Saving Behavior across the Wealth Distribution

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What We Do

- Use Norwegian administrative data on income & wealth to examine saving behavior across the wealth distribution

Why Care?

Macro

- Many workhorse models: saving rate $\approx$ independent of wealth (or slightly decreasing with wealth, especially at bottom)
- Related result: aggregate dynamics $\approx$ independent of wealth dist
- Does saving behavior in data look anything like in these models?

Inequality

- Is saving behavior a force toward diverging wealth inequality?

Our Findings

1. Relation between saving rates and wealth depends on whether saving includes capital gains

   (a) saving rates net of capital gains ("net saving")

   (b) saving rates including capital gains ("gross saving")

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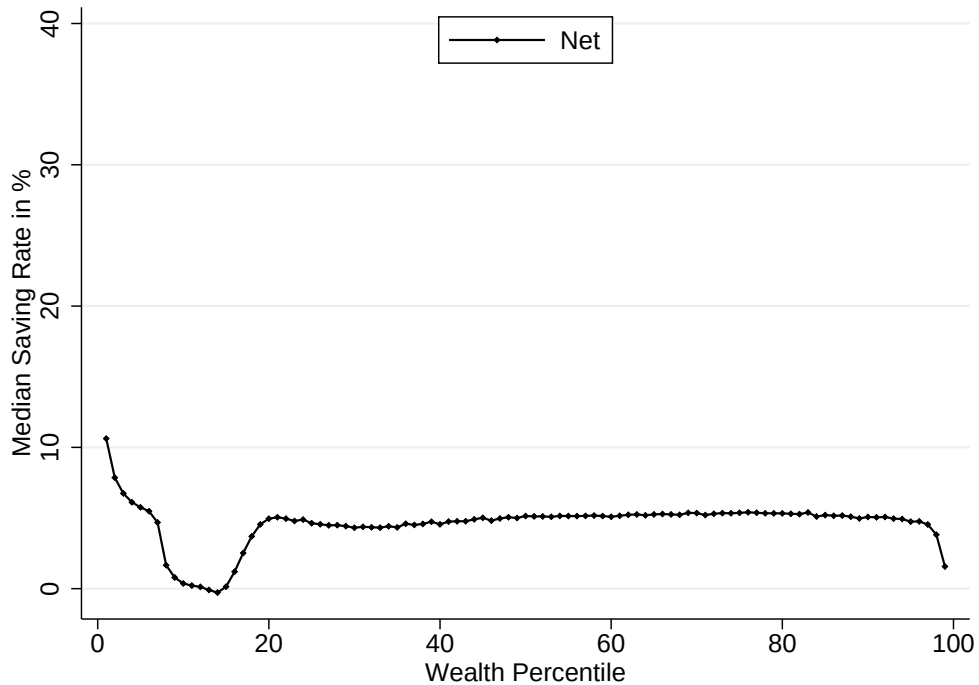

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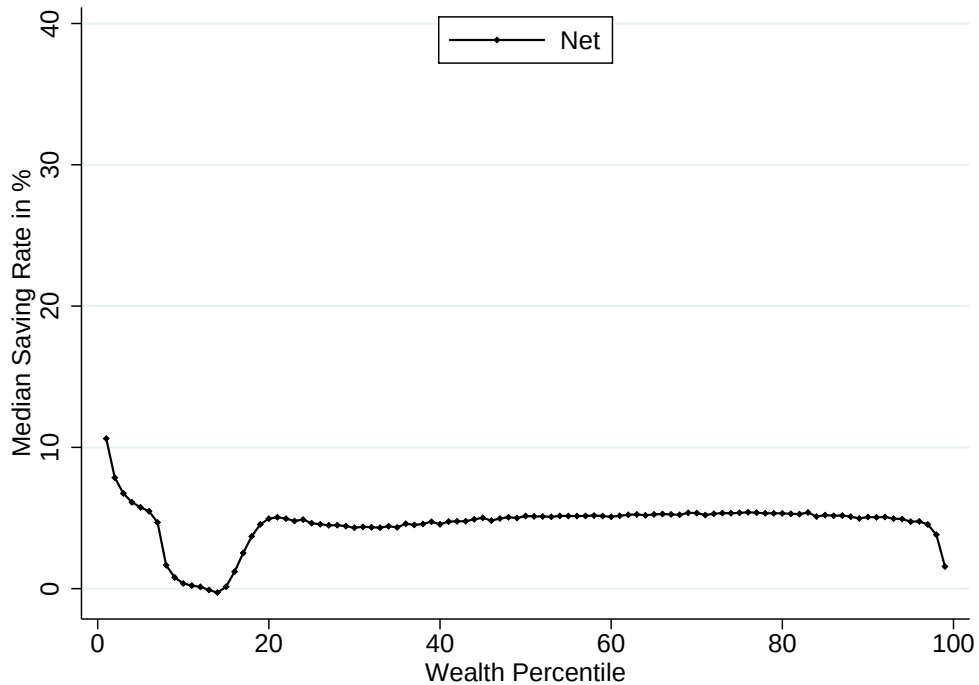

   - seemingly consistent with workhorse models

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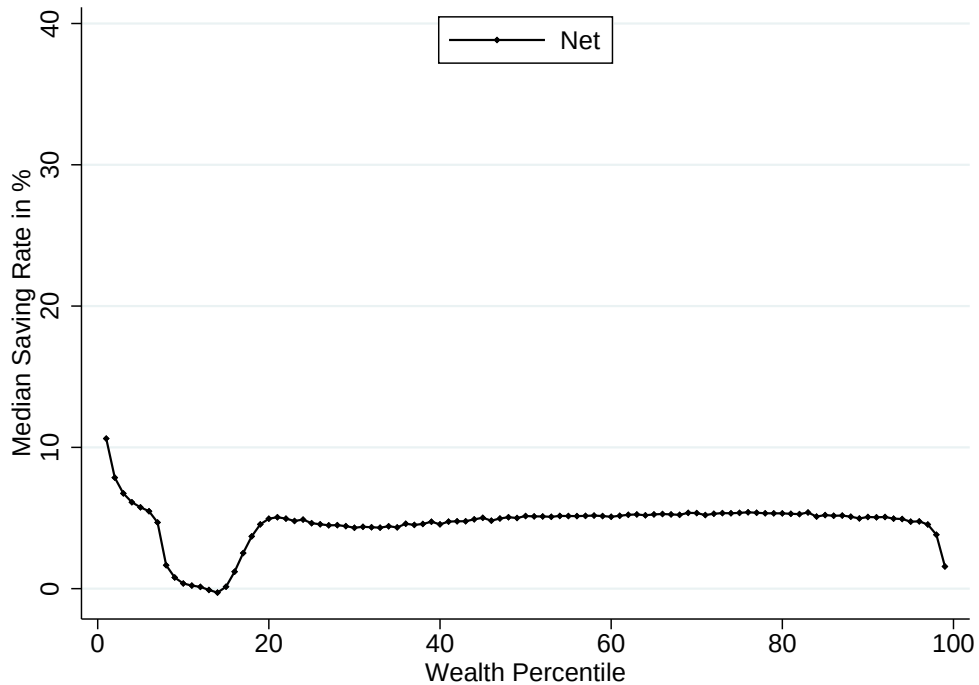

   - seemingly consistent with workhorse models
   - but: economic theories are not about net saving

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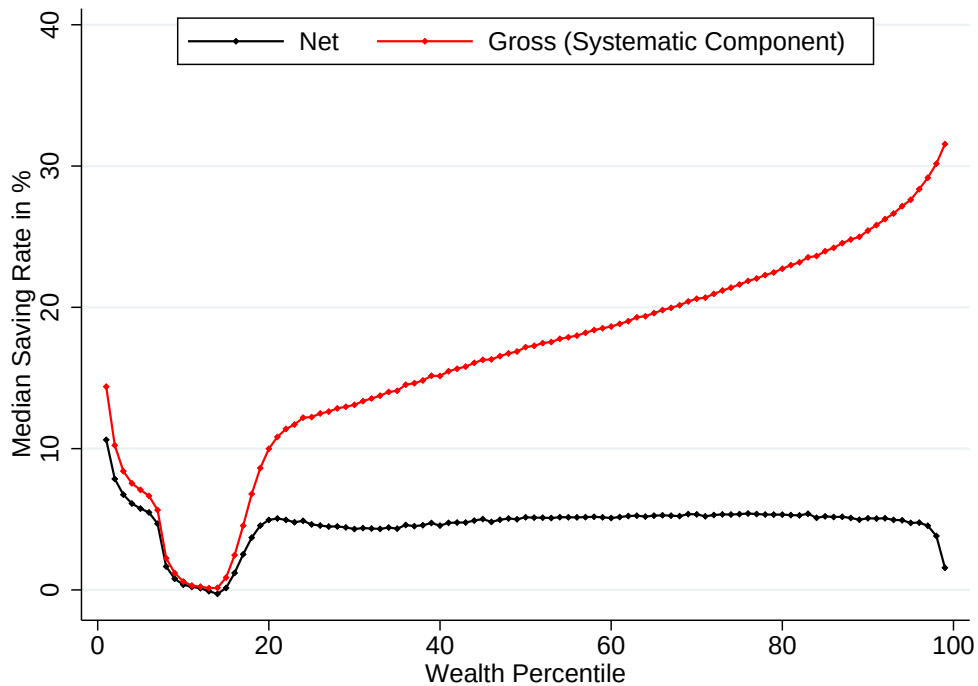

