Neighbourhood gentrification, displacement and poverty dynamics in post-recession England

Abstract

A recent 'return to the city' by middle-class professionals in England, the increasing 'suburbanisation' of poverty and an ongoing housing crisis has increased the salience of concerns about neighbourhood gentrification via the involuntary displacement of established working class residents. This paper reports a systematic analysis of gentrification and income poverty in England that adopts innovative methodological approaches: a multivariate index of gentrification; propensity score matching to establish a comparison group; and sensitivity testing with respect to different 'gentrification' definitions. The paper investigates three possible theoretical processes that could have driven the observed decline in income poverty rates in gentrifying areas: inward mobility to areas, outward mobility from areas and *in-situ* changes in poverty status. The post-recession period 2010-2014 is studied using data from the UK Household Longitudinal Study. There is good evidence from aggregate and individual-level analyses for a relationship between *inward* mobility, poverty status and area gentrification. In addition, people moving to gentrifying areas were more likely to have a university degree and more likely to be in the professional occupational class than people who moved to non-gentrifying comparison areas. On the other hand, no such relationships are found for *outward* mobility. The strongest evidence is found for 'exclusionary displacement' (the restricted ability of low income households to move in to an area) rather than 'direct displacement' (increased outward mobility of existing residents) as the dominant driver of gentrification in this period.

Publication details

Keywords

gentrification, residential mobility, migration, neighbourhood change, poverty dynamics, longitudinal analysis

Conflict of interest statement

The author has no conflicts of interest to declare.

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Introduction

With a 'return to the city' in the last 20 years increasing the population of young professionals living in central urban areas (Rae, 2013), accompanied by observations that poverty is increasingly 'suburbanised' (Bailey and Minton, 2017) and an ongoing 'housing crisis' in which secure and decent housing is more difficult to access (Dorling, 2014), concerns about the ill-effects of gentrification on established working class communities in England are highly salient. Gentrifying areas which had previously been home to low income, working class residents have sharply falling rates of poverty (Fenton, 2016), assumed to be evidence that low income households are being forced to leave their homes as a result of rising rental prices, evictions by unscrupulous landlords or social housing demolition by entrepreneurial public bodies.

The phenomenon of gentrification has been studied at a small scale by many qualitative researchers who have documented some of these processes. Large scale quantitative studies of the US and mainland Europe have attempted to disentangle the role of different processes in gentrification (e.g. Freeman, 2005; Hochstenbach and van Gent, 2015) but despite the widespread interest there are few examples of a comprehensive analysis of gentrification processes in the UK. Much attention has been paid to the role of forced outward residential mobility from areas as gentrification occurs, yet there are other ways in which changes in the population composition of a neighbourhood can occur. Where neighbourhood characteristics remain static, it means that the type of people leaving an area are similar to the type of people who arrive in their place. Consequently, neighbourhood change can occur when one or both of the inward and outward flows change, creating an imbalance. Neighbourhood composition can also be altered by in-situ changes in population characteristics, for example a reduction in the incidence of poverty due to improved labour market conditions.

This paper reports a systematic analysis of gentrification and income poverty in England in the post-recession period. It adopts a number of innovative methodological approaches: a multivariate index of gentrification; propensity score matching to establish a comparison group of non-gentrifying areas; and testing the sensitivity of findings to a variety of different 'gentrification' definitions. Drawing upon the observation that many gentrifying areas have seen a decline in income poverty rates, it investigates three possible theoretical processes that could

have driven this change: inward mobility to areas, outward mobility from areas and *in-situ* changes in poverty status over time.

Gentrification and displacement: definitions and empirical findings

Since Ruth Glass coined the term gentrification over 50 years ago (Glass, 1964), a large literature has developed which has explored the nature, causes, processes and consequences of the phenomenon. The 'classic' gentrification that Ruth Glass wrote about was characterised by middle-class households moving in to upgrade old, rundown housing in inner-city urban areas, changing the tenure of housing from rented to owner-occupied and the composition of the area from working-class to middle-class (Lees et al., 2008: 10-30). Scholars have broadened out the term to include new-build housing in previously working-class areas (Davidson and Lees, 2010), rural and suburban areas, gentrification via the rental market, and state-led rather than market-led processes (Hochstenbach, 2016). This makes gentrification '*a slippery term*' (Lees et al., 2008: 3) with multiple competing definitions. Perhaps in acknowledgement, many take a broad view of the nature and location of phenomena that can be termed gentrification:

'a class-based phenomenon whereby lower-status neighbourhoods change to higher-status ones' (Freeman et al., 2016: 2803)

'the transformation of a working-class or vacant area of a city into middle-class residential and/or commercial use' (Slater, 2009: 294)

'changes in the composition and character of urban localities in favour of newer residents with more resources and at the expense of existing residents with fewer resources' (Fenton, 2016: 7)

Gentrification can be viewed positively, as a way to improve disadvantaged neighbourhoods by attracting investment and the spending power of higher income residents (Freeman, 2005), reduce vacancy rates, increase local tax revenues thereby increasing public investment, reduce suburban sprawl and increase social mix (Atkinson and Bridge, 2005: 5). It can also be viewed negatively as a source of community resentment and cause of population loss in other areas (*ibid.*). Central to the critical view of gentrification is the concern that it necessarily involves the

involuntary *displacement* of lower-income households from gentrifying areas that they previously called home (Slater, 2009). Ruth Glass' original work is the classic exposition of this:

'one by one, many of the working class quarters of London have been invaded by the middle classes…once this process of "gentrification" starts in a district it goes on rapidly until all or most of the original working class occupiers are displaced and the social character of the district is changed' (Glass, 1964)

Gentrification researchers have elaborated upon this simple idea of 'displacement', Marcuse (1985) distinguishing between *direct displacement* and indirect, *exclusionary displacement*. Direct displacement occurs where households are involuntarily displaced from the gentrifying area where they currently live, for example through unaffordable rent increases or eviction. Contemporary concerns are exemplified by the Heygate estate in South London, a social housing estate demolished to be replaced in part by high-cost private housing (Lees and Ferreri, 2016). Exclusionary displacement occurs where households are prevented from living in gentrifying areas where they would have previously sought housing. Direct displacement is thus characterised by a change in the composition of outward migrants; exclusionary displacement is characterised by a change in the composition of inward migrants.

Neighbourhood composition can change via three mechanisms (Hochstenbach, 2016): residential mobility patterns, *in-situ* changes (e.g. rising income or changing occupation) and demographic change (e.g. the ageing-out of working class residents). Vigdor et al. (2002) assert that gentrification can provide better employment opportunities for existing residents, promoting upward *in-situ* income mobility. Noting the generational shift from working-class to middle-class occupations Hamnett (2003) has proposed that gentrification has principally occurred by 'professionalisation', a benign demographic replacement of the older working class with a younger middle class.

