Intergenerational Distributional Impact of the Zero Lower Bound

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Why does it matter?

- A change in monetary policy could have redistributive effects.

Two Examples:

- By lowering interest rates, monetary policy could harm (richer and older) households that earn more on interest-bearing assets but is usually helpful for (poorer and younger) households that rely on credit and labour income.
- By lowering interest rates, monetary policy could likely inflate asset prices, which are owned mainly by a small fraction of households (in the top wealth segments).

Life Cycle Dimension

- **Life cycle dimension** of heterogeneity is largely unexplored.
- Bielecki et al.(2022, JEEA) are the first to study this in an OHANK (overlapping generations heterogeneous agent New Keynesian) setup.
- They find that a conventional monetary policy easing (20 bps rate cut) has a distributional effect between age-cohorts - monetary expansion benefits young HHs (at the expense of old HHs).

What do we do?

- It would be revealing and more realistic to study the distributional impact of monetary policy in a zero lower bound (ZLB) scenario.

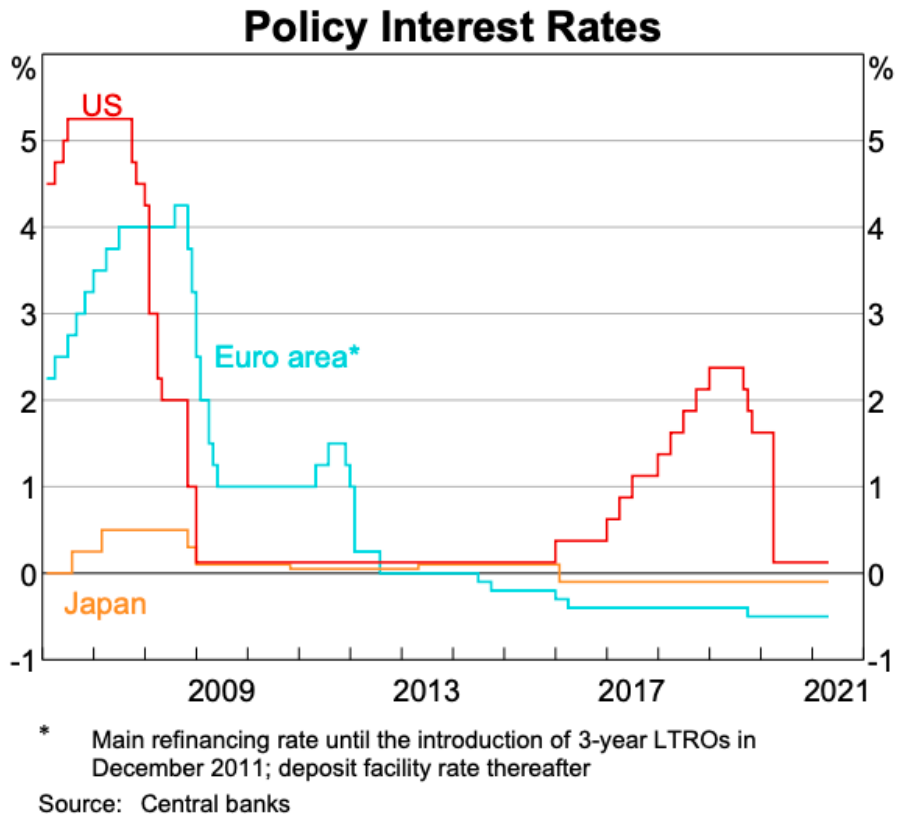

Figure 1: Policy Rates after the Global Financial Crisis

- We build on Bielecki et al.(2022), and try to create a scenario of a deep recession wherein the zero lower bound (ZLB) shows persistence.
- We do this by:
  - Introducing a **zero lower bound (ZLB) constraint** on nominal interest rates and
  - Following the literature[1], we introduce a positive **discount factor shock** that pushes the economy into the zero lower bound region.
- The discount factor shock alters the consumption-savings behaviour of the households such that they start placing more value on future consumption while spending less today.

[1] Basu and Bundick, 2017; Fernández-Villaverde et al., 2015; Nakata, 2017

Model Outline

- A (multi generational) NK DSGE model economy that consists of:
  - **Households** (80 cohorts)
  - **Firms** (4 types)
    - Final good producers: Produce homogeneous final good by purchasing intermediate inputs.
    - Intermediate goods producers: Produce differentiated goods by using capital and labour.
    - Capital producers: Produce new capital by purchasing investment goods and combining existing capital.
    - Investment funds: Intermediate nominal assets and rent physical capital.
  - **Government**
    - Fiscal Authority
    - Monetary Authority
- The model parameters are calibrated to the euro area, and the model is solved non-linearly using perfect foresight simulation.

