Appendix to “Two puzzles: recent UK labour market dynamics” - speech by Megan Greene, May 2024

This appendix sets out further details on models used to analyse drivers of changes in the unemployment rate, and their potential effects on inflation, in relation to the speech titled “Two puzzles: recent UK labour market dynamics” given by Megan Greene at Make UK on 16 May 2024.

A model-based decomposition of changes in the unemployment rate

The speech proposes excess labour hoarding as an explanation for two puzzles regarding the UK labour market: 1) due to firms retaining workers at a time of subdued growth, the unemployment rate has remained at historic lows and 2) wage growth remains higher than we can explain despite a loosening labour market and falling inflation expectations. This appendix presents model-based evidence to better understand these various drivers of labour market developments.

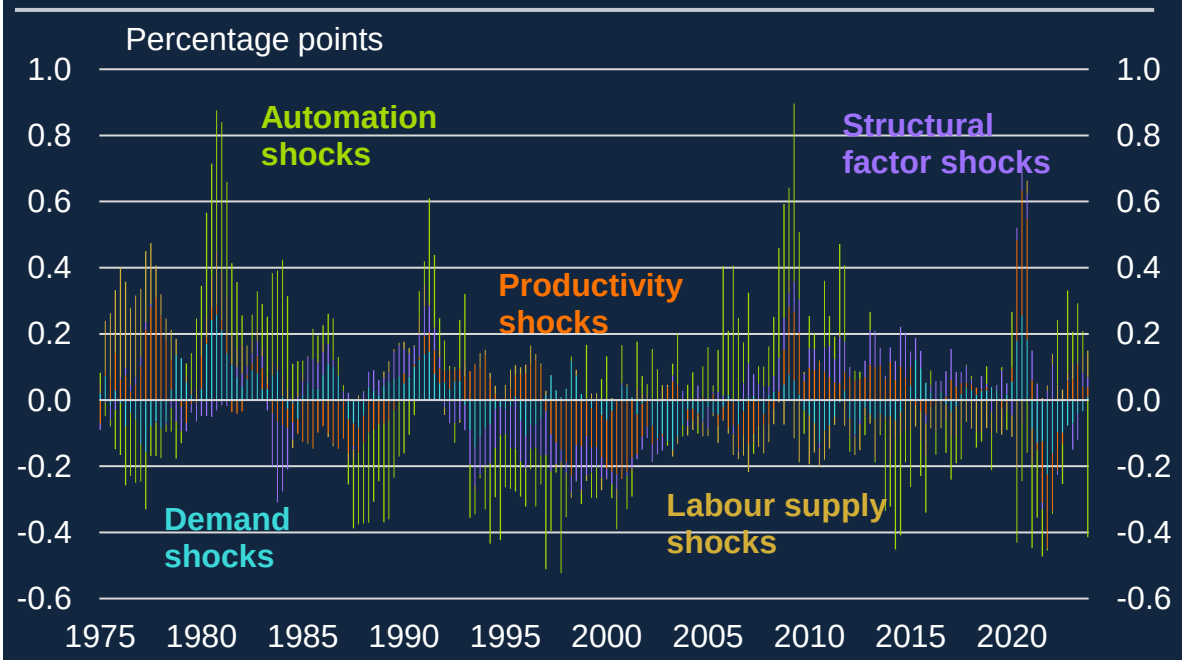
The Okun’s law relationship shown the speech is a simple mapping between GDP growth and the unemployment rate. This does not account for lags between GDP and unemployment or simultaneous causality between variables. It also does not account for different shocks driving these variables, which could have different implications for inflation.

To expand on the analysis shown in the speech, we propose a model-based decomposition of changes in unemployment into different shocks. Following **Foroni and Furnaletto (2022)**, **Chart A1** displays the historical decomposition of quarterly changes in unemployment into shocks derived from a Structural Vector Autoregression (SVAR), where **sign restrictions** recover the structural shocks. This model uses data for quarterly log changes in GDP, employment, the GDP deflator, real wages (whole economy AWE deflated by the GDP deflator), and quarterly changes in the unemployment rate.

