



Risk and Investment Conference 2011  
David McCarthy and James Sefton



# First estimates of UK National Transfer Accounts, plus some applications

20<sup>th</sup> June 2011

---

---

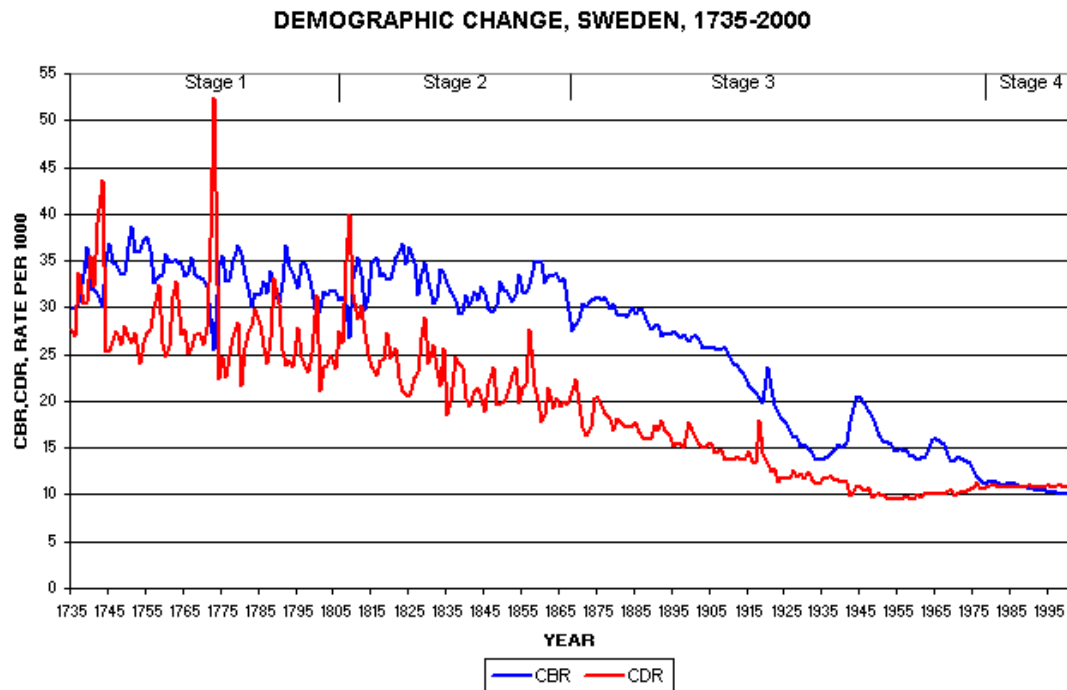
# Outline

---

- The ageing society & the economic lifecycle
- National Transfer Accounts (NTA's)
- NTA estimates for the UK
- Cross-country comparisons
- Applications
  - Are we life-cycle savers?
  - How much do children cost?
  - The response to public transfers to the elderly: lower savings, higher bequests, higher consumption or less labour income?
  - Consumption shocks and assets prices (incl residential housing)

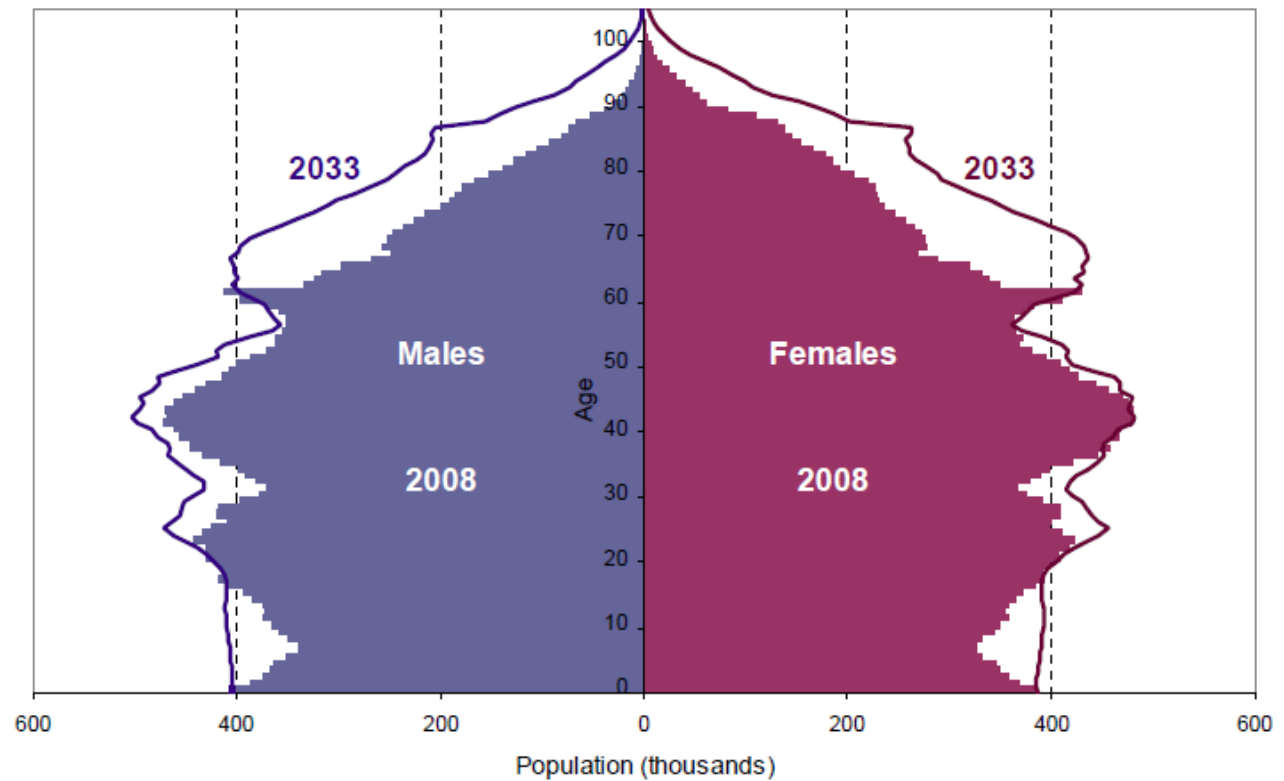
# The ageing society

- Societies all around the world are ageing
- The fundamental cause is a demographic transition from high fertility – high mortality societies to low fertility – low mortality societies
  - (Primary cause of population ageing is low fertility)



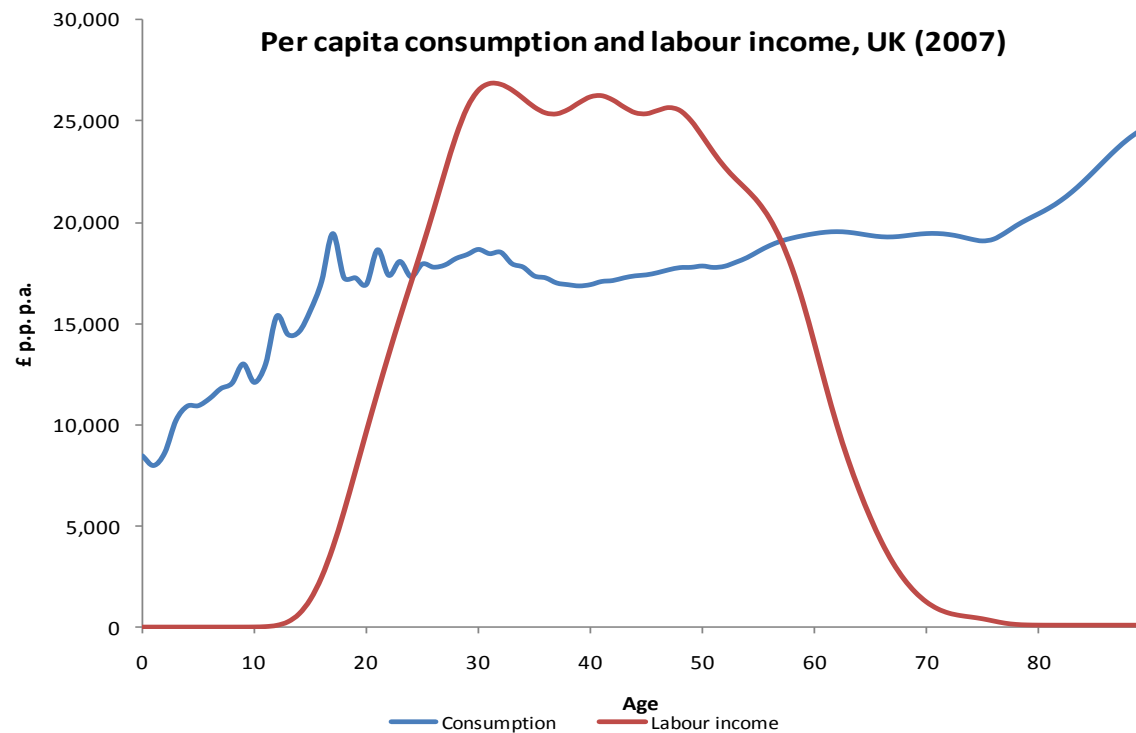
# Demographic transition

- In the future, the increase in the proportion of the population which is elderly will dominate population change
- 2008: 13.6% > 60
- 2033: 20.6% > 60



