

What can we learn about household consumption expenditure from data on income and assets?

Preliminary and incomplete version

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Introduction: Motivation

Studying the consumption and saving behavior of households requires reliable panel data on household expenditures

One possibility is to use surveys that follow the same households over time, but

- ▶ such data are rare,
- ▶ have small sample size,
- ▶ and face significant measurement issues.

Introduction: Accounting identity

An alternative approach is to use some version of the accounting identity:

$$\begin{aligned}\text{Consumption expenditure} &= \text{total income} \\ &\quad + \text{capital gains} \\ &\quad - \text{change in wealth}\end{aligned}$$

This approach was pioneered by Browning and Leth Pedersen (2003) using administrative tax records from Denmark

- ▶ Also used in Kreiner et al. (2014), and Koijen et al. (2014)

Introduction: Possible advantages

This approach has a number of possible advantages, such as:

- ▶ Administrative data often covers the entire population and follows households over time
- ▶ Tax records contain comprehensive information of income
 - ▶ In some countries, wealth is recorded as well

But also some serious challenges...

Introduction: Key challenge

Tax data do not contain info about the stock of each asset, but (at best) the values of each asset at start and end of each year

⇒ Additional data (or strong assumptions) are required

Necessary to separate changes in the net wealth due to:

- ▶ Unrealized capital gains
(which does not affect current consumption)
- ▶ Household saving some of its income
(which reduces current consumption)

Introduction: This paper

Examines the advantages and difficulties of

- ▶ deriving consumption expenditure measures
- ▶ from data on income and assets.

Our analysis combines several data sources from Norway over the period 1994-2014:

- ▶ Tax records on income and wealth
- ▶ Admin data on household portfolio choices and returns

Introduction: This paper (con't)

Using this Norwegian data, we:

- 1) Compare consumption expenditure based on the accounting identity, expenditure surveys and national accounts
- 2) Explore the implications of using the derived measures of household consumption expenditure to study:
 - Income and consumption inequality over the life cycle (Blundell and Preston, 1998)
 - How relative wage movements of cohorts and education groups affected the distribution of household consumption (Attanasio and Davis, 1996)
 - The income cyclicalities of households and its relation to consumption growth (Parker & Vissing-Jorgensen, 2009)

Outline

1. Measuring household consumption expenditure
2. Comparing different measures of consumption expenditure
3. Empirical applications

Framework: Accounting identity (1)

Total household consumption expenditure:

$$C_{it} + \sum_k p_{kt} A_{ikt} = \left(E_{it} - \tau_{it} + \sum_k r_{kt} A_{ikt-1} \right) + \sum_k p_{kt} A_{ikt-1} \quad (1)$$

where the following denotes household level:

E_{it} : labor income and cash transfers

τ_{it} : taxes

$\mathbf{A}_{it-1}$: assets held at the end of $t - 1$, earning capital income $\mathbf{r}_t \mathbf{A}_{it-1}$:

To simplify notation, we assumed

- ▶ Household holds A_{ikt-1} throughout the year
- ▶ End of year, sells $\mathbf{A}_{it-1}$ and buys $\mathbf{A}_{it}$ at prices $\mathbf{p}_t$

Framework: Accounting identity (2)

Let $W_{ikt} = p_{kt}A_{ikt}$ and re-arrange:

$$\begin{aligned} C_{it} = & \underbrace{\left(E_{it} - \tau_{it} + \sum_k r_{kt} A_{ikt-1} \right)}_{\text{disposable income}} \\ & - \underbrace{\sum_k (W_{ikt} - W_{ikt-1})}_{\text{changes in wealth}} + \underbrace{\sum_k (p_{kt} - p_{kt-1}) A_{ikt-1}}_{\text{capital gains}} \end{aligned} \quad (2)$$

$\underbrace{\hspace{15em}}_{\text{net savings}}$

Tax data offers (at best) info on disposable income and change in net wealth

- But not information on (unrealized) capital gains, A_{ikt-1} , or p_{kt}

Income components in accounting identify

Disposable Income ($E_{it} - \tau_{it} + \sum_k r_{kt} A_{ikt-1}$)		Per capita: \$ 32,468
		Share of gross income (%)
=	Market Income Net of Taxes and Transfers ($E_{it} - \tau_{it}$)	
=	Labor income	70.9
+	Government cash transfers	15.9
+	Other positive transfers	2.4
-	Other negative transfers	-1.0
-	Taxes	-23.2
+	Capital Income ($\sum_k r_{kt} A_{ikt-1}$)	
=	Owner-occupied housing services	5.6
+	Dividends from securities	2.8
+	Other capital income	1.0
+	Interest on deposits	1.4
-	Interest on liabilities	-6.6

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Labor income includes wage income and income from self-employment.

