Asset-Price Redistribution

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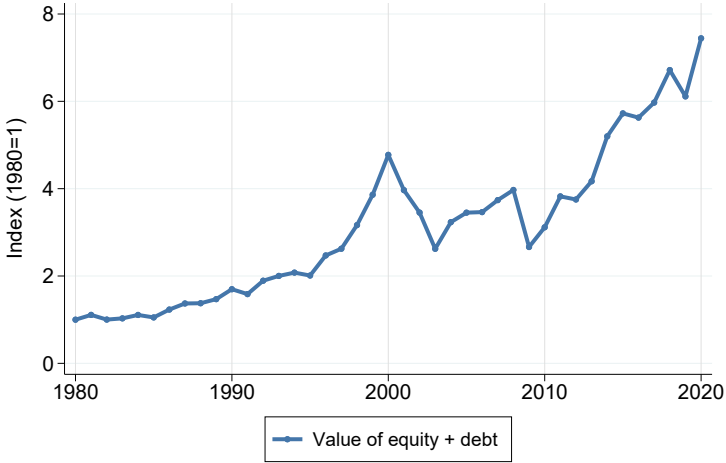
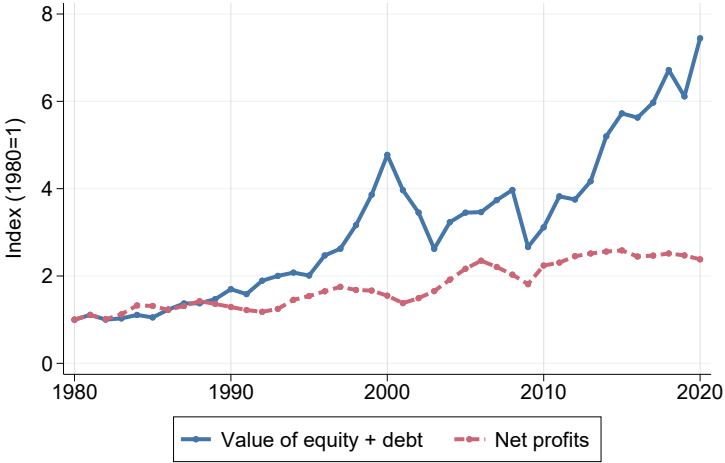
Rising Asset Prices



US Nonfinancial Corporate Businesses

Rising Asset Prices ... Relative to Income



US Nonfinancial Corporate Businesses

Motivation

- The rise in asset valuations had large effects on the distribution of wealth

Q. What are the consequences in terms of welfare? Who are the winners/losers?

- The answer is not obvious. Two polar views regarding the effect of P↑:
  - **(1)** Shift of real resources towards the wealthy (Saez–Yagan–Zucman, 2021)
  - **(2)** Welfare-irrelevant paper gains (Cochrane, 2020; Krugman, 2021)

What We Do: Theory

- Sufficient statistic for the (money metric) welfare effect of asset price "deviations"

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

- In practice. Focus on deviation of prices from dividends (ie, changes in valuations)

$$\text{Price deviation}_{kt} = \Delta\% \Big(\frac{\text{Price}_{kt}}{\text{Dividend}_{kt}} \Big)$$

- 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)

What We Do: Empirics

- Application to Norway using administrative panel microdata (1994–2015)
  - → 4 pp. decline in interest rates, 3x increase in housing price-to-rent, ...

- 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 , ...)

Outline

Theory: Two-period model

Theory: Baseline model

Empirics: Implementation

Empirics: Redistribution Between Households

Empirics: Redistribution Between Sectors

Household Problem

- Two period model $t \in \{0, 1\}$ where a individual is endowed with $\{Y_0, Y_1\}$. Agents can trade shares N at time $t = 0$ that pay a dividend D at time $t = 1$

- The household problem is

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

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

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

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 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

Outline

Environment

- We consider a deterministic, endowment economy with multiple assets

- Liquid asset. One-period ponds $\{B_t\}_{t=0}^{\infty}$ with prices $\{Q_t\}_{t=0}^{\infty}$
  - → No adjustment costs
  - → One-period return is $R_t = 1/Q_t$
  - → Cumulative return $R_{0\to t} \equiv R_1 \cdot R_2 \cdots R_t$

