

Consumption and Income Inequality

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Different dimensions of inequality

- It is now clear that inequalities can take different forms and these different dimensions matter.
- Here we will look at different *economic* dimensions:
Wages, income, and consumption inequality.
 - Wages may represent prices for labor that households face.
 - Income embeds household formation and labor supply decisions.
 - Consumption is a key determinant of well-being.
 - It is determined by savings decisions and transfers;
 - Its dynamics reflects the ability to smooth out shocks to resources.
- We will not look at other determinants of well being:
 - Within household inequality;
 - Health;
 - Political voice;
 - Community participation.
- ... but long run income potential might be important for some of those.

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We will look at:

- Inequality within and across groups.

Groups are defined by:

- Year of birth;
 - Educational attainment of household head.
- Two different countries: UK and US.

We will pay particular attention to:

- Translation of income shocks to consumption changes.
 - Measurement over different frequency intervals reflect different weightings of temporary and permanent income shocks.
 - Consider smoothing of shocks within and across groups.

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Existing evidence and literature

- An extensive literature exists on inequalities in wage, income and many other dimensions, both in the US and the UK, across and within groups.
 - See, recently, the *Deaton Review on Inequalities*.
 - Important emphasis on technical progress and its evolution (Katz and Murphy, 1992 and, more recently, Acemoglu and Autor, 2012 and others;
 - Education and cognitive skills might not be the only relevant definition of groups. (skill and tasks)
- Papers that have looked at consumption inequality are much fewer.
- A partial list includes:
 - Cutler and Katz (1991): consumption inequality increases like income;
 - Slesnick (1994, 2001), Johnson and Shipp (1997), Krueger and Perri (2006) Heathcote et al (2010) ; Consumption inequality increases less than income;
 - Data issues and different approaches: Attanasio, Battistin and Ichimura 2007; Attanasio and Pistaferri 2014, Attanasio, Hurst, and Pistaferri 2015; Aguiar and Bils 2015; Meyer and Sullivan, 2012, 2021, Bee et al 2015;
 - Meyer and Sullivan, 2022: consumption inequality increases modestly.
 - Transmission of income shocks across and within groups: Attanasio and Davis (1996); Blundell, Pistaferri and Preston (2008); Attanasio and Szekely (2014), Amin-Smith and Attanasio (2020).

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Structure

- We start by presenting some basic facts on:
 - Wages, income and consumption inequality;
 - For the UK and US;
 - We consider overall inequality (sd of logs) and different parts of the distribution (P90-P10, P90-P50, P50-P10)
 - We will look at inequality across groups (education, cohort) and within groups;
- We then look at how inequality in wages is transmitted to consumption inequality:
 - Across groups: correlate relative changes in average group consumption and wages;
 - Within groups: correlate within group standard deviations in consumption and wages.
- These exercises can be framed as an 'insurance' question: what fraction of wage shocks are transmitted to consumption net of aggregate shocks?

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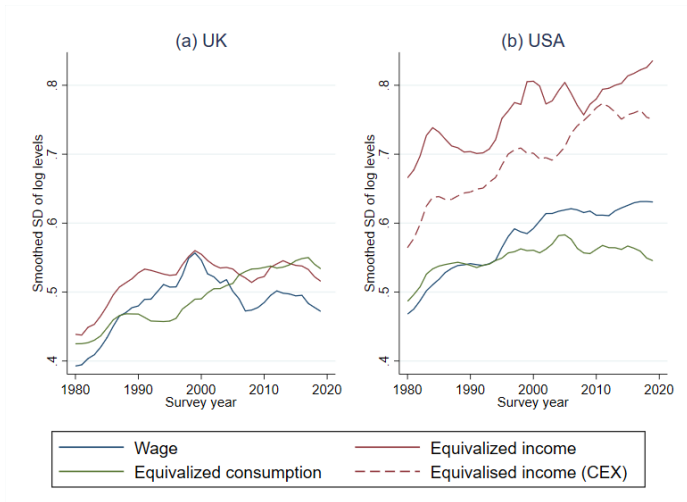
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Sample

- Sample as in Attanasio and Davis (1996)
- Males, in work, aged 23-59 and their households
- Trim very high and low wages (top 0.5% and $< 75\%$ of MW), incomes and consumption (top and bottom 0.5%)
- CPS for wage and income data, CEX for consumption data (among urban households) for the US
- Living Costs and Food Survey for UK
- 1980 - 2019