Operationalised measurements of gentrification vary, frequently driven by the availability of data as much as theoretical considerations. Ruth Glass used change in housing tenure from rented to owner occupied to identify gentrification in London. As the middle class is typically associated with professional occupations, changing occupational structure within neighbourhoods is a

common measure (Atkinson, 2000; Freeman et al., 2016; Hamnett, 2003). Gentrification is associated with an increase in house prices and rents so these are also used as indicators (Freeman, 2005; Hamnett, 2003); and an increase in household incomes is also associated with more affluent residents, as an 'indicator of position in class relations' (Fenton, 2016: 9) so measures of income (Ellen and Regan, 2011; McKinnish et al., 2010) or the prevalence of income poverty (Fenton, 2016) have been used. In a study of residential choice in US cities, Clark and Rivers (2013) use a combination of housing tenure, housing value, poverty and lone parenthood to measure neighbourhood status. These measures differ according to whether they measure absolute change or relative change (e.g. in rank position); and for those that use relative change, whether changes are measured relative to the entire nation or a smaller subregion.

A number of quantitative studies have shown little relationship between gentrification and outward mobility (direct displacement) of lower income residents. The most recent UK study (Freeman et al., 2016) found no robust relationship between neighbourhood out mobility, gentrification and household income or class over the period 2001-2009 using the British Household Panel Survey. Similar findings have been reported in studies of the United States (Ellen and Regan, 2011; Freeman, 2005; McKinnish et al., 2010; Vigdor et al., 2002). Slater (2009) has suggested that these quantitative studies fail to take into account all possible displacement mechanisms and ignore household coping strategies, whilst Newman and Wyly (2006) have suggested that the strategies households employ to stay in neighbourhoods plus their limited alternative options can mask the impact of gentrification.

The passionate debate around the direct displacement effects of gentrification has meant there has been less empirical research studying other possible processes. Little attention has been paid to neighbourhood in-mobility, or exclusionary displacement. As population turnover is significant in most neighbourhood areas (Bailey and Livingston, 2007), the difference between a gentrifying and non-gentrifying neighbourhood could be the composition of in-migrants, not a change in out-mobility. In a study of US neighbourhoods, Freeman (2005) found that '*in-movers rather than out-movers are the driving force behind neighborhood change in gentrifying neighborhoods*'. Hochstenbach and Van Gent (2015) used Dutch population register data to examine the relative importance of different processes in gentrifying neighbourhoods of Amsterdam and Rotterdam. They found that residential mobility is much greater in magnitude

than *in-situ* changes or demographic processes, but has small net effects that mostly reproduce neighbourhood composition (*ibid.*: 1497). They also found that different processes dominated in different types of gentrifying neighbourhoods in the same city - there was no single gentrification process.

These different processes have yet to be examined in the literature on the UK. Existing quantitative gentrification research studies the period before the 2008/09 global financial crisis, since when such processes may have intensified: household incomes have stagnated (Hood and Waters, 2017), more low income households live in private rented housing (Tinson et al., 2016) and state subsidies for home rental costs have been restricted (Hills et al., 2016), such that it may have become more difficult for lower income households to access or remain in gentrifying neighbourhoods (Hamnett, 2010).

This paper builds upon the contribution of Freeman et al. (2016), who analysed outward residential mobility rates to measure displacement of lower income individuals from gentrifying areas in England and Wales in the period 2001-2009. They found no robust relationship between out-mobility rates for low income or working class individuals and gentrification, but did not examine the contribution of in-mobility rates or *in-situ* changes. Their study identifies gentrifying areas as those that changed relative to others in England measured by a single indicator (occupational class) over the period 2001-2011, and used longitudinal household survey data 2001-2009 to measure this. Their study is potentially hampered by the fact they may have been measuring the process before gentrification had occurred, as neighbourhood change could have occurred towards the end of the intercensal period. Freeman et al. (2016) use random effects models to estimate the 'effect' of gentrification at an individual level, controlling for other factors associated with residential mobility. They do not examine aggregate processes i.e. whether taken together, the mobility patterns of individuals in gentrifying and non-gentrifying areas are similar. Finally, they compare gentrifying areas to all 'non-gentrifying' areas, without establishing whether these areas are truly comparable. This paper seeks to build on their work by addressing some of these limitations.

Study aims, data and methods

This paper reports upon a systematic analysis of gentrification and income poverty in England in the post-recession period 2010 to 2014. Methodologically, it proposes a comprehensive index of gentrification measured with reference to local housing market areas rather than the nation as a whole. It uses propensity score matching to robustly identify a group of non-gentrifying areas with which valid comparisons of demographic processes can be made. Recognising that the classification of an area as gentrifying or not gentrifying is somewhat arbitrary, a number of different definitions are used to test the sensitivity of the findings.

Empirically the paper attempts to understand why previous quantitative studies have found little evidence of displacement in the form of out-mobility of lower income individuals. If this is not the process driving neighbourhood change, what process is the driver? Drawing upon the observation that many gentrifying areas have seen a decline in poverty rates, it focuses on income poverty as the characteristic of interest and investigates three possible theoretical processes that could have driven this change. The research questions ask whether between 2010 and 2014, when compared to non-gentrifying areas, were gentrifying areas associated with:

- higher outward mobility rates for income poor individuals?
- lower inward mobility rates for income poor individuals?
- higher rates of poverty exit, or lower rates of poverty entry?

Measuring neighbourhood status and gentrification

This paper broadly follows the approach of Freeman et al. (2016), treating gentrification as a class-based phenomenon involving neighbourhood transformation from lower to higher status in the residential hierarchy. Accepting this definition, the analyst has decisions to make about how to measure such a concept. Three questions raise their head: how to define neighbourhoods; within what reference area the status of that neighbourhood should be measured; and by what observables should status be determined.

The study pragmatically utilises Lower Super Output Areas (LSOAs) as proxies for neighbourhood, in common with many studies (Ham et al., 2013: 3). There are 32,844 LSOAs, used for the production of official statistics in England, that contained an average of 1,500

residents in 2001. The boundaries of these areas are relatively stable; they were first defined using data from the 2001 Census and redefined following the 2011 Census, but 95% of areas had the same boundaries between the two sets. Most of the changes were made by either splitting 2001 LSOAs into two or more, or merging two or more 2001 LSOAs into one. For areas that altered between 2001 and 2011, the method used in this study makes comparison between amalgamated areas. For example, some geographical areas were covered by a single LSOA in 2001 but by numerous LSOAs in 2011 (i.e. they were split between the two sets). In these cases, the observations in 2001 are compared to the aggregated observations for all the LSOAs that covered that area in 2011 (i.e. the 2011 LSOAs are merged into a single area for the purpose of comparison over time).

If the concept of a neighbourhood hierarchy is accepted, within what reference frame should neighbourhood status be assessed? The approach of Freeman et al. (2016) is to assess neighbourhood status with reference to all other neighbourhoods in England. Given that most residential moves are within short distances (Fielding, 2012) a more satisfactory approach is to assess neighbourhood status within a local housing market area, such that neighbourhood status is assessed with reference to alternative neighbourhoods into which a residential move could realistically be made. In this paper local housing market areas are approximated by 2011 Travel to Work Areas (TTWAs), areas defined by 2011 Census data such that the majority of people who work in the TTWA also live in it, and vice-versa. There are 149 TTWAs in England.

Six different indicators are used to measure neighbourhood (LSOA) status within the local housing market area (TTWA) in 2001 and 2011. Six indicators are used so that the measure is more robust to measurement error in any one of them. Three are indicators of low status: the income poverty rate, the proportion of people living in social rented housing and the proportion of adults in the lowest occupational classes. Three are indicators of high status: housing prices, the proportion of people living in owner-occupied housing and the proportion of adults in the highest occupational classes. Each LSOA is ranked within the TTWA according to the six indicators. Ranks are scaled from 0 (lowest status) to 1 (highest status). The equally-weighted average rank across the six indicators is used as a composite index of neighbourhood status in 2001 and 2011; it is a simple task to compute the change in status between the two time points.

