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Original citation & hyperlink:
Lee, N. , Sissons, P. and Jones, K. (2015) The geography of wage inequality in British cities. *Regional Studies*, volume 50 (10): 1714-1727
http://dx.doi.org/10.1080/00343404.2015.1053859

DOI 10.1080/00343404.2015.1053859
ISSN 0034-3404
ESSN 1360-0591

Publisher: Taylor and Francis

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Published in *Regional Studies*.

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Abstract

There is widespread concern about the scale and implications of urban inequality in Great Britain, but little evidence on which cities are the most unequal and why. This paper investigates patterns of wage inequality in 60 British cities. It has two principal goals: (1) to describe which cities are most unequal and (2) to assess the important determinants of inequality. The results show a distinct geography of wage inequality, the most unequal cities tend to be affluent and located in parts of the Greater South East of England. A central determinant of these patterns is the geography of highly skilled workers. Because of this, the geography of urban wage inequality reflects the geography of affluence more generally.

JEL codes: R13; R10; J3; R23

Keywords: Inequality, Wages, Great Britain, Cities, Travel-to-Work-Areas

1. Introduction

The past few years have seen renewed interest in inequality in Great Britain and many other developed countries. High-profile academic studies have argued that inequality has negative social consequences, being at the root of social problems including crime and poor health (FRANK, 2007; WILKINSON and PICKETT, 2009; DORLING, 2010). WILKINSON and PICKETT's (2009) *The Spirit Level* argued that inequality has harmful consequences for society as a whole, not just those on low incomes. PIKETTY's (2014) work has generated considerable debate about the scale and persistence of inequality.

While the academic literature has considered long-term determinants of inequality (DORLING, 2010; ATKINSON and PIKETTY, 2007), public discourse has been framed by the crisis of the late 2000s and its aftermath. The financial crisis was linked to patterns of inequality, with one view that it was caused by the actions of the affluent, but evidence suggesting the consequences had been worst for low earners (BELL and BLANCHFLOWER, 2009; ONS, 2009; LEE, 2014; VIZARD et al., 2015). Concerns about inequality and the wealth of the top 1 percent were drivers of the Occupy Movement, although this has faded in popularity (VAN GELDER, 2011; BREAU and ESSLETZBICHLER, 2013). Inequality is now firmly on the agenda.

Discussion of inequality has often focused on national trends. Yet inequality at a city level may also matter. Peer group comparisons take place at a local level, so the psychological effects of inequality may be felt most keenly in cities (FRANK, 2007). Urban inequality has been linked to social problems such as crime (GLAESER et al. 2009). The concentration of high-wage jobs in some cities may generate additional demand for low-wage services locally, reinforcing increasingly unequal labour market structures (SASSEN 2001; DOUSSARD et al. 2009).

Urban inequality also has important implications for policymakers. Some city governments have attempted to reduce inequality, for example through 'fairness commissions' and/or Living Wage campaigns to address the causes and consequences of inequality at a local level. However, British cities lack the most powerful levers to address and alleviate inequality through the tax and benefits system.

A growing body of literature considers the determinants of urban inequality, with studies focusing on Canada (BOLTON and BREAU, 2012; BREAU et al. 2014), the United States (GLAESER et al. 2009; FLORIDA and MELLANDER, 2014) and Swedish local labour markets (KORPI, 2008). In the UK, work has considered employment polarisation (JONES and GREEN, 2009) and wage inequality (DICKEY, 2001; TAYLOR, 2006; DICKEY, 2007; STEWART, 2011), but only at a regional level. Despite considerable interest in urban inequality, little research has specifically considered patterns of wage inequality in British cities.

This paper addresses this gap. It has two main aims: (1) to investigate patterns and levels of inequality in British cities, (2) to assess the determinants of inequality in these cities. It addresses these aims using the Annual Survey of Hours and Earnings (ASHE) to calculate inequality measures for the Travel To Work Areas of 60 cities in England, Wales and Scotland.

The paper is structured as follows. Section two outlines why inequality in cities is important, and investigates the geography of inequality in Great Britain. Section three describes the data used here to investigate urban inequality in Great Britain and section four outlines which cities are the most unequal and why. Section five presents a model of inequality in British cities, and investigates the determinants of inequality in them. Section six concludes and considers the implications of our findings.

2. Assessing urban inequality

Urban inequality in Great Britain

Despite the general interest in inequality in Great Britain, there is relatively little evidence on patterns at a sub-national level (TAYLOR, 2006; DICKEY, 2007; ETHERINGTON and JONES 2009). The most comprehensive report on inequality in the UK, the report of the National Equality Panel, included some analysis of regional trends, but a lack of sub-national data prevented more detailed analysis (HILLS et al., 2010).

Yet urban inequality needs to be analysed differently to national inequality. At a basic level, inequality in cities is a function of the characteristics of the population and the rewards to these characteristics in a particular city (GLAESER ET AL. 2009). It also reflects the structure of and opportunities offered by the local labour market. A key difference between urban and national inequality is population sorting, with movement of individuals into cities altering population structures and so the wage distribution (MATANO and NATICCHIONI, 2012).

