For whom the bill tolls: redistributive consequences of a monetary-fiscal stimulus

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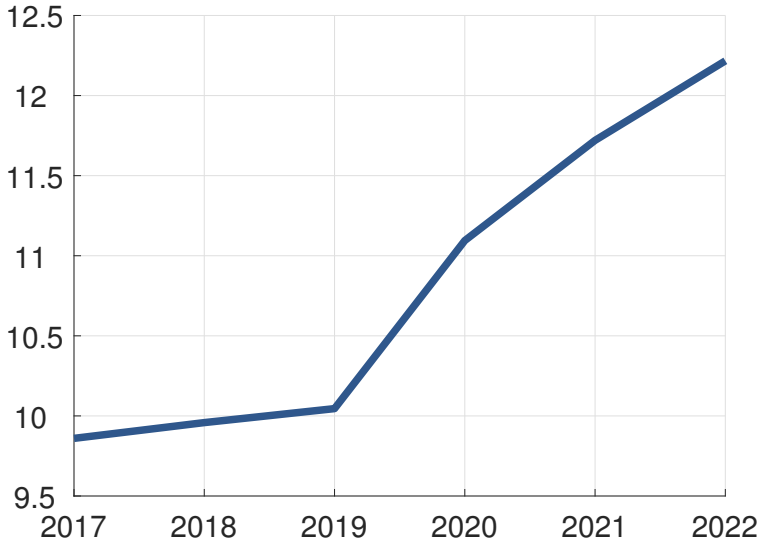
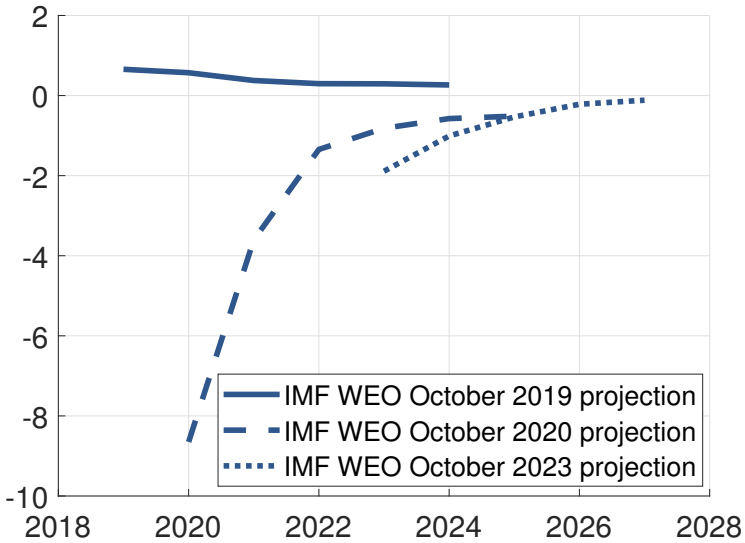
Large fiscal expansion during the pandemic

General gov. debt (EUR tn)



Source: Eurostat

Forecasts of primary surplusses

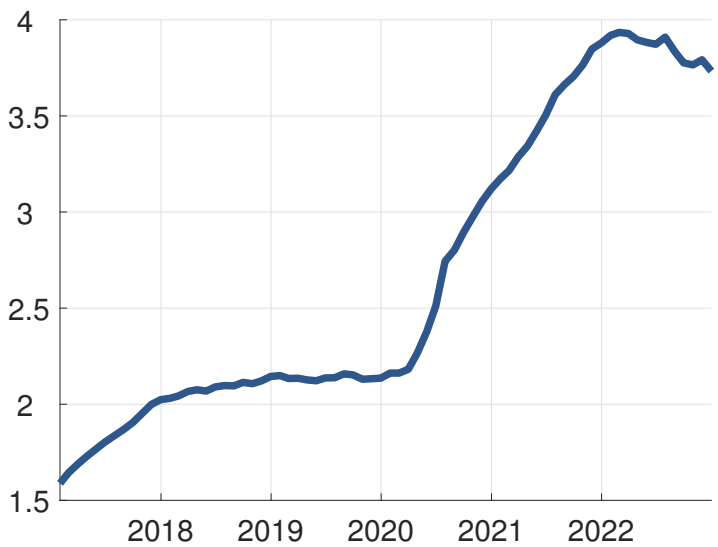


Source: IMF WEO

- Perceived as (partly) unfunded (e.g. Barro & Bianchi 2023)

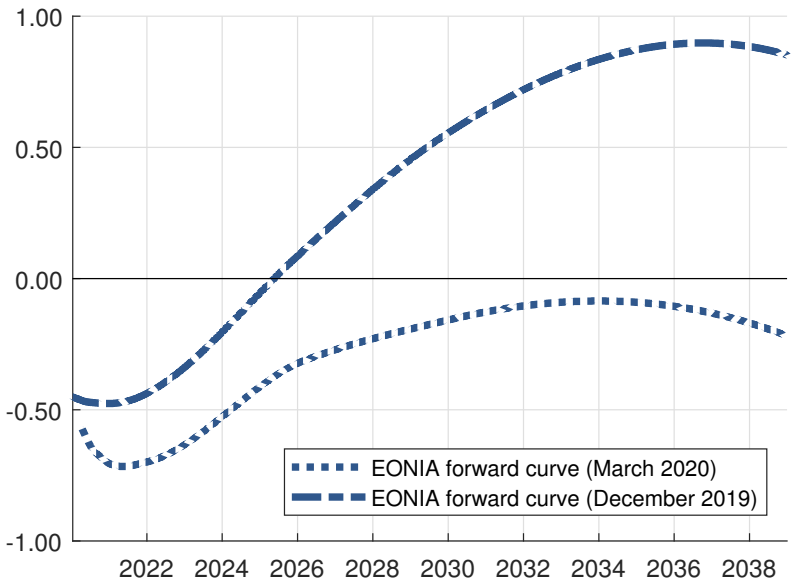
& accomodative monetary policy

Eurosystem holdings of gov. securities (EUR tn)



Source: ECB

EONIA forward rate (%)



Source: ECB

What do we do?

- The stimuls was necessary but...
- ... must have had large (direct & indirect) redistributive effects...
  - Income side (transfers + macro effects)
  - Financing side (no tax increases; macro effects)
- ... which we study

Major questions:

1. who gained and who paid the bill?
2. relative strenght of direct vs indirect effects
3. role of fiscal / monetary policy

Literature

- Monetary policy/ inflation have significant redistributive effects (in particular indirect effects):
  - inflation benefits the young: Doepke and Schneider (2006), Albanesi (2007), Adam and Zhu (2016), Pallotti et al. (2023)
  - expansionary monetary redistributes from old to young, from rich to poor: Coibion et al. (2017), Dossche et al. (2021), Lenza and Slačálek (2021) Bielecki et al. (2022)
- Fiscal policy and redistribution during the pandemic:
  - macroeconomic effects matter for redistribution: Bhattarai et al. (2023) in a TANK model
- The macroeconomic effects of fiscal policy depend on monetary policy reaction & funding:
  - stronger effects @ZLB: Christiano et al. (2011), Woodford (2011)
  - inflation and output effects stronger for unfunded fiscal shocks/ passive monetary policy reaction: theory: Leeper (1991); Bianchi et al. (2023); English et al. (2017), empirics: Cloyne et al. (2020); Hack et al. (2023),
  - stimulus was (partly) unfunded: Barro & Bianchi (2023)

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Model structure: overview

- Life-cycle model...
  - 80 cohorts of overlapping generations of households (age 20-99)
  - Detailed, age-specific asset structure: deposits, loans, bonds, housing, real fin. assets
- ...with nominal & real frictions...
  - sticky prices, sticky wages, habits, investment adjustment costs
- ...government and central bank
- Calibrated for the euro area (HFCS data)

