Asset-Price Redistribution

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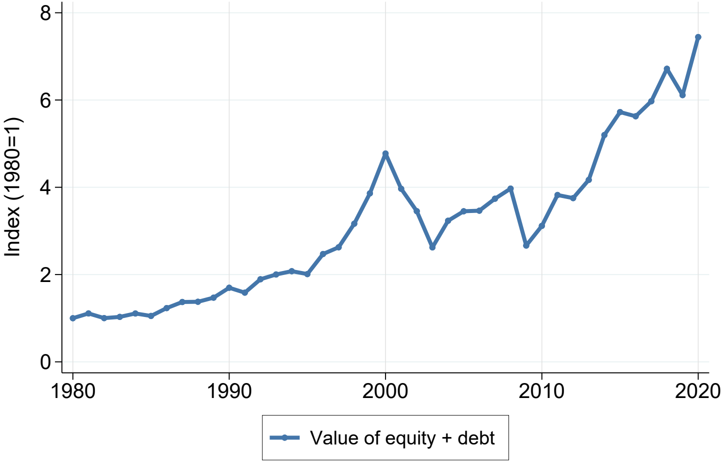
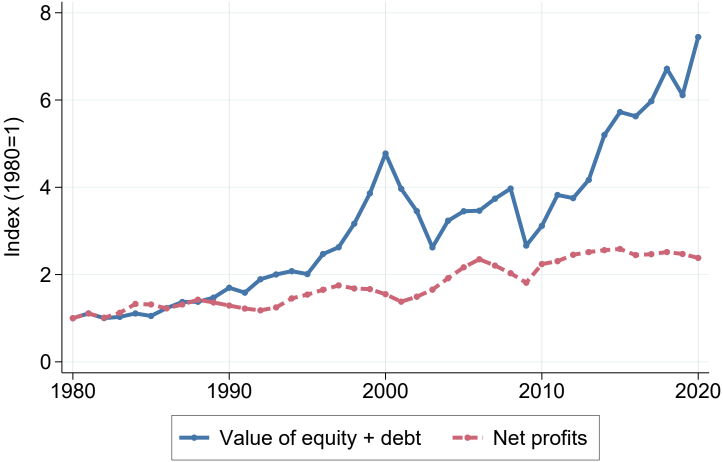
Rising asset prices



US Nonfinancial Corporate Businesses

Rising asset prices ... relative to income, i.e. rising valuations



US Nonfinancial Corporate Businesses

Valuations $\uparrow \Rightarrow$ aggregate wealth and wealth inequality $\uparrow$

These asset-price changes account for large fraction of

1. rising aggregate wealth-to-income ratios (Rognlie,...)

2. rising wealth inequality (Kuhn–Schularick–Steins,...)

Prime driver of rising valuations: expansionary monetary policy

- Empirically $r \downarrow \Rightarrow$ asset prices $\uparrow$
- ... primarily due to discounting, not cashflows $=$ valuation effect
- $\Rightarrow$ expansionary monetary policy often associated with rising wealth inequality
  (Andersen–Johannesen–Jørgensen-Peydró, Bartscher–Kuhn–Schularick–Wachtel, Holm–Paul–Tischbirek, Ampudia et al., Slacalek–Tristani–Violante)

Welfare consequences of asset-price changes?

Q. Welfare consequences of such asset-price changes? Who are winners and losers?

- Answer is not obvious. Two polar views regarding effect of $P \uparrow$:
  1. Shift of real resources towards wealthy (Piketty–Zucman, 2014; Saez–Yagan–Zucman, 2021)
  2. Welfare-irrelevant paper gains (Cochrane, 2020; Krugman, 2021)

What We Do: Theory

- Sufficient statistic for money metric welfare gains/losses from asset price changes

$$\text{Welfare Gain}_i = \sum_{t=0}^{T} \text{Discount rate}_t \times \Big(\text{Net asset sales}_{it} \times \text{Price deviation}_t\Big) + \ldots$$

  Note: effect of price deviations but holding cashflows constant, i.e. pure valuation

- In practice. Isolate valuation effects by considering deviations from constant P/D

$$\text{Price deviation}_t = \Delta\% \left(\frac{\text{Price}_t}{\text{Dividend}_t}\right)$$

- Two main lessons. Rising asset prices ...

  (1) Benefit sellers, not holders

  (2) Are purely redistributive in terms of welfare (for every seller there is a buyer)

- Both polar positions from previous slide are wrong!

What We Do: Empirics

- Application to Norway using administrative panel microdata (1994–2015)

  $\rightarrow$ 4 pp. decline in interest rates, 3x increase in housing price-to-rent ratio, ...

- Calculate sufficient statistic for every Norwegian

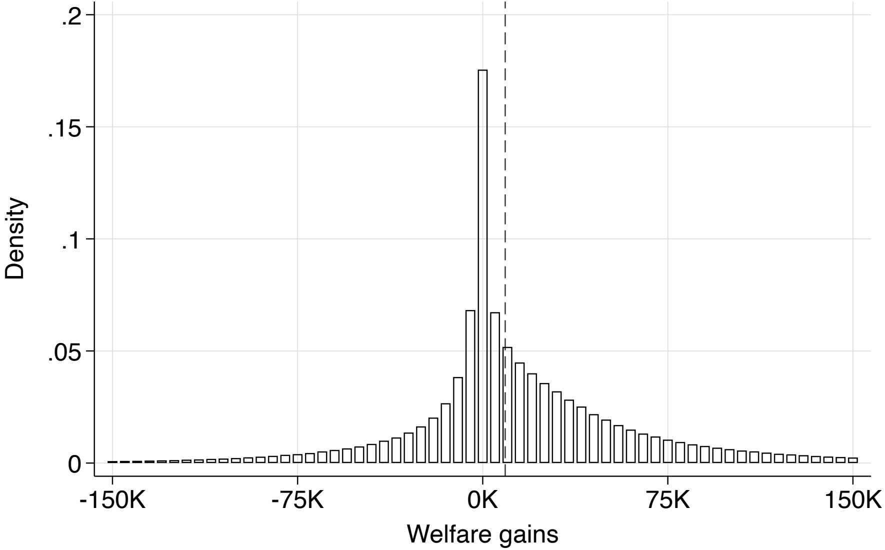
$$\text{Welfare Gain}_i = \sum_{t=0}^{T} \text{Discount rate}_t \times \sum_k \left(\text{Net asset sales}_{ikt} \times \text{Price deviation}_{kt} \right)$$

