The redistributive power of business cycle fluctuations

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Usual disclaimer applies

Motivation

- Growing interest in redistribution
- Missing: systematic view on redistribution due to business cycle fluctuations

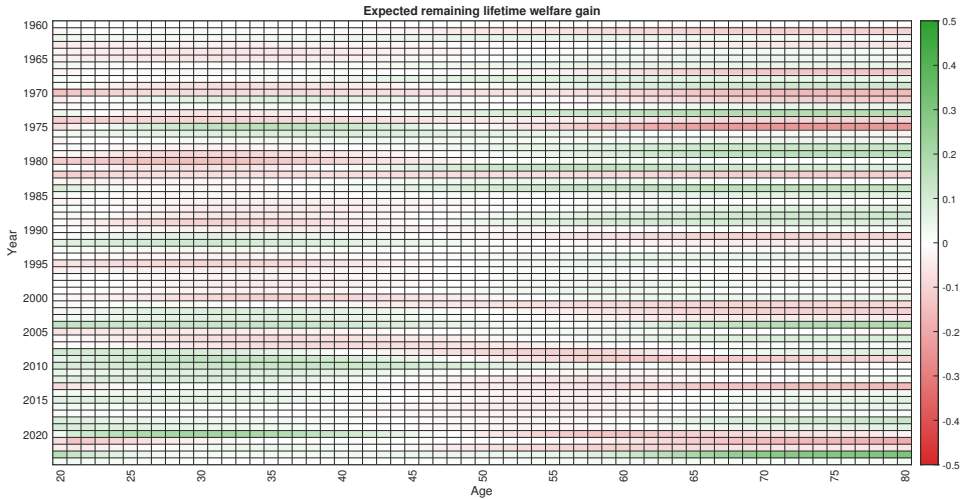
- Questions:
  - How do business cycle fluctuations redistribute across generations?
  - How large is this redistribution?

Model

- Mix of life-cycle and business cycle model:
- 80 cohorts of overlapping generations...
- ... plus sticky prices, sticky wages etc...
- ... monetary & fiscal policy ...
- ... and 9 standard business cycle shocks.
- Calibrated to match US demographic and asset holding statistics.
- Estimated on US business cycle data 1960-2024.

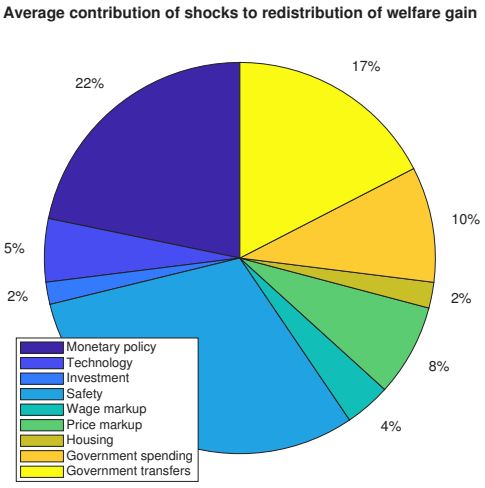
Welfare gains/losses over the business cycle