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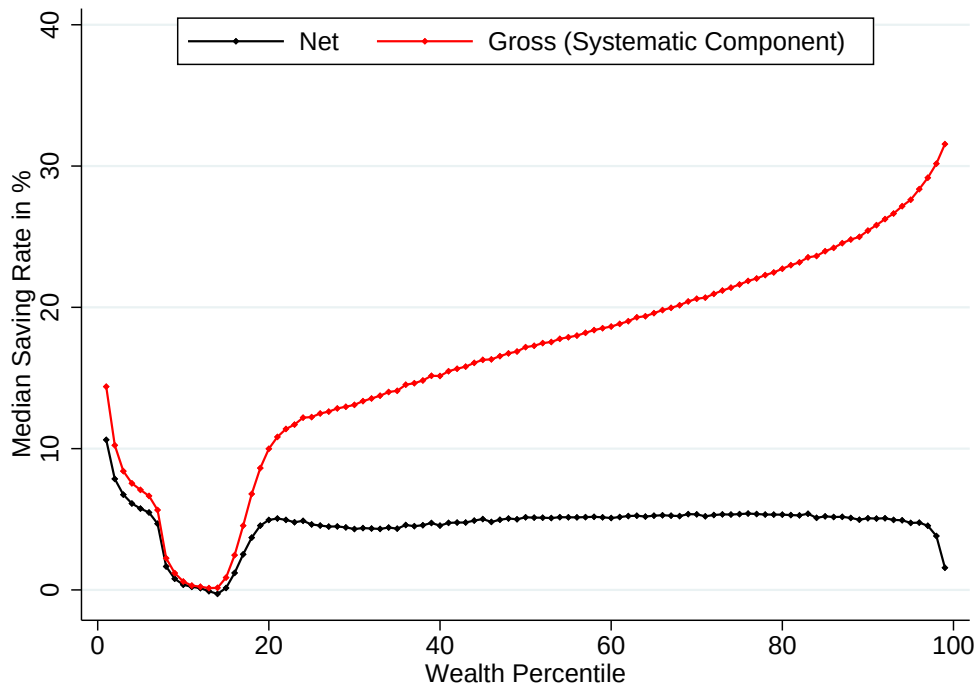
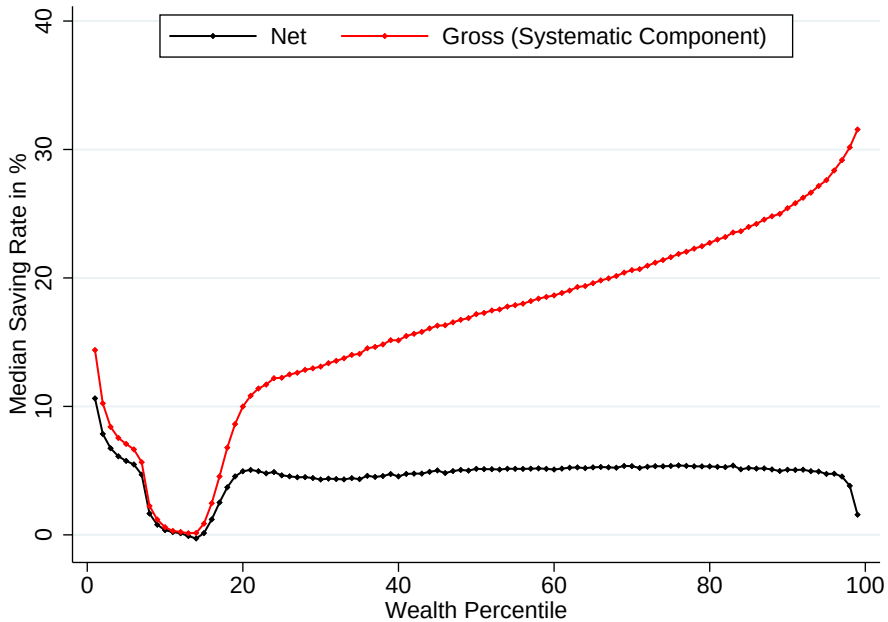


- rich people hold assets that experience persistent capital gains, do not sell these to consume ⇒ they save more

Our Findings: "Saving by Holding" – Back-of-Envelope

1. Saving rates excluding and including capital gains

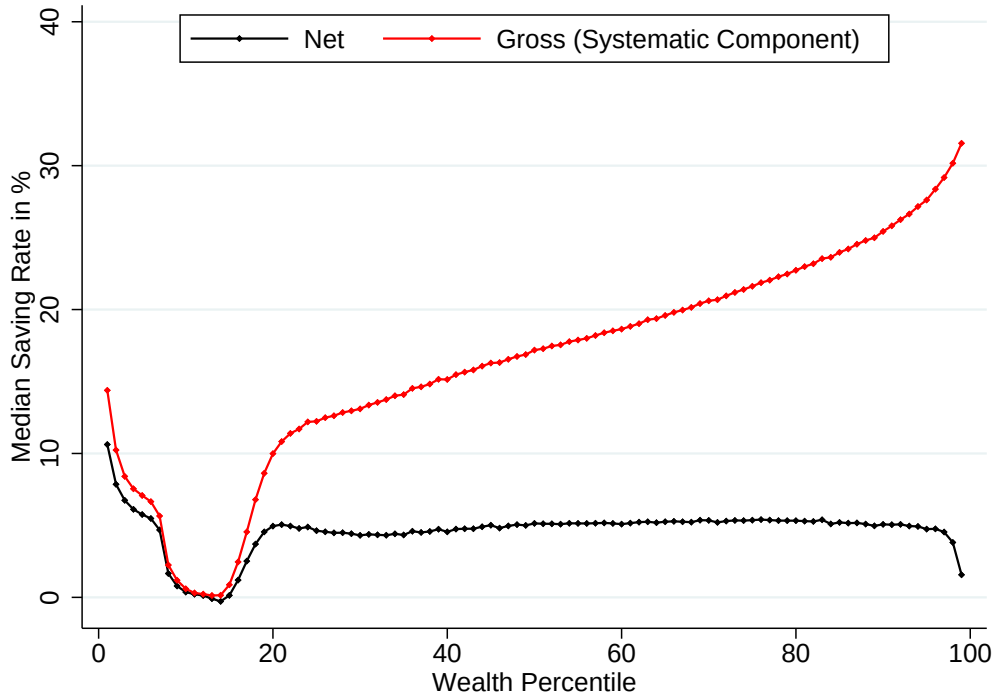


Back-of-envelope example to clarify:

- 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. Implications for theory:
   - Joint pattern for net & gross saving rates ≠ workhorse models



   - Potential explanations
     - multiple assets + portfolio adjustment "frictions"
     - ... (will discuss a few others)

Related Literature

Empirics:

1. saving across wealth distribution Bach-Calvet-Sodini
2. saving across permanent income distribution Dynan-Skinner-Zeldes, Straub
3. rates of return across wealth distribution Fagereng et al, Bach-Calvet-Sodini

Macro:

- aggregate implications of income & wealth heterogeneity
  Krusell-Smith, Krueger-Mitman-Perri, Quadrini-RiosRull, Kaplan-Violante, Auclert-Rognlie, Straub,...
- consumption response to asset price changes Poterba, Paiella-Pistaferri
  Christelis-Georgarakos-Jappelli, Berger-Guerrieri-Lorenzoni-Vara, Kaplan-Mitman-Violante, Guren et al,...

Inequality:

- theories of wealth inequality at point in time
  Benhabib-Bisin, DeNardi-Fella, Jones, Piketty-Zucman, ...
- wealth inequality dynamics, type/scale dependence?
  Gabaix-Lasry-Lions-Moll, Kaymak-Poschke, Hubmer-Krusell-Smith, Garbinti-GoupilleLebret-Piketty, Gomez, ...

Other areas:

- public finance, particularly capital taxation Saez-Stantcheva, Jakobsen-Kleven-Zucman
- household finance Campbell, Calvet-Campbell-Sodini

Plan

1. Data
2. Theoretical benchmarks
3. Key conceptual issue: how to think about changing asset prices
4. Results
5. Theoretical interpretation

Data

Norwegian Population Tax Record Data

- Sample: roughly 3.3 mio persons per year
- Period: 1993 to 2015 but focus on 2004 to 2015 (12 years) so as to combine with shareholder and housing registries
- Tax records include (Norway has a wealth tax):
  - asset holdings by broad asset class (e.g. deposits, housing)
  - income (labor, business, capital, and transfers)
- Third-party reported: scope for tax evasion limited

- Advantages: long panel data, no attrition, even very top tail in data set, limited measurement errors
- Disadvantages: don't observe individual asset prices/unrealized capital gains directly

Definition of Wealth and Asset Categories ▸ wealth distribution

- Wealth = deposits + stocks + stock fund holdings + informal loans + bonds + housing + private equity + vehicles/boats − liabilities
- For most categories: tax value = market value
- Private equity: tax value $\approx$ book value $\leq$ market value ▸ details
- Housing: use transaction data and house characteristics to estimate market values
- Pensions: not included in wealth or saving (to be estimated)

Why not US or EU data?

- Why not simply use, say, the US Survey of Consumer Finances (SCF) or EU Household Finance and Consumption Survey (HFCS)?

- Because they do not fulfill requirements to make our main figure

  1. reliable information on assets, liabilities
  2. panel data
  3. large number of observations

Theoretical Benchmarks

A Series of Benchmark Models

1. The simplest consumption-saving model
2. The simplest consumption-saving model + changing asset prices
3. Labor income risk, borrowing constraints, lifecycle, β heterogeneity
4. Housing

1. The simplest consumption-saving model

- Households solve:

$$\max_{\{c(t)\}_{t\geq 0}} \int_0^\infty e^{-\rho t} \frac{c(t)^{1-\gamma}}{1-\gamma} dt \qquad \text{s.t.}$$

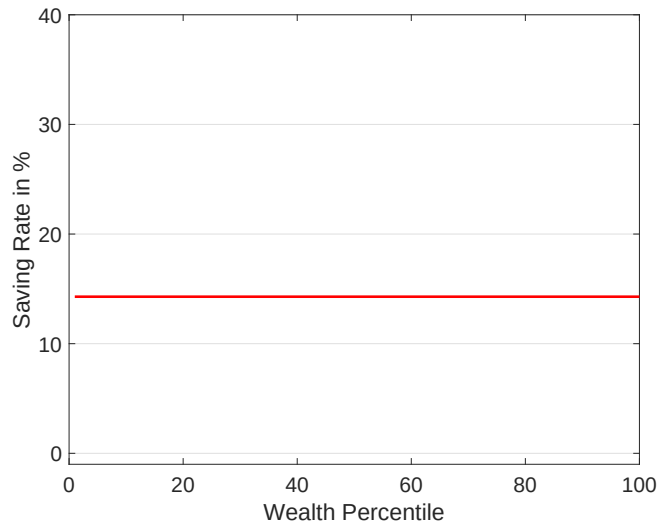
$$\dot{a} = w + ra - c, \qquad a \geq -w/r$$

