Saving Behavior Across the Wealth Distribution: The Importance of Capital Gains

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Motivation

• Many theories of household wealth accumulation:
  
  \[
  \text{saving rate} = \frac{\text{saving}}{\text{income}} \approx \text{independent of wealth}
  \]

• What does saving behavior look like in the data?

What we do:

• Use Norwegian administrative data on income & wealth to examine saving behavior across the wealth distribution
Our Findings

1. **Capital gains are key** to relation between saving and wealth

   (a) saving rates **net of capital gains** (“net saving”)
   
   (b) saving rates **including capital gains** (“gross saving”)
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   (a) saving rates net of capital gains (“net saving”)
   
   (b) saving rates including capital gains (“gross saving”)

   ![Graph showing median saving rate in percent across wealth percentiles for net and gross saving.]

• rich people hold assets that experience persistent capital gains, do not sell these to consume
  
  “saving by holding”
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   (a) saving rates **net of capital gains** (“net saving”)
   
   (b) saving rates **including capital gains** (“gross saving”)

   ![Graph showing median saving rate by wealth percentile]

   - note: rich people don’t have higher saving rates in traditional sense, but still accumulate more wealth through capital gains
Our Findings: “Saving by Holding” – Back-of-Envelope

1. **Capital gains are key** to relation between saving and wealth

Back-of-envelope example to clarify:

- assume net saving rate = 10%, capital gains on all assets = 2%
- **Paul**: income (excluding cap gains) = $100,000, assets = $0
- **Richie**: income (excluding cap gains) = $100,000, assets = $1,000,000
- gross savings are $10,000 and $10,000 + $20,000 = $30,000
- gross saving rates are 10% and \( \frac{30,000}{100,000+20,000} = 25\% \)
Our Findings

2. Macro implication: “saving by holding” explains 60-100% of increase in wealth-to-income ratio since 1995

3. Implications for theory: patterns $\neq$ canonical models of hh saving

Potential explanations:

1. Demand-driven asset price changes
2. Multiple assets + portfolio adjustment frictions
3. ... (a few others – see paper)
The Simplest Consumption-Saving Model

- Households solve:

\[
\max_{\{c(t)\}_{t \geq 0}} \int_0^\infty e^{-\rho t} \frac{c(t)^{1-\gamma}}{1-\gamma} \, dt \quad \text{s.t.} \quad \dot{a} = w + ra - c, \quad a \geq -w/r
\]

- Saving policy function:

\[
\dot{a} = s(a) = \frac{r - \rho}{\gamma} \left( \frac{w}{r} + a \right)
\]

- Constant saving rate out of income

\[
\frac{s}{y} = \frac{s}{w + ra} = \frac{r - \rho}{\gamma r}
\]
Changing Asset Prices (in partial equilibrium)

- Two sources of returns: dividends + capital gains

\[ r = \theta + \frac{\dot{p}}{p}, \quad \frac{\dot{p}}{p} = \mu + \varepsilon, \quad \mu = "\text{persistent}"; \quad \varepsilon = "\text{transitory}" \]

- Saving responses depend on type of capital gains:

  (a) Only persistent: \( \mu > 0, \varepsilon = 0 \)

  1. net saving rate decreasing with wealth (if \( \mu > 0 \))

  2. systematic component of gross saving rate independent of wealth

  (b) Both: \( \mu > 0, \varepsilon \leq 0 \)
Extensions

(a) Housing not just an asset, but also consumption good:
   - collapses to one-asset model with flat saving rate

(b) Labor income risk and borrowing constraints:
   - flat saving rate conditional on labor income

(c) More realistic life cycle:
   - flat saving rate conditional on age and income

(d) Discount rate heterogeneity:
   - flat saving rate conditional on discount rate

Overall: \( \approx \) constant saving rate conditional on observables (age, ...)
Data

- Norwegian population tax record data with supplements
  - Panel, 2005 to 2015 (11 years)
  - $\approx 3.3$M persons per year

- Tax records include (third-party reported):
  - asset holdings by broad asset class (e.g. deposits, housing)
  - income (labor, business, capital, and transfers)
Notes: Wealth = assets — liabilities, pensions: not today (in appendix)
12th pctile = 0 net worth
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Portfolio Shares

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Net, Gross and “Recurrent” Saving

