

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

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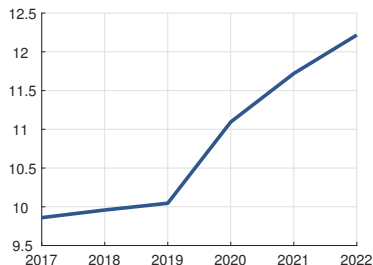
Kongres PTE
Poznań, 4-5 grudnia 2025

Outline

- 1 Intro
- 2 Model
- 3 Results
- 4 Conclusions
- 5 Additional slides

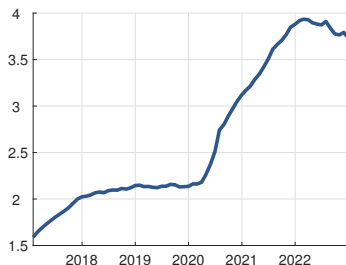
Large fiscal & monetary expansion during the pandemic

General gov. debt (EUR tn)



Source: Eurostat

Eurosystem holdings of gov. securities (EUR tn)



Source: ECB

What do we do?

- The stimuli must have had large redistributive effects...
 - HH gains (transfers + macro effects)
 - HH losses (macro effects)



Major questions:

1. who gained and who paid the bill?
2. relative strength of direct vs indirect effects

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

Calibration

- Calibration for the euro area
- Standard structural parameters: taken from literature or to match data means
- Life-cycle features:
 - Demographic data: Eurostat and EUROPOP, period average: 1999-2018
 - Age-specific productivity, hours and asset structure: HFCS (2017)

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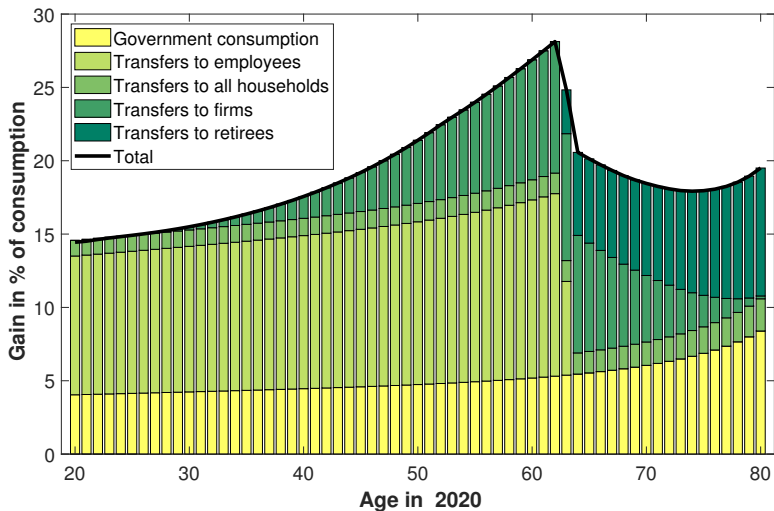
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Fiscal stimulus

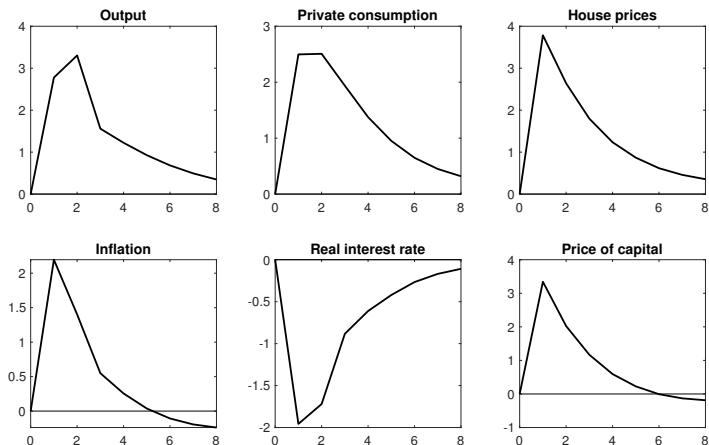
- Source: Eurostat data on GG expenditure by function
- Fiscal expenditure allocated to five categories