Model in a Nutshell: Optimization Problem

- A representative j-aged household maximizes her expected remaining lifetime utility:

$$U_{j,t} = \mathbb{E}_t \sum_{s=0}^{J-j} \beta^s \exp\left(\varepsilon_t^u\right) \frac{N_{j+s,t+s}}{N_{j,t}} \begin{bmatrix} \log\left(c_{j+s,t+s} - \varrho \bar{c}_{j+s,t+s-1}\right) \\ +\psi_{j+s} \log \chi_{j+s+1,t+s+1} \\ -\varphi_{j+s} \frac{h_{j+s,t+s}^{1+\varphi}}{1+\varphi} \end{bmatrix} \tag{1}$$

where $\beta > 0$ is the discount factor and ε_t^u is the AR(1) discount factor shock:

$$\varepsilon_t^u = \rho_u \varepsilon_{t-1}^u + e_t^u, \tag{2}$$

- subject to the budget constraint:

$$\begin{aligned} &c_{j,t} + p_{\chi,t}[\chi_{j+1,t+1} - (1-\delta_\chi)\chi_{j,t}] + a_{j+1,t+1} \\ &\quad = (1-\tau_t) w_t(\iota) z_j h_{j,t}(\iota) + \frac{R_{j,t}^a}{\pi_t} a_{j,t} + beq_{j,t} + beq_{j,t}^\chi + \Xi_{j,t}(\iota) \end{aligned} \tag{3}$$

Euler Equation

- A key optimality condition for households:

$$(c_{j,t} - \varrho c_{j,t-1})^{-1}(1-\varrho) = \beta E[(1-\omega_j)\exp(\varepsilon_t^u)(c_{j+1,t+1} - \varrho c_{j+1,t})^{-1}(1-\varrho)(R_{t+1}/\pi_{t+1})] \tag{4}$$

- The Euler equation tells us how the household allocates consumption between today and tomorrow, depending on the interest rate.

Monetary Authority

- The (gross) nominal interest rate are set according to a Taylor rule that takes into account the zero lower bound constraint.

$$R_t = \begin{cases} R_t^* & \text{if } R_t^* > 1 \\ 1 & \text{if } R_t^* \leq 1 \end{cases} \tag{5}$$

where,

$$\frac{R_t^*}{R} = \left(\frac{R_{t-1}^*}{R}\right)^{\gamma_R} \left[\left(\frac{\pi_t}{\pi}\right)^{\gamma_\pi} \left(\frac{y_t}{y_{t-1}}\right)^{\gamma_y}\right]^{1-\gamma_R} \exp\left(\varepsilon_t^R\right) \tag{6}$$

Age Profiles of Assets (Data)

