

# Skill up to level up: reducing place- based skills inequality to tackle rising unemployment

## Technical appendix

### Establishing the relationship between skills and employment

The analysis presented in the report finds that a one percentage point decrease in the share of the local working age population without a formal qualification is associated with an increase in the employment rate of 0.26 percentage points. The analysis uses fixed effects regression models to exploit variation over time within local authorities and identify the effect of changes in skill levels on changes in economic outcomes. This approach allows for greater confidence that the results accurately reflect the relationship between skill levels and economic outcomes. In addition to place fixed effects, the method controls for year fixed effects, meaning it accounts for nationwide shocks that happen across the country in specific years, for example the great recession in 2007-08. The approach is adapted from that used by Bamba, Munford, Brown et al (2018). For more discussion on the specification and merits of fixed effects regression models please refer to their paper.<sup>1</sup>

To conduct the analysis, longitudinal data was gathered on a range of different economic and skills indicators, comprising of nearly 100 variables and half a million data points. The data tracks changes in these variables between 2004 and 2018 for lower tier local authorities in England.

After testing different possibilities, the final model looks at the relationship between economic outcomes (the dependent variable) and skill levels (the key independent

variables) and controls for demographic differences, population levels and life expectancy (the additional independent variables). The principal relationship presented in the report is between the employment rate and the proportion of the population without any formal qualification, controlling for demographic and health indicators. The specification of the regression model as coded in R is as follows:

*Employment rate ~ NVQ1plus + aged 1519 + aged 2024 + aged 2534 + aged 3549 + aged 5064 + aged 65plus + Log population + life expectancy + factor(Year)+factor(local authority)*

The relationship was established both for all local authorities and also for each deprivation quintile of split by local authorities, according to the English Indices of Deprivation 2019. The results are presented in table 1.

**Table 1: Regression outputs for the relationship between employment rates and the share of the population without a formal qualification<sup>2</sup>**

| Local authority deprivation quintile | Coefficient of % with no qualification | Adjusted R2 | Observations |
|--------------------------------------|--|-------------|--------------|
| All                                  | -0.261***                              | 0.73        | 4275         |
| Q1                                   | -0.330***                              | 0.70        | 859          |
| Q2                                   | -0.296***                              | 0.54        | 851          |
| Q3                                   | -0.256***                              | 0.53        | 841          |
| Q4                                   | -0.195***                              | 0.38        | 819          |
| Q5                                   | -0.273***                              | 0.35        | 816          |

<sup>1</sup> Bamba, Munford, Brown et al (2018) *Health for Wealth: Building a Healthier Northern Powerhouse for UK Productivity*. Manchester: Northern Health Science Alliance. Available at: <https://www.thenhsa.co.uk/app/uploads/2018/11/NHSA-REPORT-FINAL.pdf>. For more information on the methodology please see the online technical appendix.

<sup>2</sup>. p-values \* p<0.05; \*\* p<0.01; \*\*\* p<0.001

Including each qualification level in the regression shows that strongest employment effect is achieved by helping people reach their first level 1 qualification. As table 2 shows, the effect of moving people from level 3 to level 4 and above is also statistically significant, but the relationship is weaker.

**Table 2: regression coefficients of the effect of skill levels on the employment rate over and above the previous level<sup>3</sup>**

| Variable | Coefficient |
|----------|-------------|
| NVQ4+    | 0.078***    |
| NVQ3+    | 0.018       |
| NVQ2+    | 0.004       |
| NVQ1+    | 0.216***    |

### Calculating the employment cost of skills inequality

To calculate a central estimate employment cost of skills inequality, we first estimate what the employment rate would be in each local area if the share of residents without a formal qualification was reduced to the level necessary to be in the top 10% of local authorities, 3.1%.<sup>4</sup> The uplift in

the employment rate in a given local authority is calculated as the share without a formal qualification minus 3.1% multiplied by the absolute of the relevant no qualification coefficient from table 1 (for example, if the local authority is in the 3<sup>rd</sup> deprivation quintile we multiply by 0.256).

This uplift in the employment rate can then be used to calculate the uplift in the number of people employed. Summing this figure for each individual area gives the total for England. Local authorities for which the uplift would be negative (because the proportion of their residents without a formal qualification is less than 3.1%) are excluded from this calculation.

Rather than focusing on this central estimate, the report recognises that there is significant uncertainty in these types of calculations by reporting a range for employment uplift. This is calculated using the 95% confidence interval for the no qualification coefficient. The 95% confidence interval is calculated as the coefficient plus and minus 1.96 multiplied by the standard error. This gives a range of uplift for each local authority. The lower and upper uplifts for England are calculated by summing the respective uplifts for each local authority.

### Data sources

**Table 3: data sources for regression and uplift analyses**

| Variable     | Data used  | Source  |
|--------------|--|---|
| Skill levels | % of local population qualified to level 4+, level 3+, level 2+, level 1+ and with no qualification, adjusted to exclude % with "other qualifications". All aged 16-64.    | ONS, Annual Population Survey, accessed via Nomis.  |
| Demographics | % of population aged 15-19, % of population aged 20-24, % of population aged 25-34, % of population aged 35-49, % of population aged 50-64, % of population aged 65plus.   | ONS, Census of Population, accessed via Nomis   |
| Population   | Natural logarithm of population.   | ONS, Population estimates - local authority based by single year of age, accessed via Nomis |
| Health       | Life expectancy at birth. Figure used is the average for males and females. Data is given in 3-year bands, so we use the central year. I.e. 2009-2011 is assigned to 2010. | ONS, Life expectancy at birth and at age 65 years by local areas, UK                        |
| Employment   | Employment rate - aged 16-64.  | ONS, Annual Population Survey, accessed via Nomis.  |
| Deprivation  | English Indices of Multiple Deprivation, 2019. Rank of average score used. Local authorities were split into five groups based on their deprivation rank.                  | Ministry of Housing, Communities and Local Government, English indices of deprivation 2019. |

<sup>3</sup> . p-values \* p<0.05; \*\* p <0.01; \*\*\* p<0.001

<sup>4</sup> Where no skills data exists for a local authority, the regional rate is used.