Households

- Maximize expected lifetime utility

$$U_{j,t} = \mathbb{E}_t \sum_{i=0}^{J-j} \beta^i \frac{N_{j+i}}{N_j} \Bigg(\log(c_{j+s,t+s} - \varrho \bar{c}_{j+s,t+s-1}) + \upsilon_j \log \chi_{j,t} + \psi_j \log m_{j,t} + \frac{\bar{g}}{\bar{c}_j} \log(g_{t+s} - \varrho \bar{g}_{t+s-1}) - \phi_j \frac{h_{j,t}(\iota)^{1+\frac{1}{\varphi}}}{1+\frac{1}{\varphi}} \Bigg)$$

subject to

$$c_{j,t} + p_{\chi,t}[\chi_{j,t} - (1-\delta_\chi)\chi_{j-1,t-1}] + m_{j,t} + a_{j,t} + \frac{R_t}{\pi_t} s_{j-1,t-1} =$$

$$= (1-\tau) w_t z_j h_{j,t} + s_{j,t} + tr_{j,t} + \frac{R^m_t}{\pi_t} m_{j-1,t-1} + \frac{R^a_{j,t}}{\pi_t} a_{j-1,t-1} + beq_{j,t}$$

- Calvo-type wage stickiness

Frictionless financial intermediation

- Investment funds:
  - Manage bonds and real financial assets owned by households
  - Maximize expected return on total portfolio
  - Distribute ex-post returns to HHs according to age-specific and exogenous portfolio composition $R^a_{j,t} = \eta_{j,t} R_{t-1} + (1 - \eta_{j,t}) R^f_t$
- Banks:
  - Accept deposits
  - Grant loans $s_{j,t} = \ell_{j,t} + (1 - \frac{1}{m}) s_{j-1,t-1}/\pi_t$, collateralized on housing $\ell_{j,t} = LTV_j \chi_{j,t} p_{\chi,t}$
  - Balance sheet: $s_t + rr_t + b^b_t = m_t$

Producers

- Final goods aggregated from differentiated intermediate products

$$c_t + i_t + g_t + \delta_\chi p_{\chi,t} \chi = \left[\int y_t(i)^{\frac{1}{\mu}} \mathrm{d}i \right]^{\mu}$$

- Intermediate goods firms produce differentiated products

$$y_t(i) = k_t(i)^{\alpha} h_t(i)^{1-\alpha}$$

- Maximize profits $f_t(i) = y_t(i) - r_t^k k_t(i) - w_t h_t(i)$
- Face Calvo-type price stickiness
- Capital producers are subject to investment adjustment cost

$$(1+n)k_{t+1} = (1-\delta)k_t + \left[1 - S\left(\frac{i_t}{i_{t-1}} \right) \right] i_t$$

Government

- Various transfers and public consumption...
- ... financed with taxes and debt

$$\frac{R_t}{\pi_t} b_t + g_t + tr_t^H + tr_t^W + tr_t^R + tr_t^F = (1+n)\, b_{t+1} + \tau w_t h_t$$

Central bank

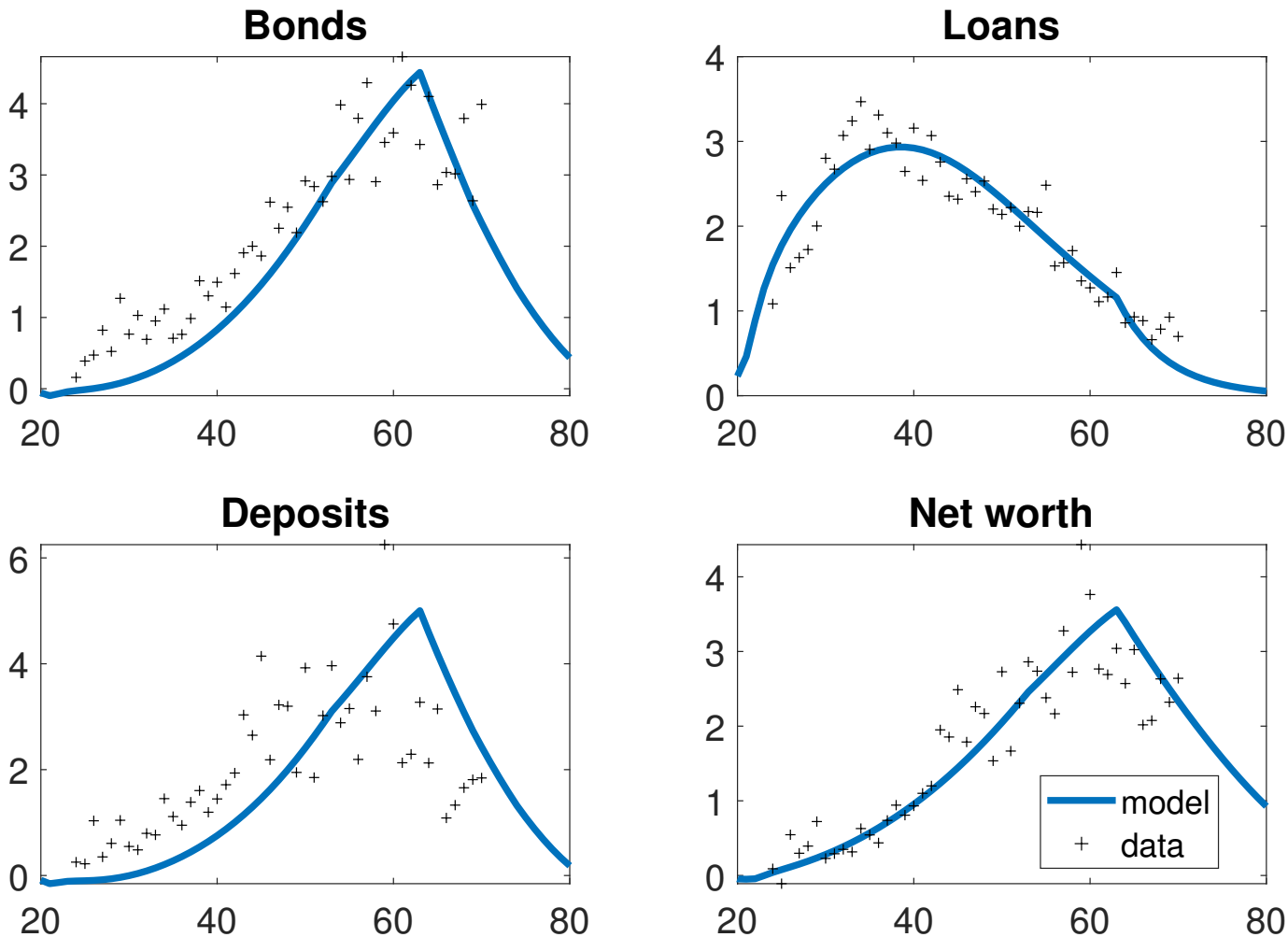
- Baseline scenario: accomodation of fiscal expansion via creation of reserves

$$rr_t = b_t^c$$

- In this case the the stimulus partly unfunded
- Alternative scenario: Taylor rule with ELB