  (i) Measure financial transactions (housing, deposits, debt, stocks, private equity)

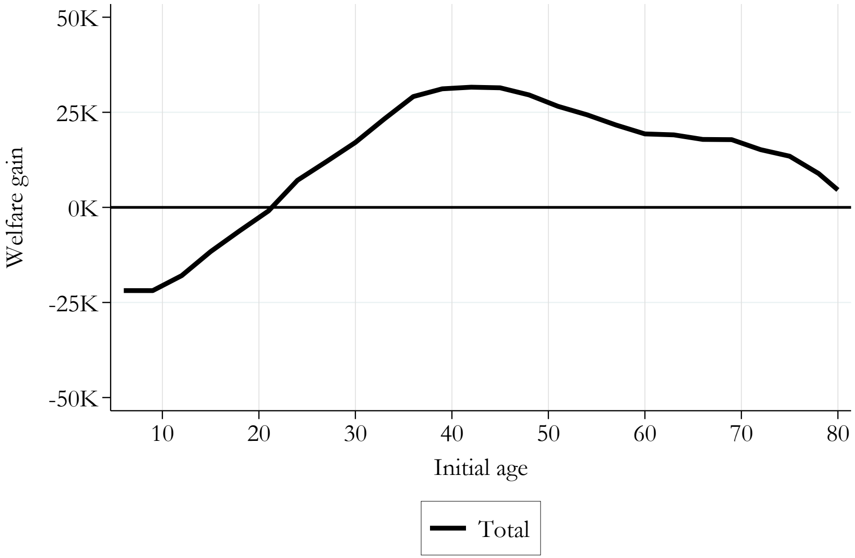
  (ii) Construct asset-specific price-dividend series

- Quantify redistribution along several dimensions
  (ie, between cohorts, along the wealth distribution, role of government/foreigners , ...)

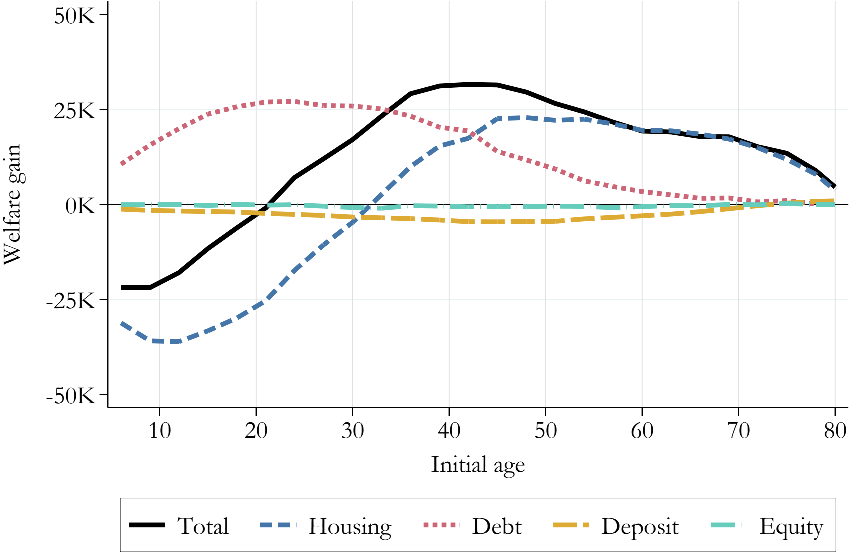
Rising asset prices generate large welfare gains and losses



Example: large redistribution from young to old ...



… mostly due to house price changes



Sufficient Statistics Formula

Intuition in two-period model

- Periods $t = 0$ and $t = 1$
- Endowments Y_0 and Y_1
- Can trade shares N at time $t = 0$ that pay a dividend D at time $t = 1$

$$\begin{aligned} V = \max_{\{C_0, C_1\}} U(C_0) + \beta U(C_1) \\ C_0 + (N_0 - N_{-1}) P_0 &= Y_0 \\ C_1 &= Y_1 + N_0 D_1 \end{aligned}$$

- Comparative static. What is the effect of P_0 on welfare V?

$$\mathrm{d}V = \underbrace{U'(C_0)}_{\text{marginal utility}} \times \underbrace{(N_{-1} - N_0)}_{\text{Asset sales}} \times \underbrace{\mathrm{d}P_0}_{\text{Price deviation}}$$

- Note: D_1 held constant, else $\mathrm{d}V = U'(C_0)(N_{-1} - N_0)\,\mathrm{d}P_0 + \beta U'(C_1) N_0\,\mathrm{d}D_1$

Welfare Gain: Intuition

$$\underbrace{\frac{\mathrm{d}V}{U'(C_0)}}_{\text{Welfare gain (in \$)}} = \underbrace{(N_{-1} - N_0)}_{\text{Asset sales}} \times \underbrace{\mathrm{d}P_0}_{\text{Price deviation}}$$

- Rising asset prices benefit sellers ($N_{-1} - N_0 > 0$), not initial holders ($N_{-1} > 0$)
- How can initial holders not benefit from $P_0 \uparrow$? Two counteracting effects:

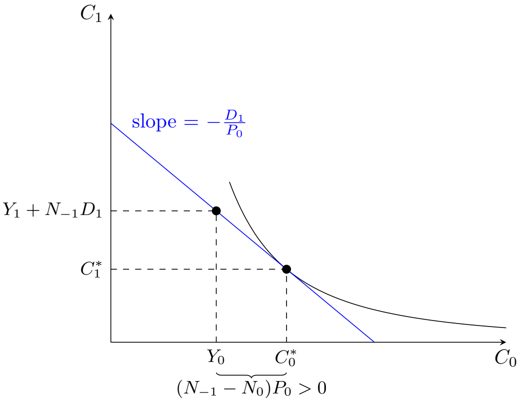
  ($t = 0$) High initial return $R_0 = P_0 / P_{-1} \uparrow$

  ($t = 1$) Low future returns $R_1 = D_1 / P_0 \downarrow$

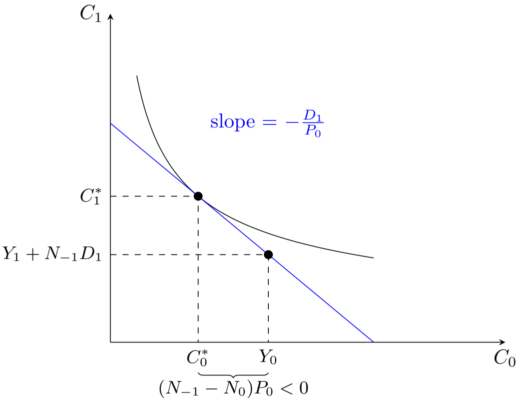
- For sellers, high initial returns dominate ...
- For buyers, low future returns dominate

Graphical intuition: welfare effect of $P_0 \uparrow$

A seller's investment decision

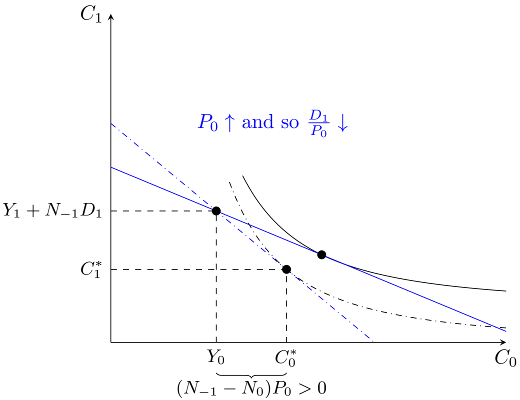


A buyer's investment decision

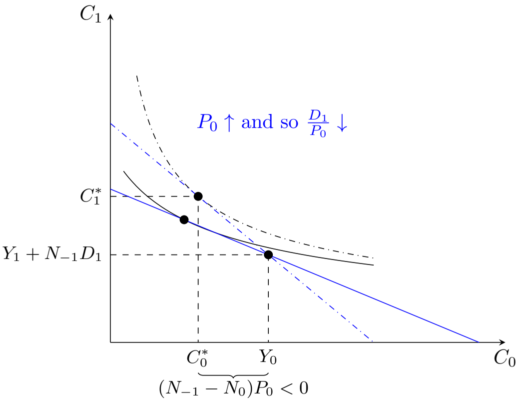


Graphical intuition: welfare effect of $P_0 \uparrow$

Effect of $P_0 \uparrow$ on seller



Effect of $P_0 \uparrow$ on buyer



Full dynamic model with multiple assets

- Deterministic infinite-horizon model

- Liquid asset: one-period ponds $\{B_t\}_{t=0}^{\infty}$ with prices $\{Q_t\}_{t=0}^{\infty}$ (ie, bank deposits)
  - $\rightarrow$ Denote the one-period return as $R_{t+1} = 1/Q_t$
  - $\rightarrow$ Denote the return from 0 to t as $R_{0\rightarrow t} \equiv R_1 \cdot R_2 \cdots R_t$

- Long-lived assets: K long-lived assets $\{N_{k,t}\}_{t=0}^{\infty}$ with prices $\{P_{k,t}\}_{t=0}^{\infty}$ and dividend stream $\{D_{k,t}\}_{t=0}^{\infty}$
  - $\rightarrow$ Trading long-lived assets subject to convex adjustment cost $\chi_k\left(N_{k,t} - N_{k,t-1}\right)$
  - $\rightarrow$ Asset returns: $R_{k,t+1} \equiv \frac{D_{k,t+1}+P_{k,t+1}}{P_{k,t}}$

Extensions: not today but see paper

1. Stochastic environment
2. Borrowing and collateral constraints
3. Bequests
4. General equilibrium
5. Government sector
6. Housing and wealth in the utility function

Individual Welfare Gain

- Households solve

$$
\begin{aligned}
V &= \max_{\{C_t, B_t, \{N_{k,t}\}_{k=1}^K\}_{t=0}^\infty} \sum_{t=0}^\infty \beta^t U(C_t) \\
\text{s.t.} \quad & C_t + \sum_{k=1}^K (N_{k,t} - N_{k,t-1}) P_{k,t} + B_t Q_t + \sum_{k=1}^K \chi_k = \sum_{k=1}^K N_{k,t-1} D_{k,t} + B_{t-1} + Y_t
\end{aligned}
$$

- **Proposition.** The welfare effect of a perturbation $\{\mathrm{d}P_t\}_{t=0}^\infty$ is

$$
\mathrm{d}V = U'(C_{i0}) \times \underbrace{\sum_{t=0}^\infty R_{0\to t}^{-1} \left(\sum_{k=1}^K (N_{k,t-1} - N_{k,t}) \, \mathrm{d}P_{k,t} - B_t \, \mathrm{d}Q_t \right)}_{\text{Welfare gain}}
$$