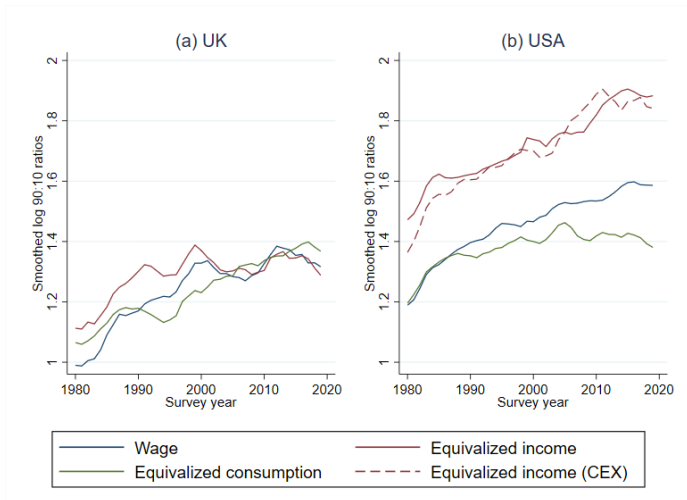
Overall inequality

Figure: Standard deviation of wages, income, and consumption, 1980 to 2019



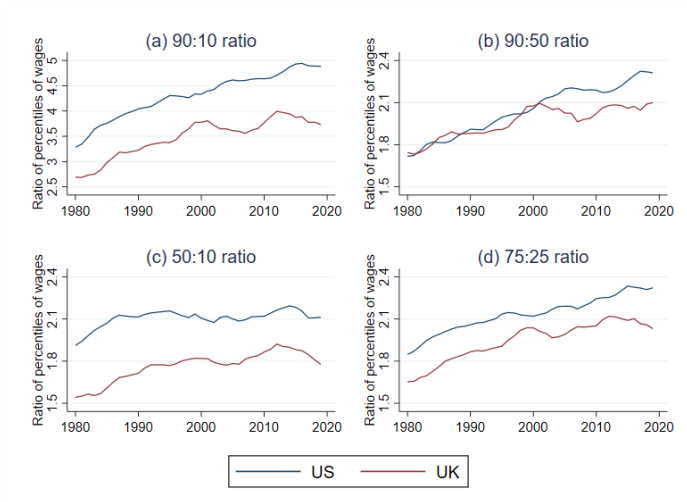
Overall inequality

Figure: 90:10 percentile ratios of wages, income, and consumption, 1980 to 2019



Wage inequality by percentiles

Figure: Smoothed percentile ratios of wages, 1980 to 2019



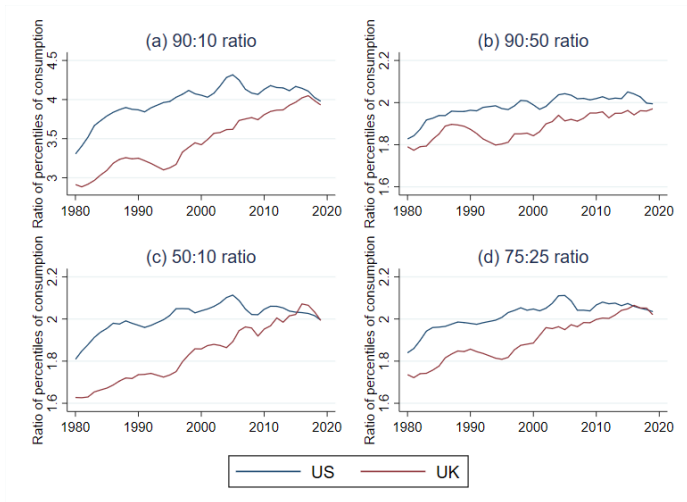
Income inequality by percentiles

Figure: Smoothed percentile ratios of household incomes, 1980 to 2019



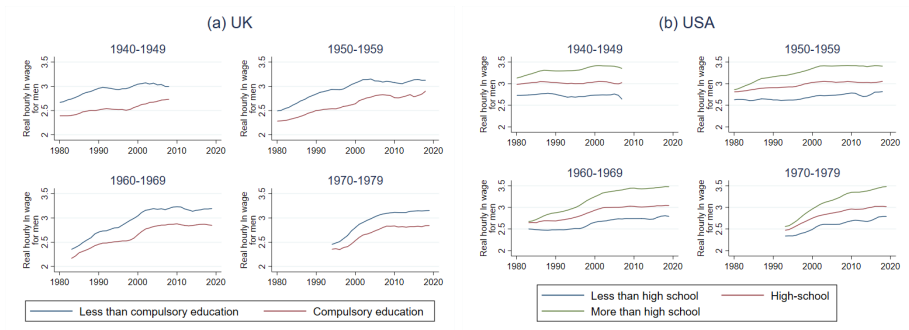
Consumption inequality by percentiles

Figure: Smoothed percentile ratios of household consumption, 1980 to 2019



