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The persistent consequences of adverse shocks: how the 1970s shaped UK regional inequality.

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Abstract:

The economic shocks experienced by the UK economy in the 1970s brought major changes in the spatial distribution of employment rates in the UK. This paper traces out the long run implications of these changes, suggesting that they were highly persistent and to a large extent shape current UK regional disparities. Most of the Local Authority Districts that experienced large negative shocks in the 1970s have high deprivation rates in 2015, and they constitute two-thirds of all districts with the highest deprivation rates. We conclude that neither economic adjustment processes nor policy measures have acted to reverse the effect of negative shocks incurred nearly half a century ago.

Keywords: Regional inequality, de-industrialisation, employment

JEL classification: R11; R12; O47; O50

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1. Introduction.

The share of secondary sector employment (largely manufacturing and construction) in the UK economy peaked in 1966 at 40.2%. In little more than a decade this share had fallen to 30.5% (1981), continuing to decline by 4-5 percentage points per decade to 15.1% in 2015 (ONS 2019, April). The decade of the 1970s saw manufacturing employment fall from 7.73mn to 6.31mn, dropping further to 4.88mn in 1990 and 2.63mn in 2015 (ONS 2019, September). Some sectors were particularly hard hit with output more than halving from the late 1960s to 1980. Steel production was 28mn tons in 1970 and just 13mn in 1980 (House of Commons Library 2017). Merchant shipbuilding went from 1.3mn tons launched in 1970 to 0.2mn in 1981 (Buxton et al. 2015).

The historical origins of these changes are analysed in the economic history literature, notably the work of Crafts and Broadberry (see Crafts and Broadberry 2003) who refer to the ‘debacle of 1970s’, and point to a German/UK manufacturing productivity gap that had reached 40% by the late 1970s. The 1970s also saw the massive economic shocks of the 1973 oil crisis, 1973-74 stock market crash, and ‘stagflation’, with the recession of 1973-75 and UK annual inflation peaking at 25% in 1975.

These shocks, in particular the decline of many manufacturing sectors, fell more heavily on some regions of the UK than others. This paper is a quantitative characterisation of the regional shocks and description of their long-run implications. We find that they have extremely persistent effects and are a major correlate of the spatial distribution of deprivation even after the passage of more than three decades. While economic (and perhaps political) processes might have been expected to ameliorate their impacts, there is little evidence that they have done so. We establish four main facts.

First, the 1970s saw a radical change in the distribution of male employment rates across the Local Authority Districts of England and Wales (LADs). We take the changes in male employment rates during this decade as the main indicator of the shocks experienced, and work with 344 LADs of England and Wales (see data appendix). Our focus is on LADs that experienced negative shocks.

Second, the shocks to the male employment rate have been remarkably persistent. Changes to the male employment rate that occurred in the 1970s were slightly amplified in the 1980s and partly reversed thereafter. But this reversal only clawed back one-eighth of the 1970s shock, i.e. each one percentage point change in an LAD’s male employment rate between 1971 and 1981 is, on average, associated with a 0.88 percentage point change in the LAD’s male employment rate over the full period 1971- 2011. Moreover, the evidence suggests that the impact of the 1970s shock on 2011 employment rates is as strong for workers born in the 1980s as for those alive at the time of the shocks.

It is not the case that the LADs that suffered the largest negative employment shocks in the 1970s were performing poorly in 1971. The LADs that experienced large negative shocks were, on average, in the middle of the distribution of male employment rates in 1971, then more than 6 percentage points below average in 1981 and 5 percentage points below average in 2011. Of the areas that experienced the largest negative shocks few - less than 10 percent - recovered sufficiently to have above average male employment rates in 2011.

Fourth, the male employment rate maps into earnings and into deprivation. LADs that experienced large negative shocks constitute nearly two-thirds of LADs with high deprivation in 2011. To be precise, 38 LADs in England feature in *both* the bottom quintile of areas ranked by their 1970s male employment shock *and* the bottom quintile of LADs ranked by their 2015 index of multiple deprivation. Yet of these 38, 20 had above average male employment rate in 1971.

That there is an association between historical shocks and current outcomes will not be news to those familiar with the recent economic history and geography of England and Wales, but the clarity and magnitude of these relationships is surprising. Our findings shed light on the balance between two sets of forces – those for convergence of regional disparities, and those for divergence (or at least persistence) of such disparities.

The classic (or neoclassical) forces for convergence are simply that wage adjustment will cause some combination of replacement jobs moving in to adversely affected places, and population moving out. The alternative view is based on several arguments.¹ The first is that, within a country, the neoclassical arguments are at best weak, or possibly damaging. Weak because a nationally integrated labour market means that the scope for relative wage adjustment is small; the only relative prices that are free to move are those of immobile factors (land and housing) and these are too small a share of firms' costs to attract inwards investment. Damaging, because out-migration is selective; in the presence of moving costs it will be the young and skilled that leave, while the bulk of the population is left behind in places that have lost key parts of their labour force. Furthermore, attracting inwards job creation requires numerous conditions to be met, and somewhat lower wages and land prices may not be sufficient. Places that have experienced negative shocks may have adverse skill and demographic characteristics, and also weak fiscal positions, poor public services, and social and health problems associated with low employment rates. Many of these are cumulative, involving vicious feedback mechanisms with multi-generational effects. At the economic level there is a set of arguments to do with agglomeration economies and the fact that, in many sectors, firms benefit from being in a cluster or 'ecosystem' of related firms and skills. A place seeking to attract activity in such a sector faces the 'first-mover' problem that no firm is willing to move out of an existing cluster unless confident of being followed by other firms. This means that it is hard to move such activities into a new location that has lost jobs in other sectors. Some activities are easier to move than others, but these are typically lower skill activities producing non-tradable goods. As a consequence, even if employment is restored it may be with less skilled and lower wage activities. Essentially, a cluster based around a traditional comparative advantage that is lost is unlikely to be replaced by an equivalent level activity; even if full employment is restored it is likely to be with lower skill activity, possibly in non-tradable rather than tradable sectors of activity.

The balance between these forces has shifted through time. The Great Depression of the 1930s had dramatically different impacts across UK regions, but these gaps were very substantially reduced in following decades with convergence during the 'golden age' (Kitson and Mitchie 2014) of UK growth during the 1950s and 1960s. In the US real wages converged across regions from 1880 until some

¹ See Venables (2020) for development of these arguments.

point in the 1980s, when convergence essentially stopped (Moretti 2011). In the earlier period, Blanchard and Katz (1992) found practically no evidence of persistence between unemployment rates in 1975 and 1985 across US states. Adjustment to shocks was rapid, and brought about largely by migration. However, from the 1990s onwards internal migration in the US slowed down dramatically (Ganong and Shoag 2017). Following this, evidence of persistence of shocks emerges. For example, Austin et al. (2018), using finely spatially disaggregate data, report a strong correlation between the proportion of males not working in 1980 and not working in 2014. The collapse of US manufacturing employment occurred in the decade 2001-2010, falling from over 17 mn to a low of 11.5 mn. The spatial impact of this and subsequent shocks has been the focus of recent work, particularly that of Autor et al. (2013), who find that job losses in sectors and places impacted by imports from China were not offset by employment growth in other sectors.