Of the structural shocks, three produce conventional responses, which raise GDP and employment growth, while reducing changes in the unemployment rate:

- Demand shocks also raise price inflation (as measured by the GDP deflator), a shift of the demand curve.
- Technology shocks reduce price inflation – by reducing firms' marginal costs – but raises real wage inflation because labour demand is stronger.
- Structural supply shocks reduce both price and real wage inflation, moving in the same direction as unemployment. This kind of shock could be driven by a reduction in workers' bargaining power, or an improvement in matching efficiency. Empirically, this shock results in a much larger implied Okun coefficient than the demand or productivity shocks.

Chart A1: Historical decomposition of quarterly changes in the unemployment rate[(a)]



Source: ONS and author's calculations.

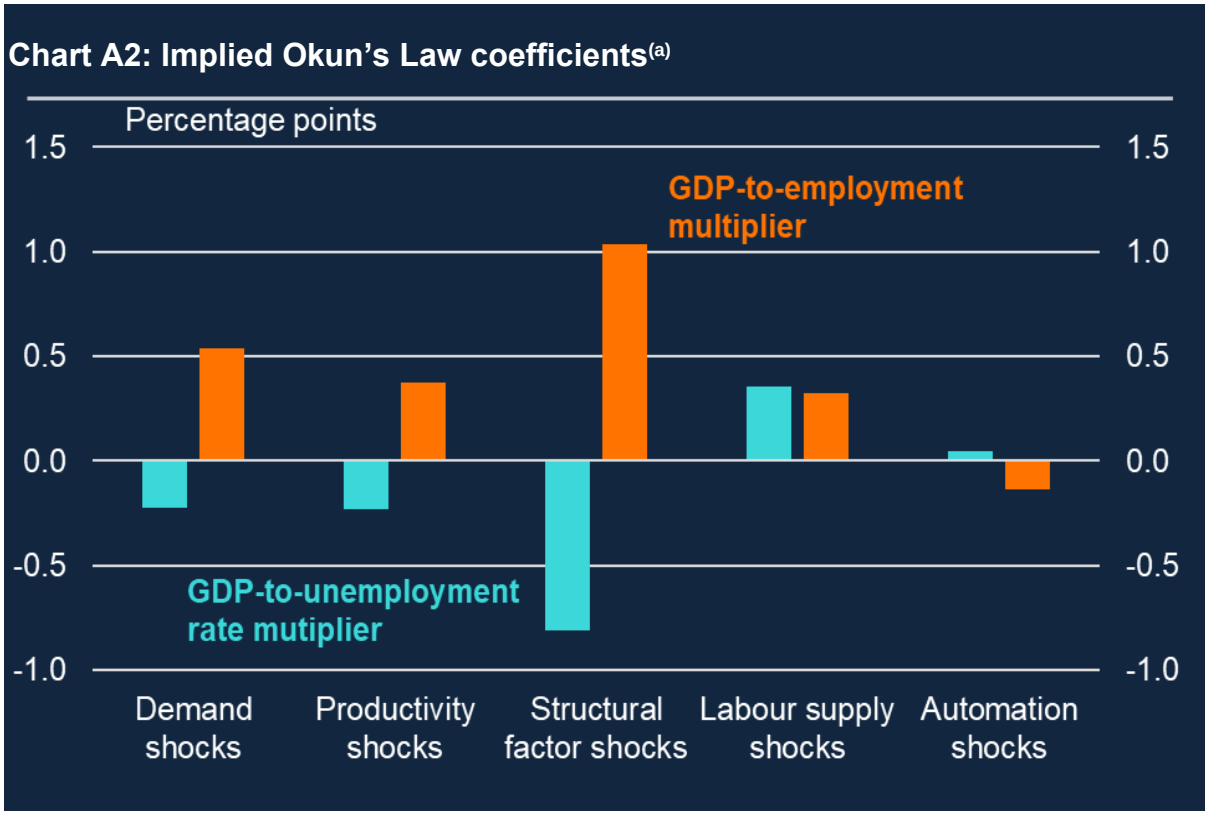
(a) Bars denote contribution of structural shocks to quarterly changes in the unemployment rate.

In addition, there are two shocks which move GDP growth and changes in the unemployment growth in the same direction:

- Labour supply shocks increase all three of GDP growth, employment growth, and changes in unemployment, while reducing price and wage inflation. This shock may be driven by an increase in the labour force participation rate, which would increase the overall labour force, but there would also be inflows from inactivity to unemployment.
- Automation shocks reduce employment growth, while raising GDP growth (and changes in the unemployment rate). This shock could also be thought of

as reflecting labour hoarding, for instance, as a result of increased recruitment difficulty. The responses of price and real wage inflation are unrestricted.