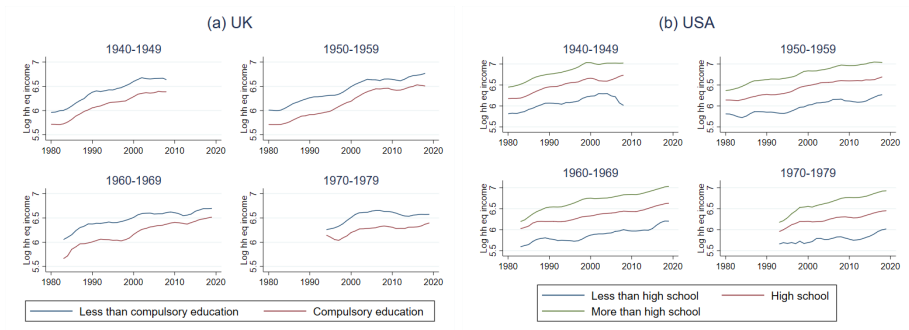
Wage inequality across groups

Figure: Wage by birth cohort and education group of household head, 1980-2019



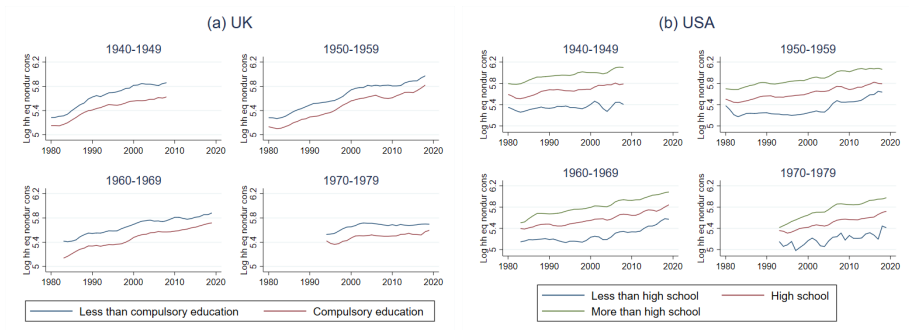
Income inequality across groups

Figure: Income by birth cohort and education group of household head, 1980-2019



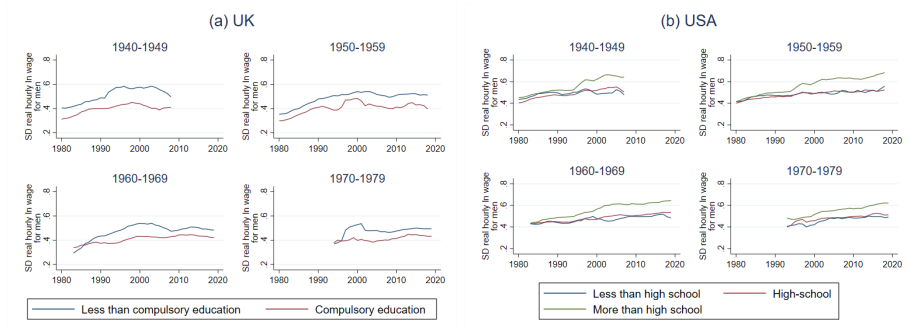
Consumption inequality across groups

Figure: Consumption by birth cohort and education group of household head, 1980-2019



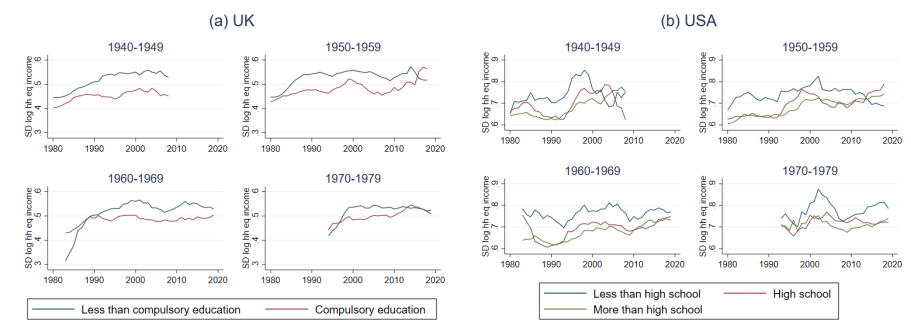
Wage inequality within groups

Figure: Standard deviation of wages by birth cohort and education group of household head, 1980-2019



