Are poorer residents being pushed out of city centres? Measuring the decentralisation of poverty in England and Wales

M. Zhang*[1] and G. Pryce[1]

[1]The Sheffield Methods Institute, Floor 2, ICOSS, 219 Portobello, Sheffield S1 4DP
*Email: meng_le.zhang@sheffield.ac.uk

Abstract

It is a stylised fact that the average incomes of residents in inner cities neighbourhoods are lower than those in the outlying suburbs. This result is true for most major American and European cities—with only a few exceptions (Rosenthal and Ross 2014). However, there are concerns that gentrification and urban regeneration are displacing poorer residents from inner city areas. Using the 2001 and 2011 UK census, we show that the *relative* concentration of benefit claimants in city centres has decreased but not as a direct result of displacement. Our work also addresses a major issue affecting measures of centrality: the existence of polycentric cities.

Keywords: Centralisation, Poverty, Gentrification, Spatial inequality

1. Introduction

The persistence of inner city poverty has been of concern for policy makers. However actions to break up the spatial concentration of poverty have been met with resistance (Slater 2006). The primary source of concern is that gentrification and urban regeneration are causing poorer resident to be priced out of inner city neighbourhoods. In 2010, former mayor Boris Johnson colourfully compared the then anticipated displacement of poorer residents from London to a 'Kosovo-style social cleansing' (Economist 2010). Inappropriate hyperbole aside, we believe that the potential displacement of poorer residents is of genuine concern. Inner cities areas typically have better transport links and more job opportunities than other areas; both qualities that are particularly advantageous for the poor.

We use areal data from the UK census and the Department of Work and Pensions to assess whether the concentration of poorer residents around city centres had changed in the ten year period between 2001 and 2011. Our indicator of poverty is the number of benefit claimants in an areal unit. We make use of two measure of centralisation: the Absolute Centralisation Index (ACI) and the Relative Centralisation Index (RCI). The former measures the concentration of a group around a centre point and the latter measures the concentration of a group around a centre point *relative* to another group. Both the ACI and RCI have a long history (Massey and Denton 1988). Recent advances have been made to derive credible intervals for the ACI and RCI using Bayesian spatial models (Kavanagh et al 2016). One traditional pitfall of the ACI and RCI is that they cannot account for the existence of polycentric cities. We will show how both centralisation measures can be generalised to incorporate the existence of multiple urban centres.

2. Measuring centralisation

We will first explain the RCI measure. In this paper we are concerned about the relative centralisation of benefit claimants compared to non-claimants. If the prevalence of poverty, as measured by claimant count, in zone k is Y_k, and where $k = 1,2 \dots K$ is an indexing number indicating a particular zone. X_k is the number of non-claimants in zone k. Each zone is ranked in terms of their distance d from a central point with the Kth zone being the furthest away from the centre whilst $k = 1$ indicates the zone closest to the centre. The number a_i indicates the cumulative proportion of people in poverty living in the i closest zones to the centre where:

$$a_i = \left(\sum_{k=1}^{i} Y_k \right) / \left(\sum_{k=1}^{K} Y_k \right)$$

The cumulative proportion of non-claimants b_i is derived in a similar way.

Figure 1 plots the cumulative proportion of claimants living near the centre (a_i) against the cumulative proportion of non-claimants (b_i). If claimants were just as likely as non-claimants to live near the city centre then the cumulative proportion of claimants ought to be equal to that of non-claimants ($a_i = b_i$) for all values of i. This is depicted by the 45 degree straight line in figure 1 which we shall call the line of equality. However, if the claimants were more likely to live near the city centre then we would get a curve that goes above the line of equality (as shown in the figure 1). The RCI measures the area between the curve and line of equality (shown in dark grey in figure 1) as a proportion of the entire area between the line of equality and the horizontal axis (which is always 0.5).

Unlike a normal proportion the RCI is signed; a positive value indicates relative centralisation for claimants whilst a negative value indicates that claimants are relatively decentralised compared to non-claimants.