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Government cash transfers includes pensions, unemployment benefits, family allowances, housing allowance, educational grants, child allowance, and social assistance.

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Other transfers includes inheritance, gifts, lottery winnings, alimony, and contributions to pension schemes.

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Value of owner-occupied housing services

We do not observe value of owner-occupied housing services

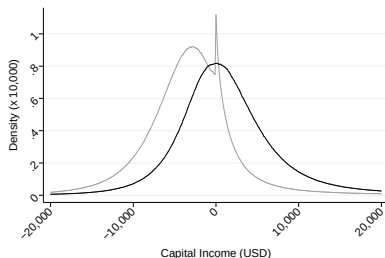
- ▶ Need an estimate to get comparable measures of consumption for renters and homeowners

Use the rental equivalence approach: Value of flow of services for owner dwelling = market rent for rented dwelling

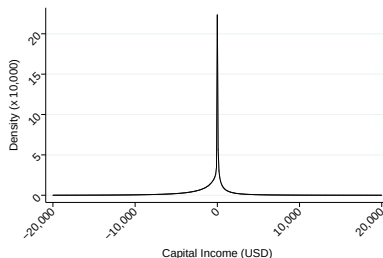
- ▶ National Accounts: Aggregate value of owner-occupied housing services based on representative sample of renter-occupied housing units
- ▶ Distribute aggregate value across households according to household's share of total value of owner dwellings

Capital income with and without housing services

(a) Homeowners



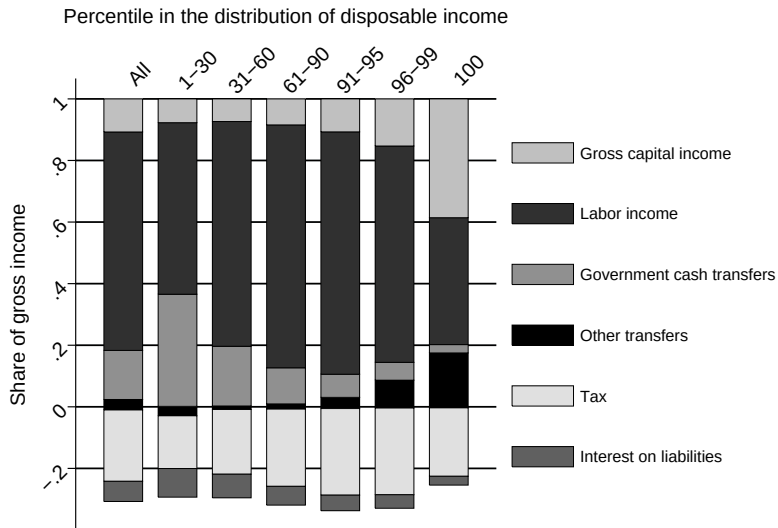
(b) Renters



— Capital income without owner-occupied housing services
— Capital income with owner-occupied housing services

Notes: Measures are expressed in 2014 USD and adjusted for household size using the EU scale. The sample consists of all households with non-missing tax statements residing in Norway each year in the period 1994-2014. Households are weighted by the number of household members. The figure is based on pooled cross-sections over the period 1994-2014.

Income components by rank in income distribution



Notes: Gross income is defined as the sum of all positive income components. Each income component is summed over all households in each income group each year and divided by the corresponding measure of gross income. The figure reports the averages over 1994-2014 of these ratios.

Capital gains and (changes in) wealth

Key challenge: separate changes in net wealth due to

- ▶ Unrealized capital gains
(which does not affect current consumption)
- ▶ Household saving some of its income
(which reduces current consumption)

Our approach: use either **transactions** data or information on **asset prices** to measure net savings

Measuring net savings

1) Using **transactions** data:

- ▶ Real estate transactions from Norwegian Land Register, 1993-2014 (and last transaction prior to 1993)
- ▶ Transactions in listed and unlisted stocks from Norwegian Registry of Securities, 2003-2014

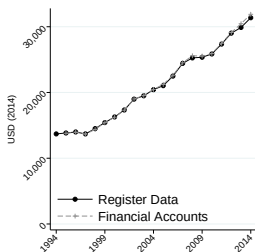
2) Using information on **asset prices**:

- ▶ For years prior to 2003 and for asset types *bonds* and *equity funds*
 - ▶ assume common price trend within each asset class
 - ▶ combine price trends from Financial Accounts with end-year value of each asset class
- ▶ Assume no trade in *unlisted securities* pre 2003

