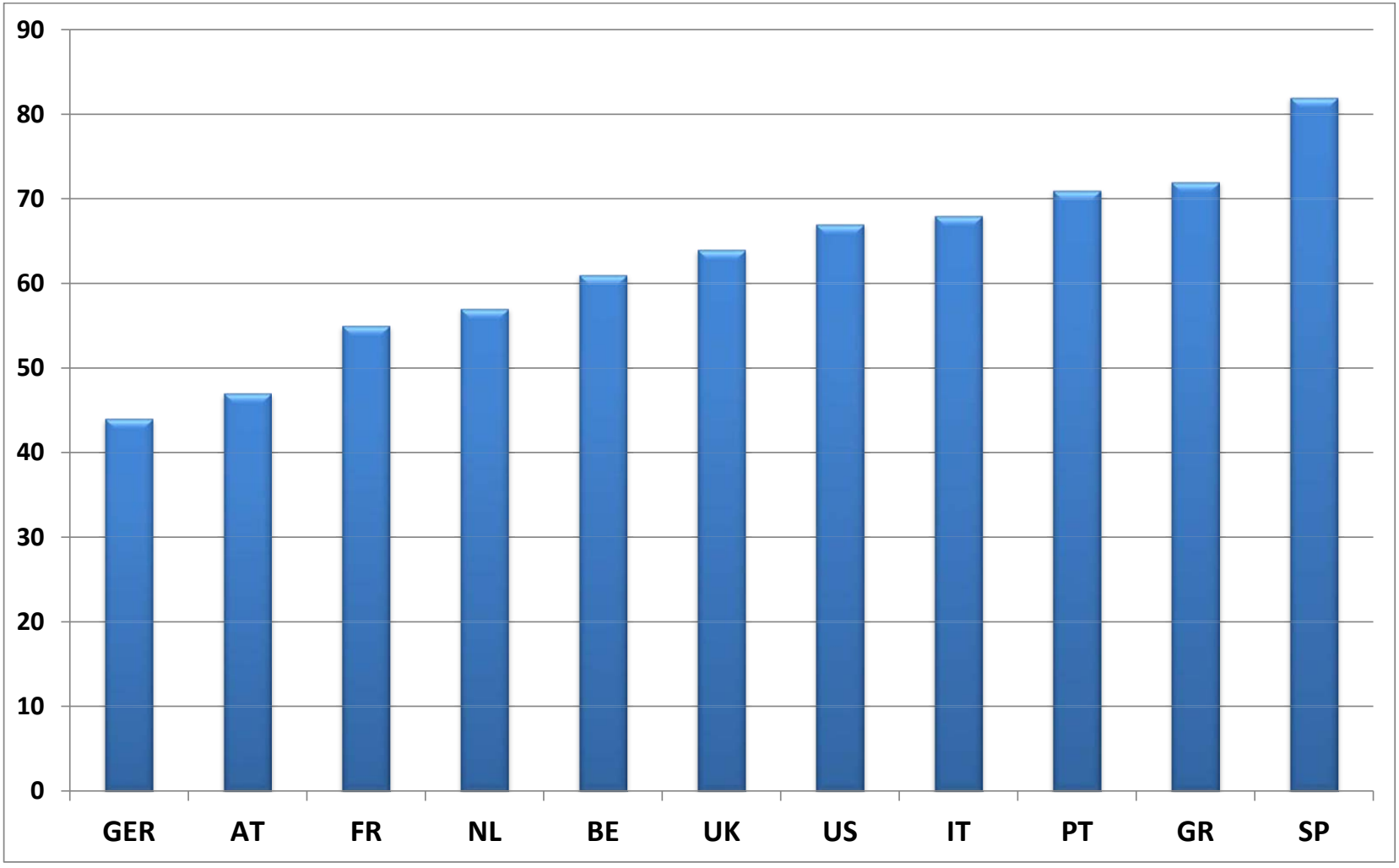
Low Homeownership in Germany - A Quantitative Exploration

L. Kaas G. Kocharkov E. Preugschat N. Siassi

Homeownership rates (2010)



Housing policies and homeownership

What is the role of **housing policies** for low homeownership in Germany?

- **Real estate transfer taxes** (RETT)
- **Social housing**
- **Mortgage interest deductions** (MID)
- Direct subsidies to (first-time) buyers
- Rental market regulation

▸ Country comparison

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$\Rightarrow$ **Need quantitative equilibrium model**

This Paper

- Build OLG **model** with **heterogeneous households** .
- Income and housing risks
- Endogenous prices and rents
- **Calibrate** to German economy with given housing policies and (progressive) tax system
- Set **housing policies** to their levels in the U.S.
- Assess counterfactual **long-run impact** on
    - **Homeownership**
    - **Welfare** - overall and across the income distribution

Literature

Mortgage interest tax deductibility

Gervais (2002), Chambers, Garriga & Schlagenhauf (2009), Cho and Francis (2011), Sommer and Sullivan (2016), Floetotto, Kirker & Stroebel (2016)

Real-estate transfer taxes and social housing

Kopczuk and Munroe (2015), Sieg and Yoon (2017)

Homeownership over the life cycle

Fernández-Villaverde and Yang (2009), Krueger (2011), Nakajima and Telyukova (2013), Halket and Vasudev (2014), Fischer and Khorunzhina (2014, 2016)

Homeownership across Europe

Hilber (2007), Kaas, Kocharkov & Preugschat (2016), Kindermann and Kohls (2016)

Model

Overview

- Small open economy: Exogenous interest rate r
- Exogenous labor income
- Stationary environment
- Agents:
  - Households
  - Real estate firms
  - Construction firms
  - Government

Households

- Stochastic life cycle with five age groups $\tau = 1, \ldots, 5$

  25-34 $\xrightarrow{\delta_1}$ 35-44 $\xrightarrow{\delta_2}$ 45-54 $\xrightarrow{\delta_3}$ 55-64 $\xrightarrow{\delta_4}$ 65+ $\xrightarrow{\delta_5}$ death

- Dying households replaced by newborns

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- Labor income

$$\log y(\tau, i) = M_\tau + \epsilon_{i,\tau}$$

  - M_τ is a common age-dependent component,
  - $\epsilon_{i,\tau}$ is a residual component where $i \in \{1, \ldots, 10\}$ is the income decile,
  - i follows Markov process with age-specific transition matrix Ψ_τ.

- Discount factor $\beta < 1$
- Period utility

$$u(c, s, \tau, \mathbb{I}_{h>0}) = \frac{1}{1-\gamma}\left[(c/n_\tau)^\zeta(\xi^\tau_{\mathbb{I}_{h>0}} s/n_\tau)^{1-\zeta}\right]^{1-\gamma}$$

  - c and s are consumption of **goods** and **housing services**
  - Equivalence scale n_τ captures household size variations over the life cycle
  - Shift parameter $\xi^\tau_{\mathbb{I}_{h>0}}$ reflects preferences for owning versus renting (only for retirees, i.e. $\xi^\tau_{\mathbb{I}_{h>0}} = 1$ for working-age households $\tau \leq 4$)
- No bequest motive (accidental bequests)

Housing

- Housing units $h \geq h_{\min}$, traded at price p
- Owned by households or real-estate firms
- Household owner consumes housing services $s \leq h$, rents out $h - s \geq 0$ at rate $\bar{\rho}$
- **Transaction costs** t^b (buyer) and t^s (seller) of purchase price

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- Trend depreciation and idiosyncratic house value risk:

$$\log h' = \log(1-\delta) + \log h + \chi' \ , \ \chi' \sim \mathcal{N}(-\sigma_\chi^2/2, \sigma_\chi^2)$$

Rental markets and social housing

- Renters ($h = 0$) may rent in the private market at idiosyncratic rent ρ which follows

$$\log \rho' = (1 - \omega) \log \bar{\rho} + \omega \log \rho + \nu' \ , \ \nu' \sim \mathcal{N}(-\frac{\sigma_\nu^2}{2(1+\omega)}, \sigma_\nu^2)$$

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- Renter gains access to **social housing** with probability π if income is below $\bar{y}$.
- Then rent up to $s \leq \bar{s}$ at (safe) rent $\rho^s < \bar{\rho}$.
- Households leave social housing
  - endogenously when they buy or want to rent $s > \bar{s}$.
  - exogenously with probability η.