- Saving policy function is linear in wealth a

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

- Constant saving rate out of total income

$$\frac{s}{y} = \frac{s}{w+ra} = \frac{r-\rho}{\gamma r}$$



- Aside: no clean prediction for saving rate out of wealth (Bach-Calvet-Sodini)

$$\frac{s}{a} = \frac{r-\rho}{\gamma}\left(\frac{w}{ra} + 1\right)$$

2. Changing asset prices

- Consider asset with price p, dividend yield θ

$$c + p\dot{k} = w + \theta pk, \qquad \frac{\dot{p}}{p} = \mu + \varepsilon$$

  μ = "persistent", ε = "transitory"

- Map into previous model by defining wealth $a := pk$

$$c + \dot{a} = w + \underbrace{(\theta + \mu + \varepsilon)}_{r} a$$

- Solution:

$$\dot{a} = s(a, w, \bar{r}) + \varepsilon a \approx \bar{s}\,(w + \bar{r}a) + \varepsilon a, \qquad \bar{r} = \theta + \mu$$

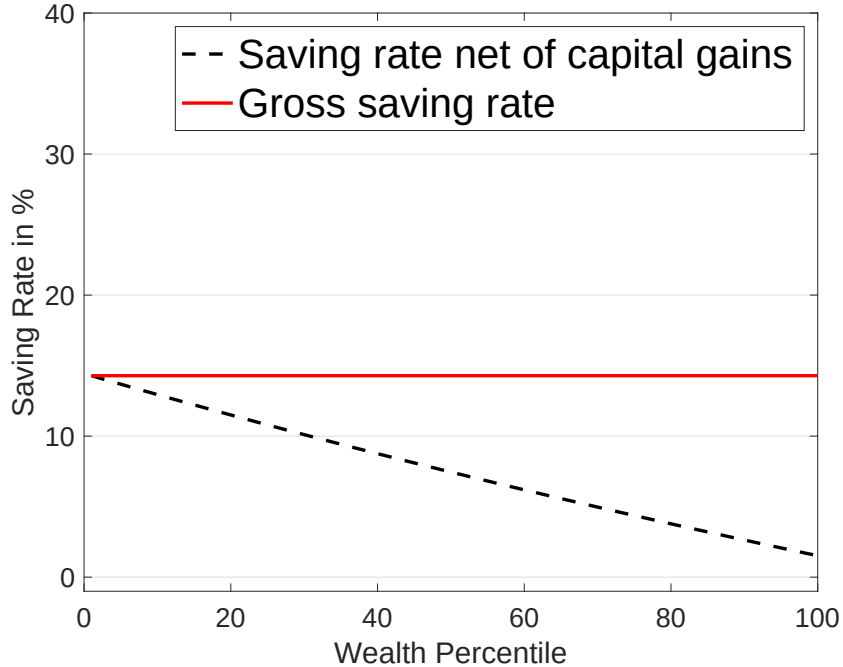
- Unrealized capital gains are income (Schanz-Haig-Simons)...
- ... but different responses to different types of capital gains:
  - transitory $\varepsilon > 0$: 100% saving rate out of these
  - persistent $\mu > 0$: consume part of resulting income flow

(similar logic as transitory vs persistent labor income shocks)

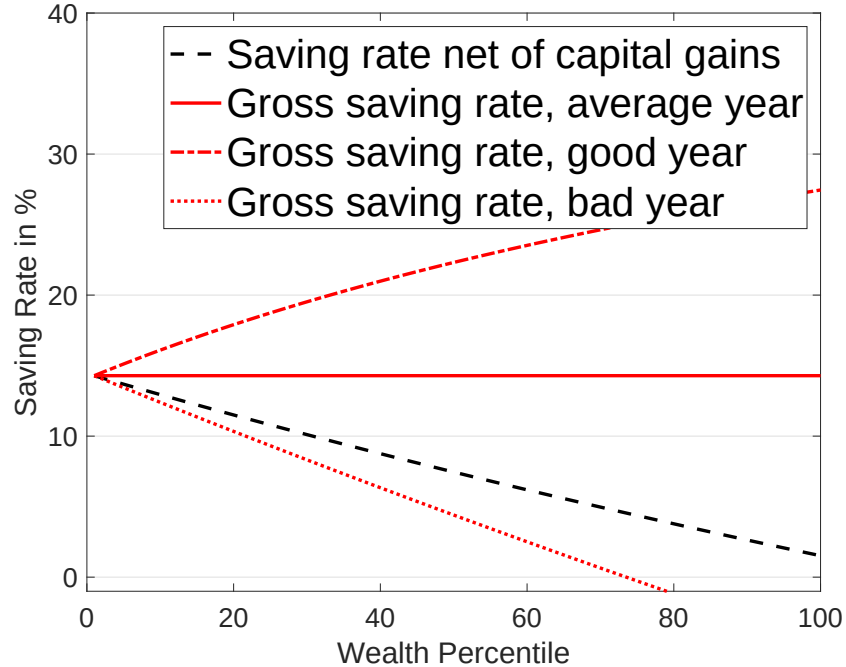
2. Changing asset prices

In cross-section, richer $\Rightarrow$ capital gains = larger fraction of income

- transitory $\varepsilon > 0$: 100% saving rate out of these
- persistent $\mu > 0$: consume part of resulting income flow



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



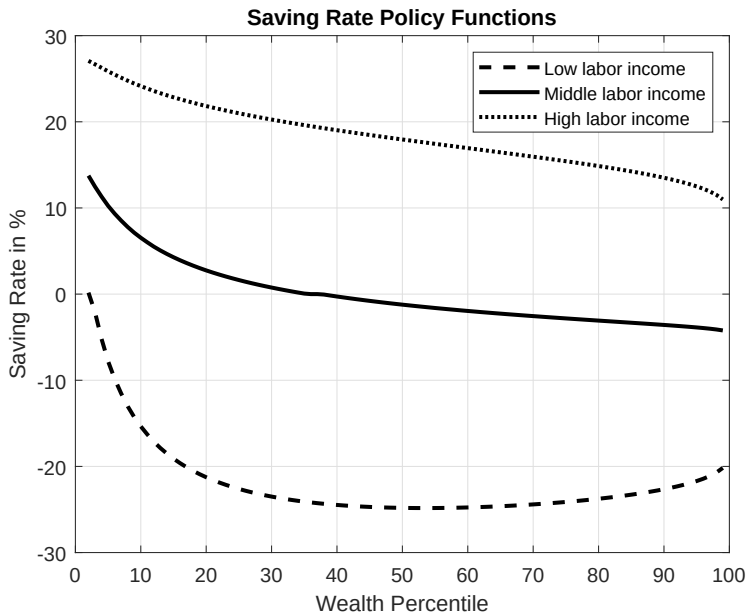
(b) Both: $\mu > 0, \varepsilon \lesseqgtr 0$

1. net saving rate decreasing with wealth (if $\mu > 0$)
2. systematic component of gross saving rate independent of wealth

3. Labor income risk etc ▸ details

(a) Labor income risk and borrowing constraints:

- flat/slightly decreasing saving rate conditional on labor income
- previously noticed by De Nardi & Fella (2017)



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(b) More realistic life cycle:

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(c) Discount rate heterogeneity:

- flat/slightly decreasing conditional on discount rate

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Overall:

- $\approx$ constant saving rate conditional on observables (age, ...)
- could be $\nearrow$ in cross-section due to spurious correlation
  But our data allows us to control for these!

4. Housing ▸ details

Housing differs from other assets:

1. not just asset but also consumption good (Glaeser, Buiter, ...)
2. indivisibilities/adjustment costs

Lots of people's intuition: (1) by itself $\Rightarrow$ should save $\dot{p} > 0$. Logic:

- $p \uparrow$ means housing more expensive = bad for you
- $\Rightarrow$ should not consume out of $\dot{p} > 0$, even if persistent

We show: (1) by itself is not enough, instead need (2). Without (2):

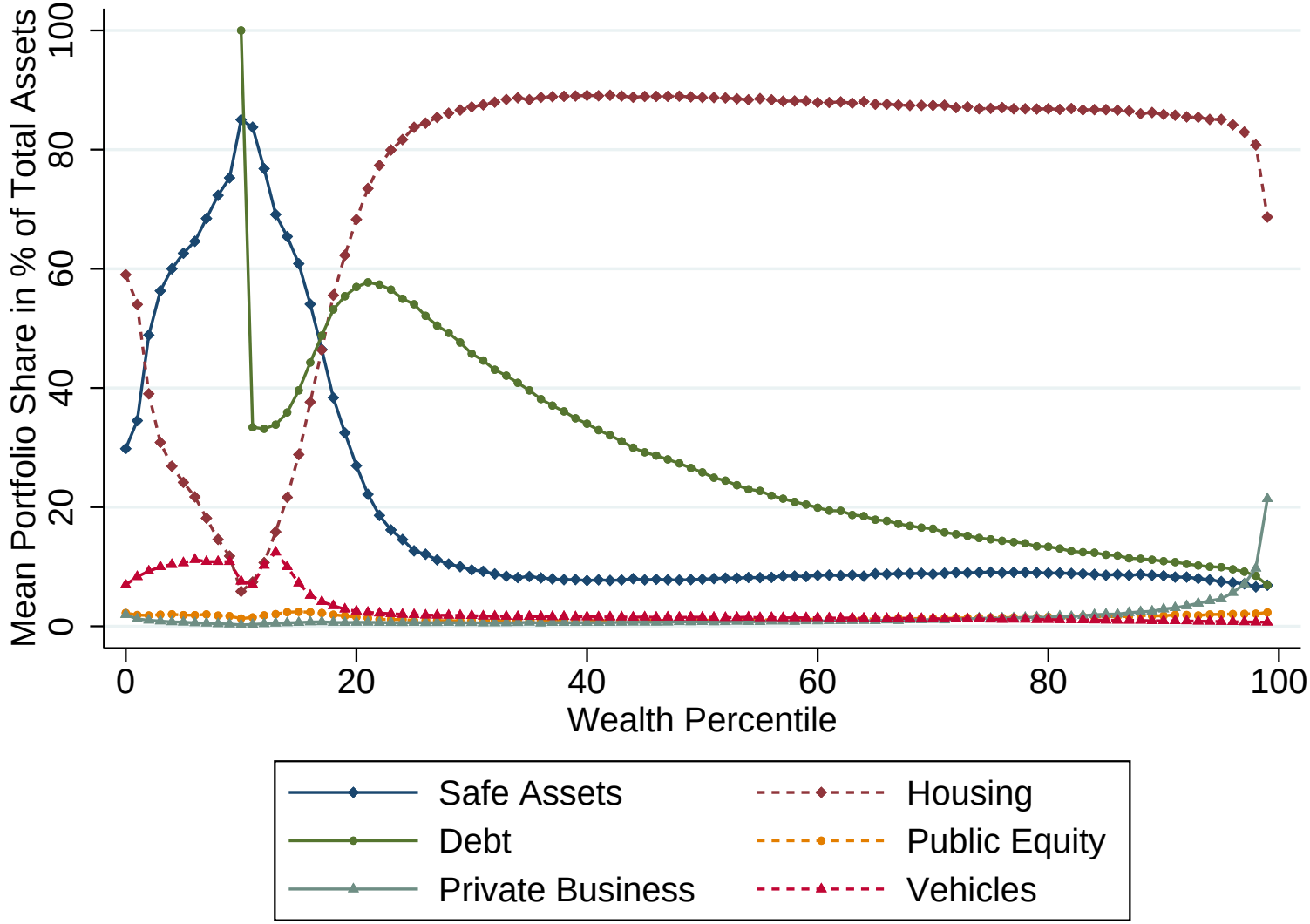
- intuition above is wrong because it ignores intertemporal substitution of housing
- $\dot{p} > 0 \Rightarrow$ buy bigger house now, then gradually sell off over time
- collapses to one-asset model with $\approx$ constant gross saving rate