The UK is distinctive in that it experienced particularly acute shocks over a relatively short period of time, and these ‘deindustrialisation’ shocks came earlier to the UK than elsewhere. This paper covers this long time period, providing descriptive evidence of the consequences of shocks that occurred nearly half a century ago.

2. The spatial distribution of employment rates:

The primary variable that we use to quantify the shocks that occurred in the 1970s is the employment rate, particularly the male employment rate. We think that this is a key indicator of the changes that occurred in the 1970s and of their long run effects. The direct impact of the 1970s shocks were largely on male employment. And there is evidence that employment (or lack of it) is a driver of mental health issues, of unhappiness (Clarke and Oswald 1994), and of premature death. Case and Deaton (2017) in their study of American morbidity emphasise the role of ‘a long-term process of decline, rooted in the steady deterioration of job opportunities’ (p429).² We show that, for the UK, the male employment rate is highly correlated with other variables of interest, such as deprivation measures.

Our data is drawn mainly from the decennial censuses for England and Wales between 1971 and 2011. This provides data at a consistent spatially disaggregated level prior to the 1990s. Data from the 1981, 1991, 2001 and 2011 census at the same spatial level, namely Local Authority Districts (LADs, pre 2015 re-organisation), may be downloaded directly from NOMIS. The 1971 census data is not available on the same basis. Here, data at a lower level of spatial disaggregation is available from CASWEB and was aggregated up to the LAD (pre-2015) level using a mapping provided by the ONS. Further details of this procedure are given in the appendix.

LADs consist of 348 areas in England and Wales used for purposes of local government. These vary substantially in terms of both area and population, and they do not necessarily match well with local labour markets. However, data at the level of alternative geographies such as travel to work areas are

² Krueger (2017) also links it to US opioid use, estimating that half of men out of the labour force are taking pain medication.

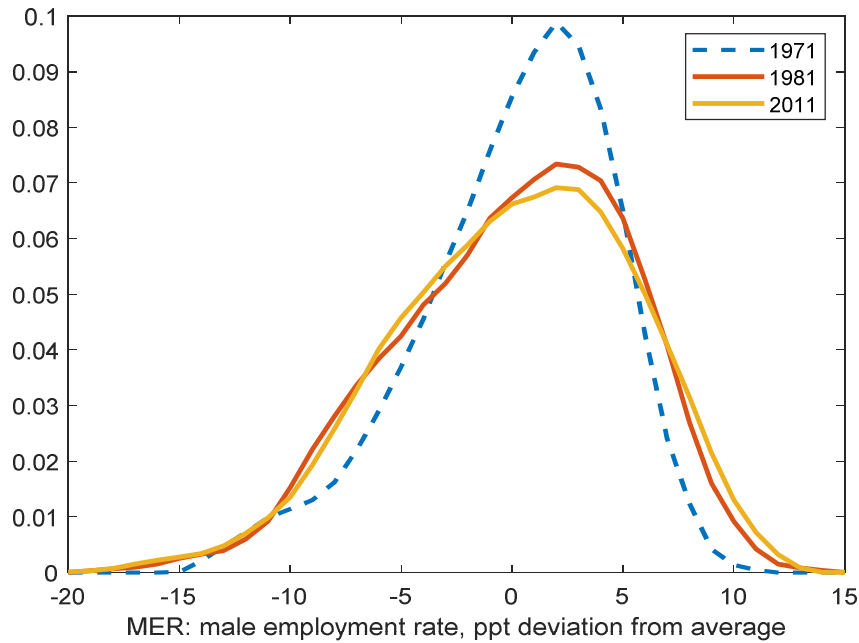
not available on a consistent basis over a time span of four decades. For the purpose of our analysis the two smallest LADs (with resident populations of less than fifth of that of next smallest LADs) are aggregated with neighbouring LADs (Isles of Scilly with Cornwall; City of London with Westminster).

Our main variable of interest is the male employment rate as measured by the percentage of the resident population aged between 16 and 74 years recorded as in employment (working) on the census date. In order to abstract from overall changes in employment and to focus on spatial differences we work throughout with the deviation of this rate from the average value at each date, and refer to this as the MER. Specific measurement problems arise from the treatment of students in the 1971 census and the timing of the census. The 1971 census took place in late April during university term time with students included in the resident population, while in 1981 the census date was early April outside university term. With a higher education participation rate of just 8% in 1970, few areas are expected to be significantly affected by this distortion. The two obvious exceptions are Oxford and Cambridge and they have been excluded from our analysis throughout.

2.1 The spatial distribution of employment rates

The national level changes that occurred in the 1970s had large and persistent effects on the distribution of the male employment rate (MER) across our spatial units, the LADs. Figure 1 shows the distributions of the MER for 1971 (dashed), 1981 (brown) and 2011 (yellow) and indicates the large changes that occurred in the 1970s. Mass is distributed from the centre of the distribution to both tails. For the upper tail, this is largely due to increases in the MERs in districts in the South-East and East of England (recall that MERs are measured relative to the average of each year). Our primary focus is on the lower part of the distribution where the number of LADs with an MER between -5 and -10 percentage points (ppts) is seen to increase substantially. The striking features of this figure are not just the change in the distribution, but the persistence of the new shape over a 30 year period, i.e. at both 1981 and 2011. (1991 and 2001 are not shown, but lie very close to the 1981 and 2011 distributions).

Figure 1: The distribution of male employment rates across LADs: 1971, 1981, and 2011.



2.2 Employment rates through time

We now turn from the overall distribution to a closer examination of changes in MERs in individual districts. The scatterplots in Figure 2 provide support for the persistence of the 1970s employment shock and an absence of substantial forces for convergence. The left hand scatter plot shows changes in MERs between 1971 and 1981 ('the 1970s employment shock') on the horizontal axis, and changes between 1971 and 2011 on the vertical. Casual inspection indicates persistence, with a strong positive correlation suggesting a regression line with slope close to unity. The right-hand panel again has the 1970s employment shock on the horizontal axis, but with the change in MER between 1981 and 2011 on the vertical. If there was significant convergence we would expect changes between 1981 and 2011 to be negatively correlated with the 1970s shock but this is not obviously the case, particularly if one disregards the evident outlier.