Financial Assets

- Risk-free asset ($a \geq 0$) with interest rate r
- Mortgage loans ($a < 0$) at rate r^m
- Mortgage borrowing subject to down payment constraint:

$$a \geq -(1 - \theta_\tau)ph$$

where parameter θ_τ is age-dependent

Real-estate firms

- Pay monitoring costs c^m per unit of rented housing
- Buy regular and social housing units at prices p and p^s

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- Pay monitoring costs c^m per unit of rented housing
- Buy regular and social housing units at prices p and p^s
- Commitment period of social housing unit ends with probability $\Phi \Rightarrow$ price adjusts to p
- Zero-profit conditions:

$$(r+\delta)p = \bar{\rho} - c^m$$

$$(r+\delta)p^s = \rho^s - c^m + \Phi(p - p^s)$$

Construction sector

- Produces regular and social housing units, I and I^s at cost $K(I + I^s)$, where $K' > 0$, $K'' > 0$.
- Profit maximization:

$$p = K'(I + I^s) = p^s + \varsigma \ ,$$

where ς is the government subsidy for social housing construction

- Steady state:

$$\delta(\bar{H} + \bar{H}^s) = I + I^s \ , \quad (\Phi + \delta)\bar{H}^s = I^s \ ,$$

where $\bar{H}$, $\bar{H}^s$ are stocks of regular and social housing.

Government

- Taxes households' income and real-estate transactions, pays pensions to retirees, subsidizes construction of social housing
- Taxable income includes labor, capital and rental income minus interest payments for mortgages on rental units
- Real estate transfer tax: $\tilde{t}^b \leq t^b$

Household problem

$$V(\tau, i, \rho, \sigma, a, h) = \max_{c,s,a',\tilde{h}',\tilde{\sigma}} u(c, s; \tau, \mathbb{I}_{h>0}) + \beta \mathbb{E} V(\tau', i', \rho', \sigma', a' + b', h') \quad \text{s.t.}$$

$$c + a' + p\tilde{h}' = y(\tau, i) + [1 + r\mathbb{I}_{a>0} + r^m \mathbb{I}_{a<0}]a + ph + \max(\bar{\rho}(h - s), 0) - \tilde{\rho} s \mathbb{I}_{h=0}$$
$$- T_\tau(y^t) - \mathbb{I}_{\tilde{h}' \neq h}(t^b p\tilde{h}' + t^s ph) \ ,$$
$$\tilde{h}' \in \mathcal{H} \cup \{0\}, \ s \geq 0, \ s \leq h \text{ if } h > 0 \ ,$$
$$a' \geq -p\tilde{h}'(1 - \theta_\tau) \ , \ \log h' = \log(1 - \delta) + \log \tilde{h}' + \chi' \ ,$$
$$\tilde{\sigma} \in \{0, 1\} \text{ and } \tilde{\sigma} = 0 \text{ if } \sigma = 0 \text{ or if } s > \bar{s} \ ,$$
$$\tilde{\rho} = \rho^s \text{ if } \tilde{\sigma} = 1 \ , \text{ and } \tilde{\rho} = \rho \text{ otherwise,}$$

$$\log \rho' = \begin{cases} (1 - \omega) \log \bar{\rho} + \omega \log \rho + \nu' & , \text{ if } h = 0 \ , \\ \sim \mathcal{N}(\log \bar{\rho} - \frac{\sigma_\nu^2}{2(1-\omega^2)}, \frac{\sigma_\nu^2}{1-\omega^2}) & , \text{ otherwise} \ , \end{cases}$$

$$\sigma' = \begin{cases} 1 & , \begin{cases} \text{with prob. } \pi_{\tau'}(y(\tau', i')) \text{ if } \tilde{\sigma} = 0 \text{ and } h' = 0 \ , \\ \text{with prob. } 1 - \eta \text{ if } \tilde{\sigma} = 1 \text{ and } h' = 0 \ , \end{cases} \\ 0 & , \text{ otherwise} \ , \end{cases}$$

$$y^t = y(\tau, i) + r \max[a, 0] + \bar{\rho} \max(0, h - s)$$
$$- r^m \min\left\{ \max[-a, 0], \max[p(h - s)(1 - \theta_\tau), 0] \right\} \ .$$

Stationary equilibrium

Value function V, policy functions $C(.)$, $S(.)$, $\Sigma(.)$, $A(.)$, $H(.)$, distribution μ over $(\tau, i, \rho, \sigma, a, h)$, bequest distribution $B(.)$, house prices p, p^s, rental rate $\bar{\rho}$, construction I, I^s and housing stocks $\bar{H}$ and $\bar{H}^s$, social housing access probability π:

1. Value and policy functions solve the household problem.
2. Real-estate firms and construction firms maximize profits.
3. Housing market equilibrium

$$\bar{H} + \bar{H}^s = \int S(\tau, i, \rho, \sigma, a, h) \; d\mu(\tau, i, \rho, \sigma, a, h) \; .$$

4. Social housing occupied by renters with access to it:

$$\bar{H}^s = \int S(\tau, i, \rho, \sigma, a, h) \mathbb{I}_{\tilde{\sigma}(\tau, i, \rho, \sigma, a, h)=1} \; d\mu(\tau, i, \rho, \sigma, a, h) \; .$$

5. μ is a stationary distribution.
6. $B(.)$ is identical to the distribution of $a' + p(1 - t^s)h'$ for households in age group $\tau = 5$.
7. Housing stocks $\bar{H}$ and $\bar{H}^s$ are stationary.

Calibration

Calibration

- **Labor income** process estimated from German SOEP 1995-2015
- Parameterize **income tax function** as $T_\tau(y^t) = y^t - \lambda_\tau (y^t)^{1-\phi_\tau}$
- Estimate $\{\lambda_\tau, \phi_\tau\}_{\tau=1}^{5}$ based on gross and net income data from SOEP
- Stylized version of German **pension system**: 42% repl. rate with caps

