Rental Markets and Wealth Inequality in the Euro Area

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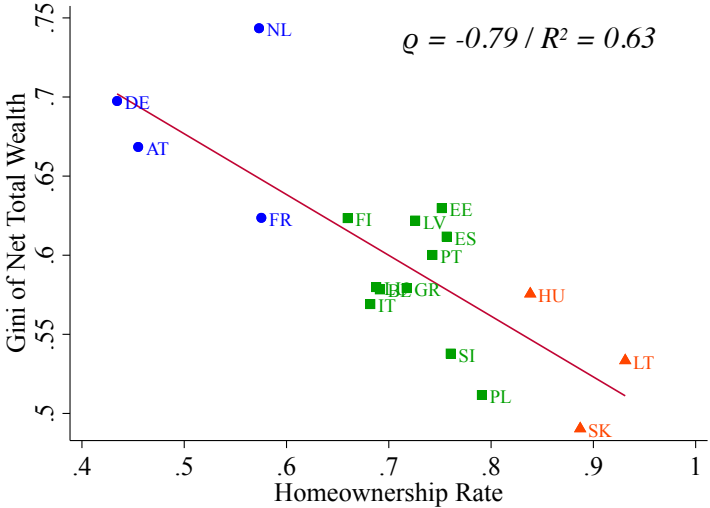
Motivation


ϱ = -0.79 / R² = 0.63
NL
DE
AT
FR
FI
EE
LV
ES
PT
BE
GR
IT
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SI
LT
PL
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Gini of Net Total Wealth
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.55
.6
.65
.7
.75
Homeownership Rate
.4
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.8
.9
1

Motivation

- Two Key Observations:
  1. Significant differences in homeownership rates across European countries
  2. Strong negative relationship between homeownership and wealth inequality

- In this paper:
  1. What does the data tell us about the origins of this relationship?
  2. Can we rationalize these two facts in a model?
  3. Is wealth inequality a "bad thing" in this context?

Preview – Insights from the Data

1. Many renters $\Longleftrightarrow$ High wealth inequality
2. Many renters $\Longleftrightarrow$ Many households with very low wealth
   - Low wealth households are predominantly renters
   - Wealth inequality is high in group of renters
3. Many renters $\Longleftrightarrow$ Many renters across all age groups
4. Many renters $\Longleftrightarrow$ Low degree of rent control

Preview – A Quantitative Model

- General equilibrium life-cycle model with
  - uninsurable idiosyncratic labor income risk
  - housing tenure choice
  - (country-specific) wedge on the rental market for shelter
- Potential other sources for cross-country differences
  - Income Process: Idiosyncratic risk + det. age profile
  - Fiscal Policies: Pension and (progressive) Tax schedules
  - Mortgage Market: Max. LTV ratios + Int. rate spreads

Preview – Findings

- Main results:
  1. Variation in homeownership rates across European countries
     → rental market efficiency
  2. Negative relationship between homeownership and wealth inequality
     → mortgage and housing markets frictions
- Key Takeaway:

  High wealth inequality connected to efficient rental markets
  → *not necessarily something to worry about*

The Data

Household Finance and Consumption Survey

- About household wealth and consumption (like SCF)
- Coordinated by ECB, carried out by national banks
- 16 Euro Area countries + Poland and Hungary
- Available since spring 2013
- Third wave data mostly collected in 2017

Sample Selection and Measure of Inequality

- Drop top 1% wealth holders from sample
- Generalized Entropy Index

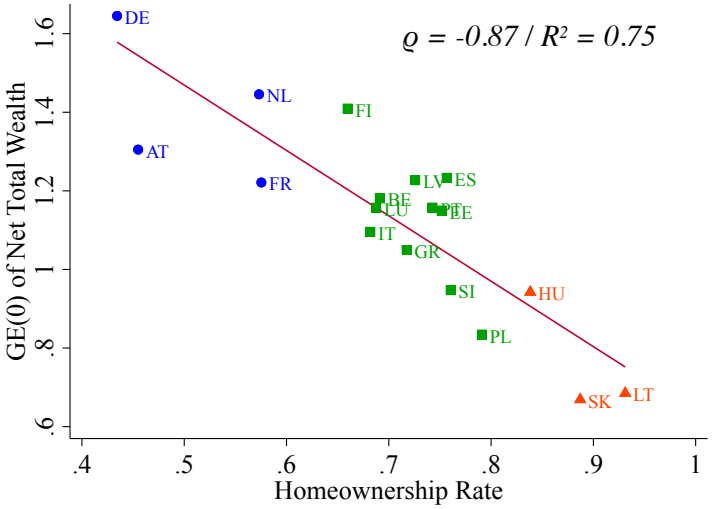
$$GE(0) = -\frac{1}{N} \cdot \sum_{i=1}^{N} \log\left(\frac{w_i}{\bar{w}}\right)$$

- Log-deviation from mean
- Puts most weight on inequality at bottom
- *GE* index easily decomposable

Insight 1:

Many renters $\iff$ High wealth inequality

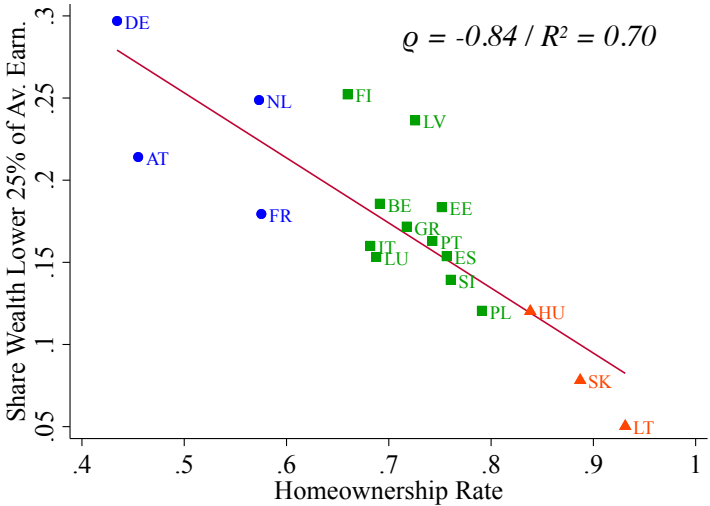
Homeownership and Wealth Inequality



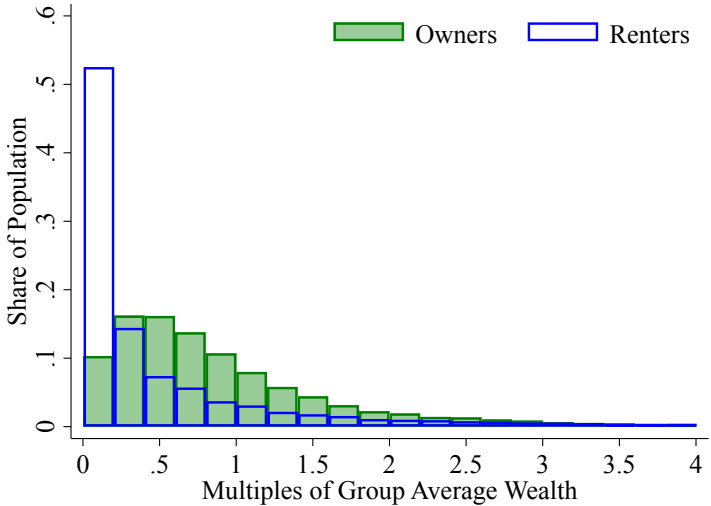
Insight 2:

Many renters $\iff$ Many households with very low wealth

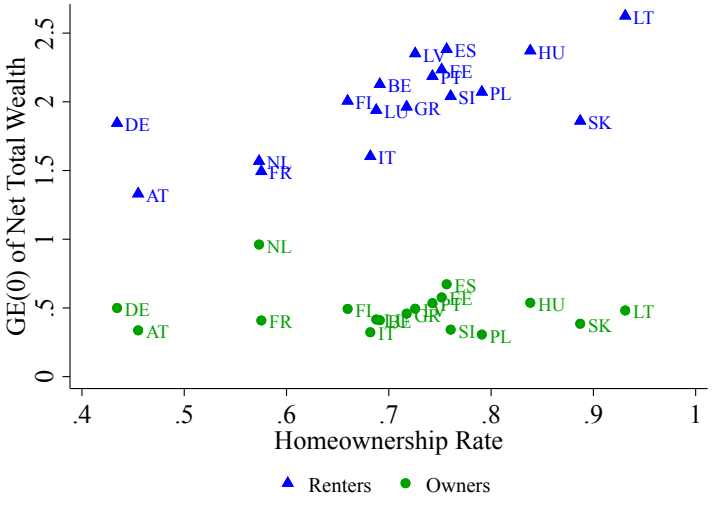
Homeownership and Low Wealth Households



Wealth Distribution by Tenure (pooled data)



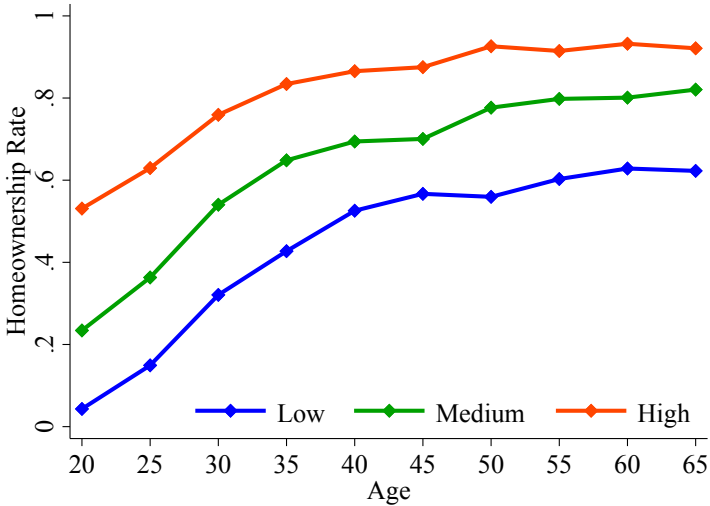
Renters are More Unequal than Owners



Insight 3:

Many renters $\iff$ Many renters across all age groups

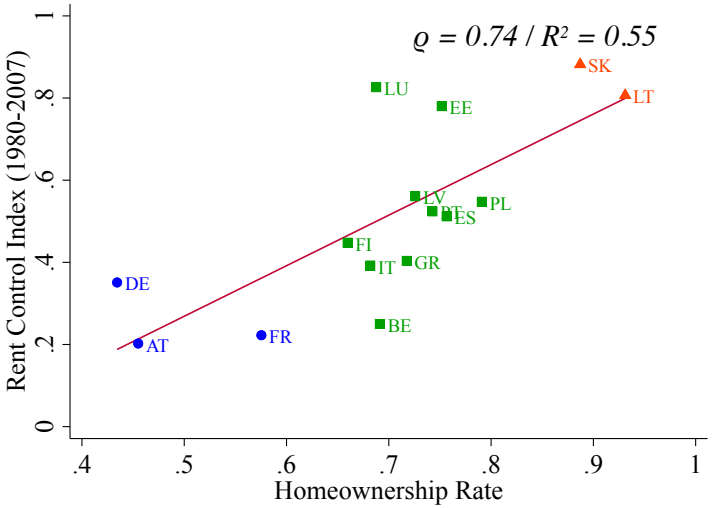
Homeownership Rate by Age Groups



Insight 4:

Many renters $\iff$ Low degree of rent control

Homeownership Rate and Rent Control



A Quantitative Model

Baseline Setup

- Open economy OLG model
- Households consume "food" and shelter
- Earn stochastic income stream
- Can invest in risk-free financial assets and real estate
- Non-convex adjustment costs for real estate
- Part of owned real estate can be rented out
- Wedge τ: renting more expensive compared to owning

Renter $(h = 0)$

- State: $z = (j, \eta, a, 0)$
- Value function

$$V(z) = \max_{c,s,a^+,h^+} \frac{\left[c^{1-\alpha} s^{\alpha}\right]^{1-\sigma}}{1-\sigma} + \beta E\left[V(z^+)|\eta\right]$$

- Budget constraint

$$c + a^+ + p_s s + p_h h^+ + \gamma(h^+, 0) = y_{net}(j, \eta) + [1 + r(a)]a$$

- LTV requirement and minimum house size

$$a^+ \geq -\lambda_{j+1} p_h h^+ \quad \text{and} \quad h^+ \in \{0, [h_{min}, \infty]\}$$

Owner ($h \geq h_{min}$)

- State: $z = (j, \eta, a, h)$
- Value function

$$V(z) = \max_{c,s,a^+,h^+} \frac{\left[c^{1-\alpha}s^{\alpha}\right]^{1-\sigma}}{1-\sigma} + \beta E\left[V(z^+)|\eta\right]$$

- Budget constraint

$$c + a^+ + p_h(h^+ - h) + \gamma(h^+, h) + p_h\delta_h h \\ = y_{net}(j,\eta) + p_s(1-\tau)(h-s) + [1 + r(a)]a$$

- LTV requirement, minimum house size, and no renting

$$a^+ \geq -\lambda_{j+1} p_h h^+ \quad , \quad h^+ \in \{0, [h_{min}, \infty]\} \quad \text{and} \quad s \leq h$$

Production Sector/Housing Market/Open Economy

- Production of "food": Cobb-Douglas in capital and labor
- Fixed shelter stock: $\overline{S}$
- Housing adjustment costs:

$$\gamma(h^+, h) = \begin{cases} 0 & \text{if } h^+ = h \\ \gamma_0 + \gamma_1 |h^+ - h| & \text{otherwise} \end{cases}$$

- Small open economy $\rightarrow$ fixed world interest rate r_w
- Financial intermediation $\rightarrow$ (country specific)

$$r(a) = \begin{cases} r_w - \frac{\kappa}{2} & \text{if } a \geq 0 \\ r_w + \frac{\kappa}{2} & \text{if } a < 0. \end{cases}$$

Endowment and Government

- Gross labor earning: $y(j, \eta) = w \times e_j \times \exp(\eta)$
  - w: real wage
  - e_j: deterministic age profile
  - η: idiosyncratic component (following AR(1) process)
- Net labor earnings: $y_{net}(j, \eta) = (1 - \tau_p) \cdot y - T(y) + p$
  - $T(y)$: (progressive) tax schedule
  - $p(\eta_{J_r - 1})$: pension payments after retirement $J_r = 63$
- Government expenditures: $G = T - P$

Market Clearing

- The housing and shelter market:

$$H = \int h \, d\Phi \quad \text{and} \quad \bar{S} = \int s \, d\Phi$$

- The rental market for shelter:

$$\underbrace{\int \mathbb{1}_{h=0} \cdot s \, d\Phi}_{\text{rental shelter demand}} = \underbrace{\int \mathbb{1}_{h>0} \cdot (h-s)(1-\tau) \, d\Phi}_{\text{rental shelter supply}}$$

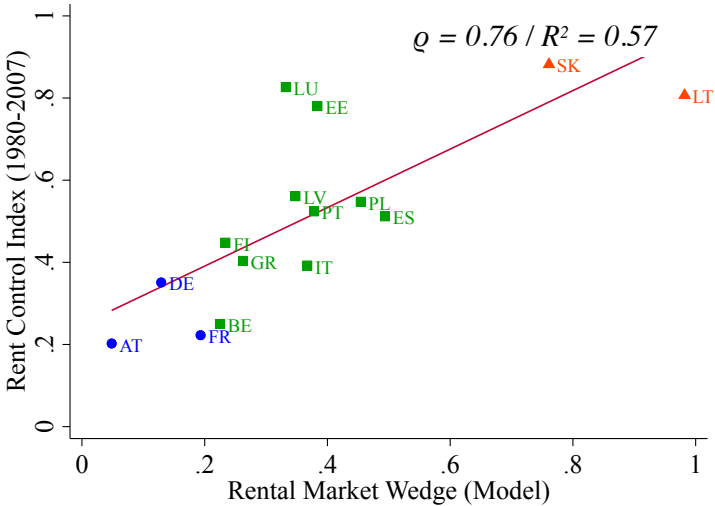
- Goods market

$$Y = C + I_K + I_h + G + \Psi_\gamma + \Psi_\tau + TB$$

Calibration

- Calibrate country invariant parameters to the German economy
- Fix baseline shelter stock to German level
- Set country specific:
  - Income Process: Idiosyncratic risk + det. age profile
  - Fiscal Policies: (progressive) Tax and Pension schedule
  - Mortgage Market: Max. LTV ratios + Int. rate spreads
- Calibrate τ for each country to match homeownership rate