1. **Most cycles redistribute**
2. **Annual gains/ losses are large**

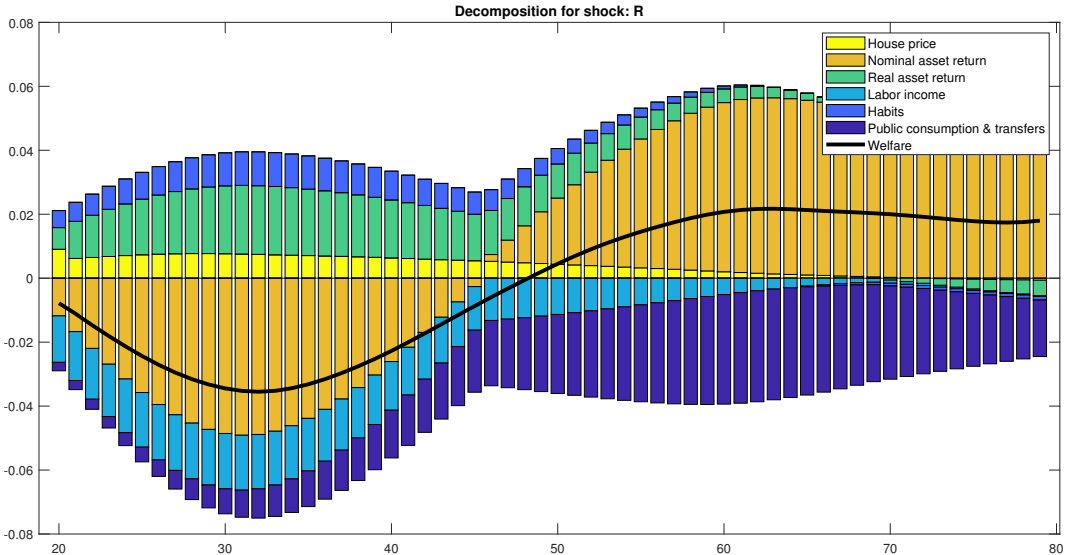


1. Where does redistribution come from?

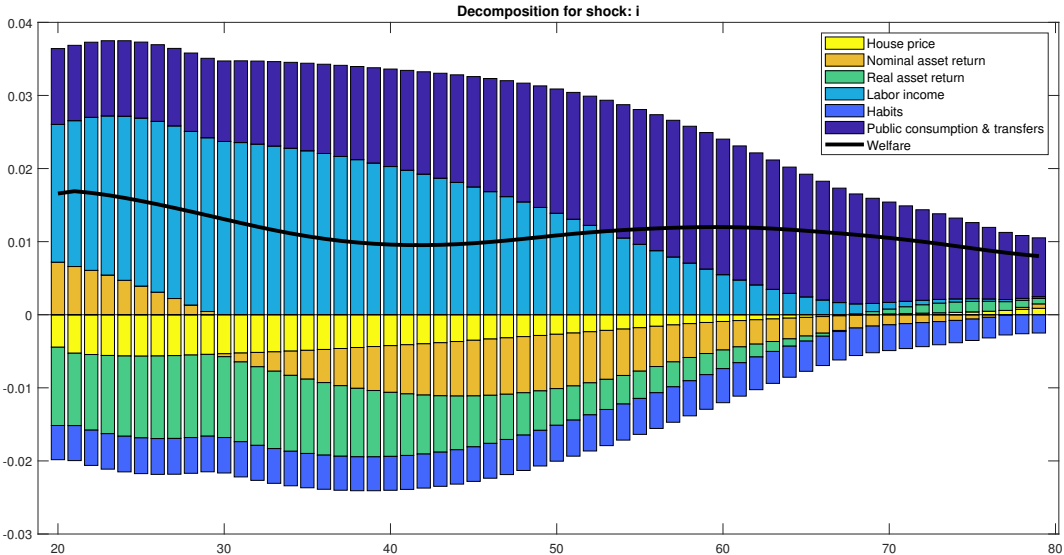
- Safety and **monetary policy shocks** are most important sources of redistribution