# Economic lifecycle

- Consumption exceeds labour income for the very young and the very old
- Changes in population structure affect everyone



---

# Population ageing presents major challenges

---

- How sustainable are our transfer systems?
  - Public sector: Number of taxpayers will decline relative to number of beneficiaries
  - Private sector: Number of working-age adults will decline relative to dependent children and elderly
- How resilient are our asset markets (housing / financial assets)?
  - If the elderly depend on selling assets to fund their retirement, how will asset prices respond to population ageing?
- How sustainable is our political consensus?
  - What is the implication of population ageing for generational equity?

---

# Literature review

---

- Generational accounts (Kotlikoff, 1995, Auerbach et al, 1999)
  - Attempt to evaluate the sustainability of fiscal policy given its generational incidence
  - (Exclude private transfers, general equilibrium)
- Evaluation of inter-generational equity (in the UK)
  - Hills (1992)
  - Cardarelli, Sefton and Kotlikoff (2000)
  - Banks et al (2000)
  - Sefton and Kirsanova (2006)
  - Barrell and Weale (2010)

---

# National Transfer Accounts

---

- Developed by Mason and Lee (1994), recent book Lee et al (2010), Elgar.
- Attempt to understand the generational economy
  - Social and economic institutions which mediate age-related flows within an economy
    - Public sector, asset markets, families
  - Quantify the size, direction and nature of age-related economic flows in the economy
  - In a way which is consistent with other measures of economic output (National Accounts)
- Ultimate goal:
  - Develop institutions which are sustainable in the face of the demographic transition
- An international project, 31 countries (UK are latecomers)



# National Transfer Accounts

- Based on a flow accounting identity which states that for any individual, over any time period, consumption must be financed by a combination of labour income, transfers, asset income or dissaving:

$$\begin{array}{ccccccc}
 C & = & Y^l & + & \underbrace{\tau^+ - \tau^-}_{\text{Net Transfers}} & + & Y^a - S \\
 \text{Consumption} & & \text{Labour income} & & & & \text{Asset income} - \text{Saving}
 \end{array}$$

- Re-arranging the equation, and aggregating all individuals of the same age ( $x$ ) together, yields:

$$\underbrace{C(x) - Y^l(x)}_{\text{Lifecycle Deficit}} = \underbrace{\tau^+(x) - \tau^-(x)}_{\text{Net Transfers}} + \underbrace{Y^a(x) - S(x)}_{\text{Asset-based Reallocations}}$$

Age Reallocations

- This equation says that any deficit of consumption over labour income needs to be financed either by transfers, or by asset-based reallocations
- (Difficulties: capital gains, incidence, general equilibrium)

---

# Methodology and data sources

---

- Basic principle is to use a nationally representative survey to estimate age profiles for the variable of interest
- Smooth the profile using a Gaussian smoother
- Use the national population to set the aggregate value implied by the smoothed profile equal to the appropriate control value from the National Accounts
- We estimated 27 separate profiles (phew!) and used:
  - Food and Expenditure Survey, 2006
  - Family Resources Survey, 2006
  - Wealth and Asset Survey, 2006/8
- We used National Accounts data for 2007 from the 2008 Blue Book
- (Data problems: students, care homes, age top-coding)

---

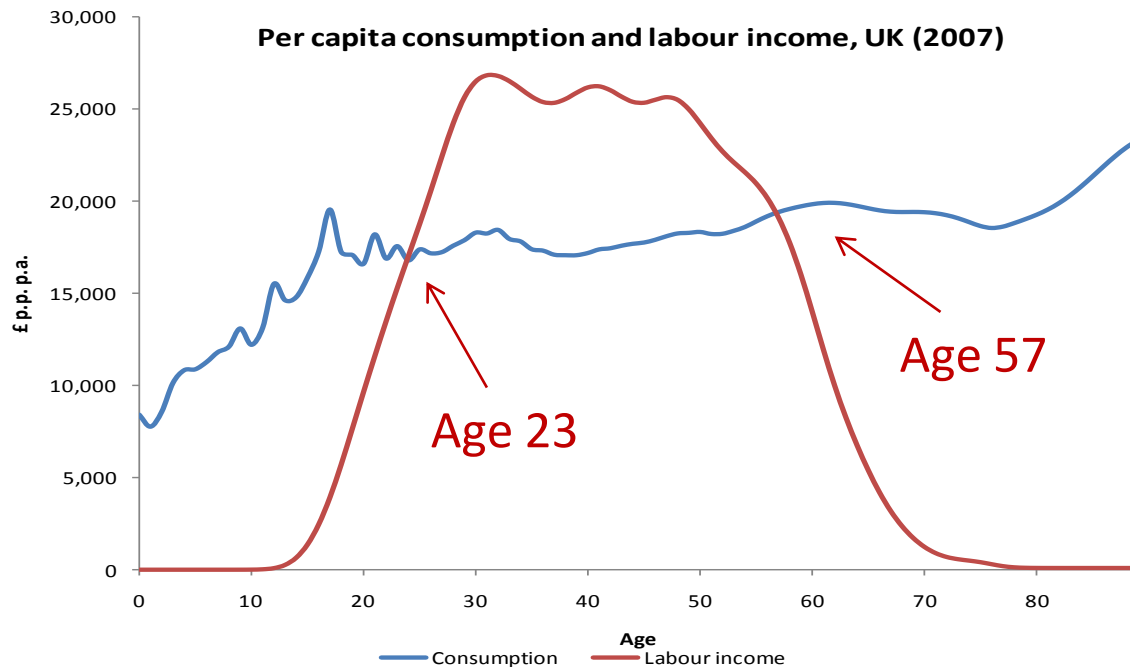
# Conceptual difficulties

---

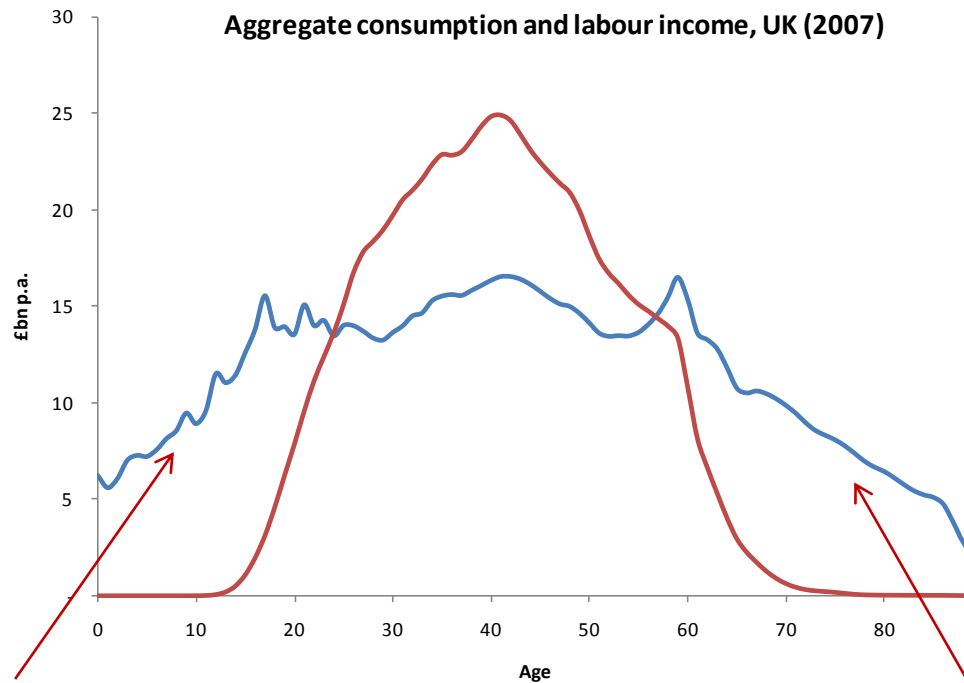
- Incidence
  - Who pays the tax in an accounting sense may not pay the tax in an economic sense
  - (e.g. Changes in income tax rates where labour supply is elastic)
- Partial vs. General equilibrium
  - Changes in fiscal policy may result in changes in factor prices
- Changes in asset prices
  - Methodology assumes that asset prices are fixed
  - If asset prices change, this may have intergenerational implications
    - (e.g. An increase in house prices represents a shift in resources towards those who own homes (the old) and away from those who have other types of wealth, such as human capital (the young))