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

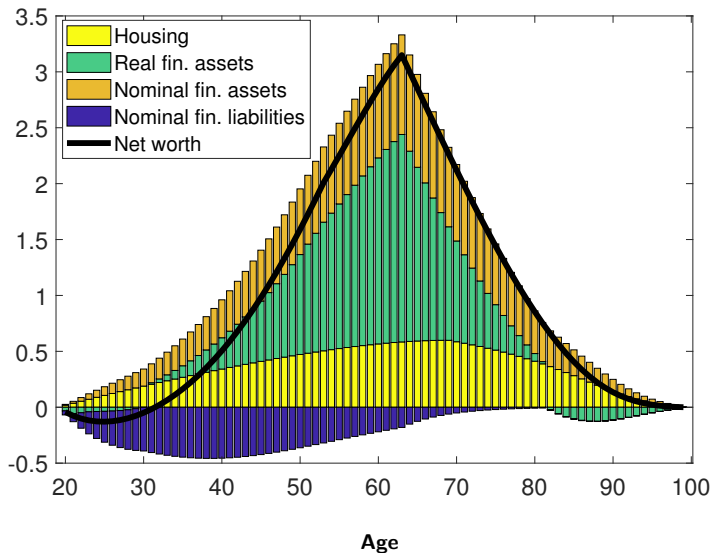
Government spending by cohort (direct effects)



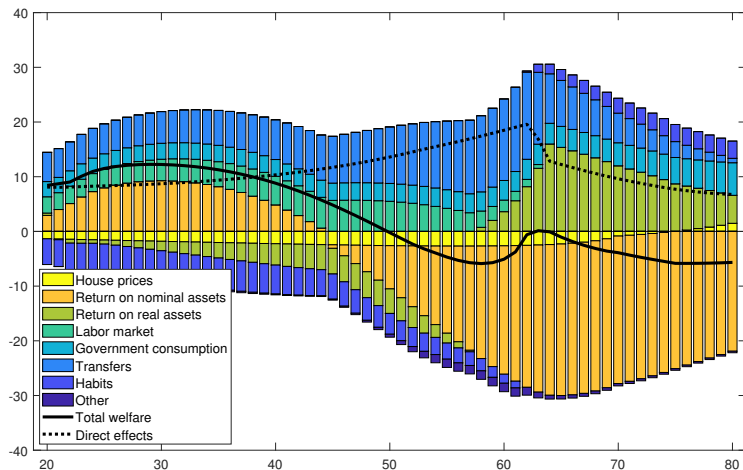
Macroeconomic effects of stimulus



Heterogeneity of asset holdings



Welfare effects of stimulus



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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 and monetary policy is passive

Literature

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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

