The Impact of Aggregate Fluctuations Across the UK Income Distribution

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Disclaimer The views expressed in this paper are those of the authors, and not necessarily those of the Bank of England or its committees.

Motivation

- There is a growing literature (e.g. Guvenen et al. (2017)) that seek to understand the distributional implications of aggregate fluctuations. Lit Review
  - But less analysis on extensive margin;
  - And little in this new literature on the UK.
- Policy maker interest.
  - Project follows from a policy project decomposing monetary policy transmission across the income distribution.
  - Need for these estimates for UK focused models e.g. HANK models

Key Questions

Leveraging the short panel in the UK Labour Force Survey (LFS) we assess:

1. What the incidence of aggregate fluctuations on earnings and employment is across the income distribution in the UK?
2. How do margins of adjustment differ across the income distribution?

Approach: Data

- Regress aggregate changes in GDP on changes in individuals earnings and labour market status in the LFS microdata.
- LFS largest household survey in UK and underpins official labour market statistics.
  - Sample replicates aggregate data including AWE ▸ Comparison
- Can follow individual for 5 waves, and change in labour income between waves 1 and wave 5.
- Sample runs from 1997 (when we can start to track income) to 2019 (pre-covid data issues).
- Similar to Broer et al. (2022) we bin employed individuals by income decile in wave 1 and follow the group into wave 5.

$$y_{g,t+h} = \frac{1}{\sum_i \mathbf{1}_{(i,t)\in g} w_{i,t}} \sum_i \mathbf{1}_{(i,t)\in g} y_{i,t+h} w_{i,t} \tag{1}$$

Approach: Data

Table Average Characteristics by Income Decile

Decile	1	2	3	4	5	6	7	8	9	10
Avg. Hours	14.4	24.0	32.9	37.0	38.6	39.6	40.4	40.6	40.7	41.9
Part Time (PT)	0.92	0.78	0.36	0.17	0.11	0.08	0.06	0.04	0.03	0.02
PT Student	0.29	0.08	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Female Shr.	0.73	0.76	0.66	0.55	0.48	0.43	0.38	0.35	0.32	0.22
Avg. Age	36.0	39.6	38.0	38.0	38.9	39.5	39.7	40.6	41.9	43.2
Dependents	0.75	0.77	0.58	0.50	0.50	0.51	0.54	0.59	0.66	0.78
Age>60 Shr.	0.13	0.10	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.04
High Skill Shr.	0.05	0.08	0.09	0.11	0.16	0.23	0.31	0.43	0.59	0.77

Note: Table reports the average of other characteristics by income decile across all periods. High Skill is based on the ONS classification of occupations (SOC) into four skill levels: we report the share in the highest skill group (level 4). Dependents is the average numbers of dependents under 16 within the individuals household.

Approach: GDP Beta

We estimate the following regression by income decile on outcome variables of interest: real earnings, employment status and job switching.

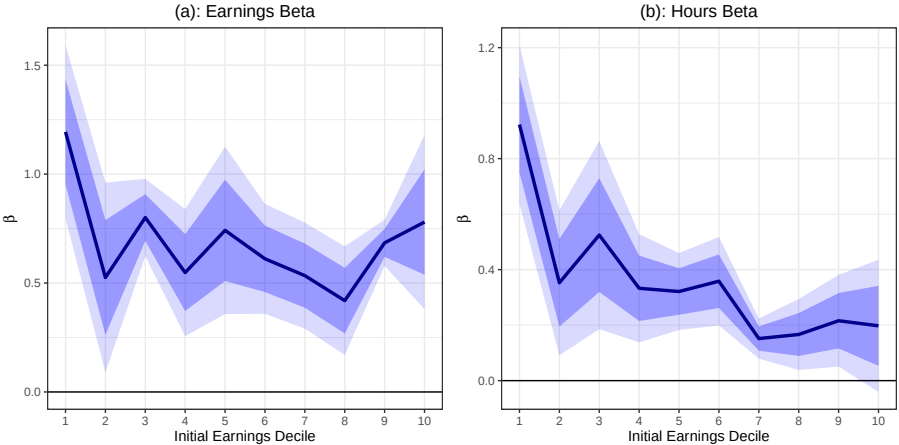
$$y_{g,t+4} - y_{g,t} = \alpha_g + \beta_g \Delta GDP_{t+4} + \epsilon_{g,t} \tag{2}$$