# Economic lifecycle: UK

- Consumption exceeds labour income below age 23 and above age 57



# Numbers are consistent with National Accounts



£193bn , around  
14% of GDP

£217bn, around  
15% of GDP

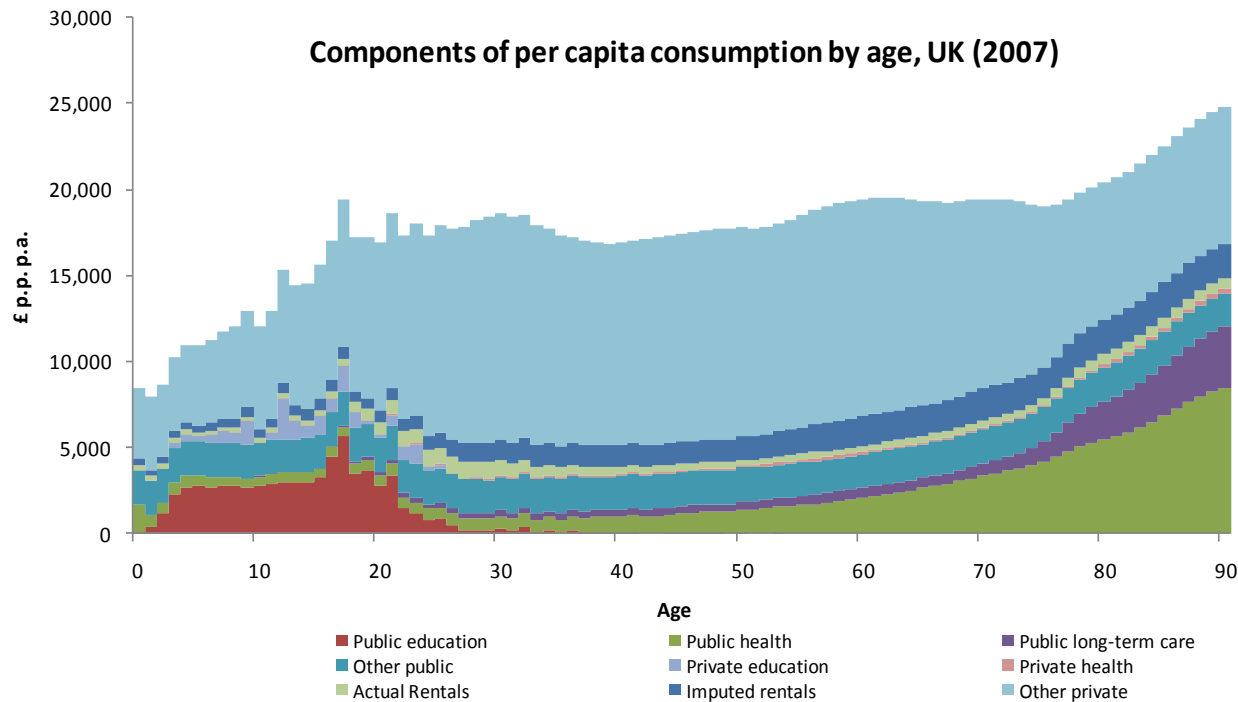
---

# Consumption profiles

---

- *Public health* estimated using a combination of unit costs obtained from the DoH and utilisation measures from the GHS, separate profiles for males and females
- *Public education* used enrollment data from the FES, unit cost data from the DoE, and a regression approach
- *Private education / health* used expenditure data from the FES and a regression approach
- *Housing* used rentals / heating / maintenance costs from FES plus imputed rentals for OOH, equivalence scale used to allocate between hh members
- *Private other* included food, alcoholic beverages and tobacco, clothing and footwear, furnishings, household equipment and carpets, transport, communication, recreation, restaurants and hotels, and miscellaneous expenditure, equivalence scale to allocate between hh members
- *Public other* was assumed to be independent of age

# Components of consumption



- Consumption includes both consumption of services provided by government (education, health care, defence etc), and private consumption

---

# Estimating public transfers

---

- Estimated age profiles using FES data for:
- Government benefits
  - *Pensions* included BSP, S2P, widows pensions
  - *Non-pension government benefits* included all other government benefits
- Taxes
  - *Corporation tax* allocated using investment income
  - *Income tax* allocated using FES
  - *NI contributions* allocated using labour income
  - *Property taxes* allocated using FES
  - *Indirect taxes (mainly VAT)* allocated by consumption
  - *Other taxes* allocated by FES and consumption



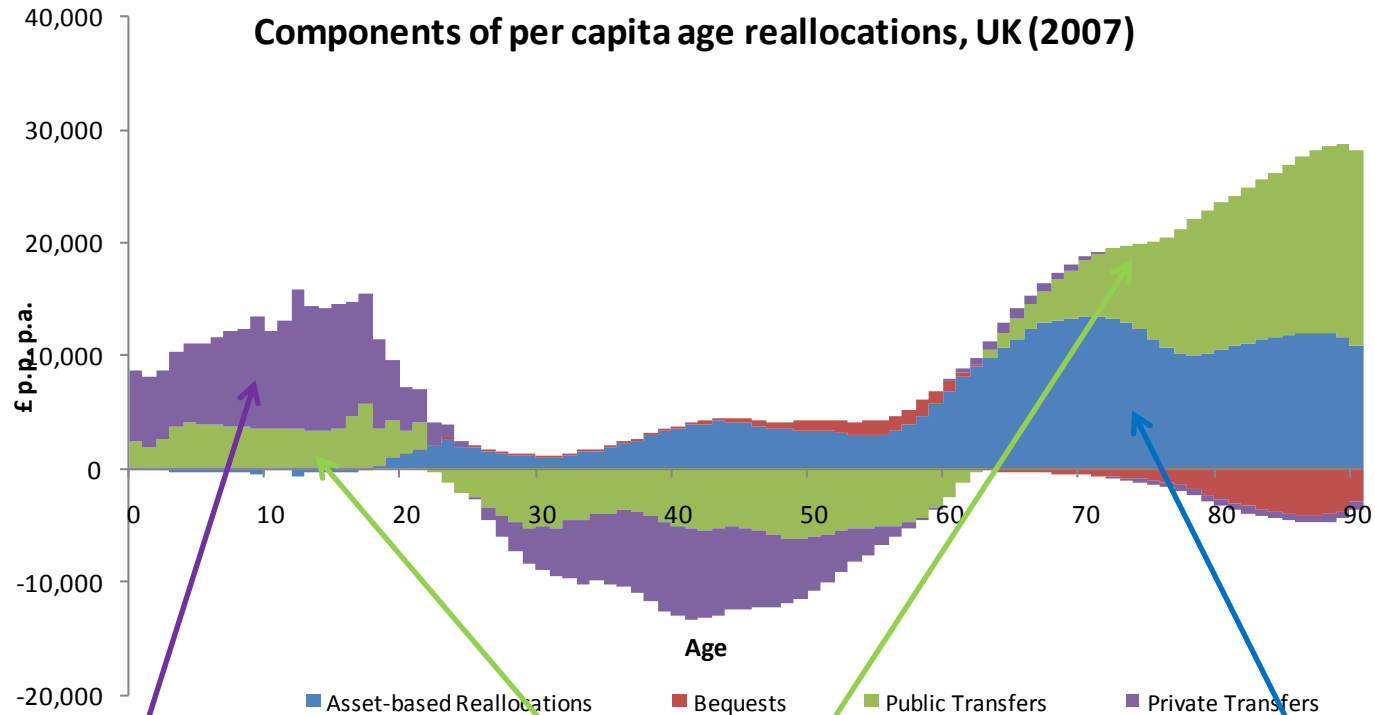
---

# Estimating private transfers

---

- Fall into three categories
  - *Inter-household transfers* were estimated using (unreliable?) FES data on cash sums paid to non-hh members and regular allowances received from outside the hh, smoothed and macro-control adjusted to equal to net private transfers in the Blue Book
  - *Intra-household transfers* were estimated using a model which assumed that all members of the household paid any surpluses to the hh head, who used this (as well as asset income /dissaving) to make good any individual deficits with transfers
  - *Bequests* were estimated using joint and single hh profiles of total hh wealth (from WAS), assuming that spouse was heir if married and child/sibling if single. Total bequests came to £68bn, compared with £59bn from HMRC (investigating using BHPS, but undercounting).
- ABR's are the balancing item