Individual Welfare Gain: Discussion

$$\boxed{\text{Welfare Gain} = \sum_{t=0}^{\infty} R_{0\to t}^{-1} \left(\sum_{k=1}^{K} (N_{k,t-1} - N_{k,t})\, \mathrm{d}P_{k,t} - B_t\, \mathrm{d}Q_t \right)}$$

1. As in two-period model, rising asset prices benefit net sellers

   ... but portfolio choice + timing of purchases also matters

2. Welfare gain = equivalent variation: how much do you value the price deviation?

3. Result is an application of the envelope theorem

   → Exact formula for small price change $\{\mathrm{d}Q_t, \{\mathrm{d}P_{k,t}\}_k\}_{t=0}^{\infty}$

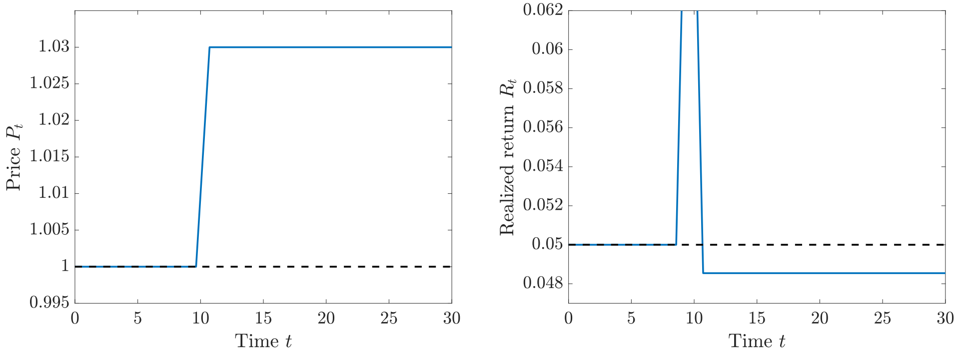
   → First-order approx for any prices deviations $\{\Delta Q_t, \{\Delta P_{k,t}\}_k\}_{t=0}^{\infty}$ (because saving decisions respond)

Again: how can asset holders not benefit from $P_{k,t}\uparrow$?

One intuition: individual who neither buys nor sells

Another intuition: $P_{k,t}\uparrow$ without cashflows $D_{k,t}\uparrow \Rightarrow$ future returns $R_{k,t}\downarrow$

Figure: $P_t\uparrow$ without cashflows $D_t\uparrow$ (valuation)



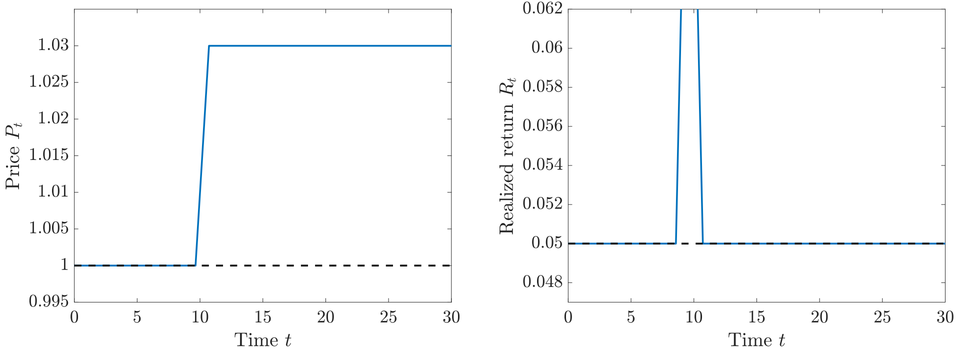
Realized return $\quad R_{k,t+1} \equiv \dfrac{D_{k,t+1} + P_{k,t+1}}{P_{k,t}}$

Again: how can asset holders not benefit from $P_{k,t} \uparrow$?

One intuition: individual who neither buys nor sells

Another intuition: $P_{k,t} \uparrow$ without cashflows $D_{k,t} \uparrow \Rightarrow$ future returns $R_{k,t} \downarrow$

Figure: $P_t \uparrow$ with cashflows $D_t \uparrow$



Realized return $\quad R_{k,t+1} \equiv \dfrac{D_{k,t+1} + P_{k,t+1}}{P_{k,t}}$

Aggregation

- **Corollary.** Suppose that initial prices clear the market.

$$\sum_{i=1}^{I} \text{Welfare Gain}_i = 0$$

Asset price deviations are purely redistributive.

(i) In an a multisector economy (government, corporation, foreigners, ...):

$$\text{Welfare Gain}_{\substack{\text{house}\\\text{holds}}} = -\text{Welfare Gain}_{\substack{\text{other}\\\text{sectors}}}$$

(ii) In GE, the total welfare effect of an aggregate shock ε is

$$\mathrm{d}V_i = \underbrace{\frac{\partial V_i}{\partial \varepsilon}\,\mathrm{d}\varepsilon}_{\text{Direct effect of } \mathrm{d}\varepsilon} + \underbrace{\frac{\partial V_i}{\partial P}\,\mathrm{d}P}_{\text{Redistributive effect of } \mathrm{d}P}$$

Implementation and sufficient statistic

- Theory: infinitesimal price deviations $\{\mathrm{d}Q_t, \{\mathrm{d}P_{k,t}\}_k\}_{t=0}^{\infty}$
- Empirical implementation: non-infinitesimal ones $\{\Delta Q_t, \{\Delta P_{k,t}\}_k\}_{t=0}^{\infty}$
- Paper: argue approximation error is small in practice