Takeaway: it's true that housing is different, but because of (2) not (1)

Key Concepts and Definitions with Changing Asset Prices

Portfolio Shares: The Importance of Housing

▸ zoom top 1%



Notes: 12th pctile = 0 net worth. Safe assets = deposits + bonds + informal loans.

▸ participation ▸ U.S. (Campbell) ▸ debt decomposition

Net, Gross and Recurrent Saving

- Two ways of writing consumption + saving = income

$$c + \underbrace{p\dot{k}}_{\text{net saving}} = \underbrace{w + \theta pk}_{\text{disposable income}} \tag{1}$$

$$c + \underbrace{p\dot{k} + \dot{p}k}_{\text{gross saving}} = \underbrace{w + (\theta + \dot{p}/p)pk}_{\text{Haig-Simons income}} \tag{2}$$

- Standard theories only have implications for gross saving in (2)
- Have shown: implications different for transitory vs persistent $\dot{p}/p$
  - expect saving rates to vary strongly with market performance
- $\Rightarrow$ focus on recurrent saving = systematic component

$$c + \underbrace{(\dot{k}/k + \mu)pk}_{\text{recurrent saving}} = \underbrace{w + (\theta + \mu)pk}_{\text{recurrent income}}, \quad \mu := \overline{\dot{p}/p} \tag{3}$$

- Simple benchmark: recurrent saving rate = independent of wealth

Additional Issues with Housing

- Housing is not just asset but also consumption good

$$\underbrace{c + Rh}_{\text{consumption}} + \underbrace{\dot{p}h + p\dot{h} + \dot{b}}_{\text{gross saving}} = \underbrace{w + rb + Rh + \dot{p}h - \delta ph}_{\text{Haig-Simons income}}$$

- Rental-equivalence approach: $R =$ rental rate on similar properties $= 2.88\% \times ph$ (Eika-Mogstad-Vestad)

- Alternative (not today): user-cost approach: $R = (r + \delta - \dot{p}/p)p$

Implementation

1. Separate gross saving into net saving and capital gains
   - housing: use transaction data
   - public equity: use holdings of individual stocks (shareholder registry)
   - private equity: arguably Δ(book value) $\approx$ net saving
   - bonds: compute from arbitrage with treasury rate
2. Estimate persistent capital gains μ
   - mean of realized $\dot{p}/p$ from 1950 or as long as series go back
   - housing: very high price growth 2004 – 2015 $\Rightarrow$ this matters

Asset	Average capital gain	Average rate of return
Public equity	3.25 %	6.18 %
Housing	2.25 %	5.13 %
Bonds	1.06 %	2.03 %

3. Calculate saving rates $\frac{s}{y}$

Saving Rates across the Wealth Distribution

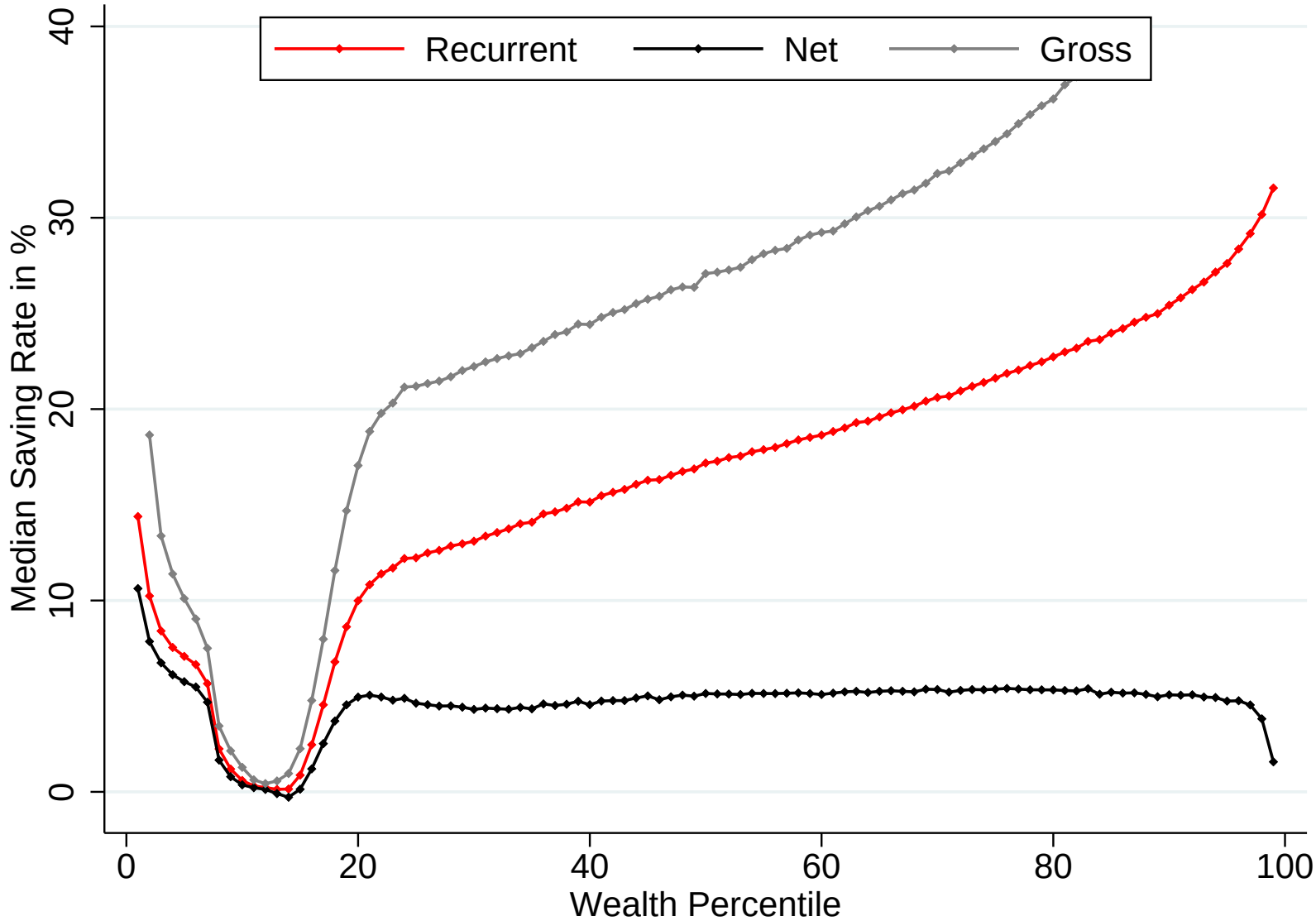
Saving Rates across the Wealth Distribution

- Start with simple descriptive plots using “raw data”

- Afterwards: similar patterns with controls

Median Saving Rates

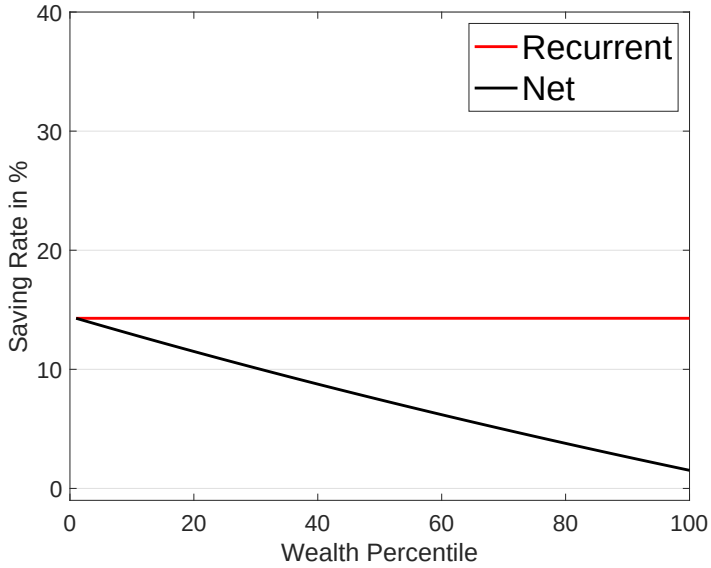
▸ zoom top 1% ▸ bad year ▸ dispersion ▸ sample restrictions