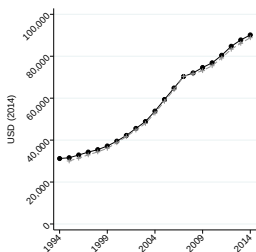
Bank deposits, liabilities, and listed securities

Register data vs Financial Accounts

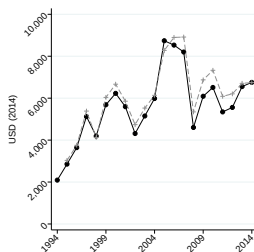
(a) Bank deposits



(b) Liabilities



(c) Listed securities

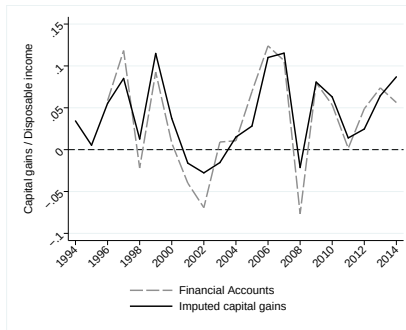


Notes: Per capita measures in 2014 USD.

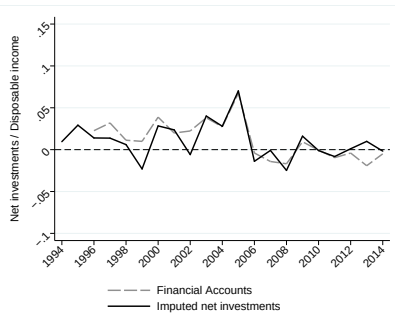
Capital gains and net savings

Register data vs Financial Accounts

(a) Capital gains

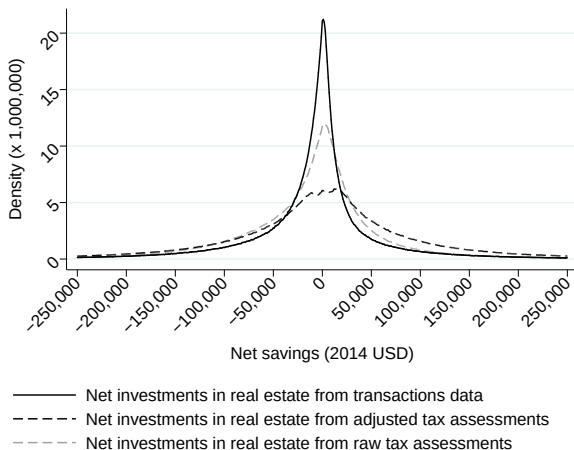


(b) Net savings



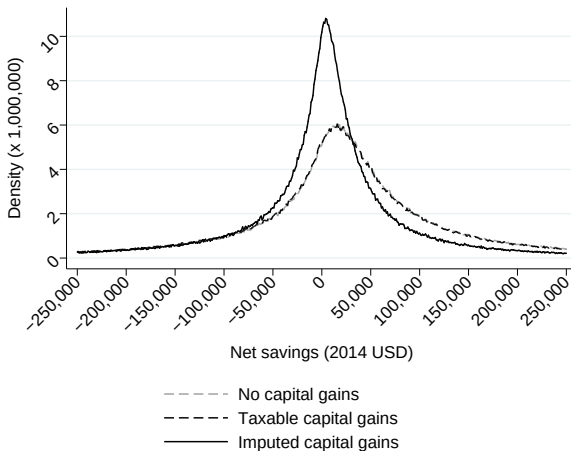
Notes: All measures are expressed in 2014 USD.

Total net savings with/without transactions in real estate



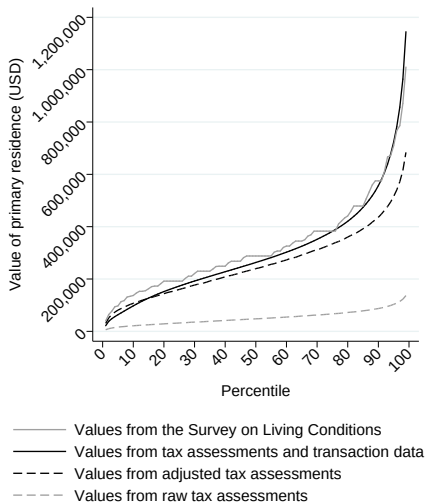
Notes: Net savings is defined as disposable income minus consumption. “Adjusted tax assessments” are raw tax assessment values adjusted according to the aggregate differences between sales prices and tax assessments. The sample is restricted to households in which either data source suggests that the household has traded real estate. Measures are expressed in 2014 USD and adjusted for household size using the EU scale. The figure is based on pooled cross-sections over the period 1994-2009.