We show that the GDP Beta β_g can be interpreted as a variance weighted elasticity of changes in trend growth dg and temporary business cycle fluctuations da. ▸ Proof sketch

$$\beta = \underbrace{\frac{Var(dg)}{Var(dgdp)}}_{TrendShocks} \gamma_1 + \underbrace{\frac{Var(da)}{Var(dgdp)}}_{TransitoryShocks} \gamma_2 \tag{3}$$

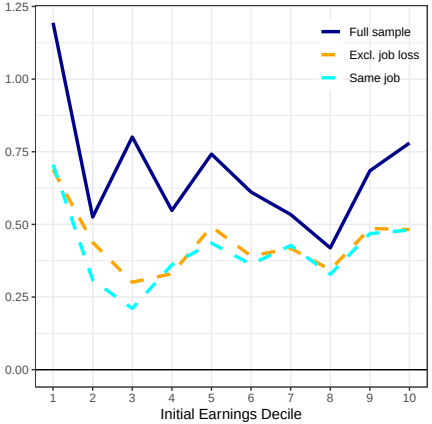
In order to further isolate temporary fluctuations we also estimate eq. (2) by instrumenting GDP growth with monetary policy shocks and forecast errors from a VAR. ▸ First Stage

Results: Earnings and Hours

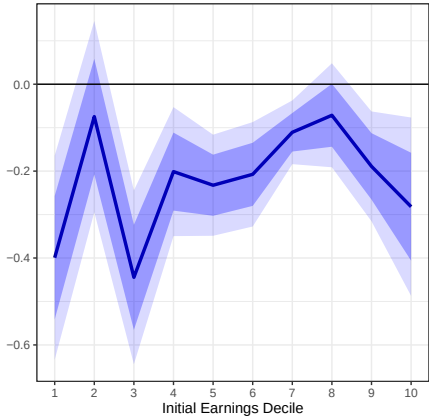


Results: Intensive v Extensive Margin

(a): Job Loss and Job Switching

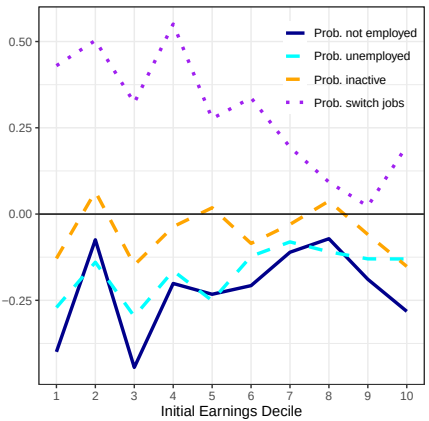


(b): Not Employed in $t + 4$

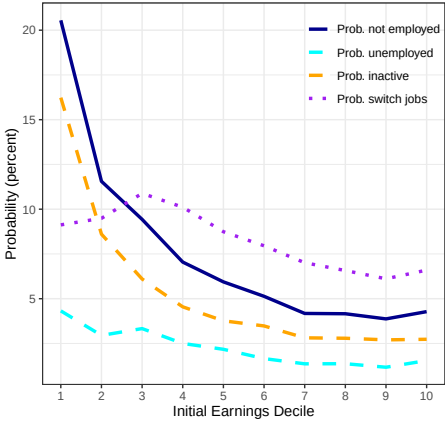


Results: Labour Market Transition Betas

(a): Labour Market Status in $t+4$

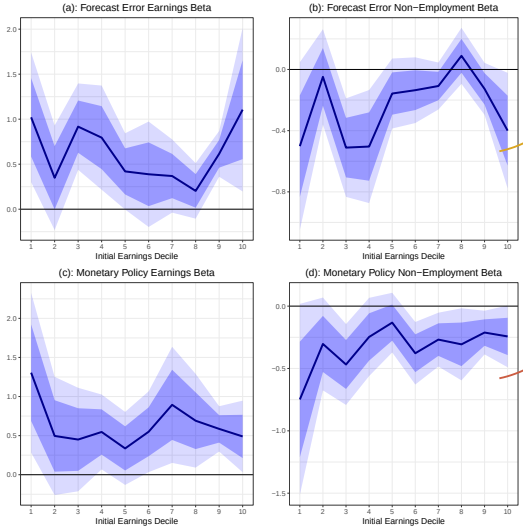


(b): Labour Market Status in $t+4$ (uncond.)