A brief comment on the outlier. This is Corby, a place that suffered the largest negative shock, of more than 20 ppts, but then succeeded in recovering 19 of them between 1981 and 2011. We return to Corby in our concluding comments, and include this observation in all reported results in the paper.

Figure 2: Changes in male employment rates (MER).

(a) Change in MER 1971-2011 vs the shock.

(b) Change in MER 1981-2011 vs the shock.

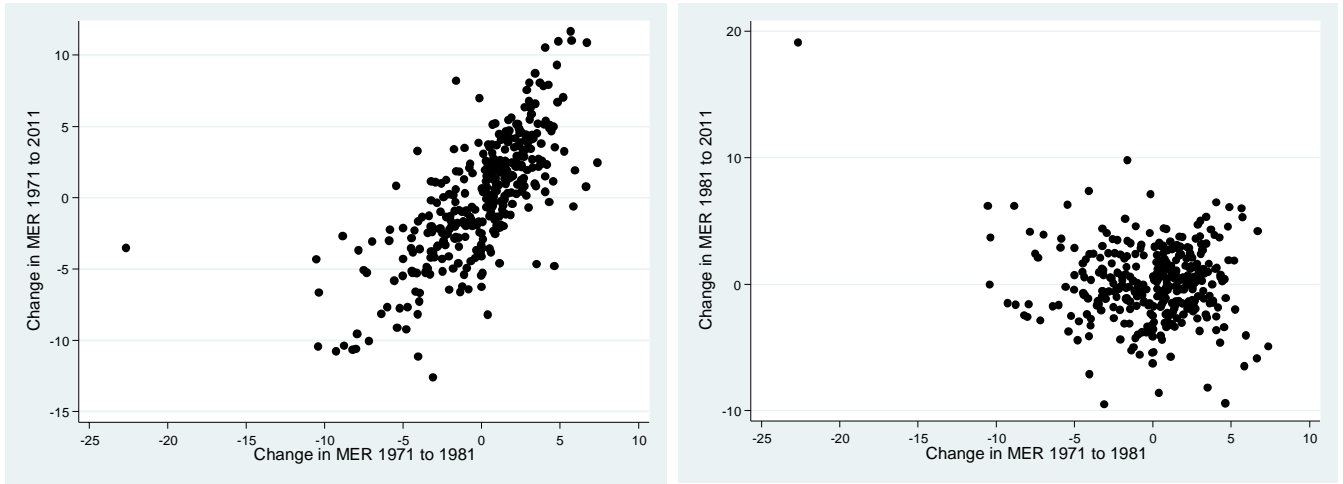


Table 1 quantifies the relationships given in the scatterplots, also breaking the effects down by decade and giving results for both males and females. The upper part of the table reports the findings for male employment. The relationship between the 1971-81 change in MER and the change for the full period (1971-2011) is given in the first column, with coefficient of 0.8793 (corresponding to Figure 2a). The full period effect can be broken down into sub-periods, and these are reported in columns 2 – 5; by construction the coefficients for the sub-periods sum to that shown in column 1. Not unexpectedly, these simple regressions have only limited explanatory power for sub-period employment changes, but the coefficient on the 1970s employment shock is robustly determined in every case. The shock's first period impact is unity, by construction. There is a further small positive effect in period 2 (1981-91), indicating MERs continuing to move in the same direction as the shock. Following this there are negative coefficients, indicating some reversal. However, these later effects while strongly significant, are small in magnitude. Overall, the estimates suggest changes equal to 110% of the 1971-81 shock by 1991, this followed by 22% of the effect being clawed back by 2011.

The lower panel of Table 1 shows the impact of the 1970s employment shock (as measured by the change in the MER) on female employment rates (FER, again in deviation form). Here, the coefficient on the full period is even closer to unity, while breaking it down by each decade indicates that the effect comes through more slowly. The change in FER in the first period is equal to 44% of the change in the MER, and is followed by an increase of similar size in the following decade, with reversal only setting in between 2001-11. Over the whole period the change in the FER is nearly equal to the change in the MER (albeit, with a lower R-squared than in the MER regression).

Table 1: Changes in employment rates: timing

	Change in MER 1971 to 2011	Change in MER 1971 to 1981	Change in MER 1981 to 1991	Change in MER 1991 to 2001	Change in MER 2001 to 2011
Change in MER 1971 to 1981	0.8793 (0.0468)	1.00	0.1031 (0.0400)	-0.084 (0.0283)	-0.1398 (0.0312)
R ²	0.5069	1.00	0.0190	0.0251	0.0590
	Change in FER 1971 to 2011	Change in FER 1971 to 1981	Change in FER 1981 to 1991	Change in FER 1991 to 2001	Change in FER 2001 to 2011
Change in MER 1971 to 1981	0.9548 (0.0881)	0.4449 (0.0324)	0.4637 (0.0451)	0.1266 (0.0297)	-0.0804 (0.0261)
R ²	0.2556	0.3553	0.2357	0.0506	0.0270

We might expect that the impact of the 1970s employment shock would be felt more strongly by older age cohorts in 2011. However, this does not appear to be the case: the correlation between the 1970s employment shock and the MER in 2011 is almost as strong for the 25 to 34 years age cohort as for the 35 to 49 years and the 50 to 64 years age groups (0.54, 0.62 and 0.6 respectively).

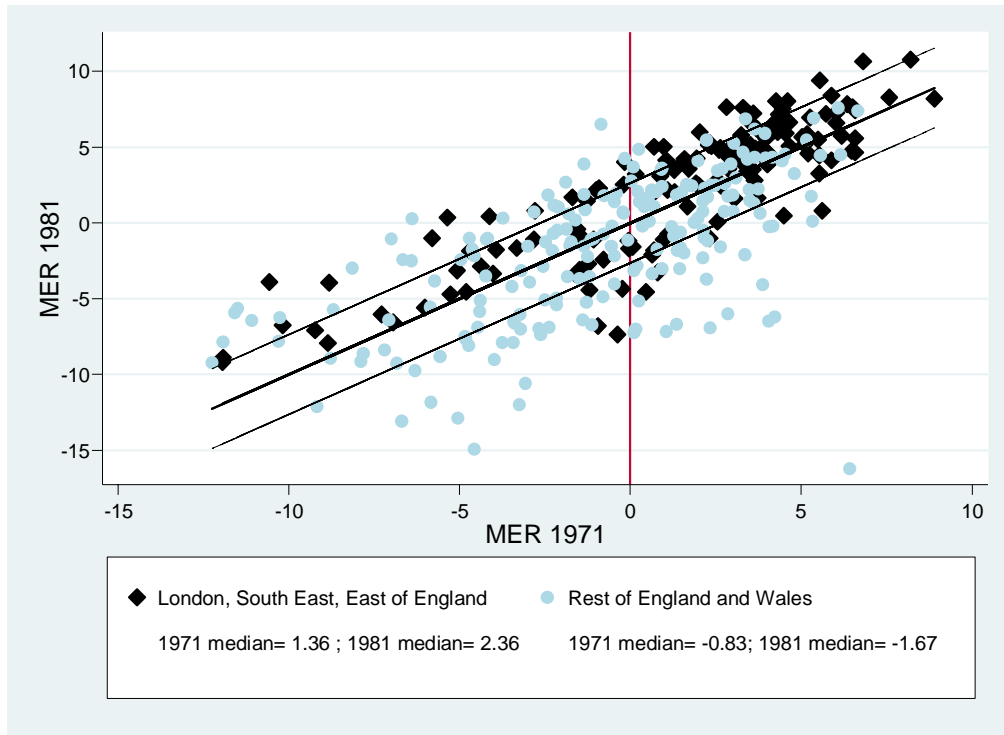
3. Which LADs experienced the largest employment shocks?

