

Distributional Effects of Monetary Policy

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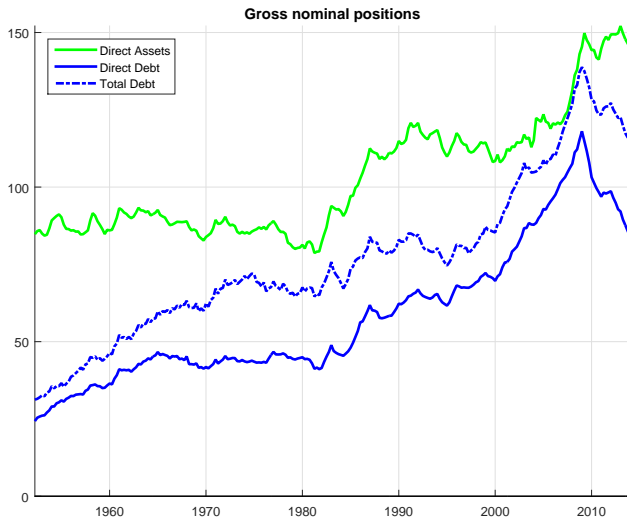
What this paper does

- Monetary policy moves interest rates, and thereby redistributes wealth between borrowers and lenders.
- Document the redistribution between different groups of households that results from changes in inflation.
- Use life-cycle model with rich heterogeneity and endogenous house prices to assess repercussions of this redistribution for the macroeconomy and welfare.

Documenting nominal wealth in the United States

- Use aggregate data from Flows of Funds accounts and household data from 2013 Survey of Consumer Finances to document nominal assets and liabilities.
- Distinguish assets and liabilities by maturity: long-duration assets have higher exposure to inflation.
- Distinguish different groups of households by income, wealth, and age.

Gross nominal positions in U.S. household sector (Percent of GDP)



The benchmark redistribution experiment

- The Fed raises the inflation target by 5 percent over a ten-year horizon.
- Change in inflation is unexpected before the announcement, but future inflation is fully anticipated after the announcement.
- Result: Parallel upshift in nominal yield curve.

Overview

- OLG model
 - ▶ Households differ by skill and preferences
 - ▶ Focus on housing: indivisible houses of different qualities, rent/buy, borrowing against value of home
 - ▶ Calibrate to aggregates and SCF data for 2013
- Redistribution shock
 - ▶ 5% more inflation over 10 years
 - ▶ Larger gain/loss on long term positions: bonds, fixed-rate mortgages
- Compute transition path
 - ▶ Impulse responses for individual actions, aggregates
 - ▶ Compute welfare along path
 - ▶ Depends on assumption on fiscal policy

Main findings

- Heterogeneous welfare effects
 - ▶ net borrowers win, especially middle-age middle class
 - ▶ net lenders lose, especially rich retirees
- Aggregates move: responses of winners and losers do not cancel
 - ▶ winners have lower MPCs: consumption falls (age effect dominates)
 - ▶ losers retired: labor supply falls
 - ▶ persistent effects: propagation via wealth distribution
- Role of housing as fixed factor
 - ▶ savings responses move house prices
 - ▶ price move at high end: middle class tries to upgrade

Model overview

- Small open economy; no aggregate uncertainty
 - ▶ Leisure and housing services nontradable
 - ▶ Other consumption (numeraire) tradable
- Housing
 - ▶ Indivisible units differ by service flow; fixed distribution
 - ▶ Competitive markets for rentals and houses
- Other assets
 - ▶ Short-term borrowing and lending at world interest rate
 - ▶ Three nominal bonds distinguished by maturity (short + two decay bonds)
 - ▶ Collateral constraint: borrowing \leq house value * (max LTV)
- Overlapping generations of households
 - ▶ Differ in preferences: discount factor, warm glow bequests
 - ▶ Differ in skills: By group, by age, + idiosyncratic shocks
- Rest of economy
 - ▶ Competitive firms produce consumption good
 - ▶ Foreigners hold assets
 - ▶ Government: Income tax, spending, social security