While no studies have considered inequality at an urban level in Great Britain, several have considered regional wage distributions (DURANTON and MONASTIRIOTSIS, 2002; TAYLOR, 2006; STEWART 2011). DURANTON and MONASTIRIOTSIS (2002) show that over the period 1982-1997 the North-South divide increased in the UK, driven by an increasingly educated population in London and the South East and increases in the relative returns to education. However, this study considered wages rather than wage inequality. STEWART (2011) considers earnings inequality in UK regions. Although the study is not specifically about the geography of inequality, he shows that London is the most unequal region by some margin, followed by the two neighbouring regions of the East and South East of England. Moreover, the growth in national inequality over the period 1997-2008 was principally driven by London and financial services in particular.

Other studies have considered inequality in London, related to its global city status. SASSEN (2001, 2006) argued that the concentration of skill intensive industries in business and financial services created a core of affluent workers willing to pay a set of lower skilled individuals to work in personal service employment, resulting in greater income polarisation (*cf.* HAMNETT, 1994; HAMNETT and CROSS, 1998).

The determinants of urban inequality

There is a more general international literature on the determinants of urban inequality. One dominant theme has been the link between the level of economic development and inequality. The seminal model of KUZNETS (1955) suggested that growth would have two effects over the long term: first it would increase inequality, as relatively few individuals work in high wage sectors; but as more individuals entered these sectors inequality would gradually decline. For US counties, NIELSEN and ALDERSON (1997)

find a negative relationship between inequality and the median income. For US Metropolitan Statistical Areas (MSAs), GLAESER et al. (2009) show that inequality has increasingly become associated with the location of the rich rather than the location of the poor.

One key determinant of wage inequality is the reward to different skills in the labour market. Technological change has increased the demand for highly skilled workers but substituted for some semi-skilled (routine) occupations, leading to greater labour market polarisation (AUTOR AND DORN, 2013 GOOS, MANNING and SALOMONS, 2010). Because of this, the distribution of skills in a city will be an important determinant of inequality (LEE and RODRIGUEZ-POSE, 2013).

International analyses of wage inequality have also highlighted the importance of labour market institutions. Cross-national studies have shown that higher unionisation rates are associated with lower earnings inequality (PAULL and PATEL, 2012). In the UK, trade union membership has fallen significantly over the past three decades (BRYSON and FORTH, 2010).

There is evidence assessing the link between city size and inequality. BAUM-SNOW and PAVAN (2013: 1535) describe a "strong positive monotonic relationship" between city size and wage inequality in the United States which has grown over the period 1969 and 2007. KORPI (2008) shows a clear positive relationship between income inequality and labour market size in Swedish local labour markets, controlling for other characteristics. BEHRENS and NICOULD (2008) use quantile regression to consider the age structure in US cities, and find larger cities associated with greater increases in wages at the top of the distribution than at the bottom.

Migration has been another important focus of research. Migration to a city may have two simultaneous effects: it changes the skill composition of the population, and may also change the returns to particular skills. For a panel of US states from 1960 - 1990, PARTRIDGE et al., (1996) show that migration has a significant positive effect on inequality. Korpi (2008) finds mixed results for different inequality measures for Swedish local labour markets. Migrant composition is important, and GLAESER et al. (2009) find that it is particularly low-skilled migration from Latin America that has increased

inequality in US cities. However, LEE and RODRIGUEZ-POSE (2013) (using a panel of both European and US cities) find migration is unimportant as a determinant of inequality.

A final area of interest has been industrial structure (NIELSEN and ALDERSON, 1997; MCCALL, 2001; GLAESER et al., 2009). The decline of manufacturing has increased urban inequality, as formerly it provided relatively high wages for low-skilled workers (CHAKRAVORTY, 1996; MCCALL, 2001). The impact of newer industries on inequality is unclear, however. ZHONG et al. (2007) show that producer service employment in US cities is associated with increased wages at the very top, but not employment polarisation overall. LEE (2011) shows no effect from 'knowledge-based' industries overall on inequality in a panel of European regions, but that financial services employment increases inequality.

3. Methodology

Data

The primary source of data is the Annual Survey of Hours and Earnings (ASHE) [ONS, 2012a], a 1% sample of employees based on administrative records (the Inland Revenue PAYE register). The use of ASHE makes our results as robust as possible, but it does have some limitations. ASHE does not include the self-employed so our findings are only for employee wages. Moreover, there is no data on qualifications and some other individual characteristics. We use ASHE to calculate a measure of basic hourly pay for full-time employees from which measures of wage inequality are then calculated. The use of full-time employees means our results are not affected by variations in part-time work, although it limits the interpretation only to full-time workers.

ASHE does not include data on some personal characteristics, such as qualifications, so we supplement the data with the Annual Population Survey (APS) [ONS, 2012b]. The APS is a sample survey of around 360,000 individuals living in Great Britain in each year. It provides a range of information about the labour market experiences of individuals surveyed. We pool APS datasets across three years (2008, 2009 and 2010) to increase the

sample size. The population of interest is limited to those of working-age (16-64). In our later analysis we also use data on industry composition at the city level calculated from the Business Register and Employment Survey (BRES), a large annual business survey.

Defining cities

Our definition of 'city' comes from the UK government's State of the English Cities Database (PARKINSON et al. 2006). As this covers England only, we add the Scottish cities of Edinburgh, Glasgow and Aberdeen and the Welsh cities of Cardiff and Swansea, giving a final sample of 60 cities.[i]

The boundaries for each city are the travel to work areas (TTWAs), defined using 2001 Census data (COOMBES and BOND, 2008). TTWAs are less intuitive than measures of urban areas based on built up area or administrative boundaries. Commuting patterns may also differ for particular groups, with better-qualified workers likely to commute further (GREEN and OWEN, 2006; ONS, 2014). However TTWAs also have important advantages. They are consistently defined for the entire population and they better reflect local labour markets, so they are the most robust way of demarcating local economies in Great Britain.

