

HOUSEHOLD BEHAVIOR AND THE DYNAMICS OF INEQUALITY

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 - Labor supply, etc. (wages → earnings)
 - Family labour supply, assortative matching and family time allocations (earnings → family earnings)
 - Taxes, welfare and social insurance (earnings → net income)
 - Saving and borrowing (income → consumption → wealth) – *don't forget nonseparabilities!*
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- Aim to explore the role of these mechanisms, during working life for the Nemmers monograph.
- Data on consumption *and* work together, $U(C, L)$, can be very informative! Add time use to understand the role of childcare.

- The aim is to uncover the distributional dynamics from wages and earnings through labour supply to consumption....

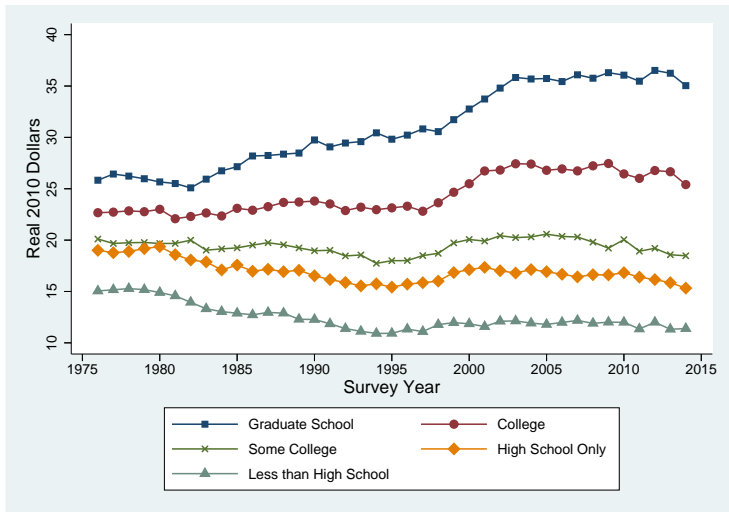
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- see IFS-Deaton Review: Inequalities in the 21st Century
<https://www.ifs.org.uk/inequality/>

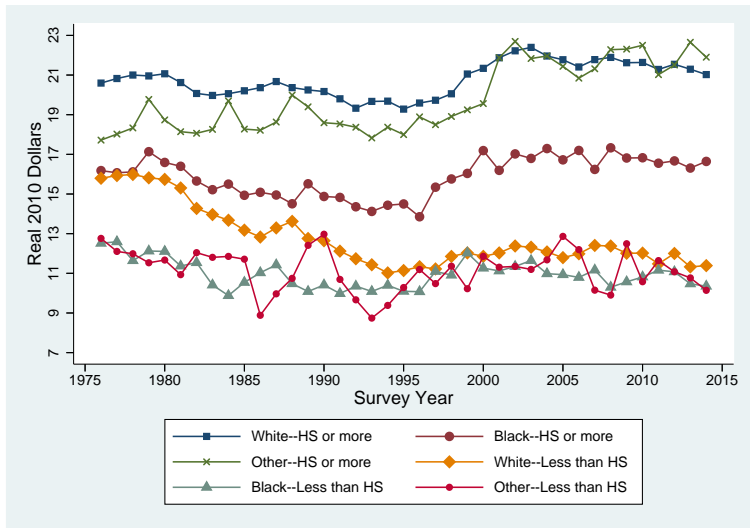
some background figures.....

Male Median Real Wages by Education in the US



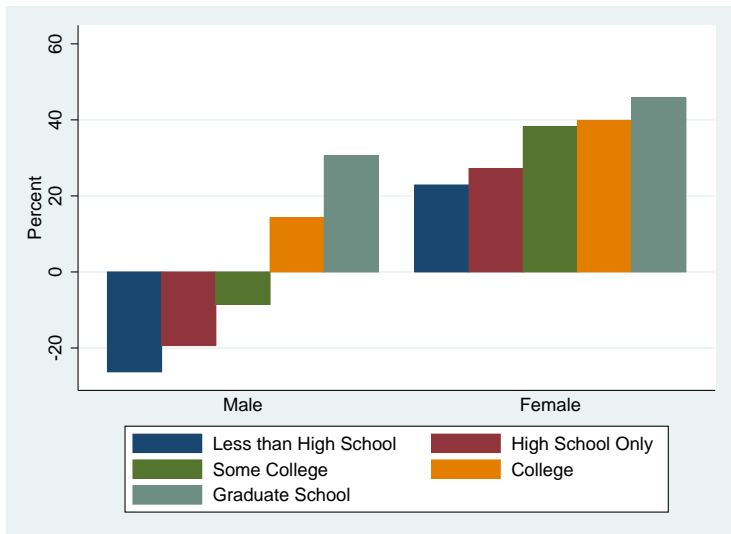
Notes: CPS, Ages 25-55; Source: Blundell, Norris-Keiller and Ziliak (2018)

Male Median Real Wages by Education and Race in the US



Notes: CPS, Men Ages 25-55; Source: Blundell, Norris-Keiller and Ziliak (2018)

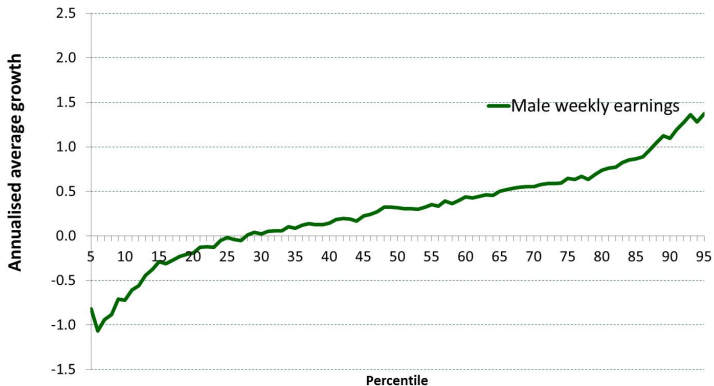
Earnings Change by Education and Gender, US



Notes: CPS, real median earnings 1976-2014, Ages 25-55.

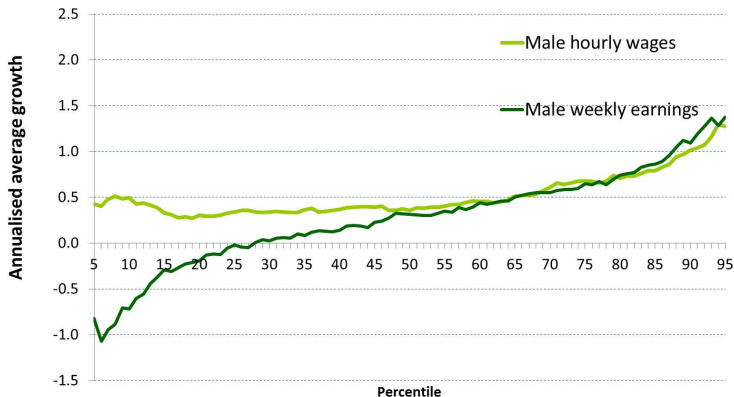
Source: Blundell, Norris-Keiller and Ziliak (2018)

Growth in UK male weekly earnings: 1994/95 – 2015/16



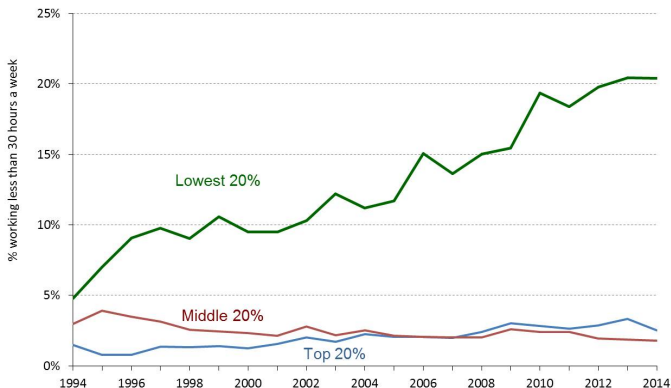
Source: Blundell, Joyce, Norris Keiller and Ziliak (2018)
Data used is UK FRS 1994-95 and 2015-16.

