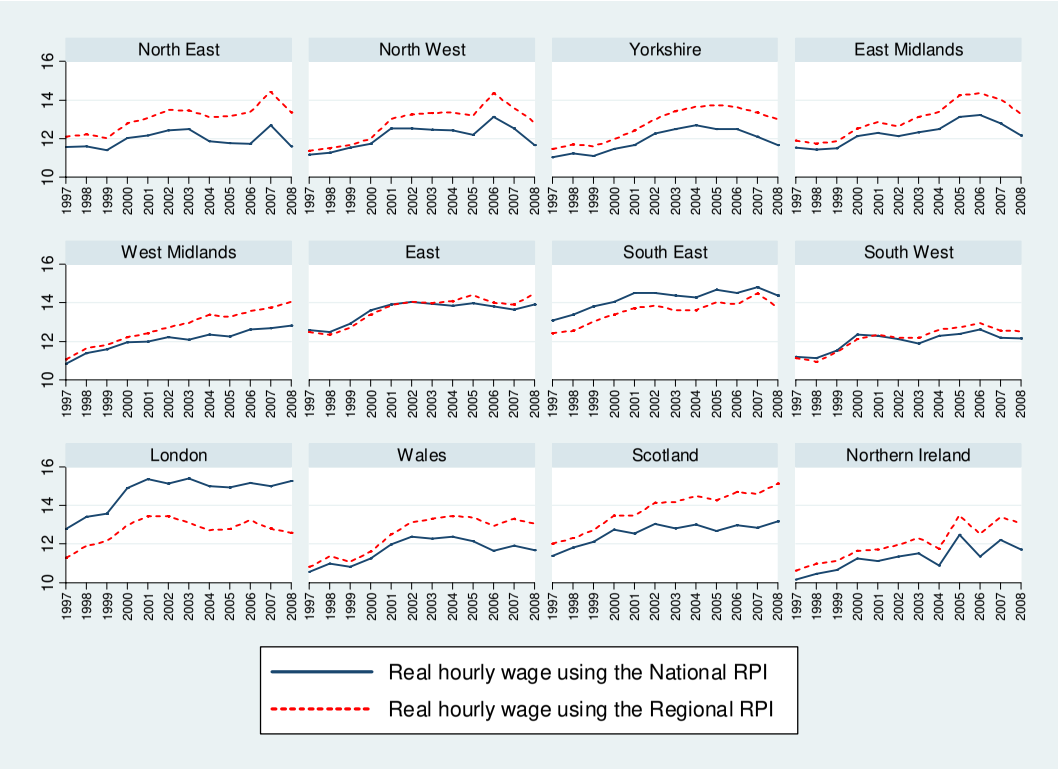


Source:EFS/FES/LCS and FRS.

Figure 3: How Increasing Share of Graduates Relate to Increasing Price for Rent

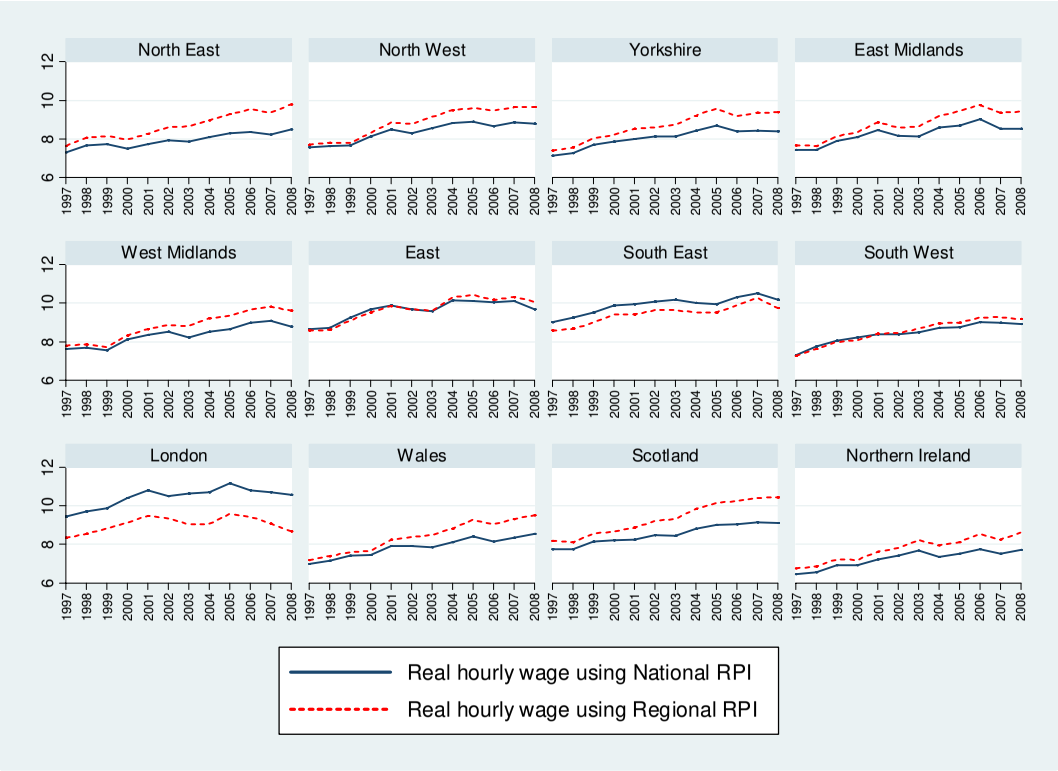
Notes: Based on the FRS and LFS, 1997-2008.