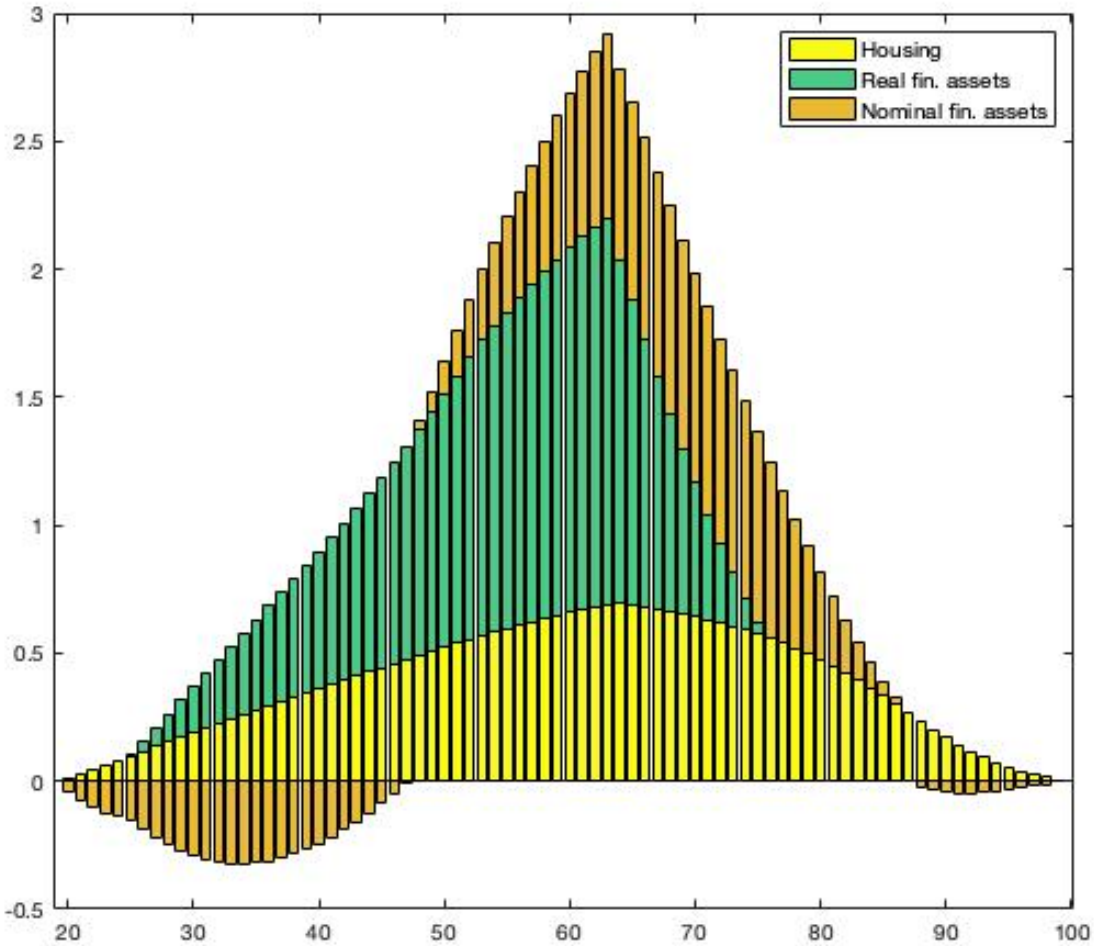

Figure 2: Smoothed age profiles of assets over the lifecycle after matching raw data