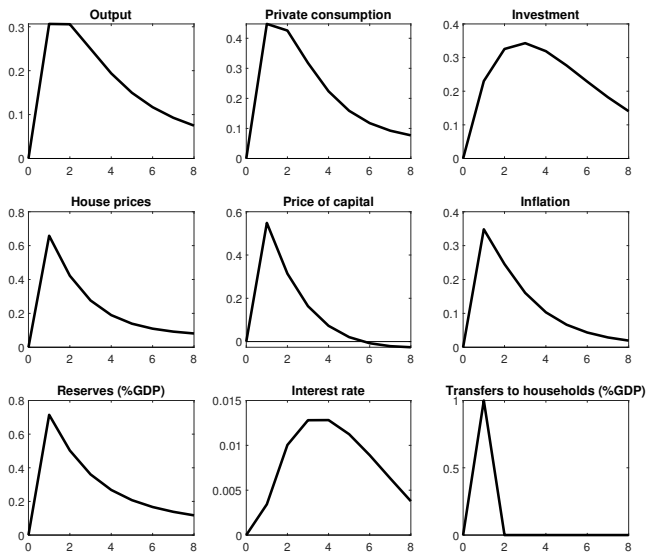
Mapping with HFCS data

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

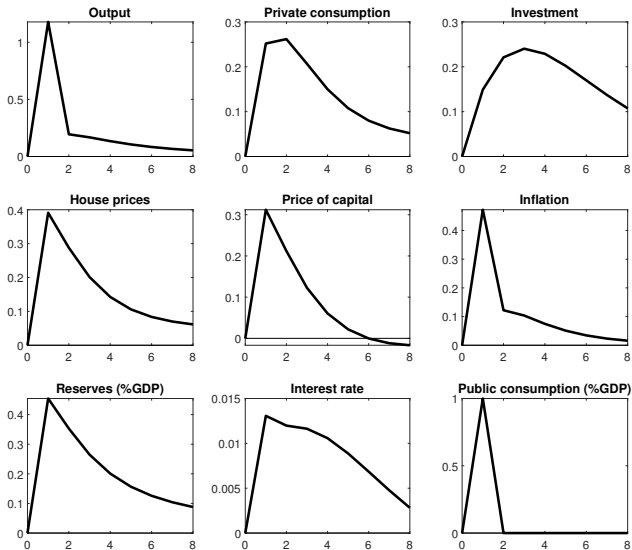
Aggregate assets calibration

- 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

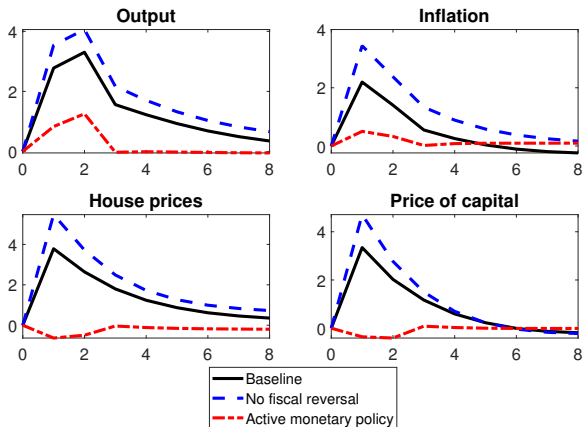
Example: effect of transfer to all HH (1% of GDP)



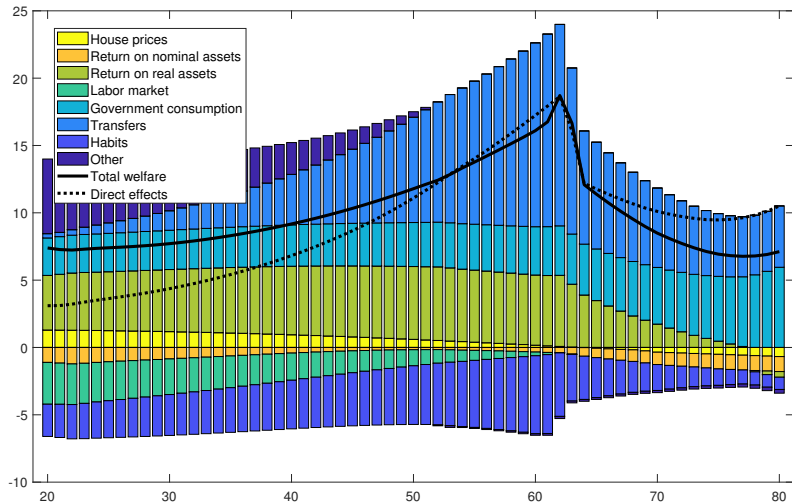
Example: effect of gov spending shock (1% of GDP)