Total net savings with/without transactions in stocks



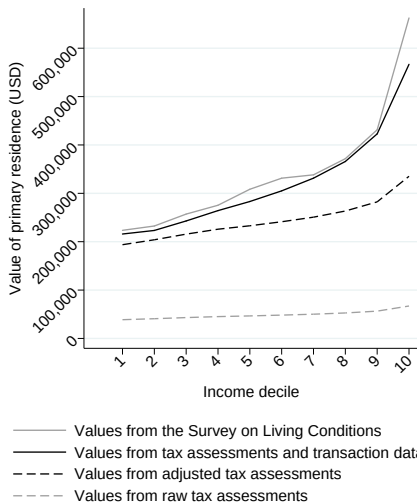
Notes: Net savings is defined as disposable income minus consumption. The figure compares the distribution of net savings based on our preferred measure of capital gains to distributions of net savings when taxable capital gains are used as a proxy for capital gains and when capital gains are assumed to be zero. The sample is restricted to the top 5% of the financial wealth distribution. Measures are expressed in 2014 USD and adjusted for household size using the EU scale. The figure is based on pooled cross-sections over the period 2003-2014.

Value of primary residences: Percentile distribution



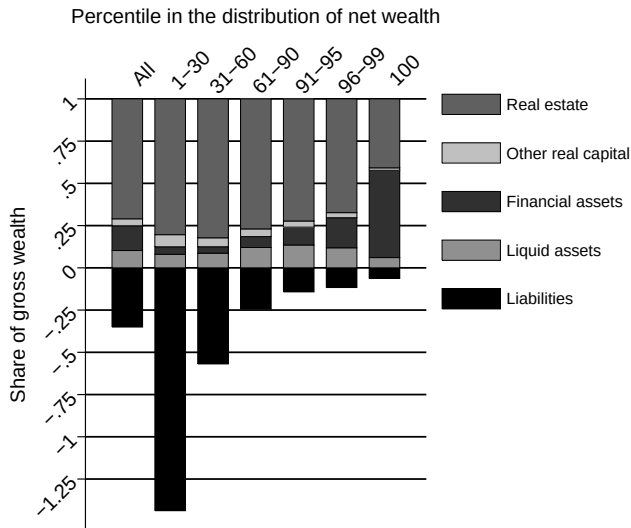
Notes: Average value of primary residences by percentile in the distribution of primary residences, among households owning a residence in 2004. The top percentile is dropped. The figure compares measures based on (i) register data when using tax assessments (raw and adjusted), and (ii) when also using transaction data, with (iii) measures using the 2004 Survey on Living Conditions. The percentage of households owning a residence is 72.6, 79.3 and 82.0, according to (i), (ii) and (iii), respectively. Households are weighted by the number of individuals aged 16–79, in accordance with the sampling of the Survey.

Value of primary residence by income decile



Notes: The figure compares the mean value of primary residences by income decile when values are derived from tax assessments, transaction data or the 2004 Survey on Living Conditions. Only homeowner households are included, and households are weighted by the number of individuals aged 16–79 in the register data, in accordance with the sampling of the Survey on Living Conditions.

Wealth components by rank in wealth distribution



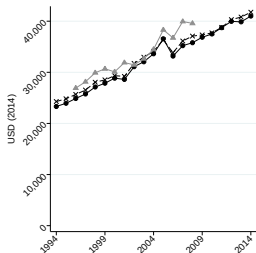
Notes: Gross wealth is defined as the sum of all positive wealth components. Each wealth component is summed over all households in each wealth group each year and divided by the corresponding measure of gross wealth. The figure reports the averages over 1994-2014 of these ratios.

Outline

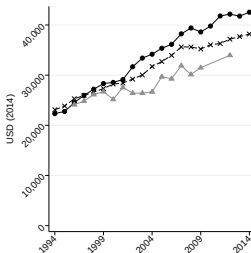
1. Measuring household consumption expenditure
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Comparing aggregates, per capita