Impulse Responses of Asset Prices

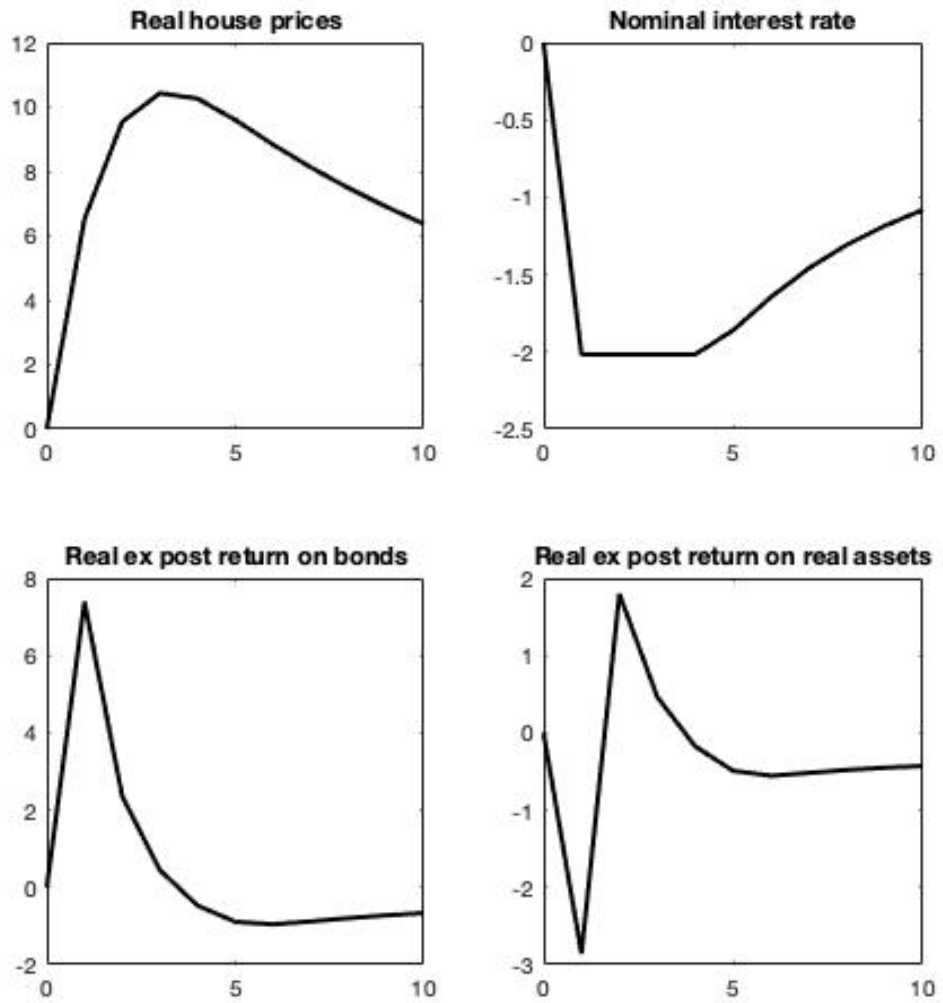

Figure 3: Aggregate responses to a discount factor shock at ZLB

Redistributive Effects on Impact

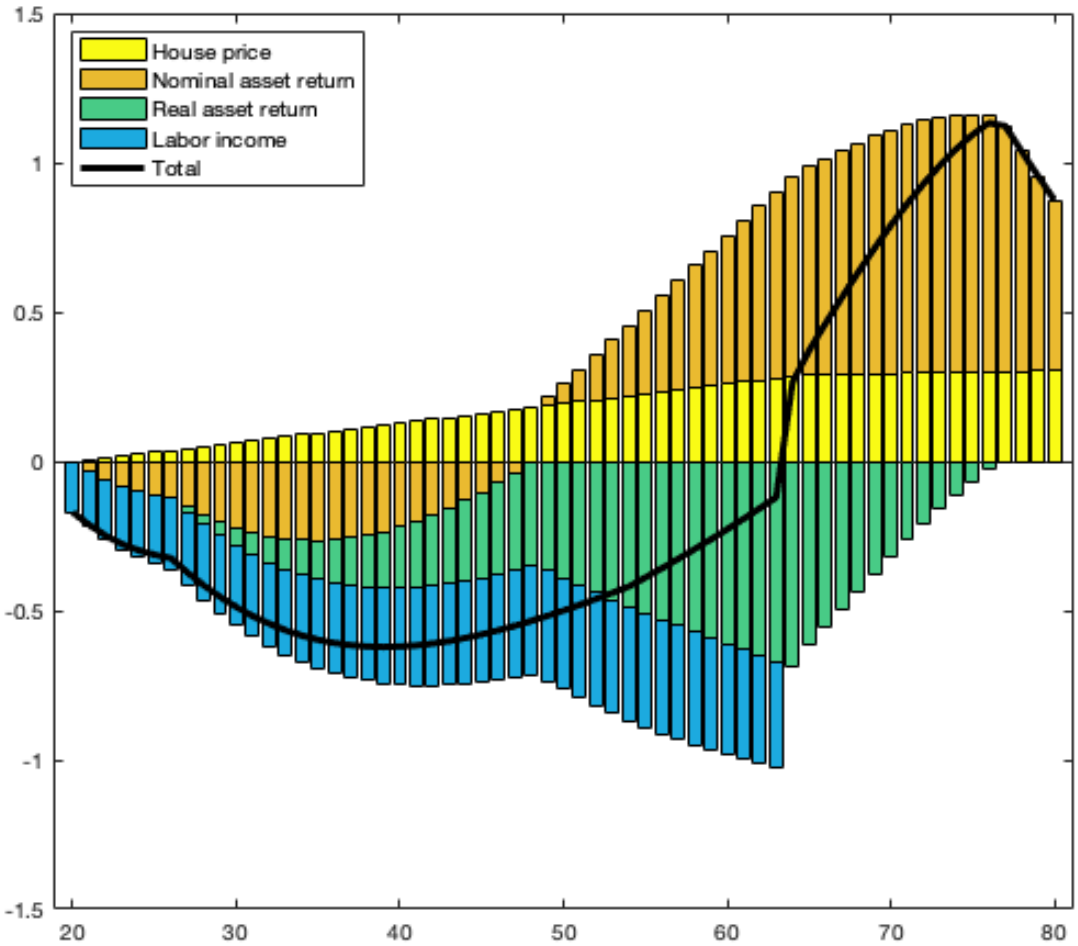

Figure 4: Redistributive Effects following a discount factor shock at ZLB

On Impact Vs Life-Time Effects

- What matters for redistribution is where you are on the path of asset accumulation (Auclert, 2019)

- Example: higher house prices are bad for a 40 year old HH despite a rise in house prices, because they are in the process of accumulating housing.

Redistributive Effects Over the Lifecyle

- The welfare is transferred from the working (middle-aged) cohorts towards the youngest and oldest cohorts.