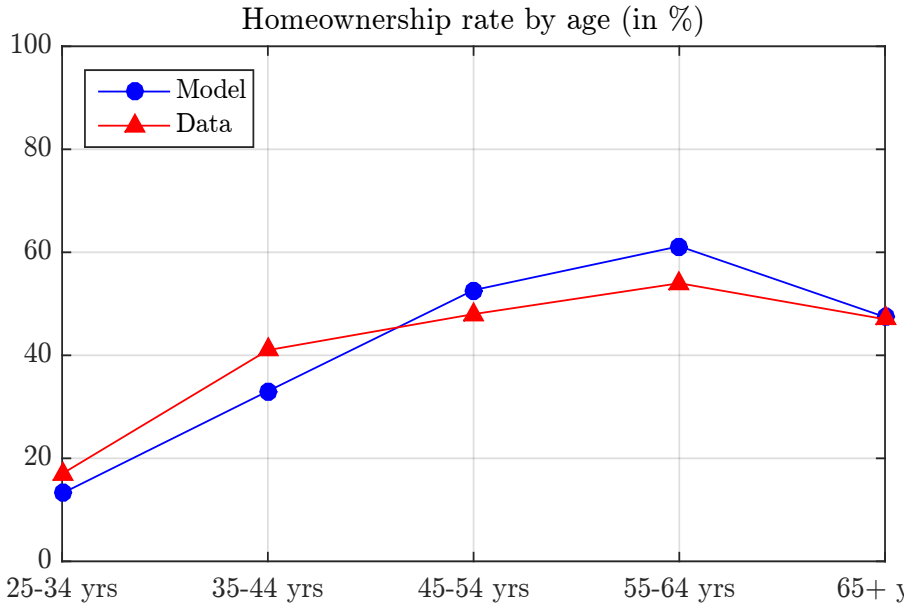
Externally calibrated parameters

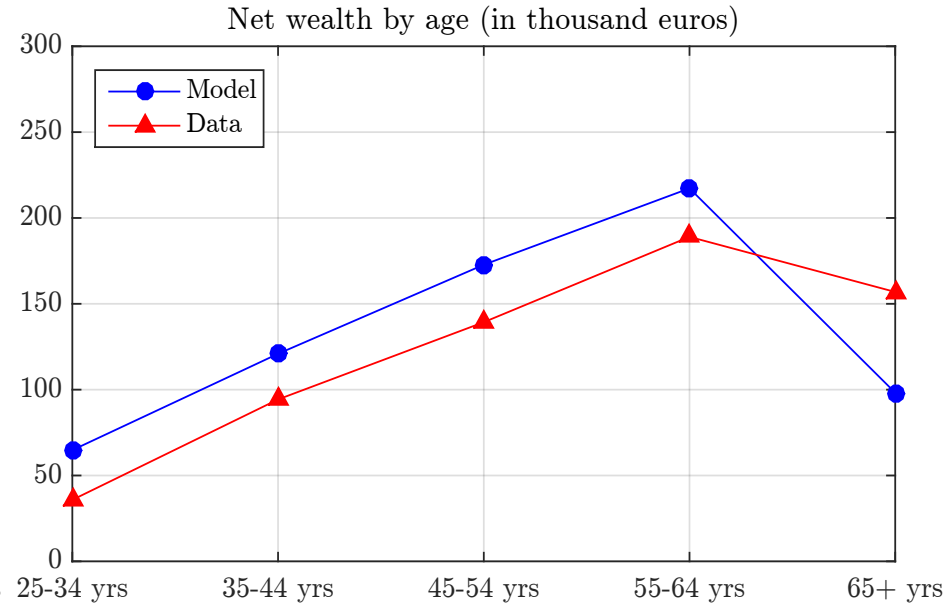
Parameter		Value	Explanation/Target
Household size	$(n_1, \ldots, n_5)$	(1.4,1.7,1.7,1.4,1.4)	OECD equival. scale
Ageing probabilities	$\vartheta_1, \vartheta_2, \vartheta_3, \vartheta_4$	0.1	10-year age groups
Death probability	ϑ_5	0.05	20-year retirement
Inheritance rate	π^I	0.05	Random beq. $\tau = 1, 2$
Risk aversion	γ	2	Standard parameter
Expenditure share	ζ	0.717	Consumption shares
Real interest rate	r	0.0255	Average 1991–2014
Real mortgage rate	r^m	0.0374	Average 1991–2014
Downpayment req.	$\theta_1, \theta_2, \theta_3$	0.20	Chiuri/Jappelli (2003)
Downpayment req.	$(\theta_4,\ \theta_5)$	(0.60,1.0)	No mortg. in retirement
Transaction costs	$(t^b, \tilde{t}^b, t^s)$	(0.108,0.052,0.029)	Brokerage fees, RETT
Depreciation rate	δ	0.01	100-yr housing lifespan
Social rent discount	$\rho^s/\bar{\rho}$	0.80	Deschermeier et al (2015)
Transformation rate	Φ	0.04	Schier/Vogtländer (2016)
House value risk	σ_χ	0.104	SOEP
Rental rate persistence	μ_ρ	0.404	SOEP
Rental rate volatility	σ_ν	0.094	SOEP
Minimum house size	$h_{\min}$	80	SOEP
Inv. supply elasticity	φ	2.34	Caldera et al. (2013)

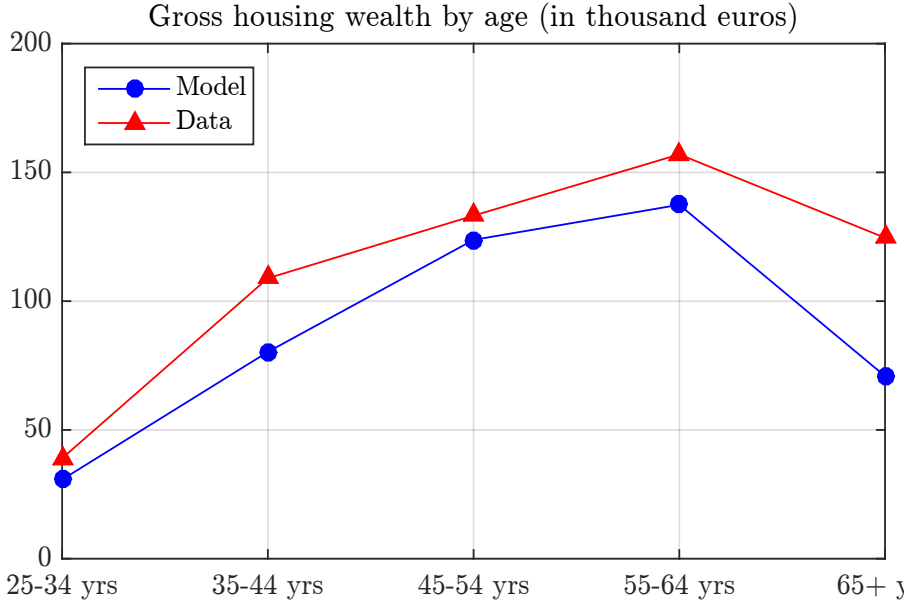
Internally calibrated parameters

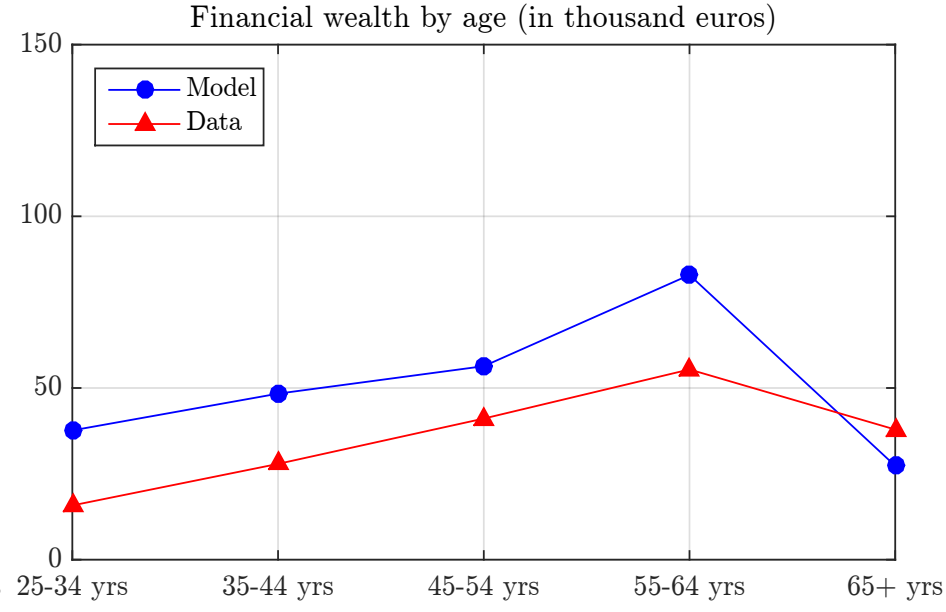
Parameter		Value	Target	Model	Data
Discount factor	β	0.9485	Average wealth	128.7	128.7
Monitoring cost (%)	c^m	0.0189	Homeownership (%)	42.5	42.2
Utility weight owner 65+	ξ_1^5	1.37	Homeownership 65+ (%)	47.4	47.6
Social h. upper size	$\bar{s}$	212	$s_{99\%}^{SH}/s_{99\%}^{Market}$	0.726	0.731
Social h. subsidy	ς	0.1442	Social housing share	0.071	0.071
Social h. exogenous exit	η	0.0155	Social housing move-in rate	0.0128	0.0128
Construction cost	k_0	0.2898	Normalization $p = 1$	–	–