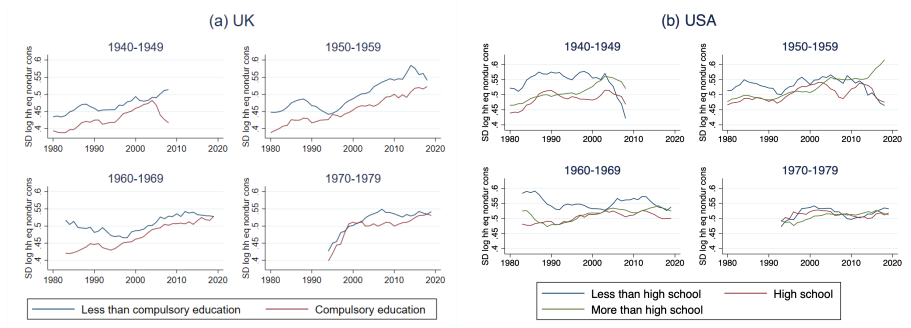
Income inequality within groups

Figure: Standard deviation of income by birth cohort and education group of household head, 1980-2019



Consumption inequality within groups

Figure: Standard deviation of consumption by birth cohort and education group of household head, 1980-2019



Theil decomposition

$$Theil = \frac{1}{N} \sum_{i=1}^N \frac{x_i}{\mu} \ln \left(\frac{x_i}{\mu} \right)$$

$$Theil = \underbrace{\sum_{g=1}^G s_g Theil_g}_{\text{Within group inequality}} + \underbrace{\sum_{g=1}^G s_g \ln \left(\frac{\bar{x}_g}{\mu} \right)}_{\text{Between group inequality}} ; \quad s_g = \frac{N_g \bar{x}_g}{N \mu}.$$

$$Theil = \underbrace{\sum_{c=1}^C \sum_{e=1}^E s_{ce} Theil_{ce}}_{\text{Within cohort-educ}} + \underbrace{\sum_{c=1}^C \sum_{e=1}^E s_{ce} \ln \left(\frac{\bar{x}_{ce}}{\tilde{x}_e} \right)}_{\text{Between cohort}} + \underbrace{\sum_{e=1}^E s_e \ln \left(\frac{\tilde{x}_e}{\tilde{x}_{ce}} \right)}_{\text{Between educ}}$$

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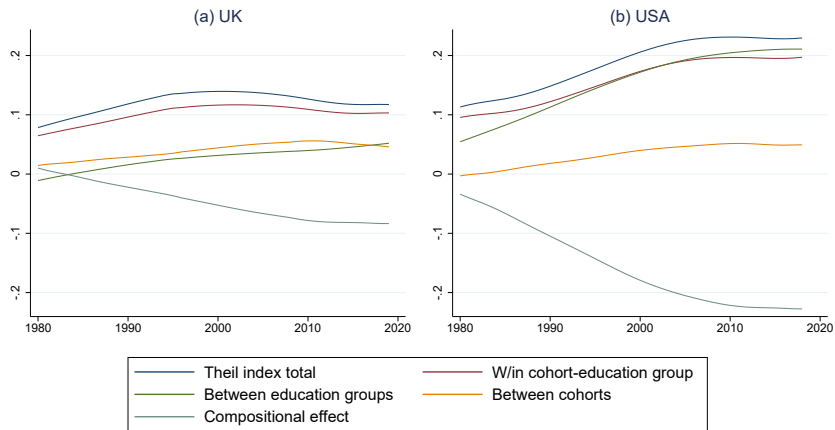
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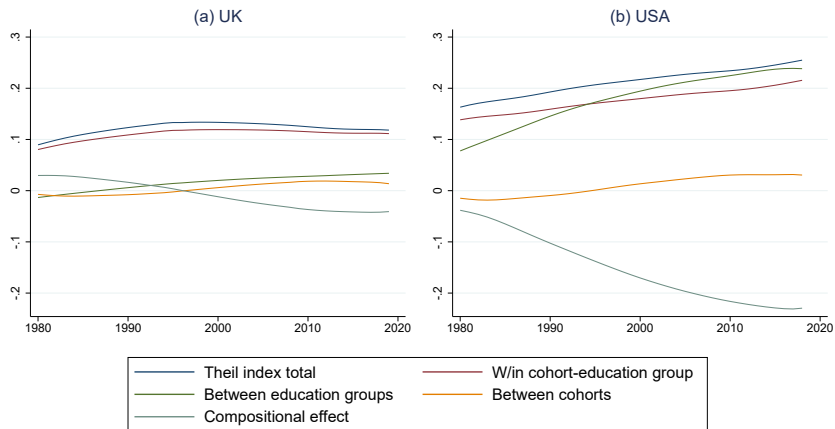
Theil decomposition for wage inequality