Figure 4a:Real Hourly Wage for Graduate Workers by Region,
All Workers 1997-2008



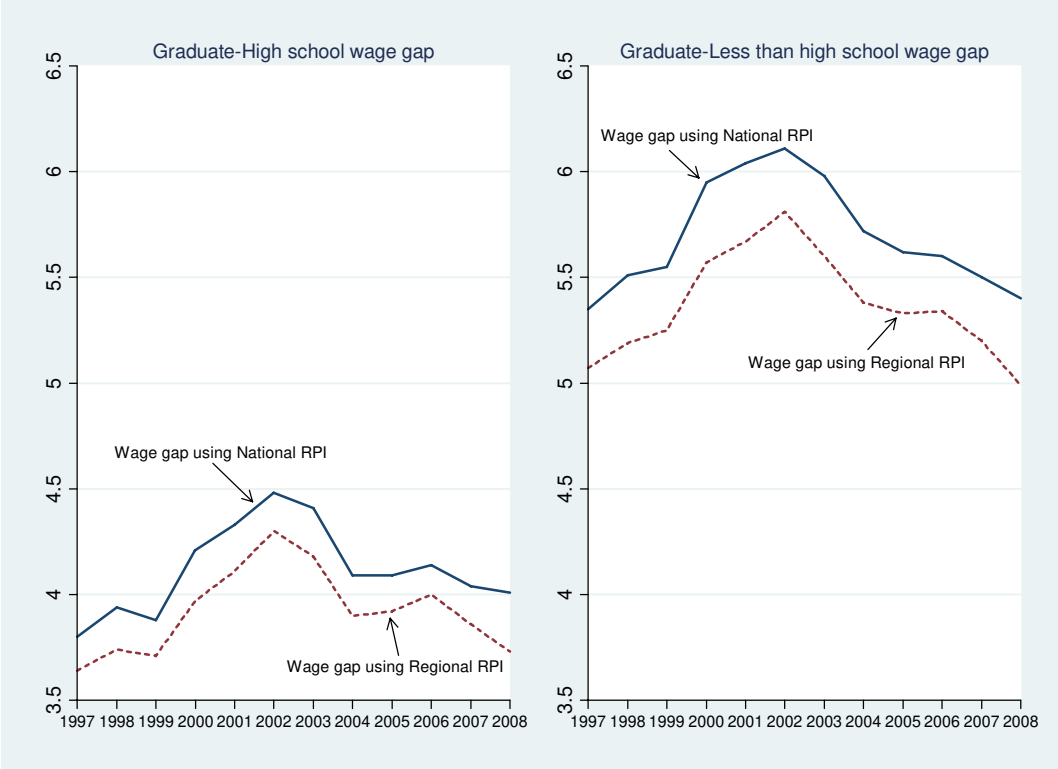
Notes: Based on the LFS. Sample is based on men (16-64) and women (16-59) working full-time and part time, employees and main job only. Wages are deflated at 1997 level. Graduate refers to anyone who left full time education at 21 or later.