Were places that experienced negative employment shocks in the 1970s atypical, or were they representative of the LADs as a whole? We continue to focus on the male employment rate as our key indicator, and look at the relationship between initial values of this variable and the shock experienced.

Figure 3 gives the scatter plot of 1971 MER against that of 1981, so points below the 45 degree line through the origin experienced a negative shock, and those above a positive shock. The points beyond the outer parallel lines are places in the top and bottom quintiles of the 1970s employment shock. The LADs in the bottom quintile are listed by name in Figure A1 in the appendix.

Several messages come from Figure 3. First is the geographical distinction between places in London, the South East and the East (black diamonds) and the rest of England and Wales (light blue circles). The former tend to be grouped above and to the right of the point {0, 0}, i.e. they are LADs that started somewhat above average and for which the shock was positive. Of the 42 LADs in the South and East that started below average (mainly LADs in London), 31 experienced a positive shock. Places in the rest of England and Wales are more widely dispersed on the figure, with 1971 MERs predominantly below the national average, and predominantly recipients of a negative shock.

Figure 3: MERs: 1971 and 1981.



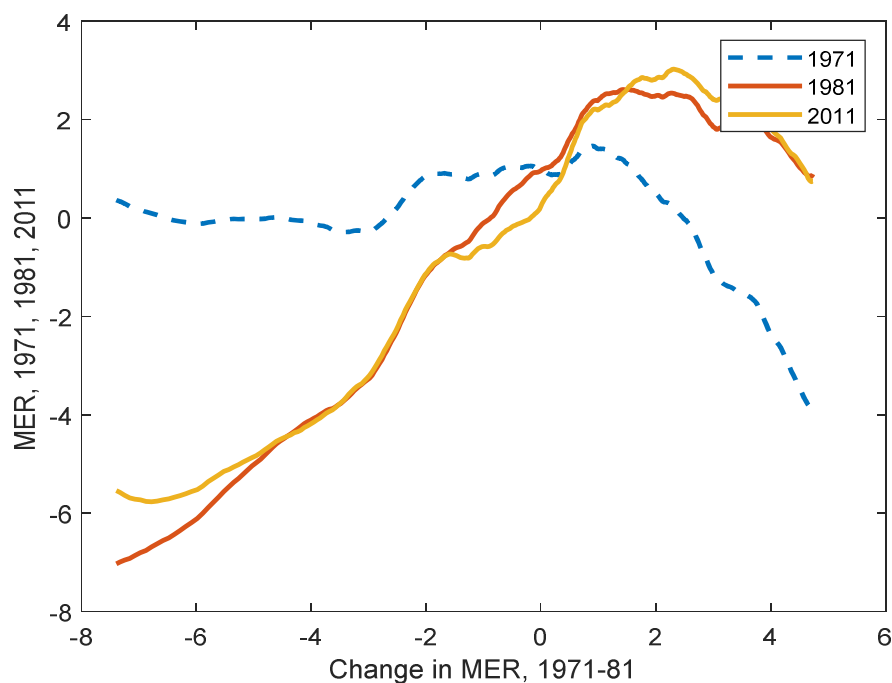
Are the LADs that had the largest shocks (places in the top and bottom quintiles of the shock, outside the uppermost and lowest lines in Figure 3) representative of the population of LADs? Casual inspection of points below the lowest of the 45 degree lines suggest these places were not, on average, systematically away from the 1971 mean, i.e. those LADs that experienced the largest negative shocks were, on average, representative of the population of LADs as a whole. The median value of the 1971 MER for this group was 0.098, marginally above the average for England and Wales as a whole. However, looking at points above the uppermost 45 degree line, the LADs that had the largest positive shocks were preponderantly starting from a below average 1971 MER (i.e. to the left of the vertical line) with a median 1971 MER of -1.36.

Figure 4 presents this information according to the size of the 1970s employment shock. LADs are ranked by the size of the change in MER from 1971 to 1981 and the horizontal axis is a moving average of shock size (see appendix). There is an asymmetry between places that experienced negative shocks and those that experienced moderate or large positive shocks, and we first discuss the case of negative shocks, the left-hand side of the figure. The dashed line is the moving average of the 1971 MER, and this line being close to zero (vertical axis) indicates that LADs with the corresponding shock (horizontal axis) were, on average, representative of the 1971 population. The message is that the places that experienced negative shocks were not, on average, drawn from atypical initial positions.

The yellow line is the moving average of the 2011 MER, so looks forward three decades and reinforces the message of persistence. If there were perfect convergence then this 2011 line would lie close to zero as places reverted to the mean (or towards their initial positions). For LADs that experienced a negative shock the line has slope close to unity, in line with the results given in column 1 of table 1. The figure also gives the 1981 MER (brown line) which lies very close to that of 2011, reinforcing the point of little change between 1981 and 2011.

The asymmetry between places with negative and those with large positive shocks is apparent from the figure. The dashed line becomes negative, indicating that LADs with large positive shocks (greater than 2ppt) did, on average, start with relatively low 1971 MERs. The line for 2011 (yellow) takes positive values, indicating that the positive shocks, lifted these places, on average, from below the mean to above the mean MER.

Figure 4: 1971, 1981 and 2011 MERs against the size of the shock.



4. Earnings in 2015

We have shown that employment rates in many of the places that experienced a negative shock did not recover. What happened to earnings? To investigate this we use information on the distribution of hourly earnings at the LAD level from the Annual Survey of Hours and Earnings 2015 (ASHE). We look just at 2015 to identify the long-run effect since comparison with 1971 is not possible at the LAD level. ASHE is based on a 1 percent sample of employee jobs, giving a sample size of approximately 300,000. Sample numbers are small for some of the smaller LADS and in some cases, earnings

estimates are suppressed as statistically unreliable. This tends to be more of a problem for estimates of earnings in the upper tail of the earnings distribution.