Chart A2 plots the implied Okun's Law coefficients for unemployment and employment, defined as the peak change in unemployment and employment divided by the peak change in GDP. Of the three standard shocks, the structural supply shock appears to have the largest implied Okun Law coefficients, that is, unemployment is even more responsive to GDP in response to this shock than a typical Okun coefficient would suggest.



Source: ONS and author's calculations.

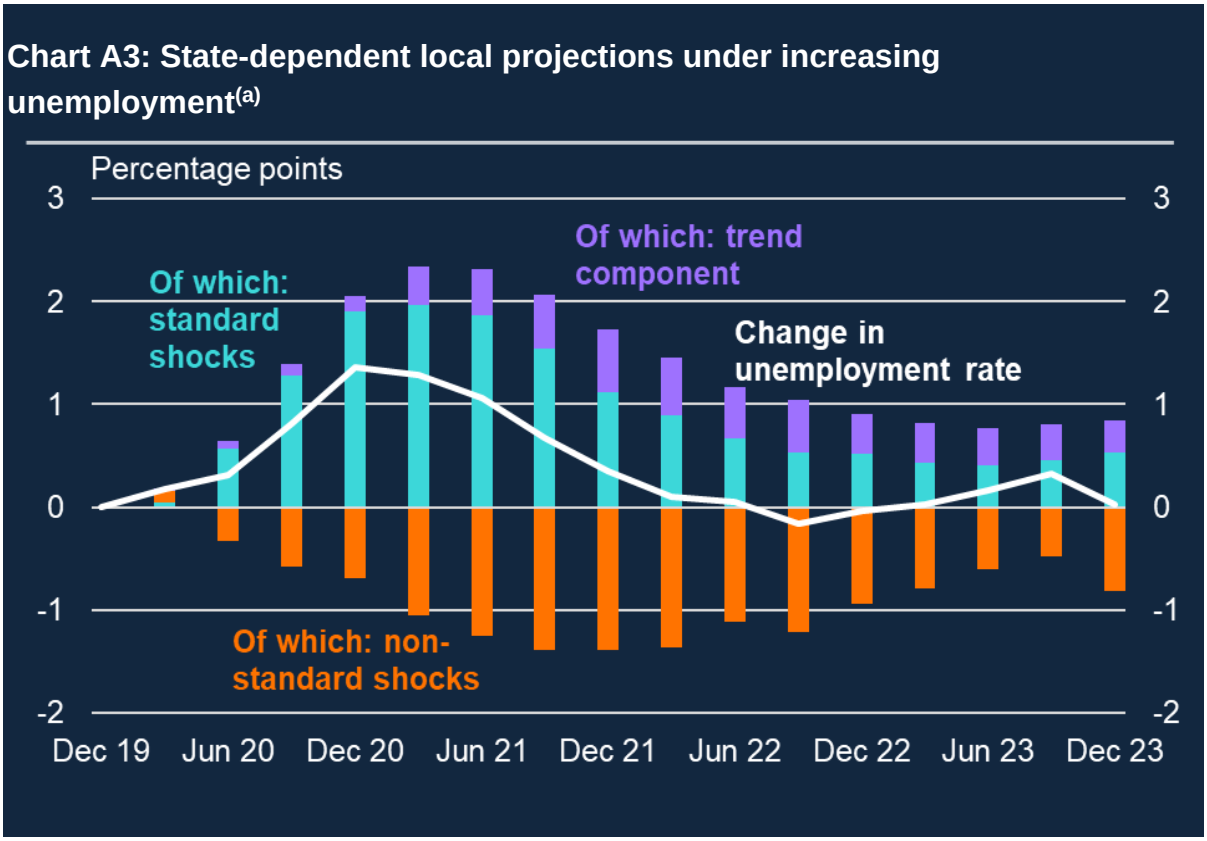
(a) Bars denote maximum impulse response of employment growth and changes in the unemployment rate divided by the maximum impulse response of GDP growth, in response to an identified shock.