Rental Market Efficiency: Data vs. Model



Model Validation:

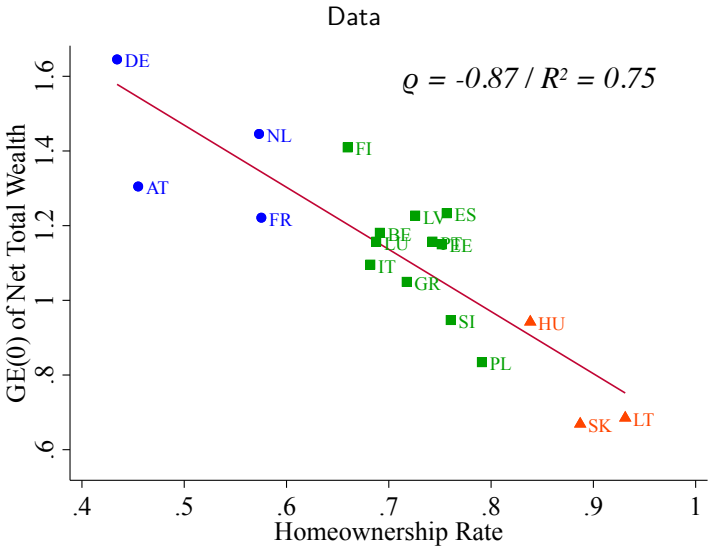
Can the model replicate the stylized facts from the data?

Insight 1:

Data vs. Model

Many renters $\Longleftrightarrow$ High wealth inequality

Homeownership and Wealth Inequality



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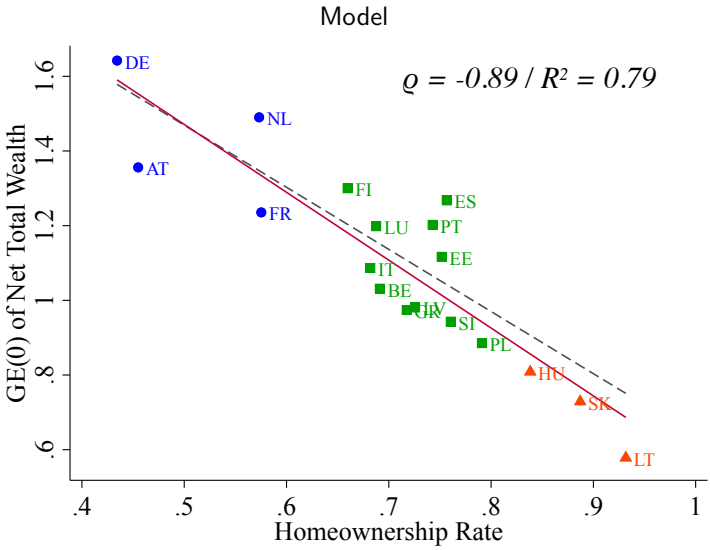

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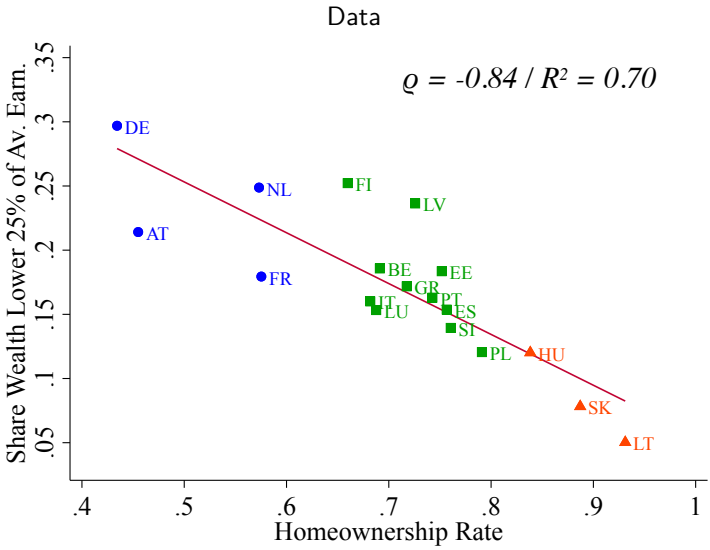
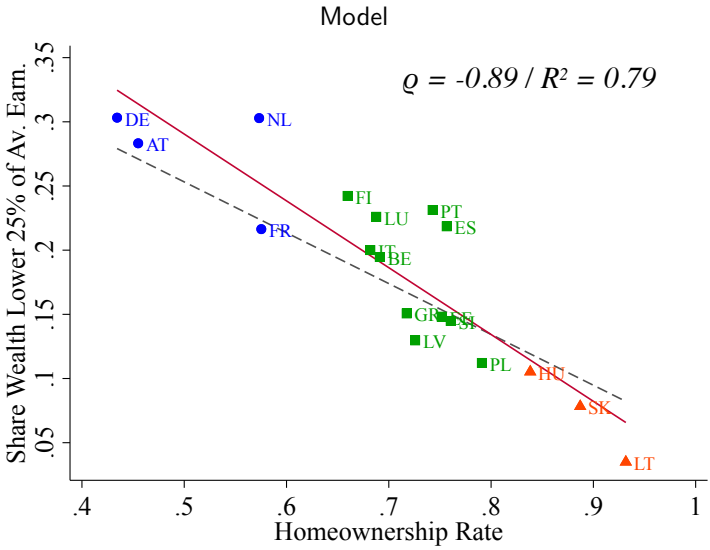
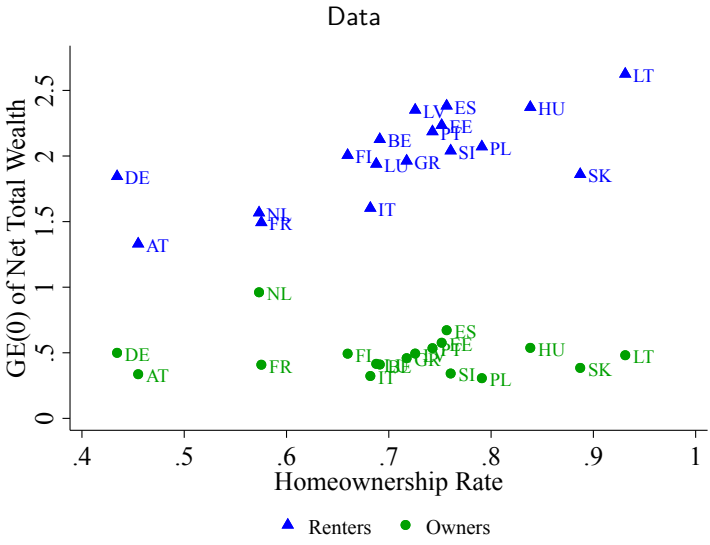