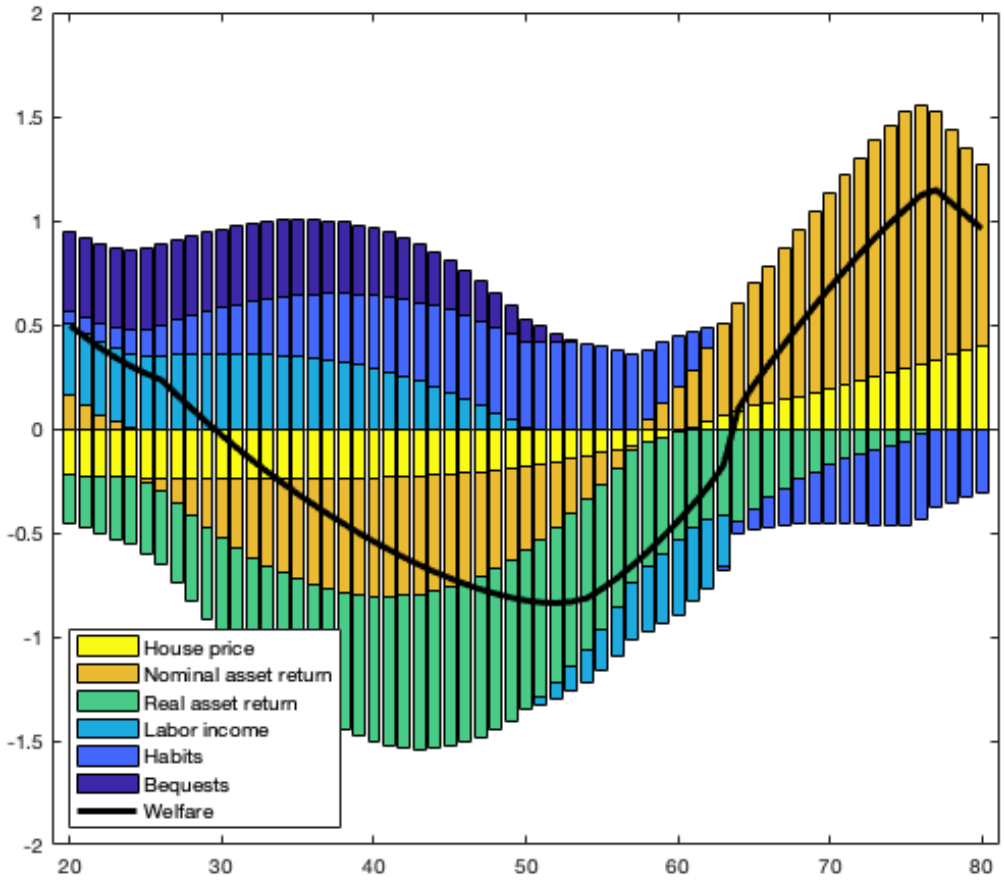

Figure 5: Welfare effects over the lifecycle in a persistent zero lower bound

Redistributive Effect of the ZLB

- When monetary policy is not constrained (Figure 7), the welfare effect is reduced as the proportions of losses arising from assets become even more amplified.