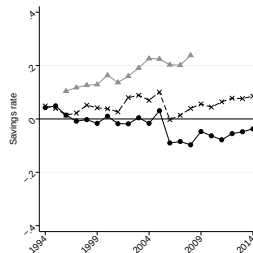
(a) Income



(b) Consumption



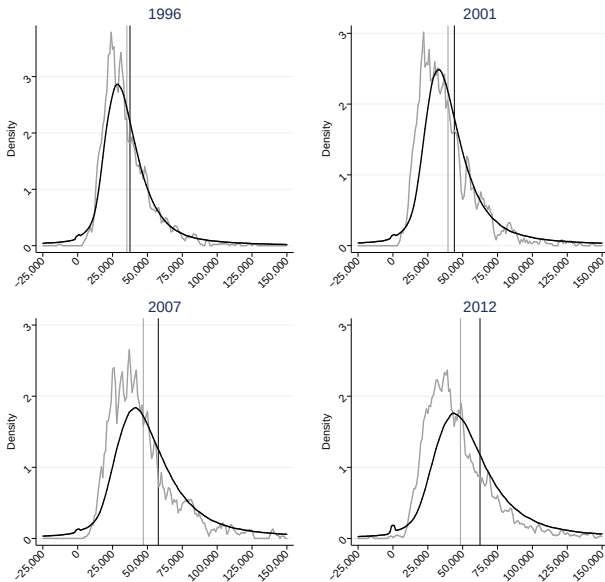
(c) Savings



—▲— Expenditure Survey
- - x - - National Accounts
—●— Register Data

Notes: Per capita measures of income, consumption and savings in 2014 USD. Consistent data from the survey is not available before 1996, and is also missing for income (and savings) after 2008. For the register based measures and for the survey based measures, savings is defined as the difference between disposable income and consumption.

Cross-sectional distributions of consumption



Notes: Black lines - Register Data; Grey lines - Expenditure Survey. Measures are expressed in 2014 USD and adjusted for household size using the EU scale. Households are weighted by the number of household members.

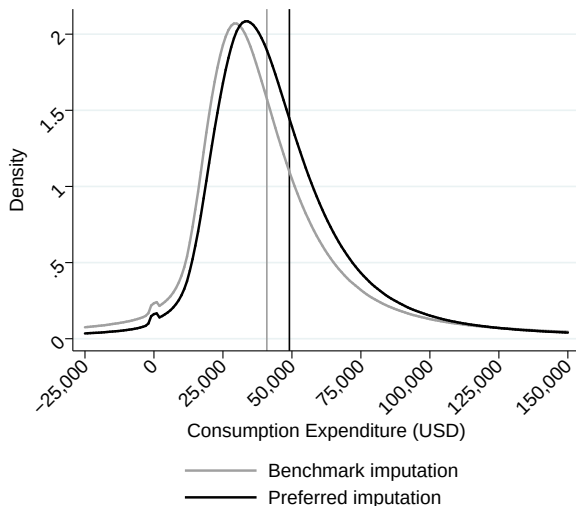
Measure based on tax data only

Benchmark measure is subject to the following restrictions:

- (a) Investments in real estate based on tax assessments only
- (b) Value of owner-occupied housing services set to zero
- (c) Capital gains on financial assets set to zero
- (d) Durables counted as fully consumed in year of purchase
- (e) Data from inheritance tax registry not used

Relax (a)–(e) $\implies$ **Preferred measure**

Distribution of consumption expenditure



Notes: Consumption is measured in 2014 USD and adjusted for household size using the EU scale, and households are weighted by the number of household members. The figure is based on pooled cross-sections over the period 1994-2014.

What are the key limitations of the tax data?

	Benchmark measure	Relax restrictions (a) and (b)	Relax restrictions (a) - (c)	Preferred measure
Non-positive consumption	0.088	0.043	0.035	0.036
50th / 10th Percentile	9.70	2.23	2.11	2.12
90th / 50th Percentile	2.45	2.04	2.01	2.00
Mean	40,908	47,009	49,171	49,089
50th Percentile	36,828	41,202	41,721	41,931

Notes: Consumption is measured in 2014 USD and adjusted for household size using the EU scale, and households are weighted by the number of household members. The table is based on pooled cross-sections over the period 1994-2014.

Outline

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Income and consumption inequality over the life cycle

Income measures:

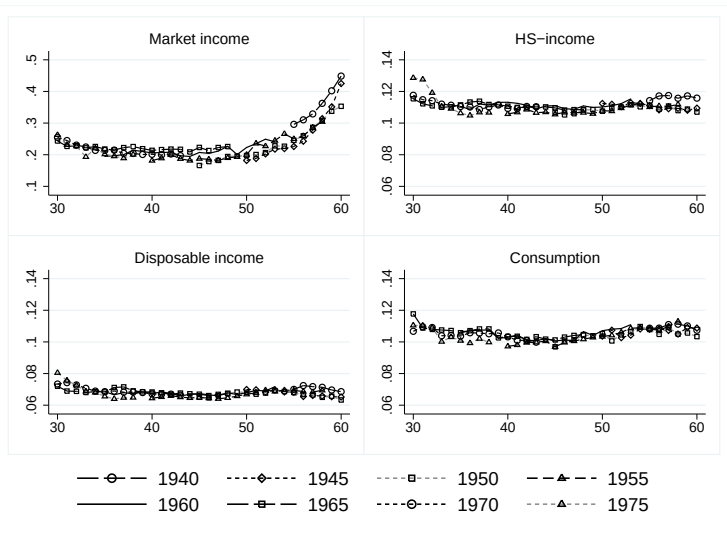
- ▶ Disposable income
- ▶ Market income
- ▶ Haig-Simons income = Disposable income + Capital gains

Sample based on cohorts 1934–1984 and years 1995–2013:

- ▶ Include (households of) non-immigrant men ages 30-60
- ▶ Exclude self-employed and households with non-positive income/consumption
- ▶ Exclude top/bottom 1% of income/consumption distribution
- ▶ Exclude outliers in transitory changes in consumption

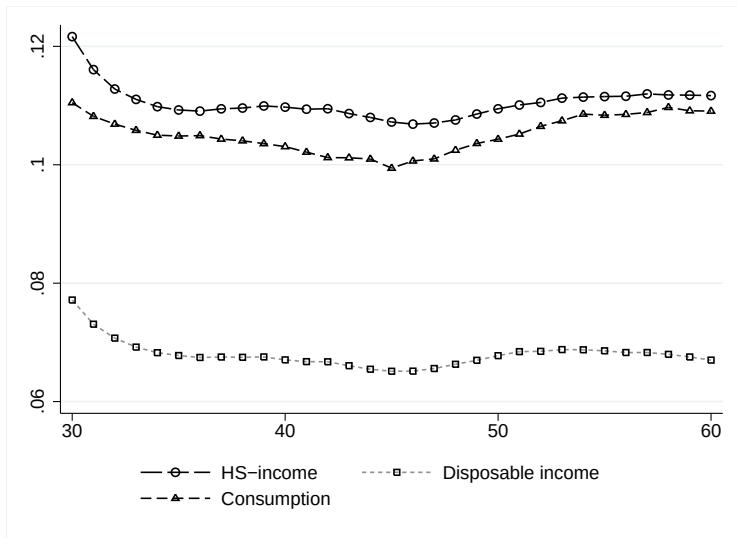
Inequality in income and consumption

Net of common calendar time effects



Inequality in income and consumption

Average observed cohort



Propensity to consume and inequality

We observe that

$$\text{var}(\log(C_{it})) < \text{var}(\log(Y_{it})) \quad (3)$$

With a bit of algebra, this inequality can be expressed as:

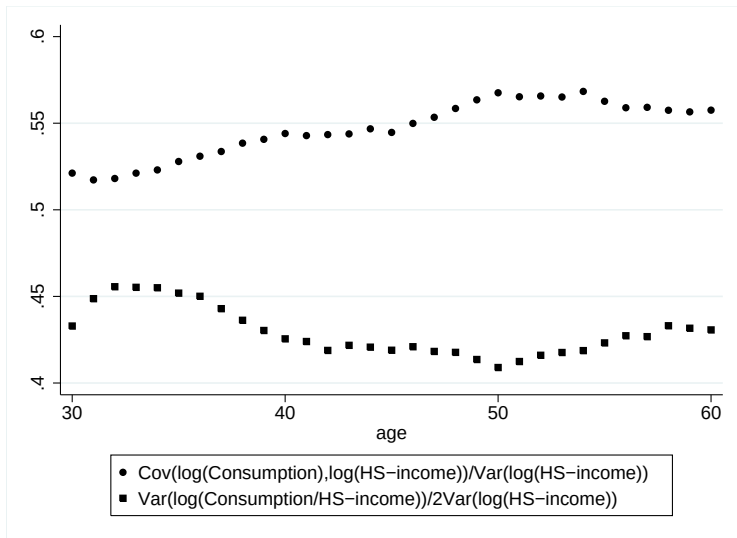
$$\frac{\text{var}(\log(C_{it}) - \log(Y_{it}))}{2\text{var}(\log Y_i)} + \frac{\text{cov}(\log C_i, \log Y_i)}{\text{var}(\log Y_i)} < 1 \quad (4)$$

which shows that inequality in cons. vs income depends on

- i) ineq. in the propensity to consume relative to income ineq.
- ii) the elasticity of consumption with respect to income

Propensity to consume and inequality: Estimates

Average observed cohort



Attanasio and Davis (JPE1996): Relative wage movements and the distribution of consumption