- Three ways of writing \( \text{consumption} + \text{saving} = \text{income} \)

\[
c + p\dot{k} = w + \theta pk
\]  
net saving \quad \text{net income} \quad (1)

\[
c + p\dot{k} + \dot{p}k = w + (\theta + \dot{p}/p)pk
\]  
gross saving \quad \text{Haig-Simons income} \quad (2)

\[
c + (\dot{k}/k + \mu)pk = w + (\theta + \mu)pk, \quad \mu := \overline{\dot{p}/p}
\]  
“recurrent saving” \quad “recurrent income” \quad (3)

- Implementation:
  1. Separate gross saving into net saving and capital gains (use housing transaction data and shareholder registry)
  2. Estimate persistent capital gains \((\mu)\) (mean of realized capital gains as long as series go back)
Median Saving Rates

![Graph showing median saving rates by wealth percentile. The graph includes three lines, representing Recurrent, Net, and Gross savings. The y-axis represents the median saving rate in percentage, while the x-axis represents the wealth percentile.](image-url)
Controlling for Age, Earnings ...

(a) Age, net saving rate

(b) Age, recurrent saving rate

(c) Earnings, net saving rate

(d) Earnings, recurrent saving rate
Importance for Aggregate Wealth

**Counterfactuals**: what if recurrent saving rates were flat as in the models?

“Saving by holding” explains 60-100% of increase in wealth-to-income
Importance for Aggregate Wealth

**Counterfactuals**: what if recurrent saving rates were flat as in the models?

![Graph showing the Wealth-to-Income Ratio from 1995 to 2015 for different countries.](source: WID.world)

“Saving by holding” explains 60-100% of increase in wealth-to-income.
Importance for Aggregate Wealth

**Counterfactuals:** what if recurrent saving rates were flat as in the models?

"Saving by holding" explains 60-100% of increase in wealth-to-income
What Explains Our Results?

Reduced form of all our explanations

\[ \text{gross saving} = s_d (\text{net income}) + s_c (\text{cap gains}) \quad s_d \ll s_c \approx 100\% \]

Potential explanations

1. demand-driven asset price changes
2. multiple assets + portfolio adjustment “frictions”
What Explains Our Results?

Reduced form of all our explanations

\[
gross\ saving = s_d (\text{net income}) + s_c (\text{cap gains}) \quad s_d \ll s_c \approx 100\%
\]

Potential explanations

1. demand-driven asset price changes
   - same as benchmark model but with time-varying discount rate
   - two sources of capital gains:
     (a) dividend growth (“supply”)
     (b) discount rates (“demand”)
   - if only (b): consume constant dividend stream but not cap gains
What Explains Our Results?

Reduced form of all our explanations

\[ \text{gross saving} = s_d(\text{net income}) + s_c(\text{cap gains}) \quad s_d \ll s_c \approx 100\% \]

Potential explanations

1. demand-driven asset price changes

2. multiple assets + portfolio adjustment “frictions”
   - two assets: ‘consumption asset,’ ‘investment asset’ (e.g. housing)
   - investment asset experiences capital gains but is costly to liquidate
What Explains Our Results?

Reduced form of all our explanations

\[
\text{gross saving} = s_d (\text{net income}) + s_c (\text{cap gains}) \quad s_d \ll s_c \approx 100\%
\]

Potential explanations (see paper for 3.-5.)

1. demand-driven asset price changes
2. multiple assets + portfolio adjustment “frictions”
3. non-homothetic preferences
4. misperceptions about asset price process
5. inattention and behavioral explanations
Conclusions

We provide evidence on how saving rates vary across wealth distribution using population tax records from Norway

1. **Capital gains are key** to relation between saving and wealth
   - net saving rate $\approx$ flat across wealth distribution
   - gross saving rate increasing with wealth

2. **Saving by holding explains 60-100% of wealth-to-income increase**

3. **Joint pattern for net & gross saving rates $\neq$ canonical models**
   - demand-driven asset price changes
   - multiple assets + portfolio adjustment frictions

Theories of wealth accumulation need to include changing asset prices!
Q&A Slides
Portfolio Shares with Public Pensions

![Graph showing portfolio shares for various asset types across different wealth percentiles. The x-axis represents the wealth percentile (including pensions), and the y-axis shows the mean portfolio share in % of total assets. Different asset types are represented by distinct lines on the graph.]