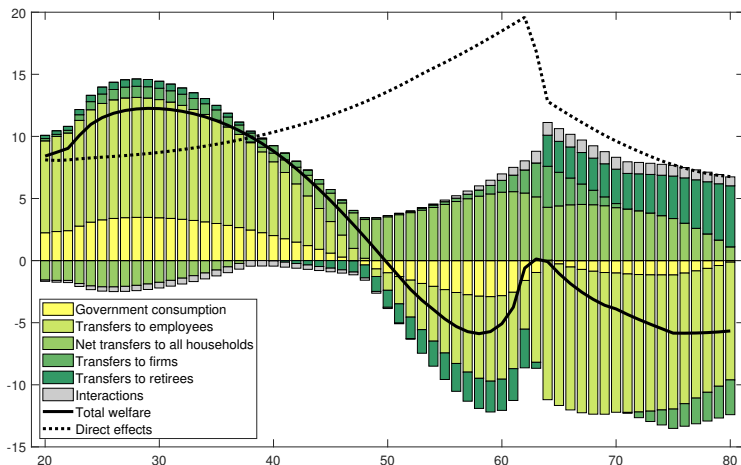
Macroeconomic effects of stimulus (alternatives)



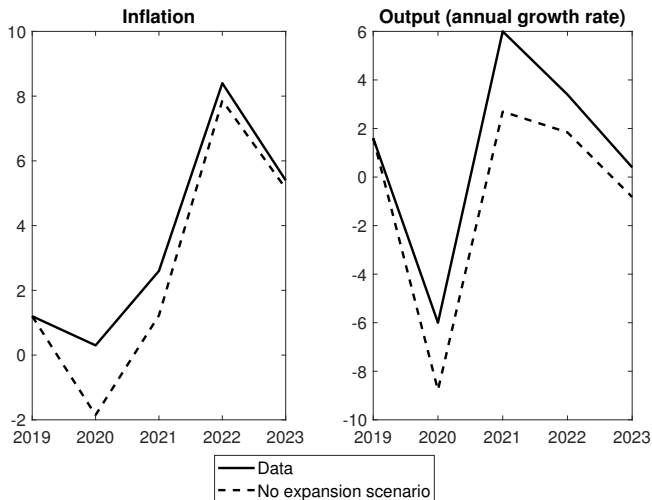
Welfare effects: funded (active monetary policy)



Welfare effects of stimulus by instrument



Counterfactual w/o stimulus



Validation: comparison of price levels

	Price level increase 2024 - 2019 above trend
Data (Banbura et al., 2023)	4.4%
No fiscal reversal	8.6%
Baseline	4.4%
Funded (active m.p.)	1%

Welfare decomposition

- Totally differentiate 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_t^f/π_t etc.)

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

- where e.g.

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

Households

- Maximize expected lifetime utility

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

subject to

$$c_{j,t} + p_{\chi,t} [\chi_{j,t} - (1 - \delta_{\chi}) \chi_{j-1,t-1}] + m_{j,t} + a_{j,t} + \frac{R_{t-1}}{\pi_t} s_{j-1,t-1} = \\ = (1 - \tau) w_t z_j h_{j,t} + s_{j,t} + tr_{j,t} + \frac{R_{t-1}^m}{\pi_t} m_{j-1,t-1} + \frac{R_{j,t}^a}{\pi_t} a_{j-1,t-1} + beq_{j,t}$$

- 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 $R_{j,t}^a = \eta_{j,t}R_{t-1} + (1 - \eta_{j,t})R_t^f$
- 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: $s_t + rr_t + b_t^b = m_t$

Producers

- Final goods aggregated from differentiated intermediate products

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

- Intermediate goods firms produce differentiated products

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

- Maximize profits $f_t(i) = y_t(i) - r_t^k k_{t-1}(i) - w_t h_t(i)$
- Face Calvo-type price stickiness
- Capital producers are subject to investment adjustment cost

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

Government

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

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

Central bank

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

$$rr_t = b_t^c$$

- In this case the stimulus (partly) unfunded
- Alternative scenario: Taylor rule

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

- In this case stimulus fully funded