Figure: Theil index of inequality in wages



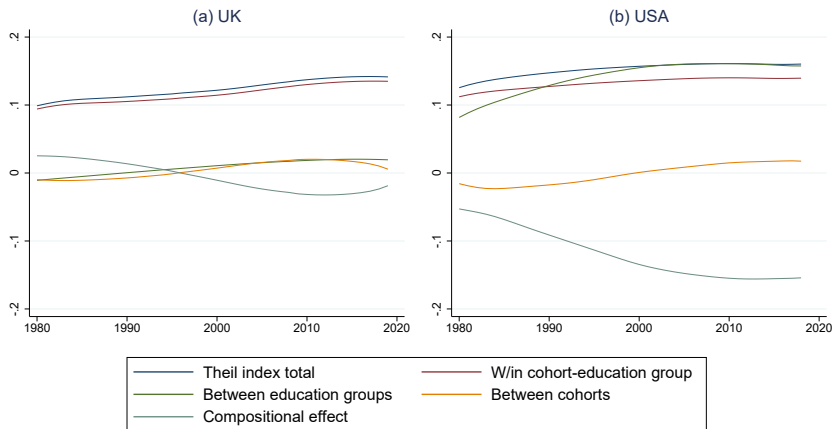
Theil decomposition for income inequality

Figure: Theil index of inequality in income



Theil decomposition for consumption inequality

Figure: Theil index of inequality in consumption



Take-home message from descriptive statistics

- The UK and the US have very different patterns:
 - Not only is the US more unequal but the dynamics is different;
 - Inequality level and increases are larger in the US.
- Rising wage inequality feeds into higher income inequality but not completely into rising consumption inequality;
 - Increase in consumption inequality much less pronounced in the US.
- Education plays a big role in both countries.
- For the UK P50:P10 plays an important role;
 - Large increases in minimum wage (introduced in 1999, big increases in 2016) compressed wage distribution;
 - The same does not happen for consumption.
- For the UK, inequality increases both within and across groups, for the US much of the action is across groups.

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Relating resources and consumption inequality

- Given changes in the distribution of resources (wages or income), an interesting question is whether these shifts are reflected into changes in the distribution of consumption.
- Under perfect insurance, the distribution of consumption growths should be *uncorrelated* with changes to the distribution of income (or wages).
- Consumption is particularly interesting because is a key determinant of well-being....
- ...and what types of shocks are transmitted to consumption can be informative about the ability to smooth resource shocks within or across certain groups.
 - Townsend (1994), Attanasio and Davis (1996).
- Given an assumption on the available asset and transfer markets, differences in the dynamic of income and consumption inequality can be informative of the relevance of different types of shocks: Blundell, Pistaferri and Preston (2008).

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Townsend (1994) test:

- Considering the social planner program that is typically used to characterise full risk sharing within an (arbitrarily defined) risk sharing group, one obtains the following f.o.c. for individual i at time t :

$$\frac{\partial U(C_{i,t}, z_{i,t})}{\partial C_{i,t}} \beta_t \pi_i = \nu_t$$

where π_i are the Pareto weight for individual i and μ_t is the multiplier associated to the resource constraint *for the risk sharing group*

- In logs, with CRRA utility and log-linear effects of $z_{i,t}$:

$$c_{i,t} = \ln(C_{i,t}) = \varphi_i + \tilde{\delta}' z_{i,t} + \mu_t + \omega_{i,t}$$

- taking k-periods differences

$$\Delta_k c_{i,t} = \Delta_k \tilde{\delta}' z_{i,t} + \Delta_k \mu_t + \Delta_k \omega_{i,t}$$