Homeownership and Low Wealth Households



Wealth Inequality by Tenure



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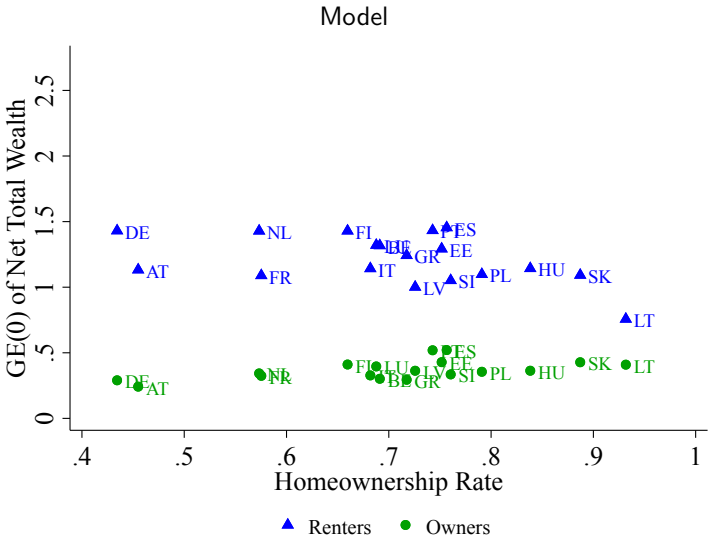

Insight 3:

Data vs. Model

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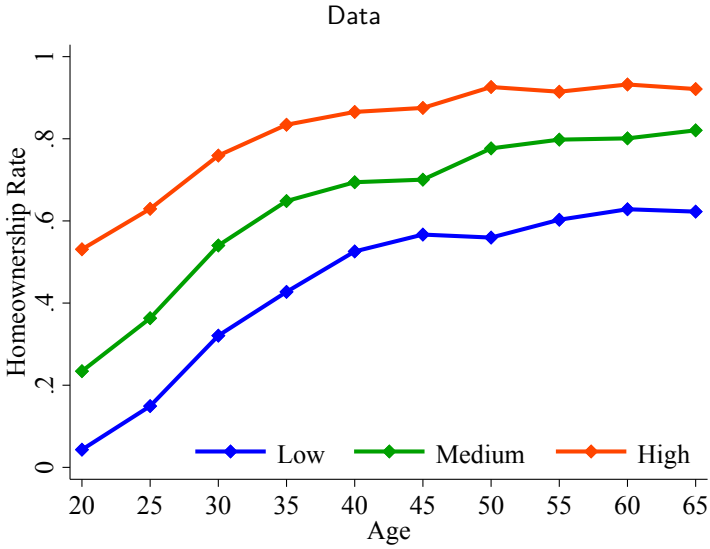
Homeownership Rate by Age Groups



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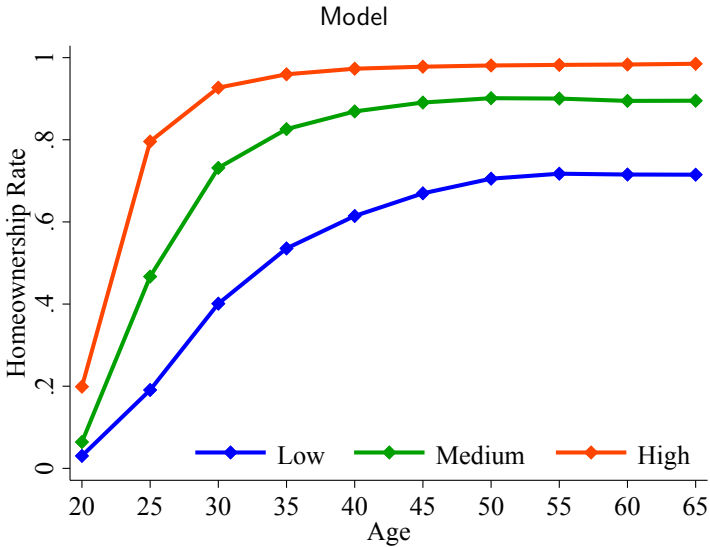


Counterfactuals:

What explains the variation in homeownership rates?

Explaining the Variation in Homeownership

- Create counterfactuals for the 18 sample countries
- Using either the actual country-specific parameters or fixing some/all to their (unweighted) country averages
  - Income Process: average income profiles and variances
  - Fiscal Policies: average tax and pension policy
  - Mortgage Market: average housing characteristics
  - Rental Market Efficiency: average τ across the countries
- Measure the goodness of fit as

$$R_h^2 = 1 - \frac{\sum_c \left(HOR^c_{model} - HOR^c_{data}\right)^2}{\sum_c \left(HOR^c_{data} - \overline{HOR}^c_{data}\right)^2}.$$

Explaining the Variation in Homeownership

Cross-Country Variation				HOR		
Wedge	Income	Policy	Mortgage	R_h^2	min	max
☑	☑	☑	☑	1.000	0.434	0.932

Explaining the Variation in Homeownership

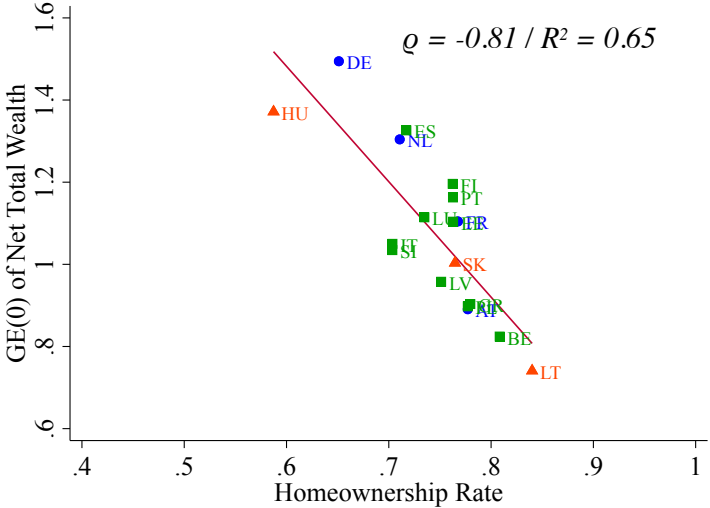
Cross-Country Variation				HOR		
Wedge	Income	Policy	Mortgage	R_h^2	min	max
☑	☑	☑	☑	1.000	0.434	0.932
☐	☑	☑	☑	-0.129	0.587	0.840

Explaining the Variation in Homeownership

Cross-Country Variation				HOR		
Wedge	Income	Policy	Mortgage	R_h^2	min	max
☑	☑	☑	☑	1.000	0.434	0.932
☐	☑	☑	☑	-0.129	0.587	0.840
☑	☐	☐	☐	0.860	0.411	0.915

Explaining the Variation in Homeownership – detailed

Homeownership Rate and Wealth Inequality – Without Wedge



Counterfactuals:

What explains the negative relationship between homeownership rates and wealth inequality?

What are the Mechanisms that shape wealth inequality?

- Create counterfactuals for the 18 sample countries
- Separately shut down single model ingredients shaping cross-country wealth inequality
  - housing market frictions
  - mortgage market frictions
  - everything else (income, policy, etc).

Explaining the Wealth Inequality-Homeownership Relationship

	$GE(0)$	
Model	β	Δ in %
Full model	-1.817	
Housing market frictions		
no minimum house size h_{min}	-1.500	-17.46
no adjustment costs $\gamma(h, h^+)$	-1.718	-5.49
Mortgage market frictions		
no interest rate spread κ^c	-1.274	-29.89
no variable LTV requirements λ_j	-1.640	-9.77
Other country differences		
no income & policy differences	-1.458	-19.78

Welfare Analysis:

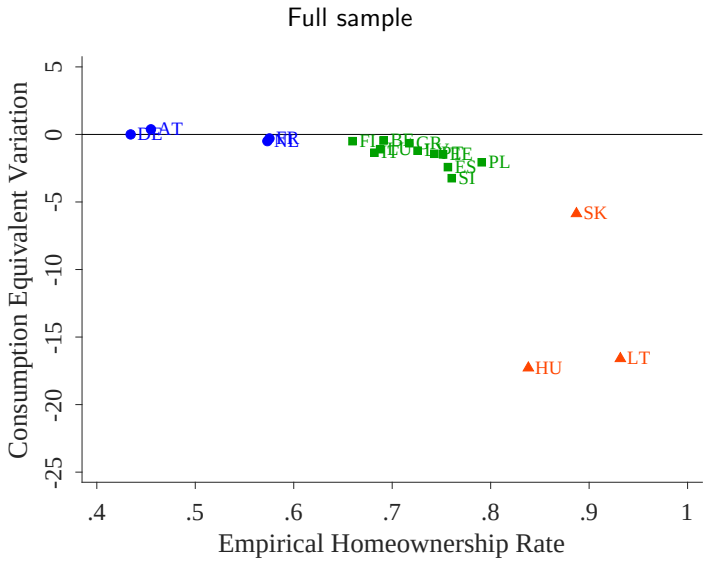
Some normative implications

Welfare Analysis (varying only τ^c)