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

Calibration for the euro area



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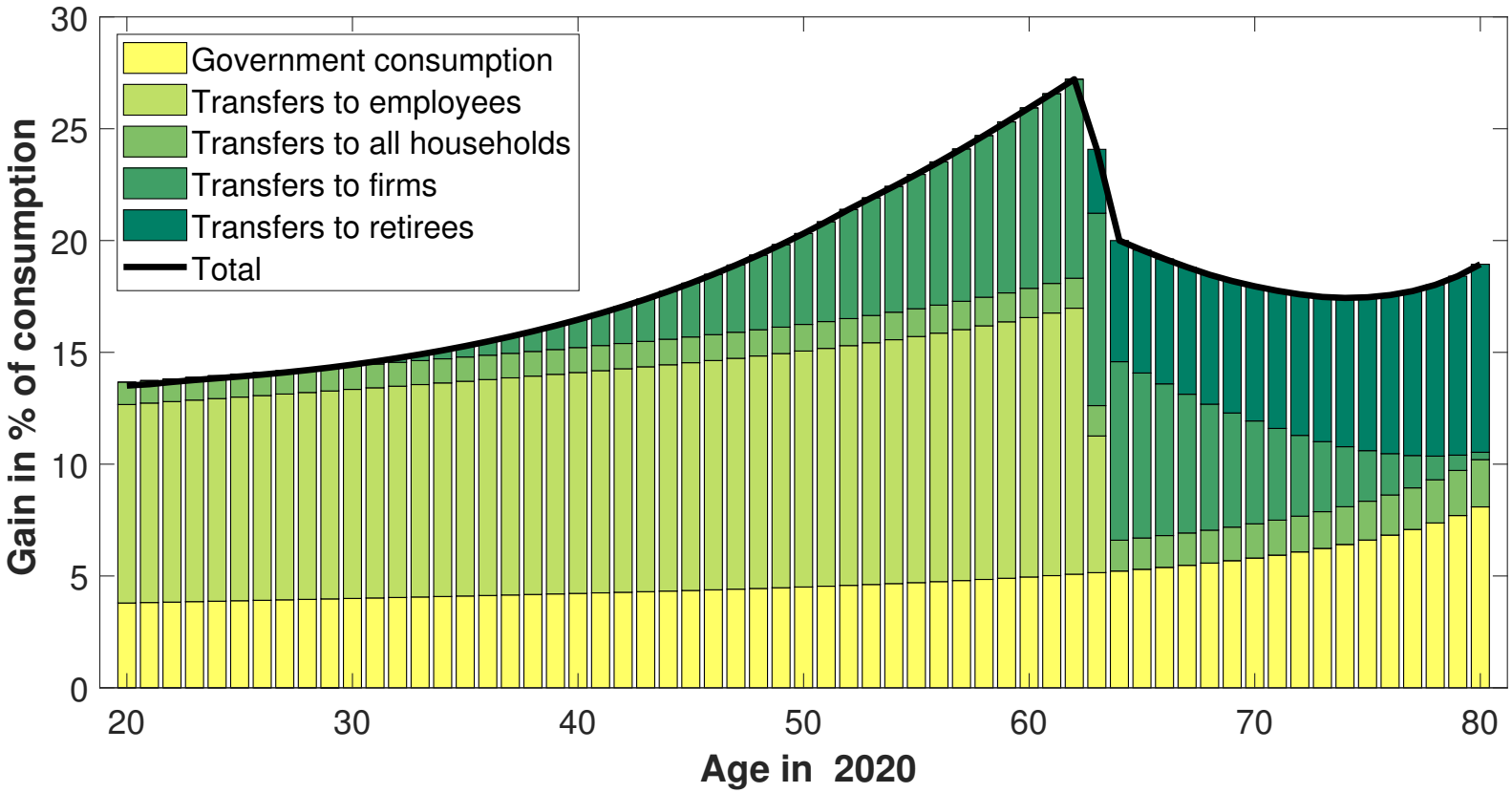
Fiscal stimulus

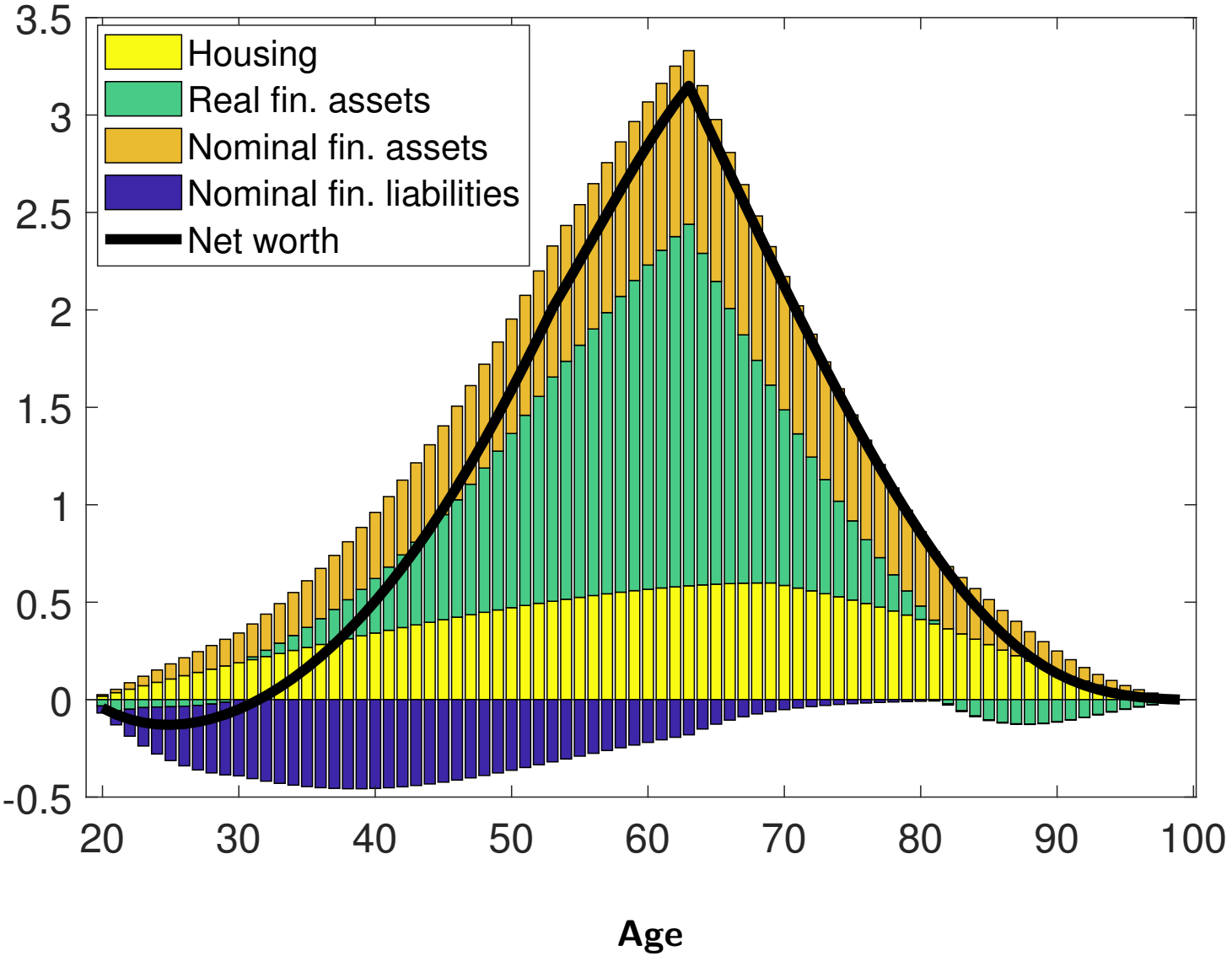
- Source: Eurostat data on GG expenditure by function
- Fiscal expenditure allocated to five categories

Expenditure (% GDP in 2019)	**2020**	**2021**
Transfers to employees	2.08	2.07
Public consumption	1.03	1.46
Transfers to firms	0.45	0.89
Transfers to retirees	0.34	0.40
Other transfers to households	0.13	0.53
Total	**4.02**	**5.35**