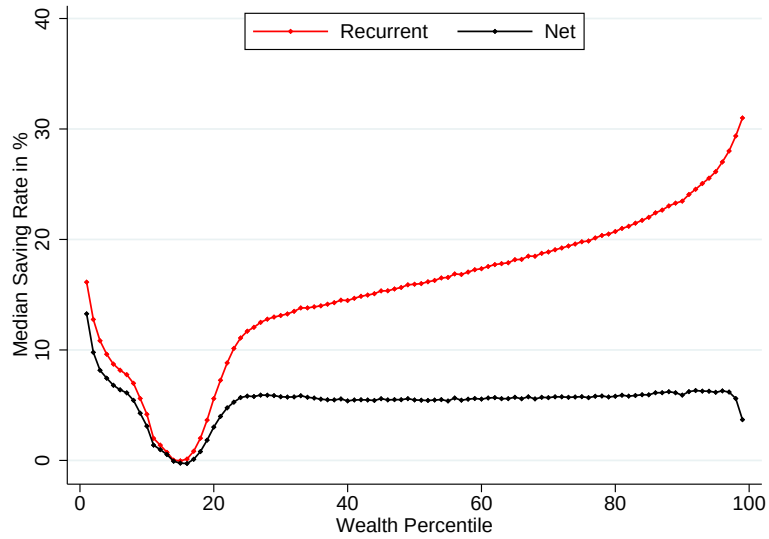
Note: for now, dropped bottom 1st percentile

To be clear

1. Completely different from predictions of simple benchmark model



(a) Benchmark model



(b) Data

2. Not just one lucky year: $\dot{p}/p > 0$ in most years and

Asset	Average capital gain
Public equity	3.25 %
Housing	2.25 %
Bonds	1.06 %

Controlling for the usual suspects

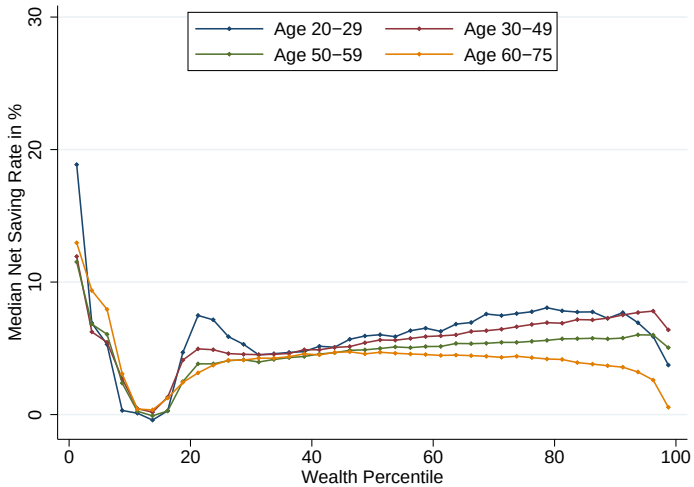
▸ age ▸ inc ▸ educ

Median regression with controls $\mathbf{x}_{it}$ = age, earnings, education

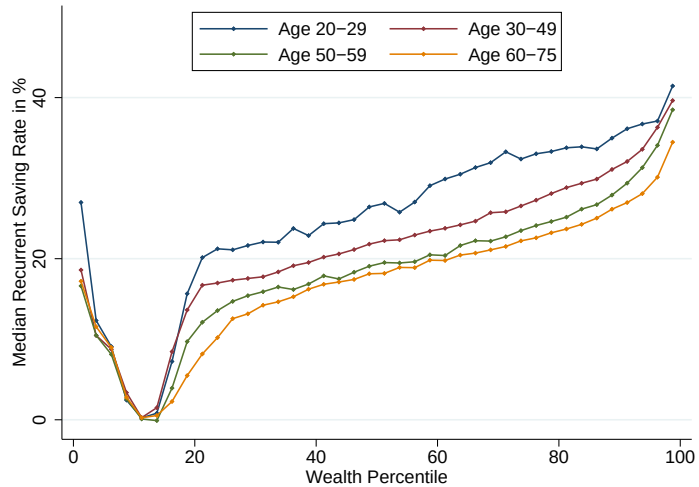
$$\frac{s_{it}}{y_{it}} = \phi_1 + \sum_{p=2}^{100} \phi_p D_{it,p} + f(\mathbf{x}_{it}) + \mu_t + \varepsilon_{it}$$

(for now: 5 % sample)

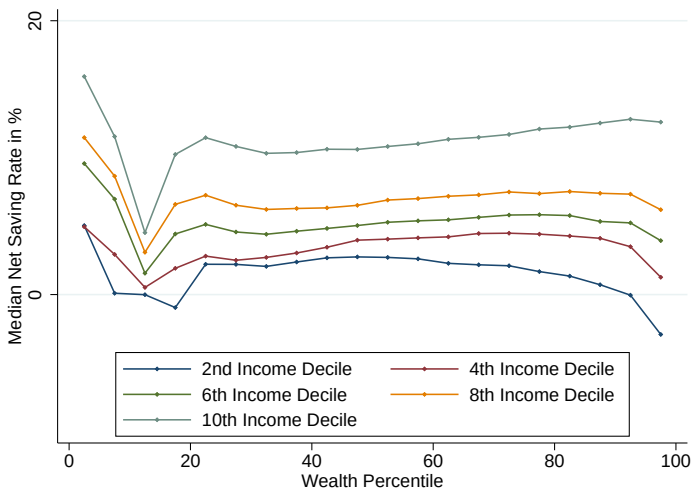
Controlling for age, earnings, and education



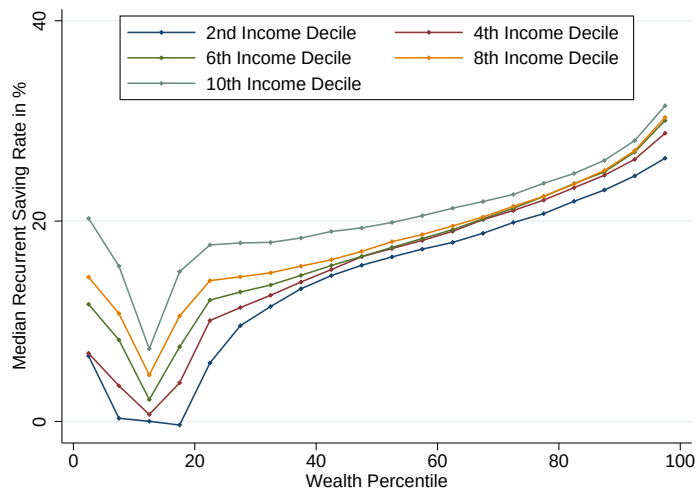
(a) Age, net saving rate



(b) Age, recurrent saving rate



(c) Earnings, net saving rate



(d) Earnings, recurrent saving rate

Is this exclusively a story about housing? No

Question: what if "take out" housing?

- similar patterns for net and gross saving rates?
- how do households treat capital gains on other assets?

Challenge: Norwegians hold few other assets with capital gains ▸ portfolios

Solution: restrict to households with stocks $> 25\%$ of financial wealth

▸ Alternative exercise: drop all home owners

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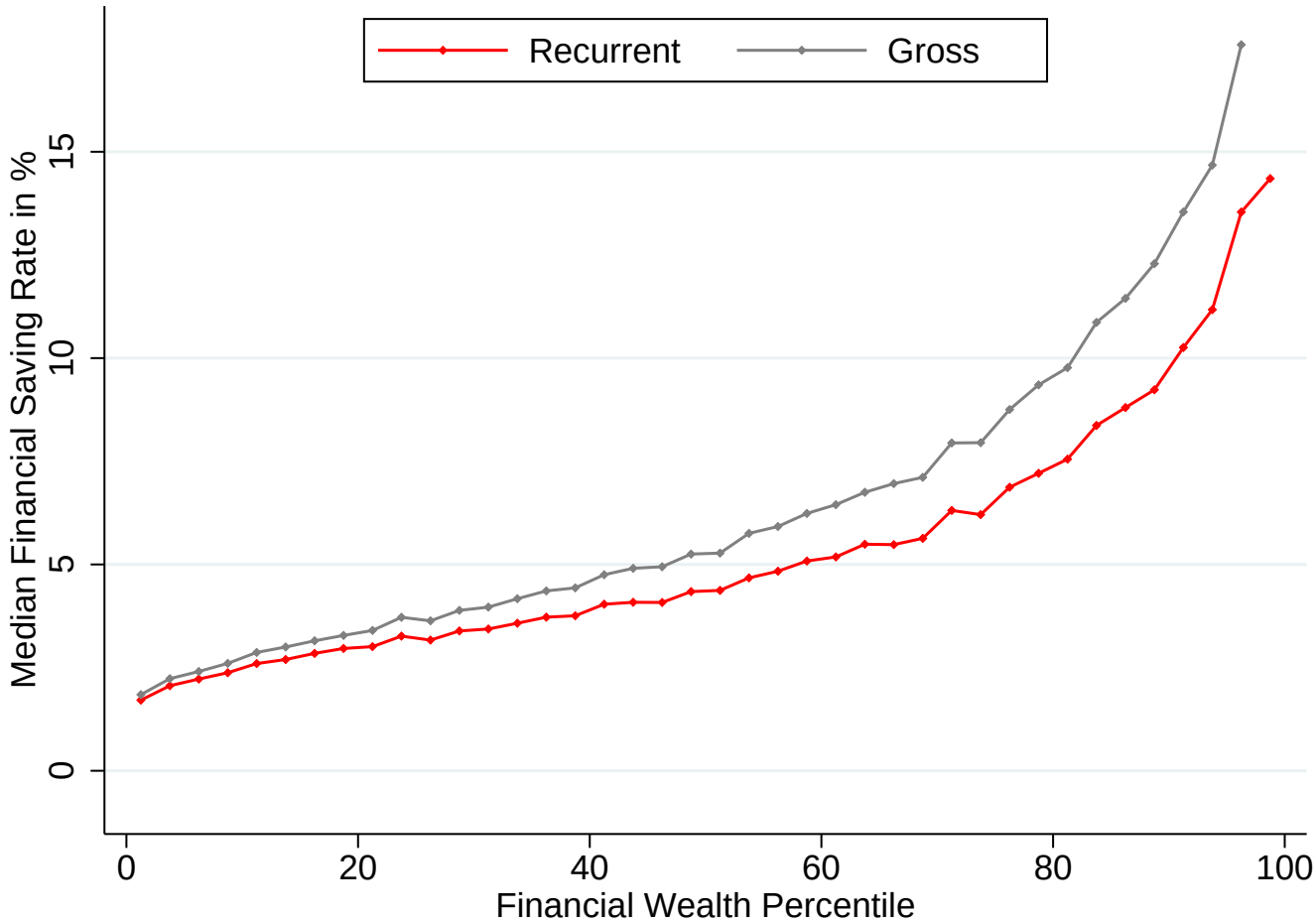