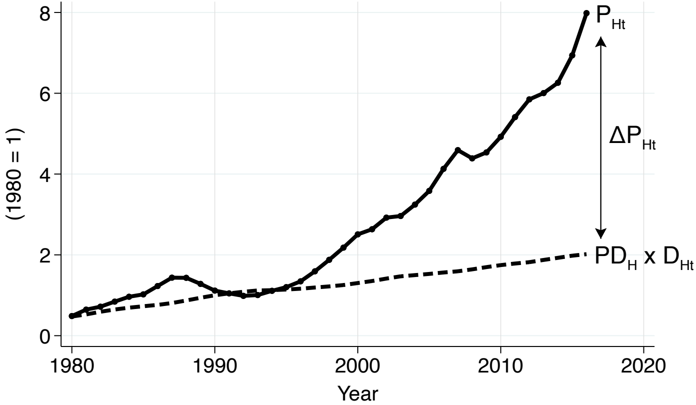
Implementation and sufficient statistic

- $\{\Delta Q_t, \{\Delta P_{k,t}\}_k\}_{t=0}^{\infty}$ = price changes holding dividends constant $\Delta D_{k,t} = 0$
- But in data, dividends change over time. What to do?
- Solution: consider price deviations ΔP_t relative to changing dividends

$$\underbrace{\Delta P_{k,t}}_{\text{Price deviation}} = \underbrace{P_{k,t}}_{\text{Price}} - \underbrace{\overline{PD}_k}_{\substack{\text{Baseline}\\ \text{price/dividend}}} \times \underbrace{D_{k,t}}_{\text{Dividend}}$$

i.e. price changes due to changing price-dividend ratios $\frac{\Delta P_{k,t}}{P_{k,t}} = \frac{PD_{k,t} - \overline{PD}_k}{PD_{k,t}}$

Example of Price Deviation: Housing



- These price deviations exactly capture valuation effects emphasized in intro
- Equivalently, interpret as deviations from Gordon growth model
  (ie, a world where dividends follow random walk and discount rates are constant)

Sufficient Statistics Formula

$$\boxed{\text{Welfare Gain} = \sum_{t=0}^{T} R_{0\to t}^{-1} \left(\sum_{k=1}^{K} (N_{k,t-1} - N_{k,t}) P_{k,t} \times \frac{PD_{k,t} - \overline{PD}_k}{PD_{k,t}} - B_t Q_t \times \frac{Q_t - \overline{Q}}{Q_t} \right)}$$

- Formula we take to data
- Depends only on financial transactions and valuation ratios = observables

Empirics

Implementation

Data on Holdings and Transactions

- Administrative data covering the universe of Norwegians over 1993–2015
- Focus on 4 broad asset categories that cover most of liquid household wealth
  1. Deposits (15%)
  2. Debt (mortgage, student loan, ..., −35%)
  3. Equity (individual stocks, mutual funds, private businesses, ..., 10%)
  4. Housing (110%)
- For deposits/debt, we only need to measure the holdings
- For equities/housing, we use data on individual transactions
- Take into account indirect transactions/holdings through equity ownership

Sufficient statistic

For each individual, we compute the following asset-specific welfare gain formulas:

$$\text{Welfare Gain}_{\text{housing}} = -\sum_{t=1994}^{2015} 1.05^{-t} \times (N_{H,t} - N_{H,t-1})P_{H,t} \times \frac{PD_{H,t} - \overline{PD}_H}{PD_{H,t}}$$

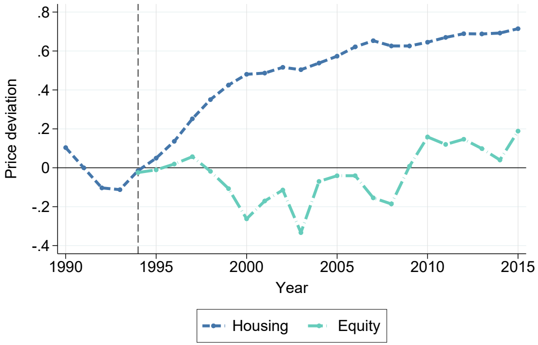
$$\text{Welfare Gain}_{\text{equity}} = -\sum_{t=1994}^{2015} 1.05^{-t} \times (N_{E,t} - N_{E,t-1})P_{E,t} \times \frac{PD_{E,t} - \overline{PD}_E}{\overline{PD}_{E,t}}$$

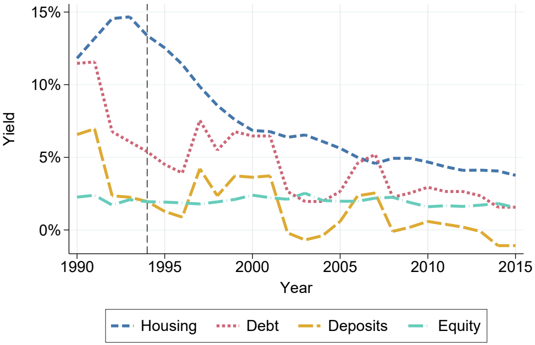
$$\text{Welfare Gain}_{\text{debt}} = -\sum_{t=1994}^{2015} 1.05^{-t} \times B_{M,t}Q_{M,t} \times \frac{Q_{M,t} - \overline{Q}_M}{Q_{M,t}}$$

$$\text{Welfare Gain}_{\text{deposit}} = -\sum_{t=1994}^{2015} 1.05^{-t} \times B_{D,t}Q_{D,t} \times \frac{Q_{D,t} - \overline{Q}_D}{Q_{D,t}}$$

Baseline $\overline{\text{PD}}$ and $\overline{\text{Q}}$ are set to 1991–1995 averages.