Focussing on the post-Covid period, **Chart A3** plots the cumulative change in unemployment since 2019Q4 against the cumulative contribution of different shocks to changes in the unemployment rate. The aqua bars represent the sum of the three standard shocks, which move GDP and unemployment in opposite directions. These bars widened during the pandemic, as Covid lockdowns depressed GDP and pushed up on unemployment, before partially unwinding as GDP recovered. The orange

bars, which represent the sum of the two non-standard shocks, have been negative since 2019Q4[1].

This means that throughout post-Covid period, unemployment has been lower than a typical relationship with GDP would have implied, as per the first labour market puzzle. This is partly because of furlough measures, which prevented ubeh during Covid lockdowns. Also UK labour force participation has been below trend throughout this period, which mechanically reduces the unemployment rate. However, it is also likely that excess labour hoarding has also contributed to unemployment deviating from its typical relationship with GDP.

Chart A3: State-dependent local projections under increasing unemployment[(a)]



Source: ONS and author's calculations.

(a) Bars denote contribution of structural shocks to quarterly changes in unemployment, accumulated between 2020 Q1 and 2023 Q4. Standard shocks (aqua bars) are the sum of demand, productivity and structural factor shocks. Non-standard shocks (orange bars) are the sum of labour supply and automation shocks. The purple bars include the contribution of the deterministic trend.

[1] The purple bars include the contribution of the deterministic trend. The decomposition in Chart A3 is consistent with: a decomposition derived from a bivariate SVAR with sign restrictions, where GDP and unemployment move in opposite directions for standard shocks; and the estimated contribution of changes in GDP growth to changes in the unemployment rate from a simple autoregressive distributed lag model.

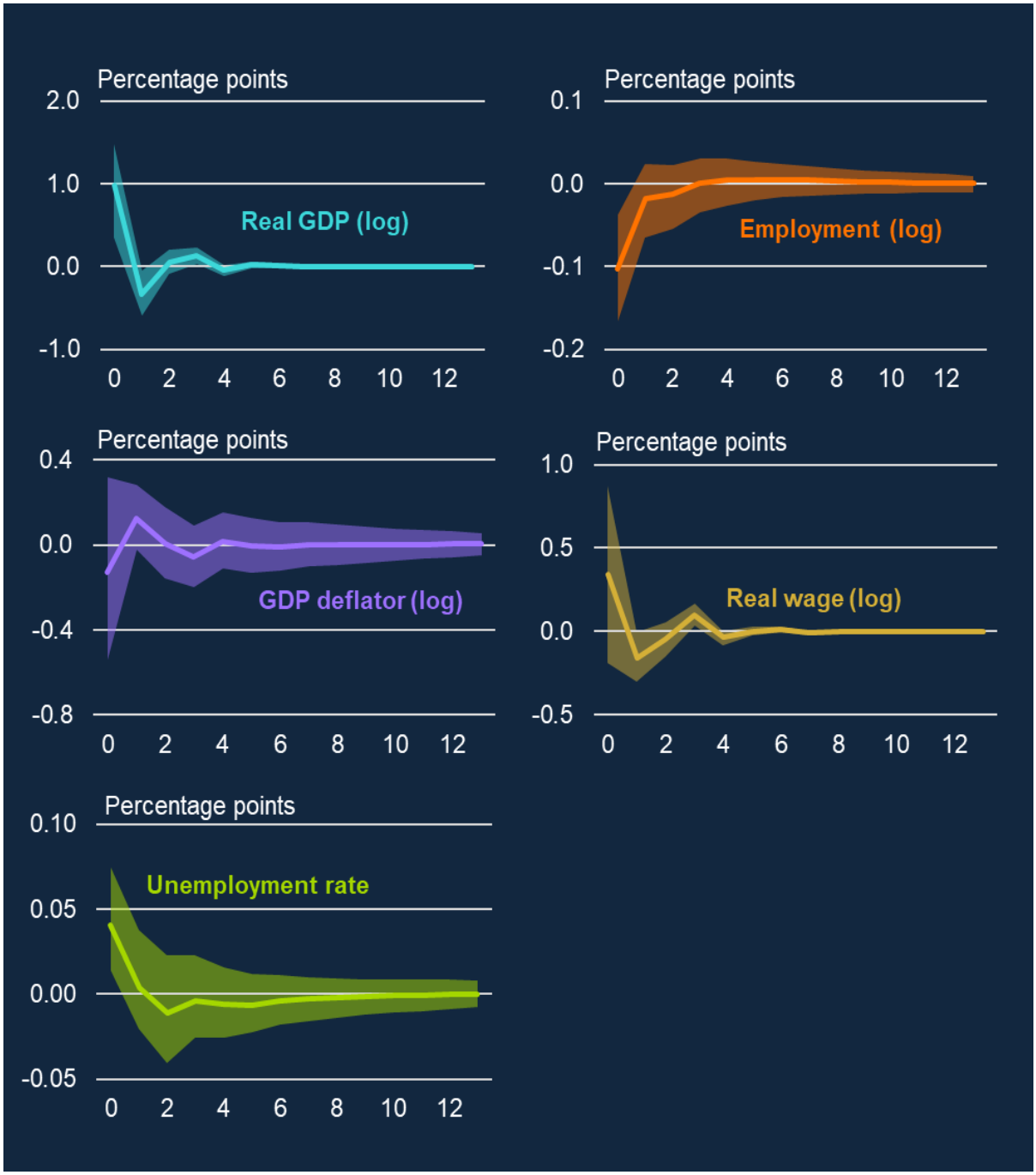
Over the past year, the aqua bars have been largely flat, consistent with the weakness of domestic activity. The orange bars had appeared to narrow up to 2023Q3, consistent with a fading contribution of atypical shocks to the unemployment rate; though they widened again in 2023Q4, it is difficult to take a clear steer from this, given the ongoing issues regarding LFS response rates.