Income poverty estimates are taken from the income domain of the English Indices of Deprivation 2004 and 2015 (Smith et al., 2015) with reference points of August 2001 and August 2012 respectively. Tenure and occupational class (NS-SEC) are derived from the 2001 and 2011 Censuses. The lowest occupational classes include routine and manual occupations; the highest occupational classes include higher managerial, administrative and professional occupations. The median house price within each LSOA was calculated for 2000-2002 and 2010-2012 using record-level 'price paid' data published by the UK Land Registry and the National Statistics Postcode Lookup file. Some of these measures were changed between the two time points: the state cash benefits upon which the Indices of Deprivation income domain is based changed over time; the Standard Occupational Classification (SOC) which forms the basis of NS-SEC also changed. Computing changes in rank rather than change in an absolute measure means that the status index is more robust to changes in these underlying measures, as well as enabling an assessment of status with reference to other local neighbourhoods.

This approach provides an indicator of neighbourhood rank within the local housing market area in 2001 and 2011, and consequently the change in rank over that period. Finally, the question arises of how to identify 'gentrifying' areas from these measures. Our definition demands that gentrifying areas should have initially been 'low status', and that they should be increasing their status. From an empirical point of view, there are trade-offs to be made in the choice of cutoff points for defining 'low status' and 'increased status'. To identify the largest possible differences between areas, we may wish to focus on the lowest status areas that have increased their status by a large amount. This may be counterproductive, as it may result in a very small sample size which is unable to robustly establish differences between area types. On the other hand, focusing on higher status areas that have increased their status by a smaller amount may reduce the difference between area types, making any such difference harder to detect in the sample. There is a trade-off between maximising the likely difference by focusing on a small population, and keeping the population large enough to minimise the uncertainty in the estimates.

To illustrate the main results, gentrifying areas are identified as those that were in the bottom 40% of neighbourhood ranks in 2001, and of these areas, were among the 10% of areas that had increased their rank the most between 2001 and 2011. In the results section below a number of

different cutoff points are utilised to explore the sensitivity of the findings to different definitions of 'gentrifying'.

Selecting comparison 'non-gentrifying' areas

Having described a method for selecting gentrifying areas, it is necessary to select 'non-gentrifying' areas to compare mobility patterns and poverty dynamics between them. One approach is to use all areas that began as lower status neighbourhoods but did not increase rank over time. The difficulty is that there is considerable heterogeneity within this large group of lower status neighbourhoods, making the comparison with gentrifying areas less meaningful. Rather, our comparison group should ideally consist of those areas that appear similar to gentrifying neighbourhoods, the only difference being their history of status change.

This paper uses a matching algorithm to select a comparison group of non-gentrifying neighbourhoods, implemented by the R package MatchIt (Ho et al., 2007). Matching is often used in quasi-experimental designs to select a 'control' group of subjects to compare to some 'treatment' group, aiming to achieve 'covariate balance' i.e. similarity in the observed covariates that may be related to the outcome of interest. There are a number of different approaches to achieving covariate balance (Morgan and Winship, 2014), but a 'nearest neighbour' approach (not to be confused with geographical nearest neighbour) is used in this study having been compared to alternative approaches available in MatchIt. This involves calculating a 'propensity score' for each LSOA, which is the probability of the LSOA being included in the group of 'gentrifying' neighbourhoods. The propensity score is calculated from a logistic regression model with gentrification status as the dependent variable and the observed characteristics (the six neighbourhood status variables plus age structure and TTWA) as predictors. These predictors are all measured in 2011, thus identifying a comparison group of neighbourhoods that, in 2011, were identical to gentrifying neighbourhoods with respect to these observed characteristics. The nearest neighbour algorithm selects the n non-gentrifying LSOAs that have the closest propensity score to each gentrifying LSOA. The value of n was set to achieve a total sample of approximately 20% of all LSOAs in England; consequently it varies with different values of the cutoff points described above.

Covariate balance is assessed by comparing the means of each covariate, conducting t-tests and calculating the 'standardised bias'. For each covariate the standardised bias is calculated as the difference in means between the gentrifying and comparison areas, divided by the pooled standard deviation (Eggers and Hainmueller, 2009). The average standardised bias is the mean across all covariates. These measures are compared before and after matching, to examine the degree to which the matching algorithm improves covariate balance.

Measuring residential mobility and poverty dynamics

Residential moves and changes in poverty status are observed via longitudinal household microdata sourced from the UK Household Longitudinal Study (UKHLS), also known as *Understanding Society* (University of Essex Institute of Economic and Social Research et al., 2016). UKHLS consists of a stratified and clustered random sample of 40,000 UK households that began in 2009 (Knies, 2016). Initial respondents to UKHLS have been shown to be geographically representative of the national population in terms of neighbourhood deprivation and demographics (Petersen and Rabe, 2013). The LSOA of residence for each UKHLS household at each interview was accessed on Special Licence conditions from the UK Data Archive.

This study utilises data from households in England at waves 2 to 5 of UKHLS. The interviews in each wave of UKHLS are conducted over two years, so wave 2 includes interviews conducted in 2010-11 and wave 5 covers interviews in 2013-14. Data from wave 1 is excluded for two reasons: first, the time point of interviews (2009-10) is before neighbourhood gentrification is observed to have been taking place (2011). Second, other studies (DWP, 2017b: 19) have discarded poverty transitions between the first two waves due to an artefactual rise in self-reported income between the first and second UKHLS interviews. This is postulated to be a result of 'dependent interviewing' (where respondents are reminded of a previous answer) and reduced concerns about sharing sensitive information (Fisher, 2019). Data from waves 6 and 7 of UKHLS are currently available, but these were excluded to keep the observation window (2010-2014) close to the time when gentrification was observed to have taken place (2011).

Poverty is defined here in relative terms as the '*inability to participate [in society] owing to a lack of resources*' (Nolan and Whelan, 1996: 188) and operationalised by means of a relative

income poverty measure. An individual is classified as being in income poverty if the net equivalised income of their household is below 60% of the median household income, the commonly used definition of the income poverty line (DWP, 2017a). Net income is income from all sources including government transfers, net of direct taxes (variable *w_hhnetinc3* in UKHLS) and before housing costs. Household income is equivalised according to the modified OECD scale to account for the higher income required by larger households to secure adequate living standards. Household incomes are calculated in January 2015 prices using a price deflator provided by the Office for National Statistics.

Only individuals with positive longitudinal weights at wave 5 are included in the study i.e. people who provided a survey response at each of the first five waves. The weights are used to adjust the estimates for panel attrition and differential sampling probabilities. People aged 66 years and over were excluded from the sample on the basis that people of pensionable age have rather different patterns of residential mobility and income dynamics from people in working age households.