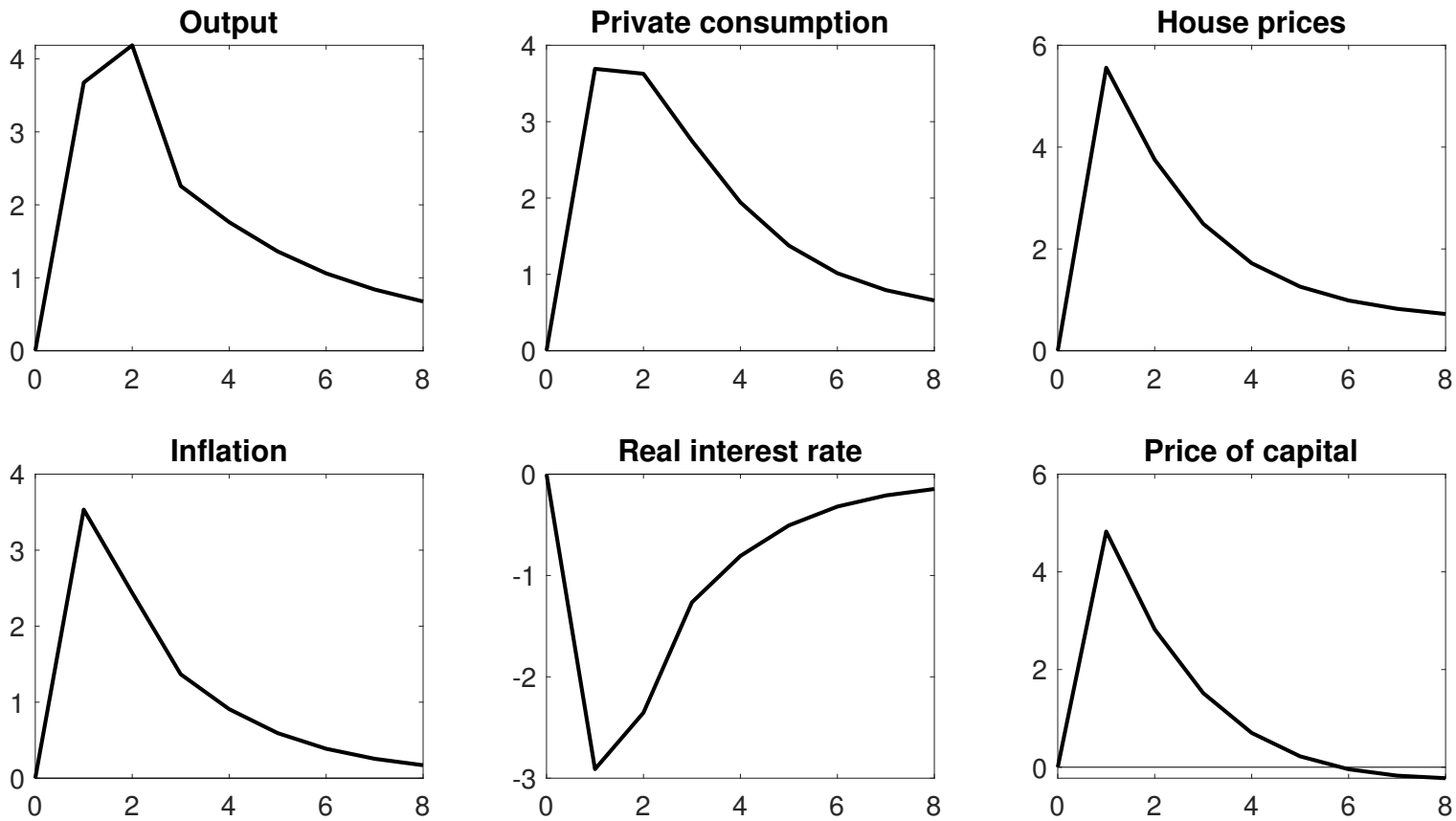
Government spending by cohort (direct effects)