The first three columns of table 2 report the results of simple regressions of earnings at each quartile of the 2015 earnings distribution on the change in MER from 1971 to 1981. In each case, we have a robustly determined positive relationship between the level of earnings and the 1970s employment shock. A 10ppt negative shock reduces earnings at the bottom quartile by £1.08 (11% of the average value in the lowest quartile), at the median by £1.85 (13%) and at the upper quartile by £4.06 (20%). The introduction of regional dummies for the nine broad regions of England and Wales (lower panel of table 3), reduces the magnitude of the estimated coefficients on the employment shock variable but they remain negative and statistically significant, and the pattern of results is unchanged.

Table 2: Earnings in 2015 and the 1970s employment shock

	Hourly earnings of males in full time employment, 2015 (£)				Percentage of males in full-time employment with earnings < £9.89
	Lower quartile	Median	Upper quartile	Ratio of LQ to UQ	
Change in MER 1971 to 1981	0.1082 (0.0207)	0.1849 (0.0364)	0.4056 (0.0712)	-0.0043 (0.0008)	-0.7489 (0.1297)
Constant	10.1186 (0.2628)	14.101 (0.1250)	20.512 (0.2337)	0.5005 (0.0029)	25.318
Adj. R-sqd	0.0713	0.0679	0.1084	0.0794	0.0935
No. of obs	343	341	260	260	325
	Lower quartile	Median	Upper quartile	Ratio of LQ to UQ	Percentage of males in full-time employment with earnings < £9.89
Change in MER 1971 to 1981	0.0689 (0.0195)	0.1325 (0.0343)	0.3243 (0.0697)	-0.0043 (0.001)	-0.4725 (0.1303)
Regional dummies	yes	yes	yes	yes	yes
Constant	9.689 (0.1663)	13.115 (0.2925)	19.128 (0.5883)	0.5129 (0.0085)	28.4430
Adj. R ²	0.4067	0.4015	0.4172	0.2218	0.3457
No. of obs	343	341	260	260	325

Results robust to exclusion of Corby as an outlier.

The pattern of coefficients suggests that the magnitude of the employment shock is associated with a change in the shape of the earnings distribution. The effects of the shock are larger at the top of the earnings distribution than at the bottom in absolute terms (effect at the upper quartile twice that at the median and four times that at the lower quartile) and also proportionately, with a proportional effect on earnings that doubles across this range. The finding is confirmed by the results in column 4 which

indicate that the ratio of lower quartile to upper quartile earning is negatively related to the shock. This suggest that not only are earnings lower in the LADs that experienced a large negative shock to the MER in the 1970s, but also that the earnings distribution is more compressed. This is consistent with the loss of relatively high paid jobs in places with a large shock. Employment mass at the upper end of the distribution is lost, shifting the upper quartile wage downwards compared to the median and lower quartile. These findings suggest therefore that the shock caused a compositional change, with affected places seeing a higher proportion of employment in lower paid occupations.

A different perspective on this issue is obtained by examining the percentage of employees in each LAD that may be thought of as ‘low-paid’ by national standards. To do this we use the ASHE earnings data to estimate the percentage of workers in each LAD whose gross hourly earnings are less than the value of earnings at the bottom quartile value of the distribution for England and Wales as a whole (£9.89 in 2015). Figure 5 is the scatter plot of LADs, with the 1970s employment shock on the horizontal axis, and the percentage of ‘low paid employees’ on the vertical axis. The range of variation in this share of low paid workers in employment is enormous, ranging from less than 10% (Epsom and Ewell, Chilterns) to nearly 60% (Boston). Colour coding of two broad regions indicates the large north-south disparity, with LADs in London, the South-East and East of England generally having a much smaller proportion low paid employees than the rest of the country.

The scatterplot suggests that a large negative 1970s employment shock is associated with a higher share of low paid employees, and this is confirmed by the regression estimates in column 5 of Table 2. Not surprisingly, the 1970’s employment shock on its own provides little explanatory power for the share of low paid workers in the LAD more than 40 years later. However, the negative coefficient is robustly determined and indicates that a 10 ppt negative MER would raise the share of employees earning less than £9.89 by 7 ppts, small compared to the range of this variable indicated on Figure 5. The inclusion of regional dummies reduces the magnitude of the effect but it remains negative and strongly significant.

Once again it is revealing to examine more closely the LADs which suffered the most severe employment shock in the 1970s; the lowest quintile are the 69 points to the left of the vertical line on figure 5. Of this group, 58 have a higher share of low paid workers than the England and Wales average (and of the 11 with lower share, six are in London). Half of this group (34 out of 69) are amongst the worst LADs for low pay (in the upper quartile of the distribution for the share of low paid employees). These LADs – i.e. those in the worst quintile for the 1970s shock and for low pay in 2015 – are listed in Table 3, with their rank for the 1970s shock and the share of male employees with low 2015 earnings reported in parentheses.

Figure 5: Percentage of Low Paid Male Employees in 2015.

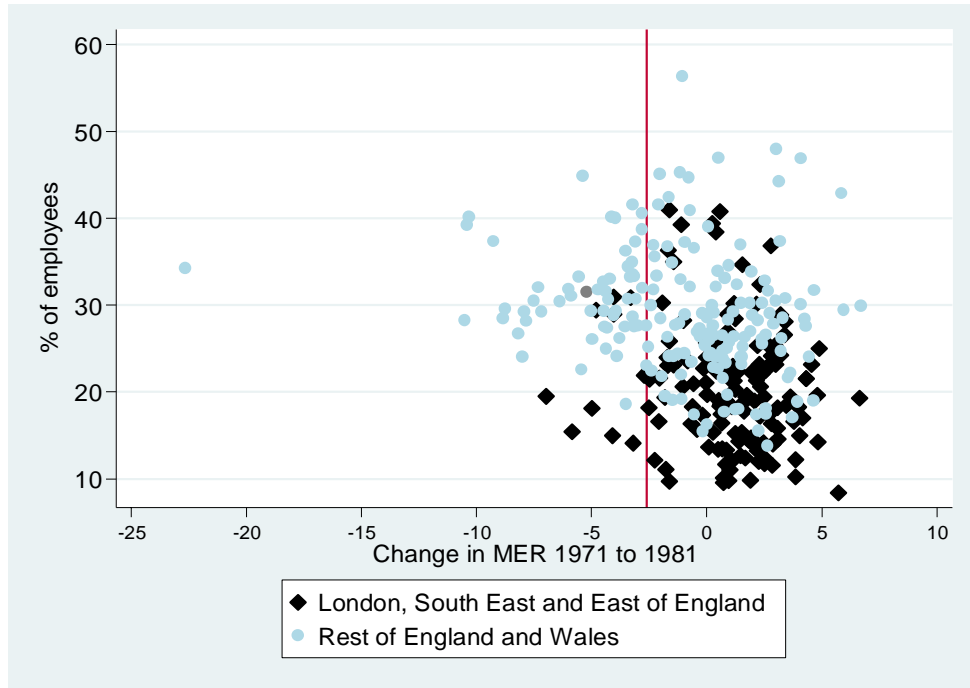


Table 3: LADs in lowest quintile of 1970s shock and upper quartile of low-paid workers (2015)