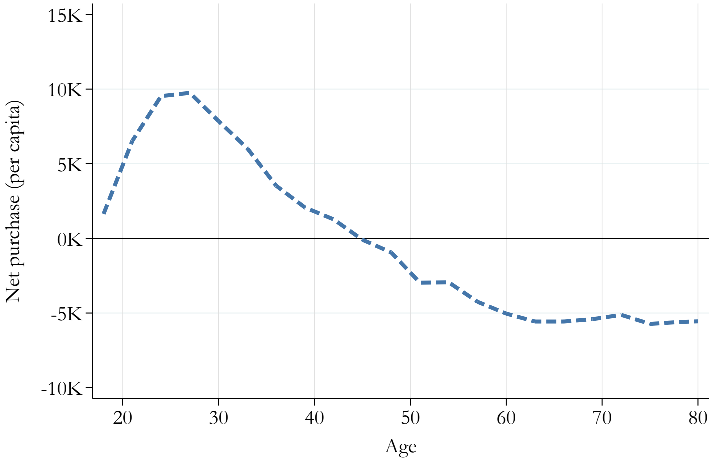
Data on Valuations





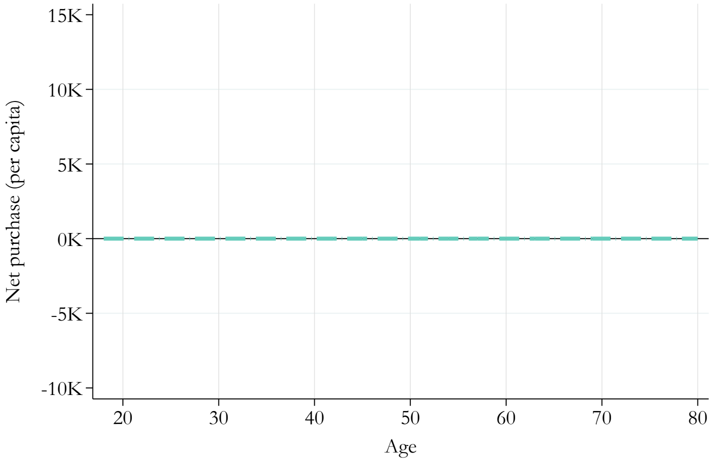
Gross real interest rate (debt/deposits); Rents/Price (housing); Cashflows/EV (equity)

Data on Housing Transactions



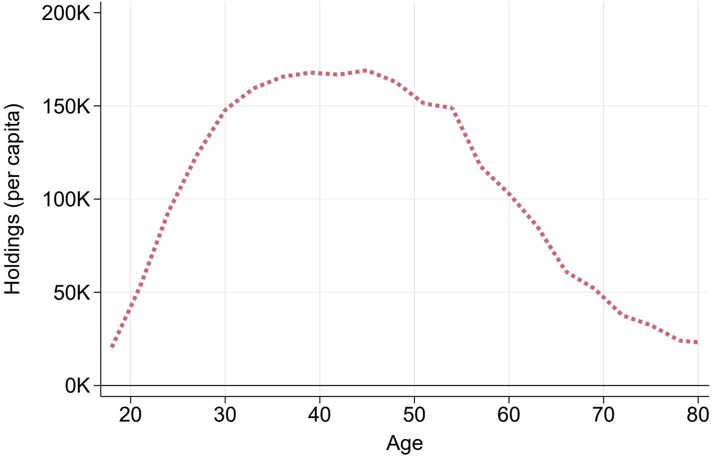
Average net purchase of housing by age (2006)

Data on Equity Transactions



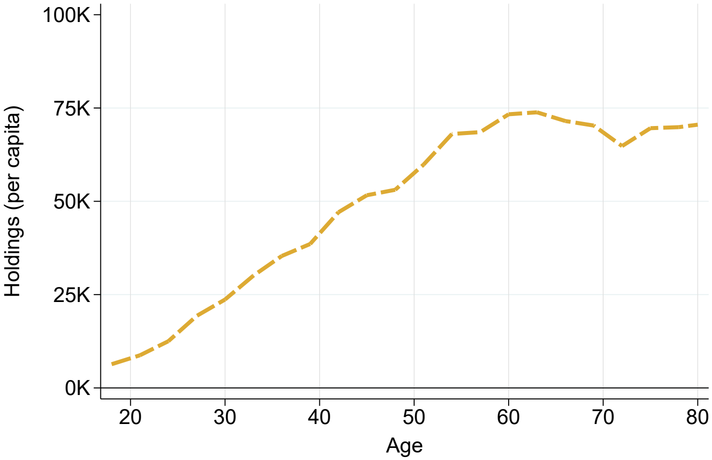
Average net purchase of equity by age (public+private, 2006)

Data on Debt



Average holdings of debt by age (2006)

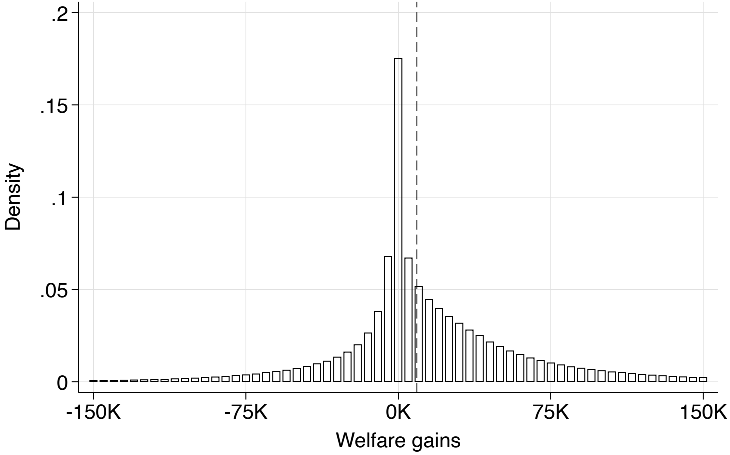
Data on Deposits



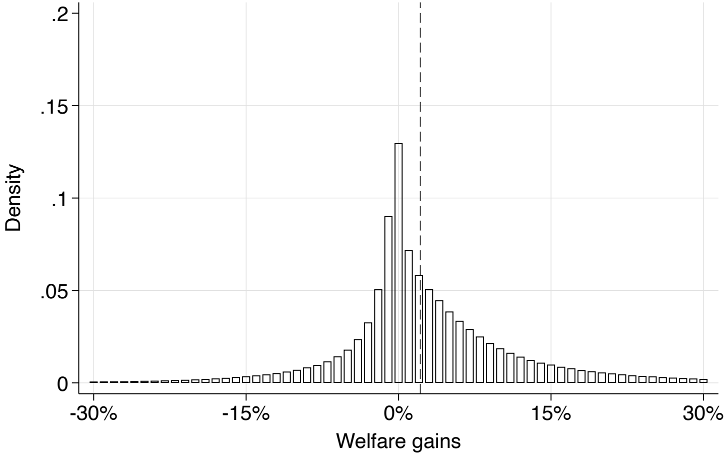
Average holdings of deposits by age (2006)