Observing processes in gentrifying and non-gentrifying areas

Having acquired the data described above it is a simple task to identify when individuals move LSOA between waves, or when they enter or exit poverty. The question is, how to use this data to describe the processes operating in the gentrifying and matched comparison areas? One approach to this (utilised by Freeman et al., 2016) is to analyse the data at the level of individuals, describing the association (or more ambitiously, the causal relation) between residential mobility rates and gentrification, using regression models to control for individual characteristics. If we are interested in neighbourhood processes, we do not wish to control for individual characteristics - we wish to understand who is moving in and out of areas, leaving in any compositional effects, to understand what processes may be causing the neighbourhood composition to change.

This paper uses a variety of methods to interrogate the data. First, residential moves and poverty transitions are analysed at an aggregate level. UKHLS respondents living in gentrifying LSOAs are treated as being representative of the population living in such LSOAs (after using sample weights); respondents living in matched comparison areas are similarly treated as being

representative of the population living in those neighbourhoods. Outward mobility is estimated by selecting all those living in gentrifying or matched comparison areas in year t=0, and calculating the proportion who had moved out of the area by year t=1. Estimates are broken down by area type and poverty status at t=0 to enable comparisons. Inward mobility is estimated by selecting all those living in gentrifying or matched comparison areas in year t=1, and calculating the proportion who had moved in to the area in the year before. Poverty entrance and exit is calculated in an analogous fashion, using the UKHLS sample living in gentrifying or matched comparison areas in year t=0 and comparing their poverty status one year later. Second, this aggregate analysis is complemented by logistic regression models that include additional individual characteristics that are related to residential mobility propensities (albeit these should be accounted for by the matching process). The logistic regression analysis is then broken down by TTWA type to investigate geographic patterns. The four types used are London, large urban areas (Birmingham, Bristol, Leeds, Bradford, Liverpool, Manchester, Newcastle, Nottingham, Leicester, Sheffield), London hinterland (areas surrounding London in south-east England) and small urban/rural areas. Finally there is an aggregate analysis of the characteristics of people moving in to gentrifying and non-gentrifying areas: age, gender, living in a household with children, income poverty, housing tenure, occupational class, university education and ethnic group.

The UKHLS data was analysed using methods in the R package *survey* (Lumley, 2010) which applies weights and adjusts standard errors for clustering and stratification of the sample when estimating statistical models and conducting statistical tests. 95% confidence intervals are constructed to evaluate the statistical significance of differences between groups. Mutually exclusive confidence intervals are a conservative test of statistical significance (Schenker and Gentleman, 2001); Lumley (2010: 31) recommends an F test of bivariate association which is implemented in the *survey* package and reported in the text. The analysis was conducted in R version 3.4.3 (R Core Team, 2016) and the code is available at https://github.com/mfransham/2020-02-gentrification-displacement-PSaP.

Results

Gentrifying and non-gentrifying matched areas

<< Table 1 >>

The first step in constructing the index of neighbourhood status in 2001 and 2011, and consequently the index of neighbourhood change, was to rank each LSOA within its parent Travel to Work Area according to each of the six indicators. Table 1 shows the linear correlation between these indicators in 2011 for all 32,844 LSOAs in England. There is a very strong correlation between the income poverty rank and the other five indicator ranks of between 0.73 and 0.85. The lowest correlations are between the median house price and the indicators of tenure and occupation, but still moderately strong at between 0.51 and 0.57. In general the indicator ranks appear to be well correlated, such that in combination we would expect them to be measuring the same concept.

The mean change in the index of neighbourhood status for those LSOAs that were in the bottom four deciles of the neighbourhood ranking in 2001 was 0.003 with a standard deviation of 0.054. There is a right skew to the distribution (a chart is provided as supplementary material), with 106 LSOAs having large increases in rank of over 0.2. Cutoffs at 85, 90, 95 and 97.5 centiles are used to identify 'gentrifying' areas in various different definitions used in the sensitivity tests below. The base case used in the main results identifies gentrifying areas as the 40% lowest status areas in 2011 that had the 10% largest increase in rank between 2001 and 2011. This equates to 32,844 x 0.4 x 0.1 = 1,314 'gentrifying' LSOAs.

<< Table 2 >>

Table 2 shows the results of using the Matchit nearest neighbour algorithm to find a matched comparison group of non-gentrifying LSOAs. Each gentrifying LSOA was matched with four non-gentrifying LSOAs to generate a large enough sample for subsequent analysis. The gentrifying and matched comparison areas are compared to an unmatched comparison group, those LSOAs that were in the bottom four deciles of neighbourhood rank in 2001 but did not increase their rank more than the defined cutoff. The table shows the means of the variables on which the areas were matched and p-values from t-tests for significant differences in means between the characteristics of the gentrifying and matched comparison areas.

The unmatched comparison group is particularly different to the gentrifying areas on some characteristics: higher poverty rates, a lower proportion of people in professional occupations, a higher proportion in routine occupations, lower house prices and a lower proportion of people aged 16 to 44 years. The matched comparison group improves on these significantly, with very small differences remaining on all variables. Most of the t-tests show non-significant differences between the gentrifying and matched comparison areas. The t-tests for the neighbourhood rank in 2011 and proportion of people aged 0 to 15 years do indicate statistically significant differences, though the differences in means are very small at 0.01 and 0.4% respectively. Whether these statistically significant differences are of practical significance to the results is discussed later. The average standardised bias is 0.36 in the unmatched sample and 0.03 in the matched sample (a full plot is provided as supplementary material).

Residential mobility rates

<< Figure 1 >>

Figure 1 shows the average annual proportion of people who moved out of and into the matched sample of LSOAs between 2010 and 2014, by area type (gentrifying / non-gentrifying) and poverty status in the previous year (income poor / not income poor). There was a higher rate of outward mobility among income poor individuals compared to not income poor individuals. There was no difference between areas: income poor individuals were no more likely to move

out of gentrifying than non-gentrifying areas. Similarly, there was no difference for not income poor individuals.

Some differences are evident in inward mobility. Income poor people were less likely to move into gentrifying LSOAs than non-gentrifying comparison areas; and not income poor people were more likely to move into gentrifying LSOAs than matched comparison areas. F-tests of association indicate that the association between in-mobility and gentrification for income poor individuals is not statistically significant at the 95% level ($F(1|292)=3.01$, $p=0.084$). The association between in-mobility and gentrification for not income poor individuals is statistically significant ($F(1|782)=4.08$, $p=0.044$): not income poor individuals have a higher in-mobility rate to gentrifying areas compared to the matched comparison areas.

This simple analysis is extended in table 3, which shows the results from logistic regression models of the propensity to move in to a neighbourhood. The first model, which recovers the same estimates presented in figure 1, is a parsimonious model that includes area type (gentrifying / non-gentrifying), income poverty status and the interaction term between the two. This interaction term indicates whether moves in to a gentrifying area are associated with income poverty status. As can be seen in the table, this interaction term is negative and statistically significant at the 95% confidence level, indicating that there is such an association (confirming expectations from the F-tests above).

<< Table 3 >>

The second model in table 3 extends the first model by adding characteristics that are known to be associated with residential mobility propensity. The process of matching neighbourhood composition should have already ensured that the populations in gentrifying and non-gentrifying areas are similar with respect to these characteristics, but this analysis offers an additional check. As expected it shows that age, the presence of children and housing tenure are significant predictors of propensity to move, but the interaction term between poverty status and gentrification remains statistically significant, reassurance that the matching process has done its job.