Corby (1, 34.3)	Swansea (28, 31.8)	Caerphilly (51, 33.3)
Sandwell (3, 39.3)	Lincoln (29, 32.7)	Brent (52, 30.9)
Blaenau Gwent (4, 40.2)	West Lancashire (32, 31.6)	Sunderland (53, 35.0)
Wolverhampton (5, 37.4)	Torfaen (35, 30.6)	Bolton (54, 33.6)
Neath Port Talbot (12, 30.5)	Oldham (36, 33.0)	Blackburn w. Darwen (55, 41.6)
Newport (13, 32.1)	Kingston u. Hull (37, 40.2)	Wellingborough (58, 33.4)
Liverpool (16, 30.4)	Peterborough (41, 30.9)	Nottingham (61, 37.3)
Manchester (17, 31.8)	Stoke on Trent (42, 40.1)	Kirklees (62, 30.7)
Telford & Wrekin (18, 31.1)	NE Lincolnshire (47, 36.3)	Carmarthenshire (65, 38.8)
Salford (20, 33.3)	Tameside (49, 34.5)	Preston (66, 40.6)
Leicester (22, 44.9)	Rhondda Cynon Taff (50, 30.7)	Sefton (67, 32.0)
Dudley (23, 31.5)		

Notes: Brackets give the rank by change in MER 1971 to 1981 (largest negative change is rank 1) and the proportion of workers who are low paid, 2015.

5. Deprivation in 2015

The wider socio-economic effects of adverse employment shocks are documented in an extensive literature, as indicated in section 2 of this paper, and we now explore the effect of the 1970s employment shock on a range of measures of deprivation. We find that a high proportion – nearly

two-thirds – of LADs that experienced large negative shocks in the 1970s are amongst the most deprived areas in 2015, and similarly, two-thirds of the most deprived areas in 2015 are places that experienced a large negative 1970s shock.

5.1 Summary indicators of deprivation

Indices of Deprivation for 2015 provide relative measures of deprivation for small areas across England based on a number of different aspects of deprivation: income; employment; education, skills and training; health and disability; crime; barriers to housing; living environment. The indices of deprivation are designed primarily to be ‘neighbourhood’ measures but a range of summary indicators are produced at the LAD level and these are used in the analysis that follows.³ Similar measures are produced for Wales but there are differences in the definitions of the underlying indicators and so in what follows we look only at English LADs. Two aspects of the summary LAD level indicators of deprivation are of interest – the average level of deprivation across the LAD as a whole and the extent of severe deprivation within the LAD. The average deprivation score is the population-weighted average of the deprivation scores of all neighbourhoods in the LAD. The extent of severe deprivation is captured by the local concentration measure which focuses on the most deprived neighbourhoods in the LAD and is the population-weighted average of the ranks (in England as a whole) of the most deprived neighbourhoods that contain 10 percent of the LAD’s total population. Thus LADs with large pockets of severe deprivation will have a high number for the local concentration measure. Figure 6 illustrates the 2015 values of the two indicators and their relationship to 2011 MER. Evidently, the scatter-plots indicate that both measures of deprivation are highly correlated with the MER. The solid symbols used in the plots indicate LADs with the largest negative 1970s MER shocks, (lowest two deciles, respectively green triangles and red circles). As is clear, these places are over-represented in places with high levels of deprivation, and almost totally absent from places with low levels, particularly low levels of the pernicious concentrated pockets of deprivation.

These observations are confirmed by the regression results reported in Table 4. The coefficient on the 1970s employment shock is negative and highly significant in all specifications for both measures of deprivation. As one would expect, including the 2011 MER as an additional control greatly improves the fit and the coefficient on the 1970s shock is substantially reduced in magnitude, but it remains negative and well-determined. These results are largely unchanged by the introduction of the female employment rate which has the expected negative effect on the average deprivation scores although, in the case of the local concentration measure, the coefficient is positive and not statistically significant. Similar results in terms of statistical significance and overall fit are obtained if we use the rank of the deprivation measure as a dependent variable rather than the actual value.

³ Indices are computed at the level of the ‘lower-layer super output area’. LSOAs have an average population of 1500 people or 650 households. LSOAs are ranked by deprivation such that the higher deprivation scores have higher rank; the maximum rank being 32844. For further information see DCLG (2015).