# Per-capita age reallocations, UK (2007)



Private transfers  
largely downward, few  
upward transfers

Public transfers upward  
and downward

ABR's largely positive,  
and significant

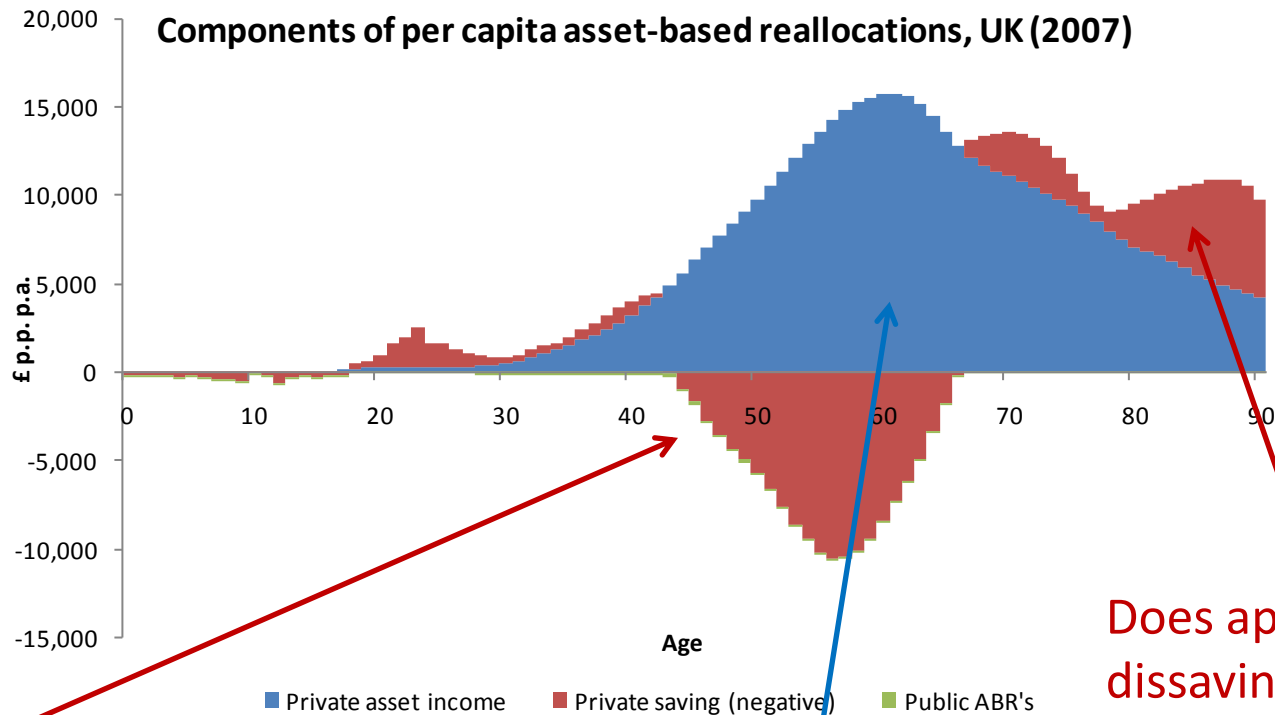
---

# Balancing item: asset-based reallocations

---

- Asset-based reallocations are the balancing item in the NTA
  - We separate into public and private (but public ABR's are small)
- Made up of
  - *Asset income* (six profiles, including distributed and undistributed earnings of corporations, capital share of hh mixed income, imputed rentals, and interest income and expense)
  - *Savings* (which must balance to total net national savings in the National Accounts), this is the true balancing item for the age profiles
- We used a (rough) profile for asset income obtained from the public release of WAS data, we have not yet obtained access to the individual-level data

# Asset-based reallocations and saving



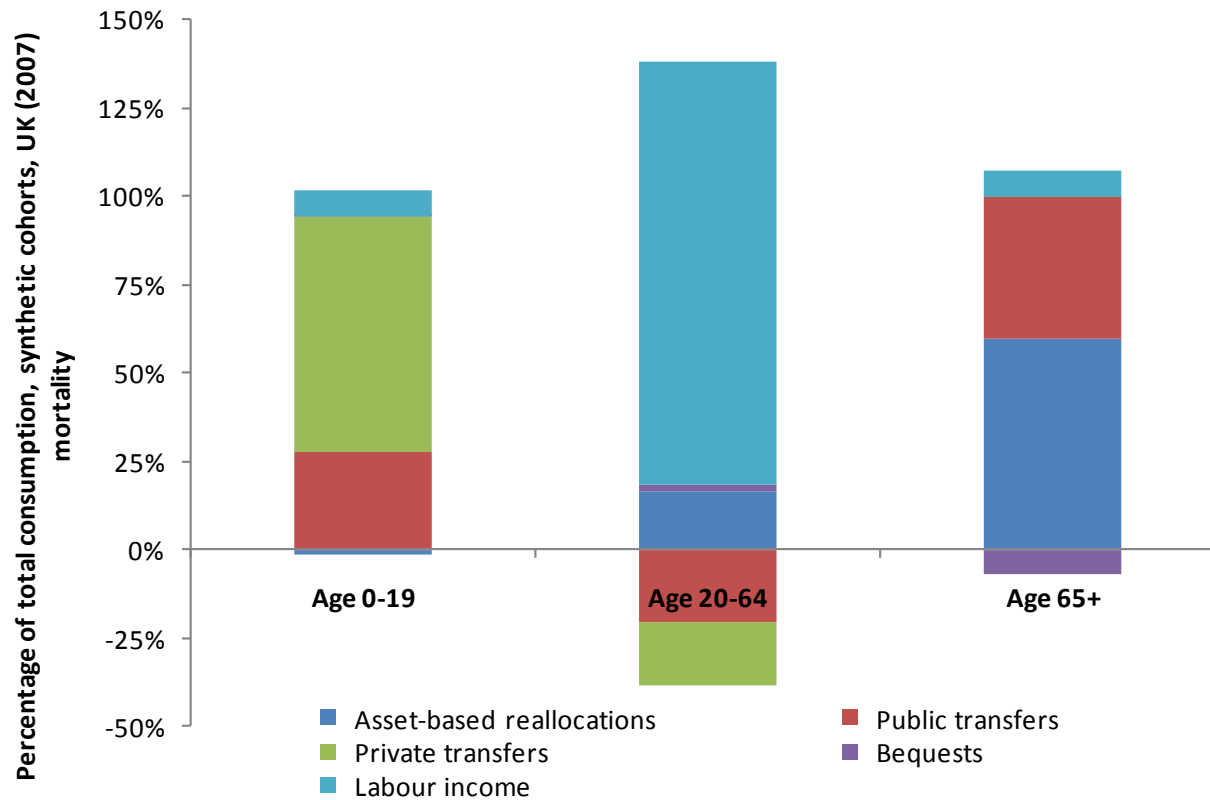
Most private saving occurs between the ages of 43 and 65

Asset income largely received after the age of 40, declines with dissaving

Does appear to be real dissaving at older ages (although most may be private pensions)

# Components of consumption, UK (2007)

## Components of consumption, synthetic cohorts, UK (2007)



---

# Applications

---

- International comparisons of the economic lifecycle
- How much does it cost to raise a child?
- Are we life-cycle savers?
- Consumption and asset prices
  - Residential housing
  - Other assets