- Long-duration assets. K assets $\{N_{k,t}\}_{t=0}^{\infty}$ with price/dividends $\{P_{k,t}, D_{k,t}\}_{t=0}^{\infty}$
  - → Trading subject to convex adjustment cost $\chi_k(\Delta N_{k,t})$
  - → One-period return is $R_{k,t+1} = \frac{D_{k,t+1}+P_{k,t+1}}{P_{k,t}}$

Individual Welfare Gain

- The household problem is

$$V = \max_{\{C_t, B_t, \{N_{k,t}\}_{k=1}^K\}_{t=0}^\infty} \sum_{t=0}^\infty \beta^t U(C_t)$$

$$\text{s.t.} \quad C_t + \sum_{k=1}^K (N_{k,t} - N_{k,t-1}) P_{k,t} - B_t Q_t = \sum_{k=1}^K N_{k,t-1} D_{k,t} + B_{t-1} + Y_t - \sum_{k=1}^K \chi_k$$

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

$$\mathrm{d}V = U'(C_0) \times \underbrace{\sum_{t=0}^\infty R_{0\to t}^{-1} \left(\sum_{k=1}^K (N_{k,t-1} - N_{k,t}) \, \mathrm{d}P_{k,t} - B_t \, \mathrm{d}Q_t \right)}_{\text{Welfare gain}}$$

Individual Welfare Gain: Discussion

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

1. As in two-period model, rising asset prices benefit net sellers
... but portfolio choice + timing of purchases also matters

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

Individual Welfare Gain: Discussion

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1. As in two-period model, rising asset prices benefit net sellers
... but portfolio choice + timing of purchases also matters

2. Welfare gain is an 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 $\mathrm{d}P_t$

→ First-order approx for arbitrary price deviations ΔP_t (because saving decisions respond)

Aggregation

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

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

Asset price deviations are purely redistributive.

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

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

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

Extensions

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

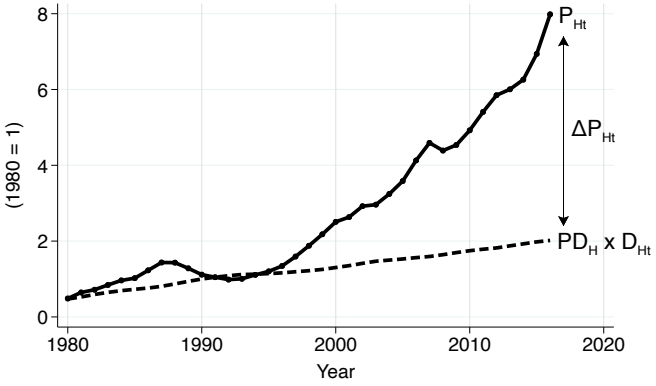
Outline

Price Deviations in Practice

- $\mathrm{d}P_t$ represents a perturbation of prices holding dividends constant ($\mathrm{d}D_t = 0$)
- In practice, we consider price changes ΔP_t due to change in the price-dividend ratio

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

Example of Price Deviation: Housing



- Since 1994, prices have grown 8x while rents have grown 2x but
- Our implementation captures pure valuation effects $\Longrightarrow$ 4x price-to-rent increase

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:

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

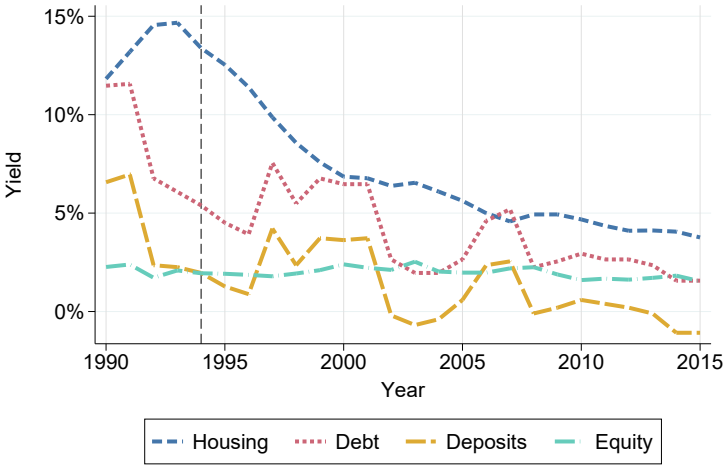
$$\text{Welfare Gain}_{\text{debt}} = -\sum_{t=1994}^{2015} 1.05^{-t} \times B_{M,t} Q_{M,t} \times \frac{Q_{M,t} - \overline{Q}_M}{Q_{M,t}}$$

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

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

Baseline $\overline{\text{Q}}$ and $\overline{\text{PD}}$ are set to 1992–1996 averages.

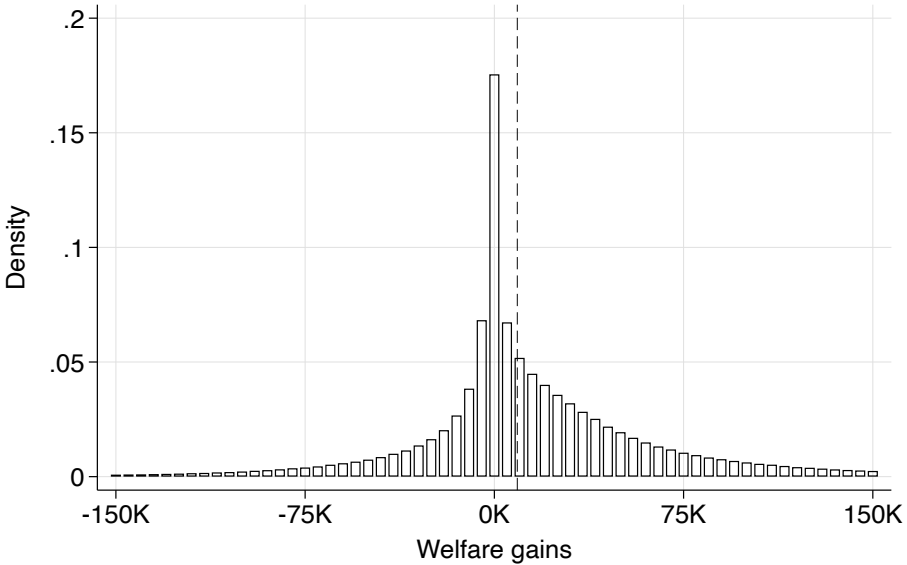
Data on Valuations



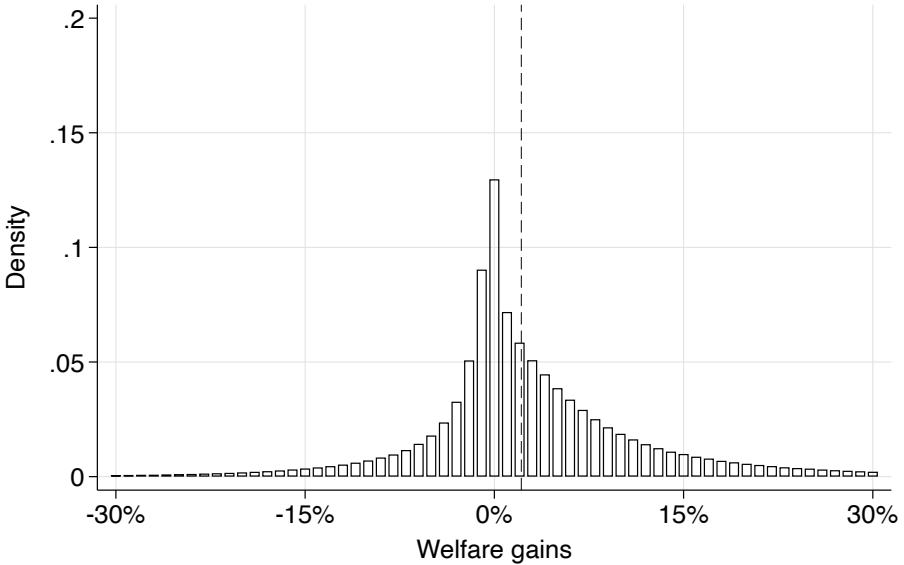
Gross real interest rate (debt/deposits); Rents/Price (housing); Cashflows/EV (equity)