Growth in UK male hourly wages: 1994/95 – 2015/16



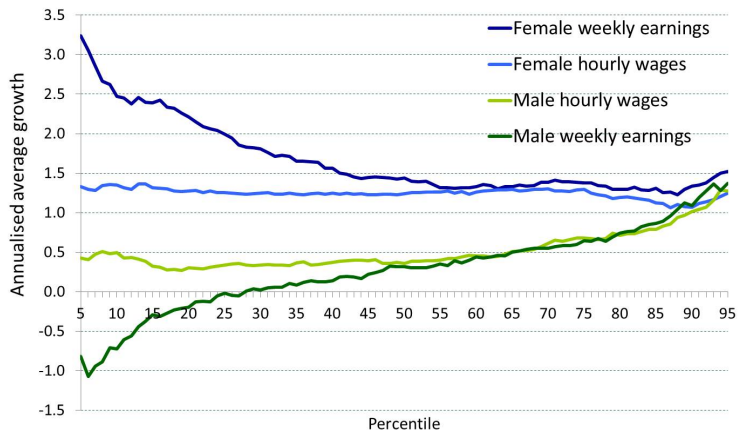
Source: Blundell, Joyce, Norris Keiller and Ziliak (2018)
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Male hours of work in the UK by wage quintile: 1994/95 – 2015/16



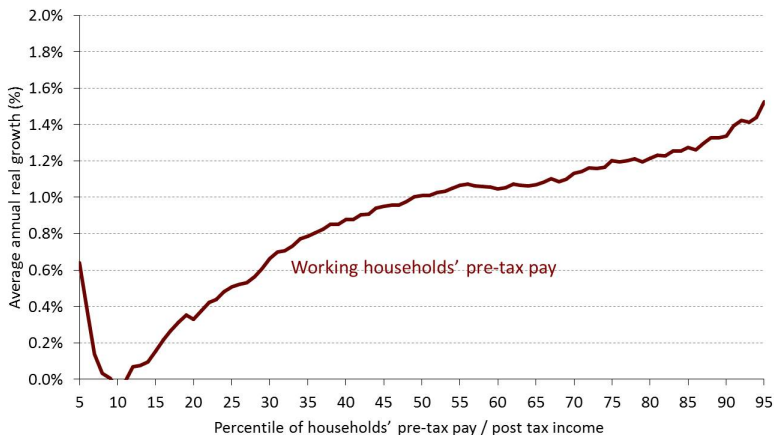
Source: Blundell, Joyce, Norris Keiller and Ziliak (2018)
Data used is UK FRS 1994-95 and 2015-16.

Growth in UK male and female earnings: 1994/95 – 2015/16



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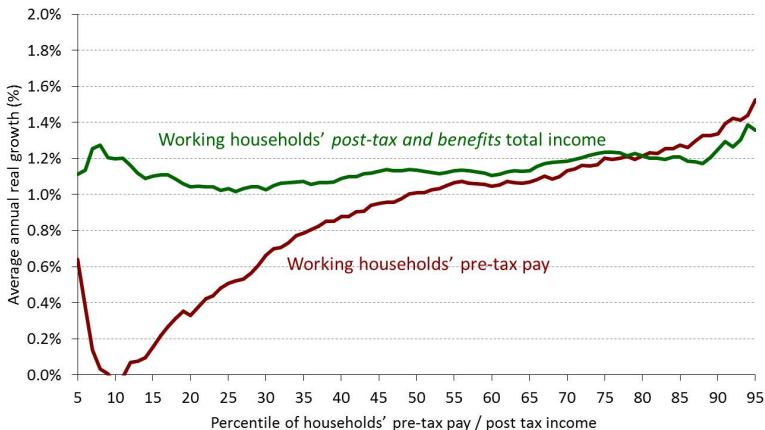
Growth in UK household earnings: 1994/95 – 2015/16



Source: Blundell, Joyce, Norris Keiller and Ziliak (2018)

Data used is UK FRS 1994-95 and 2015-16.

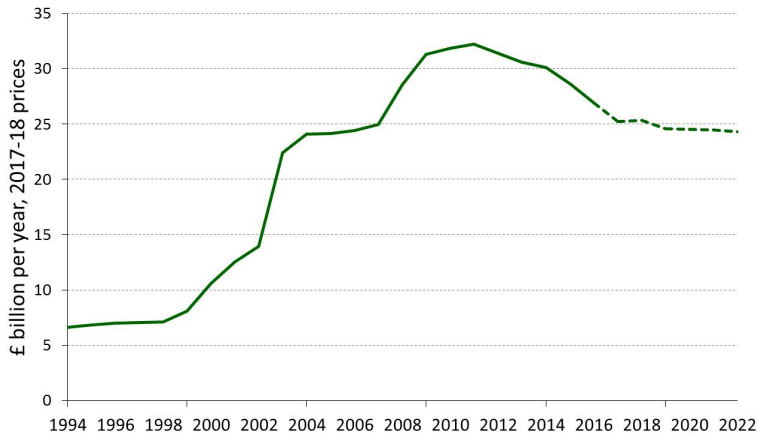
Growth in UK household post-tax income: 1994/95 – 2015/16



Source: Blundell, Joyce, Norris Keiller and Ziliak (2018)

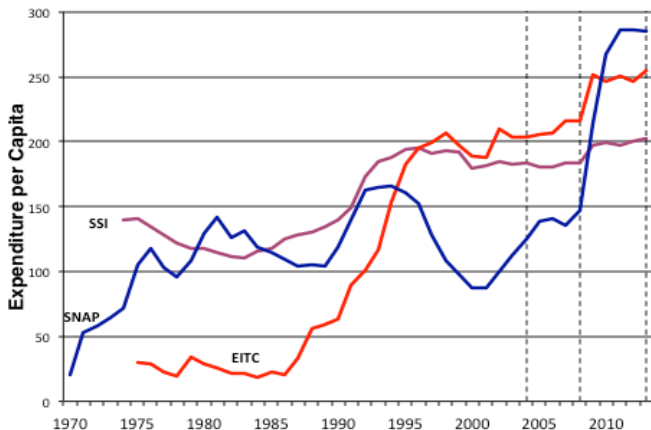
Data used is UK FRS 1994-95 and 2015-16.

