

Battle of the Ages: Distributional and Aggregate Effects of Monetary Policy in a Model with Age Demographics

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Motivation: monetary policy in aging societies

- Societies are aging and pension reform is on the agenda everywhere \Rightarrow **retirement savings** are a growing share of household balance sheets.
- Recurring public criticism: low rates “*expropriate savers.*”
 - Draghi (2015): for those saving for retirement, low rates “*may . . . become an inducement to save more*”
 - If savers cut consumption when rates fall, monetary easing could (partly) backfire.
- Heterogeneous-agent literature: mostly income/wealth heterogeneity; **age heterogeneity and pensions** remain understudied at business-cycle frequency.
- Yet age separates the two key savings motives:
 - **middle aged**: savings for *retirement*
 - **young**: precautionary savings against *unemployment risk*... and both groups compete for the same pool of safe assets.

This paper

Framework. Quarterly New-Keynesian model with an extended perpetual-youth life cycle, unemployment risk for the young, incomplete markets, and a pension system ($\mu^r =$ replacement rate).

1. **Q:** Could middle-aged *savers* cut consumption after a rate cut (negative income effect)?
A: **No** – the income effect does not dominate for middle-aged or young agents. Only the newly retired lose, and only mildly.
2. **Q:** Does generosity of the pension system matter for *aggregate* power of monetary policy?
A: **Yes, a lot:** real economy response meaningfully different.
3. **Q:** Why?
A: A “**battle of the ages**” for the fixed supply of safe assets (retirement savings crowd out unemployment insurance of the young) plus a level effect: consumption is more rate-sensitive when the steady-state real rate is low.

Model overview

Demographics (extended perpetual youth, Blanchard 1985)

- young $\xrightarrow{\delta^y}$ middle aged $\xrightarrow{\delta^m}$ retired $\xrightarrow{\delta^r}$
replaced by newborns
- each stage 20 years in expectation; constant pop.

Workers

- **young**: face unemployment risk (search & matching) \Rightarrow precautionary savings
- **middle aged**: no job risk, but approaching retirement \Rightarrow save for old age
- **retirees**: annuitized savings + pension $\mu^r w^m$
(tax financed, fixed at retirement)

Markets & frictions

- one liquid nominal asset, *fixed supply*; no contingent claims
- borrowing limited by a smooth interest-rate premium
- sticky prices (Rotemberg), Taylor rule
- representative firm owner; capital, vacancy posting

Solution: LeGrand-Ragot implementation of Reiter method with explicit employment histories in Dynare

Clean laboratory: one group saves against job loss, one saves for retirement – same fixed asset supply

Calibration: euro-area quarterly model

- Pension replacement rate $\mu^r = 0.5$ of after-tax wage (alternative: 0.2685)
- Unemployment benefits $\mu^y = 0.5$;
 $u_{ss} = 10.7\%$, expected duration 3.6 quarters
(Den Haan–Rendahl–Riegler, euro area)
- Asset supply per worker = 130% of annual after-tax wage; middle aged hold $\sim 84\%$ of it
- 30% of retirement consumption financed by investment income
- Taylor rule: $\theta_\pi = 1.99$, $\theta_y = 0.24$, $\theta_r = 0.84$
(estimated EA DSGE)

Discipline / validation

- consumption drop after 1y of unemployment: 15% (data: 16–26%, Kolsrud et al. 2015)
- 25bp rate cut \Rightarrow peak output +0.55%, employment +0.85% – upper end of empirical IRF estimates
- real-rate decline is persistent: peak in q4, halved 7 quarters later

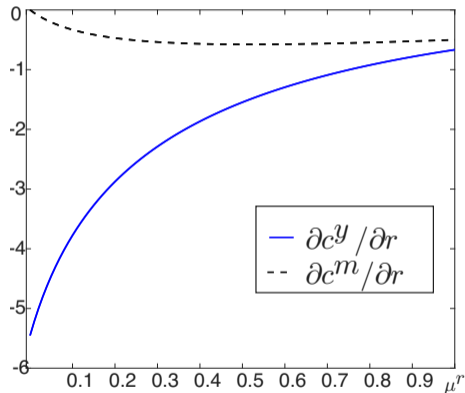
Mechanism 1a: pensions move the steady state in a 3-period OLG model

$$\left. \frac{\partial c_{\tau}^y}{\partial r_{\tau}} \right|_{r_{\tau}=\bar{r}} = - \left(y^m + \frac{\mu^r}{1+\bar{r}} \right) \frac{1}{3(1+r_{\tau})^2} \Bigg|_{r_{\tau}=\bar{r}},$$

$$\left. \frac{\partial c_{\tau}^m}{\partial r_{\tau}} \right|_{r_{\tau}=\bar{r}} = - \mu^r \frac{1}{2(1+r_{\tau})^2} \Bigg|_{r_{\tau}=\bar{r}}.$$