Outline

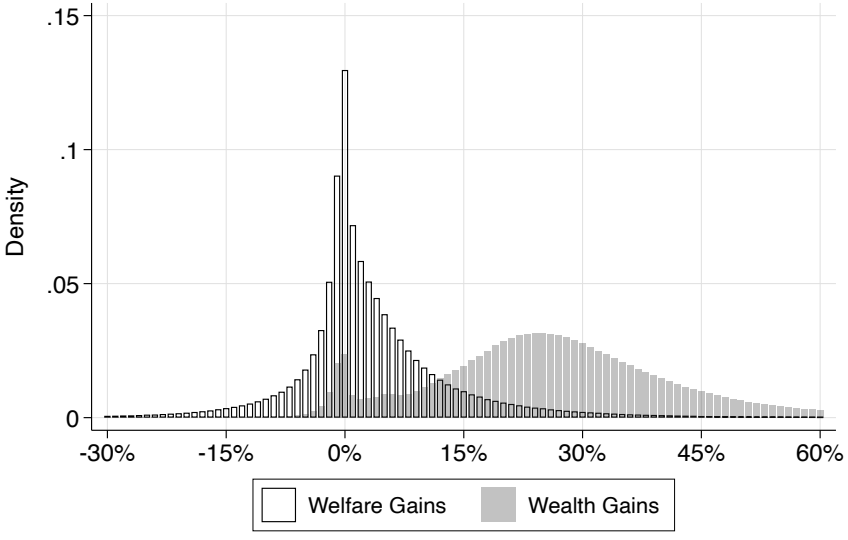
Large Amount of Redistribution



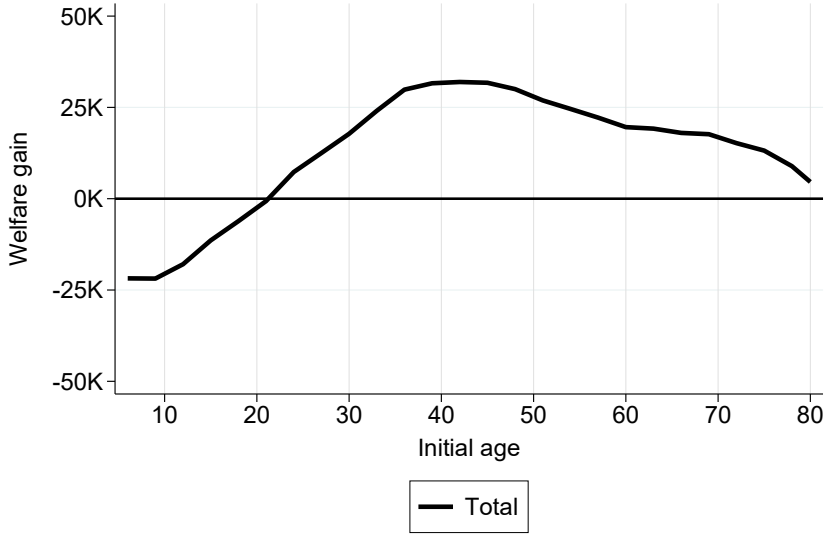
Large Amount of Redistribution (% of initial total wealth)