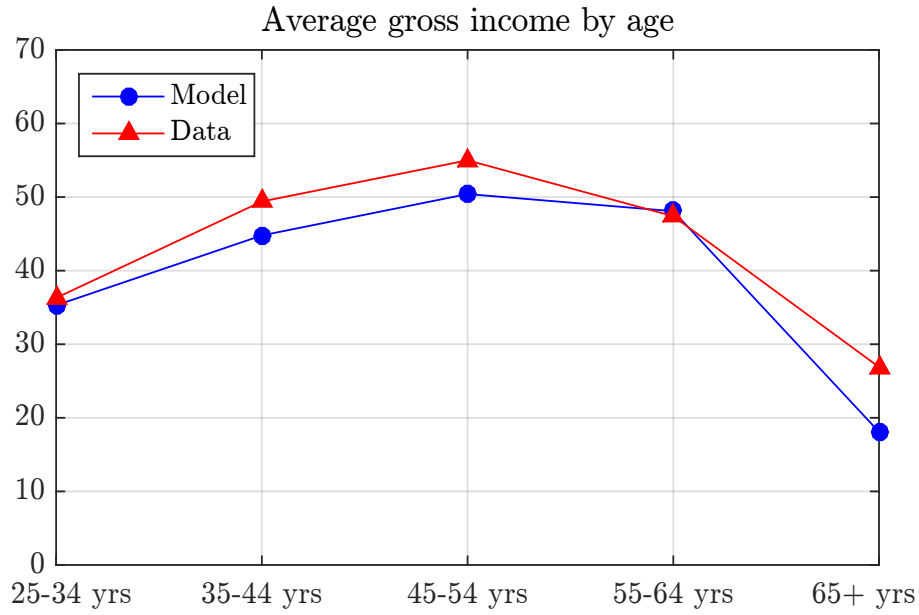
Model Fit

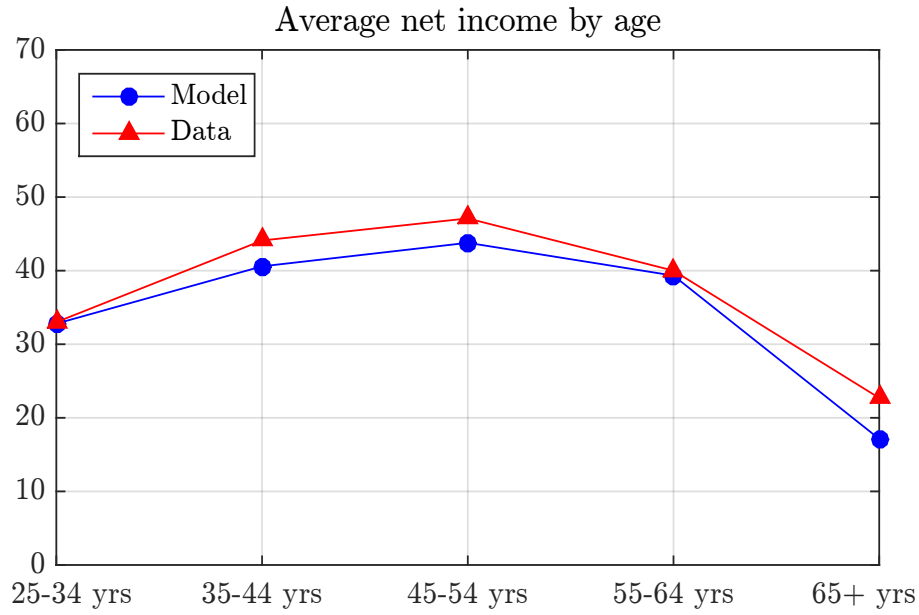

Homeownership rate by age (in %)
Model
Data
100
80
60
40
20
0
25-34 yrs
35-44 yrs
45-54 yrs
55-64 yrs
65+ yrs


Net wealth by age (in thousand euros)
Model
Data
300
250
200
150
100
50
0
25-34 yrs
35-44 yrs
45-54 yrs
55-64 yrs
65+ yrs


Gross housing wealth by age (in thousand euros)
Model
Data
200
150
100
50
0
25-34 yrs
35-44 yrs
45-54 yrs
55-64 yrs
65+ yrs


Financial wealth by age (in thousand euros)
Model
Data
150
100
50
0
25-34 yrs
35-44 yrs
45-54 yrs
55-64 yrs
65+ yrs


Average gross income by age
Model
Data
70
60
50
40
30
20
10
0
25-34 yrs
35-44 yrs
45-54 yrs
55-64 yrs
65+ yrs


Average net income by age
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60
50
40
30
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10
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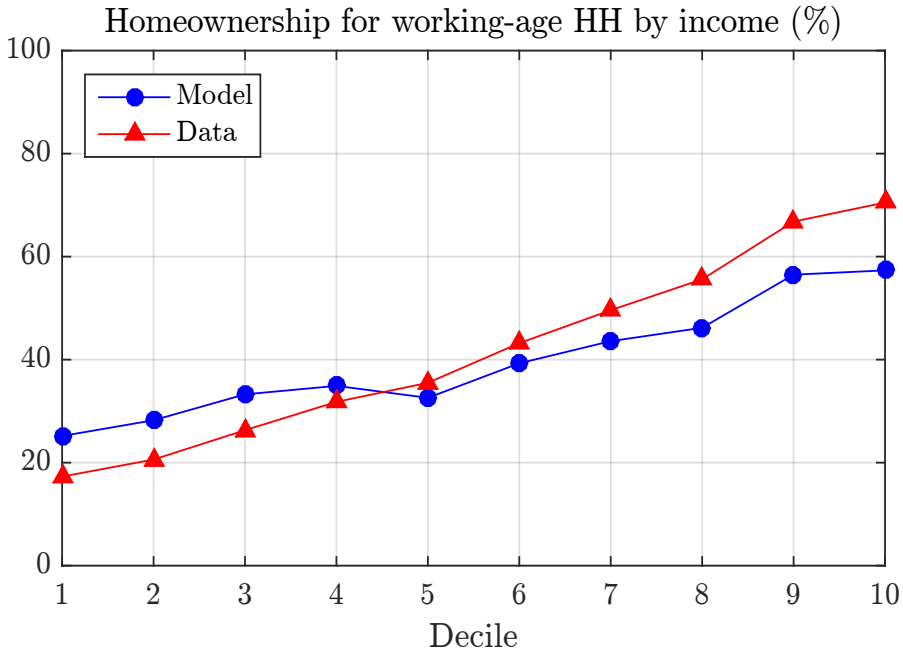
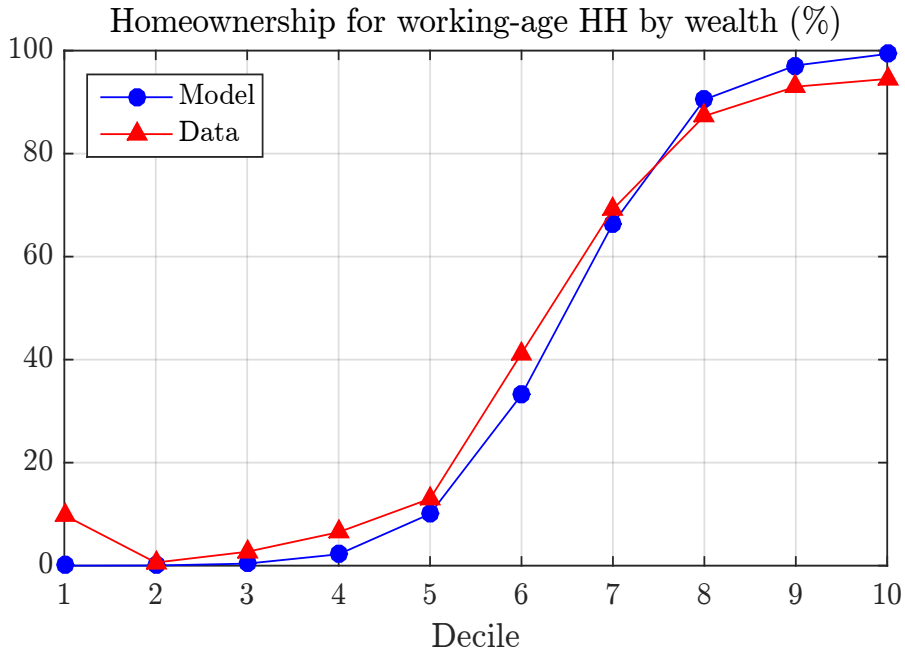

Homeownership for working-age HH by income (%)
Model
Data
100
80
60
40
20
0
1
2
3
4
5
6
7
8
9
10
Decile


Homeownership for working-age HH by wealth (%)
Model
Data
100
80
60
40
20
0
1
2
3
4
5
6
7
8
9
10
Decile

Results

Accounting for Low Homeownership

- **Quantify** importance of housing policies for **homeownership** and then evaluate welfare
- Counterfactual experiments:

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- Counterfactual experiments:

  C1: **Real-estate transfer tax** (RETT) set to U.S. value: $\tilde{t}^b = 0.33\%$.

  C2: **Mortgage interest payments** are fully tax deductible.

  C3: No **social housing**.

  C4: Full **combination** of C1-C3.