Redistributive shock: monetary policy shock

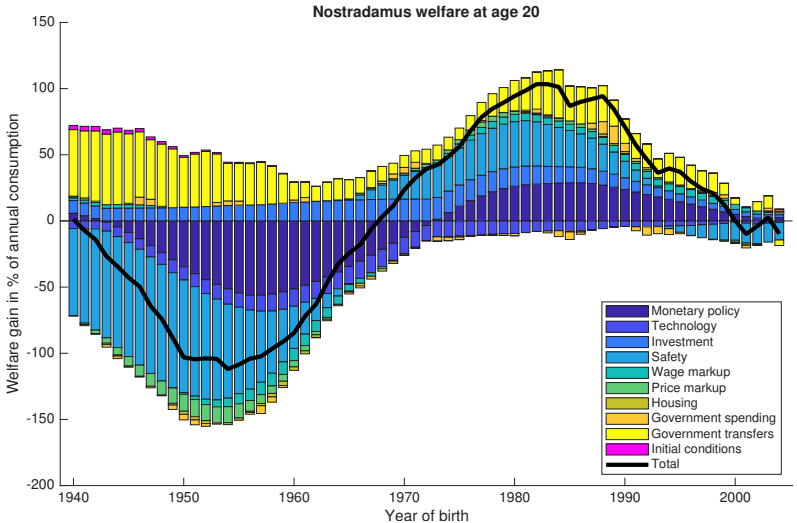


Egalitarian shock: investment shock



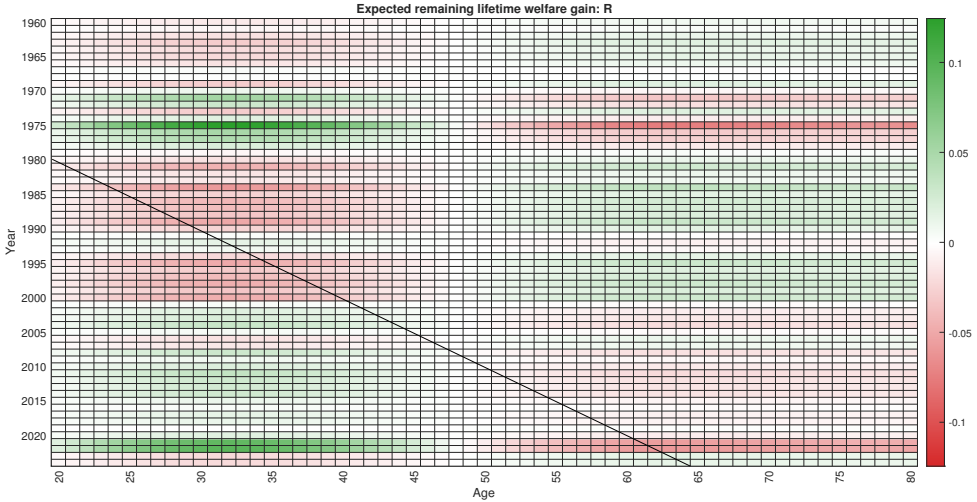
2. Do gains/losses net out over lifetimes?

- "Nostradamus welfare" at 20: all future prices and aggregate allocations are known



Why not?

- Positive and negative shocks do not cancel out in finite sample
- Even 2 symmetric shocks may affect welfare!



Conclusions

- **Business cycles redistribute welfare** across generations (quite heavily)
- **Effects do not cancel out over typical lifetime** - first order effects matter!
- **Safety and monetary policy shocks** are most important
- And much more in the paper...

Additional slides

Households

- A j-aged household ι maximizes

$$U_{j,t}(\iota) = \mathbb{E}_t \sum_{i=0}^{J-j} \beta^i \frac{N_{j+i,t+i}}{N_{j,t}} \left(\begin{array}{c} (1-\varrho)\log(c_{j+i,t+i}(\iota) - \varrho c_{j+i,t+i-1}) + \frac{g}{c_{j+i}}\log(g_{t+i}) \\ -\phi_{j+i}\frac{\ell_{j+i,t+i}(\iota)^{1+\varphi}}{1+\varphi} + \psi_{j+i}\varepsilon^h_{t+i}\log(h_{j+i+1,t+i+1}) \\ +\zeta_{j+i}\varepsilon^b_{t+i}\log(1+b_{j+i+1,t+i+1}) \end{array} \right)$$

- Subject to budget constraint

$$\begin{aligned} c_{j,t} + p_{h,t}\left[h_{j+1,t+1} - (1-\delta_h)\,h_{j,t}\right] + p_{k,t}\left[k_{j+1,t+1} - (1-\delta_k)\,k_{j,t}\right] + b_{j+1,t+1} \\ = (1-\tau)z_j w_t \ell_{j,t} + r^k_t k_{j,t} + f_{j,t} + \frac{R_{t-1}b_{j,t}}{\pi_t} + t_{j,t} + beq_t \end{aligned}$$