Rather, the narrowing of the orange bars up to 2023Q3 appears consistent with analysis shown in the speech, which suggests that labour hoarding dynamics had been most prevalent over 2022 to mid-2023, before subsiding more recently. Changes in UK unemployment have become more closely aligned with GDP growth, and labour demand has moderated relative to supply. Recent improvements in recruitment difficulties and matching efficiency may have contributed to this normalisation.

How might labour hoarding affect inflation?

In theory, excess labour hoarding may contribute to higher inflation for a given level of productivity – as per the second labour market puzzle – by keeping unemployment low (relative to equilibrium), and by strengthening workers' bargaining power.

Chart A4: Impulse response of different variables to automation shocks[(a)]



Source: ONS and author's calculations.

(a) Impulse response over time of endogenous variables to identified automation shocks. Solid lines denote mean estimate mean local projection estimates. Shaded areas denote bootstrapped 68% confidence interval over 1000 draws.

This does not appear to be borne out in the empirical results from our SVAR model, however. **Chart A4** shows the impulse response functions for automation shocks, which may represent labour hoarding. A shock that raises GDP growth is associated with only a mild fall in price inflation and a mild increase in real wage inflation.

Inverting the signs, this result suggests the labour hoarding we have currently seen – at a time when GDP growth has weakened – only mildly pushes up on inflation[2].

However, it is plausible that labour hoarding may indirectly affect inflation, by affecting the transmission of shocks hitting the economy. As outlined in the speech, this may imply two-sided risks to the outlook for UK inflation.

To investigate this, we run state-dependent local projections of unemployment and (nominal) wages on the demand shocks identified from the SVAR model. Typically, a demand shock that raises the unemployment rate also depresses wages.

Our regression specification is as follows:

$$Y_{t+h} = F(z_t)\beta^{I}{}_{h}\varepsilon_t + \big(1 - F(z_t)\big)\beta^{II}{}_{h}\varepsilon_t + \sum_{j=1}^{N} \gamma X_{t-j} + u_{t+h}$$

Y_{t+h} is our variable of interest, h periods ahead of the shock. ε_t is the structural shock we investigate, in this case, demand shocks. X_{t-j} is a vector of control variables lagged by j periods: we include two quarterly lags of the levels of real GDP, employment, the GDP deflator, nominal wages and the unemployment rate. u_{t+h} is a residual component.

$F(z_t)$ is a logistic function which denotes the probability that a given variable is above a certain threshold. The value of $F(z_t)$ fluctuates smoothly between zero and one depending on how far above the threshold this variable is at any given time, as opposed to a dummy variable which can only equal zero or one. $\beta^{I}{}_{h}$ denotes the impact of a structural shock on our variable of interest at time h when during the first state, while $\beta^{II}{}_{h}$ denotes the impact of a structural shock during the opposite state.