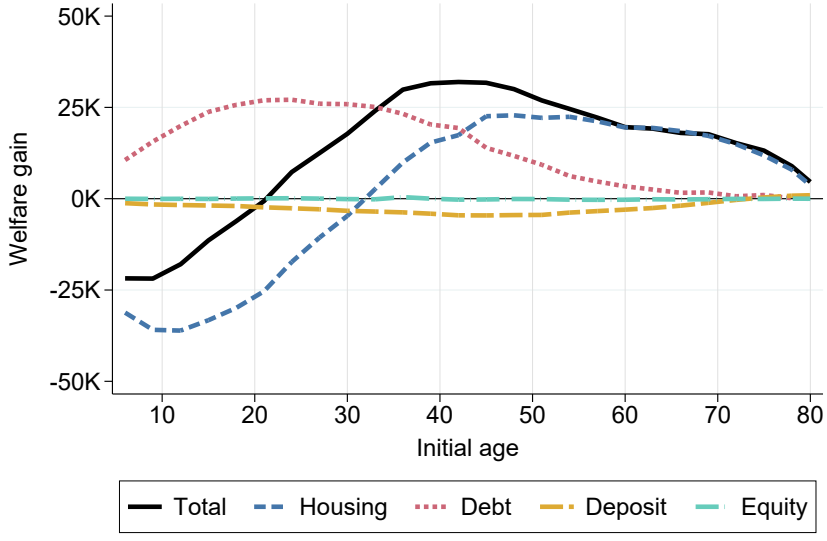
Welfare Gain ≠ Wealth Gain



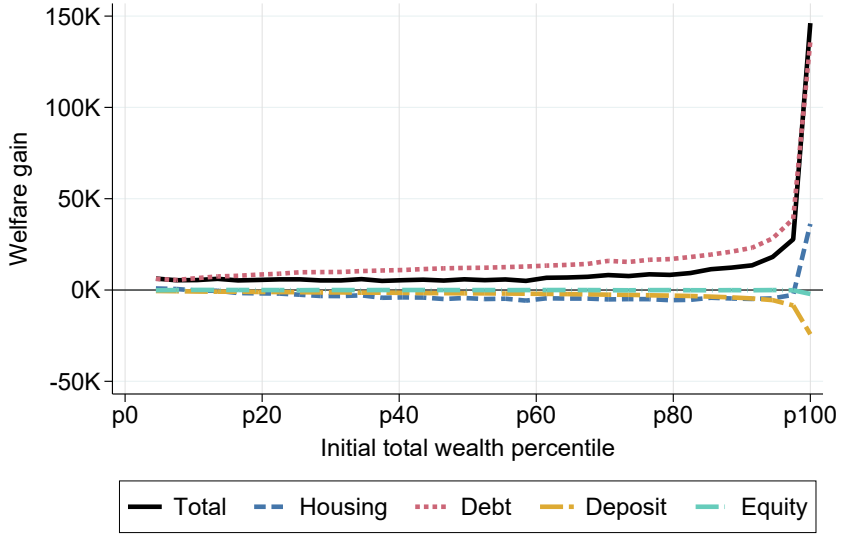
Redistribution From Young to Old



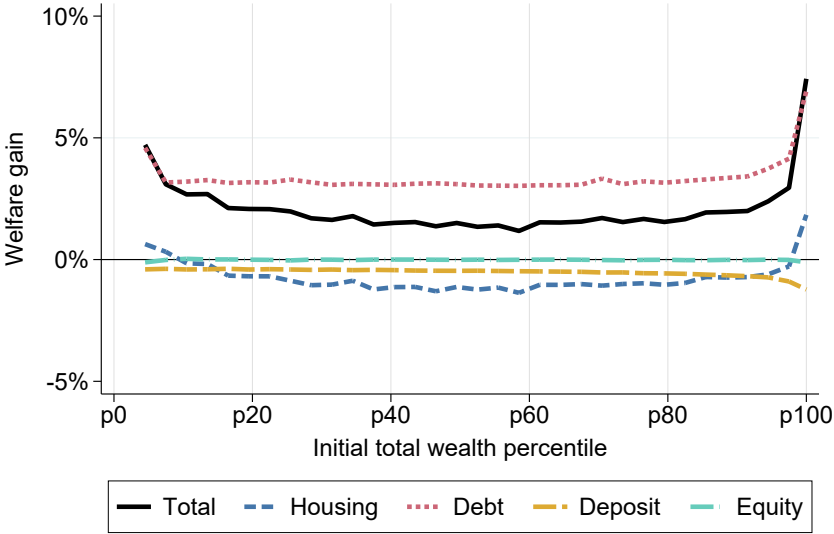
Redistribution From Young to Old



Welfare Gains Concentrated at the Top



... Largely Reflecting Wealth Inequality



Outline

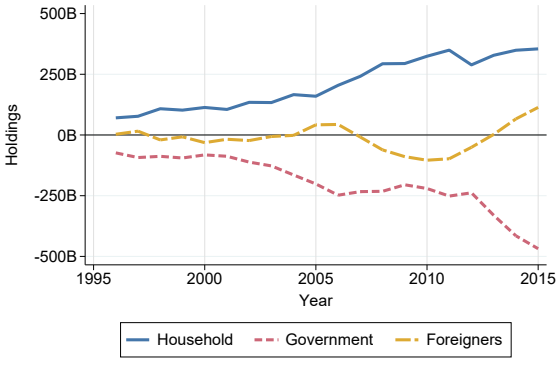
Sectoral Accounting

- The household sector as a whole has a positive welfare gain.
  Who is the losing counterparty?

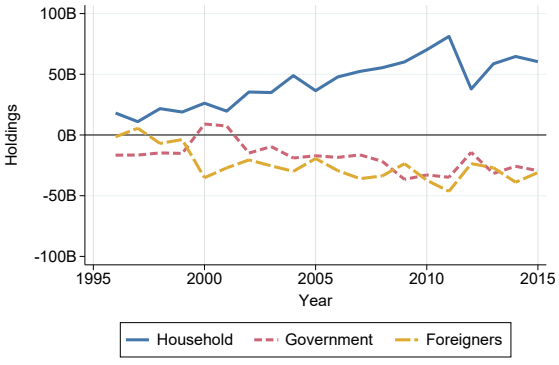