Regression framework:

$$\Delta_{\tau} \log c_t^g = \alpha_t + f(a_t^g) + \beta \Delta_{\tau} \log w_t^g + \varepsilon_t$$

- g : education $\times$ 5-year birth cohort groups
- $f(a_t^g)$: third-order polynomial in age
- $\log c_t^g$: average log consumption
- $\log w_t^g$: average log hourly wage

$\hat{\beta} > 0 \implies$ deviation from full risk sharing across groups

Attanasio and Davis: Sample and measurement

Sample based on cohorts 1945–1984 and years 1997–2014

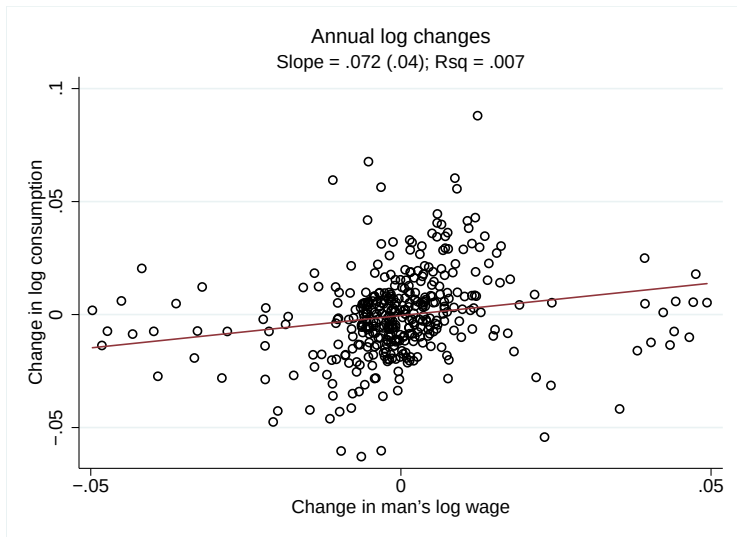
Consumption measured net of housing and other durables

- ▶ Include (households of) non-immigrant men ages 25-60
- ▶ Exclude households with non-positive consumption
- ▶ Exclude households buying or selling real estate
- ▶ Exclude self-employed households

Hourly wage = total monthly earnings / usual hours per month

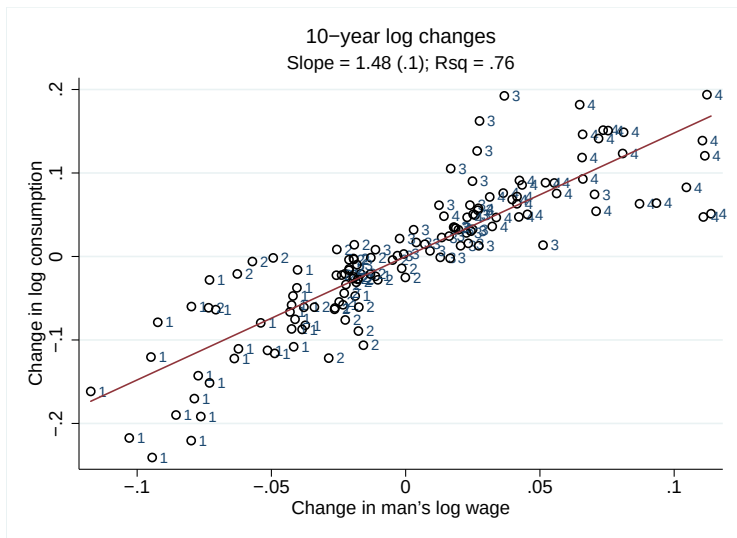
- ▶ Source: Norwegian Wage Statistics

Household consumption vs transitory wage changes



Notes: Plotted values are residuals from regressions on year effects and a cubic in age. Annual changes are measured over the period 1997-2014.

Household consumption vs persistent wage changes



Notes: Plotted values are residuals from regressions on a cubic in age. 10-year changes are measured over the period 1997-2014. 1: Less than High School; 2: High School; 3: Post secondary; 4: College.