Growth in UK tax and welfare expenditure: 1994/95 ->



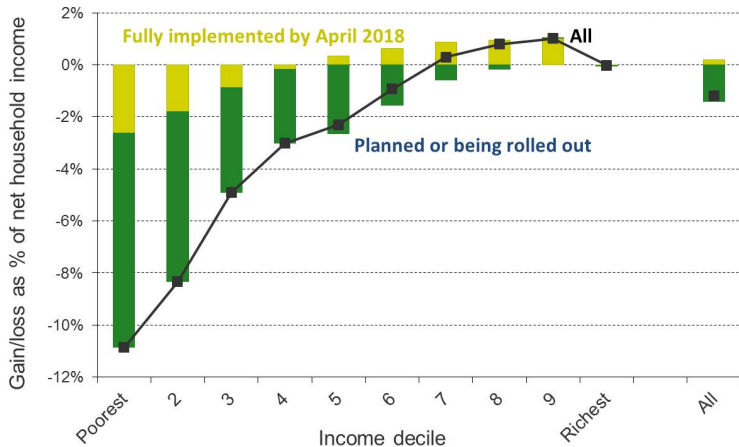
Source: Blundell, Joyce, Norris Keiller and Ziliak (2018).
DWP calculations plus IFS.

Expenditure per Capita, Non-Medicaid Means Tested Programs, US.



Source: Moffitt (2016); SNAP, EITC and SSI, [note AFDC/TANF].

UK tax and welfare policy responses



Source: Blundell, Joyce, Norris Keiller and Ziliak (2018).
IFS calculations.

Explore the mechanisms families use to accommodate (adverse) labour market shocks and assess effectiveness of the tax/welfare system

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- 2 Blundell, Low and Preston [BLP] 'Decomposing changes in income risk using consumption data' (*QE*, 2013)
- 3 Blundell, Graber and Mogstad [BGM1/2] 'Labor income dynamics and insurance using population register data' (*JPubE*, 2015; WP 2018)
- 4 Arellano, Blundell and Bonhomme [ABB] 'Earnings and consumption dynamics' (*Ecta*, 2017)
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Full references in the *Nemmers Lecture* on my webpage.

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Making use of new administrative and survey data of consumption, net assets and earnings in families over time.....

I. Administrative linked data: e.g. Norwegian population register.

- Linked registry databases with unique individual identifiers
 - Containing records for every Norwegian from 1993 to 2015.
 - Detailed information: earnings, cash transfers, financial transactions data on real estate and assets, extended family links;
 - Location identifiers \Rightarrow local labour market and house price shocks.
- Labour market information and new consumption measurements.
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II. Newly designed panel surveys: e.g. PSID 1999 - 2015.

- Collection of consumption and assets had a major revision in 1999
 - 70% of consumption expenditures - around 90% from 2005.
 - Food at home, food away from home, gasoline, health, transportation, utilities, clothing, leisure activities, ...etc .
 - zip codes and house prices.
- Earnings, hours, assets and debt measured in each wave.
 - for background see Blundell, Pistaferri and Saporta-Eksten (2016).

THE PARTIAL INSURANCE APPROACH

- Begin with modelling the dynamics of income as two latent components:
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- **There is also good economic reasoning behind this decomposition:**
 - persistent shocks to income are more difficult to insure,
 - especially the young with low (net) assets.
- **How families cope with persistent shocks and the implications for inequality is the main focus. Three key elements:**
 - 1 First, look at some new partial insurance results,
 - 2 Second, examine the importance of nonlinear persistence,
 - 3 Third, unpack the role of family labour supply and time use.

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- Write (log) earned income for household i in time period t , is as

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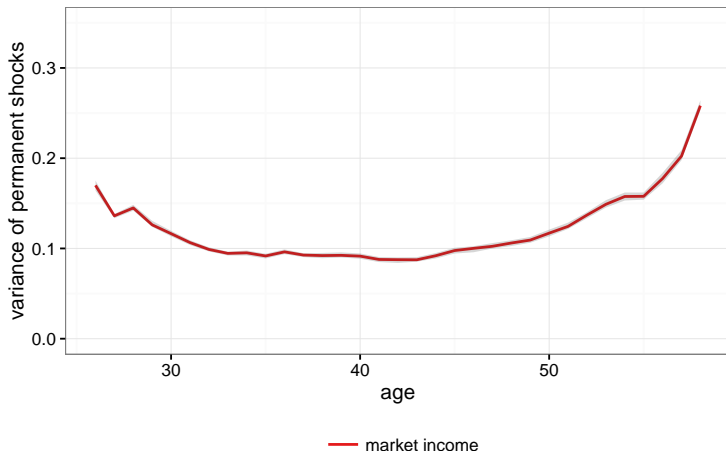
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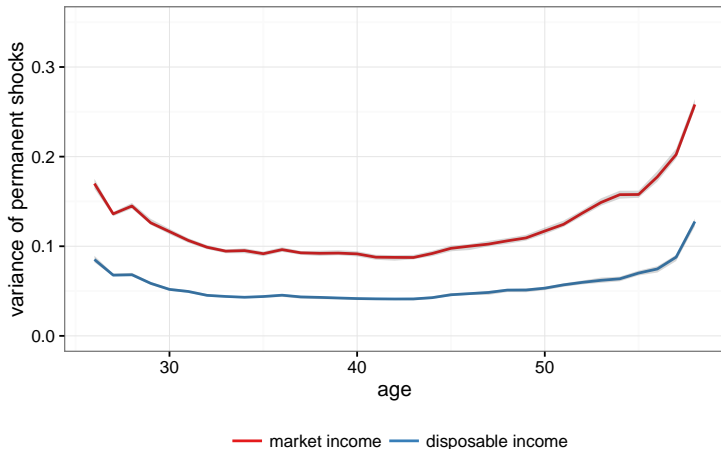
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- Simple but can be very revealing - detailed work on Norwegian population register panel data....

Variance of permanent shocks to income



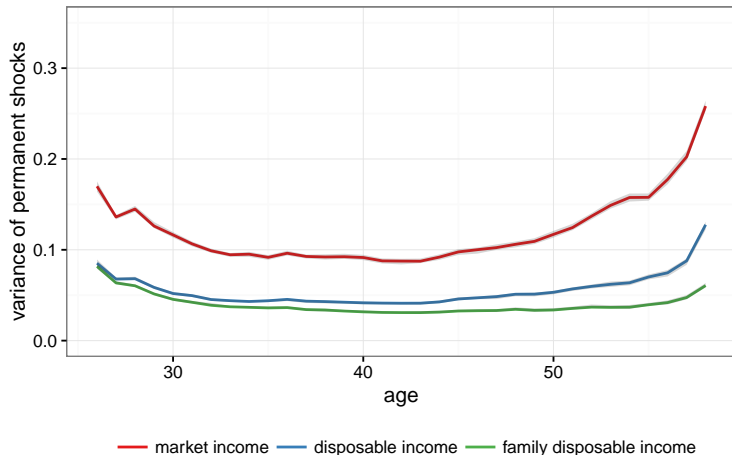
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Variance of permanent shocks to income



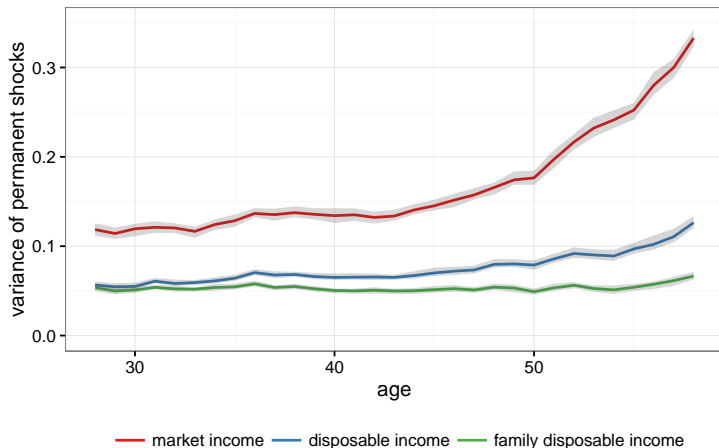
Source: Blundell, Graber and Mogstad (2015).