▸ Init. unemployed

Results: Transitory shocks (IV approach)



Response to lpp GDP Forecast Error

Response to Monetary Policy Shock

Summary

- Using the LFS we've tried to asses the incidence of aggregate fluctuations on earnings and employment across the income distribution in the UK.
- We found significant and heterogeneous effects across the distribution.
  - The largest effects at the very bottom
  - The extensive margin and job switching is more important in the bottom half.
  - The smallest effects are in the upper middle.
  - Unemployment margin dominates inactivity margin in response to shocks.
- In other exercises (not shown today) we found:
  - Not a significant difference when estimating at household level. ▸ Household
  - Not significantly different results for negative v positive growth periods. ▸ Neg. GDP
  - Positive fluctuations reduce earnings variance, largely through reducing EU transition rates. ▸ Variance

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Related literature

- Closest papers Guvenen et al. (2017) use a large administrative dataset for the US to document a U-shaped response across the income distribution to movements in GDP.
- Other recent studies such as Amberg et al. (2022), Andersen et al. (2022) and Holm et al. (2021) have focused on the distributional implications of monetary policy. The conclusions from these papers vary, common thread is that there is excess sensitivity to business cycle fluctuations induced by monetary policy at the bottom and top of the distribution.
- Papers such as Broer et al. (2022) and Hoffmann and Malacrino (2019) also consider extensive margin adjustment and document it's importance. Hoffmann and Malacrino (2019) analyse administrative data from Italy and conclude that employment changes and spells of unemployment contribute to the pro-cyclical skewness of income.
- Our paper also contributes to a small UK literature on the incidence of aggregate shocks. Bell et al. (2022) use the ASHE to study income dynamics.
- In addition, we contribute to a wider UK literature on cyclical earnings dynamics and the role of labour market transitions in generating employment fluctuations. Schaefer and Singleton (2019) use the ASHE data to measure the job-level response of wages and hours worked to business cycle fluctuations. Elsby et al. (2011), Gomes (2012), Razzu and Singleton (2016) and Singleton (2018) examine the contribution of labour market transitions to cyclical movements in the UK unemployment and inactivity rates.

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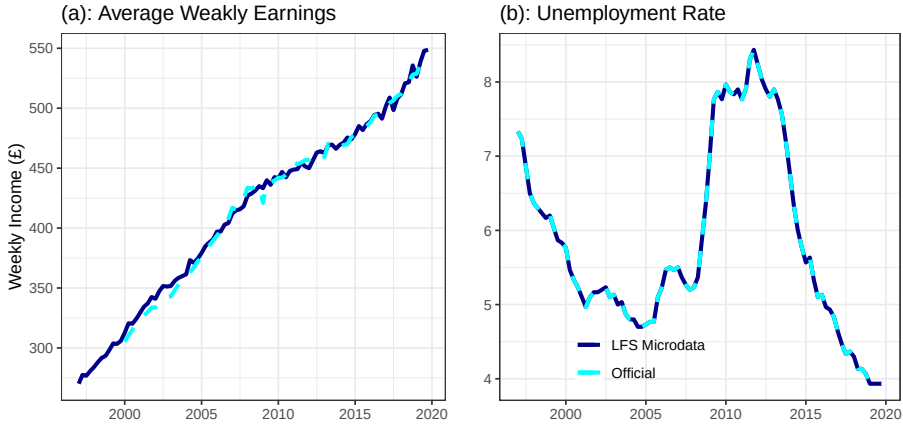
Replicating Official Data