- Labor unions set nominal wages subject to Calvo friction and cost-push shocks ε^w_t

Producers

- Final goods aggregated from differentiated intermediate products

$$y_t = \left[\int y_t(f)^{\frac{1}{\mu_p}} \mathrm{d}f \right]^{\mu_p}$$

- Intermediate goods firm f produces a differentiated product

$$y_t(f) = \exp(\varepsilon_t^z) k_t(f)^{\alpha} \ell_t(f)^{1-\alpha} - \Phi$$

- Maximizes profits

$$p_t(f) y_t(f) - \exp(\varepsilon_t^p) \left(w_t \ell_t(f) + r_{k,t} k_t(f) \right) + t_t^f$$

- Staggered price setting (Calvo)
- Capital producers are subject to investment adjustment cost

$$(1+n) k_{t+1} = (1-\delta_k) k_t + \exp(\varepsilon_t^i) \left[1 - S\left(\frac{i_t}{i_{t-1}} \right) \right] i_t$$

Fiscal and monetary authority

- Collects labor income tax, issues debt, spends on transfers and public consumption

$$(1+n)\, b^g_{t+1} = \frac{R_{t-1}}{\pi_t} b^g_t + g_t + t_t - \tau w_t h_t$$

- Exogenous spending

$$g_t = g \exp(\varepsilon^g_t)$$

- Fiscal rule

$$\frac{t_t}{t} = \left(\frac{t_{t-1}}{t}\right)^{\gamma_t} \left(\frac{b^g_t}{b^g}\right)^{-\eta} \exp(\varepsilon^t_t)$$

- Taylor rule

$$\frac{R_t}{R} = \left(\frac{R_{t-1}}{R}\right)^{\gamma_R} \left[\left(\frac{\pi_t}{\pi}\right)^{\gamma_\pi} \left(\frac{y_t}{y}\right)^{\gamma_y}\right]^{1-\gamma_R} \exp(\varepsilon^r_t)$$

Calibration and estimation

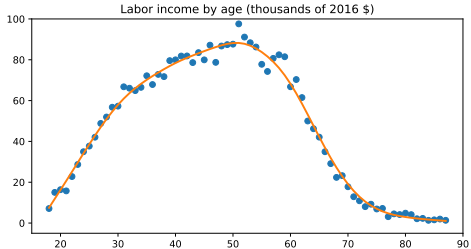
Calibration

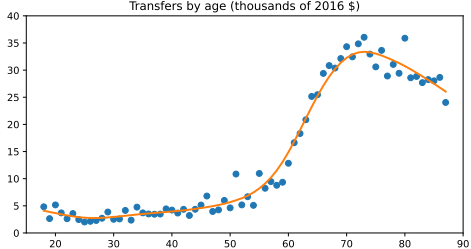
- Life-cycle profiles calibrated to demographic and distributional data (SCF)
- Steady-state ratios calibrated to sample means

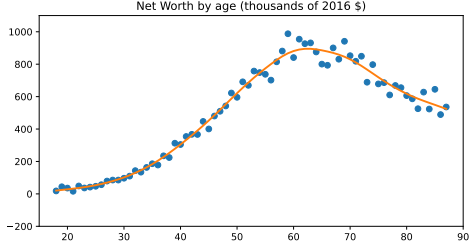
Estimation

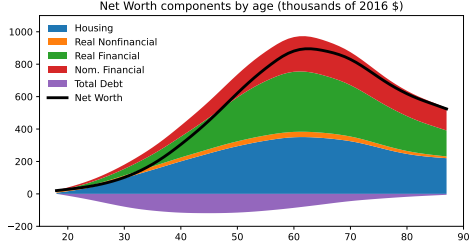
- US aggregate cyclical data (1960-2024):
  - GDP, consumption, investment, real hourly wage, hours worked, inflation, nominal interest rate, public debt to GDP, real house price
- Full-information Bayesian estimation with priors from DSGE literature