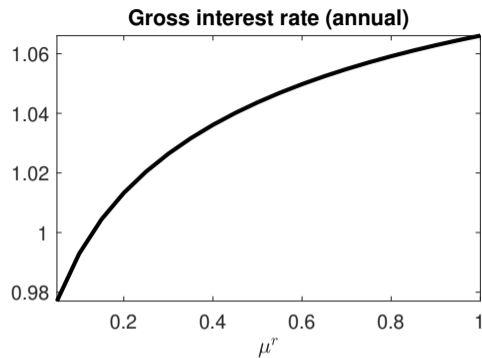
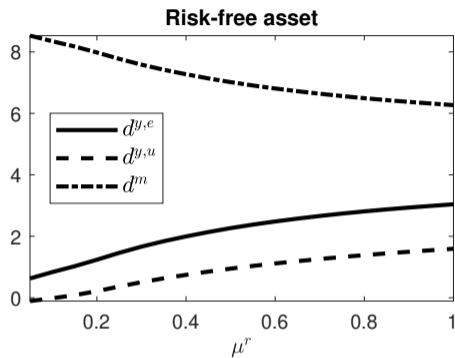
- Direct effect through μ^r and indirect effect through \bar{r}
- The young respond more than the middle aged (more future income to discount)

Sensitivity of consumption by pension generosity μ^r



More generous pensions \Rightarrow less retirement saving \Rightarrow higher equilibrium \bar{r} \Rightarrow consumption demand *less* sensitive to rate changes

Mechanism 1b: pensions move the steady state of the full model

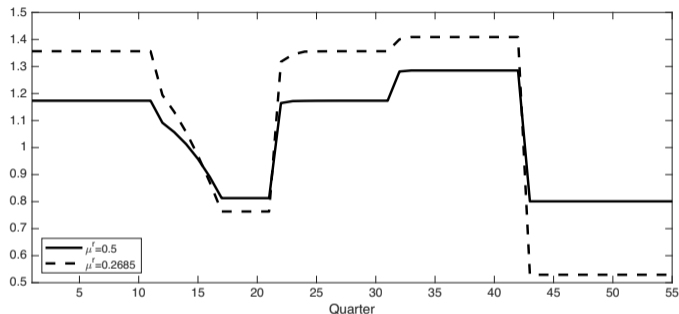


- Lower $\mu^r \Rightarrow$ middle aged save more, absorbing larger share of the fixed asset supply
- Middle aged dominate asset holdings at *any* μ^r : wealth accumulation takes time
- Raising μ^r from 0.05 to 1 lifts the annual real rate by 9pp

Pension design is key determinant of the equilibrium real rate – and hence of monetary policy effectiveness

Mechanism II: the battle of the ages for the safe asset

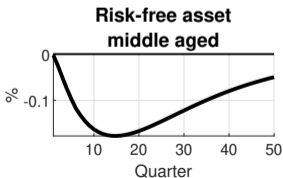
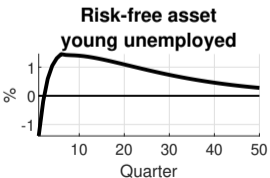
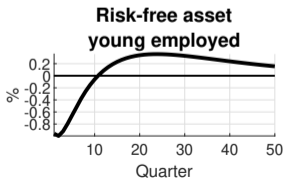
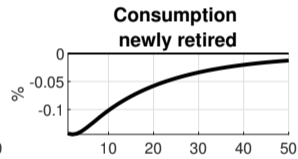
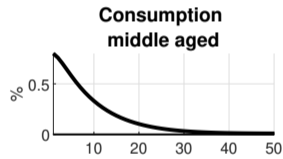
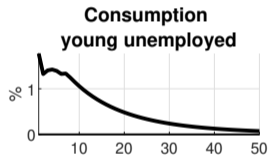
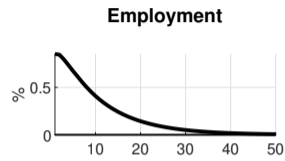
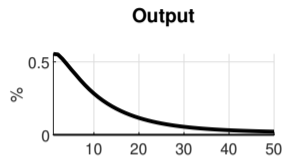
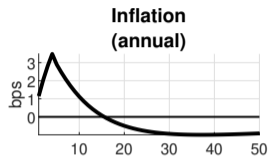
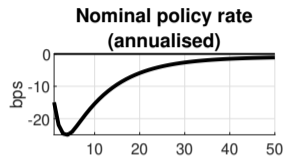
Individual consumption time path: impact of different retirement benefits