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GDP Beta Interpretation

Consider the case where the data generating process for individual wage growth is as follows:

$$dy_{i,t} = dL_{i,t} + dz_{i,t} + \gamma_1 dg_t + \gamma_2 da_t \tag{4}$$

where the change in GDP is $dgdp_t = dg_t + da_t$ is composed of a slow moving growth trend dg and faster moving business cycle component da. Individual pay growth is determined by returns to age and experience, dL, and by idiosyncratic shocks dz. If we then estimate the regression:

$$dy_{i,t} = \alpha + \beta dgdp_t + \epsilon_{i,t} \tag{5}$$

we will attain the following coefficient estimates for α and β:

$$\alpha = E[dL] + E[dz] + \frac{E[dgdp]}{Var(dgdp)}(\gamma_1 - \gamma_2)E[da^2] \tag{6}$$

$$\beta = \frac{Var(dg)}{Var(dgdp)}\gamma_1 + \frac{Var(da)}{Var(dgdp)}\gamma_2 \tag{7}$$

where we have assumed $E[da] = 0$ and $E[dadg] = 0$.

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First Stage for IV

Table First Stage Regression on GDP

Instrument:	Monetary Policy Shock	Forecast Error
$z_{1,t}$	-6.32*	1.11**
	(3.60)	(0.456)
$z_{2,t}$	-4.06	
	(2.689)	
constant	0.020***	0.019***
	(0.003)	(0.004)
F-stat	12.85***	40.1***
R^2	0.22	0.32

Note: Table shows results from first stage regression $\Delta GDP_{t+4} = \delta z_t + \epsilon_t$. In the monetary policy shock implementation z is accumulated high frequency shocks from one (quarters $t-1$ to $t-4$) and two years prior (quarters $t-5$ to $t-8$). In the forecast error version z is the 1 year ahead GDP forecast error at time t from a VAR following Cesa-Bianchi et al. (2020). HAC standard errors reported: *p<0.1; **p<0.05; ***p<0.01.

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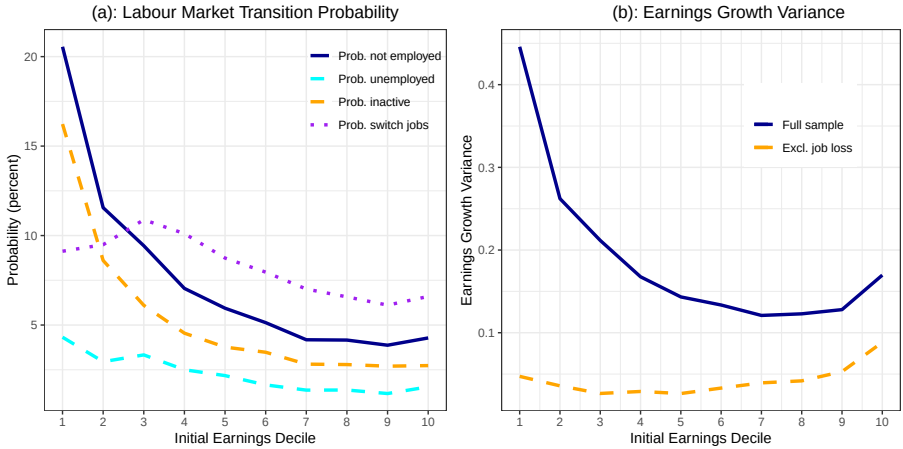
Unconditional/Average Transition Rates



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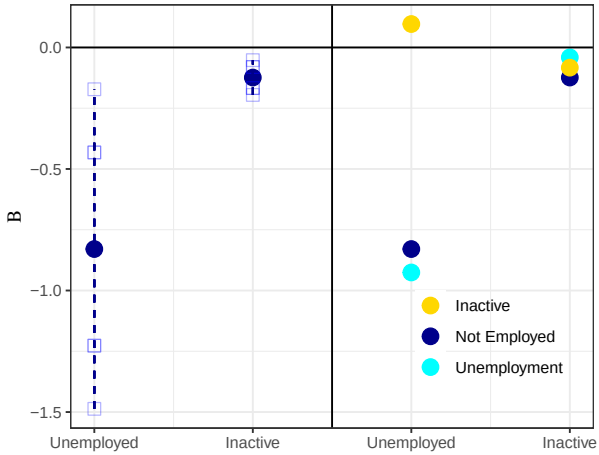
Transitions from Unemployment and Inactivity