- Create counterfactuals for the 18 sample countries
- Only vary τ across the countries
- Fix other country-specific parameters to their (unweighted) average
  - Income Process: average income profiles and variances
  - Fiscal Policies: average tax and pension policy
  - Mortgage Market: average housing characteristics
- Measure welfare in terms of consumption equivalent variation

$$\phi^c = 100 \left[\left(\frac{U_0^c}{U_0^{\text{DE}}} \right)^{\frac{1}{(1-\sigma)(1-\alpha)}} - 1 \right] \text{ with } \quad U_0^c = \mathbb{E}_0 \sum_{j=1}^{J} \beta^{j-1} \frac{\left[(c_j^c)^{1-\alpha} (s_j^c)^{\alpha} \right]^{1-\sigma}}{1-\sigma}$$

Consumption Equivalent Variation

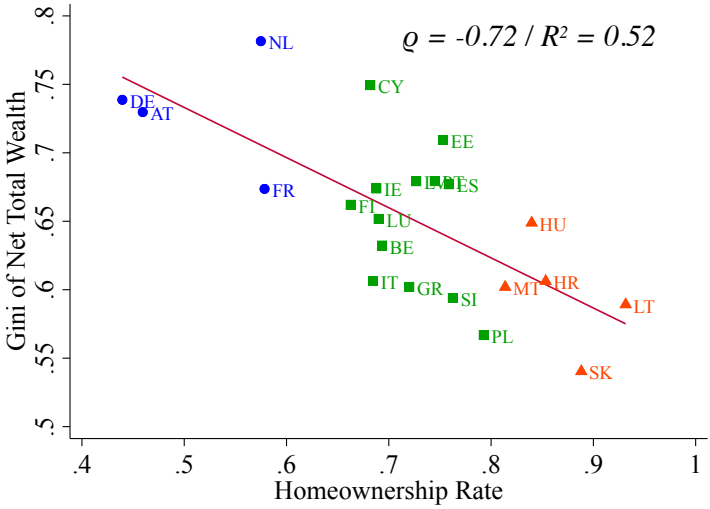


Conclusion

- Wedge on the rental market can explain the large variation in homeownership rates across countries
- Mortgage and housing market frictions are key to explain the negative correlation between wealth inequality and the homeownership rate across countries
- Our model suggests that countries with very high homeownership rates could benefit from policies aimed at making rental markets work better

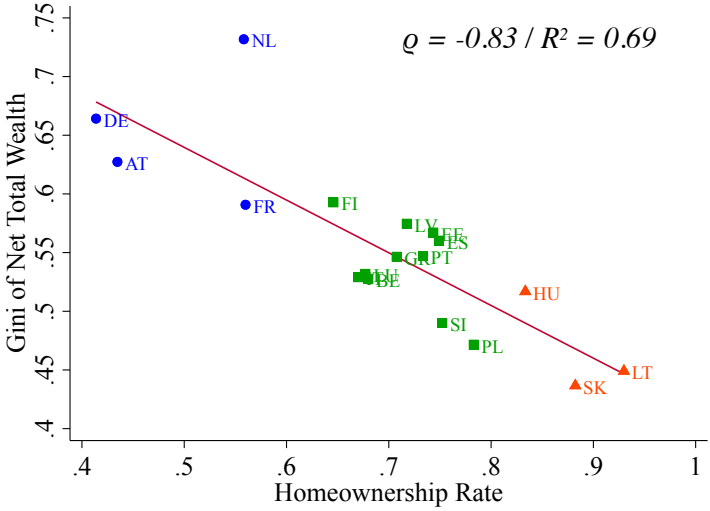
Thank you for your attention!

Gini – Full sample



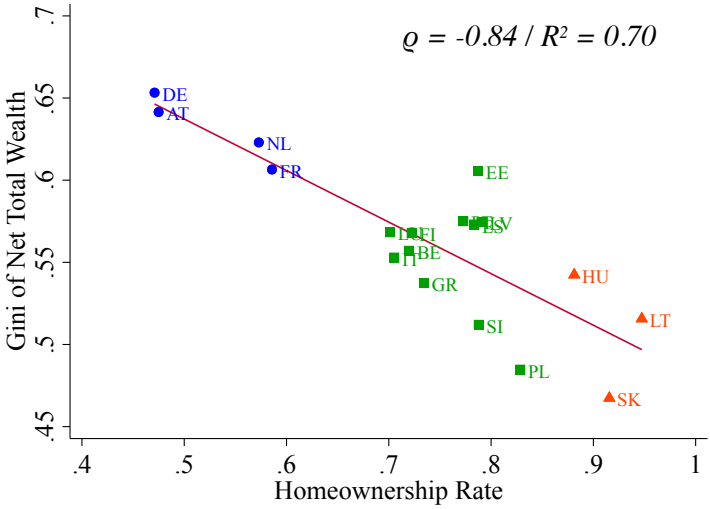
Back

Gini – Bottom 95% of wealth distribution



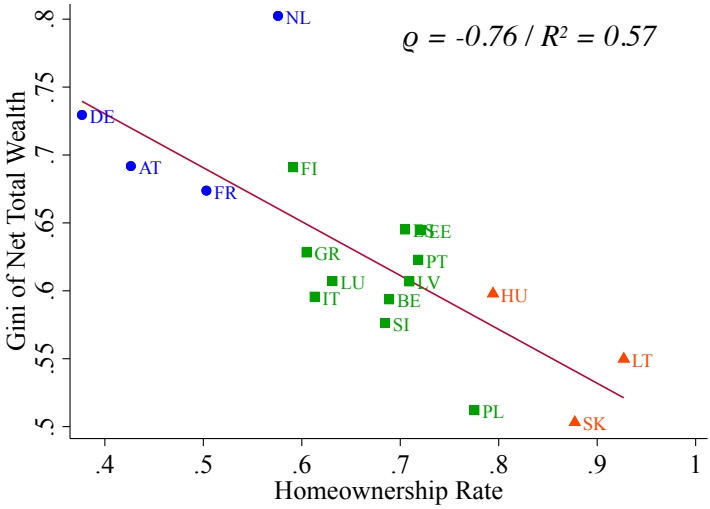
Back

Gini – Only positive net wealth



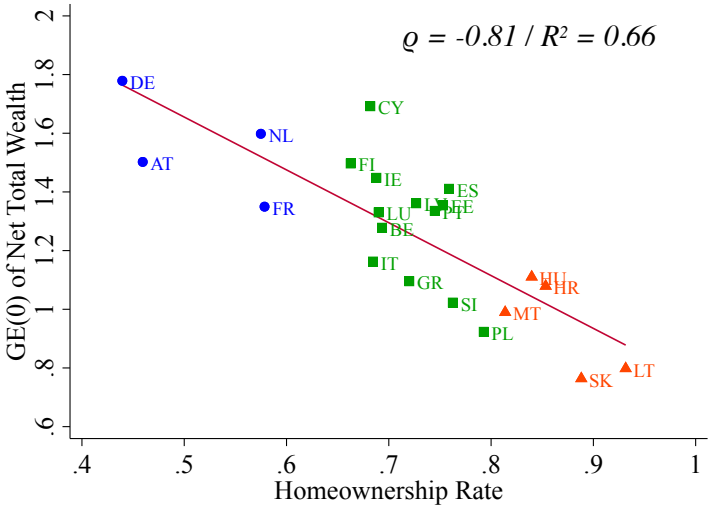
Back

Gini – Working age population



Back

GE(0) – Full sample



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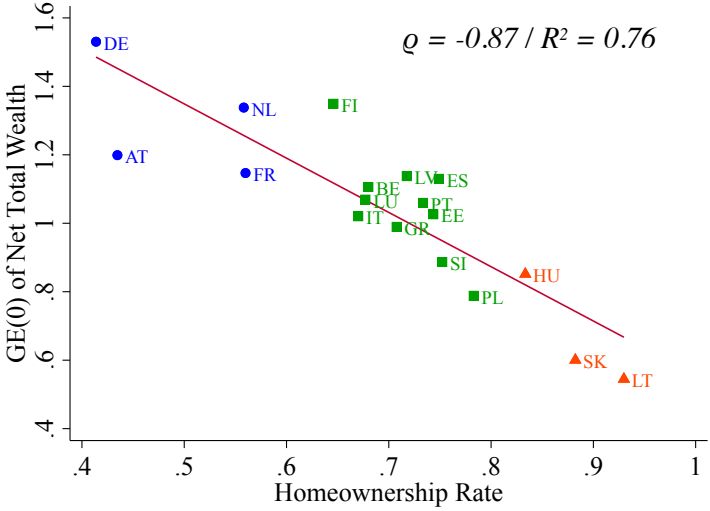