Accounting for Low Homeownership

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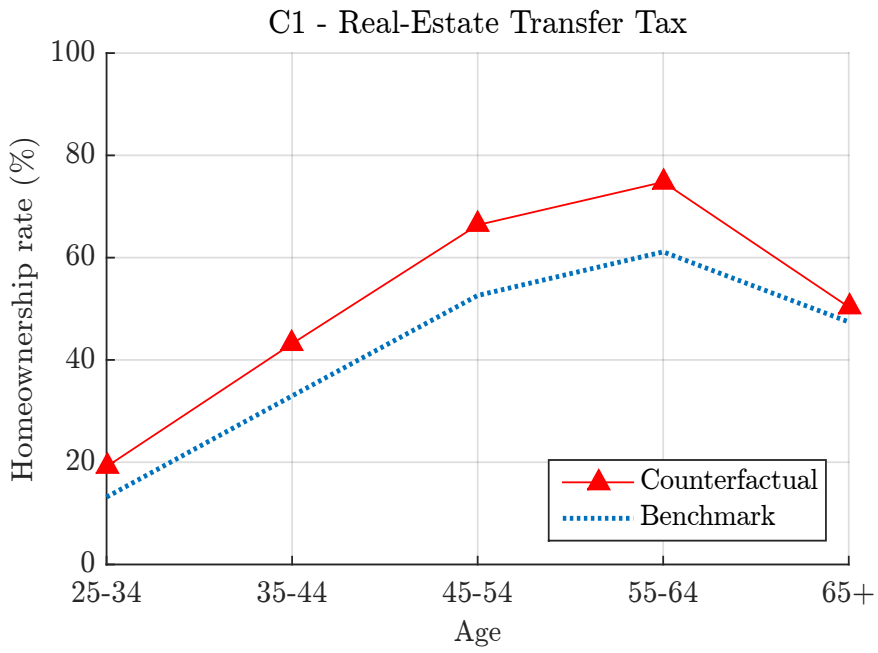
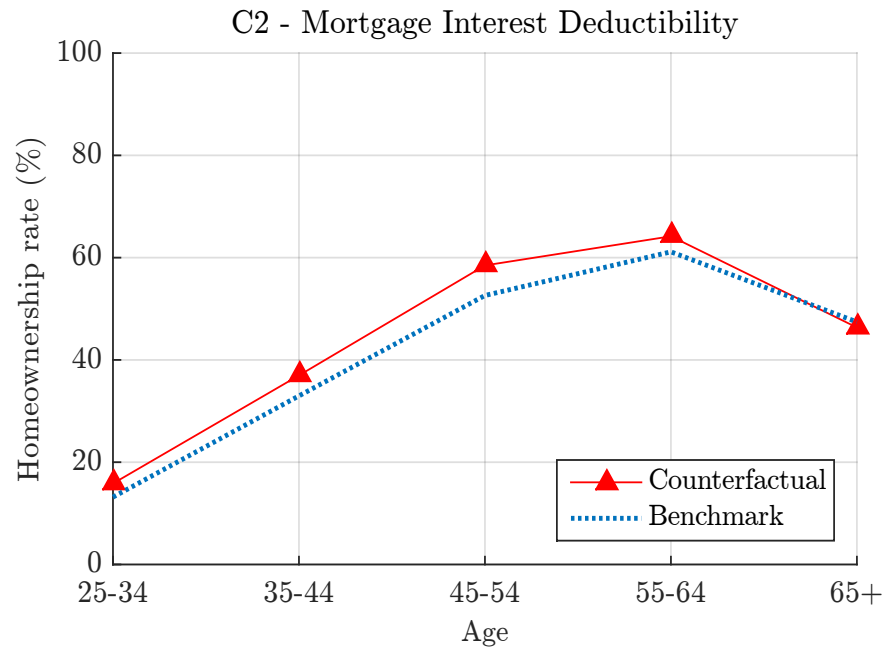
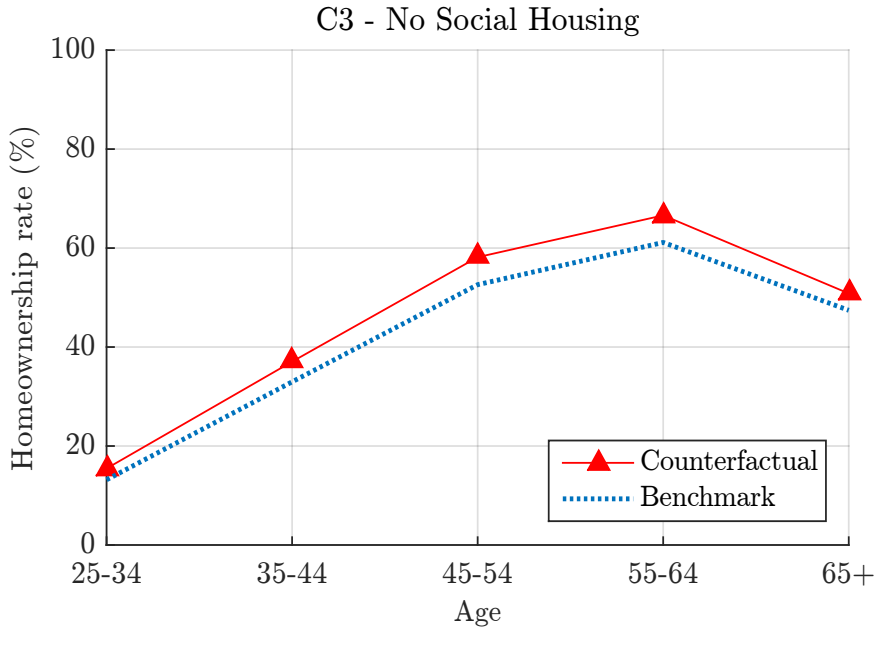
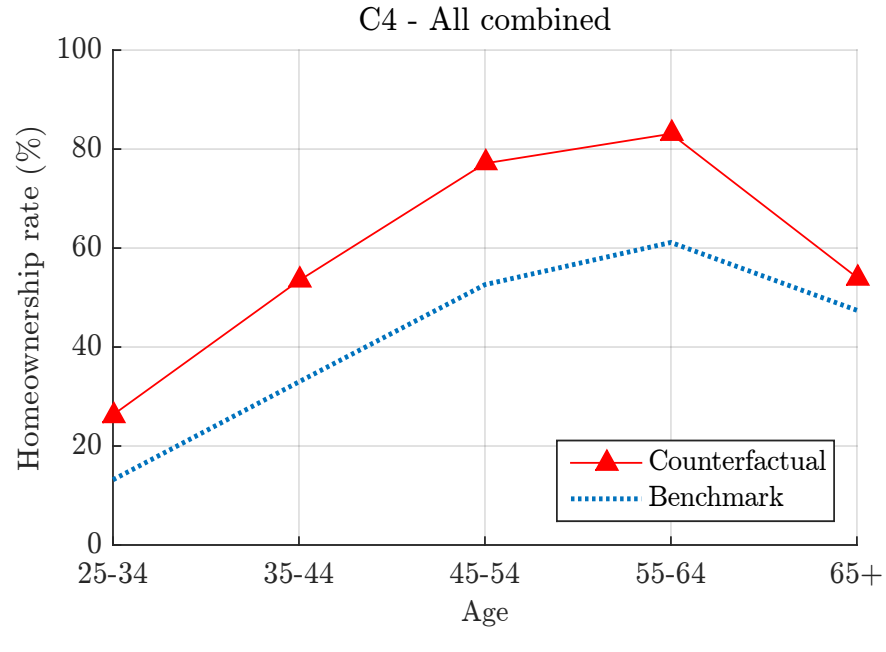
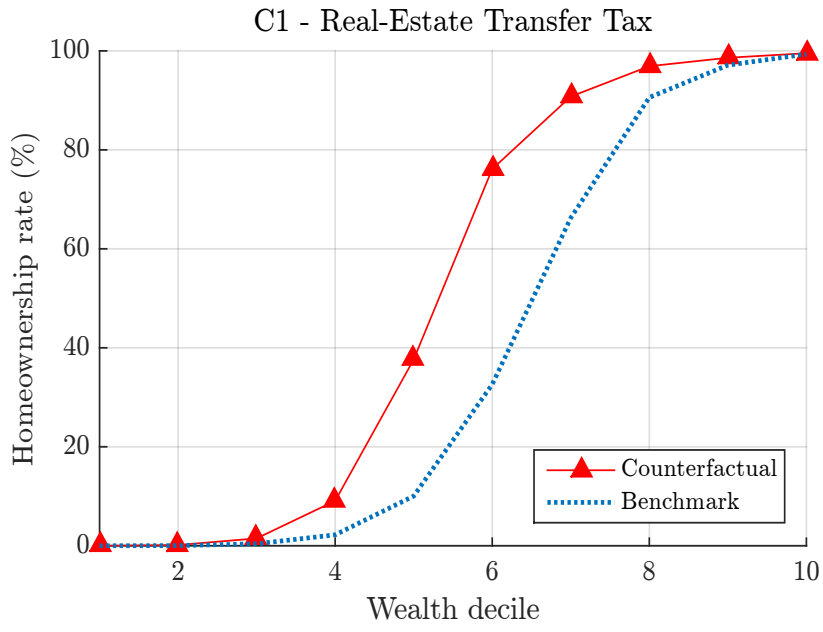
  - **C3:** No **social housing**.
  - **C4:** Full **combination** of C1-C3.
- General equilibrium and revenue neutrality