$$\text{Welfare Gain}_{\text{household}} = -\text{Welfare Gain}_{\substack{\text{other} \\ \text{sectors}}}$$

- Next: (i) Describe transactions between sectors, (ii) Compute welfare gain by sector, (iii) Interpret the meaning of “government welfare gain”

Sectoral Flows: Debt & Deposits



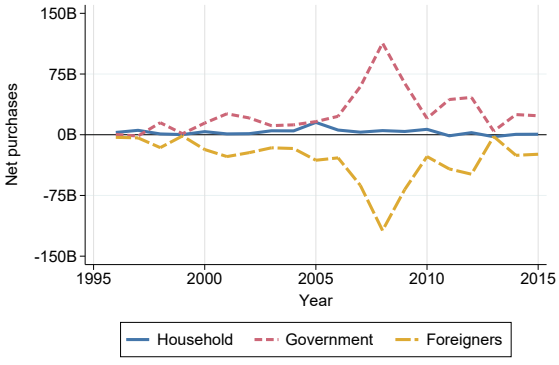
(a) Debt



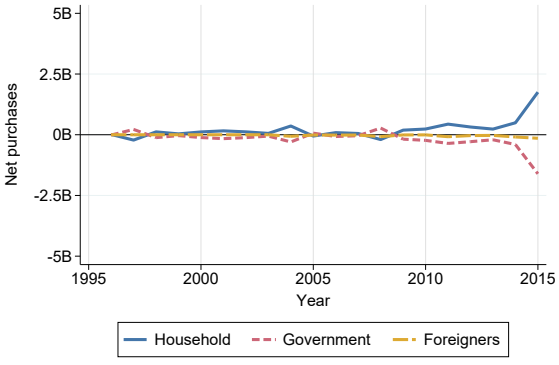
(b) Deposits

- Households debt > deposits $\Longrightarrow$ the government lends to households