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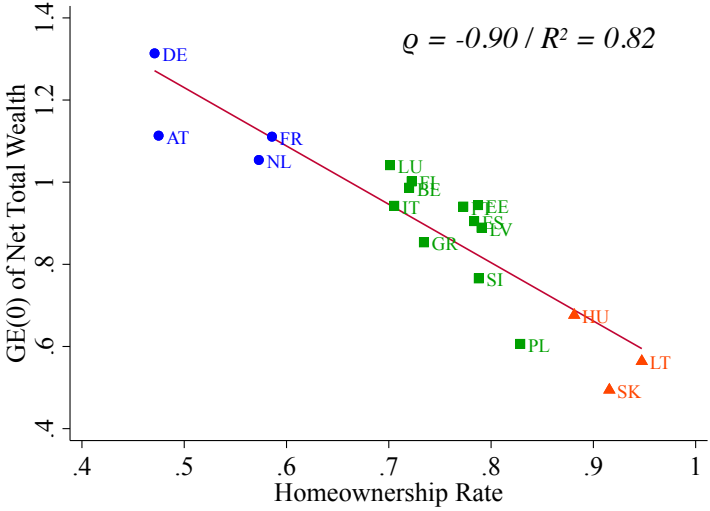
GE(0) – Only positive net wealth



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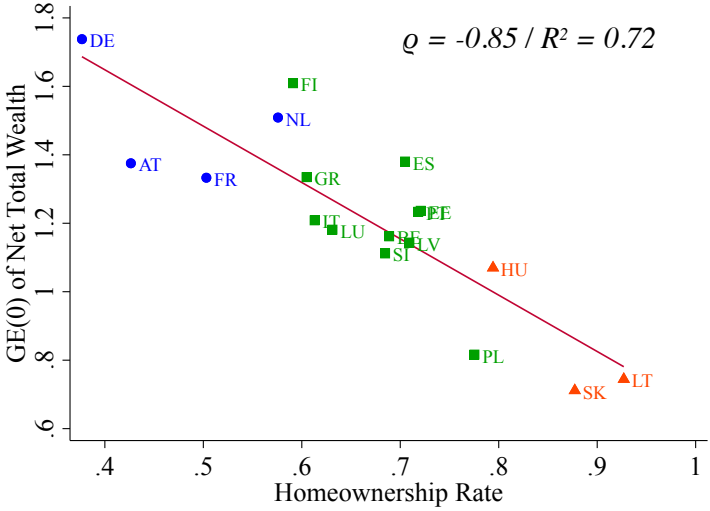
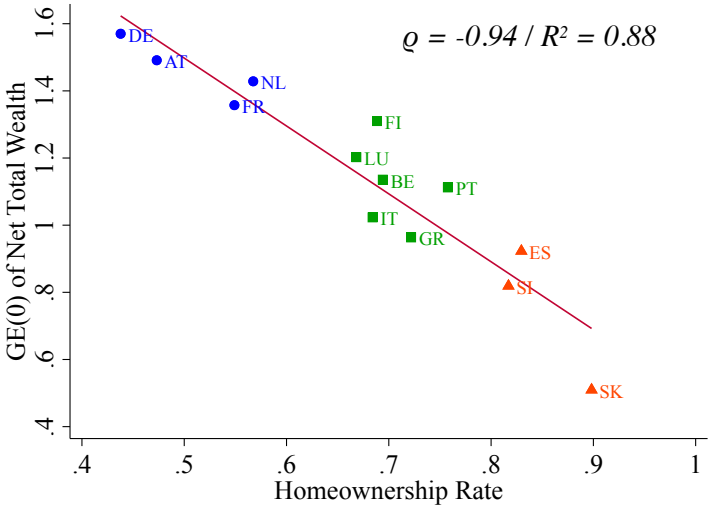
GE(0) – Working age population



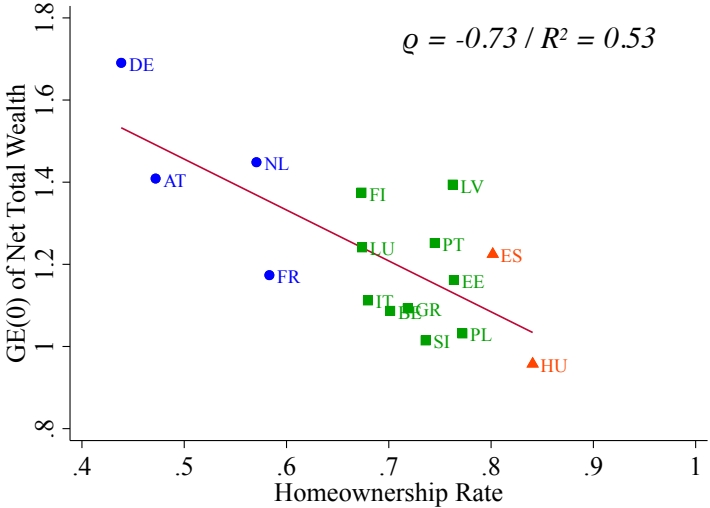
Back

Homeownership and Wealth Inequality – Wave 1



Back

Homeownership and Wealth Inequality – Wave 2



Back

Decomposition of the GE(0) Index

- For each country c and tenure subgroup $g \in \{o, r\}$ we denote:
  - HR_c: aggregate homeownership rate in a country c,
  - GE_c: $GE(0)$ – index of wealth inequality in a country c,
  - $GE_{c,g}$: $GE(0)$ – index of wealth inequality of group g in a country c,
  - $\bar{w}_c$: average wealth in a country c,
  - $\bar{w}_{c,g}$: average wealth of group g in a country c,
  - $WR_{c,g} = -\log\left(\frac{\bar{w}^c}{\bar{w}^c_g}\right)$: Log-wealth-ratio of group g in a country c.
- Then we can write

$$GE_c = \underbrace{(1 - HR_c) \cdot WR_{c,r} + HR_c \cdot WR_{c,o}}_{\text{between group inequality}} + \underbrace{(1 - HR_c) \cdot GE_{c,r} + HR_c \cdot GE_{c,o}}_{\text{within group inequality}}$$