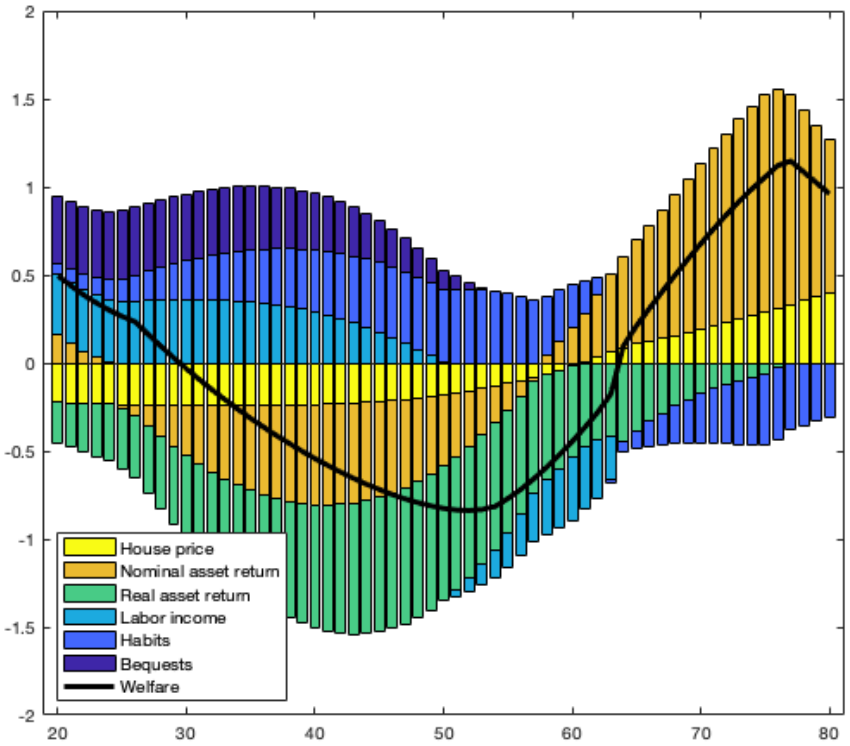

Figure 6: Welfare: DFS with the ZLB

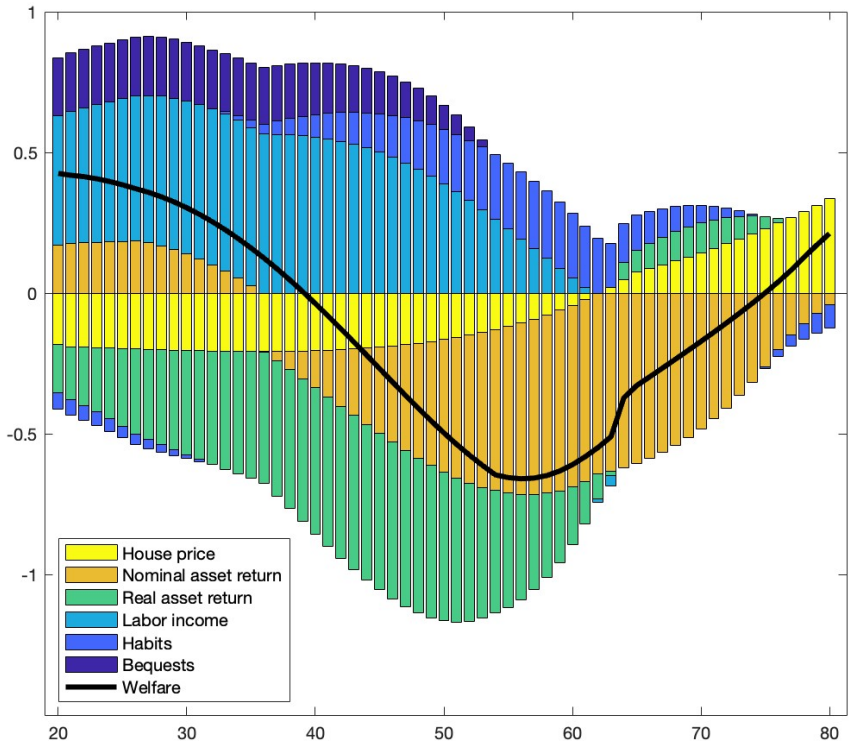

Figure 7: Welfare: DFS without the ZLB

Additional Effect of the ZLB

- The ZLB has the additional effect of preventing the elderly from being the greatest losers.
- In the absence of the ZLB, the older generations suffer losses due to the incredibly poor returns on nominal financial assets, which are the predominant vehicle for retirement savings.