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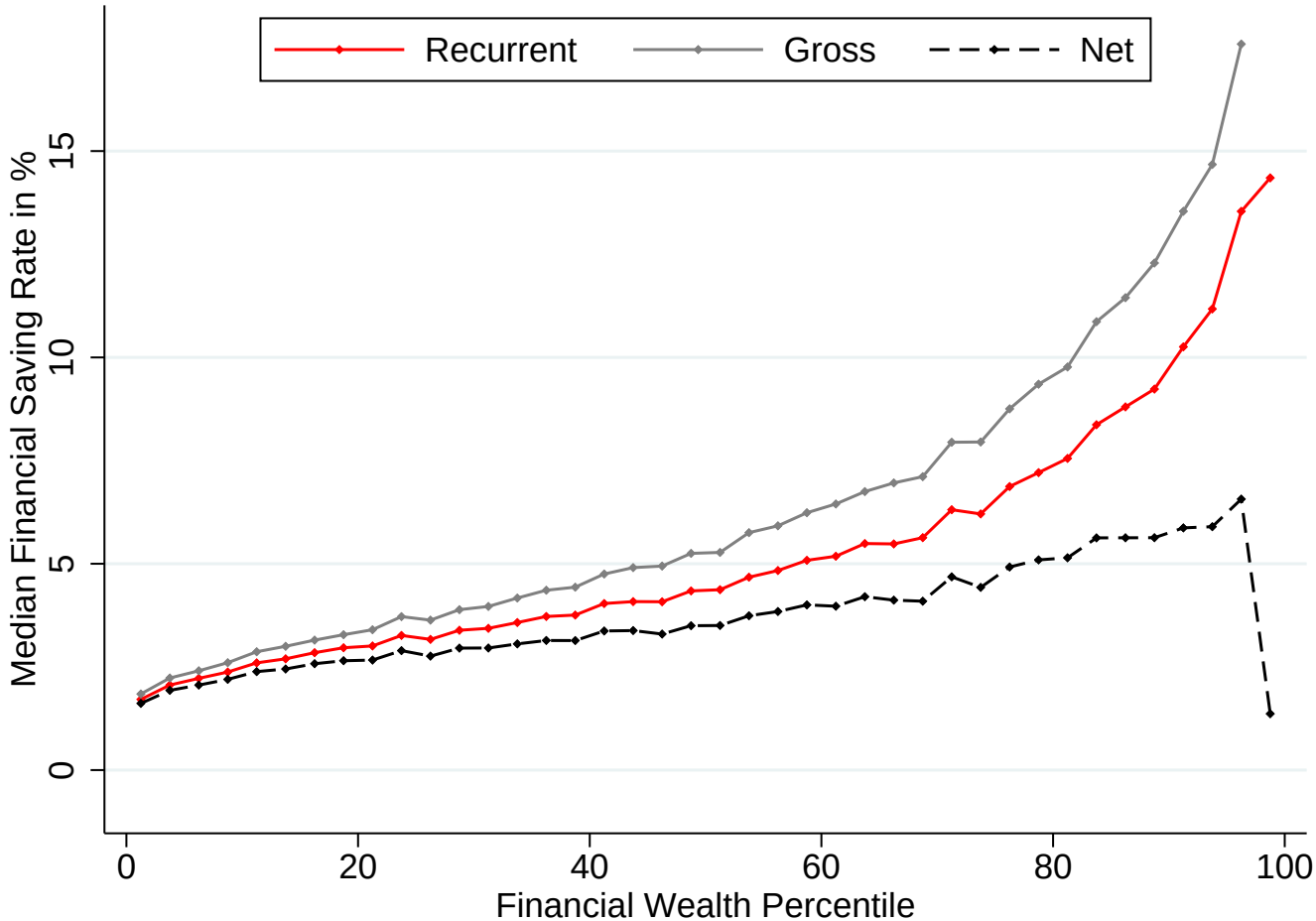
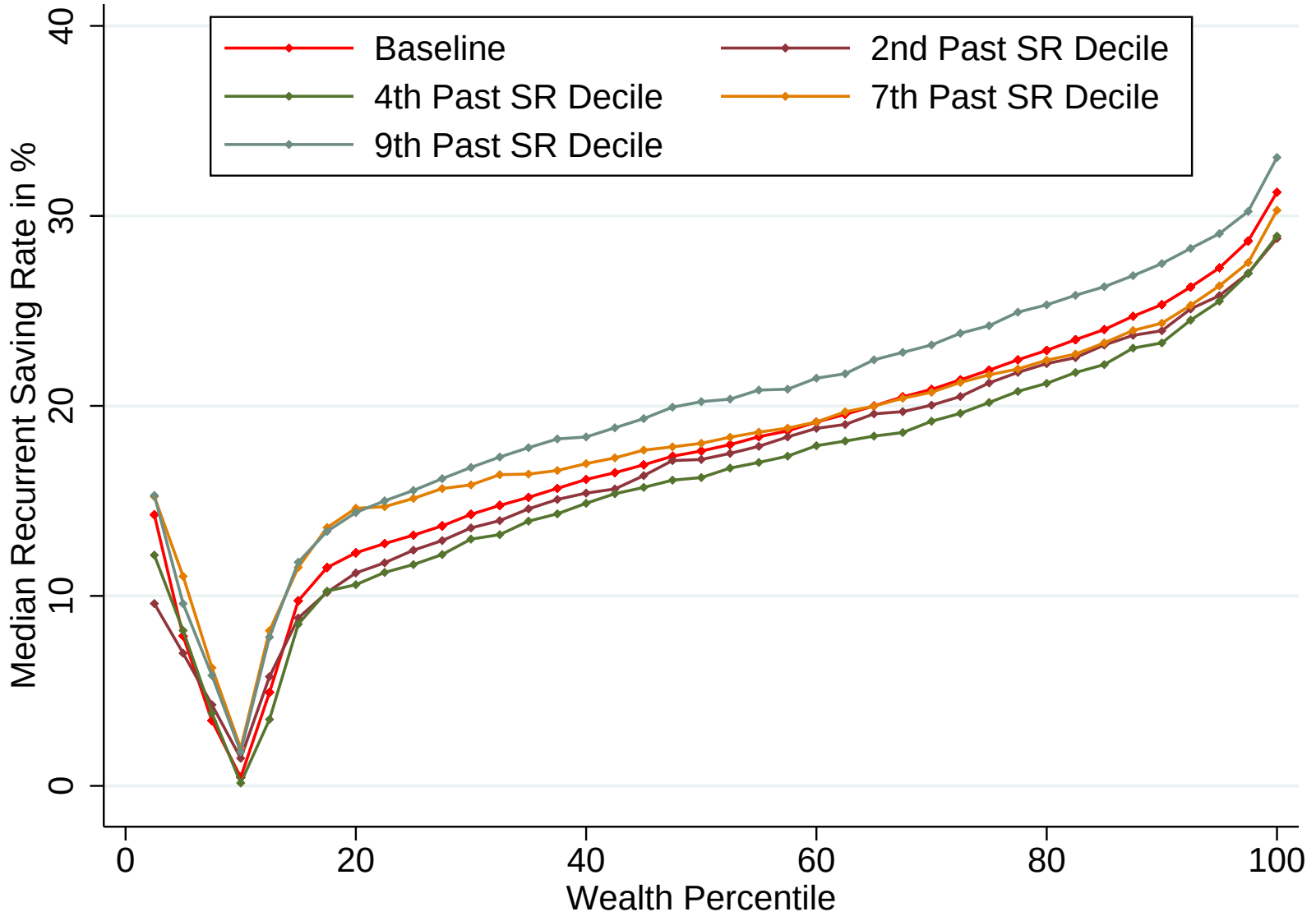