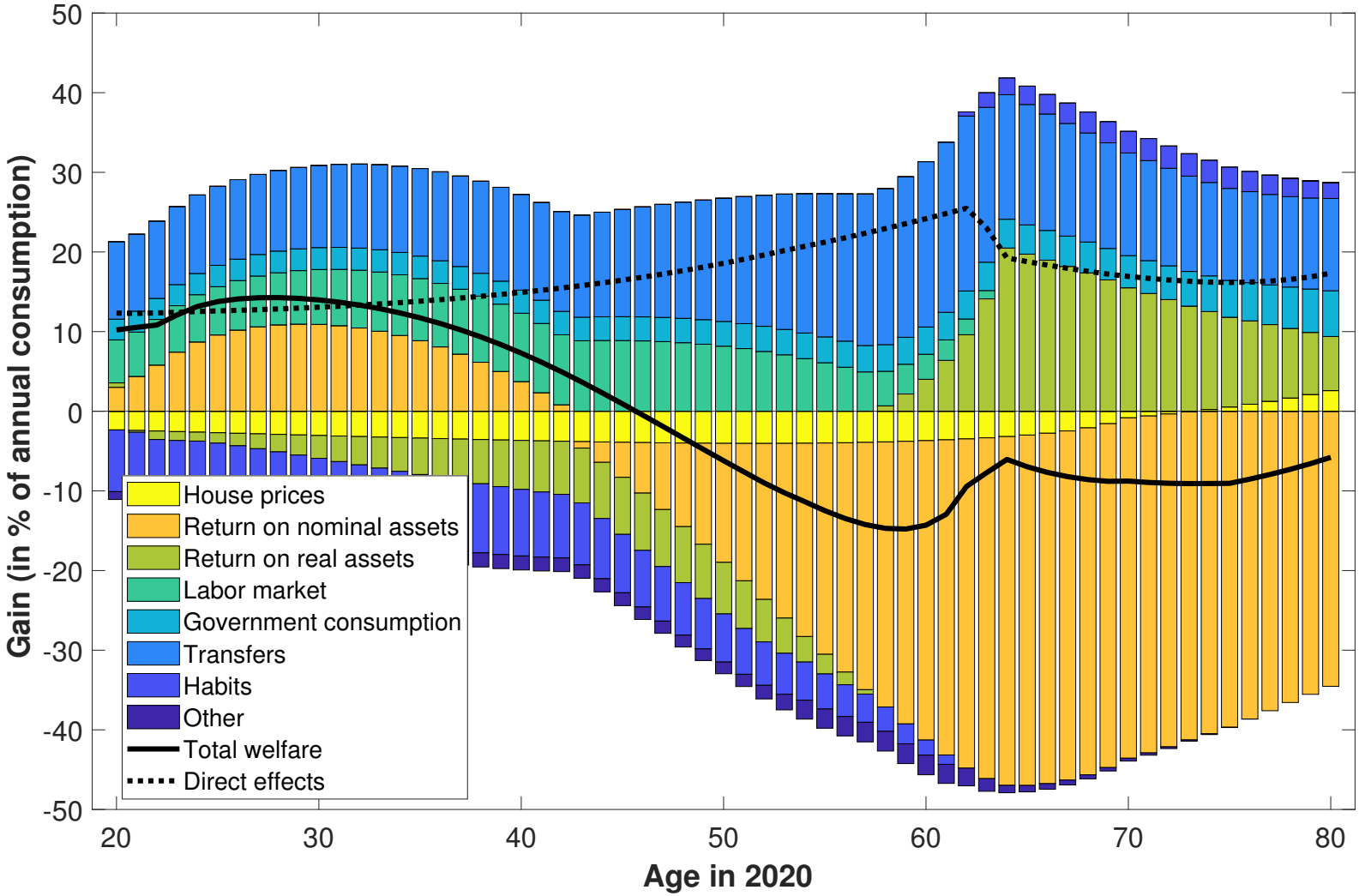
Heterogeneity of asset holdings



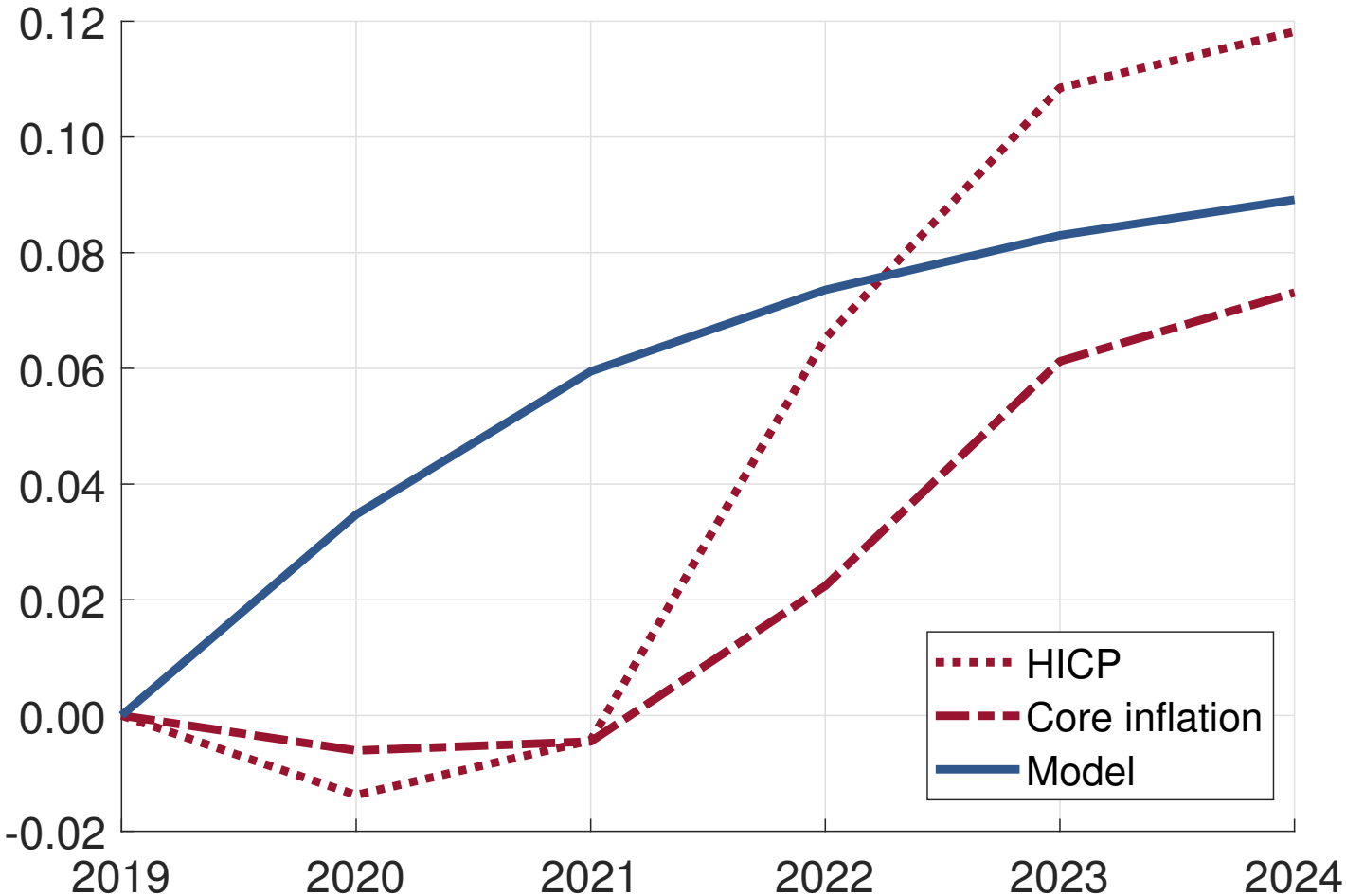
Macroeconomic effects of stimulus



Welfare effects of stimulus by economic channel

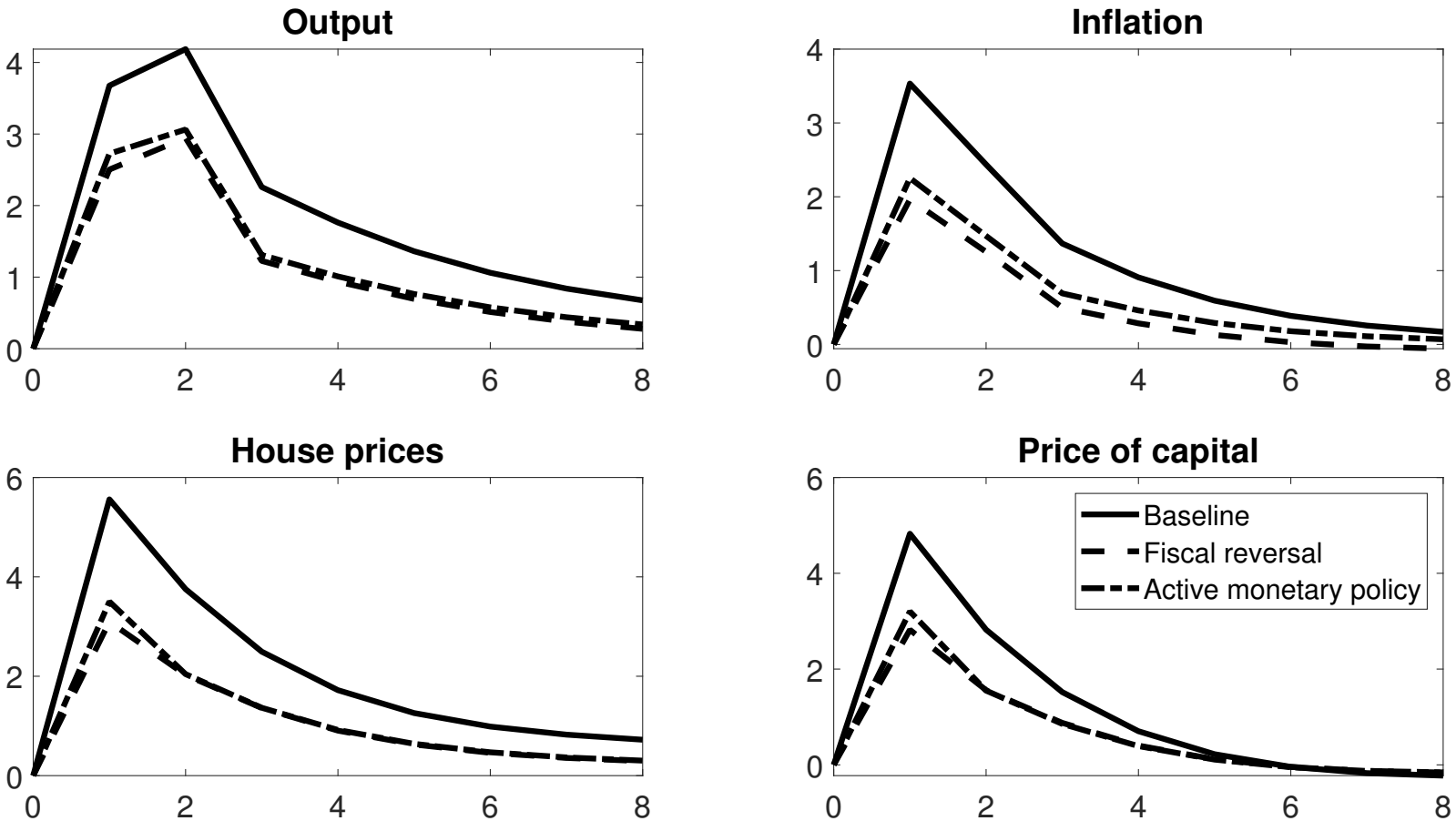


Validation: comparison of price levels

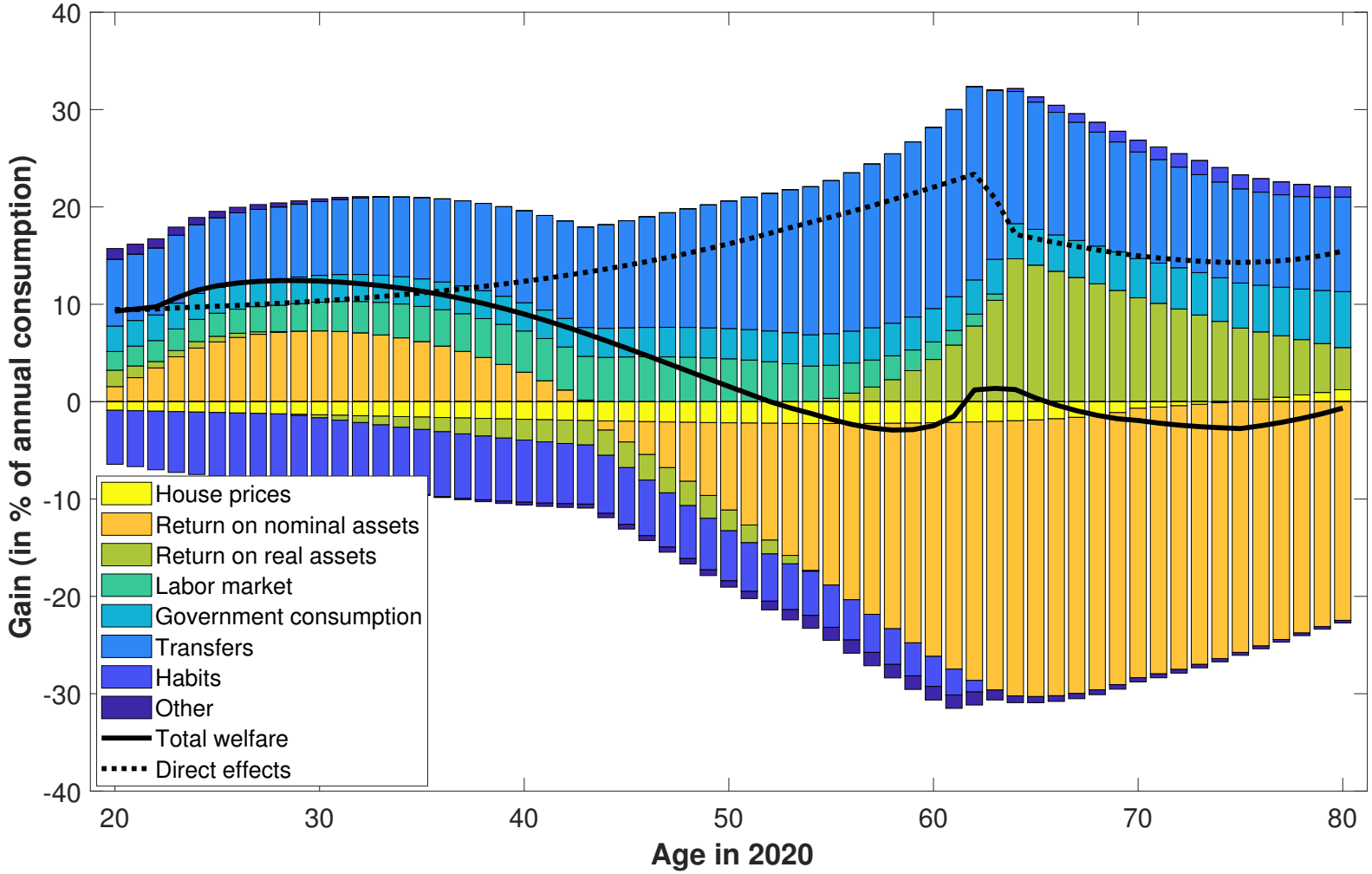


Note: All data in deviation from trend or steady state. Data for 2024 comes from the ECB Staff projections from March 2024.

Alternative assumptions about monetary/fiscal policy



Welfare effects: active monetary policy + ELB



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Conclusions

Who gained? The younger: workers and indebted households

Who paid the bill? The older: owners of nominal assets

General equilibrium channels inverted the effect for many cohorts

The redistribution is strong, when:
- public deficit is unfunded or
- monetary policy is constrained (ELB)

Literature

Adam, Klaus, and Junyi Zhu (2016) 'Price-Level Changes and the Redistribution of Nominal Wealth Across the Euro Area.' *Journal of the European Economic Association* 14, 871–906

Albanesi, Stefania (2007) 'Inflation and inequality.' *Journal of Monetary Economics* 54(4), 1088–1114

Bhattarai, Saroj, Jae Won Lee, and Choongryul Yang (2023) 'Redistribution and the monetary fiscal policy mix.' *Quantitative Economics* 14(3), 817–853

Bianchi, Francesco, Renato Faccini, and Leonardo Melosi (2023) 'A Fiscal Theory of Persistent Inflation.' *The Quarterly Journal of Economics* 138(4), 2127–2179

Bielecki, Marcin, Michal Brzoza-Brzezina, and Marcin Kolasa (2022) 'Intergenerational Redistributive Effects of Monetary Policy .' *Journal of the European Economic Association* 20(2), 549–580

Christiano, Lawrence, Martin Eichenbaum, and Sergio Rebelo (2011) 'When is the government spending multiplier large?' *Journal of Political Economy* 119(1), 78–121

Cloyne, James, Oscar Jorda, and Alan M. Taylor (2020) 'Decomposing the Fiscal Multiplier.' Working Paper Series 2020-12, Federal Reserve Bank of San Francisco, March