The third model explores the relationship between area gentrification, income poverty, moves and housing tenure, by introducing a three-way interaction term. None of the three-way interaction terms are statistically significant. This means that there is little evidence to support the proposition that propensity to move in to gentrifying areas is associated with housing tenure type, over and above the other characteristics already included in the model. The interaction term between income poverty and area gentrification remains statistically significant in this third model. A notable feature of these three models is that area gentrification is a significant predictor of moves in to an area. This suggests that gentrifying areas are more likely to have had moves in to the area than non-gentrifying areas. A fourth model was also run (not shown for brevity) that included interaction terms between income poverty, area gentrification and ethnic group; the interaction terms in this model were not significant, suggesting little evidence of a stratification of patterns by ethnic group.

These same three models were run for the propensity to move out of areas. The results (provided as supplementary material) show that there is no association between income poverty and area gentrification for moves out of areas in any of the model specifications.

<< Table 4 >>

To investigate whether there are any specific geographic patterns within this aggregate picture, table 4 shows the simple model specification broken down by Travel to Work Area (TTWA) type. For three of the four TTWA types the interaction term is a similar size or larger than in the aggregate model presented in table 3. However because of reduced sample size the standard error of these estimates is approximately doubled, with the result that only one of the interaction terms (for the 'large urban' TTWA type) is statistically significant at the 95% level. A table of results for models of outward moves by TTWA type (provided as supplementary material) shows the same conclusion as the aggregate models, that there is no association in any of the TTWA types between income poverty and area gentrification for moves out of areas.

<< Figure 2 >>

Figure 2 shows estimates of the characteristics of the population observed to move in to gentrifying and non-gentrifying areas. It shows that there are statistically significant differences by income poverty, occupational class and degree-level qualifications in the population who move in, by area type. 14.7% (9.3-20.0) of people who moved in to gentrifying areas lived in households with incomes below the poverty line, compared to 23.1% (18.9-27.3) of people who moved in to non-gentrifying areas. 51.2% (41.0-61.5) of people who moved to gentrifying areas were in the professional occupational class compared to 41.9% (36.9-46.9) of people who moved to non-gentrifying areas; for people in the routine occupational class these figures were 23.5% (15.1-31.9) and 30.1% (25.4-34.9) respectively. People moving in to gentrifying areas were also more likely to be a university graduate - 41.9% (31.9-51.9) of inward movers had a degree, compared to 28.4% (24.0-32.9) of people who moved to non-gentrifying areas. There are no statistically significant differences between the two populations in age, sex, living in a household with children, housing tenure or ethnic group (collapsed here into White British and other for reasons of sample size).

Conversely there are no statistically significant differences in the characteristics of the populations observed to move out of gentrifying and non-gentrifying areas. A similar chart to figure 2 for the characteristics of outmovers is provided as supplementary material.

Sensitivity analysis: residential mobility rates

<< Figure 3 >>

To investigate the sensitivity of these results to the definition of 'gentrifying area', figure 3 shows how the coefficient on the interaction term between income poverty and gentrification status varies according to different cutoffs used to identify gentrifying LSOAs. The model used in these estimates is the simple logistic regression model including income poverty and

gentrification status (i.e. model 1 in table 3), with results from separate models of in-mobility and out-mobility shown. The base case reported in the main results is in the middle of the charts, labelled (0.4, 0.1): areas in the bottom four deciles in 2001 that were in the 10% of areas with the largest increase in neighbourhood rank. Other cutoffs are labelled similarly: for example, the case labelled (0.3, 0.025) identifies areas in the bottom three deciles in 2001 that were in the 2.5% of areas with the largest increase in neighbourhood rank. The figure plots the point estimate of the interaction term coefficient along with a 95% confidence interval.

The out-mobility results show that there is no evidence of an association between income poverty and area gentrification in terms of propensity to move out of an area, regardless of the definition of gentrification used. All of the confidence intervals around the coefficient estimates overlap with zero, and the point estimates appear fairly randomly scattered about zero.

There are quite different results for in-mobility. All of the point estimates of the interaction term coefficient are negative, and six of the twelve are statistically significant at the 95% level. For the broadest definition of gentrification as areas starting in the bottom 50% of neighbourhood ranks, none of the model interaction coefficients are statistically significant. As the definitions focus more tightly upon those areas with the largest changes in rank we would expect the coefficients to become larger, as those areas which have had the largest increases in rank might also have had the largest difference in mobility patterns. This is indeed what is observed, but we can see quite clearly the trade-off in the gentrification definitions - the coefficients become larger, but this comes at the expense of larger standard errors as the sample size becomes smaller.

This pattern could also be an artefact of the declining efficiency of the matching process as the gentrification definition narrows. As the number of gentrifying LSOAs decreases, it becomes more difficult to find sufficient close matches to gain a large enough total sample of LSOAs. For example, the average standardised bias for the base case matched sample is (as reported above) 0.03, but it rises to 0.09 and 0.17 for cutoffs of the highest 5% and 2.5% of rank rises respectively. The increasing difference in mobility rates could therefore be due to increased differences in the underlying characteristics of the comparison group.

Sensitivity analysis of the pairwise F-tests presented in figure 1 is provided as supplementary material; it illustrates similar patterns though with fewer statistically significant results.

Poverty dynamics in gentrifying neighbourhoods

<< Figure 4 >>

Figure 4 shows the proportion of people in income poverty in year t by area type and poverty status in year t-1, averaged over 2010-2014. The upper set of bars shows the proportion of people income poor in one year who were still in poverty the following year. There was no difference in one year poverty persistence between people who were living in gentrifying compared to non-gentrifying areas. The lower set of bars shows the proportion of people not income poor in one year who were income poor the following year i.e. rates of annual poverty entry. This indicates that people who lived in gentrifying areas were more likely to enter poverty in any given year (0.142, CI 0.119-0.165) than people living in non-gentrifying areas (0.105, CI 0.094-0.116). An F-test of association shows that this is highly statistically significant (F(1|786)=9.45, p=0.002).

<< Figure 5 >>

Figure 5 shows how these findings are affected by changes to the cutoffs used to define gentrification, the analogous analysis to that undertaken for residential mobility rates. The findings with respect to poverty persistence are unaltered - none of the differences in poverty persistence between gentrifying and matched comparison areas are statistically significant. The story is different for poverty entry; of the 5%/10%/15% definitions, 7 of 9 estimates are statistically significant. The p-values for estimates where gentrification is defined by the 2.5% of areas with the largest change in rank are very large, which may be due to the small sample sizes involved. There appears to be some evidence of higher poverty entry rates in gentrifying areas, but this conclusion is sensitive to the choice of gentrifying areas.

Discussion

Using a variety of definitions, this paper identifies a set of neighbourhoods that between 2001 and 2011 had increased their rank in the local neighbourhood hierarchy ('gentrified'), and compares these neighbourhoods to areas that were similar in 2011 but had not changed in status over this time. Using data from the UK Household Longitudinal Study and the observation that many gentrifying areas have declining rates of income poverty, it compares demographic processes in these two sets of areas with the aim of establishing what it is in these areas that causes poverty rates in one to decline, and in the other to remain relatively stable. This could be caused by a higher rate of mobility of poor individuals out of these areas (*direct displacement*), a lower rate of in-mobility of poor individuals into these areas (*exclusionary displacement*), or a higher rate of *in-situ* poverty exit. Each of these three processes are systematically examined.