Variance of permanent shocks to income



Source: Blundell, Graber and Mogstad (2015).

Variance of permanent shocks to income (low skilled)



Source: Blundell, Graber and Mogstad (2015).

PARTIAL INSURANCE:

LINKING INCOME AND CONSUMPTION INEQUALITY

Introduce *transmission* or *partial insurance* parameters, writing consumption growth as:

$$\Delta \ln C_{it} \cong \gamma_{it} + \Delta Z'_{it} \varphi + \phi_t v_{it} + \psi_t \varepsilon_{it} + \xi_{it}$$

where ϕ_t and ψ_t can be individual specific and provide the link between the consumption and income distributions - v_{it} the persistent and ε_{it} the transitory shock to income.

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- For example, in a simple benchmark intertemporal consumption model for consumer of age t

$$\phi_t = (1 - \pi_{it}) \text{ and } \psi_t = (1 - \pi_{it}) \gamma_{Lt}$$

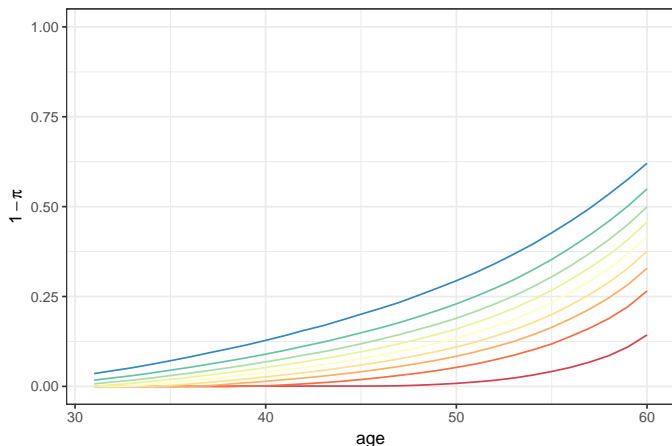
where

$$\pi_{it} \approx \frac{\text{Assets}_{it}}{\text{Assets}_{it} + \text{Human Wealth}_{it}}$$

- We generalise this framework: taxes, welfare benefits, other mechanisms and other assets to examine US and Norwegian data....

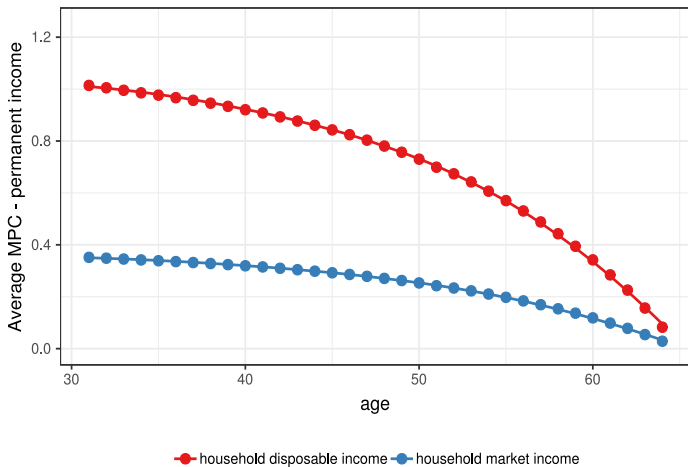
ASSET SHARES OUT OF ASSET AND HUMAN WEALTH:

Norway 1994-2014, High Skill, $\pi_{i,t} \approx \frac{\text{Assets}_{i,t}}{\text{Assets}_{i,t} + \text{Human Wealth}_{i,t}}$



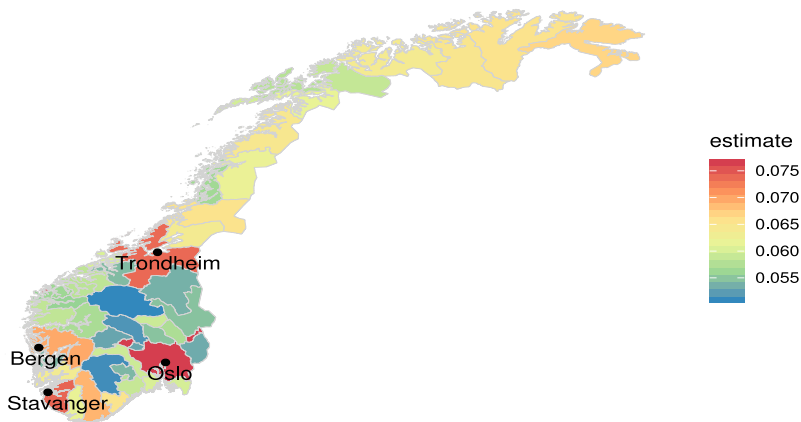
Source: Blundell, Graber and Mogstad (2019).

THE TRANSMISSION OF PERMANENT INCOME SHOCKS: NORWEGIAN REGISTER DATA



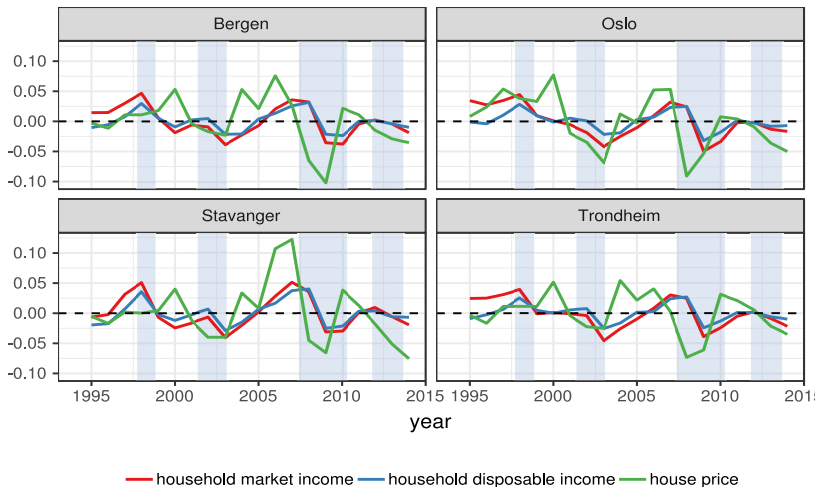
Source: Blundell, Graber and Mogstad (2019).