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Relating resource and consumption inequality

- The essence of Townsend's tests: adding resources shocks to the perfect insurance framework (where $y_{i,t} = \ln(Y_{i,t})$).

$$c_{i,t+k} = \gamma y_{i,t+k} + \varphi_i + \tilde{\delta}' z_{i,t+k} + \mu_t + \omega_{i,t+k}$$

$$\Delta_k c_{i,t+k} = \kappa + \tilde{\gamma} \Delta_k y_{i,t+k} + \tilde{\delta}' \Delta_k z_{i,t+k} + \Delta_k \omega_{i,t+k} + \Delta_k \mu_{t+k}$$

- When γ or $\tilde{\gamma} = 0$, changes to the distribution of income are not transmitted to the distribution of consumption.
- Note the second equation can be considered for different values of k .
- If resources have permanent and transitory components:

$$y_{i,t+1} = p_{i,t+1} + u_{i,t+1}; \quad p_{i,t+1} = p_{i,t} + \eta_{i,t+1} \quad u_{i,t+1} \text{ and } \eta_{i,t+1} \text{ i.i.d.}$$

which implies:

$$y_{i,t+1} = \left(\sum_{j=0}^{\infty} \eta_{i,t+1-j} \right) + u_{i,t+1}; \quad \Delta_k y_{i,t+1} = \left(\sum_{j=0}^k \eta_{i,t+1-j} \right) + u_{i,t+1} - u_{i,t+1-k}$$

- The weight of permanent shocks increases with k .

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$$y_{i,t+1} = p_{i,t+1} + u_{i,t+1}; \quad p_{i,t+1} = p_{i,t} + \eta_{i,t+1} \quad u_{i,t+1} \text{ and } \eta_{i,t+1} \text{ i.i.d.}$$

which implies:

$$y_{i,t+1} = \left(\sum_{j=0}^{\infty} \eta_{i,t+1-j} \right) + u_{i,t+1}; \quad \Delta_k y_{i,t+1} = \left(\sum_{j=0}^k \eta_{i,t+1-j} \right) + u_{i,t+1} - u_{i,t+1-k}$$

- The weight of permanent shocks increases with k .

Relating resource and consumption inequality

- The essence of Townsend's tests: adding resources shocks to the perfect insurance framework (where $y_{i,t} = \ln(Y_{i,t})$).

$$c_{i,t+k} = \gamma y_{i,t+k} + \varphi_i + \tilde{\delta}' z_{i,t+k} + \mu_t + \omega_{i,t+k}$$

$$\Delta_k c_{i,t+k} = \kappa + \tilde{\gamma} \Delta_k y_{i,t+k} + \tilde{\delta}' \Delta_k z_{i,t+k} + \Delta_k \omega_{i,t+k} + \Delta_k \mu_{t+k}$$

- When γ or $\tilde{\gamma} = 0$, changes to the distribution of income are not transmitted to the distribution of consumption.
- Note the second equation can be considered for different values of k .
- If resources have permanent and transitory components:

$$y_{i,t+1} = p_{i,t+1} + u_{i,t+1}; \quad p_{i,t+1} = p_{i,t} + \eta_{i,t+1} \quad u_{i,t+1} \text{ and } \eta_{i,t+1} \text{ i.i.d.}$$

which implies:

$$y_{i,t+1} = \left(\sum_{j=0}^{\infty} \eta_{i,t+1-j} \right) + u_{i,t+1}; \quad \Delta_k y_{i,t+1} = \left(\sum_{j=0}^k \eta_{i,t+1-j} \right) + u_{i,t+1} - u_{i,t+1-k}$$

- The weight of permanent shocks increases with k .

Relating resource and consumption inequality

- In the absence of longitudinal data these equations can be aggregated for a certain number of groups.

$$\frac{1}{N_g} \sum_{i \in g} c_{i,t+k} = \gamma \frac{1}{N_g} \sum_{i \in g} y_{i,t+k} + \varphi_i + \tilde{\delta}' \frac{1}{N_g} \sum_{i \in g} z_{i,t+k} + \mu_t + \frac{1}{N_g} \sum_{i \in g} \omega_{i,t+k}$$

$$\Delta_k \frac{1}{N_g} \sum_{i \in g} c_{i,t+k} = \kappa + \tilde{\gamma} \Delta_k \frac{1}{N_g} \sum_{i \in g} y_{i,t+k} + \tilde{\delta}' \Delta_k \frac{1}{N_g} \sum_{i \in g} z_{i,t+k} + \Delta_k \frac{1}{N_g} \sum_{i \in g} \omega_{i,t+k} + \Delta_k \mu_{t+k}$$

- With enough groups these equations measure the relation between changes in relative resources *across groups* and changes in relative consumption.
- Effectively this is 'insurance' across groups.