Household Problem

$$v_j(a, k, b, h, z, \beta, \Omega) =$$

$$\max_{c, r, s, n, k', b', m', h'} \left\{ u_j(c, s, n) + \beta \sum \pi_j(z', \beta' | z, \beta) v_j(a + 1, k', b', h', z', \beta', \Omega') \right\}$$

subject to:

$$P((1 + \tau_c) c + p_r r + p_h(h') + q_k k') + Q_0 b_0 + \sum_{i=1}^2 Q_i (b'_i - \delta_i b_i)$$

$$= P(p_h(h) + (1 - \tau_n) w_j(a) z n + k) + \sum_{i=0}^2 b_i,$$

$$s = s(h) + \mu s(r),$$

$$P q_k k' + \sum_{i=0}^2 Q_i b'_i \geq -\psi P p_h(h').$$

Portfolio Choice

- Model solved under perfect foresight for aggregate price level.
- Financial assets are perfect substitutes.
- No-arbitrage condition for short instruments:

$$Q_0 = \frac{q_k P}{P'}.$$

- No-arbitrage condition for the long-term nominal asset is:

$$Q_i = \frac{(\delta_i Q_i' + 1) q_k P}{P'}.$$

which gives:

$$Q_{i,t} = \sum_{s=1}^{\infty} \frac{\delta_i^{s-1} q_k^s P_t}{P_{t+s}}.$$

- Can use no-arbitrage conditions to reprice long-term nominal bonds when there is an unanticipated change to future inflation.

Equilibrium properties

- Production of consumption good
 - ▶ Factor prices from firm first-order conditions
 - ▶ Labor supply determines scale of production
- Household choices
 - ▶ Consumption smoothing + precautionary savings
 - ▶ Housing choice
 - ★ Utility benefit from ownership versus need for downpayment
 - ★ Larger house if more taste for ownership, net worth
- Housing assignment and valuation
 - ▶ Rented houses earn world interest rate
 - ▶ Prices adjust to make richer people own larger houses
 - ▶ Price-rent ratios can differ across quality levels

Household heterogeneity

- Age
 - ▶ Period length 2.5 years: 22 cohorts
 - ▶ Exogenous retirement at 65
- Skills
 - ▶ "The rich": deterministic age profile, bequest
 - ▶ "The masses": Age profile + Markov chain
 - ▶ *Split helps generate high wealth inequality*
- Discount factor
 - ▶ "The rich": (high) number
 - ▶ "The masses": Markov chain
 - ▶ *Extra source of heterogeneity in savings and house choice*
- Preference for housing
 - ▶ Share of "the masses" always rents

Targets for quantitative implementation

- ① Up front choices
 - ▶ CRRA-Cobb-Douglas felicity
 - ▶ Growth rate, interest rate, max LTV, cons. and capital taxes
- ② Joint matching
 - ▶ Discount factors, income process, bequest function
- Match MPCs and MPNs
- Three household groups, defined conditional on age
 - ▶ Rich = top 10% by net worth
 - ▶ Poor = bottom 20% by income
 - ▶ Middle = everyone else
- Match steady state to 2013 SCF cross section
 - ▶ Labor income by age and group
 - ▶ Net worth by group
- House quality
 - ▶ More large houses than rich households
- Aggregates
 - ▶ ownership rate and house value
 - ▶ household sector: transfer wealth share
 - ▶ social security, taxes, government debt

Portfolio allocation

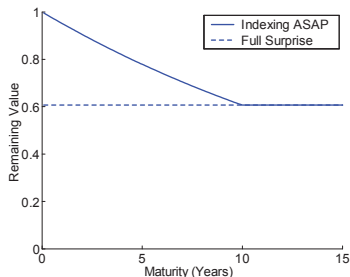
- Nominal assets in the model:
 - ▶ Short term bond + 2 decay bonds
 - ▶ Asset allocation is not uniquely determined (no uncertainty about the price level, no adjustment costs)
- Duration matters for redistribution shock
- Use data to determine division of total financial assets by type of household