This paper finds that, of these possible processes, there is strongest evidence for a difference in the composition of incomers to an area as the driver of neighbourhood change. Logistic regression models of the propensity to move out of an area contingent on poverty status and area gentrification consistently show that there is no evidence of increased outward mobility of income poor individuals from gentrifying compared to non-gentrifying areas. This finding is robust to different specifications of the models and different definitions of gentrification. Conversely, logistic regression models of the propensity to move in show that there is good evidence for a relationship between inward mobility, poverty status and area gentrification. This finding is somewhat sensitive to the choice of cutoffs used to categorise gentrifying areas, but the findings appear promising and strongest for the more narrowly focused definitions of gentrification. Pairwise F-tests that investigate whether this is due to higher inward mobility of not income poor people or lower inward mobility of income poor people are less definitive, but suggest that both mechanisms may be at work. This conclusion about the role of inward mobility is strengthened by the finding that people moving to gentrifying areas are less likely to be income poor, more likely to have a university degree and more likely to be in the professional occupational class than people moving to non-gentrifying areas.

The unexpected finding of this paper is the evidence that poverty entry rates may be higher in gentrifying than non-gentrifying areas. This is in the opposite direction to that theoretically expected: if an area is climbing in neighbourhood status, and income poverty is falling, we might

expect net poverty reduction *in-situ* (via lower rates of poverty entry or higher rates of poverty exit) to be involved. In the base case for analysis, areas identified as gentrifying in 2011 had an average income poverty rate of 21%, whereas in 2001 it had been 27% (for matched comparison areas it was 21% and 22%). It is possible that labour markets in and near gentrifying areas have greater insecurity, consequently leading to greater rates of poverty entry; or that the residents who remain during the process of gentrification are more vulnerable to poverty entry than those in comparable non-gentrifying areas.

One of the limitations of this study is that it assumes that the processes that occurred in gentrifying areas between 2001 and 2011 were still occurring in the observation window 2010-2014. It is possible that direct displacement had taken place earlier in the gentrification process, and therefore was unobserved by this study. In addition, the results presented here are an average over all processes in all gentrifying areas: it is likely that such processes are heterogenous, leaving open the possibility that while the dominant average process is exclusionary displacement, direct displacement does occur in some places at some times. Similarly, this paper examines a particular window of time, a historically atypical period of post-recession stagnation in household incomes following the global financial crisis; the findings could plausibly be different in other periods. Replicating the method in this paper using data from the British Household Panel Survey from 1991 to 2008 may be able to illuminate this question.

This paper makes a number of methodological contributions including the application of the UKHLS to the study of gentrification processes and the use of matching methods to compare processes between areas. One question to ask is whether sample attrition from the UKHLS - the progressive loss of the sample over time - is likely to bias the findings of this paper, particularly given that sample attrition can be associated with moving home. This bias would occur if income poor people moving into gentrifying areas were more likely to leave the UKHLS sample than people moving in to non-gentrifying areas (controlling for demographic observables related to attrition); and if not income poor people moving into gentrifying areas were less likely to leave the UKHLS sample than people moving into non-gentrifying areas. It is difficult to imagine plausible scenarios as to why these patterns would explain the tentative findings described above.

Another question to ask is whether the imperfect matching of areas could influence the results. In the base case presented above, two of the t-tests for difference in means were statistically

significant, though in practical terms the differences were very small - the matched comparison group had 0.01 lower mean neighbourhood rank in 2011 and 0.4 percentage points higher mean proportion of 0 to 15 year-olds. Poverty entry rates are higher in higher poverty areas, so if anything this may have slightly reduced the difference between gentrifying and non-gentrifying areas rather than increased it. A higher proportion of 0 to 15 years olds (and consequently a lower proportion of over 45 year-olds) would suggest a slightly higher rate of mobility in non-gentrifying areas, though we would expect this difference in both inward and outward mobility - the fact that differences are only evident in one of these flows suggests that the impact of slightly different age structures is relatively small.

An ancillary finding from the logistic regression analyses is that area gentrification is a significant predictor of moves into an area over this period. This suggests that there may have been a higher overall rate of inward movement into gentrifying compared to non-gentrifying areas, and points to the role of processes of 'dilution' that are taking place alongside exclusionary displacement. As reported by Rae (2013), the residential areas of large cities have seen significant population growth in the past two decades. Compositional change is in part taking place due to a rise in the total population, where the incoming population is different in characteristics to the established population, thus 'diluting' its characteristics. One such example is so-called 'new-build gentrification' (Davidson and Lees, 2010). This kind of population 'dilution' may also be involved in other socio-demographic shifts such as change in ethnic group composition.

Conclusion

To summarise the findings on residential mobility patterns: using a different methodology, a different dataset and a different time period, this study replicates the result of Freeman et al. (2016) that there is no evidence of direct displacement of low income individuals from gentrifying areas. In answer to the puzzle of what, then, is driving the process of neighbourhood change, the analysis presented above finds good evidence that it is a change in the composition of incomers to an area that is the strongest driver, or what might be termed exclusionary displacement.

An obvious question is how this finding relates to numerous small-scale qualitative studies that do find evidence of direct displacement of existing residents through, for example, the demolition of social housing such as the Heygate estate in London (Lees, 2014). Do the findings outlined in this systematic analysis of gentrification in England invalidate the findings of qualitative case studies; or vice-versa, do the qualitative studies cast doubt on the conclusions drawn here? In the absence of the detailed data required to conduct quantitative case studies, these two types of studies should be viewed as complementary rather than in opposition. Whilst there is strong evidence that exclusionary displacement is the dominant process in gentrification, it cannot be asserted that it is the only one - there is clear case study evidence of housing injustice faced by some existing residents in processes of gentrification. That said, the assertion that neighbourhood gentrification necessarily involves the direct displacement of existing residents cannot be unquestioningly supported.

It is often asserted in policy and media discussion that direct displacement - the involuntary displacement of people from their homes - is the most egregious aspect of gentrification (Slater, 2009). Even if gentrification typically proceeds via exclusionary rather than direct displacement, or via processes of 'dilution', there are still negative welfare impacts that should concern us. Exclusionary displacement may have an impact on people who in the absence of gentrification may have moved to gentrifying areas, and upon those long-term residents who remain. This study leaves open the question of where people who are not moving to gentrifying areas are moving to instead. It may be that these people are displaced to areas that are further from labour market opportunities and/or have poorer services and amenities. For long-term residents who remain, it is likely that neighbourhood change reduces some sources of social welfare but creates others. There may be some positive impacts via an increase in 'middle-class voice' and reduced territorial stigmatisation. On the other hand, it may lead to services and facilities being targeted at higher-income individuals, leading to a decline in the facilities for people living on lower incomes and an erosion of the support derived from social networks of people in similar situations. Urban and housing policy has a large role to play in mediating these welfare impacts by intervening in the housing market to increase the availability of secure and decent housing.