---

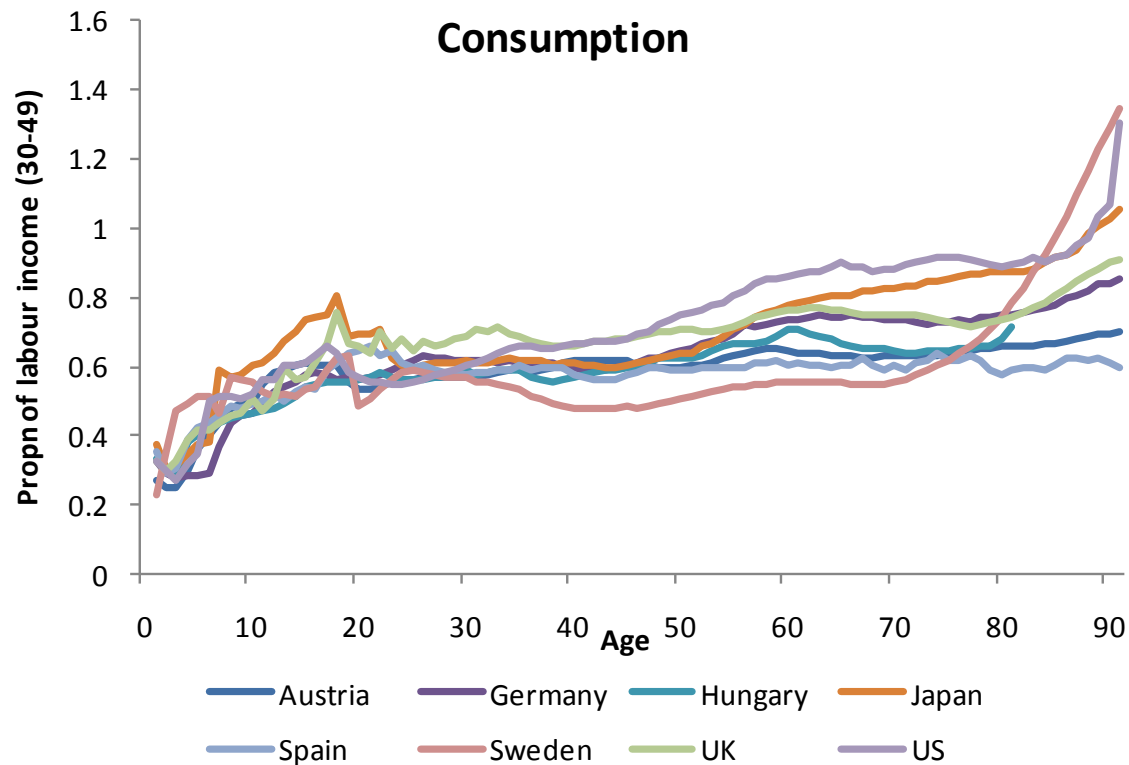
# Comparison with other NTA countries

---

- NTA results are available on the NTA website for project members ([www.ntaccounts.org](http://www.ntaccounts.org))
- This allows detailed comparisons of NTA quantities between NTA countries
- Chose a group of 'peer' countries to the UK

COUNTRY	YEAR
Austria	2000
Germany	2003
Hungary	2005
Japan	2004
Spain	2000
Sweden	2003
UK	2007
US	2003

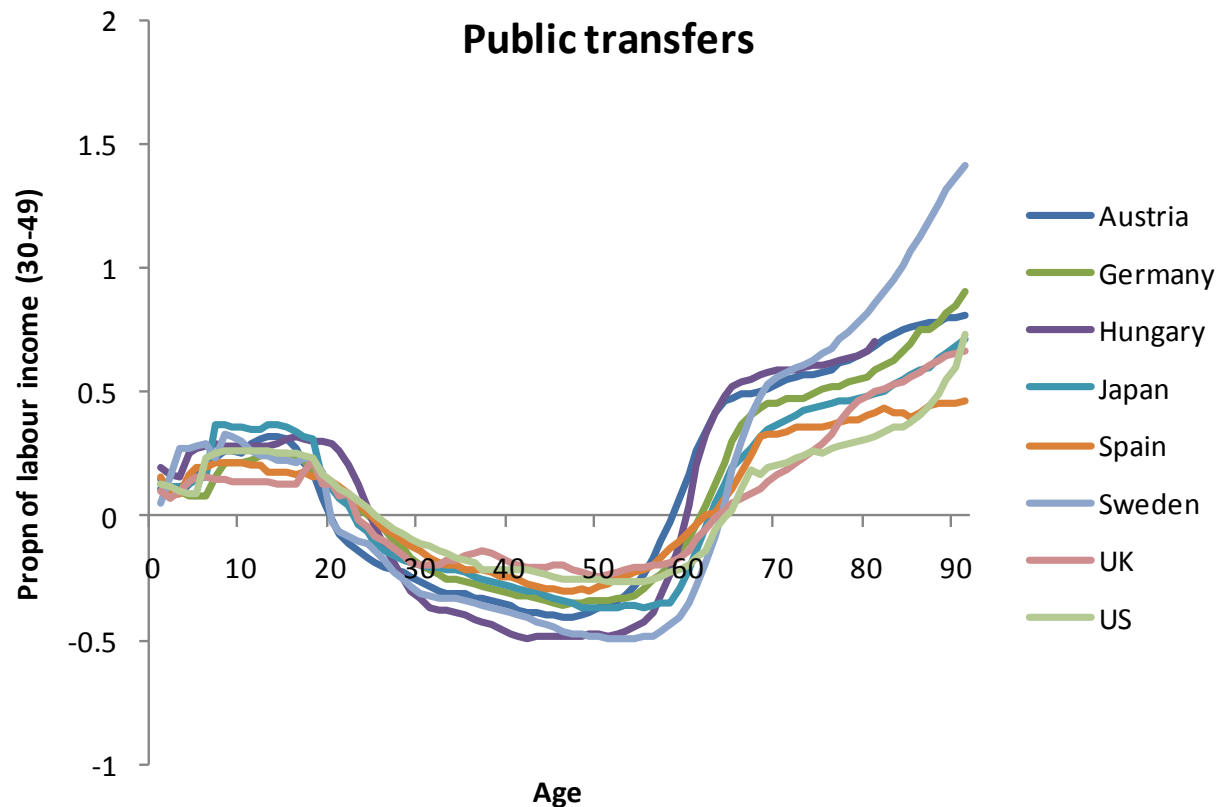
# Age profiles of consumption



All profiles scaled by average labour income between 30-49 in each country



# Proportion of consumption at each age which is public



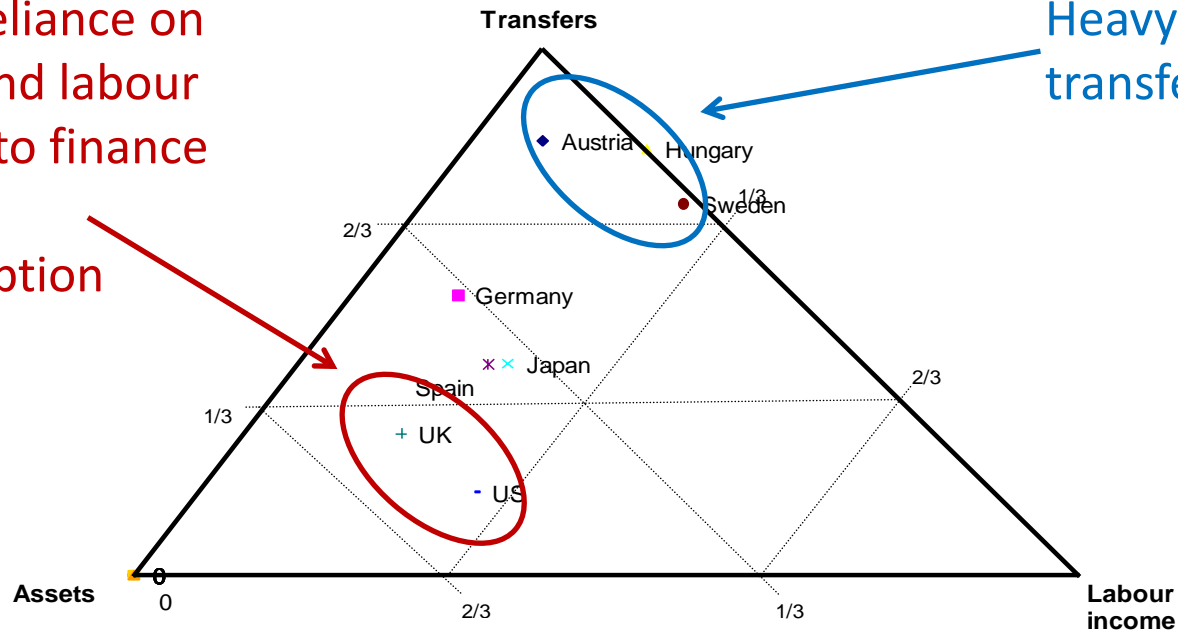
UK has average consumption at young ages but a low proportion of this is publicly financed