For a given number of areal units, the formula for the RCI is:

$$\left(\frac{1}{2} \sum_{k=1}^{K} (b_i - b_{i-1})(a_i + a_{i-1}) - 0.5 \right) / 0.5$$

We can derive this after considering figure 1. The above can be simplified into:

$$\sum_{i=2}^{K} a_{i-1}b_i - \sum_{i=2}^{K} a_i b_{i-1}$$

Which is the commonly used expression for RCI.
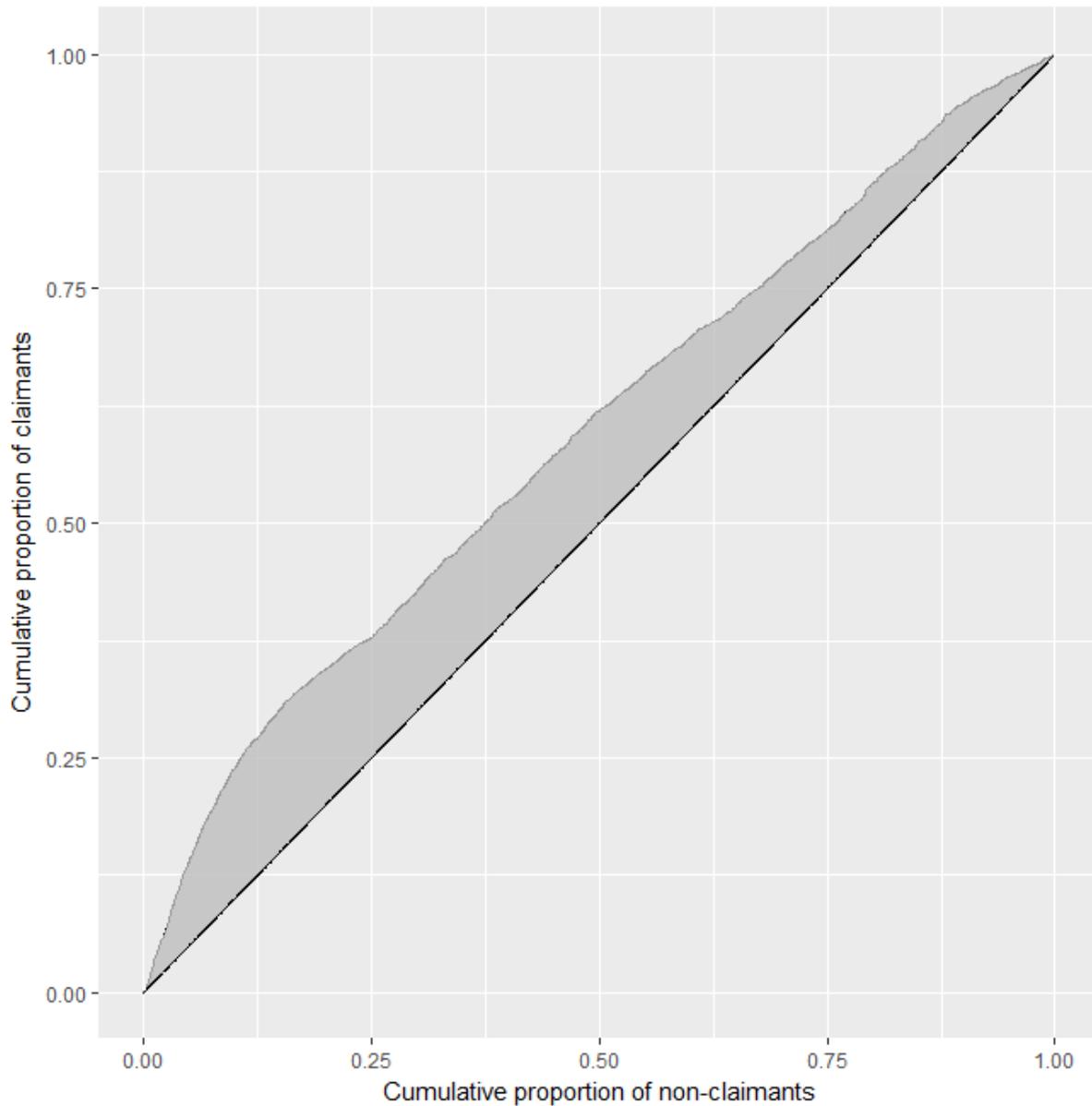
Figure 1: Example visualisation of RCI

The absolute centralisation index measures the concentration of claimants near a centre relative to city area. It uses the same formula as the RCI with b_i being replaced by the cumulative proportion of total city area (rather than the cumulative proportion of non-claimants).