The ASHE data come linked to workplace TTWAs. However, control variables calculated using the APS are not, so a probabilistic allocation process is used (see LEE, 2014 for a similar application). APS data give a local authority identifier for each individual. Where a local authority falls completely within a particular TTWA, all individuals within the local authority can be counted as part of the TTWA. Where a local authority is divided into two or more TTWAs, individuals are randomly allocated into TTWAs based on the ratio of each of the TTWA postcode points which overlap with it. This procedure may introduce some error into the data. However, any error will be largely random and is unlikely to significantly bias the results.

Measuring inequality

This study focuses on wage inequality, in part to reflect the labour market but also because wage inequality constitutes the bulk of overall income inequality (HILLS et al.,

2010). There is no definitive measure of inequality, but a set of different potential indicators, each of which reflects subtly different aspects of the income distribution. The Gini coefficient is the standard inequality indicator (WILKINSON and PICKETT, 2009; GLAESER et al., 2009). This measure accounts for the entire wage distribution, rather than being a simple ratio of two points. It is invariant to scale, meaning that the size of the city should not impact the results (GLAESER et al., 2009). It is also robust to general wage growth, as an increase in all income by a set amount will not change the results.

However, the Gini coefficient only gives one view of the wage distribution and is sensitive to changes around the mode. To address this, we also consider three percentile ratios which capture the dispersion of wages. These are:

- The 90/10 ratio – the ratio of the 90th to the 10th percentile in earnings. This gives a measure of the spread of wages and the scale of difference between high and low earners, but little indication of the distribution within this.
- The 90/50 ratio – the ratio of the 90th to the 50th percentile of the wage distribution. This is a measure of upper-tail inequality: how far the top of the distribution (the 90th percentile) is from the median.
- The 50/10 ratio – the ratio of the 50th to the 10th percentile of the wage distribution. This is a measure of lower-tail inequality.[ii]

In addition, we also include a measure of labour market polarisation – the polarisation index developed by JONES and GREEN (2009). This is a measure of polarisation in the employment structure and the extent to which jobs are in low and high wage occupations relative to those at the median wage. The index takes the value of between zero and one, and is higher in cities which are more polarised.

4. The geography of urban inequality in Great Britain

We first present findings of a descriptive analysis of inequality by providing rankings of British cities across the different measures of inequality. Our indicators of inequality are slightly lower than those of national level studies using similar data (HILLS 2010). This is due to the nature of our wage indicator and because we focus on individual not household inequality.

Table 1 presents inequality measured by the Gini coefficient and by the polarisation index for the ten cities at the top and bottom of the rank order on each variable. Turning first to the Gini coefficient measure, unsurprisingly we find that London – the largest and one of the richest cities in Britain – has the most unequal wage distribution. The list also includes a number of nearby cities, including Reading & Bracknell, Guildford & Aldershot, Milton Keynes & Aylesbury and Southend & Brentwood. Aberdeen, a city with strong oil and gas industries, also comes out as being unequal. Perhaps less expectedly Portsmouth, Warrington & Wigan and Manchester also appear towards the top of the rankings. Their relatively high ranking is driven by upper-tail inequality; all have comparatively high ratios of earnings at the 90th percentile compared to median wages.

Insert table 1around here

The cities with the lowest levels of overall inequality, measured by the Gini coefficient, tend to be former industrial cities of the Midlands and North of England, including Stoke, Barnsley, Bradford and Sunderland where median wages are relatively low as is the proportion of employment in higher paying jobs.

The most cities with the highest employment polarisation index tend to be located in the Greater South East (London, the South East and East of England). The most polarised are Guildford & Aldershot, Reading & Bracknell, and London. Most other cities in the top 10 are also in the Greater South East. One exception is Blackpool, not normally considered an affluent city but one with a relatively small group of high-wage workers in the Energy sector, alongside a large number of low wage service workers. The other is Bournemouth which is just outside the Greater South East. The least polarised cities, in contrast, tend to be less affluent, and include Burnley, Peterborough and Swansea.

Table 2 presents the 90/10 ratio and indicators of upper-tail and lower-tail inequality (the 90/50 and 50/10 ratios of wages). Patterns using the 90/10 ratio are similar to those using the Gini coefficient and employment polarisation measures. More unequal cities tend to be those around London, while less unequal cities are normally formerly industrial. In the three most unequal cities – London, Reading & Bracknell and Aberdeen

– earnings at the 90th percentile are more than four times those at the 10th percentile. For the most equal cities – Sunderland, Cardiff and Telford – the wages of those at the 90th percentile are around 2.8-2.9 times as high as they are at the 10th percentile.

Insert table 2 around here

The cities with high upper-tail inequality are largely those with high rates of overall inequality (using the Gini and 90/10 measures).[iii] The list is again dominated by cities around London. The results on lower tail inequality introduce cities with less pronounced differences in overall inequality but where median wages tend to be higher in comparison to low earnings. These include Oxford, Crawley and Huddersfield. In Oxford and Crawley this appears to be driven by comparatively high median wages not low wages at the bottom of the distribution. The characteristics of the cities which come out as more equal are relatively consistent across measures and are again dominated by former industrial areas.