Figure 4b: Real Hourly Wage for High School Workers by Region, All Workers 1997-2008



Notes: Based on LFS from 1997-2008; sample includes all workers in labour force, employed and main job only. High School workers are defined as those who left school between 17 and 20 years old.

Figure 5: Graduate-High School and Graduate-Less then High School Wage Gap, UK 1997-2008



Notes: Based on the LFS. Sample is based on men (16-64) and women (16-59) working full-time and part time, employees and main job only. Wages are deflated at 1997 level. Graduate refers to anyone who left full time education at 21 or later; "High school graduate" refers to those who left full time education between the age of 17 and 20.

Table 8: Nominal and Real Conditional Wage Difference between Workers with a High School Degree and Workers with College or more, UK Born

* p<0.05, ** p<0.01, *** p<0.001

Notes: Standard errors clustered by region in parentheses. Sample is based on men and women aged 25-60, employees,

	1997	2008	1997-2008 Change	1997	2008	1997-2008 Change
	(1)	(2)	(3)	(4)	(5)	(6)
Model 1						
Nominal Wage Difference	0.440***	0.422***	-0.018	0.396***	0.387***	-0.008
	(0.007)	(0.007)	(0.000)	(0.009)	(0.007)	(0.000)
Model 2						
Real Wage difference- Regional RPI						
	0.415***	0.387***	-0.028	0.399***	0.373***	-0.026
	(0.007)	(0.007)	(0.000)	(0.007)	(0.012)	(0.000)
Region Fixed Effects	No	No		Yes	Yes	

working full time and part time, main job only UK born only. The dependent variable in Model 1 is the log of nominal hourly wage. The dependent variable in Model 2 is the log of real hourly wage, deflated by regional RPI. Controls include a cubic in potential experience, year fixed effects, gender and race.

Table 9: Nominal and Real Conditional Wage Difference between Workers with a High School Degree and Workers with College or more, Migrants and UK Born

	1997	2008	1997-2008 Change	1997	2008	1997-2008 Change
	(1)	(2)	(3)	(4)	(5)	(6)
Model 1						
Nominal Wage Difference	0.431***	0.405***	-0.026	0.390***	0.364***	0.026
	(0.007)	(0.007)	(0.000)	(0.008)	(0.008)	(0.000)
Model 2						
Real Wage difference-Regional RPI	0.398***	0.360***	-0.038	0.394***	0.358***	-0.036
	(0.007)	(0.007)	(0.000)	(0.008)	(0.008)	(0.000)
Region Fixed Effects	No	No		Yes	Yes	

Notes: Standard errors clustered by region in parentheses. Sample is based on men and women aged 25-60, employees, working full time and part time, main job. The dependent variable in Model 1 is the log of nominal hourly wage. The dependent variable in Model 2 is the log of real hourly wage, deflated by regional RPI. Controls include a cubic in potential experience, year fixed effects, gender and race.

Table 10: Nominal and Real Conditional Wage between Workers and with College or more and High School Degree, by Men and Women

	1997	2008	1997-2008 Change	1987	2008	1997-2008 Change
	(1)	(3)	(4)	(5)	(7)	(8)
Panel A. Men						
Nominal Wage Difference	0.390***	0.404***	0.014	0.317***	0.322***	-0.005
	((0.029)	(0.034)	(0.000)	(0.027)	(0.025)	(0.000)
Real Wage difference- Regional RPI	0.353***	0.351***	-0.002	0.326***	0.319***	-0.007
	(0.021)	(0.018)	(0.000)	(0.008)	(0.009)	(0.000)
Panel B. Women						
Nominal Wage Difference	0.472***	0.415***	-0.057	0.454***	0.458***	0.004
	(0.020))	(0.033)	(0.000)	(0.018)	(0.018)	(0.000)
Real Wage difference- Regional RPI	0.442***	0.376***	-0.066	0.397***	0.393***	-0.004
	(0.026)	(0.027)		(0.024)	(0.023)	
Region Fixed Effects	No	No		Yes	Yes	

Notes: Standard errors clustered by region in parentheses. Sample includes workers aged 25-60, only UK born, working part-time and full-time. The dependent variable in Model 1 is the log of nominal hourly wage. The dependent variable in Model 2 is the log of real hourly wage, deflated by regional RPI. Controls include a cubic in potential experience, year fixed effects, gender and race.