Average house price growth by commuting zone



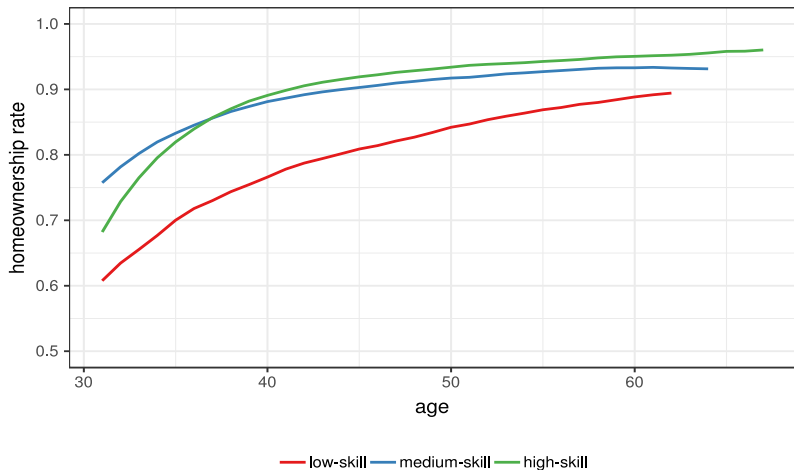
Source: Blundell, Graber and Mogstad (2019)

LOCAL INCOME AND HOUSE PRICES



Source: Blundell, Graber and Mogstad (2019)

HOME OWNERSHIP OVER THE LIFE CYCLE



Source: Blundell, Graber and Mogstad (2019)

I. Reduced-form (local average), extending BPP

$$\Delta c_{i,t} = \underbrace{\kappa_1 v_{it}}_{\text{perm. inc.}} + \underbrace{\kappa_2 \zeta_{j(i,t)}^Y}_{\text{local inc.}} + \underbrace{\kappa_3 \varepsilon_{it}}_{\text{trans. inc.}} + \underbrace{\kappa_4 \zeta_{j(i,t)}^H}_{\text{house wealth}} - \underbrace{\kappa_5 \zeta_{j(i,t)}^P}_{\text{prices}} + v_{it}$$

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Specification I: MPC Specification II: MPC

permanent income	0.78	0.76
local income	0.66	0.67
housing price (cpi adj)	0.02	0.02

PARTIAL INSURANCE AND HOUSE PRICES: NORWAY

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Family linkages in housing are the key to explain the young who have parents with housing.... test using young renters.

DIGGING DEEPER....

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Explore two directions that extend the partial insurance approach:

- 1 **The income process:** usual shocks and nonlinear persistence.
- 2 **Other mechanisms:** separate out the role of family labour supply, time use, assets and social insurance through taxes and welfare benefits.

1. NONLINEAR PERSISTENCE IN A HIDDEN MARKOV MODEL

- In Arellano, Blundell and Bonhomme (Ecta, 2017) we allow for “*unusual*” shocks that wipe out the memory of past shocks
- As before:

$$y_{it} = \eta_{it} + \varepsilon_{it}, \quad i = 1, \dots, N, \quad t = 1, \dots, T.$$

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- ▷ Introduce a new measure of persistence:

$$\rho_t(\eta_{i,t-1}, \tau) = \frac{\partial Q_t(\eta_{i,t-1}, \tau)}{\partial \eta}.$$

⇒ measures the persistence of $\eta_{i,t-1}$ when, at age t , it is hit by a shock u_{it} that has rank τ . *The persistence of histories.*

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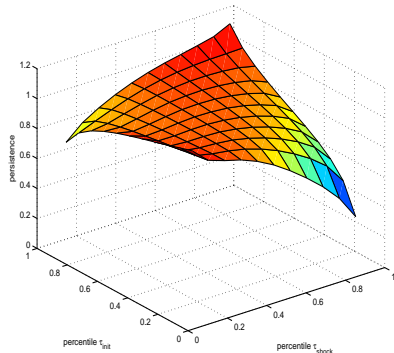
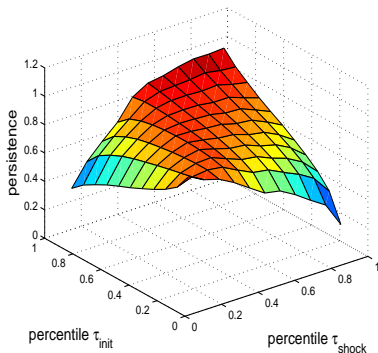
- ⇒ measures the persistence of $\eta_{i,t-1}$ when, at age t , it is hit by a shock u_{it} that has rank τ . *The persistence of histories.*
- ⇒ allows general conditional heteroscedasticity, skewness and

Motivating evidence from quantile autoregressions of log family earnings

$$\frac{\partial Q_{y_t|y_{t-1}}(y_{i,t-1}, \tau)}{\partial y}$$

New PSID panel data

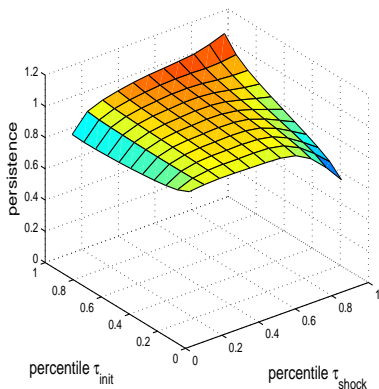
Norwegian register panel data



Notes: Household labour earnings, Age 30-59, 2005-2015 (US), 1993-2014 (Norway).
Estimates of average derivative of conditional quantile function of y_{it} given $y_{i,t-1}$ with respect to $y_{i,t-1}$, on grid of 11-quantiles and 3rd degree Hermite polynomial.

Nonlinear persistence of permanent factor η_{it} (PSID):

$$\rho_t(\eta_{i,t-1}, \tau) = \frac{\partial Q_{\eta_t|\eta_{t-1}}(\eta_{i,t-1}, \tau)}{\partial \eta}$$



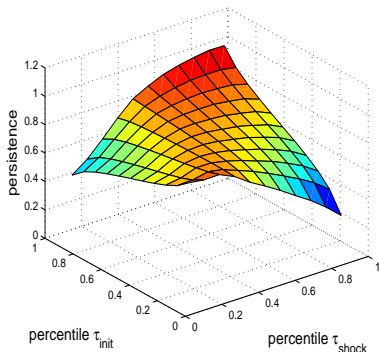
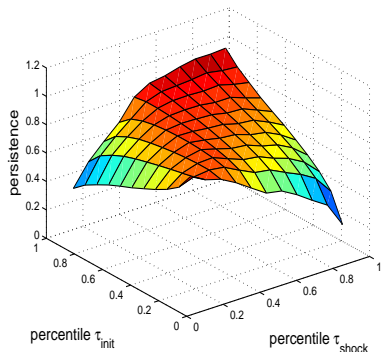
Note: Estimates of the average derivative of the conditional quantile function of η_{it} on $\eta_{i,t-1}$ with respect to $\eta_{i,t-1}$, evaluated at percentile τ_{shock} and at a value of $\eta_{i,t-1}$ that corresponds to the τ_{init} percentile of the distribution of $\eta_{i,t-1}$. Evaluated at mean age in the sample.