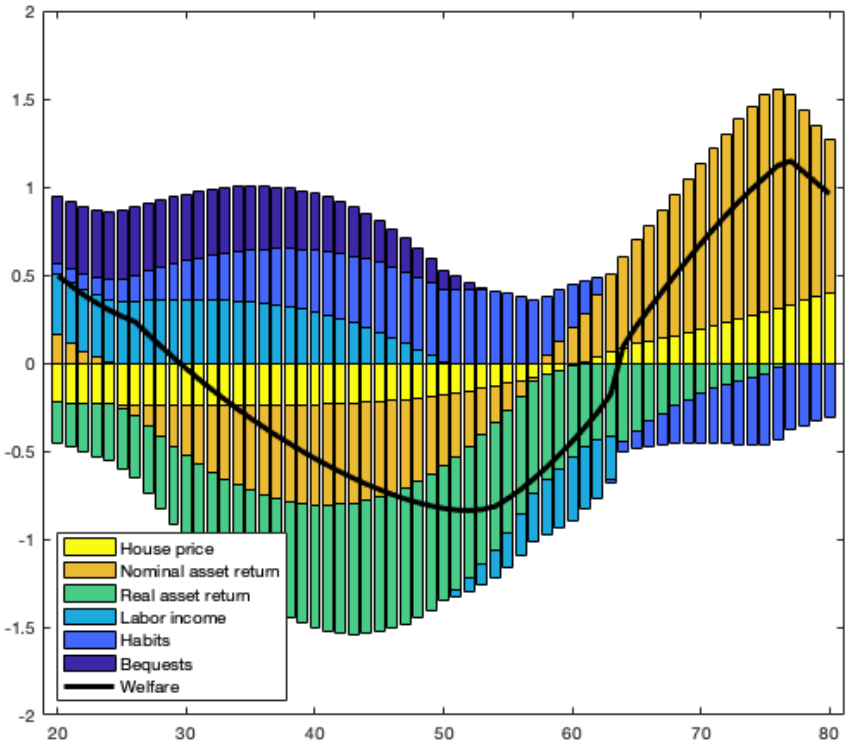

Figure 8: Welfare: DFS with the ZLB

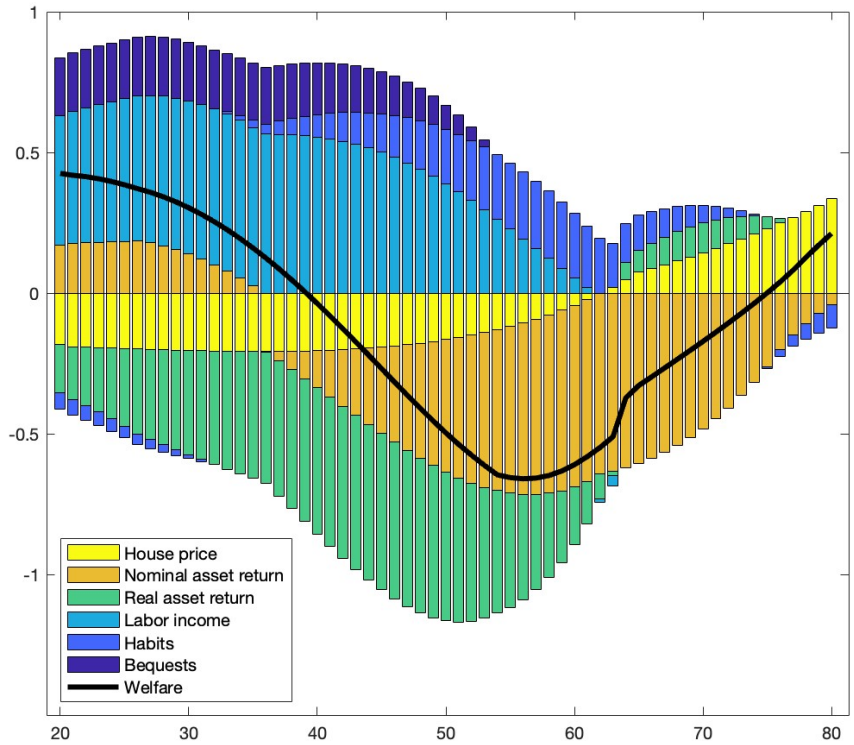

Figure 9: Welfare: DFS without the ZLB

Conclusion

- A shock to the discount factor when interest rates are at ZLB redistributes welfare across age cohorts.
- Redistribution over life-time differs crucially from redistribution on impact.
- The ZLB scenario benefits the older cohorts, whereas the middle-aged cohorts lose under all policies.

Future Work

- The complementarity of fiscal and monetary policy interactions.
- Modelling credit constraints on households.
- Assessing the properties of optimal monetary policies (commitment vs. discretion).
- Unconventional monetary policies (Forward Guidance and QE).

Thank You!

References

Auclert, A. (2019). Monetary policy and the redistribution channel. *American Economic Review*, *109*(6), 2333–67.

Basu, S., & Bundick, B. (2017). Uncertainty shocks in a model of effective demand. *Econometrica*, *85*(3), 937–958.

Fernández-Villaverde, J., Gordon, G., Guerrón-Quintana, P., & Rubio-Ramirez, J. F. (2015). Nonlinear adventures at the zero lower bound. *Journal of Economic Dynamics and Control*, *57*, 182–204.

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Impulse Responses (by cohorts)