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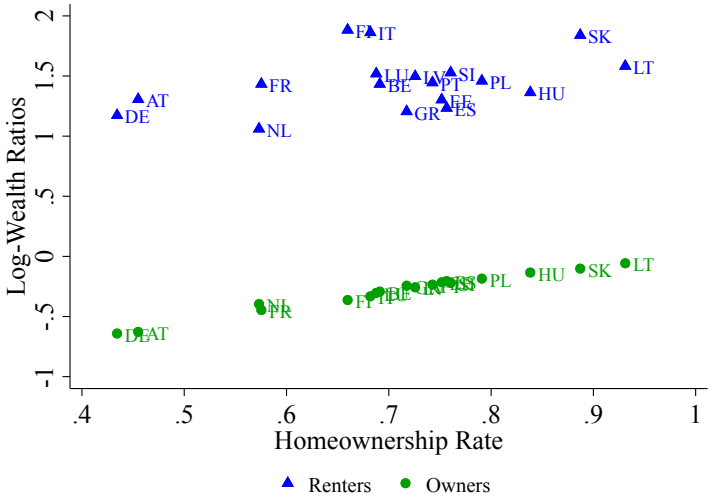
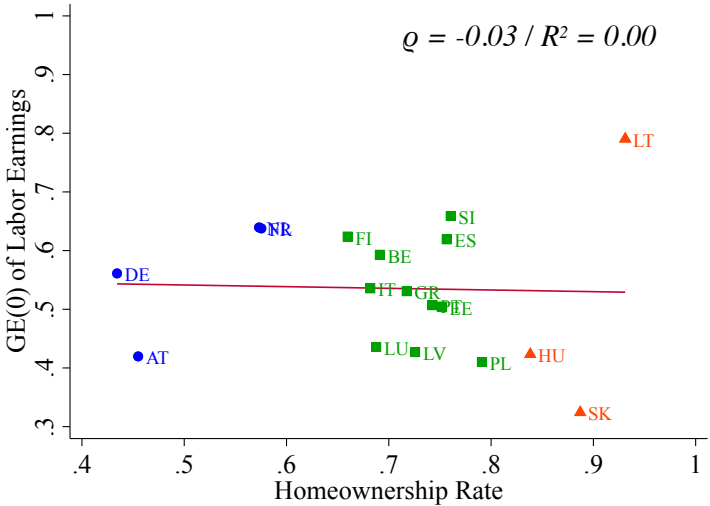
Log-Wealth-Ratios



Back

Homeownership Rate and Income Inequality



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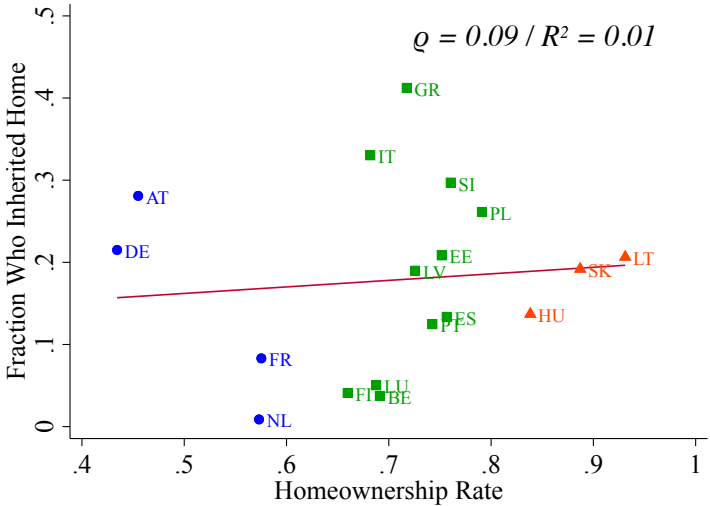
Homeownership Rate and Inherited Houses (Owners)



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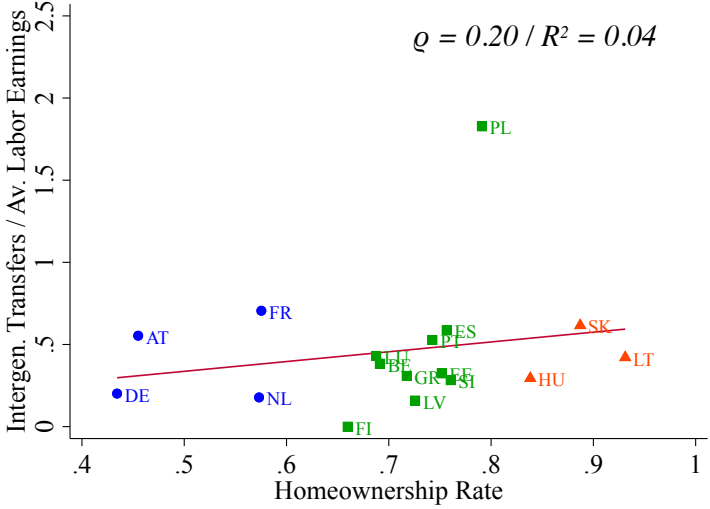
Homeownership Rate and Intergenerational Transfers



Back

Calibration: Preferences and Production

- Preferences: $u(c, s) = \left(c^{\alpha} \cdot s^{1-\alpha}\right)^{1-\sigma}$
  - Discont factor: $\beta = 0.992 \rightarrow$ Share of low-wealth households of 30% (Germany)
  - Expenditure share: $\alpha = 0.16$ (Eurostat)
  - Relative risk aversion: $\sigma = 2$

- Production: $Y(K, L) = \Omega \cdot K^{\epsilon} \cdot L^{1-\epsilon}$
  - Capital intensity of production: $\epsilon = 0.3$
  - Technology parameter: normalize the marg. product of labor ($w = 1$) $\rightarrow \Omega$
  - Depreciation rate of capital: German trade balance 6.26% of GDP $\rightarrow \delta_k = 0.059$

back

Calibration: Housing and Shelter Market

- Agg. shelter supply: Normalize German house price ($p_h = 1$) $\rightarrow \bar{S}/Y = 1.828$
- Lump-sum adjustment costs: $\gamma_0 = 0.15$ (Andrews et al. (2011))
- Proportional adjustment costs: $\gamma_1 = 0.05$ (Andrews et al. (2011))
- Min. house size: 5th perc. of house to av. income (pooled sample) $\rightarrow h_{min} = 1.26$
- Depreciation rate of housing: Approx. 40 years of property life $\rightarrow \delta_h = 0.025$

back

Calibration: Mortgage Markets (country-specifc)

- Interest rates (ECB)
  - World interest rate: $r_w = 0.025$
  - Interest rate spreads: $\kappa^c = r_{\text{mortgage\_5\_year}} - r_{\text{deposits\_1\_year}}$

- LTV requirement (HFCS)
  - λ_j^c initially equals 90th percentile of the loan-to-value distribution.
  - Decreases linearly to zero from age 40 to retirement ($J_r = 63$)

back

Calibration: Labor Income (country-specifc)

- Labor income process

$$\log y(j,\eta) = \log(e_j) + \eta \quad \text{with} \quad \eta^+ = \rho_e \eta + \varepsilon \ , \ \varepsilon \sim N(0, \sigma_\varepsilon^2).$$

- Use cross-section of household labor earnings from HFCS
- Regress on age fixed effects
- Use residuals to determine variance σ_ε^2 with $\rho = 0.95$
- Smooth out age profiles by piecewise polynomials
- Normalize $\log(e_j)$ such that average earnings $\bar{y}^c$ are equal to 1.

back

Calibration: Taxes and Pensions (country-specifc)

- Estimate tax/pension functions following Guvenen et al. (2013) using OECD data
- Tax function:

$$t^c(y) = \frac{T^c(y)}{y} = t_0^c + t_1^c \cdot y + t_2^c \cdot y^{\phi^c}$$

- Pension payments:

$$p(\eta_{J_r-1}) = b_0^c \times \bar{y}_{net} + b_1^c \times \min\left[y_{index}\left(\eta_{J_r-1}\right), y_{max}^c\right].$$

- where

$$y_{index}\left(\eta_{J_r-1}\right) = \mathbb{E}\left[\frac{\sum_{j=1}^{J_r-1} y_j - T(y_j)}{J_r - 1}\middle|\eta_{J_r-1}\right].$$