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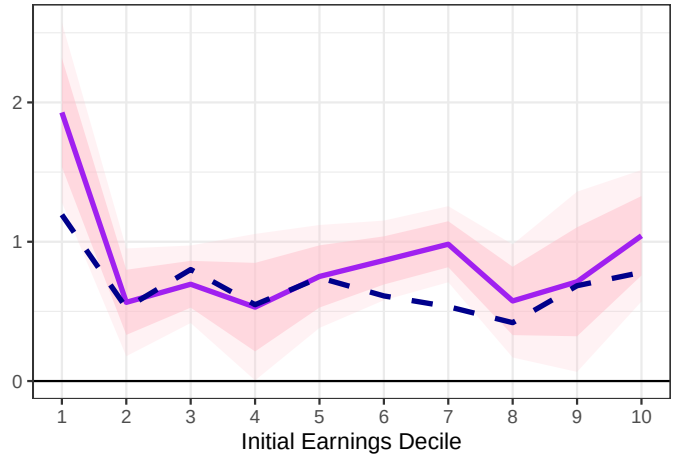
Further Results: Household level



Note: The purple line plots the coefficients β_g from Equation (2) but aggregating and binning at the household level rather than the individual level. The darker (lighter) shaded area represents the 68% (90%) confidence intervals. Households are sorted into deciles in each quarter based on household earnings in t. The blue dashed line repeats the estimate from the main earnings results. The sample period is 1997Q2-2019Q4. HAC standard errors reported.

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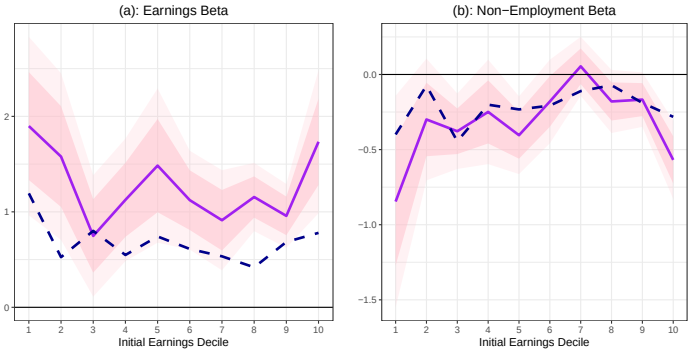
Further Results: Controlling for Recessions



Note: Panel (a) and panel (b) plot GDP beta estimates β_g that control for the impact of recessions by including a negative growth indicator as an interaction term: $y_{g,t,4} - y_{g,t,0} = \alpha_g + \gamma_g \mathbf{1}_{\Delta GDP_{t+4}<0} + \beta_g \Delta GDP_{t+4} + \beta_{g\_} \Delta GDP_{t+4} \mathbf{1}_{\Delta GDP_{t+4}<0} + \epsilon_{g,t}$. The purple lines plot the estimate that controls for periods of negative growth which are compared to the full sample estimates in the blue dashed lines. The darker (lighter) shaded area represents the 68% (90%) confidence intervals. Individuals are sorted into deciles in each quarter based on their earnings in t. The sample period is 1997Q2-2019Q4. HAC standard errors reported.

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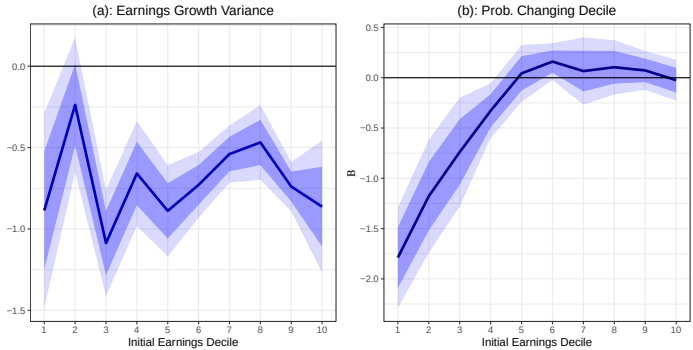
Further Results: Earnings Variance



Note: Panel (a) plots results for Equation (2) with within initial income decile pay variance $Var(dy_{t+4})$ on the LHS. The darker (lighter) shaded area represents the 68% (90%) confidence intervals. Panel (b) plots the GDP beta for the probability of changing income decile or changing labour market status (i.e. going to decile 0). Individuals are sorted into deciles in each quarter based on their earnings in t. The sample period is 1997Q2-2019Q4. HAC standard errors reported.

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