A much higher proportion of the consumption of the elderly is publicly financed

# Components of 65+ consumption (synthetic cohorts)

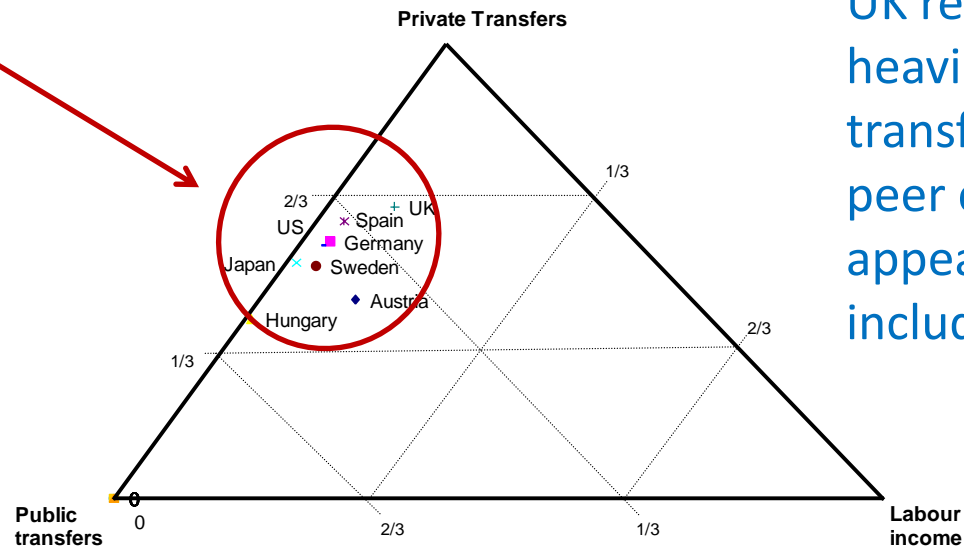
Heavy reliance on assets and labour income to finance old-age consumption

Heavy reliance on transfers



# Components of 0-19 consumption (synthetic cohorts)

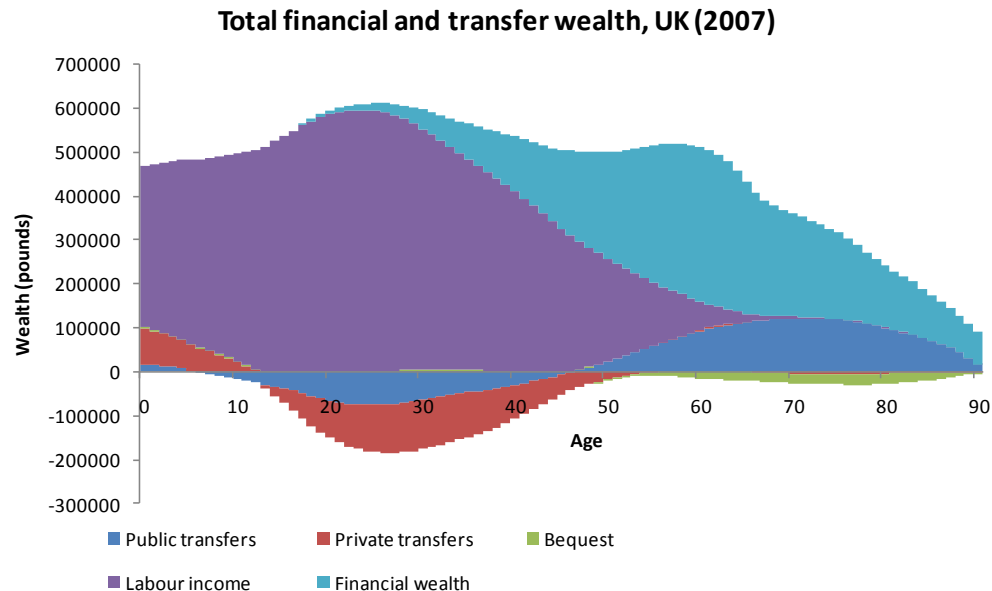
Much less variation between countries than with old-age consumption



UK relies more heavily on private transfers than its peer countries appear to do, including the US

# Applications: *Are we life-cycle savers?*

- Previous attempts to test the life-cycle model of consumption and saving have suffered from the problem that they have not had a comprehensive measure of wealth, including (private) transfer wealth
- NTA's provide this measure of wealth (provided you are willing to make some strong assumptions)



---

## Some theory

---

- Consider a life-cycle model of consumption and savings, with no bequest motives, no uncertainty, labour and transfer income, and mortality:

$$\max_{\{c_0, \dots, c_\omega\}} \sum_{i=0}^{\omega} \rho^i \pi_i u(c_i) \text{ s.t. } w_{i+1} = (w_i - c_i + \tau_i + y_i)(1+r)$$

- Model solution given by:

$$c_i = \frac{w_i + \sum_{j=i}^{\omega} y_j (1+r)^{i-j} + \sum_{j=i}^{\omega} \tau_j (1+r)^{i-j}}{\sum_{j=i}^{\omega} ((\rho(1+r))^{j-i} \frac{\pi_j}{\pi_i})^{1/\gamma} (1+r)^{i-j}}$$

---

# Average propensity to consume out of wealth

---

- Average propensity to consume out of total wealth at age  $i$  is defined as:

$$APC_i = \frac{c_i}{w_i + \sum_{j=i}^{\omega} y_j (1+r)^{i-j} + \sum_{j=i}^{\omega} \tau_j (1+r)^{i-j}}$$

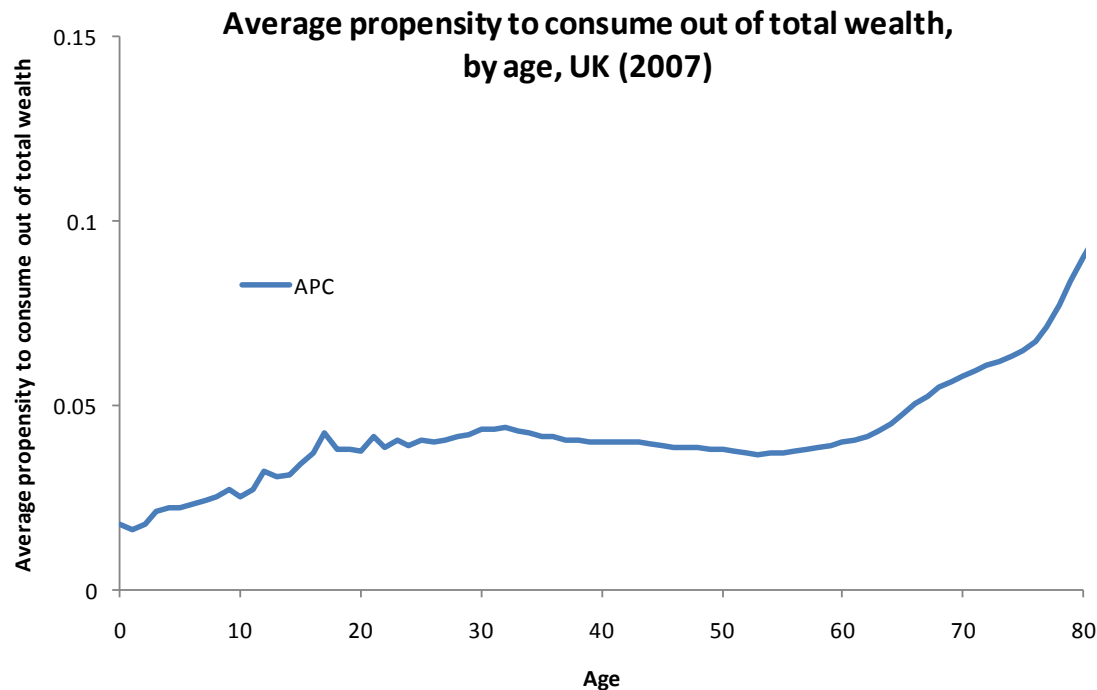
- Which using the solution to the model can be rewritten as:

$$APC_i = \frac{1}{\sum_{j=i}^{\omega} ((\rho(1+r))^{j-i} \frac{\pi_j}{\pi_i})^{1/\gamma} (1+r)^{i-j}}$$
$$\approx r - \frac{1}{\gamma} (r - (1-\rho) - (1 - \frac{\pi_{i+1}}{\pi_i})) ,$$