It should be noted that the differences between cities are relatively small when measured by the Gini coefficient, although they are significantly larger when using the 90th/10th percentile differential. The exact rankings also changes depending on which measure is used; it is not possible therefore to identify a single most, or least, unequal city. However, the results do suggest certain types of cities tend to come out as either relatively equal or relatively unequal irrespective of the measure used. Inequality is higher in London and surrounding cities, it is lower in former industrial cities, particularly smaller ones. This suggests that similar city characteristics associated with individuals and labour markets are likely to be driving these patterns.

5. Determinants of urban wage inequality

The model

To investigate the underlying factors associated with urban inequality we use a simple cross-sectional regression model. This views wage inequality as a function of the characteristics of the city, labour force and local economy. The model is specified as follows:

$$INEQUALITY_i = \alpha + \beta_1 CITYSIZE_i + \beta_2 MEDWAGE_i + \beta_3 QUALS_i + \beta_4 AGE_i + \beta_5 MIGRATION_i + \beta_7 PUBLIC_i + \beta_8 FINANCE_i + \varepsilon,$$

with the regression estimated for city 'i'.

We control for the major determinants of inequality, as outlined in the literature above. First, city size is seen as a key determinant of inequality (KORPI, 2008; VOLSCHO, 2007; WHEELER, 2004). As this paper focuses on labour markets, we use the log of the total number of employees in the city (Employees (ln)) from the Business Register and Employment Survey (BRES). Larger cities are expected to be more unequal. This measure may be affected by the strength of the local economy, with lower employment in cities with weaker economies. However, use of a total population variable instead leads to little change in the results.

Second, we control for the overall level of economic development. Here we use the initial median wage (Median Pay). Work for both the US and European regions suggests that richer areas tend to be more unequal (GLAESER et al., 2009). We would expect this variable to be related to both city size and population skills, and also linked closely to measures of inequality which include the median wage in their calculation. Because of this, we include the wage variable only in some models.

Third, population skills are important. To capture those with relatively high skill levels we include the proportion of the population qualified to degree level or above (NVQ 4+ (%)). This variable is derived from information on whether individuals have qualifications at Level 4 or above on the National Qualification Framework (NQF) which includes both higher level academic and vocational attainment. We also include a further variable for age structure, reflecting the returns to experience. Our variable is 'peak earners' defined as the percent of the working population aged 35-50 – this reflects the fact that wages in the UK peak at 38 for women and 50 for men (ONS, 2014b). We expect cities with a higher share in this age group to be more unequal.

To test for the impact of migration we use the proportion of the population not born in the UK (Foreign Born (%)). For US Cities and States, WHEELER (2007) finds a

positive link between diversity and inequality. The dominant perspective on migration is that it tends to bid down wages and so increase inequality, although this will depend on the characteristics of the migrants (GLAESER et al., 2009).

Finally, previous research has linked local industrial structure with inequality. Industries such as financial services may offer particularly high wages, while the decline of manufacturing has been seen as important in increasing inequality (CHAKRAVORTY, 1996; BLUESTONE and HARRISON, 1982). The public sector may also reduce inequality by compressing the wage distribution (VOLSCHO and FULLERTON, 2005). A variable for employment in Education, Health and Public Administration is used to account for this (Public sector (%)). To account for the possible relationship between financial services and inequality we control for the share of employment in this sector (Financial services (%) – more specifically defined as SIC K: Financial and insurance activities). We do not control separately for occupations as these form the basis of the employment polarisation measure.

Insert table 3 around here

Table 4 provides a correlation matrix. Our analysis here focuses on the relationship between inequality measures and city characteristics. A higher median wage is associated with all five measures of inequality. Larger cities are more unequal by all but one inequality indicator (the exception, polarisation, is significant at the 12% level). A greater proportion of higher skilled residents is positively associated with all five inequality indicators, as is the share of foreign born and the share of the population aged 35–50. In contrast, public sector employment is negatively associated with all inequality indicators. Employment in finance is positively associated with inequality on the polarisation measure, the 90-10 ratio and the 90-50 ratio (the relationship with the Gini coefficient is significant at 13%).

Insert table 4 around here

Results

Table 5 gives the results of the first set of regressions. The basic model considers the relationship between wage inequality and median pay, city size, and the share qualified to NVQ4+. All three of these will be correlated, as large cities tend to have higher wages and, on average, more highly qualified residents.

Insert table 5 around here

The median wage is positively related to both wage inequality and employment polarisation. Without controls (columns 1 and 6), the coefficient is both positive and significant. This effect remains for wage inequality in column 5 which includes the full set of control variables, although the coefficient reduces in size. For employment polarisation (column 10) the measure loses significance once controls are introduced. Overall, as our descriptive results suggested, more affluent cities tend to be more unequal.[iv]

Larger cities are more unequal but are not necessarily more polarised in their occupational structure. City size is significant in Gini models without a control for median wage (column 4). However, once controlling for the median wage the coefficient halves in magnitude and loses significance (column 5), suggesting it is the higher median wages in large cities which makes them more unequal – the presence of more skilled and better-paid workers drives inequality. Moreover, while the coefficient for population size is positive it is not significant in the models considering employment polarisation.