- Safe Assets
- Housing
- Debt
- Public Equity
- Private Business
- Vehicles
- Public Pensions

Legend:
- Safe Assets
- Housing
- Debt
- Public Equity
- Private Business
- Vehicles
- Public Pensions
Saving Rates with Public Pensions

[Graph showing the relationship between median saving rate and wealth percentile, excluding pensions. The graph compares recurrent, net, and gross saving rates.]
Zooming in on right tail of wealth distribution

(a) Mean portfolio shares

(b) Saving rates

(c) Capital gains, asset-to-income

(d) Saving rates in 2008
Saving Rates by Year

(a) Net saving rates across years

(b) Gross saving rates across years
Dispersion in Saving Rates

(a) Net saving rate

(b) Recurrent saving rate
Controlling for the usual suspects

Median regression with controls $x_{it} = \text{age, earnings, education}$

$$
\frac{S_{it}}{y_{it}} = \phi_1 + \sum_{p=2}^{100} \phi_p D_{it,p} + f(x_{it}) + \mu_t + \epsilon_{it}
$$
Education Controls

(a) Education, net saving rate

(b) Education, recurrent saving rate
Simply High Saving Rate ⇒ High Wealth?
Exclusively a Story About Housing?

Restrict to households with stocks > 25% of financial wealth (≈ 10%)
• Challenge: Norwegians hold few other assets with capital gains
(a) Saving rates as fraction of wealth

\[
\hat{\dot{a}} = \frac{r - \rho}{\gamma} \left( \frac{w}{r} + a \right),
\]

\[
\hat{\dot{a}} = \frac{\rho - r}{\gamma} \left( \frac{w}{r a} + 1 \right),
\]

(b) Imputed cons as fraction of wealth

\[
c = \left( r - \frac{r - \rho}{\gamma} \right) \left( \frac{w}{r} + a \right),
\]

\[
\frac{c}{a} = \left( r - \frac{r - \rho}{\gamma} \right) \left( \frac{w}{r a} + 1 \right),
\]
Average Capital Gains and Asset-to-Income Ratio

Wealth Percentile

Median Recurrent Capital Gains Rate in %

Recurrent Capital Gains Rate (left)

Assets to Disposable Income (right)
Saving Rates with Time Averaging

- Concern: medians of year-to-year saving rates may get it wrong if expenditure is “lumpy”

- Our solution: time-average saving rates within individuals
Housing (in partial equilibrium)

Housing differs from other assets:

1. not just an asset, but also a consumption good

2. indivisibilities, transaction costs

Common intuition: (1) by itself ⇒ should save \( \dot{p} > 0 \)

- \( p \uparrow \) means housing more expensive = bad for you

We show: intuition ignores intertemporal substitution in housing

- \( \dot{p} > 0 \) ⇒ buy bigger house now, then sell off over time

- collapses to one-asset model with \( \approx \) constant gross saving rate

Takeaway: housing is different, but due to (2), not (1)
1. Demand-driven Asset Price Changes

\[ \max_{\{c_t\}_{t \geq 0}} \int_0^\infty e^{-\int_0^t \rho_s ds} \frac{c_t^{1-\gamma}}{1-\gamma} dt \quad \text{s.t.} \quad c_t + p_t \dot{k}_t = w + \Theta_t k_t \]

Now endogenize asset price. Viewing return \( r_t \) as primitive:

\[ p_t = \int_t^\infty e^{-\int_t^s r_{\tau} d\tau} \Theta_s ds \]

Case I: capital gains due dividend growth ("supply-driven")

- equivalent to earlier model: consume out of persistent capital gains

Case II: capital gains due to time-varying returns ("demand-driven")

- if \( \rho_t = r_t \), then consume constant dividend stream but not cap gains

\[ c_t = w + \Theta k_t, \quad p_t \dot{k}_t = 0 \]
2. Multiple Assets + Portfolio Adjustment “Frictions”

- Two assets: consumption asset $b$ and investment asset $k$

$$\dot{b} = w + r^b b + \theta p k - p d - c$$

$$\dot{k} = d, \quad \frac{\dot{p}}{p} = \mu + \epsilon$$

- + some reason for $d = 0$ most of the time

(a) Saving Rates

(b) Portfolio Shares