Relative income and consumption among-group test results for the UK

	(1) No c, OLS	(2) No c, IV	(3) C, IV
	<i>Annual difference (N = 310)</i>		
Mean log income	0.476*** (0.0502)	0.422 (0.362)	0.216 (0.447)
	<i>Eight-year difference (N = 206)</i>		
Mean log income	0.466*** (0.0486)	0.473*** (0.0747)	0.446** (0.137)
	<i>Levels (N = 358)</i>		
Mean log income	0.495*** (0.0389)	0.483*** (0.0516)	0.578*** (0.104)

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Relative income and consumption among-group test results for the US

	(1) No c, OLS	(2) No c, IV	(3) C, IV
	<i>Annual difference (N = 640)</i>		
Mean log income	0.0720 (0.0562)	0.183 (0.149)	0.0878 (0.138)
	<i>Eight-year difference (N = 432)</i>		
Mean log income	0.252*** (0.0426)	0.347*** (0.0587)	0.266*** (0.0752)
	<i>Levels (N = 736)</i>		
Mean log income	0.314*** (0.0342)	0.386*** (0.0380)	0.339*** (0.0472)

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

From among to within groups inequality

- Considering again the f.o.c. for perfect insurance:

$$c_{i,t} - \tilde{\delta}' z_{i,t} - \omega_{i,t} = \varphi_i + \mu_t +$$

- Taking the cross sectional variance within a group g

$$\text{Var}_g(c_{i,t} - \tilde{\delta}' z_{i,t} - \omega_{i,t}) = \text{Var}_g(\varphi_i)$$

- The left hand side represents the (variance) of the marginal utility of consumption *within a group*.
- Under perfect risk-sharing it is constant over time (Deaton and Paxson, 1994)
- Deviations from this measures imperfect insurance (and transmission of shocks) within groups (Attanasio and Székely, 2014).

$$\text{Var}_g(c_{i,t} - \tilde{\delta}' z_{i,t} - \omega_{i,t}) = \alpha_g + \beta \text{Var}_g(y_{i,t}) + \varepsilon_{gt}$$

Within group St. Dev.

	UK	US
	<i>Annual difference</i>	
SD log income	0.206*** (0.0493)	-0.0138 (0.0188)
	<i>Eight-year difference</i>	
SD log income	0.191*** (0.0518)	-0.0189 (0.0122)
	<i>Levels</i>	
SD log income	0.120** (0.0447)	-0.0038 (0.0198)

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Conclusions

- The dynamics of income and consumption inequality is different and can teach us some important lessons.
- There are some important differences and similarities between the UK and the US.
- We have looked at inequality in wages, household income and consumption and found that certain type of shocks to resources (permanent?) are transmitted to consumption.
- Short term fluctuations seem to be absorbed in the UK but not in the US.

Relative wages and consumption among-group test results for the UK

	(1) No c, OLS	(2) No c, IV	(3) C, IV
<i>Annual difference (N = 310)</i>			
Mean log wages	0.402*** (0.0626)	-0.242 (4.119)	-0.854 (24.10)
<i>Eight-year difference (N = 206)</i>			
Mean log wages	0.266*** (0.0573)	0.250*** (0.0892)	0.388** (0.104)
<i>Levels (N = 358)</i>			
Mean log wages	0.383*** (0.0571)	0.259*** (0.0891)	0.574*** (0.0921)

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Relative wages and consumption among-group test results for the US

	(1) No c, OLS	(2) No c, IV	(3) C, IV
	<i>Annual difference (N = 640)</i>		
Mean log wages	0.350*** (0.0341)	0.542*** (0.144)	0.591*** (0.145)
	<i>Eight-year difference (N = 432)</i>		
Mean log wages	0.349*** (0.0281)	0.358*** (0.0380)	0.488*** (0.0644)
	<i>Levels (N = 736)</i>		
Mean log wages	0.304*** (0.0194)	0.290*** (0.0212)	0.470*** (0.0409)

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.