Impulse response to redistribution shock

- Economy initially in steady state
- Date 0 announcement: 5% more inflation for 10 years
 - ▶ No immediate change in price level
 - ▶ Lower market value of existing debt
- Redistribution shock
 - ▶ Hits generations born -1, -2, ..
 - ▶ Generations 0,1,2,... only affected via house prices & bequest
 - ▶ Also affects government and rest of the world
- Fiscal policy along transition path
 - ▶ Gradually adjust spending

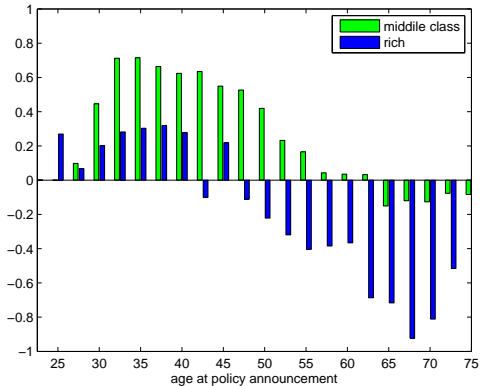
Measuring redistribution shock

- Date 0 announcement: 5% more inflation for 10 years
 - ▶ Nominal bond price of maturity n falls by factor $\exp(-0.05n)$
 - ▶ Positions longer than 10 years lose 40%

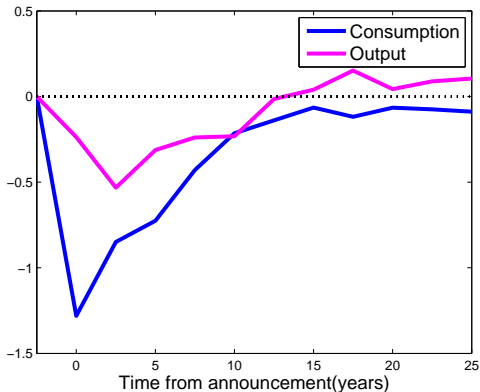


- Data: Aggregate gains and losses as share of GDP
 - ▶ Household sector gains 7.7%, losses 7.4%
 - ▶ Government gains 7.1%, rest of the world loses 8.5%

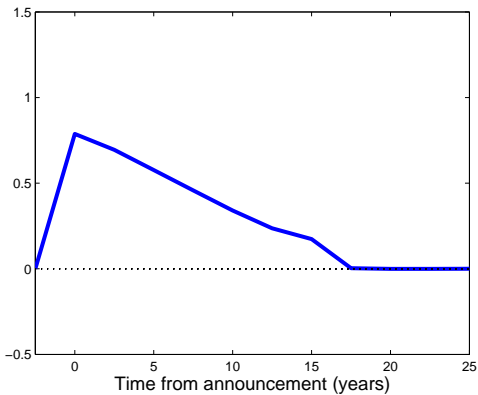
Redistribution among household groups, % GDP



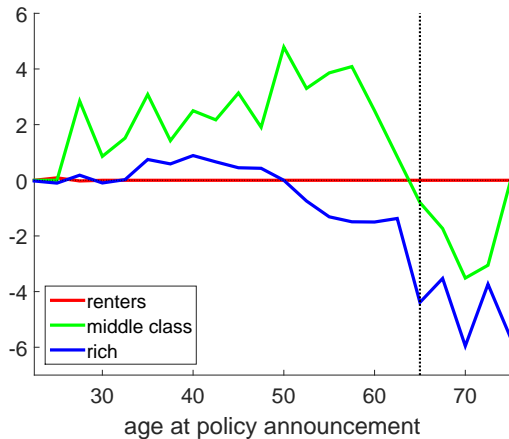
Aggregate consumption and output (% steady state)



Price of large house (% steady state)



Welfare by group (% equiv. consumption for life)



Summary

- Inflation-induced redistribution leads to:
 - ① Huge changes in group-specific welfare.
 - ② Highly persistent effects on economic aggregates.
 - ③ Downward shift in labor supply and output.
 - ④ Increase in price of upgrade homes, little change in price of starter homes.

Broader Message

- General conclusions from monetary models with household heterogeneity:
 - ① Effects of monetary policy depend crucially on fiscal policy.
 - ② Effects of monetary policy depend crucially on mortgage finance.
 - ③ Distributional effects dominate welfare effects - need to work out implications for political economy of monetary policy.