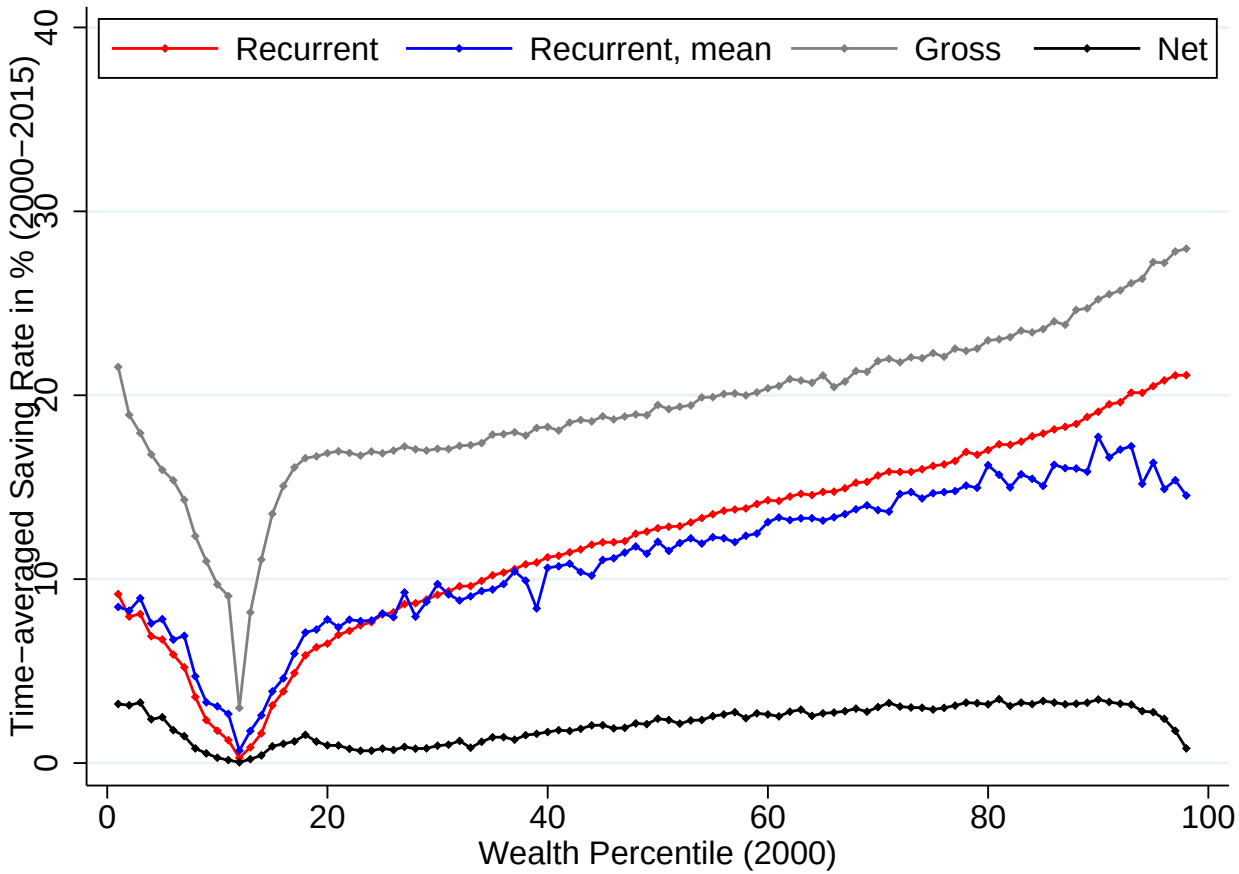
- Caveat: cannot use shareholder registry for stock fund holdings, use aggregate index $\Rightarrow$ net saving biased if $\text{Cov}(a_i, \dot{p}_i) \neq 0$.
- Not just about housing. But smaller capital gains for other assets.

Simply High Saving Rate ⇒ High Wealth? No



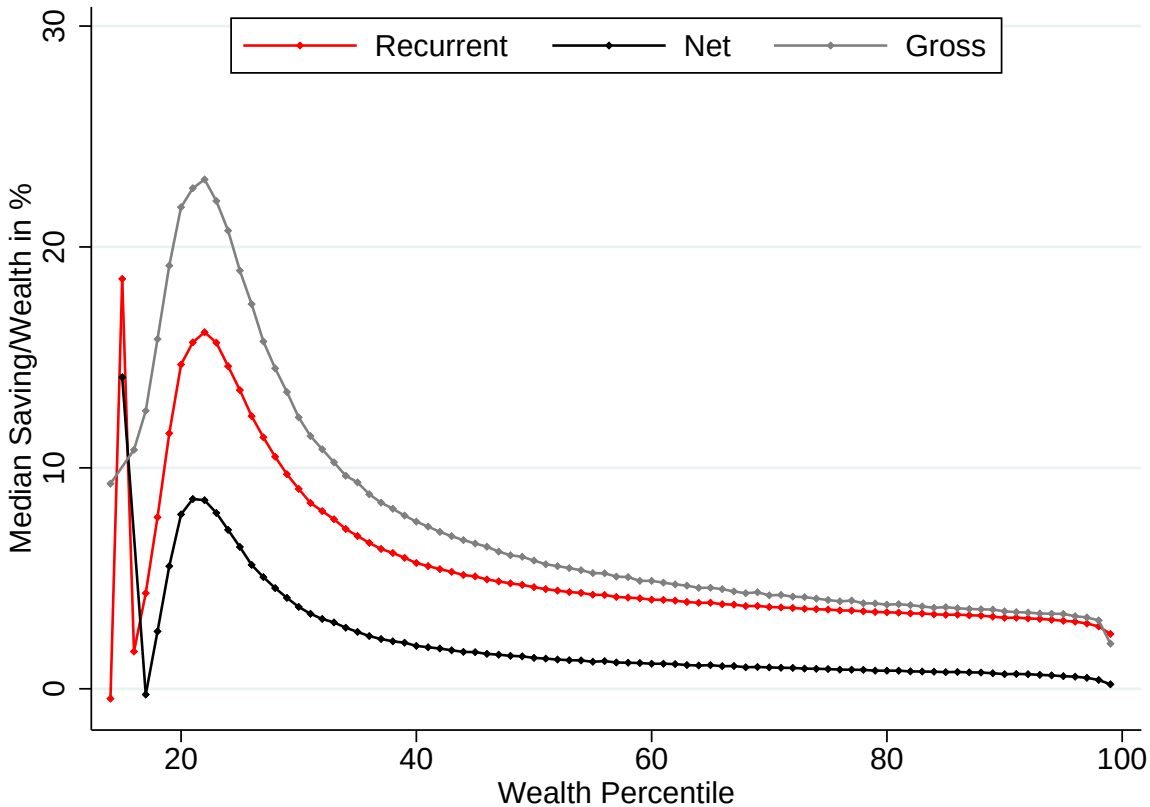
Saving Rates with Time Averaging

- Concern: medians of year-to-year saving rates may get it wrong if expenditure is “lumpy”
- Our solution: time-average saving rates within individuals



Aside: Saving as Fraction of Wealth (Bach-Calvet-Sodini)

$$\dot{a} = \frac{\rho - r}{\gamma}\left(\frac{w}{r} + a\right), \qquad \frac{\dot{a}}{a} = \frac{\rho - r}{\gamma}\left(\frac{w}{ra} + 1\right)$$



▸ Time-averaged

Consumption-Equivalent Saving Rates

- So far: market values of wealth, income, saving
- But: market values may not reflect consumption, welfare
- $\Rightarrow$ try to translate market values into consumption equivalents

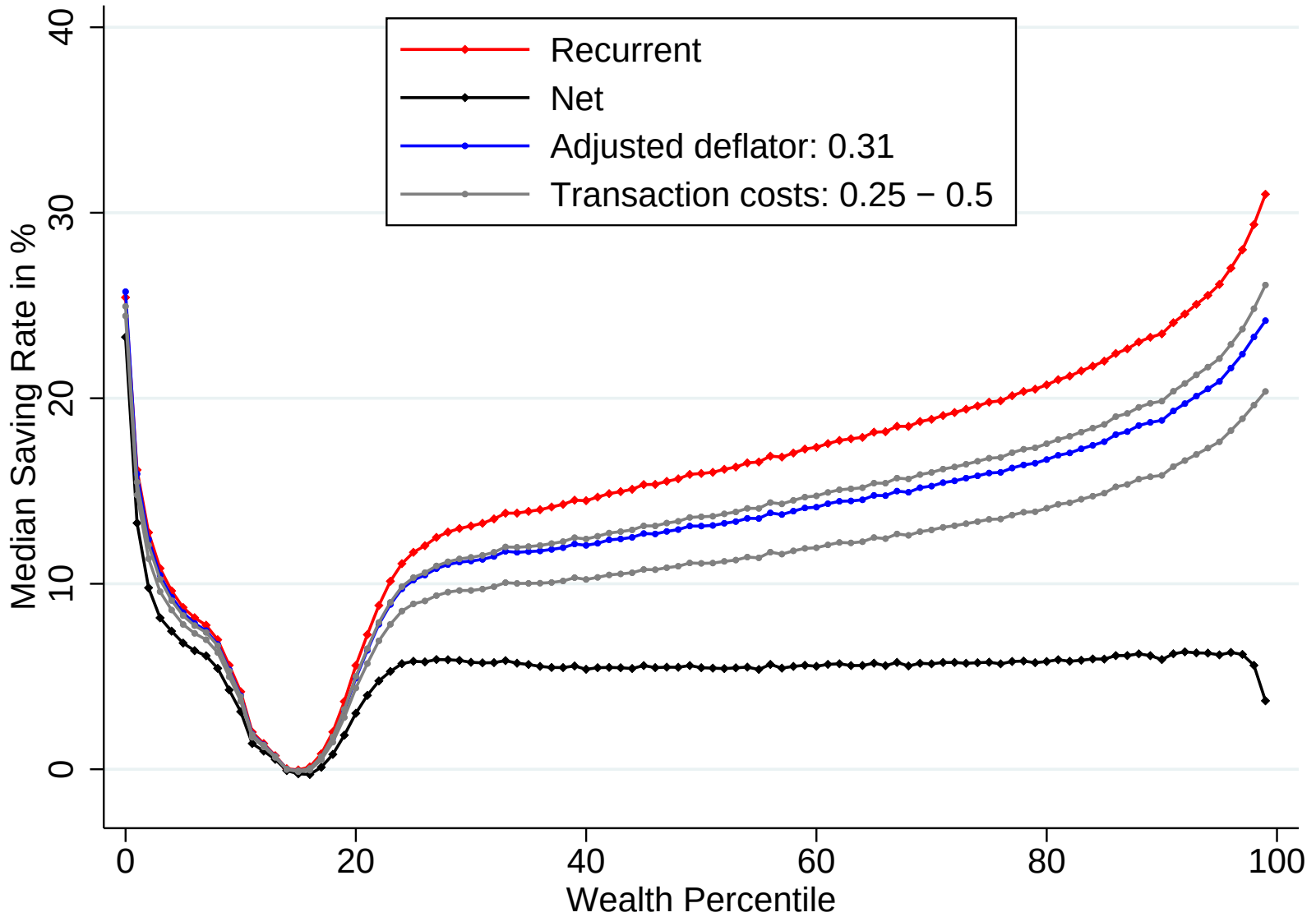
1. Housing is not just asset but also consumption good
   - really a matter of choosing the right deflator (Poterba, 2000)
   - construct new deflator with implicit rent $\propto$ house price index