Coibion, Olivier, Yuriy Gorodnichenko, Lorenz Kueng, and John Silvial (2017) 'Innocent bystanders? monetary policy and inequality.' *Journal of Monetary Economics* 88, 70–89

Doepke, Matthias, and Martin Schneider (2006) 'Inflation and the redistribution of nominal wealth.' *Journal of Political Economy* 114, 1069–1097

Dossche, Maarten, Jiří Slačálek, and Guido Wolswijk (2021) 'Monetary policy and inequality.' *ECB Economic Bulletin, Issue 2/2021*

English, William B., Christopher J. Erceg, and J. David Lopez-Salido (2017) 'Money-Financed Fiscal Programs : A Cautionary Tale.' Finance and Economics Discussion Series 2017-060, Board of Governors of the Federal Reserve System (U.S.), June

Hack, Lukas, Klodiana Istrefi, and Matthias Meier (2023) 'Identification of systematic monetary policy.' Working Paper Series 2851, European Central Bank, October

Leeper, Eric M. (1991) 'Equilibria under 'active' and 'passive' monetary and fiscal policies.' *Journal of Monetary Economics* 27(1), 129–147

Lenza, Michele, and Jiří Slačálek (2021) 'How does monetary policy affect income and wealth inequality? Evidence from quantitative easing in the euro area .' *ECB Working Paper Series, No 2190/2018*

Woodford, Michael (2011) 'Simple analytics of the government expenditure multiplier.' *American Economic Journal: Macroeconomics* 3(1), 1–35

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Calibration

Parameter	Value	Description
β	0.9875	Discount factor
φ	0.5	Frisch elasticity of labor supply
ϱ	0.32	Habit persistence
δ_χ	0.04	Housing depreciation rate
δ	0.12	Capital depreciation rate
α	0.25	Capital share in output
S_1	4	Investment adjustment cost curvature
μ	1.2	Steady state product markup
θ	0.19	Calvo probability (prices)
Φ	0.04	Intermediate goods producers fixed cost
μ_w	1.2	Steady state wage markup
θ_w	0.41	Calvo probability (wages)
g_y	0.2	Share of government purchases in GDP
b^g/y	0.54	Steady state government bonds to GDP ratio
π	1.02	Inflation target