Empirics
Redistribution between households

Rising asset prices generate large welfare gains and losses

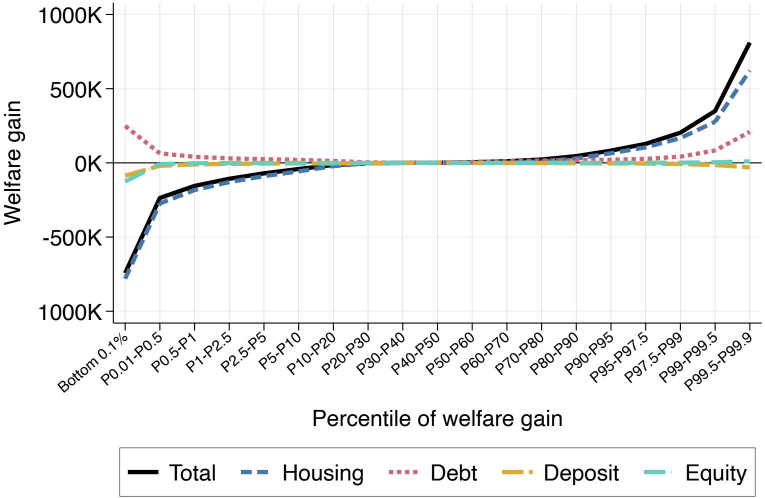


Large gains and losses (as a % of initial wealth)

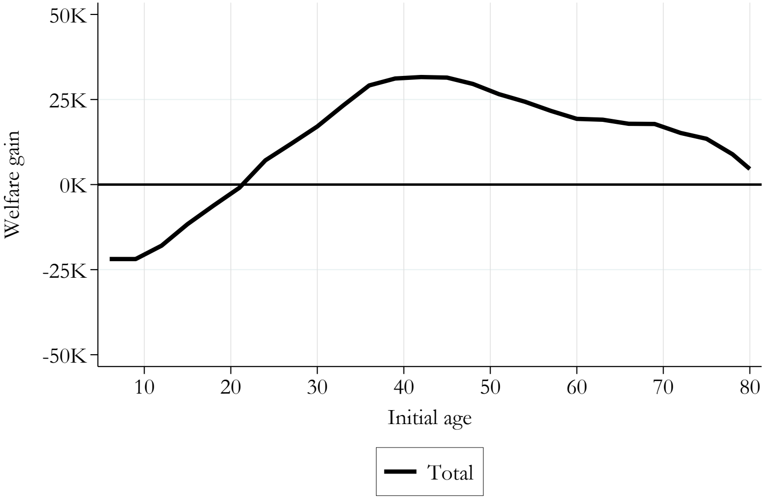


In theory, we have $\frac{\text{Welfare gain}}{\text{Total wealth}} = \frac{\sum_{t=0}^{\infty} R_{0\to t}^{-1} \, \mathrm{d}C_t}{\sum_{t=0}^{\infty} R_{0\to t}^{-1} C_t}$ = welfare gain as a share of lifetime consumption

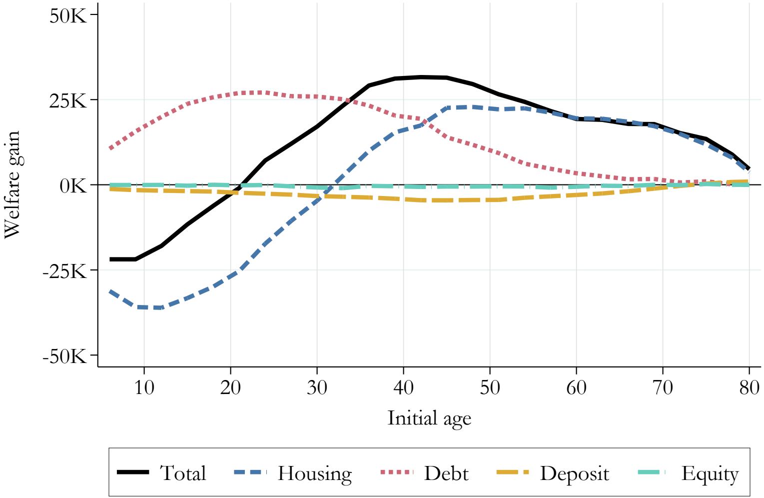
Large gains and losses ... driven by housing and debt