Figure 6: MERs and deprivation

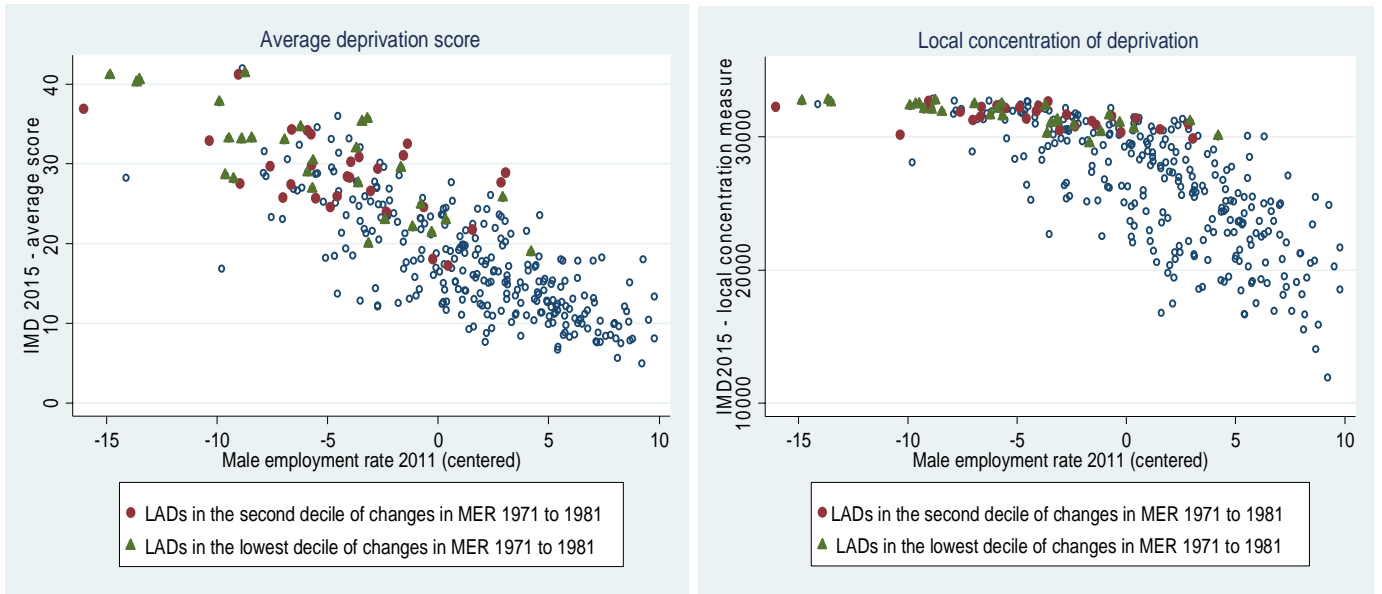


Table 4: Indices of deprivation in 2015 and the 1970s employment shock

	Average Score	Average score	Average score	Local concentration	Local concentration	Local concentration
Change in MER 1971 to 1981	-1.5498 (0.1035)	-0.8296 (0.0755)	-0.8176 (0.0749)	-781.85 (64.750)	-394.99 (55.125)	-398.53 (55.203)
MER 2011		-1.0538 (0.0503)	-0.7761 (0.1127)		-566.05 (36.707)	-647.51 (83.036)
FER 2011			-0.3718 (0.1352)			109.024 (99.695)
Constant	19.640 (0.3438)	20.060 (0.2243)	20.045 (0.2221)	27092.23 (215.03)	27318 (163.66)	27322 (163.67)
Adj R ²	0.4101	0.7510	0.7560	0.3130	0.6039	0.6042

LADs in England: 322 observations.

The impact of the 1970s employment shock on deprivation more than four decades later is more vividly illustrated if we focus on those English LADs that experienced the most severe shocks, i.e. the 65 English LADs in the bottom quintile of the distributions for the 1970s shock. Of this set of LADS, 38 are also among the highest quintile of the distribution of average deprivation scores in 2015. In other words 58% (38/65) of LADs with the largest negative employment shocks in the 1970s are amongst the most deprived areas of England four decades later. And conversely, of the most deprived LADs in 2015, 58% had experienced a severe negative shock in the 1970s.

If we focus on the experience of severe deprivation, we find a similar overlap with 34 of the 65 LADs with the largest negative employment shock also among the set of districts with the worst local concentration measures. Table 5 lists the 28 areas in England with worst outcomes on all three measures, i.e. in the bottom quintile of the distribution of the 1970s employment shock, the top quintile of the average deprivation score in 2015, and of the local concentration of deprivation in 2015.

Table 5: LADs in lowest quintile for all of: shock, deprivation, concentration of deprivation

Sandwell (3)	Salford (20)	Rochdale (43)
Wolverhampton (5)	Leicester (22)	St Helens (46)
Middlesbrough (7)	Hartlepool (24)	NE Lincolnshire (47)
Redcar and Cleveland (8)	Lincoln (29)	Tameside (49)
Coventry (9)	Halton (31)	Sunderland (53)
Walsall (10)	Oldham (36)	Bolton (54)
Knowsley (11)	Kingston upon Hull (37)	Blackburn and Darwen (55)
Birmingham (14)	Sheffield (39)	Nottingham (61)
Liverpool (16)	Stoke-on-Trent (42)	Preston (66)
Manchester (17)		

Notes: Brackets give rank by change in MER 1971 to 1981.

5.2 Aspects of Deprivation

As noted above the indices of multiple deprivation are derived by combining indicators of deprivation across different dimensions or ‘domains’ of deprivation. The four indicators with the greatest weight relate to income, employment, education and training, and health and disability.

Income deprivation measures the percentage of the population in the LAD at risk of low income as indicated by their eligibility for income support payments such as income-based Jobseeker’s Allowance, Working Tax Credit and Child Tax Credit. *Employment deprivation* measures the percentage of the working-age population in an area involuntarily excluded from the labour market. This includes people who would like to work but are unable to do so due to unemployment, sickness or disability, or caring responsibilities. The *Education, Skills and Training* domain measures the lack of attainment and skills in the local population. This is based on two sub-domains, one relating to children and young people and one relating to adult skills. These subdomains are designed to respectively reflect the ‘flow’ and ‘stock’ of educational disadvantage within an area respectively. The *Health Deprivation and Disability* domain measures the risk of premature death and the impairment of quality of life through poor physical or mental health. This measures morbidity, disability and premature mortality but not aspects of behaviour or environment that may be predictive of future health deprivation.

The four domains of deprivation are measured on very different scales and so in order to facilitate comparisons, we consider the rank of each LAD with respect to each domain rather than the actual value, where the most deprived area in each case is ranked 1. The effect of the 1970s employment

shock is estimated to be positive in each case (Table 6), consistent with the observation that the larger the change in the MER between 1971 and 1981, the lower is deprivation in 2015 (higher the rank of the LAD). The estimated coefficient is broadly similar in magnitude for each of the four domains such that all other things being equal an increase in the 1970s shock to MER of 1 pot improves the rank by between 7.4 and 10.3 positions out of 322.

The 2011 MER is associated with lower deprivation and higher rank as expected although here we observe far more variation in the magnitude of the effect, with the estimated coefficient for the health and disability domain more than three times that for the education and training domain. The effects of the 2011 FER are even more mixed with a significant negative coefficient in the case of health and disability suggesting that a higher FER is associated with higher level of deprivation and a lower rank in the this domain.

Table 6: Domains of deprivation in 2015 and the 1970s employment shock

	Income	Employment	Education & training	Health & disability
Change in MER 1971 to 1981	10.279 (0.9172)	8.6382 (0.8922)	7.4014 (1.3538)	8.6316 (0.9416)
MER 2011	8.5952 (1.3797)	13.9777 (0.0541)	4.9663 (2.0363)	17.9000 (1.4163)
FER 2011	4.0879 (1.6565)	-1.6329 (1.6113)	5.2493 (2.4449)	-7.2475 (1.7004)
constant	156.30 (2.7195)	155.39 (2.6454)	157.79 (4.0139)	155.92 (2.7916)
Adj R ²	0.7310	0.7448	0.4150	0.7192

Notes: LADs in England: 322 observations.

While the four different domains of deprivation tend to highly correlated, the overlap is far from perfect with just 43 LADs ranked in the top quartile (top 80) for all four domains. Once again, we observe that LADS that experienced a severe negative employment shock in the 1970s are strongly represented in this set of areas experiencing wide ranging deprivation: 25 LADS were in the bottom quintile for the 1970s employment shock; 31 LADS, more than 70% of the group, were in the bottom quartile for the 1970s employment shock. These LADs are listed in Table 7 below.

In addition to the results reported in detail above, we have examined the relationship between the 1970s employment shock and measures of life expectancy with similar results. The change in MER between 1971 and 1981 has a statistically significant positive effect on life expectancy at birth (2012-2014) for both men and women and the relationship is robust to the inclusion of 2011 MER and FER as controls. Similar results are obtained for measures of life expectancy at age 65 years.