The RCI is responsive to the concentration of *both* claimants and non-claimants around a centre point. When comparing the RCI across time periods, the measure will leave some ambiguity in its interpretation. For instance, given that a person is a welfare claimant, their chances of living near a city centre can be the same across two time periods. However, the RCI can still increase or decrease depending on changes in the concentration of non-claimants across the same time period.

2.1. Accounting for polycentricism

For multiple centres, we can generalise the RCI formula by ordering the cumulative proportion of claimants and non-claimants based on the distance $\tilde{d}$ of a zone to the *nearest* centre point. This will yield $\tilde{a}_i$ and $\tilde{b}_i$ which are functionally identical to a_i and b_i except that they are based on $\tilde{d}$ instead of d. The general formula for the RCI becomes:

$$RCI = \sum_{i=2}^{K} \tilde{a}_{i-1}\tilde{b}_i - \sum_{i=2}^{K} \tilde{a}_i\tilde{b}_{i-1}$$

Here the RCI still has the same interpretation: it measure the relative concentration of claimants around urban centres. When there is only one centre $d = \tilde{d}$ and the measure is identical to the standard RCI formula.

In the case of multiple centres, we can further decompose the contribution that each centre makes to the RCI score. This may be particularly useful if the overall boundary area is composed of multiple cities or large settlements, each with its own urban centre. Let C_k denote the centre that closest to zone k where $C_k = 1,2 \dots M$. The contribution that centre m makes to the RCI is:

$$RCI_m = \sum (\tilde{b}_i - \tilde{b}_{i-1})(\tilde{a}_i + \tilde{a}_{i-1}) - \sum (\tilde{b}_i + \tilde{b}_{i-1})(\tilde{b}_i - \tilde{b}_{i-1}) \text{ where } C_k = m$$

The RCI can then also be expressed as:

$$RCI = \sum_{m=1}^{M} RCI_m$$

We can also take a similar approach for the generalised version of the ACI.

3. Results for England and Wales

We examine results for the sixteen largest cities in England and Wales (excluding London) as well as the functional economic areas around those cities (as indicated by travel to work area). For most cities, the relative concentration of poor to non-poor residents around the city centre had decreased between 2001 and 2011. However, we do not find evidence to suggest that poorer residents are being displaced from inner city areas. Instead, the ACI results show that the absolute concentration of benefit claimants around the city centre remained stable. We also find consistent results when we extend the analysis to the wider functional economic area around a city.

5. References

Kavanagh, L., Lee, D., & Price, G. (2016). Is Poverty Decentralising? Quantifying Uncertainty in the Decentralisation of Urban Poverty. *Annals of the Association of American Geographers*, *106*(6), 1286–1298. http://doi.org/10.1080/24694452.2016.1213156

Massey, D. S., & Denton, N. A. (1988). The dimensions of residential segregation. *Social Forces*, *67*(2), 281–315. http://doi.org/10.1093/sf/67.2.281

Rosenthal, S. S., & Ross, S. L. (2015). Change and persistence in the Economic Status of Neighbourhoods and Cities. In G. Duranton, V. Henderson, & W. Strange (Eds.), *Handbook of Regional and Urban Economics* (pp. 1047–1120). Amsterdam, NL: Elsevier Science and Technology.

Slater, T. (2006). The Eviction of Critical Perspectives from Gentrification Research. *International Journal of Urban and Regional Research*, *30*(4), 737–757. http://doi.org/10.1111/j.1468-2427.2008.00772.x

The Economist. (2010). *Boris Johnson's Idiocy: Kosovo and Social Cleansing*. [Online] [Retrieved April 10, 2017]. http://www.economist.com/blogs/easternapproaches/2010/10/kosovo_and_social_cleansing