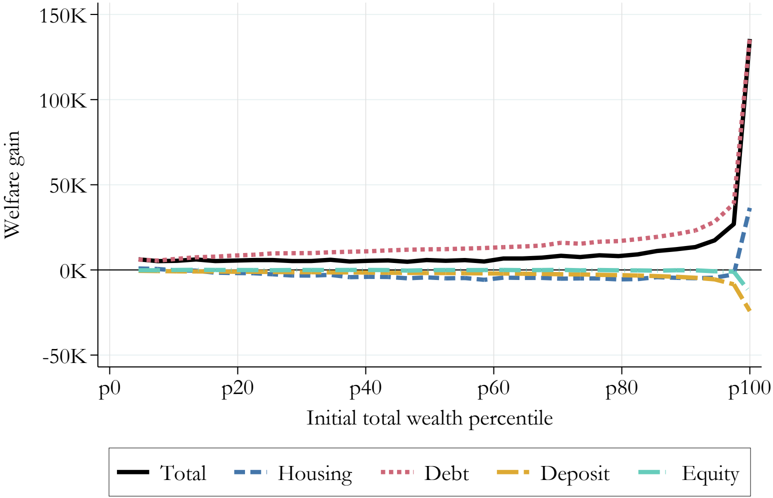
Redistribution from young to old



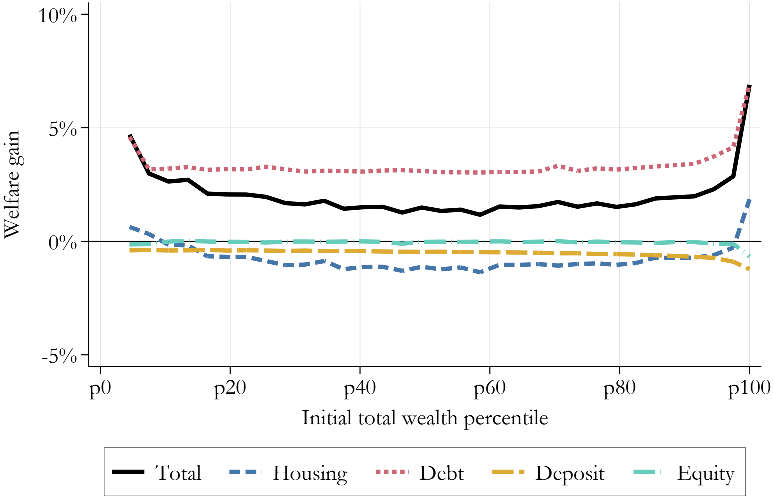
Redistribution From Young to Old



Welfare gains concentrated at top of wealth distribution

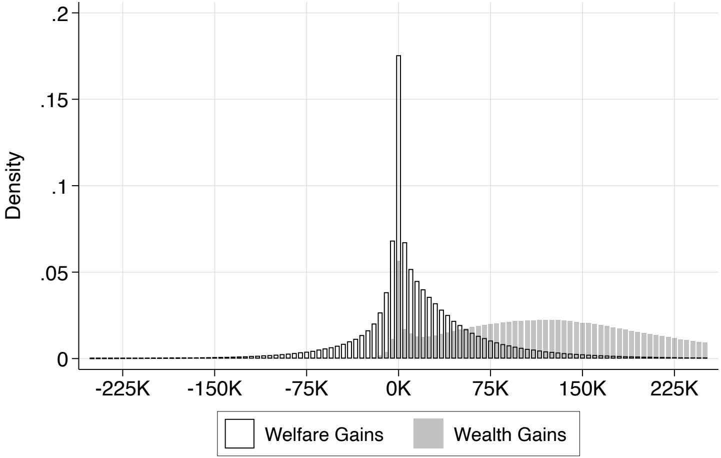


... largely reflecting wealth inequality

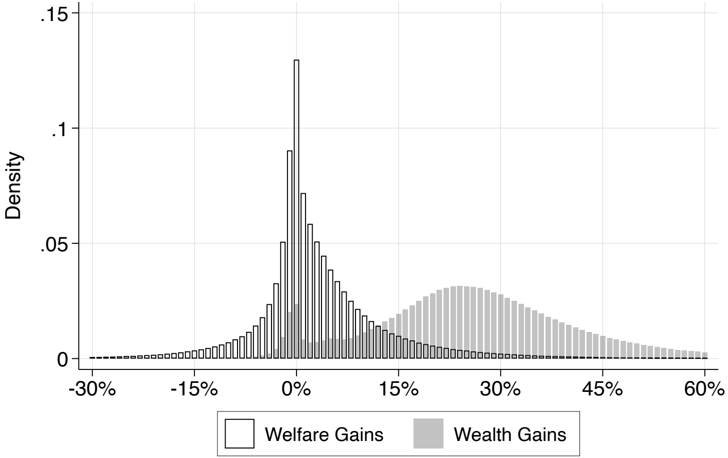


Empirics
Welfare Gains vs Wealth Gains

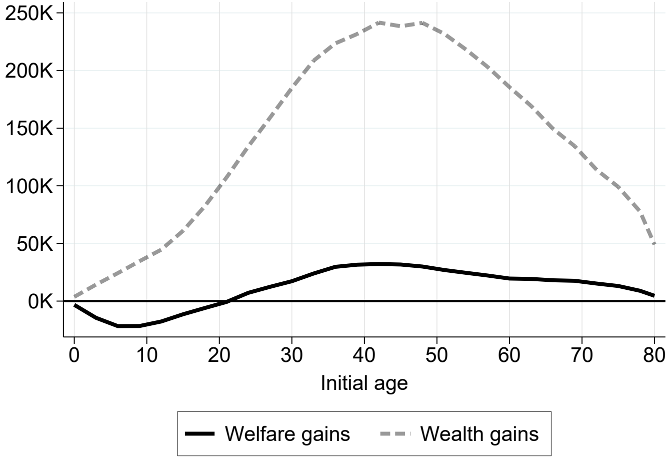
Wealth vs Welfare Gains Across Households



Wealth vs Welfare Gains Across Households (as a % of initial wealth)



Wealth vs Welfare Gains Between Cohorts



Conclusion

- Simple framework to quantify welfare effect of historical asset price changes

- Application to Norway over 1994–2015

   (i) Large redistributive effects

   (ii) Redistribution from young to old

   (iii) Redistribution from poor to rich

   (iv) Negative "welfare gain" for government $\implies$ decline in future net transfers

   (v) Wealth gains $\neq$ welfare gains

- Monetary policy: $P \uparrow$ due to $r \downarrow$ has large redistributive effects
  ... but subtler than $r \downarrow \Rightarrow$ wealth inequality $\uparrow$ = bad thing