We investigate the response of macroeconomic variables to identified demand shocks under two different states. First, whether productivity is decreasing or increasing. **Chart A5** (also shown in the speech) uses realised productivity – defined as output per employee – as a threshold: when realised productivity is declining, this means that firms are producing less output for a given level of employment. This could be indicative of labour hoarding, particularly when the economy enters technical recession.

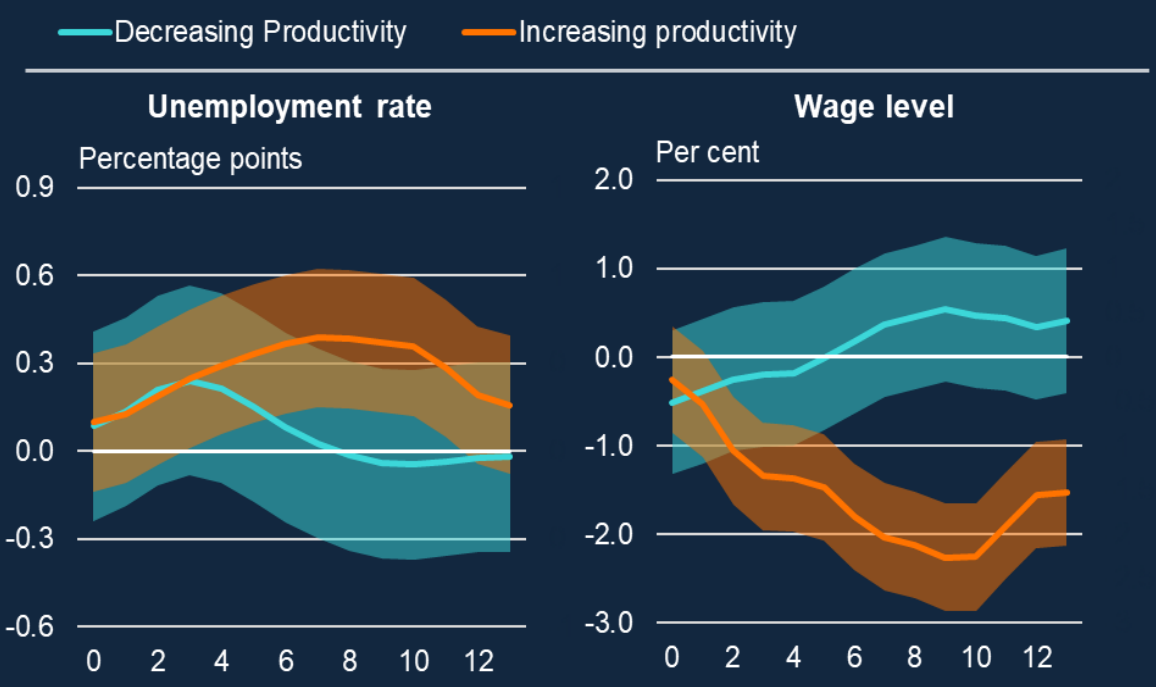
The aqua line shows the response of these variables to demand shocks during periods when realised productivity (GDP per employee) is declining, while the

[2] Consistent with these results, we find that recruitment difficulties – which have likely encouraged firms to hoard labour – have only a small effect on price and wage inflation.

orange line shows the responses when realised productivity is increasing. This suggests that unemployment may be less responsive to demand shocks when there is labour hoarding: though the aqua and orange lines increase in step for the first four quarters, they diverge significantly thereafter, with the aqua line returning quickly to zero.

More striking is the response in wages: there is no statistically significant change in the wage level in response to a demand shock when productivity is declining, compared to a steep decline when productivity is increasing. This could suggest that under labour hoarding, wages are less sensitive to changes in unemployment. At the current juncture, that could mean that adverse demand shocks – such as restrictive monetary policy – are less effective at reducing inflation.

Chart A5: State-dependent local projections under decreasing versus increasing productivity[(a)]



Source: ONS and author's calculations.
(a) Solid lines denote mean local projection estimates, under a given state. Shaded areas denote 68% confidence interval.