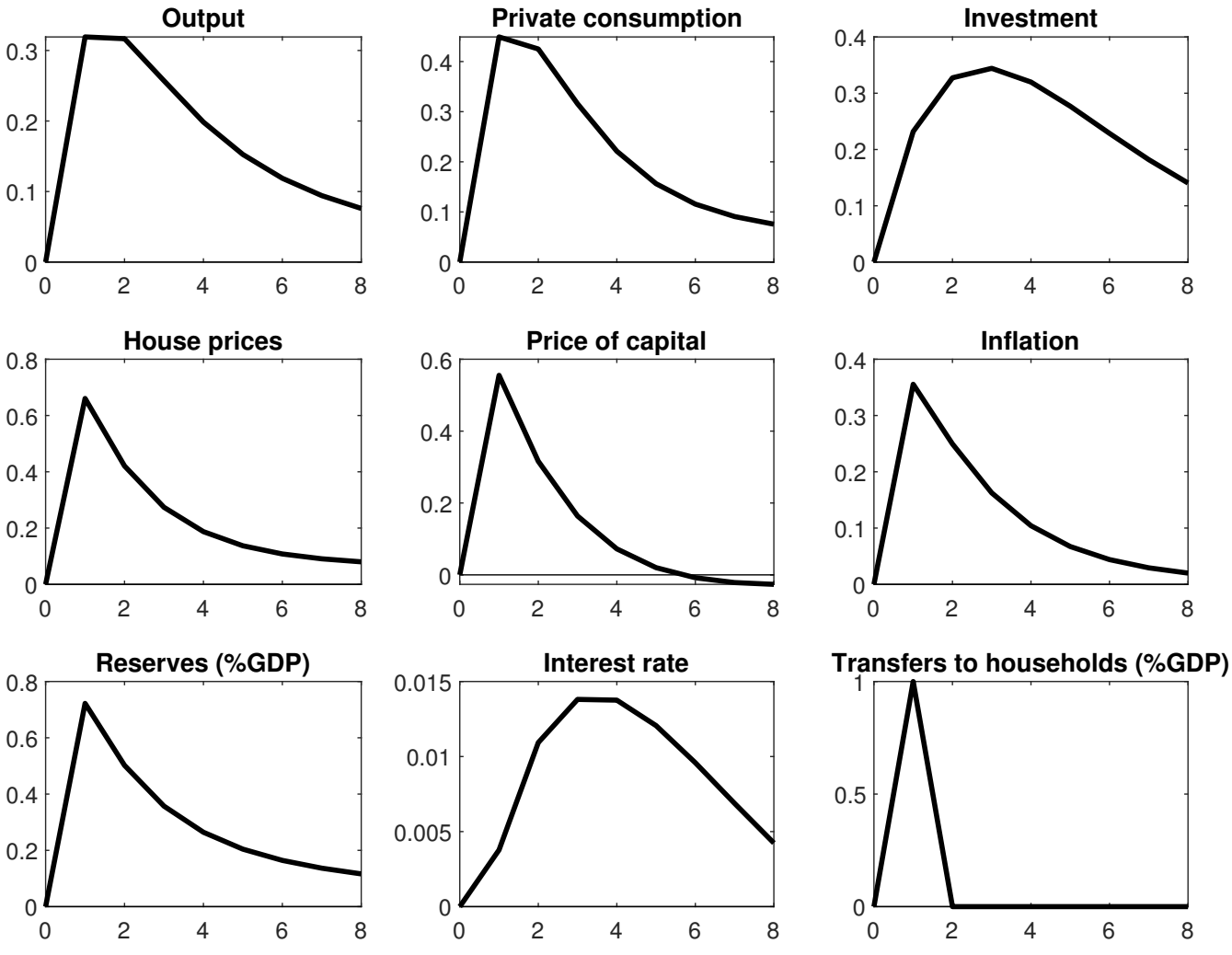
Mapping with HFCS data

Labor income	= Employee income	DI1100
	+ Self-employment income	DI1200
Hours worked	= Hours working a week - main job	PE0600
Housing stock	= Value of household's main residence	DA1110
	+ Value of other real estate property not for business activities	DA1122
Real financial assets	= Business wealth	DA1200
	+ Value of non self-employment private business	DA2104
	+ Shares, publicly traded	DA2105
	+ 50% Mutual funds	DA2102
	+ 50% Voluntary pension/whole life insurance	DA2109
Nominal financial assets	+= Bonds	DA2103
	+ 50% Mutual funds	DA2102
	+ 50% Voluntary pension/whole life insurance	DA2109
Deposits	= Deposits	DA2101
Loans	= Outstanding balance of mortgage debt	DL1100
	+ Outstanding balance of other, non-mortgage debt	DL1200

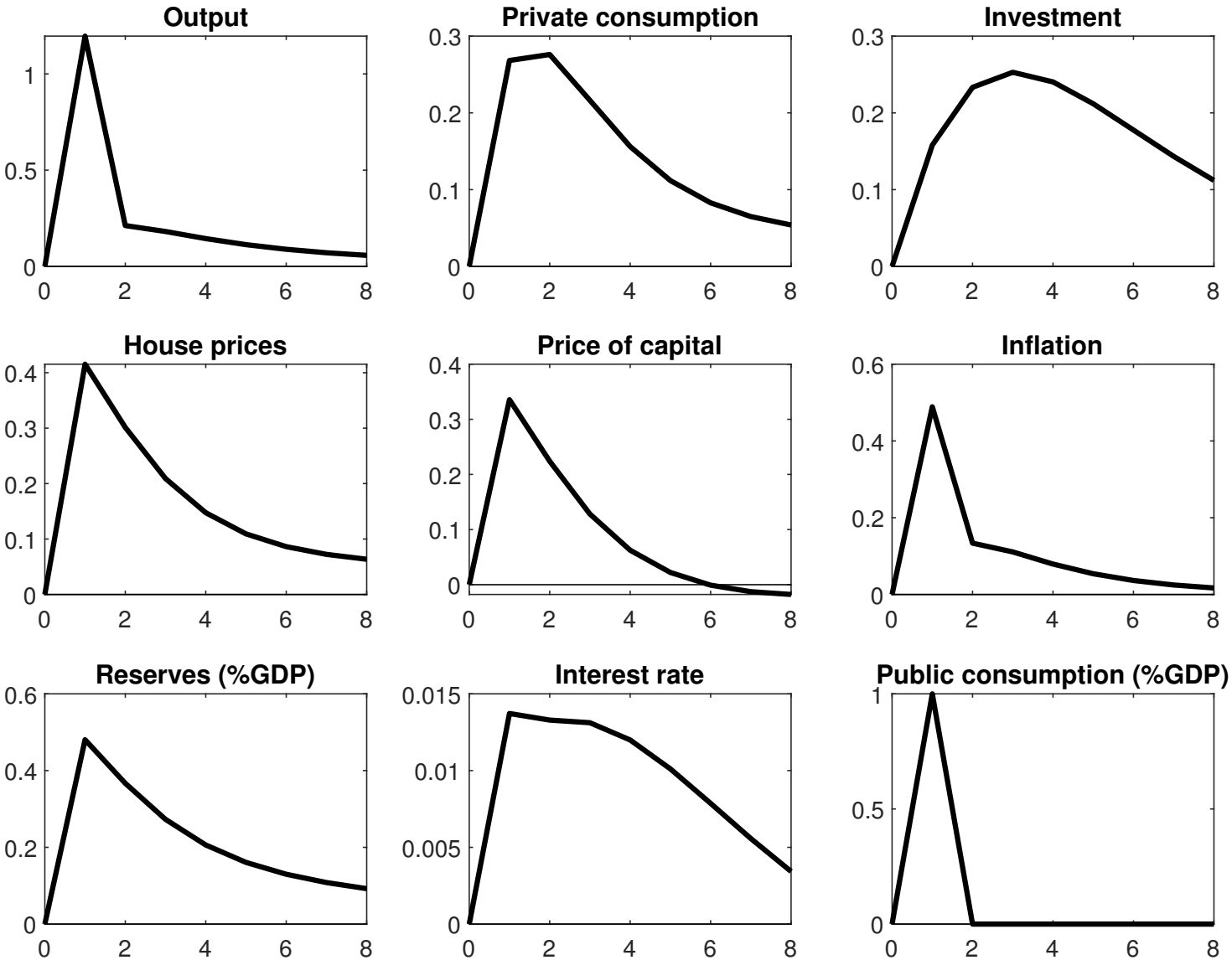
Aggregate assets calibration

- Aggregate data from financial and non-financial balance sheets (Eurostat, % of GDP w/o government expenditures):
  - Housing stock 130% GDP
  - Nonresidential fixed assets 197% GDP
  - Loans: 87% GDP
  - Money: 98% GDP
  - Reserves: 12% GDP
  - Gov. bonds: 53% GDP