The share of the population qualified to NVQ4+ is positively related to both inequality and employment polarisation without control variables (columns 3 and 8). However, controlling for city size and median wages this also loses significance (columns 4-5 and 9-10). A skilled population raises wages and this increases inequality. This is a similar result to that given by FLORIDA and MELLANDER (2014) who also find a positive relationship between Human Capital and wage inequality using a larger sample of US cities.

International migration does not seem to have a strong influence on inequality. It is worth noting that the sample sizes for migrants are both small and unevenly distributed across cities. However, even accounting for this the analysis suggests that migration is

not a major cause of urban inequality. The proportion of the population in peak earning years (aged 35-50) does not appear to have a strong influence over the Gini measure of inequality, although it is positively associated with employment polarisation.

The proportion of the workforce employed by the public sector is negatively associated with wage inequality, although with controls for median wages this loses significance. There is no statistically significant relationship between public sector employment and employment polarisation. There is a weak positive association with financial services employment and employment polarisation but not wage inequality.

Table 6 presents results for further analysis of pay ratio measures of inequality. We use three measures of inequality: the 90/10 ratio,; the 90/50 ratio, and the 50/10 ratio. Because of the relationship between median wages and indicators of the wage distribution, these are included in every second regression. In others, we present full controls.

Considering first the overall spread of wages (the 90/10 ratio), both city size and the qualifications of the population are positively and significantly related to inequality. In contrast, cities with more public sector workers tend to be more equal. This may indicate weaker economies, as the public sector will account for a greater share of employment in cities with smaller private sectors. In British cities low paid public sector workers receive a wage premium relative to private sector workers and higher paid public sector workers a wage penalty (LEE et al., 2013). In column 2, which also includes median pay, these relationships disappear. Once again, the key determinant of wage inequality at an urban level is affluence – but factors such as city size and the share of the population with NVQ4+ work through this and are themselves partial determinants of higher wages. As cities become larger and increase their base of highly skilled workers, median wages grow, but so too does wage inequality.

Columns 3–6 consider upper- and lower-tail inequality. Large cities are associated with greater upper- and lower-tail inequality. The finding for upper-tail inequality is consistent with the idea that larger cities are important for specialized economic functions with higher earning workers. In this case, larger cities would have greater gaps between the median and 90th percentile. The share of the population qualified to NVQ4+ is positively

and significantly related to both measures of upper- and lower-tail inequality (columns 3 and 5). The public sector is negatively related to upper-tail inequality but not lower tail inequality. The variables measuring demographics and migration are insignificant in the upper-tail models. However in the lower tail models there is a negative relationship between migration and inequality and a positive relationship between the proportion of the population aged 35-50 and inequality. The population relationship loses significance when controlling for median wage. The migration coefficient halves in size but remains statistically significant. This result is explained by London and, removing this one variable, loses statistical significance.

Financial services are negatively related to the 50/10 ratio (when controls for median wage are not included). The dominant view of financial services employment is well paid bankers in London, yet such employment is only a small share of total financial services employment. Instead, our measure may capture relatively more mundane back-office employment (DAWLEY et al. 2014). This often comprises sales and secretarial work which is relatively better paid than in other sectors, reducing inequality. At the same time, these industries also contain professional employment, increasing employment polarisation.

Insert table 6 around here

The key debate on urban inequality has been around the impact of city size. The results here provide suggest that the affluence of the population is more important, with richer cities tending to be more unequal. Other research has produced similar results on this point for US cities (WHEELER, 2007).

Overall, our results suggest that important determinants of urban inequality are city size and the skills of the population. These both drive inequality because they increase wages, with skills important by all measures but larger cities experiencing increasing inequality at the top of the wage distribution. However, when controlling for median wages these factors are no longer significant as their effect on inequality is through raising wages (including at the median). Wage inequality in British cities is an outcome of economic success.

Migration does not seem an important factor in determining overall inequality. However, it is significant in both models for lower-tail inequality, but only when London is included in the regressions. Age structure is only important in some regressions, with a positive impact on lower-tail inequality – most likely, because it is associated with higher median wages.

Employment in financial services is positively associated with inequality on some measures, but once controlling for median wages the effect becomes largely insignificant. The comparative weakness of this relationship may be explained by the relatively large proportion of financial services employment which does not constitute the stereotypical well-paid city banker. Conversely, public sector employment is negatively associated with inequality, although again the relationship becomes insignificant when controlling for median wages.

6. Conclusions and policy implications

This paper has investigated patterns of inequality and employment polarisation in British cities. The most unequal cities tend to be in the Greater South East of England, such as Reading & Bracknell and Guildford & Aldershot. London comes out as the most unequal on most measures. More equal cities tend to be the ex-industrial cities in the North of England or the Midlands, such as Sunderland, Stoke and Barnsley. A similar pattern is observed when measuring city-level employment polarisation, with greater polarisation found in London and cities in the Greater South East of England.

The skills of the population are an important driver of both inequality and employment polarisation, with greater skills associated with higher wages and increased inequality. City size is also associated with higher wages towards the top of the wage distribution. As cities experience economic growth, and increase the proportion of highly skilled workers, average wages increase - but so does wage inequality. In contrast to some of the US literature, international migration did not seem important. Public sector employment was associated with lower inequality.

The results do suggest that concentrations of high-skilled workers are a significant driver of inequality. This raises a potential challenge for policymakers, as skilled workers are considered vital for the economy. Moreover, the employment opportunities of low-skilled workers are increasingly seen as dependent on proximity to highly skilled workers. The results raise again the potential tension between efficiency and economic growth and equity (STORPER, 2013).