Life-cycle profiles









Welfare decomposition by channels

- Totally differentiate the indirect utility function wrt. all arguments (house prices, return on nominal assets, return on equity, etc.)

$$\mathrm{d}WG_{j,0}(\iota) = \mathbb{E}_0 \sum_{s=0}^{J-j} \frac{\partial WG_{j,0}(\iota)}{\partial p_{h,s}} \mathrm{d}p_{h,s} + ...$$

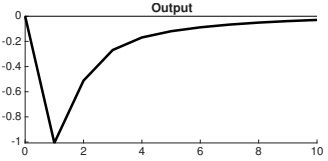
- For example, house price effect is (using envelope theorem)

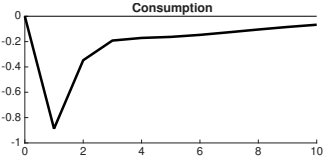
$$\sum_{s=0}^{J-j} \frac{\partial WG_{j,0}(\iota)}{\partial p_{h,s}} \mathrm{d}p_{h,s} = u_j^c \sum_{s=0}^{J-j} (1+r)^{-s} [(1-\delta_h) h_{j+s-1} - h_{j+s}] \mathrm{d}p_{h,s}$$

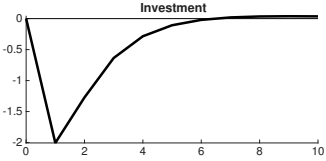
Variance decomposition

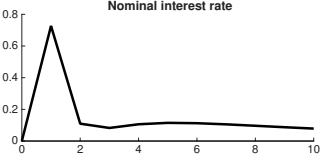
Variable	Contribution of shock (in %)								
	ε_z	ε_i	ε_p	ε_w	ε_h	ε_b	ε_r	ε_g	ε_t
Output	10	7	4	45	0	19	14	1	0
Private consumption	10	8	5	41	0	22	13	1	1
Investment	9	15	2	46	0	14	13	1	0
Real labor income	4	6	22	27	0	21	18	1	0
Real house price	7	4	4	26	36	11	12	1	0
Inflation	10	2	7	8	0	50	21	1	2
Nominal interest rate	5	3	4	8	0	67	9	1	3
Real return on nominal assets	12	3	10	7	0	45	23	1	1
Real return on real assets	28	7	8	43	0	6	8	0	0
Public debt	2	3	3	16	0	4	13	3	57
Consumption of 20 yo	10	7	5	43	0	14	19	1	1
Consumption of 40 yo	10	7	5	43	0	12	22	1	0
Consumption of 60 yo	9	7	4	41	0	24	12	1	1
Consumption of 80 yo	5	5	4	20	0	29	8	2	27