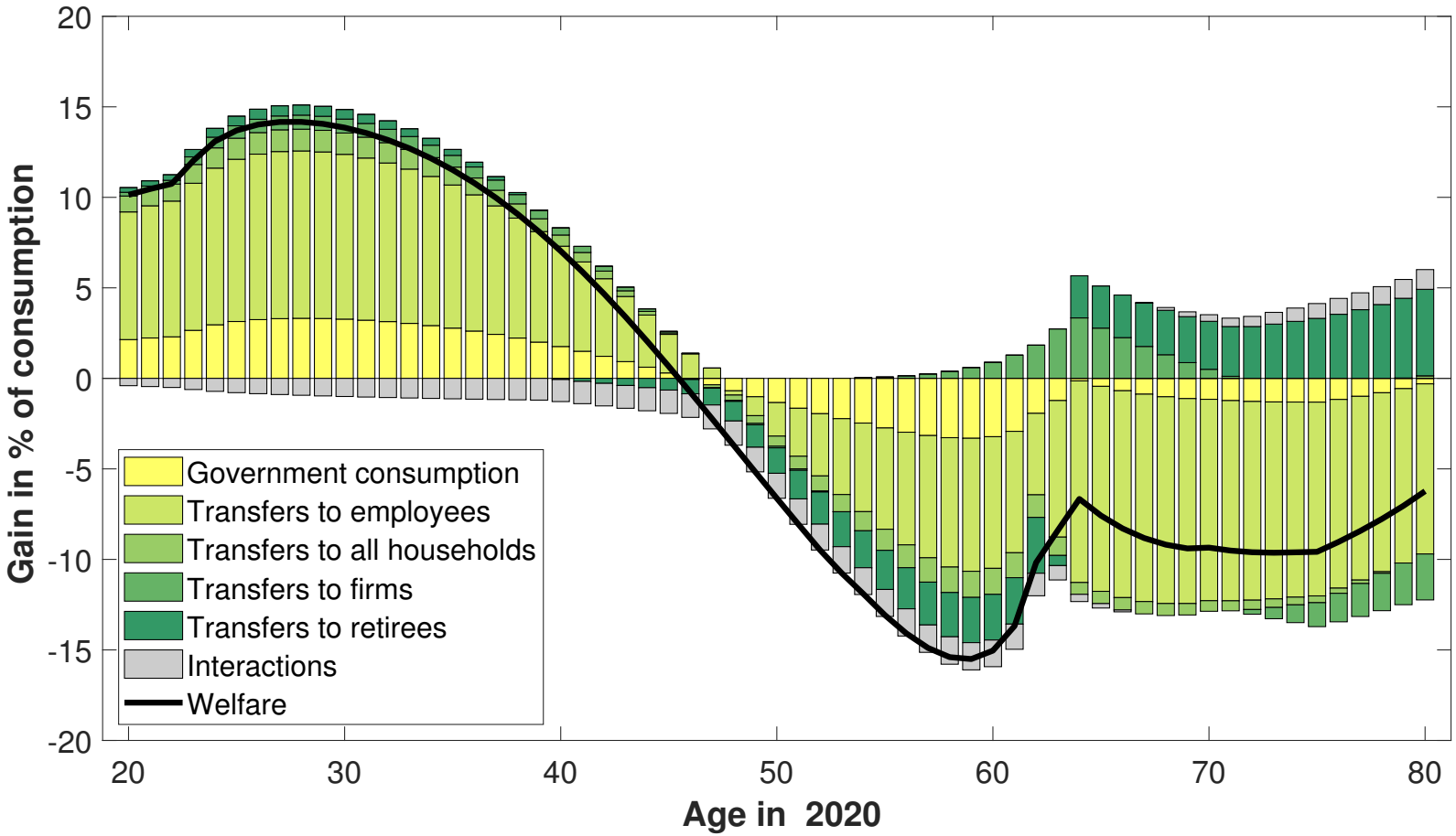
Example: effect of transfer to all HH (1% of GDP)



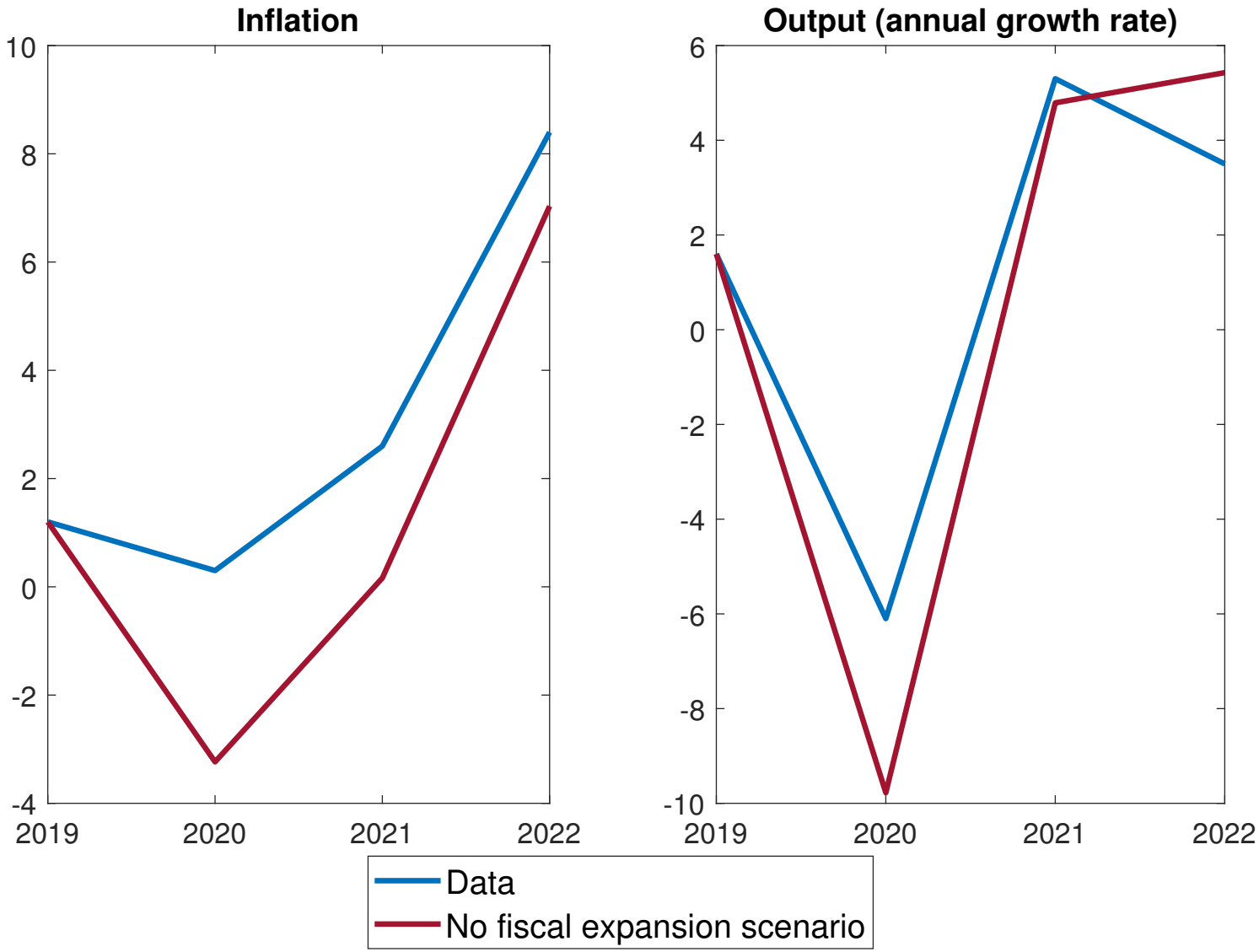
Example: effect of gov spending shock (1% of GDP)



Welfare effects of stimulus by instrument



Counterfactual w/o expansion



Welfare decomposition

- Totally differenciate the indirect utility function wrt all arguments (house prices $p_{\chi,t}$, ret. on nom. assets R_{t-1}/π_t, ret. on equity R^f_t/π_t etc.)

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

- where e.g.

$$\begin{aligned}
\sum_{s=0}^{J-j} \frac{\partial \mathcal{W}_{j,0}(\iota)}{\partial p_{\chi,s}} \mathrm{d}p_{\chi,s} &= -\sum_{s=0}^{J-j} \lambda_{j+s}[\chi_{j+s} - (1-\delta_\chi)\chi_{j+s-1}]\mathrm{d}p_{\chi,s} \\
&= -\sum_{s=0}^{J-j} \beta^s \omega_j^s u^c_{j+s}[\chi_{j+s} - (1-\delta_\chi)\chi_{j+s-1}]\mathrm{d}p_{\chi,s} \\
&= u^c_j \sum_{s=0}^{J-j} (1+r)^{-s}[(1-\delta_\chi)\chi_{j+s-1} - \chi_{j+s}]\mathrm{d}p_{\chi,s}
\end{aligned}$$