It is important to state that the results do not suggest inequality is inevitably associated with economic success. Inequality at the urban level is clearly very different to national level inequality as it reflects the spatial sorting of people with different characteristics into different places (GLAESER et al. 2009). The central tools to address or alleviate inequality rest with national government, in particular through the tax and benefits system as well as through labour market institutions and regulation. Addressing urban inequality is therefore heavily dependent on national choices.

Actors at the city level are not without powers to act on urban inequality; policies such as Living Wage Campaigns may help to improve outcomes for low earners. However, British cities have more options to help workers at the bottom of the distribution than they do to intervene at the top, yet it is the top that drives inequality. Indeed for cities with lower levels of inequality, economic growth strategies which target increasing the number of higher wage jobs may have contradictory effects: one of the key drivers of growth is attracting or developing individuals with high levels of human capital, but this also seems to increase inequality (SCOTT and STORPER, 2009).

This paper has provided only a first analysis of the situation in Britain, and has a number of limitations which could be addressed through further research. First, the paper only deals with wage inequality and does not consider wealth or income inequality . FLORIDA and MELLANDER (2014) show that the geography of income inequality differs from the geography of wage inequality in US cities. It would be an important, but difficult, contribution to test whether this for the UK. Second, further work may wish to investigate similar issues in a causal framework – using panel data would be one way of addressing this issue. Finally, we have not considered cost of living, yet this will vary by city and according to the income distribution and would be an important future research area (GLAESER et al., 2009).

Acknowledgements

This paper was funded by the Joseph Rowntree Foundation. We would like to thank Chris Goulden, Tom Phillips, Ian Gordon, Naomi Clayton, Alex Fenton and Ruth Lupton and participants at the Urban Geography Research Group annual conference 2012 and three insightful referees and Professor Ivan Turok for helpful comments. The data used is Crown Copyright and has been made available by the Office for National Statistics (ONS) through the UK Data Archive. It is reproduced with permission. Neither the ONS nor the Data Archive bears any responsibility for the analysis and interpretation of the data presented in this study. The authors would like to acknowledge the help of the Secure Data Service in accessing data.

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Tables

Table 1. Most and least unequal cities: Gini coefficient of basic pay and employment polarisation, 2010

	Gini coefficient			Polarisation index		
	Rank	City	Index	Rank	City	Ratio
Most unequal	1	London	0.337	1	Guildford &	0.473
	2	Aberdeen	0.321	2	Reading & Bracknell	0.468
	3	Portsmouth	0.319	3	London	0.463
	4	Reading & Bracknell	0.313	4	Bournemouth	0.456
	5	Guildford &	0.306	5	Luton & Watford	0.456
	6	Luton & Watford	0.306	6	Crawley	0.456
	7	Milton Keynes &	0.303	7	Hastings	0.452
	8	Southend &	0.302	8	Worthing	0.440
	9	Warrington & Wigan	0.300	9	Portsmouth	0.439
	10	Manchester	0.299	10	Blackpool	0.438
	Rank	City	Index		Rank	Ratio
Least unequal	51	Bradford	0.254	51	Cardiff	0.410
	52	Plymouth	0.253	52	Gloucester	0.408
	53	Barnsley	0.253	53	Northampton	0.407
	54	Stoke	0.253	54	Wakefield &	0.405
	55	Burnley	0.252	55	Sunderland	0.402
	56	Wirral and Ellesmere	0.251	56	Newcastle &	0.402
	57	Maidstone & North	0.251	57	Leicester	0.402
	58	Cardiff	0.251	58	Swansea	0.398
	59	Peterborough	0.249	59	Peterborough	0.396
	60	Sunderland	0.237	60	Burnley	0.393

Source: ASHE, 2010. Data for TTWAs. 60 Observations. Measure is Gini coefficient of basic pay and 90/10 ratio amongst full-time workers. Note: the Gini coefficient is a measure of the entire wage distribution. The 90/10 ratio gives relative income disparities, but does not control for inequality in the middle of the distribution.

Table 2. Most and least unequal cities: 90/10, 90/50 and 50/10 ratios of basic pay, 2010

	90/10 Ratio			90/50 Ratio			50/10 Ratio		
	Rank	City	Ratio	Rank	City	Ratio	Rank	City	Ratio
Most	1	London	4.269	1	Aberdeen	2.228	1	London	1.947
	2	Reading &	4.100	2	Milton Keynes &	2.203	2	Derby	1.935
	3	Aberdeen	4.016	3	London	2.193	3	Reading &	1.902
	4	Luton &	3.857	4	Luton & Watford	2.192	4	Cambridge	1.823
	5	Guildford &	3.757	5	Reading &	2.155	5	Aberdeen	1.803
	6	Derby	3.667	6	Bournemouth	2.122	6	Guildford &	1.772
	7	Cambridge	3.655	7	Guildford &	2.120	7	Huddersfield	1.772
	8	Edinburgh	3.586	8	Edinburgh	2.074	8	Luton &	1.759
	9	Milton	3.564	9	Warrington &	2.064	9	Crawley	1.748
	10	Gloucester	3.538	10	Southend &	2.048	10	Oxford	1.746
		Rank	Ratio	Rank	City	Ratio		Rank	Ratio
Least	51	Blackburn	2.980	51	Liverpool	1.871	51	Stoke	1.578
	52	Peterborough	2.976	52	Peterborough	1.862	52	Bolton	1.577
	53	Hastings	2.962	53	Swansea	1.858	53	Plymouth	1.574
	54	Barnsley	2.926	54	Telford	1.848	54	Newcastle &	1.574
	55	Bradford	2.920	55	Sunderland	1.838	55	Mansfield	1.563
	56	Bolton	2.891	56	Bradford	1.835	56	Telford	1.558
	57	Stoke	2.883	57	Bolton	1.833	57	Blackburn	1.552
	58	Telford	2.879	58	Maidstone & North	1.833	58	Hastings	1.514
	59	Cardiff	2.858	59	Barnsley	1.830	59	Sunderland	1.509
	60	Sunderland	2.774	60	Stoke	1.827	60	Cardiff	1.478