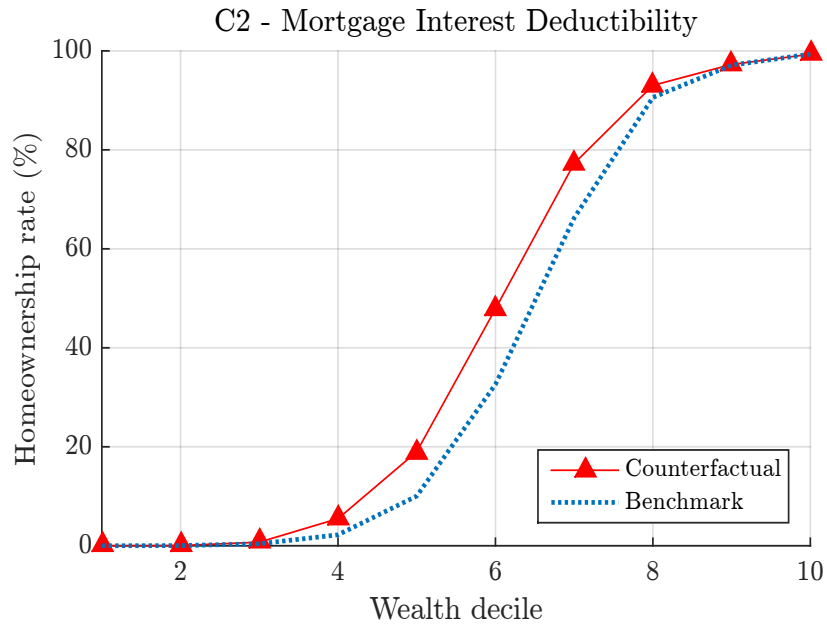

C1 - Real-Estate Transfer Tax
Homeownership rate (%)
100
80
60
40
20
0
25-34
35-44
45-54
55-64
65+
Age
Counterfactual
Benchmark

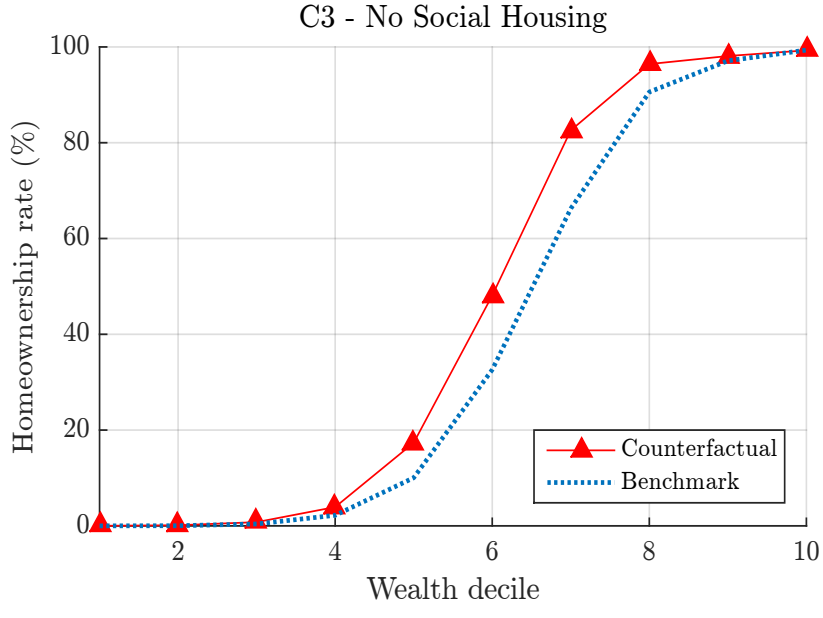

C2 - Mortgage Interest Deductibility
Homeownership rate (%)
100
80
60
40
20
0
25-34
35-44
45-54
55-64
65+
Age
Counterfactual
Benchmark

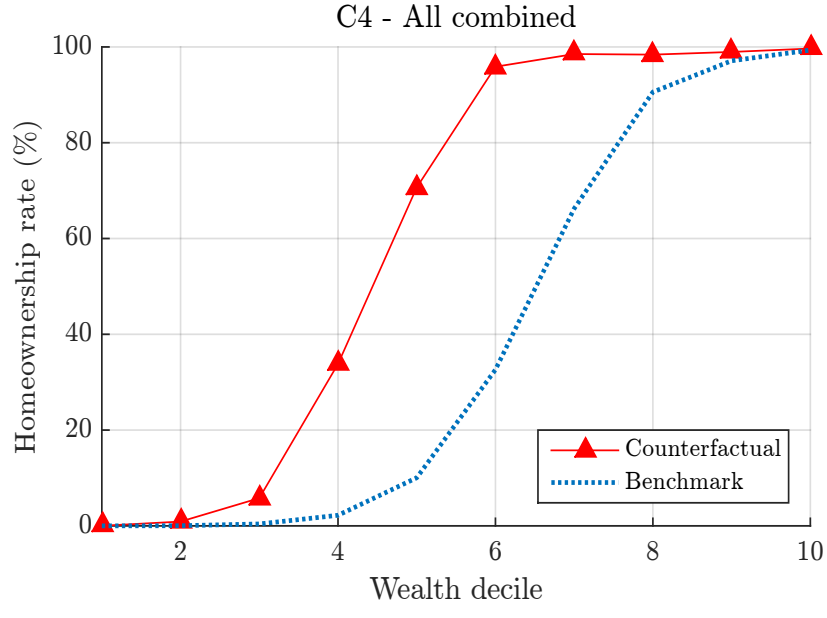

C3 - No Social Housing
Homeownership rate (%)
100
80
60
40
20
0
25-34
35-44
45-54
55-64
65+
Age
Counterfactual
Benchmark


C4 - All combined
Homeownership rate (%)
100
80
60
40
20
0
25-34
35-44
45-54
55-64
65+
Age
Counterfactual
Benchmark


C1 - Real-Estate Transfer Tax
Homeownership rate (%)
Wealth decile
Counterfactual
Benchmark


C2 - Mortgage Interest Deductibility
Homeownership rate (%)
Wealth decile
Counterfactual
Benchmark


C3 - No Social Housing
Homeownership rate (%)
Wealth decile
Counterfactual
Benchmark


C4 - All combined
Homeownership rate (%)
Wealth decile
Counterfactual
Benchmark

General equilibrium and revenue neutrality

	Bench	RETT C1	Mort Ded C2	No SocialH C3	Combination C4
Homeownership (%)	**42.5**	50.7	44.7	46.4	**58.0**
– 25-34 yrs	13.2	19.1	15.8	15.5	26.3
– 35-44 yrs	33.0	43.2	37.0	37.0	53.4
– 45-54 yrs	52.6	66.4	58.5	58.2	77.1
– 55-64 yrs	61.1	74.8	64.2	66.6	83.1
– 65+ yrs	47.4	50.4	46.3	50.8	54.1
Total wealth	128.6	138.9	131.2	133.0	142.9
– Housing	85.6	107.2	92.7	93.1	121.3
– Financial	46.6	37.7	43.9	44.0	31.3
House price	1.000	1.019	1.008	0.996	1.014
Rationing prob π (%)	1.28	1.60	1.34	0	0

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– 45-54 yrs	52.6	66.4	58.5	58.2	77.1
– 55-64 yrs	61.1	74.8	64.2	66.6	83.1
– 65+ yrs	47.4	50.4	46.3	50.8	54.1
Total wealth	128.6	138.9	131.2	133.0	142.9
– Housing	85.6	107.2	92.7	93.1	121.3
– Financial	46.6	37.7	43.9	44.0	31.3
House price	**1.000**	**1.019**	**1.008**	**0.996**	**1.014**
Rationing prob π (%)	1.28	1.60	1.34	0	0