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Tables

Table 1 Linear correlation between six neighbourhood status indicators measured in 2011, all LSOAs in England

	Poverty	Professional	Routine	House prices	Owner occ.	Social rent
Poverty	1.00					
Professional	0.78	1.00				
Routine	0.85	0.90	1.00			
House prices	0.73	0.79	0.82	1.00		
Owner occ.	0.80	0.56	0.57	0.55	1.00	
Social rent	0.83	0.62	0.66	0.51	0.83	1

Table 2 Means of matching characteristics in 2011 for gentrifying areas, matched comparison areas and unmatched comparison areas

Variable	Gentrifying areas	Matched comp.	Unmatched comp.	t-tests
Poverty	20.8	21.2	24.7	0.21
Professional occupations	25.0	24.6	19.3	0.24
Routine occupations	43.0	43.8	51.3	0.05
House prices	181000	182100	136300	0.75
Owner occupation	45.4	45.6	47.0	0.78
Social rented	30.4	30.7	33.3	0.65
Neighbourhood rank	0.34	0.33	0.21	0.01
Aged 0-15	20.1	20.5	21.2	0.03
Aged 16-24	14.5	14.3	12.9	0.31
Aged 25-44	33.0	32.6	28.8	0.2

Table 3: Logistic regression models of propensity to have moved to the neighbourhood

	Model 1	Model 2	Model 3
(Intercept)	−2.42***	−1.66***	−1.65***
	(0.06)	(0.13)	(0.13)
Gentrifying area	0.26*	0.34*	0.34*
	(0.13)	(0.14)	(0.14)
Income poor	0.12	0.17	0.17
	(0.13)	(0.13)	(0.13)
Gentrifying area.income poor	−0.66*	−0.83**	−1.87*
	(0.26)	(0.27)	(0.74)
Female		0.14*	0.14*
		(0.06)	(0.06)
Age		−0.03***	−0.03***
		(0.00)	(0.00)
Children in household		−1.00***	−1.00***
		(0.12)	(0.12)
Tenure (base: owner occupied)			
Social rented		0.04	0.02
		(0.13)	(0.13)
Private rented		1.74***	1.72***
		(0.11)	(0.11)
Tenure interactions			
Gentrifying area.income poor.social rented			1.14
			(0.82)
Gentrifying area.income poor.private rented			1.24
			(0.80)
Deviance	13745	11984	11976
Dispersion	1.00	1.00	1.00
Num. obs.	20101	20014	20014

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$
Standard errors shown in brackets

Table 4: Logistic regression models of propensity to have moved to the neighbourhood, by travel to work area type

	London	Large urban	London hinterland	Smaller urban / rural
(Intercept)	-2.48***	-2.61***	-2.17***	-2.36***
	(-0.13)	(-0.11)	(-0.15)	(-0.1)
Gentrifying area	0.67**	0.61**	-0.55	-0.09
	(-0.23)	(-0.22)	(-0.37)	(-0.25)
Income poor	0.3	0.18	-0.01	0.06
	(-0.27)	(-0.21)	(-0.38)	(-0.21)
Gentrifying area.income poor	-0.48	-1.59**	0.34	-0.58
	(-0.44)	(-0.48)	(-0.77)	(-0.49)
Deviance	3983	4221	1736	3750
Dispersion	1	1	1	1
Num. obs.	5427	6732	2358	5584

***p < 0.001, ***p* < 0.01.
Standard errors shown in brackets

Figures
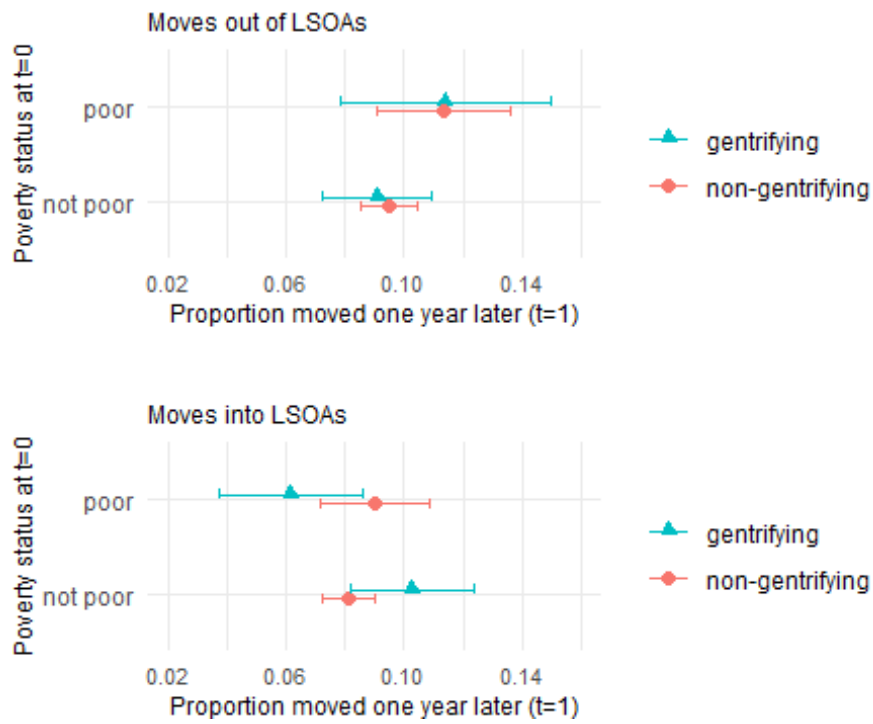
Figure 1 One-year mobility rates into and out of gentrifying and matched comparison areas, by poverty status in previous year
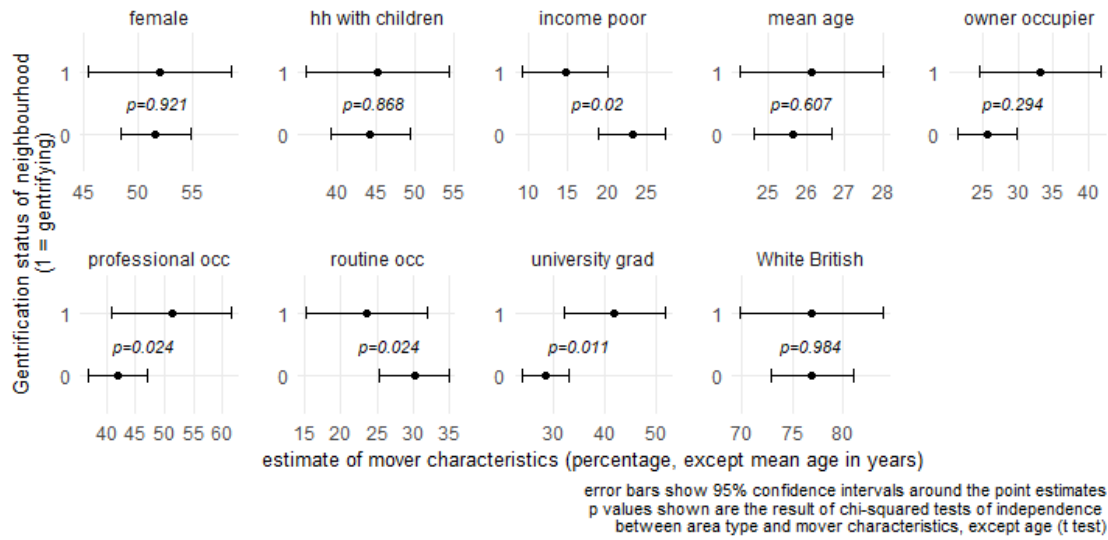
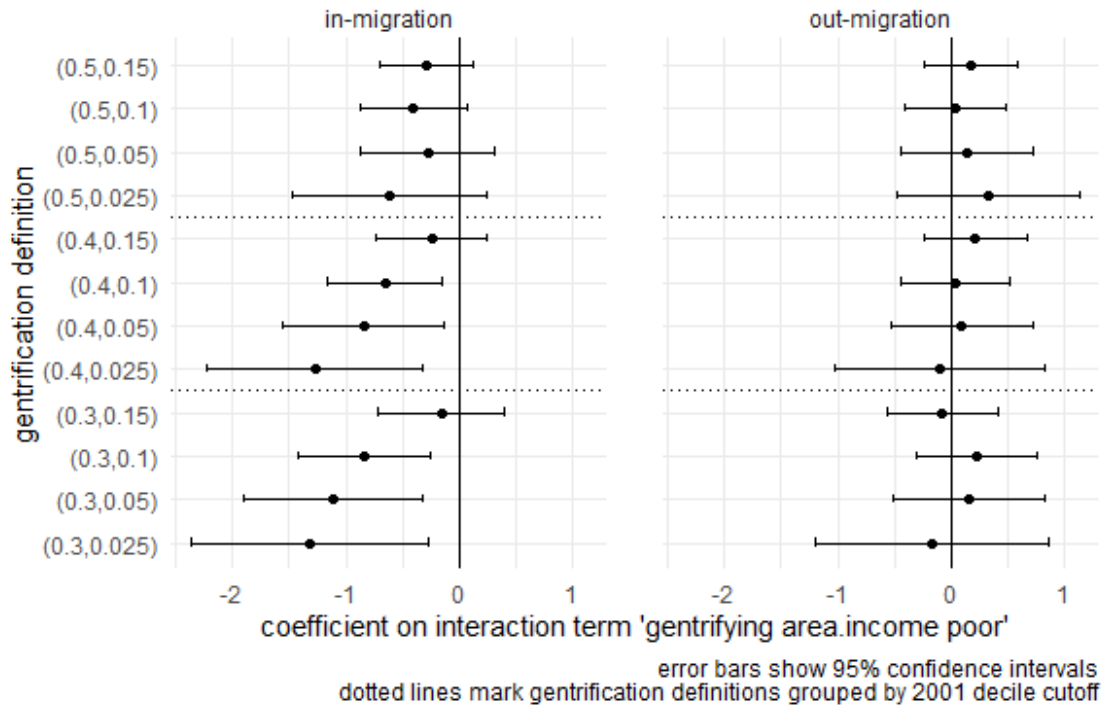*Figure 2 Characteristics of people moving in to areas*