Source: ASHE, 2010. Data for TTWAs. 60 Observations. Measure is 90/50 and 50/10 ratio of basic pay amongst full-time workers.

Table 3. Variables and definitions

	Definition	Source
Inequality variables		
Gini	Gini Coefficient of hourly pay	Annual Survey of Hours and Earnings (ASHE)
Polarisation	Measure of employment polarisation adapted from Jones and Green (2009)	Annual Survey of Hours and Earnings (ASHE)
Ratio 90/10	Ratio of the 90^{th} to the 10^{th} percentile of wages. This gives a measure of the wage distribution, but no information about the distribution within this.	Annual Survey of Hours and Earnings (ASHE)
Ratio 90/50	Ratio of the 90^{th} to the 50^{th} percentile of wages. This gives a measure of the upper half of the wage distribution.	Annual Survey of Hours and Earnings (ASHE)
Ratio 50 / 10	Ratio of the 50^{th} to the 10^{th} percentile of wages. This gives a measure of the bottom half of the wage distribution.	Annual Survey of Hours and Earnings (ASHE)
Control variables		
Median Pay	Median wage amongst full-time workers	Annual Survey of Hours and Earnings (ASHE)
Employees (ln)	Total employees (natural log)	Business Register and Employment Survey (BRES)
NVQ 4 + (%)	Share of workers qualified to NVQ 4 and above	Annual Population Survey (APS)
Foreign Born (%)	Share of population born outside the UK	Annual Population Survey (APS)
Aged 35 -50 (%) (%)	Share of workforce aged between 35 and 50	Annual Population Survey (APS)
Public sector (%)	Share of workforce in public sector	Business Register and Employment Survey (BRES)
Financial services (%)	Share of workforce in financial services	Business Register and Employment Survey (BRES)

Table 4. Correlation matrix

	Gini	Polarisation	Ratio 90/10	Ratio 90/50	Ratio 50/10	Median pay	Employment (ln)	NVQ 4+ (%)	Foreign born (%)	Aged 35 -50 (%)	Public sector (%)	Financial services (%)
Gini	1.0000											
Polarisation	0.5401 *** (0.0000)	1.0000										
Ratio 90/10	0.8785 *** (0.0000)	0.5725 *** (0.0000)	1.0000									
Ratio 90/50	0.8001 *** (0.0000)	0.5535 *** (0.0000)	0.8354 *** (0.0000)	1.0000								
Ratio 50/10	0.7161 *** (0.0000)	0.4267 *** (0.0000)	0.8737 *** (0.0000)	0.4645 *** (0.0002)	1.0000							
Median pay	0.7264 *** (0.0000)	0.5070 *** (0.0000)	0.8801 *** (0.0000)	0.5804 *** (0.0000)	0.9010 *** (0.0000)	1.0000						
Employment (ln)	0.5178 *** (0.0000)	0.2026 (0.1205)	0.5065 *** (0.0000)	0.3963 *** (0.0017)	0.4578 *** (0.0002)	0.6009 *** (0.0000)	1.0000					
NVQ 4+ (%)	0.5080 *** (0.0000)	0.3489 *** (0.0063)	0.6341 *** (0.0000)	0.4936 *** (0.0063)	0.5813 *** (0.0000)	0.6808 *** (0.0001)	0.4466 *** (0.0003)	1.0000				
Foreign born (%)	0.5565 *** (0.0000)	0.2807 ** (0.0298)	0.6097 *** (0.0000)	0.4368 *** (0.0000)	0.5823 *** (0.0000)	0.6568 *** (0.0000)	0.6185 *** (0.0000)	0.5697 *** (0.0000)	1.0000			
Aged 35 -50 (%)	0.3292 **	0.3772 *** (0.0030)	0.3616 ***	0.2380 *	0.3847 ***	0.3476 ***	-0.0436 (0.7406)	0.2366 *	0.0175 (0.8947)	1.0000		

	(0.0102)		(0.0045)	(0.0671)	(0.0024)	(0.0065)		(0.0688)				
Public sector (%)	-0.2998 **	-0.3016 ** (0.0192)	-0.2875 **	-0.2568 **	-0.2330 *	-0.2361 *	0.0484 (0.7135)	0.0962 (0.4646)	-0.3271 *	-0.2598 **	1.0000	
	(0.0200)		(0.0259)	(0.0476)	(0.0732)	(0.0694)			(0.0107)	(0.0450)		
Financial services (%)	0.2000 (0.1256)	0.2703 ** (0.0367)	0.2297 *	0.3007 **	0.1045 (0.4268)	0.2554 *	0.3962 ** (0.0017)	0.3601 ***	0.3317 ***	0.0093 (0.8882)	-0.1226 (0.3505)	1.0000
			(0.0775)	(0.0196)		(0.0489)		(0.0047)	(0.0096)			