Sectoral Flows: Equity & Housing



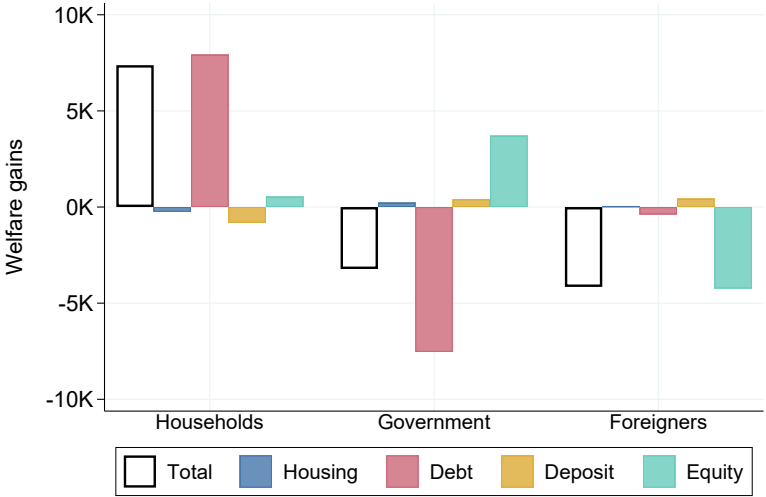
(a) Equity



(b) Housing

- The government is a net buyer of foreign equities

Redistribution From the Government to Households



Conclusion

- Simple framework to quantify the welfare effect of historical asset price fluctuations
- Application to Norway over 1994–2015
  - **(i)** Large redistributive effects
  - **(ii)** Wealth gains $\neq$ welfare gains
  - **(iii)** Redistribution from young to old
  - **(iv)** Redistribution from poor to rich
  - **(v)** Negative "welfare gain" for government $\implies$ decline in future net transfers
- What does this imply for optimal policy? (Insuring the unborn, capital gains taxes, ...)

Appendix

Wealth gains vs Welfare Gains

- We define "capital gain" as the contribution of price deviations ΔP on wealth

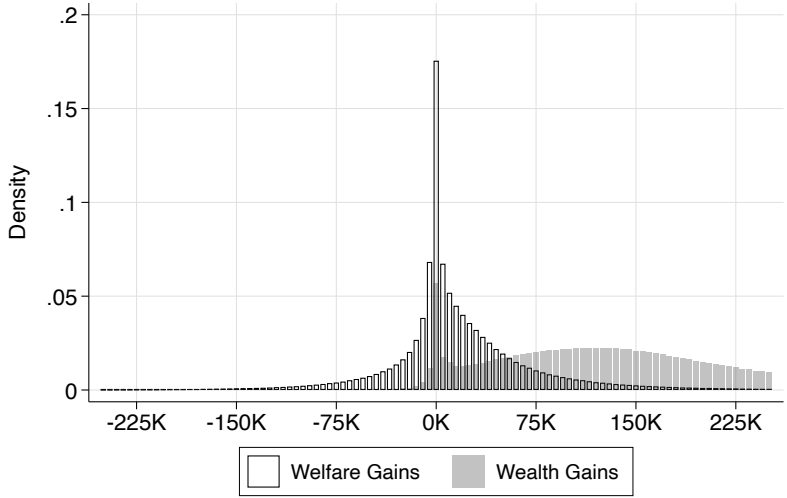
$$\begin{aligned}\text{Capital Gain} &\equiv \sum_{t=0}^{T} R_{0\to t-1}^{-1} \sum_{k=1}^{K} N_{k,t-1} \left(R_t^{-1}\Delta P_{k,t} - \Delta P_{k,t-1}\right) - \sum_{t=0}^{T} R_{0\to t}^{-1} B_t \Delta Q_t \\ &\neq \sum_{t=0}^{T} R_{0\to t}^{-1} \sum_{k=1}^{K} (N_{k,t-1} - N_{k,t}) \Delta P_{k,t} - \sum_{t=0}^{T} R_{0t}^{-1} B_t \Delta Q_t\end{aligned}$$

(1) The contribution of the liquid asset B_t is the same

(2) The contribution of the long-lived assets is different.
Wealth gains do not capture the contribution of lower future returns over $t > T$.

(3) With $T \to \infty$, the two measures converge

Capital vs Welfare Gains Across Households



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

Capital vs Welfare Gains Between Cohorts