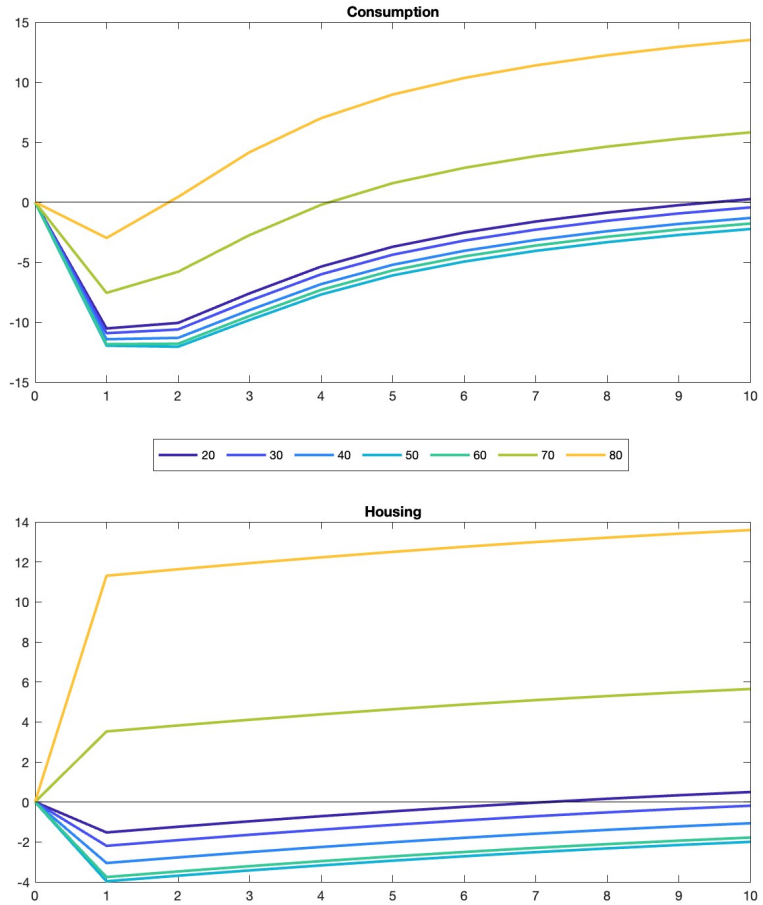

Figure 10: Impact on Consumption and Housing by Cohorts

Aggregate Impulse Responses

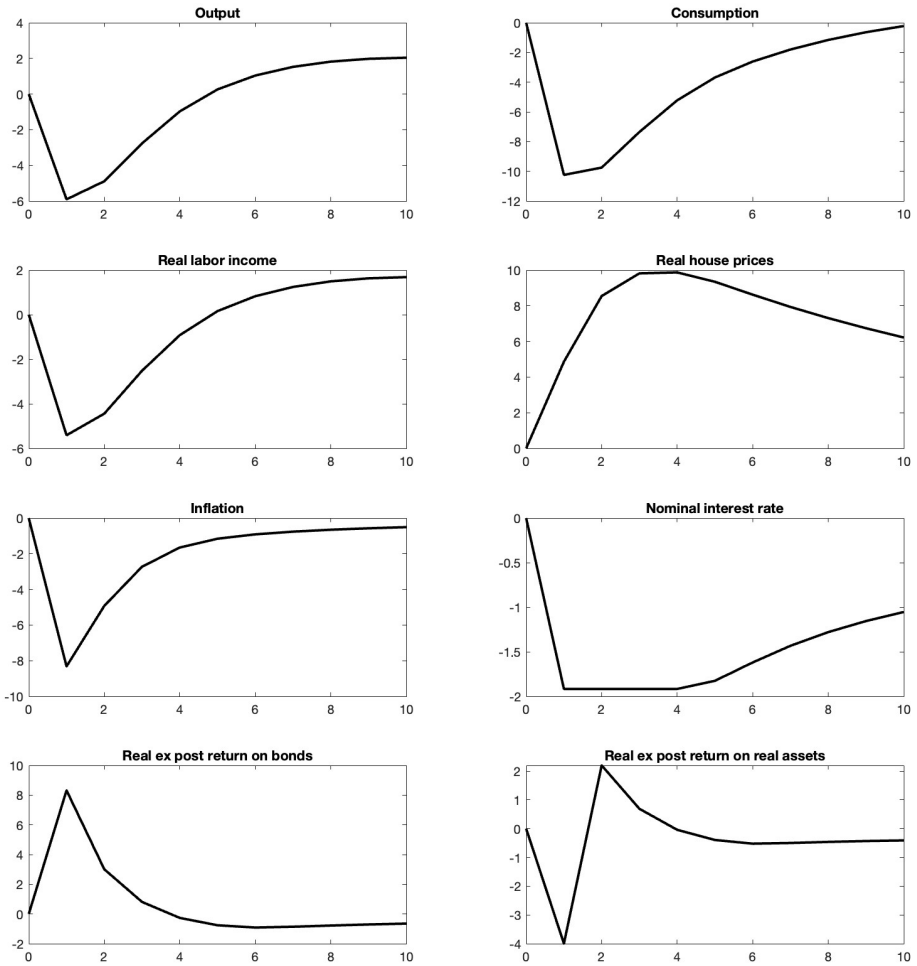

Figure 11: Aggregate Responses to a DFS at ZLB