60 Observations. P-value in parenthesis
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Inequality and employment polarisation in British cities

.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable:	Gini	Gini	Gini	Gini	Gini	Polarisation	Polarisation	Polarisation	Polarisation	Polarisation
Median pay	0.000375***				0.000214**	0.000217***				0.000190
	(4.15e-05)				(8.21e-05)	(4.66e-05)				(0.00012 6)
Employees (ln)		0.0153***		0.0121***	0.00727		0.00496		0.00238	-0.00191
		(0.00214)		(0.00342)	(0.00464)		(0.00316)		(0.00221)	(0.00433)
NVQ 4+ (%)			0.157***	0.0982	0.0389			0.0892***	0.0660	0.0132
			(0.0327)	(0.0621)	(0.0730)			(0.0270)	(0.0436)	(0.0445)
Foreign Born (%)				0.0242	0.00669				-0.0198	-0.0353
				(0.0825)	(0.0763)				(0.0465)	(0.0472)
Aged 35-50 (%)				0.194	0.114				0.218**	0.146*
				(0.113)	(0.120)				(0.0698)	(0.0735)
Public sector (%)				-0.167*	-0.114				-0.126	-0.0782
				(0.0831)	(0.102)				(0.0700)	(0.0554)
Financial services (%)				-0.00136	-0.000801				0.00120*	0.00170***
				(0.00085 2)	(0.00089 4)				(0.00065 2)	(0.00048 2)
Constant	0.124***	0.0895***	0.220***	0.0744	0.0802	0.335***	0.363***	0.392***	0.329***	0.334***
	(0.0176)	(0.0254)	(0.0121)	(0.0502)	(0.0468)	(0.0178)	(0.0390)	(0.00993)	(0.0331)	(0.0301)

Observations	60	60	60	60	60	60	60	60	60	60
R-squared	0.528	0.268	0.258	0.535	0.584	0.257	0.041	0.122	0.306	0.363

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6. Wage ratios in British cities

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	R9010	R9010	R9050	R9050	R5010	R5010
Median pay		0.00561***		0.000688		0.00222***
		(0.000745)		(0.000506)		(0.000381)
Employees (ln)	0.133***	0.00608	0.0369*	0.0214	0.0348**	-0.0153
	(0.0394)	(0.0444)	(0.0199)	(0.0273)	(0.0123)	(0.0125)
NVQ4+ (%)	2.117**	0.561	0.624*	0.433	0.526**	-0.0906
	(0.796)	(0.750)	(0.310)	(0.372)	(0.175)	(0.128)
Foreign Born (%)	-0.532	-0.0734	0.149	0.205	-0.368**	-0.186*
	(0.828)	(0.680)	(0.461)	(0.429)	(0.127)	(0.0969)
Aged 35-50 (%)	2.767	0.661	0.338	0.0793	1.160***	0.326
	(1.691)	(1.454)	(0.685)	(0.738)	(0.337)	(0.294)
Public sector (%)	-2.339**	-0.929	-0.849*	-0.676	-0.441	0.118
	(0.957)	(0.851)	(0.424)	(0.489)	(0.262)	(0.136)
Financial services (%)	-0.0188	-0.00422	0.00177	0.00356	-0.0105**	-0.00476
	(0.0126)	(0.0145)	(0.00705)	(0.00720)	(0.00344)	(0.00301)
Constant	1.083	0.776	1.256*	1.218*	1.127***	1.006***
	(1.178)	(0.985)	(0.669)	(0.647)	(0.252)	(0.132)
Observations	60	60	60	60	60	60
R-squared	0.632	0.790	0.386	0.408	0.579	0.839

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[i] The cities are: Aberdeen, Barnsley, Birmingham, Blackburn, Blackpool, Bolton, Bournemouth, Bradford, Brighton, Bristol, Burnley, Cambridge, Cardiff, Coventry, Crawley, Derby, Doncaster, Edinburgh, Glasgow, Gloucester, Grimsby, Guildford & Aldershot, Hastings, Huddersfield, Hull, Ipswich, Leeds, Leicester, Liverpool, London, Luton & Watford, Maidstone & North Kent, Manchester, Mansfield, Middlesborough & Stockton, Milton Keynes & Aylesbury, Newcastle & Durham, Northampton, Norwich, Nottingham, Oxford, Peterborough, Plymouth, Portsmouth, Preston, Reading & Bracknell, Rochdale & Oldham, Sheffield & Rotherham, Southampton, Southend & Brentwood, Stoke, Sunderland, Swansea, Swindon, Telford, Wakefield & Castleford, Warrington & Wigan, Wirral & Ellesmere Port, Worthing, York.

[ii] All inequality measures are calculated using the Stata INEQDECO programme developed by Stephen Jenkins (JENKINS, 1999)

[iii] Running simple correlations between the Gini coefficient and both upper-tail (90/50) and lower-tail (50/10) inequality suggests a stronger relationship for the former (correlation coefficient = 0.8) than the latter (0.7), although both are statistically significant.

[iv] Note that collinearity, one potential reason of the insignificance of these variables, is not a problem according to standard diagnostic tests. The mean variance inflation factor (VIF) is only 2.38, well below the common rule of thumb of 7. The highest VIF is 3.21 for the Median Wage variable.