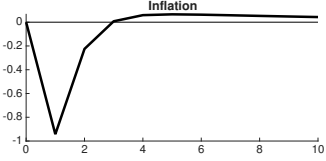
IRF: Monetary policy shock

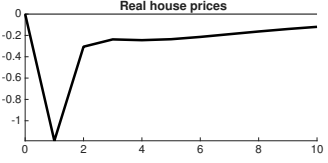


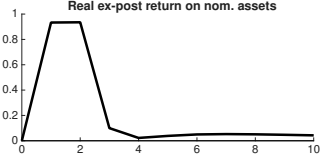


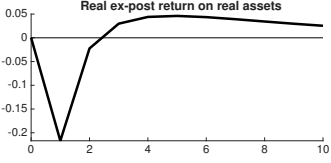




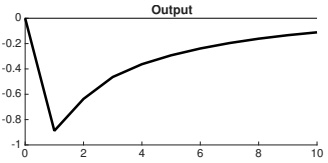


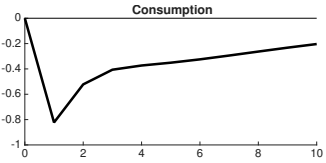


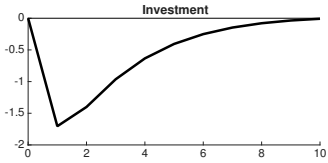


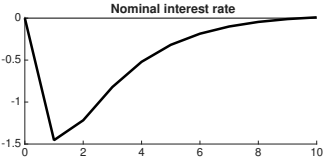


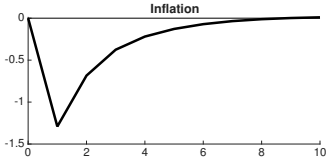
IRF: safety shock

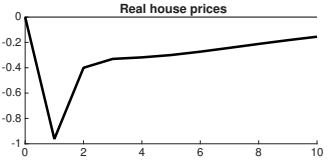


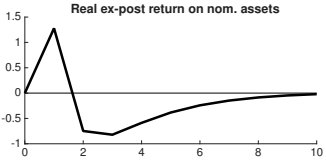


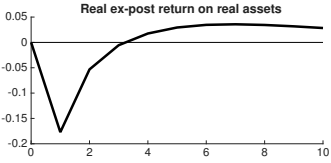










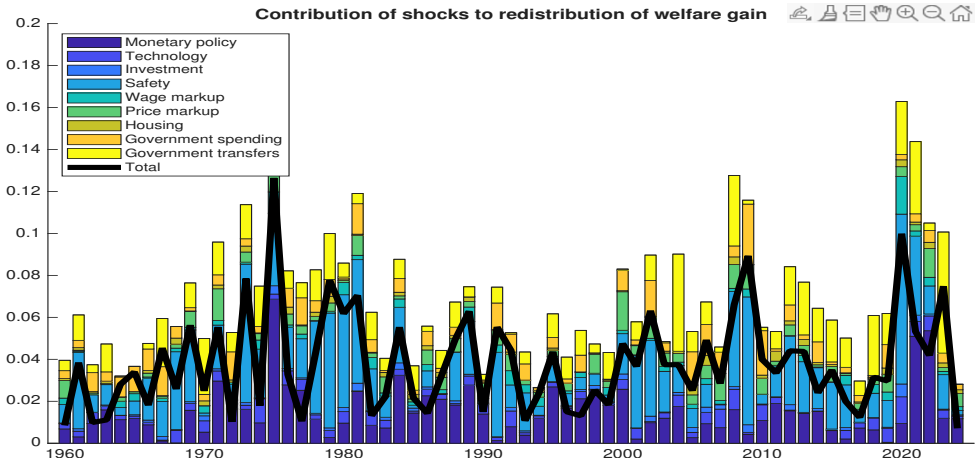


1. Why do business cycles redistribute?

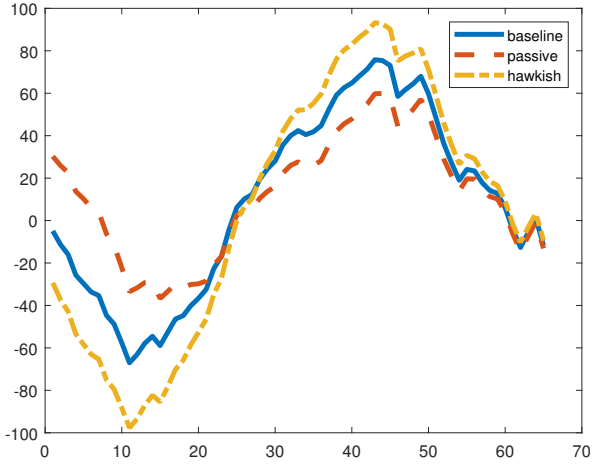
- Which shocks/channels are most important for redistribution?
- Amount of redistribution calculated as:

$$AMOR_t = \sum_j \frac{N_{j,t}}{N_t} \left\| WG_{j,t} - \sum_j \frac{N_{j,t}}{N_t} WG_{j,t} \right\|$$