Figure 3 Sensitivity analysis: point estimate and confidence interval for poverty x gentrification interaction term in logistic regression model, for different gentrification definitions
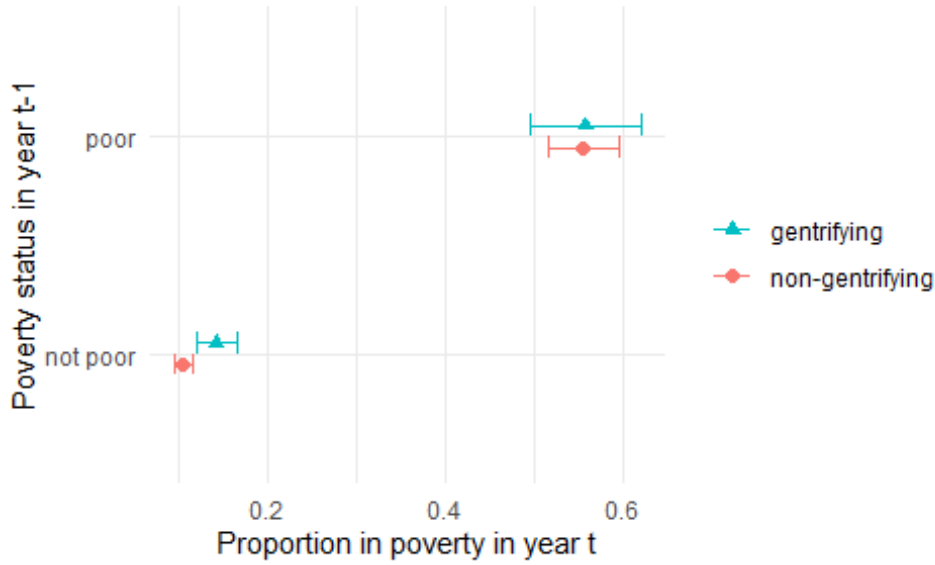
Figure 4 One-year poverty dynamics in gentrifying and matched comparison areas
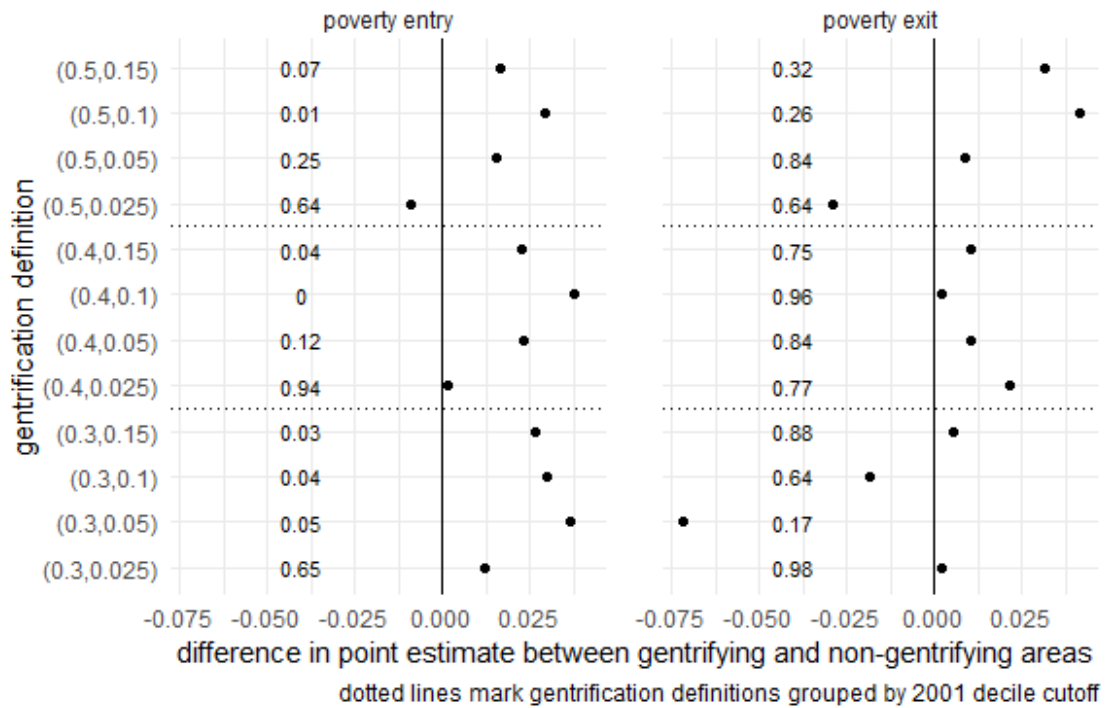

Figure 5 Poverty dynamics sensitivity analysis: point estimate and p-value for difference in poverty entry and exit rates between gentrifying and non-gentrifying areas, for different gentrification definitions