Nonlinear persistence of y_{it}

$$\frac{\partial Q_{y_t|y_{t-1}}(y_{i,t-1}, \tau)}{\partial y}$$

PSID panel data

Nonlinear model



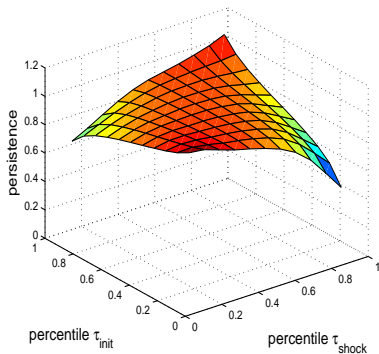
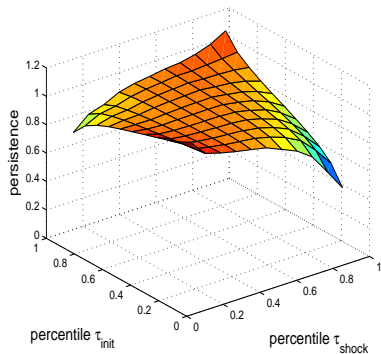
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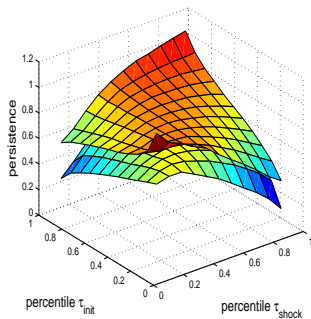
Nonlinear model



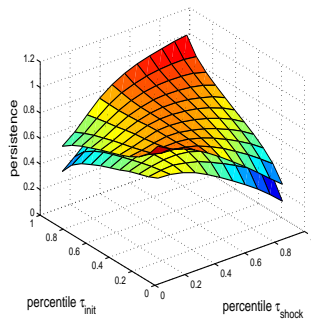
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Nonlinear persistence, 95% confidence bands

(a) Earnings, PSID data



(b) Earnings, nonlinear model



Note: Pointwise 95% confidence bands. Parametric bootstrap, 500 replications.

- Allow the permanent and transitory income components to interact with assets, age and individual heterogeneity:

$$c_{it} = g_t(A_{it-1}, \eta_{it}, \varepsilon_{it}, \nu_{it}, \zeta_i)$$

->

assets A_{it-1} , permanent income η_{it} , transitory shocks ε_{it} , taste differences ν_{it}, ζ_i (not incorporated Alan Olivi's results yet!).

IMPLICATIONS FOR THE CONSUMPTION DISTRIBUTION

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- Show identification of g_t and estimate a more general definition of **partial insurance**:

$$\phi_t(A, \eta, \varepsilon) = E \left[\frac{\partial g_t(A, \eta, \varepsilon, v)}{\partial \eta} \right],$$

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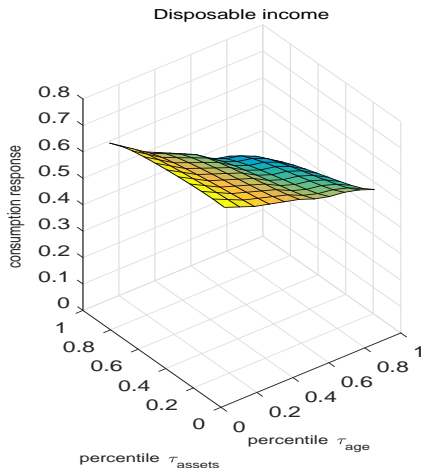
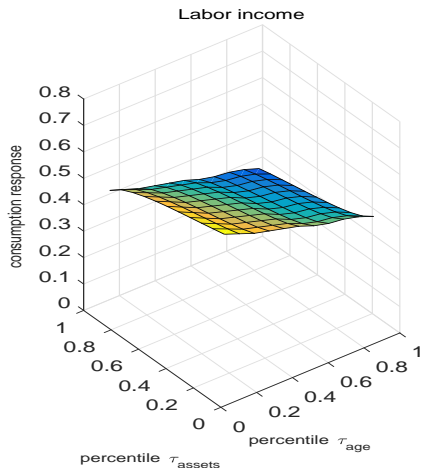
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- Tracking the impact of changes in η_t on consumption for different levels of assets and for different ages.....

Partial Insurance of Labour Income and Disposable Income by Age and Assets

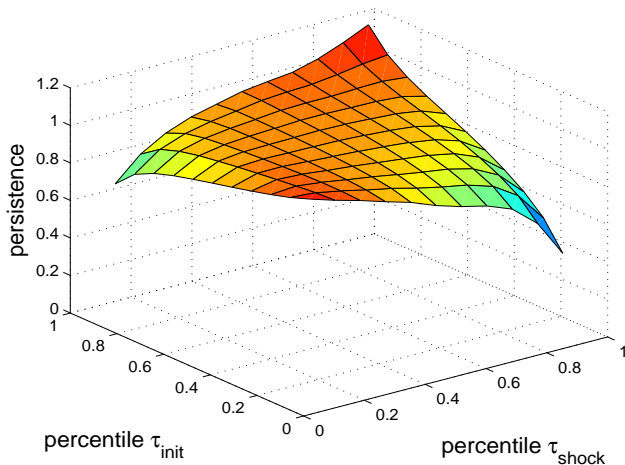


Notes: Families with head aged 30-60, 1999-2015 (US).

Nonparametric estimates of the average partial insurance of persistent shocks.

Source: Arellano, Blundell, Bonhomme and Light (2019).

.... Note, nonlinear persistence remains a key feature for wages



Notes: Log male wages, Age 30-60 1999-2015 (US). Estimates of average derivative of conditional quantile function. Source: Arellano, Blundell, Bonhomme & Light (2019).

2. WHAT ROLE FOR FAMILY LABOUR SUPPLY?

- Separate family labour supply, tax/benefit and self-insurance mechanisms:
 - ① Labour supply and time use of other family members,
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- extend baseline partial insurance model to allow wage shocks to impact on consumption *and* on family labour supply and time use,

- allowing for correlated wage shocks, nonseparabilities in family labor supply and for redistribution/insurance in tax and welfare system ->

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 - assortative matching (and data) suggests positive correlation,
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 - even with correlated wage shocks and complementary preferences, find a **persistent decline in his earnings induces an increase in her earnings to maintain consumption.**
- Consider a persistent shock to *his* wages:
 - **the impact on consumption will depend on net assets (self-insurance), on how important his earnings are in family earnings, and on labour supply elasticities...**

CONSUMPTION RESPONSES AND FAMILY LABOUR SUPPLY

PARTIAL INSURANCE IN THE ADDITIVELY SEPARABLE CASE

$$\begin{pmatrix} \Delta c_t \\ \Delta e_{1,t} \\ \Delta e_{2,t} \end{pmatrix} \simeq \begin{pmatrix} 0 & 0 & \phi_{c,v_1} & \phi_{c,v_2} \\ \phi_{y_1,u_1} & 0 & \phi_{y_1,v_1} & \phi_{y_1,v_2} \\ 0 & \phi_{y_2,u_2} & \phi_{y_2,v_1} & \phi_{y_2,v_2} \end{pmatrix} \begin{pmatrix} \Delta u_{1,t} \\ \Delta u_{2,t} \\ v_{1,t} \\ v_{2,t} \end{pmatrix} + \begin{pmatrix} \Delta \tilde{\xi}_{c,t} \\ \Delta \tilde{\xi}_{y_1,t} \\ \Delta \tilde{\xi}_{y_2,t} \end{pmatrix}$$

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where the key transmission parameters for persistent shocks $v_{j,t}$ have the form:

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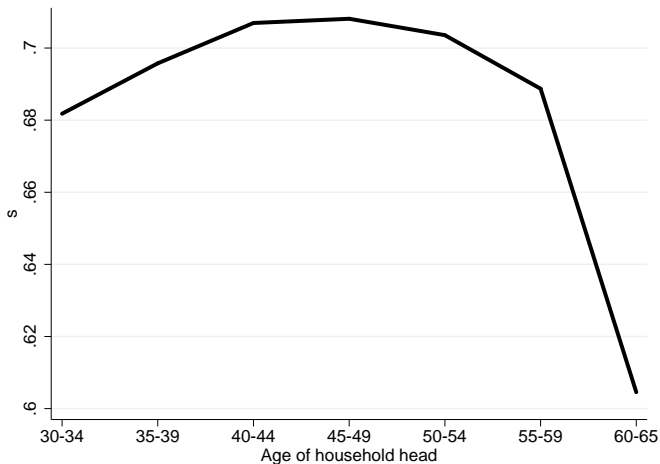
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- introduce β representing 'outside' insurance
- extend to allow for nonseparabilities and nonlinear taxation.
- use nonlinear method of moments.