- (Which in turn allows us to estimate rho by age, provided we know  $r$ , gamma and the mortality probabilities)

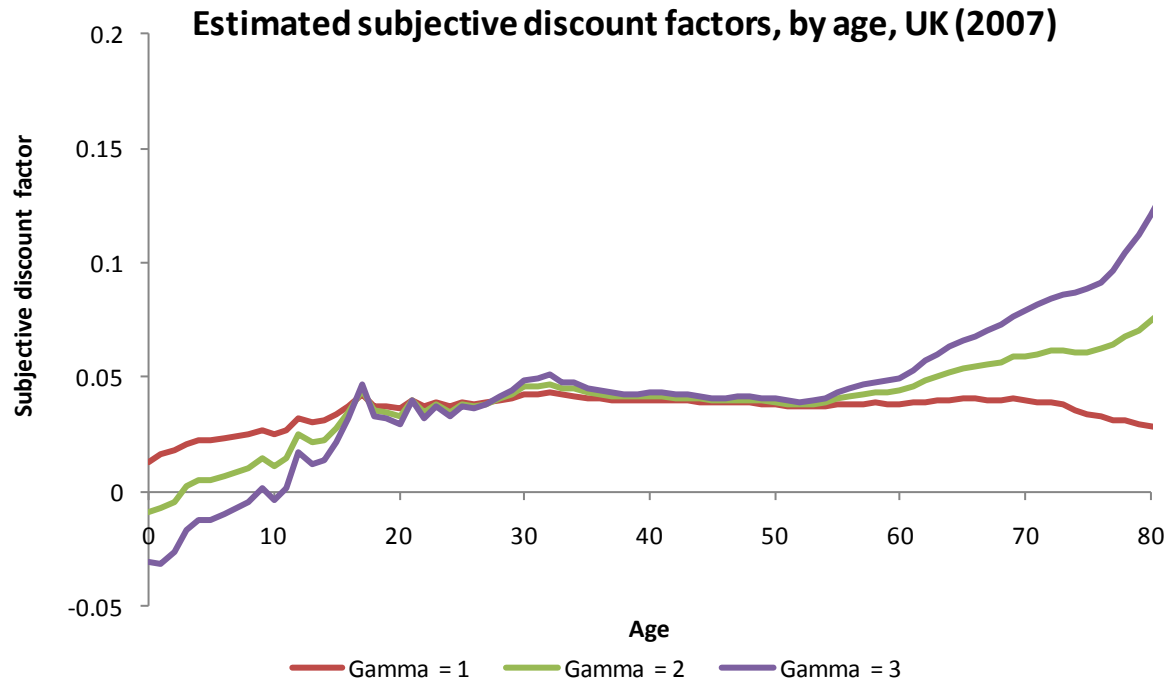
# NTA-derived APC, by age (UK, 2007)

- Using NTA-derived estimates of total wealth at each age, and NTA consumption profiles, we can obtain the APC at each age



- Estimates compare well with Sefton & Kirsanova (2006)

# Estimated subjective discount factors, by age, UK (2007)



(Slope depends heavily on assumed level of risk aversion)



---

# Applications: *How much does it cost to raise a child?*

---

- There is a huge literature on the determinants of fertility, parental investment in children, and the role of bequests, going back to Becker, 1974.
- NTA's allow at least reasonable estimates of the cost – public and private – of raising a child
- In the UK, PV of private transfers to a child between 0 and 19 are £143,000, public transfers are £61,000 (around 8.6 years of labour income on average)

0-19	Labour income	Private transfers	Public transfers	ABR's	TOTAL
Austria	1.1	3.4	3.3	0.2	8.1
Germany	0.3	4.3	2.9	0.1	7.7
Hungary	0.1	3.0	4.6	0.1	7.8
Japan	0.2	5.0	4.4	0.1	9.7
Spain	0.4	5.1	3.0	-0.1	8.3
Sweden	0.5	4.4	3.8	0.1	8.7
UK	0.8	5.5	2.3	-0.1	8.6
US	0.3	4.7	3.5	0.1	8.6

---

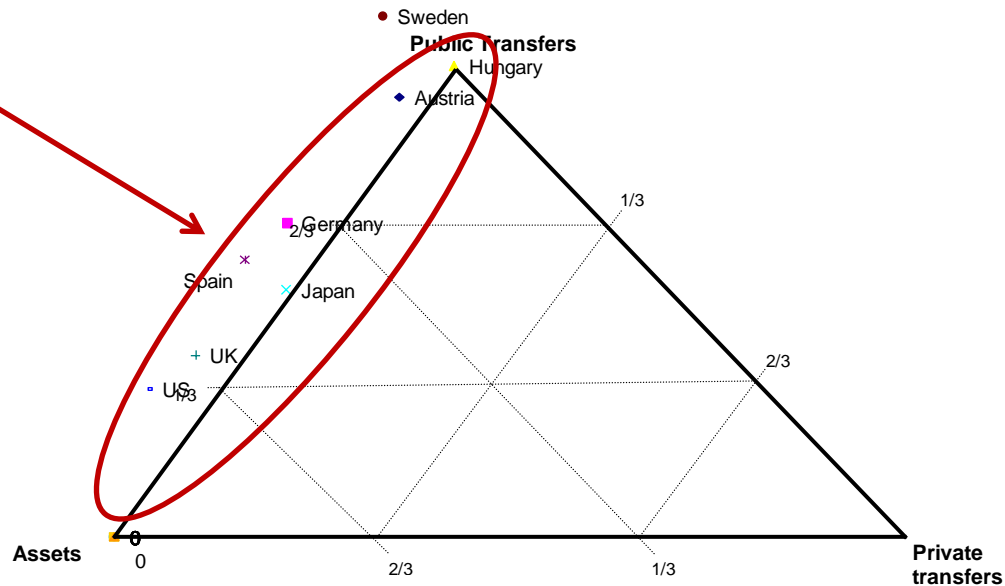
## Applications: *Response to higher old-age transfers*

---

- Two schools of thought in economics on the response of individuals to higher transfers to the elderly
  - Feldstein (1974): individuals save less when they are young in anticipation of receiving larger transfers
    - (Of course the elderly may increase their consumption when the transfers are received, and/or may work less)
  - Barro (1974): individuals may simply save the transfers and then bequeath more (undoing the effect of the transfers)

# Components of 65+ transfer mechanisms

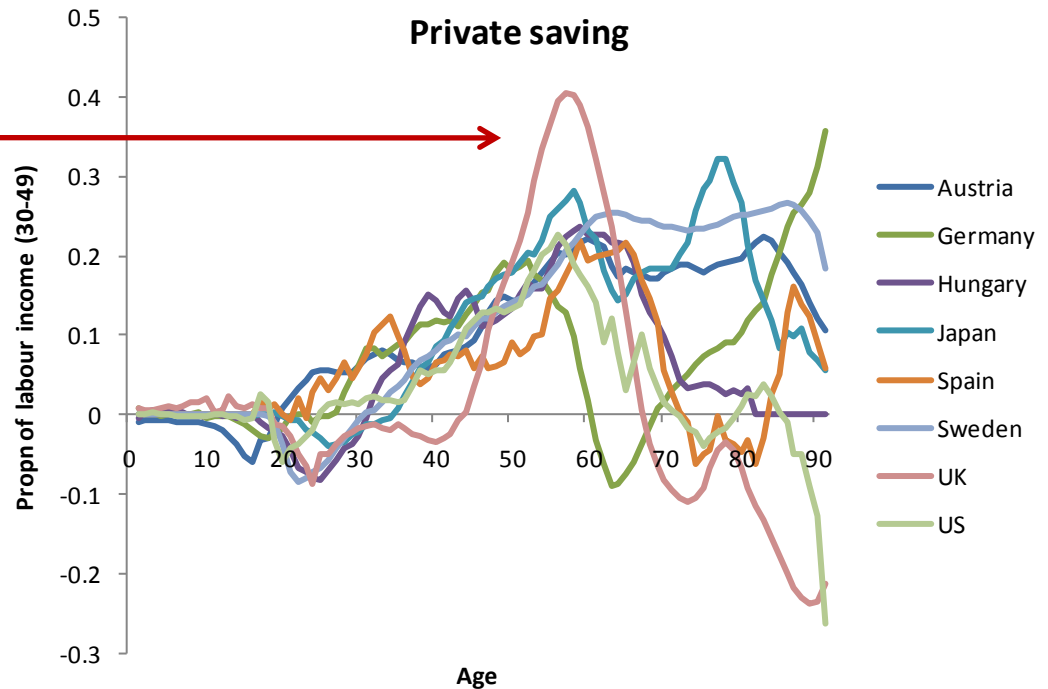
Since private transfers are small, there is almost a one-for-one trade-off between ABR's and public transfers



But do Swedes/Hungarians/Austrians save less or bequeath more?