Parker & Vissing-Jorgensen (AER 2009; BEPA2010)

Focus: Income cyclicalilty of high-income households

- ▶ Covariance of income growth with aggregate consumption growth
- ▶ Heterogeneity by income percentile

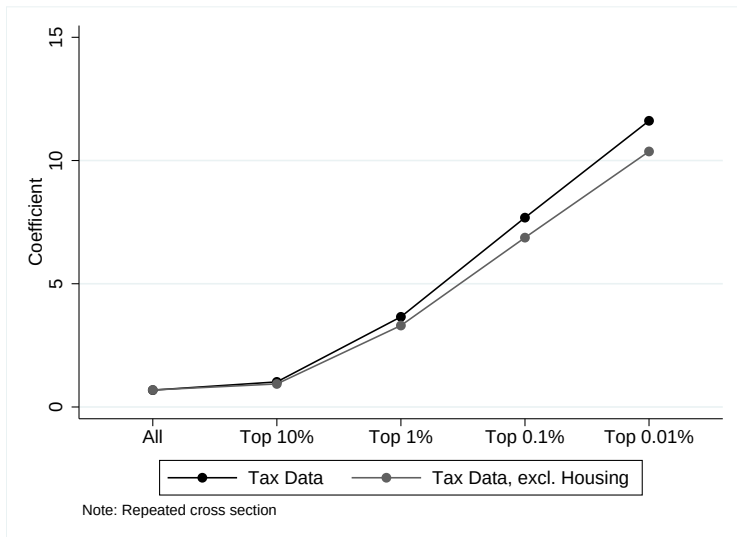
Specification:

$$\text{Income Growth}_{i,t+1} = \alpha_i + \beta_i \Delta \log X_{t+1} + \varepsilon_{i,t+1},$$

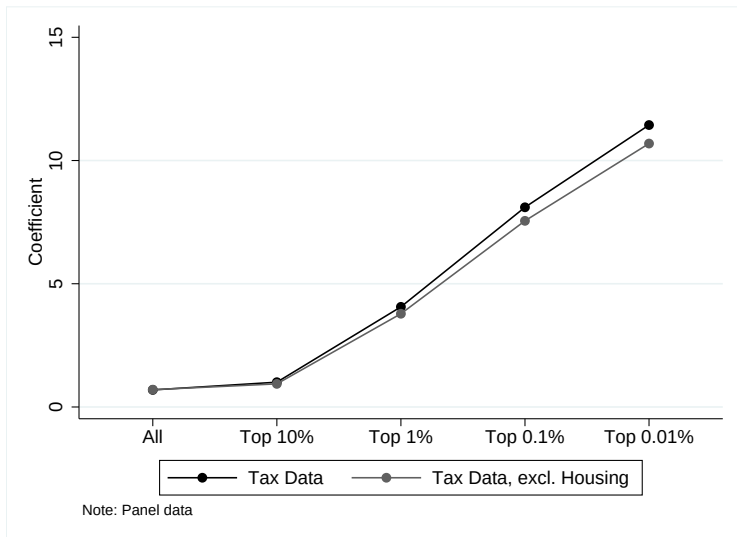
where

- ▶ i denotes income bin (e.g. top 10%)
- ▶ LHS denotes difference of mean log income for group i
- ▶ X_{t+1} denotes log consumption (or income) per capita

Cyclicalty of group income: Repeated cross sections



Cyclicalty of group income: Panel data



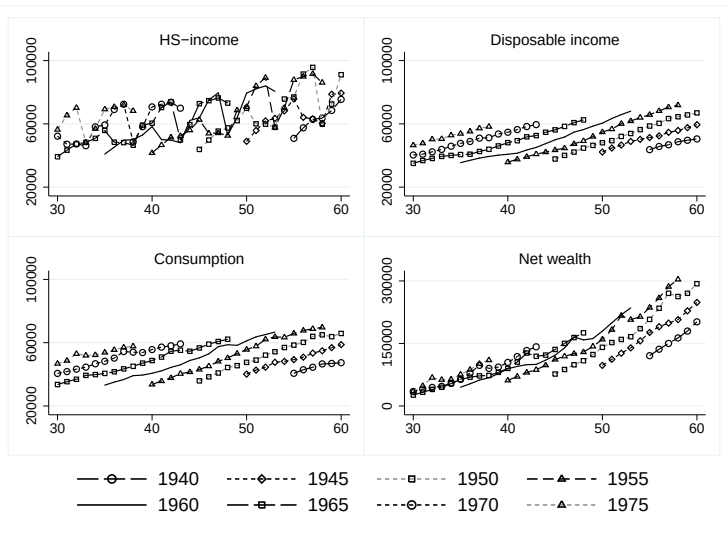
Concluding remarks

Tax records do not contain enough information to derive reliable measures of household consumption expenditure

Transaction data is key, at least in the Norwegian context

Next step is to use our new data to study the consumption, saving, and labor supply behavior of households over the life/business cycle

Means of income, consumption, and wealth by cohorts



Means of log-income and log-consumption

Net of common calendar time effects