The share of his human wealth by age

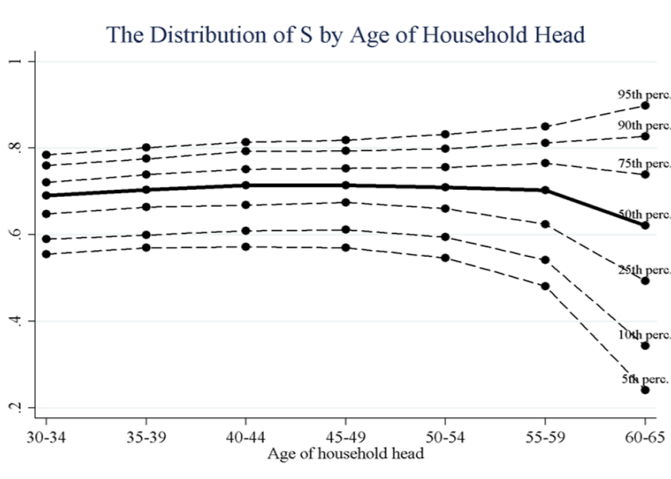
$$s_{i,t} \approx \frac{\text{Human Wealth}_{\text{male},i,t}}{\text{Human Wealth}_{i,t}}$$



Notes: PSID. Source: Blundell, Pistaferri and Saporta-Eksten (2018)

The distribution of his human wealth by age

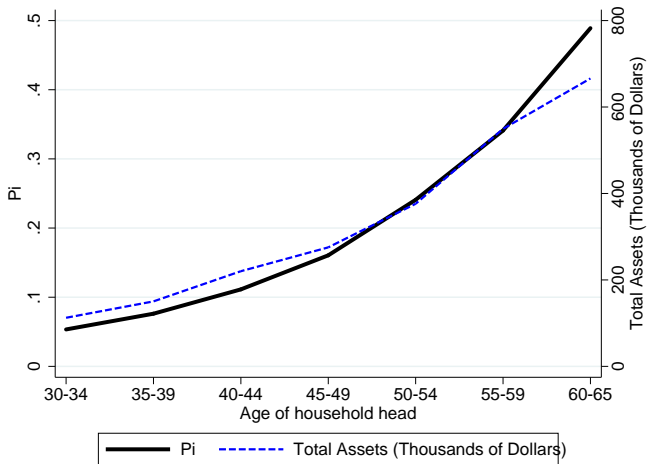
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The share of assets to human wealth by age

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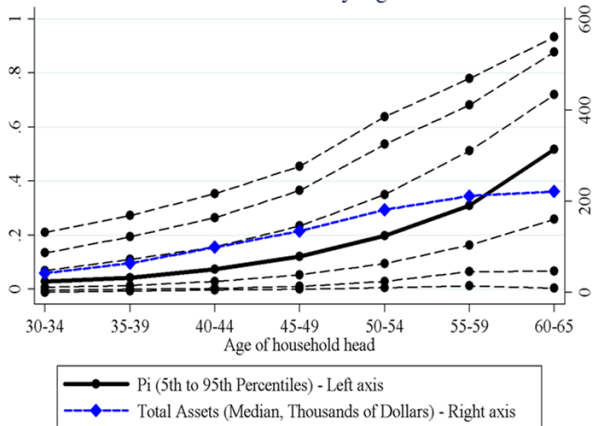


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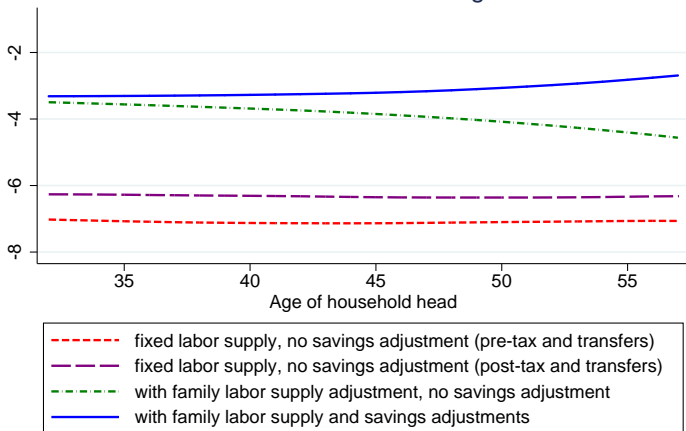
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The Distribution of π_i and Assets by Age of Household Head



HOUSEHOLD CONSUMPTION RESPONSES

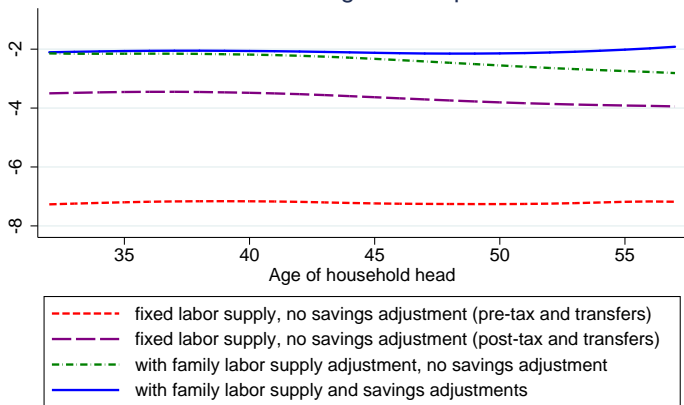
Response of Consumption to a 10% Permanent Decrease in the Male's Wage Rate



Average response. Source: Blundell, Pistaferri and Saporta-Eksten (2018)

CONSUMPTION INSURANCE FOR 'SNAP' GROUP

Response of Consumption to a 10% Permanent
Decrease in the Male's Wage Rate
SNAP Eligible Sample



Source: Blundell, Pistaferri and Saporta-Eksten (2018)

Use time-use data (ATUS and CDS) to unpack what's going on.

- Generalise family labour supply model to allow explicitly for household production and extensive margin.
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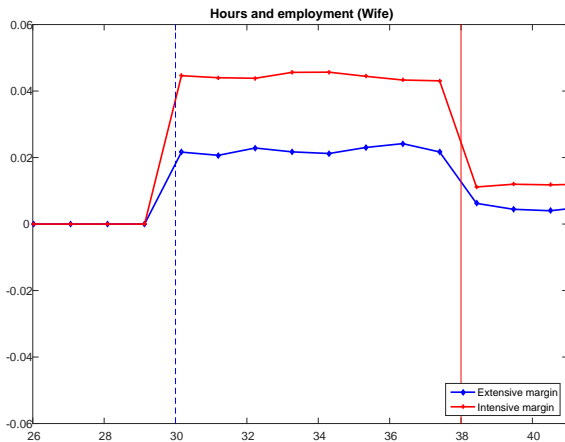
Again we find a tension between the desire of spouses to spend time with each other, and the specialization in care of children.

- Complementarity in leisure but specialization in childcare time.

Implication is that family labour supply flips between being substitutes to complements as the child ages.

