

Appendix

The youth employment-to-population rate is dependent on cyclical labour market conditions, the Kaitz bite ratio and some unobserved heterogeneity (error term):

$$E_{i,t} = \alpha + \beta BITE_{i,t} + \gamma X_{i,t} + \delta_i + \vartheta_{i,t} + \varepsilon_{i,t} \quad (A.1)$$

represents the employment-to-population rate of adults from the 16–24 age group in region i at time t . $BITE_{i,t}$ is the regional Kaitz index (NLW divided by the median hourly wages) with a coefficient β which is the measure of the percentage-point change in the youth employment rate associated with a one-percentage point change in the bite ratio. This should not be treated as a conventional own-wage elasticity, but as a semi-elasticity expressed in percentage points. $X_{i,t}$ is a vector of various controls (controls include unemployment rate, share of population in full-time education), δ_i observes the regional fixed effects (e.g. industrial composition), $\vartheta_{i,t}$ is the time fixed effect and $\varepsilon_{i,t}$ is an error term.

Parameter estimates are derived following mainly Dube (2019), Manning (2021) and Cengiz et al. (2024). A central estimate of $\hat{\beta} = -0.372$, (p-value = 0.13 and a clustered standard error of 0.230) falls within a plausible range of -0.1 to -0.4 identified in Cengiz et al. (2024) and Dustmann et. al. (2022).

On the identification strategy

Regional data was obtained for all variables for a period between 2010–2025. A two-way fixed effect model is used with a total of 192 observations over a 16-year period.

A major concern in our identification strategy (i.e. isolating causal effects) is that labour market conditions and the NLW are determined concurrently. This is because, the Low Pay Commission makes its recommendations based on interpretations of the state of the labour market across the country. Thus, it is difficult to establish explicitly whether wages affect economic conditions or vice versa. This is because wage variations across regions may correlate with unobserved regional characteristics. Therefore, estimates in this paper capture a conditional association across local labour markets, not a direct causal effect of the national policy itself. Mitigating for these confounding factors while isolating this conditional relationship, we do the following:

1. Although bite ratios are set regionally, NLW remains a national figure. Geographical differences in the bite ratio are driven by regional median wage differences. Adjusting for aggregate unemployment reveals that regional wage patterns are independent of temporary shocks to youth employment.
2. $\vartheta_{i,t}$ absorbs all national-level variations (plus LPC responses, i.e. changes to NLW)

On counterfactuals

Given an estimate for $\hat{\beta}$, to observe a counterfactual policy which would result in a reduction in the bite ratio from $BITE_0$ to $BITE_1$, we have:

$$E_{t \text{ counter}} = E_{t \text{ observed}} + \hat{\beta}(BITE_1) - BITE_0 \quad A.2$$

This can be applied on a national scale, observing the total number 16–24 year-olds that will be employed as a result of this change in policy. This is expressed as:

$$\Delta N = \left(\frac{\hat{\beta}}{100} \right) \cdot (BITE_1 - BITE_0) \cdot POP\{16 \text{ to } 24\} \quad A.3$$

For $BITE_0 = 66$, $BITE_1 = 56$, (a return to the pre-NLW level), $\hat{\beta} = -0.2$, and $POP\{16 \text{ to } 24\} \approx 7.25$ million, equation (A.6) yields $\Delta N \approx +145,000$. Under the upper-bound elasticity $\hat{\beta} = -0.4$, $\Delta N \approx +290,000$.

Macroeconomic effects

Here, we set out the calculations of the macroeconomic effects reported in the productivity and output section of the document.

GVA effects

Let:

- N denotes the total number of Britain's employed workforce (approximately 33.5 million people),
- W denotes the average annual GVA contribution of existing workers (£80,500);
- ΔN denotes the additional employment as a result of freezing the NLW (approx. 270,000)
- W_m represents the average annual GVA contribution of the added-on entrants to the labour market (£36,000 or 45 per cent of W)

The pre-policy estimate of the aggregate GVA can be understood as $Y = N * W$. Post-policy, we are interested in the change effect (*i. e.* $Y' = \Delta N * W_m$). The change in GVA per worker is represented as:

$$\Delta(\text{GVA per worker}) = \frac{Y + Y'}{(N + \Delta N) - W} \quad (A.4)$$

with the absolute change in annual GVA expressed as:

$$\Delta Y = \Delta N * W_m \quad (A.4.1)$$

The annual GVA gain to be expected from freezing the NLW is estimated therefore to be £9.7bn with the change in GVA per worker falling by -0.44 per cent due to diminishing marginal returns from extra labour.

Long-run wage scarring effect

Consider:

- D as the average annual earnings a British worker may obtain over the course of his career (ONS ASHE estimate this as £32,000)
- p as the proportional wage scarring effect as proposed by Gregg and Tominey (2005) as 8 per cent.
- T as the total length of a typical worker's career years (40 years)
- r as the HM Treasury recommended discount rate of 3.5 per cent (HM Treasury, 2026).

Without any wage scarring effect, we can apply the standard annuity formula to express the present value of career earnings as:

$$PV_0 = D * \left[\frac{1 - (1+r)^{-T}}{r} \right] \quad (A.5)$$

Adding wage scarring effects depresses lifetime earnings by $(1-p)$:

$$PV_1 = D * (1-p) * \left[\frac{1 - (1+r)^{-T}}{r} \right] \quad (A.5.1)$$

The gain the new entrant to the labour market would achieve by avoiding further wage scarring is the difference between PV_0 and PV_1 :

$$PV \text{ gain per worker} = D * p * \left[\frac{1 - (1+r)^{-T}}{r} \right] \quad (A.5.2)$$

We derive a per-worker present value gain of £54,700, which widens to £14.7 billion in present value when aggregated across approximately 270,000 additional workers to the labour market.

Fiscal effects

The relevant welfare and tax parameters are derived from public sources and applied to a representative worker. Let:

- k as the annual gross earnings of a young entrant at £20,000
- q_{PA} as the personal income tax allowance of £12,570
- τ_{PA} as the Employer NI threshold of £5,000
- r_{IT} as the personal income tax rate of 20 per cent
- r_{NIEE} as Employee NI rate of 8 per cent
- r_{NIER} as Employer NI rate of 15 per cent
- $\overline{UC}$ as the DWP (2025) estimated annual savings in Universal Credit per extra young adult in work (£4,500)

We can derive the per-worker effects as follows:

$$\gamma_{IT} = r_{IT} * \max(0, k - q_{PA}) \quad (A.6a)$$

$$\gamma_{NIEE} = r_{NIEE} * \max(0, k - q_{PA}) \quad (A.6b)$$

$$\gamma_{NIER} = r_{NIER} * \max(0, k - q_{PA}) \quad (A.6c)$$

$$\text{Net fiscal gain per worker} = G = \gamma_{IT} + \gamma_{NIEE} + \gamma_{NIER} + \overline{UC} \quad (A.6)$$

Aggregating across the additional employment as a result of freezing the NLW (ΔN) would give a value of ($\Delta N * G$)

Applying the parameters in A.9 yields $G = \text{£}8,830$ per worker per year. For approximately 270,000 workers, the annual fiscal gain becomes $\text{£}2.4$ billion.