Table 7: LADs in lowest quartile for 1970s MER shock and all four deprivation domains

Sandwell (3)	Leicester (22)	Tameside (49)
Wolverhampton (5)	Hartlepool (24)	Sunderland (53)
Middlesbrough (7)	Lincoln (29)	Bolton (54)
Redcar and Cleveland (8)	Halton (31)	Blackburn and Darwen (55)
Walsall (10)	Oldham (36)	Nottingham (61)
Knowsley (11)	Kingston upon Hull (37)	Rotherham (63)
Birmingham (14)	Sheffield (39)	Hyndburn (73)
Liverpool (16)	S Peterborough (41)	Burnley (78)
Manchester (17)	Stoke-on-Trent (42)	Bradford (81)
Salford (20)	Rochdale (43)	Mansfield (82)
		Barking and Dagenham (84)

Notes: Brackets give rank by change in MER 1971 to 1981.

6. Concluding comments

Regional inequalities in the UK are amongst the largest in high-income countries and, as widely documented, are a source of economic and social deprivation and political discontent. It is important to understand how we got to the present position, and this paper shows that a large part of present spatial inequality is associated with shocks experienced more than 40 years ago. The paper does not construct counterfactual analyses or untangle the various causal mechanisms, but several messages seem clear. First, the economic mechanisms of changes in labour demand and supply triggering a process of convergence, either by jobs moving in to places or workers moving out, have not been sufficient to offset the damage done by negative shocks. Second, regional assistance policies, conducted by the UK and by the EU throughout the entire period, have not been sufficient either. Third, this historical experience provides a stark warning about the risks associated with losing jobs in sectors which are spatially concentrated; the losses are not readily reversed, and their implications are persistent and pernicious.

But finally, what about Corby, the extreme outlier throughout the paper? Its steelworks closed in 1980-81 with the loss of 7000 jobs and unemployment in the town went to over 20%. By 1991 unemployment had fallen to the national average. The town has the advantage of good location in the East Midlands, close to the geographic centre of England and to main road and rail routes between London and the North. There was prompt action following the closure, with the establishment of an Industrial Development Committee containing a wide range of stakeholders. Designation as a Development Area made the town eligible for European Community support and in 1981 it became the first town with Enterprise Zone status, with zone sites employing more than 4,000 people by 1984 (National Audit Office 1986, Eveleigh, 1991). Was this being in the right place, having prompt action, or most likely both?

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Appendix:

Employment data

Data relating to employment is drawn from the decennial censuses for England and Wales between 1971 and 2011. There are few sources that provide data at a consistent spatially disaggregated level prior to the 1990s, the exception being the Census. Data from the 1981, 1991, 2001 and 2011 Census at the local authority districts level (pre-2015 reorganisation) was downloaded from NOMIS. LADS (pre-2015) consist of 348 areas in England and Wales used for purposes of local government.

The 1971 census data is not available on the same basis. Here, data at a lower level of spatial disaggregation was obtained from CASWEB and was aggregated up to the LAD (pre-2015) level using a mapping provided by the Census Team at ONS. The mapping matches the 1366 lower level districts of the 1971 census to the 348 LADs. The majority of the 1971 districts mapped onto the LADs: 934 of 1198 districts (78%) in England and 138 of the 168 districts (82%) in Wales. The remaining 1971 districts were split across LADs and it was necessary to go to a lower 1971 ward level in order to resolve the mapping. The majority of these were rural districts reorganised under the 1972 Local Government Act.

Our main variable of interest is the employment rate as measured by the percentage of the resident population aged between 16 (15 years in 1971) and 74 years recorded as in employment (working full-time or part-time) on the census date.

Earnings data

The earnings data is from the Annual Survey of Hours and Earnings for 2015. ASHE is based on a 1 percent sample of employee jobs taken from HRMC PAYE records at April each year. The earnings measure used is gross hourly pay excluding overtime. The data for the 348 LADS (pre-2015) of England and Wales was downloaded from NOMIS at the LAD level.

Index of Multiple Deprivation for England

The Indices of Deprivation 2015 are a relative measure of deprivation for 32,844 small areas (Lower-layer Super Output Areas) across England. The overall Index of Multiple Deprivation 2015 combines indicators under seven different domains of deprivation: income; employment; education, skills and training; health and disability; crime; barriers to housing and services; living environment. The majority of data used to compile these indicators are for 2012/13.

<https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015>

Average deprivation score: The average score summary measure is the population weighted average of LSOA scores in each LAD. The resultant scores for the larger areas are then ranked, where the rank of 1 (most deprived) is given to the area with the highest score.

Local concentration measure: Population weighted average of the ranks of a LAD's most deprived LSOAs that contain exactly 10% of the LAD's population. The local concentration measure gives additional weight to very highly deprived areas.

The Income Deprivation Domain measures the proportion of the population experiencing deprivation relating to low income. The definition of low income includes people out-of-work, and those that are in work but who have low earnings (and who satisfy the respective means tests).

The Employment Deprivation Domain measures the proportion of the working-age population (women aged 18 to 59 and men aged 18 to 64) in a neighbourhood considered to be involuntarily excluded from the labour market. This includes people who would like to work but are unable to do so due to unemployment, sickness or disability, or caring responsibilities.

The Education, Skills and Training Domain measures the lack of attainment and skills in the local population. The indicators fall into two sub-domains: one relating to children and young people and one relating to adult skills, designed to reflect respectively the 'flow' and 'stock' of educational disadvantage within an area. The 'children and young people' sub-domain measures the attainment of qualifications and associated measures ('flow'), while the 'skills' sub-domain measures the lack of qualifications in the resident working age adult population ('stock'). The indicators are:

The Health Deprivation and Disability Domain measures the risk of premature death and the impairment of quality of life through poor physical or mental health. The domain measures morbidity, disability and premature mortality but not aspects of behaviour or environment that may be predictive of future health deprivation.

Full details on the construction of these measures are given Department for Communities and Local Government (2015).

Notes on figures and tables:

Figure 1: Created by Matlab fitdist command using Epanechnikov kernel function, default bandwidth.

Figure 4: The moving average for each variable y_i is constructed as $\bar{y}_i = \sum_j y_j \exp(-0.05 d_{ij}) / \sum_j \exp(-0.05 d_{ij})$, i.e. with weights exponentially declining in the distance $d_{ij} = \text{abs}(r(i) - r(j))$ where $r(i)$ is the position of LAD i in the rank of LADs by change in MER 1971-81.

**Figure A1: LADs in the bottom quintile of the distribution for changes to the MER 1971-1981
(rank in brackets, largest negative change is rank 1)**