Partial equilibrium with fixed taxes and house prices

	Bench	RETT C1	Mort Ded C2	No SocialH C3	Combination C4
Homeownership (%)	42.5	53.3	45.9	46.2	59.2
Total wealth	128.6	142.4	132.7	132.4	146.2
House price	1.000	1.000	1.000	1.000	1.000
ΔGov't BC (per HH)	–	-0.329	-0.067	+0.081	-0.432
–ΔRETT Rev	–	-0.260	0.025	0.028	-0.256
–ΔIncTax Rev	–	-0.085	-0.097	-0.015	-0.243
–ΔSocHous Subs	–	-0.016	-0.005	-0.068	-0.068
ΔDemand (in %)	–	2.84	1.12	-0.63	2.94
–Income Q1	–	3.95	1.25	-1.10	3.24
–Income Q2	–	3.63	1.82	-1.19	3.62
–Income Q3	–	2.87	1.30	-0.92	2.49
–Income Q4	–	2.04	0.82	-0.51	2.16
–Income Q5	–	2.42	0.72	0.10	3.35

Welfare Effects

- **Welfare:** Percentage consumption equivalence to the benchmark of a newborn household, after drawing the first income realization.

▸ Transition

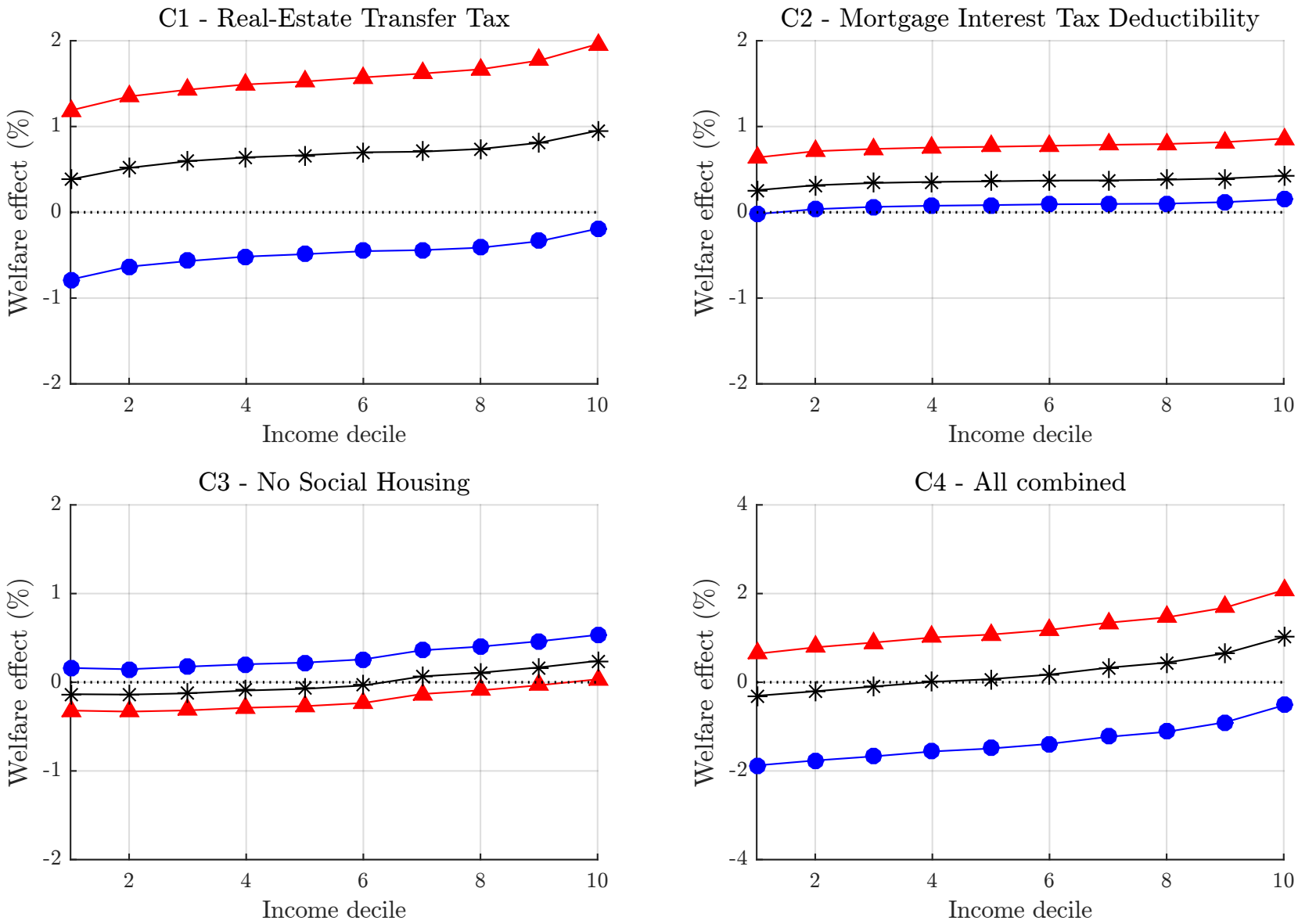
Welfare Effects

- **Welfare:** Percentage consumption equivalence to the benchmark of a newborn household, after drawing the first income realization.

  ▸ Transition

- Compute welfare results for C1-C4 in 3 steps:

  1. Fixed prices (PE) and fixed taxes.
  2. Adjusted prices (GE) and fixed taxes.
  3. Adjusted prices (GE) and adjusted taxes (fiscal neutrality).