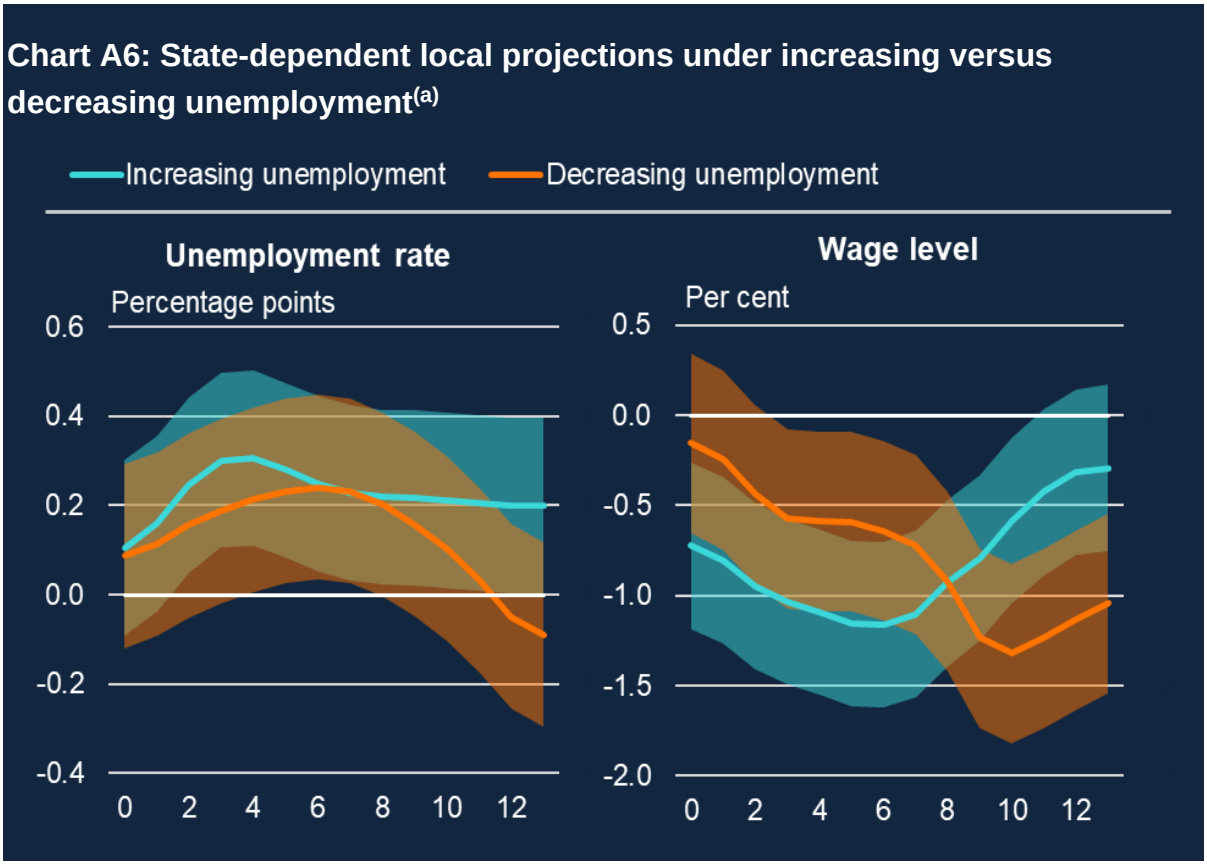
Our second threshold is whether the economy is experiencing recessionary dynamics. **Chart A6** (also shown in the speech) shows the responses of unemployment and wages to demand shocks under periods of increasing versus decreasing unemployment rates, in the aqua and orange lines respectively. This design choice aims to evaluate unemployment dynamics during the current recession: the May 2024 MPR projects a relatively mild increase in unemployment,

compared to previous recessionary episodes where the unemployment rate (and Sahm rule recession indicator) rose more sharply.

Under periods of increasing unemployment, the peak increase of unemployment in response to a demand shock is greater and more persistent compared to periods of decreasing unemployment. This means there is a risk that if the UK economy weakens more materially, unemployment could rise much more steeply than projected in the MPC's May 2024 MPR projection.

In addition, wage levels fall more sharply during the first two years during periods of increasing unemployment, though they normalise thereafter. The peak impact of demand shocks on wages in times of decreasing unemployment is equally strong, though the peak materialises around one year later.

Chart A6: State-dependent local projections under increasing versus decreasing unemployment[(a)]



Source: ONS and author's calculations.

(a) Solid lines denote mean local projection estimates, under a given state. Shaded areas denote 68% confidence interval.