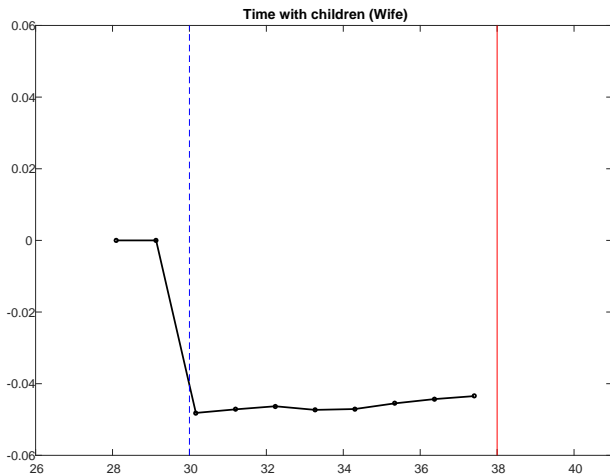
- Find, especially for lower educated/low assets, it is mother's time with children that takes a hit following adverse shock to husbands earnings....

Mother's labor supply response to a persistent adverse shock (10%) to husband's earnings



Notes: ATUS and PSID; Source: Blundell, Pistaferri and Saporta-Eksten (2018)

Mother's time with children response to a persistent adverse shock to husband's earnings



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GATHERING UP THE RESULTS....

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 - ① strong evidence for nonlinear persistent income shocks in US and Norway,
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- **Highlighting the value, of high quality survey & administrative data on earnings, hours, social insurance, consumption and assets.**

BUT MORE TO BE DONE!

- **Housing prices and labour market shocks** - Interacting impact on housing asset values and local labour market shocks. Locally linked data in Norway and, hopefully PSID.
- **Human capital during working life** - BCMS (Ecta, 2016) show little experience effects for lower skilled - new linkages to training data in UK data.
- **Technology and firm specific wage progression** - firm linked data to measures of innovation in UK and Norway.
- **Disability and persistent health shocks** - linked to medical expenditures and health insurance.
- **Family formation and the extended family** - relationship links.

Household Behaviour and the Dynamics of Inequality

Richard Blundell

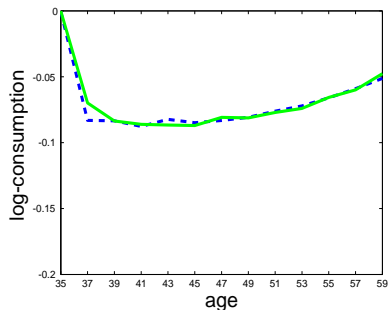
U(C,L) & IFS

LISER, March 2020

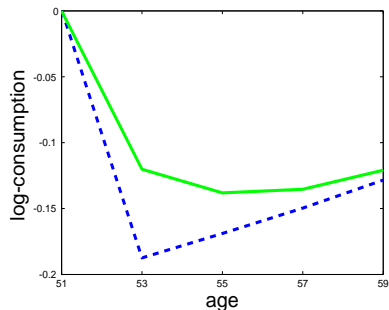
Impulse responses of persistent shocks, by age and initial assets

Consumption
 $\tau_{init} = .9, \tau_{shock} = .1$

Young



Old



Notes: Initial assets at age 35 (for “young” households) or 51 (for “old” households) are at percentile .10 (dashed curves) and .90 (solid curves).

CONSUMPTION IN THE NORWEGIAN REGISTER DATA

The analysis combines several data sources for the period 1994-2014

- Tax records on income and wealth
- Real estate transactions from Norwegian Land Register
- Transactions in listed and unlisted stocks from Norwegian Registry of Securities.

The initial sample covers all households where the household's oldest is at least 18 years old, everyone above 17 years has filed a tax return

- The number of household-year observations in the initial panel is 44,302,000.
- In each year, we keep only households with a male head, age 30 - 60, cohort 1945 - 1975, with non-missing information on schooling and location.

Detailed description of the dataset and consumption measurement in Eika, Mogstad and Vestad (2018).

MEASURING CONSUMPTION NORWAY (CONT.)

Let $W_{ikt} = p_{kt}A_{ikt}$, total household consumption expenditure:

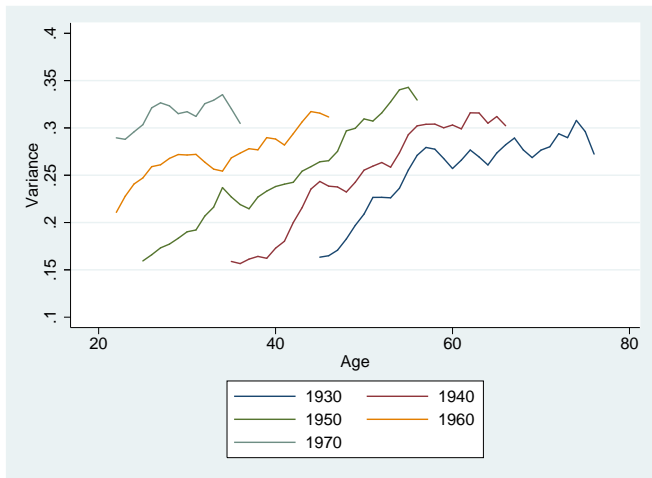
$$C_{it} = \underbrace{\left(Y_{it} - \tau_{it} + \sum_k r_{kt}A_{ikt-1} \right)}_{\text{disposable income}} - \underbrace{\sum_k (W_{ikt} - W_{ikt-1}) + \sum_k (p_{kt} - p_{kt-1})A_{ikt-1}}_{\text{changes in wealth} \quad \text{capital gains}} \\ \underbrace{\hspace{10em}}_{\text{net savings}}$$

where

- Y_{it} : labour income and cash transfers
- τ_{it} : taxes
- A_{it-1} : assets held at the end of period $t - 1$.

Combining the last two terms using financial and real estate transactions data has been a key insight.

Consumption inequality by age and birth cohort (UK)



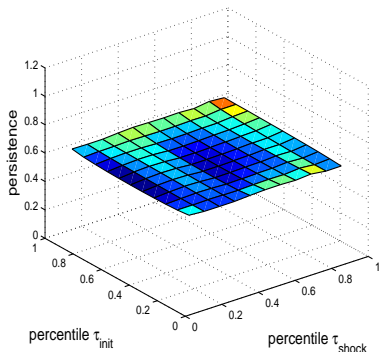
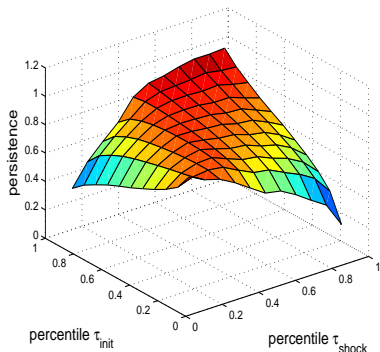
Notes: Variance (log); Source: Blundell, O'Dea and Joyce (2016).

Nonlinear persistence of y_{it} (cont.)

$$\frac{\partial Q_{y_t|y_{t-1}}(y_{i,t-1}, \tau)}{\partial y}$$

PSID data

Canonical model



Note: Estimates of the average derivative of the conditional quantile function of y_{it} given $y_{i,t-1}$ with respect to $y_{i,t-1}$, evaluated at percentile τ_{shock} and at a value of $y_{i,t-1}$ that corresponds to the τ_{init} percentile of the dist. of $y_{i,t-1}$.