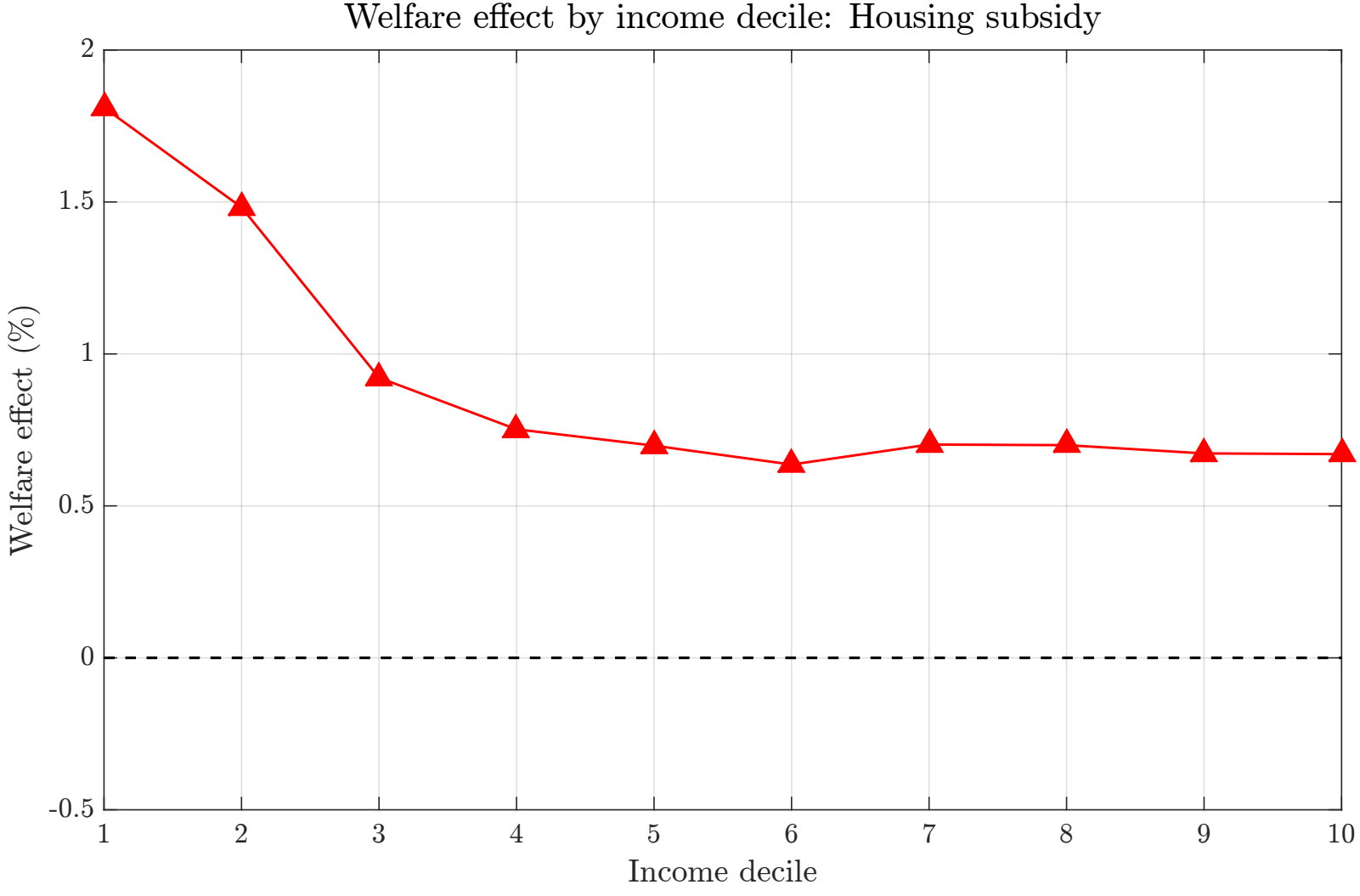

C1 - Real-Estate Transfer Tax
C2 - Mortgage Interest Tax Deductibility
C3 - No Social Housing
C4 - All combined
Welfare effect (%)
Income decile
Fixed prices, fixed taxes
Prices adjust, fixed taxes
Prices adjust, taxes adjust

Direct Housing Subsidy

- Low transaction taxes and mortgage interest tax deductions do not bring welfare gains, especially not for low-income households
- Abolishing social housing improves welfare, but more so for high-income households
- Alternative policies targeting low-income households?

Direct Housing Subsidy

- Low transaction taxes and mortgage interest tax deductions do not bring welfare gains, especially not for low-income households
- Abolishing social housing improves welfare, but more so for high-income households
- Alternative policies targeting low-income households?
- **Direct housing subsidy:** Abolish social housing and introduce targeted housing subsidies to households in the lowest two deciles (owners and renters). Spending on the policy equal to social housing spending in the benchmark.


Welfare effect by income decile: Housing subsidy
Welfare effect (%)
2
1.5
1
0.5
0
-0.5
1
2
3
4
5
6
7
8
9
10
Income decile

	Benchmark	Housing subsidy
Homeownership (%)	42.5	46.1
– 25-34 yrs	13.2	15.0
– 35-44 yrs	33.0	36.5
– 45-54 yrs	52.7	57.5
– 55-64 yrs	61.2	66.2
– 65+ yrs	47.4	50.6
Total wealth	128.7	132.1
– Housing	85.7	92.4
– Financial	46.6	43.9
House price	1.000	0.998

NOTE: All monetary values in thousand euros.

Conclusions

- **Social housing and tax policies** account for **two thirds of the homeownership gap** between Germany and the U.S.
- Implementing tax policies as in the U.S. **does not lead to welfare gains**
  - **Higher income taxes** are required to balance the government budget
  - **House price increases** due to stronger housing demand
- Abolishing **social housing** raises homeownership and brings (small) long-term welfare gains due to lower prices and taxes.
- **Direct housing subsidies** induce larger welfare gains for low-income households.

Housing policies and homeownership

Country	HOR	MID	Subs.	RETT	SH
Germany	44	+	++	+	+
France	55	+	++	+	+
United Kingdom	64	++	+++	+++	+
United States	67	+++	++	+++	+++
Italy	68	++	++	++	++
Spain	82	+++	+++	+	+++

NOTES: More + signs indicate policies more favorable for homeownership.

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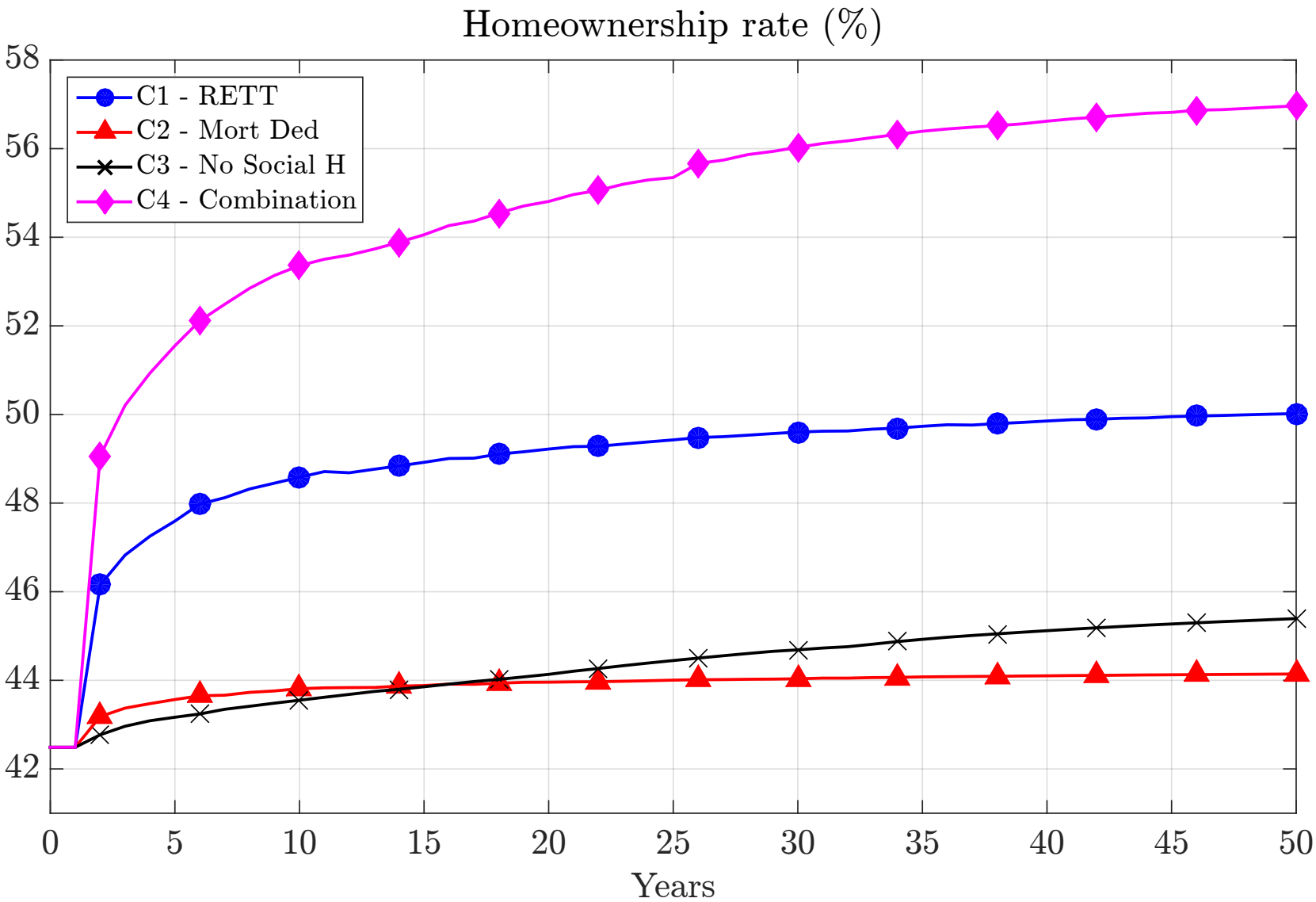
Welfare effects for the population alive at the time of the reform

	RETT C1	Mort Ded C2	No Social H C3	Combination C4
Fraction of winners (%)	15.9	27.0	88.8	17.7
– 25-34 years	17.5	99.4	82.1	20.9
– 35-44 years	22.9	51.2	84.9	31.1
– 45-54 years	20.1	8.0	82.9	27.2
– 55-64 years	21.6	2.9	90.7	19.0
– 65+ years	6.7	0.3	96.2	4.1
Average welfare effect† (%)	-0.56	-0.16	0.22	-0.59

NOTES: Fraction of households who benefit from the reform and average welfare effect for the population alive at the time of the reform. † In consumption equivalent variations.


Homeownership rate (%)
C1 - RETT
C2 - Mort Ded
C3 - No Social H
C4 - Combination
58
56
54
52
50
48
46
44
42
0
5
10
15
20
25
30
35
40
45
50
Years

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