# Saving appears high in high-transfer countries.....

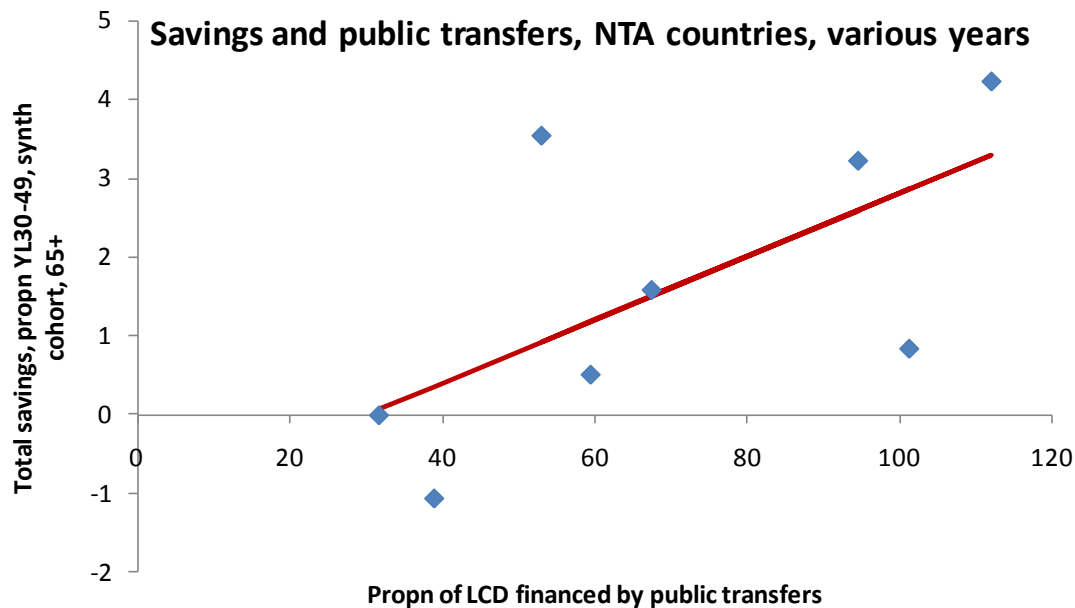
Very high savings as a proportion of average income 30-49 in the UK between ages 50 and 60. Is this result confirmed in any other work?



... suggesting that bequests must be higher there too?

# Total savings (65+) vs. Public transfers / LCD

- Absolute level of savings appears to be higher in countries where a higher proportion of the LCD is financed by public transfers



- What about bequests?

---

## Application: *Consumption and asset prices*

---

- Serious work will only be possible once a full set of NTA estimates has been completed
- Finance theory suggests a strong link between consumption and assets prices, but empirical relationships are weak
- What role do transfers (and the sensitivity of transfers to economic shocks) play in explaining the weak empirical findings in the asset-pricing literature?

---

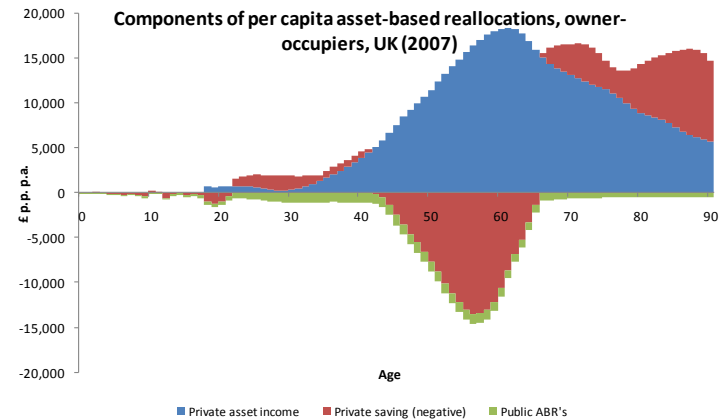
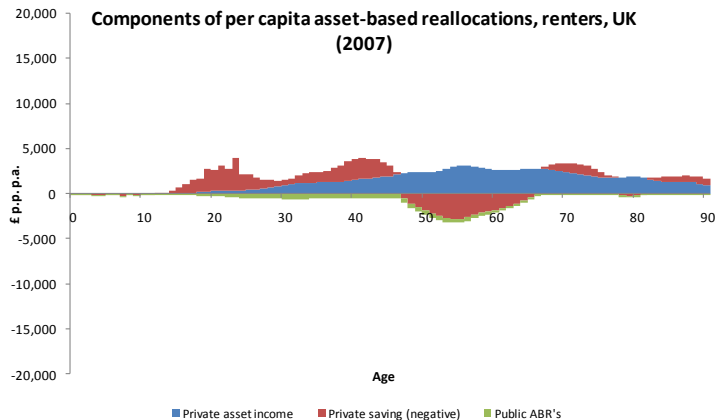
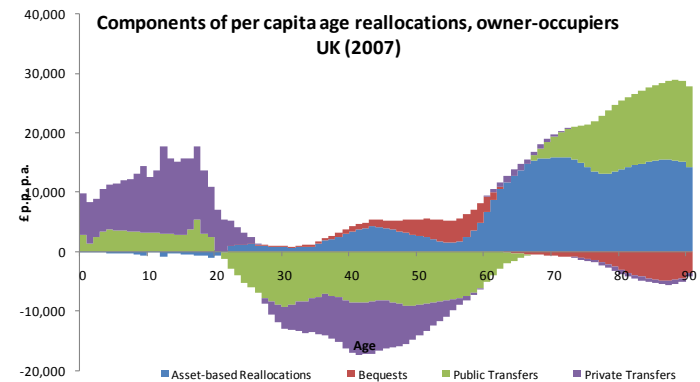
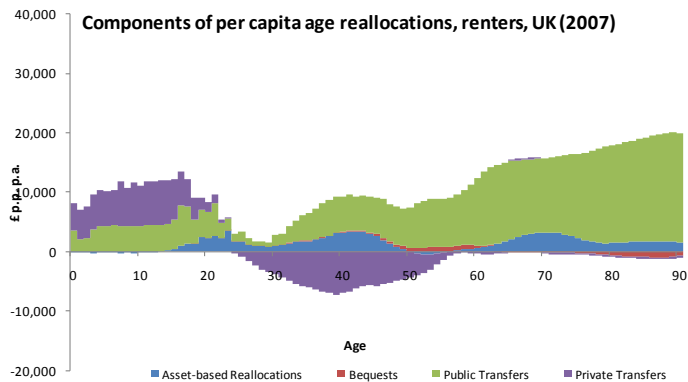
## Application: *Consumption and house prices*

---

- Case, Quigley and Shiller (2005, 2007) find a strong relationship between changes in aggregate consumption and changes in house prices, in both directions
- Attanasio and Weber (1994), Attanasio et al (2009) suggest that house price changes affect mainly the consumption of the young, indicating that some common factor is driving both house price changes and consumption (they identify income expectations)
- Campbell and Cocco (2007) find a stronger effect of house price changes on the consumption of the elderly than on the young, suggesting a wealth effect
- NTA's are perfect for investigating this in more detail, but full analysis will require a time series of NTA estimates, which we are currently working on

# Application: *Consumption and house prices*

- Estimated NTA's separately for owner-occupiers and renters in 2007
- Very different structure of transfers across the lifecycle





---

# Conclusion & future work

---

- NTA's for the UK appear to indicate that we transfer less to young people than our peer countries (more to older people, especially the very old) even controlling on the level of consumption
- UK public age-based reallocations appear quite low
- Our children are quite reliant on private transfers, with possible implications for inter-generational transmission of inequality
- Our older people are quite reliant on asset-based reallocations relative to other countries
- We illustrated some potential applications of NTA's
- Currently assessing whether NTA methodology can shed light on differential savings patterns within sub-groups of the UK population