Amount of redistribution over time

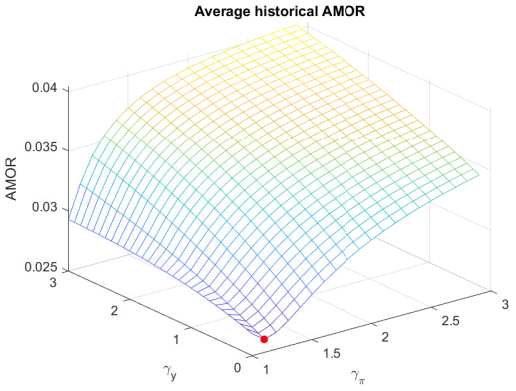


“Nostradamus welfare” and systematic monetary policy



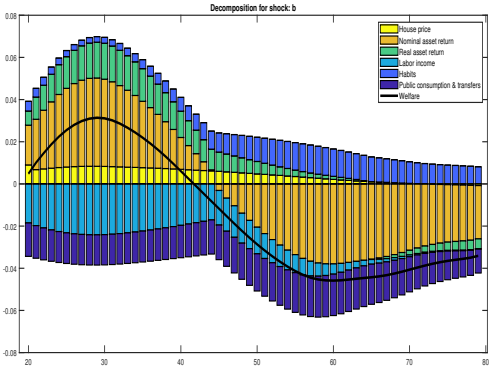
- Note: no monetary shocks

Systematic monetary policy and redistribution

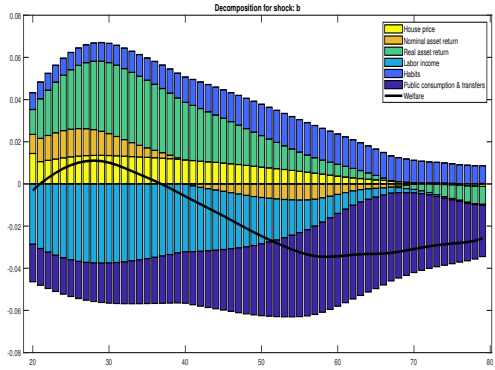


- Active response to major fluctuations => high volatility of return on nominal assets (despite lower volatility of inflation)

Redistribution via safety shock



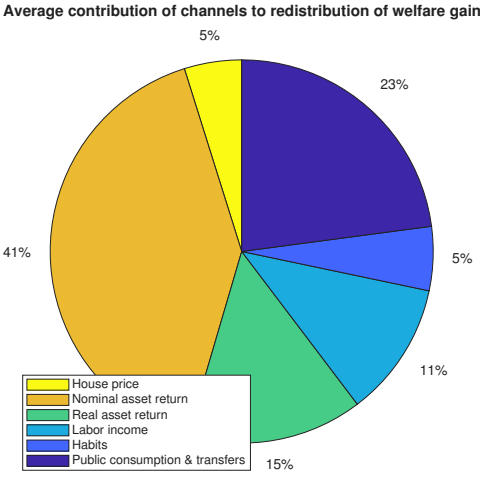
Baseline ($\gamma_\pi = 1.6$, $\gamma_y = 0.2$)



'Passive' policy ($\gamma_\pi = 1.001$, $\gamma_y = 0$)

How do channels contribute to redistribution?

- Dominant role of **nominal asset returns**



2nd order effects

- Literature on costs of business cycle fluctuations following Lucas:
  - How much would an agent be willing to pay to avoid income risk?
  - Typically based on models with infinitely lived agents (1st order effects net out)
  - Concentrates on 2nd order (volatility) effects
  - Costs are typically found small
- Our model: how much would a 20-year old pay to avoid the income risk:
  - Our model: equivalent of 1.9% of lifetime consumption
  - 1.3% in comparable representative agent model

Redistributive shock: safety (bond preference) shock