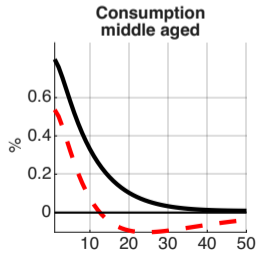
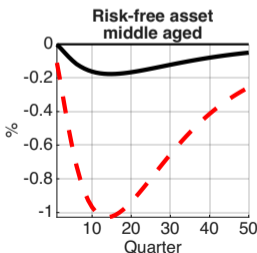
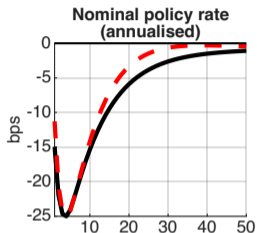
- Lower pensions \Rightarrow middle aged hoard the safe asset \Rightarrow less left for the young to self-insure
- Consumption drop in a long unemployment spell: 31% \rightarrow 44% when μ^r falls to 0.2685
- *Endogenous* market incompleteness: a distributional twist on Aiyagari–McGrattan (1998)

The pension system changes how well the young are insured – without changing unemployment benefits

Finding 1: savers do *not* cut consumption in a typical easing



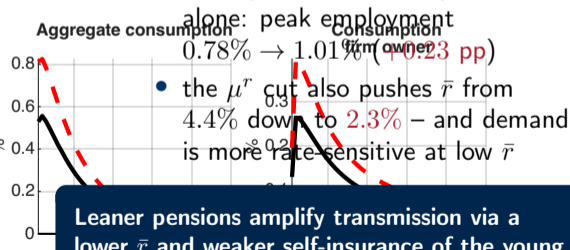
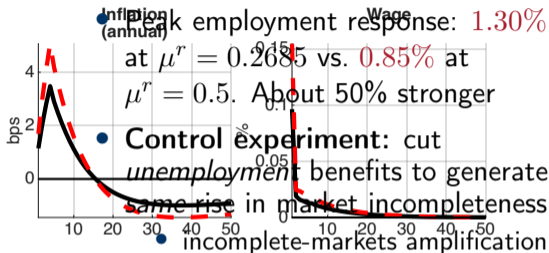
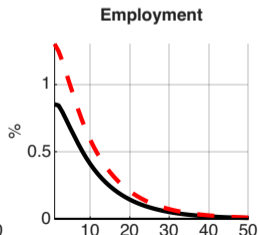
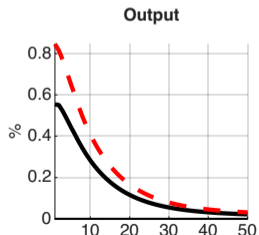
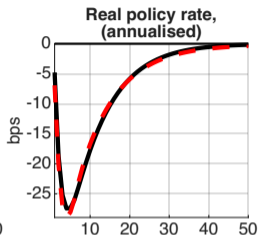
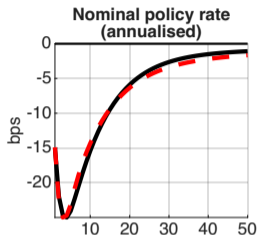
Finding 1: savers do *not* cut consumption in a typical easing (stress test)



- Middle aged are large savers (assets = 138% of annual income vs. 39% for the young) \Rightarrow large **negative income effect** when rates fall
- **Stress test:** fix their after-tax wage, so the lower interest rate is the *only* change they face (red dashed lines)
- Consumption response smaller, but still **positive** for ~ 2.5 years; eventual decline is tiny – middle aged run *down* their asset holdings

The “expropriated saver” is quantitatively not 1st-order concern for typical monetary easing

Solid: baseline. Dashed: after-tax wage of the middle aged held fixed.



Peak employment response: 1.30% at $\mu^r = 0.2685$ vs. 0.85% at $\mu^r = 0.5$. About 50% stronger

Control experiment: cut unemployment benefits to generate same rise in market incompleteness

incomplete-markets amplification alone: peak employment 0.78% \rightarrow 1.01% (+0.23 pp)

the μ^r cut also pushes \bar{r} from 4.4% down to 2.3% – and demand is more rate-sensitive at low \bar{r}

Leaner pensions amplify transmission via a lower \bar{r} and weaker self-insurance of the young

Solid: baseline ($\mu^r = 0.5$) Dashed: low pension ($\mu^r = 0.2685$)

Consumption middle aged (nc) Consumption newly retired (nc)

Takeaways

1. **No saver-driven reversal.** Middle-aged consumption rises robustly after a typical rate cut – even when the rate change is all they experience. Only the newly retired lose, and mildly.
2. **Pension systems shape monetary transmission.** Less generous pensions \Rightarrow more retirement saving \Rightarrow lower \bar{r} and a fiercer battle for safe assets \Rightarrow monetary policy roughly 50% more powerful.
3. **The level of \bar{r} matters for potency.** Demand is more rate-sensitive when the steady-state real rate is low; demographics and pension reform move that level.

For policy: aging and pension reform are not just fiscal issues, but they alter the economy's elasticity to monetary policy and the distribution of its effects.