2. Some assets are illiquid (housing, private firms,...)
   - may not want to count illiquid saving/income at market value
   - define effective saving and income ($\chi :=$ adj cost)

   effective saving $=$ liquid saving $+ (1 - \chi) \times$ illiquid saving

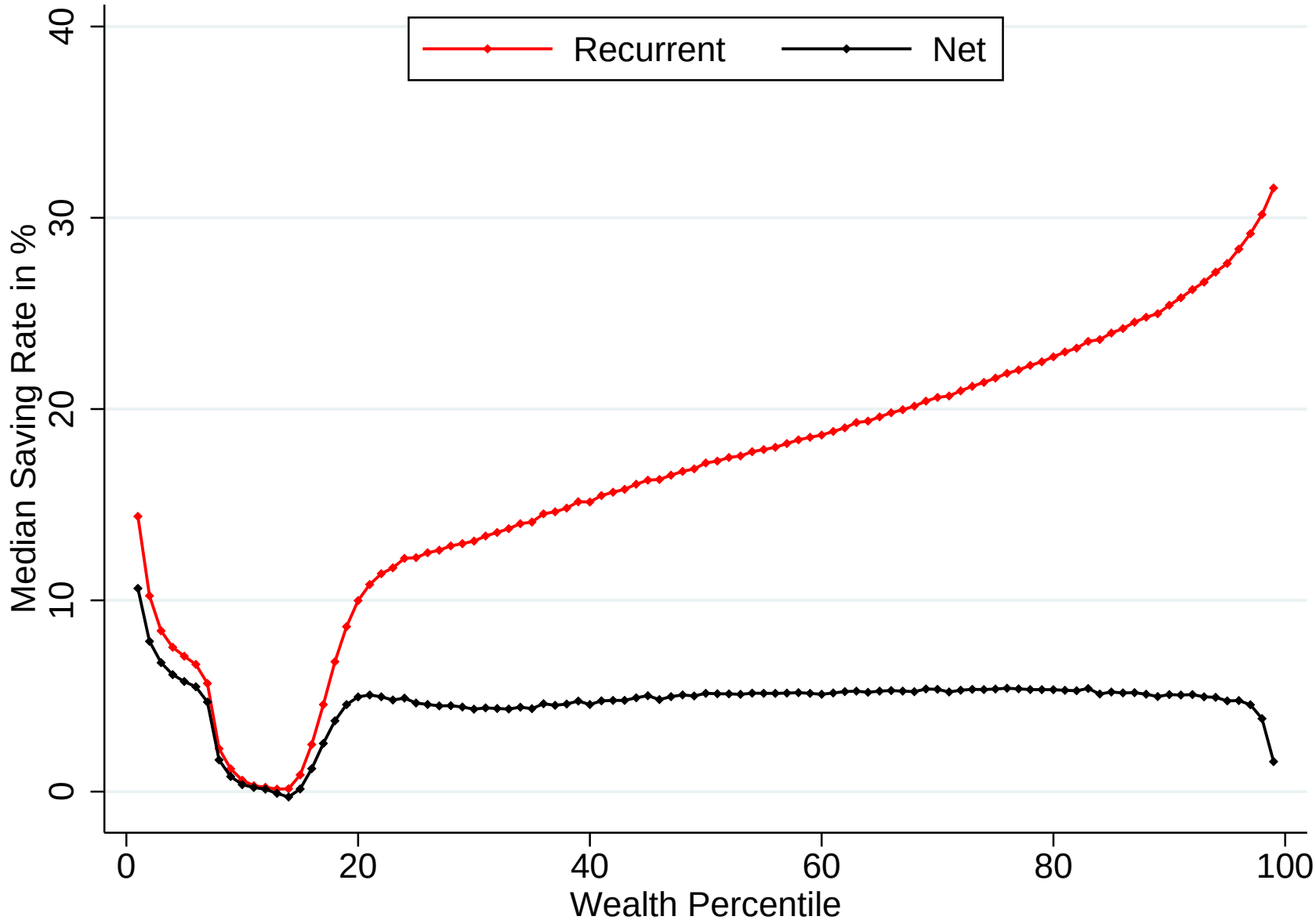
   effective income $=$ liquid income $+ (1 - \chi) \times$ illiquid income

Patterns Remain even with Large Adjustments



Theoretical Interpretation

What explains joint pattern of net & recurrent saving?



What explains joint pattern of net & recurrent saving?

- Reduced form of all our explanations

  gross saving $= s_d$(disp income)$+s_c$(cap gains) $\quad s_d << s_c \approx 100\%$

- Next slide: multiple assets + portfolio adjustment "frictions"

- Other potential explanations (not today)

  1. Capital gains driven by increased demand of asset holders (e.g. home owners experience housing preference shift)
  2. Non-homothetic preferences. But hard to explain flat net saving rate.
  3. (Unlikely) Wrong expectations about asset price changes: perceive all capital gains as transitory (ε rather than μ)
  4. ...

A Model with "Saving by Holding"

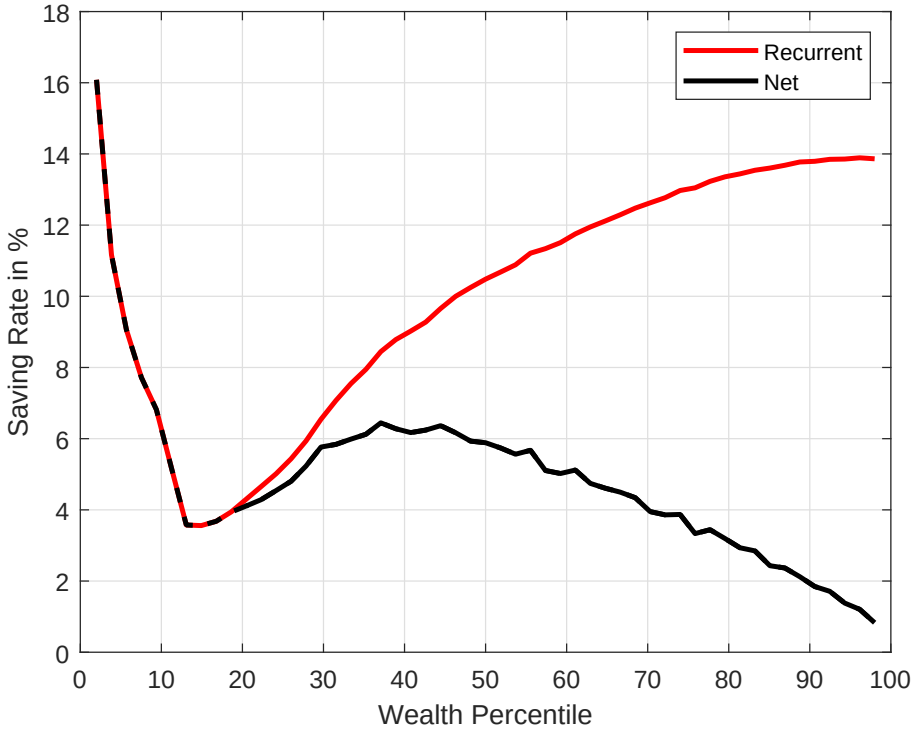
- Kaplan-Violante & Kaplan-Moll-Violante with twist = stochastic asset prices
- Two assets: consumption asset b and investment asset k

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

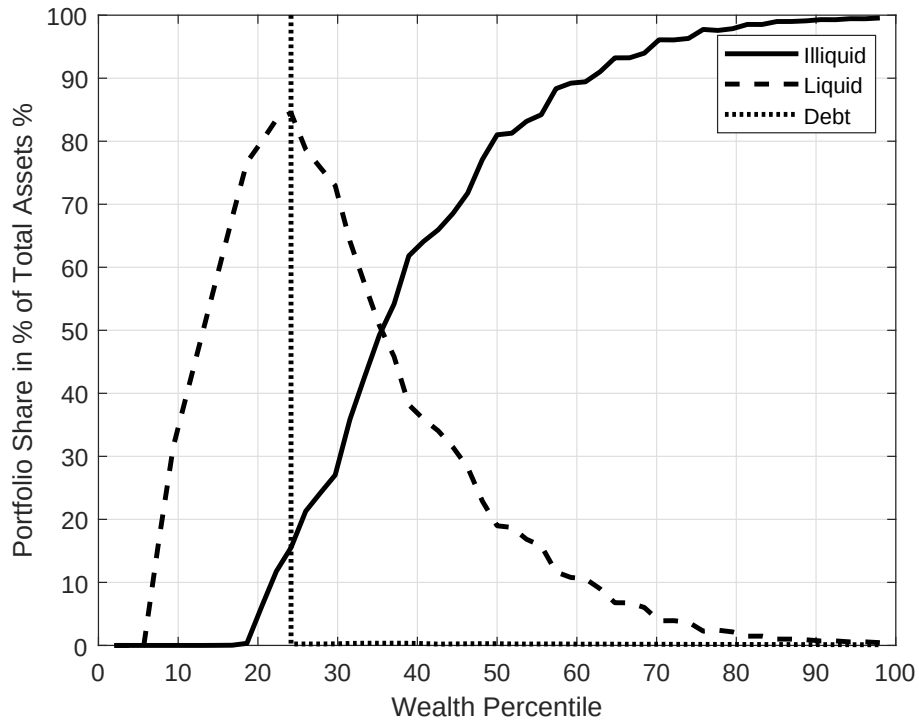
$$\dot{k} = d, \quad \frac{\dot{p}}{p} = \mu + \varepsilon$$

- + some reason for $d = 0$ most of the time
  - e.g. physical transaction cost but could be something else
  - tax on realizing capital gains, inattention, commitment,...
- + wedge between borrowing and saving rates $r_-^b > r_+^b$

The model with "saving by holding" can qualitatively explain the patterns



(e) Saving Rates



(f) Portfolio Shares

Note: assumes $r_-^b > r^a > r_+^b > \rho$ where $r^a := \theta + \mu$

Conclusion

- Little is known about the distribution of saving rates and how these vary across the wealth distribution
- We provide evidence using population tax records from Norway
- Results
  1. net saving rate $\approx$ flat across wealth distribution
  2. gross saving rate steeply increasing with wealth
  3. close to 100% saving rate out of (persistent) capital gains
- Take-aways for theory
  - joint pattern for net & gross saving rates $\neq$ workhorse models
  - fits with multiple assets + portfolio adjustment "frictions"
- Macro & wealth inequality literatures need to take into account changing asset prices!