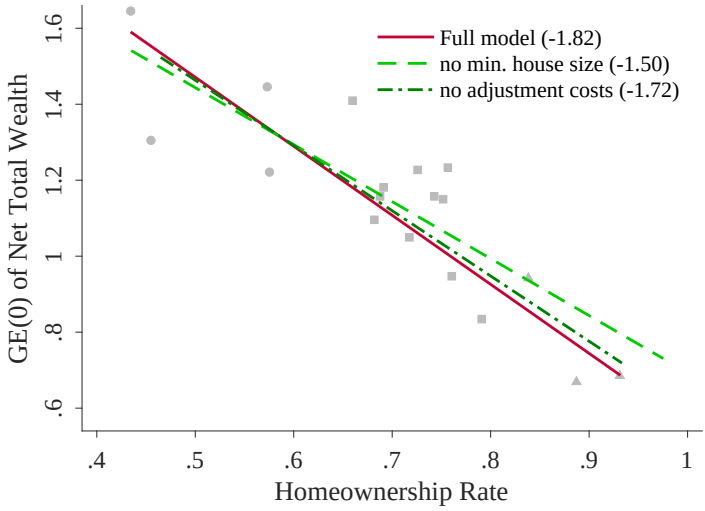
back

Explaining the Variation in Homeownership

Cross-Country Variation				HOR		
Wedge	Income	Policy	Mortgage	R_h^2	min	max
☑	☑	☑	☑	1.000	0.434	0.932
☑	☑	☑	☐	0.924	0.446	0.942
☑	☐	☐	☑	0.852	0.409	0.895
☑	☐	☐	☐	0.860	0.411	0.915
☐	☑	☑	☑	-0.129	0.587	0.840
☐	☑	☑	☐	0.050	0.665	0.849
☐	☐	☐	☑	-0.277	0.621	0.802

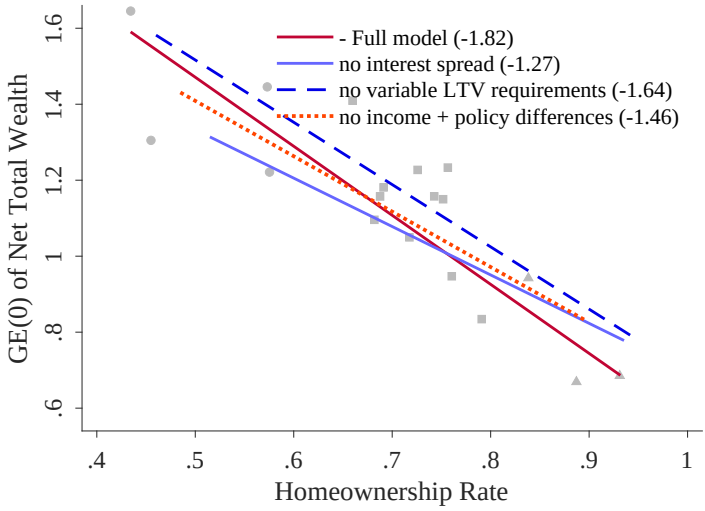
Back

Wealth Inequality-Homeownership Relationship



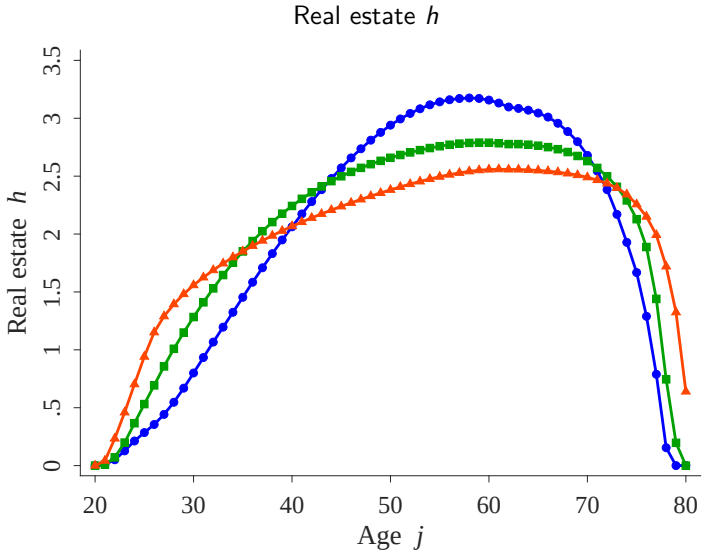
Back

Wealth Inequality-Homeownership Relationship



Back

Life-cycle profiles (varying only τ^c)



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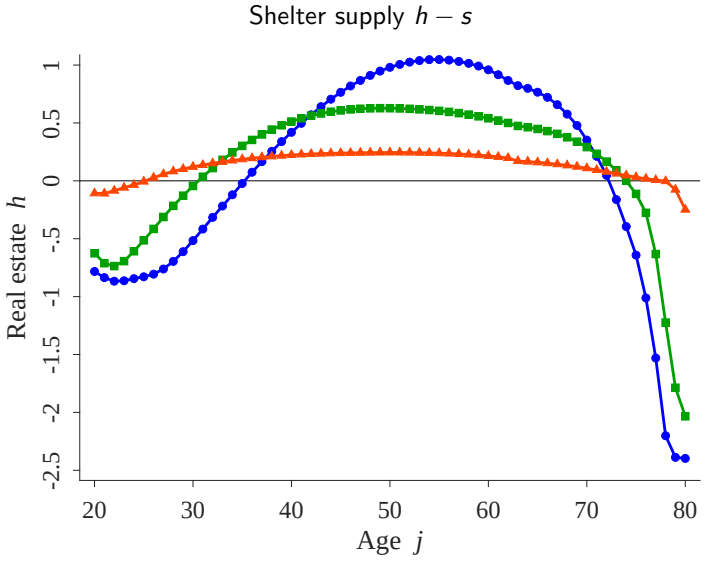

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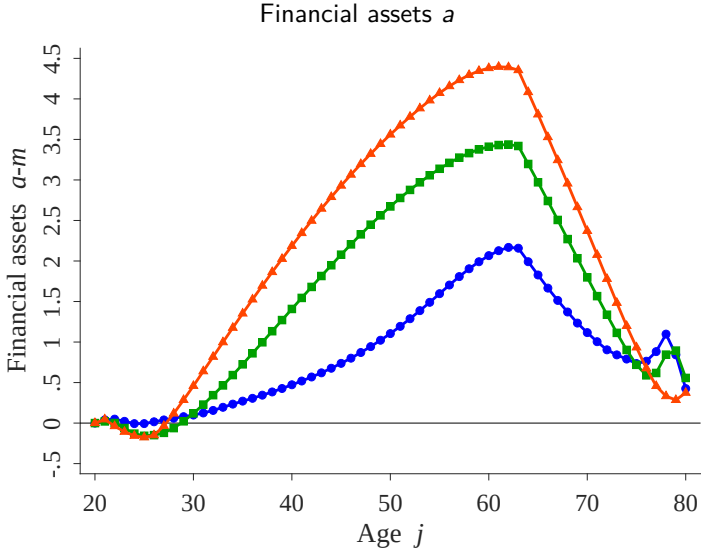

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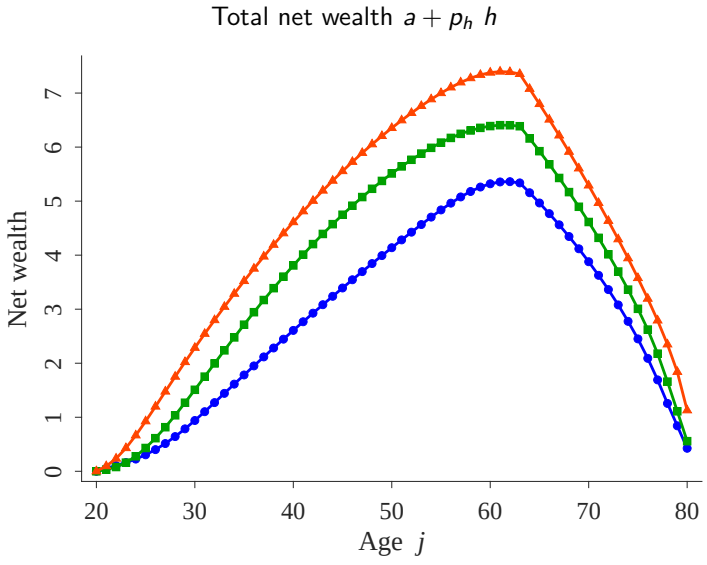

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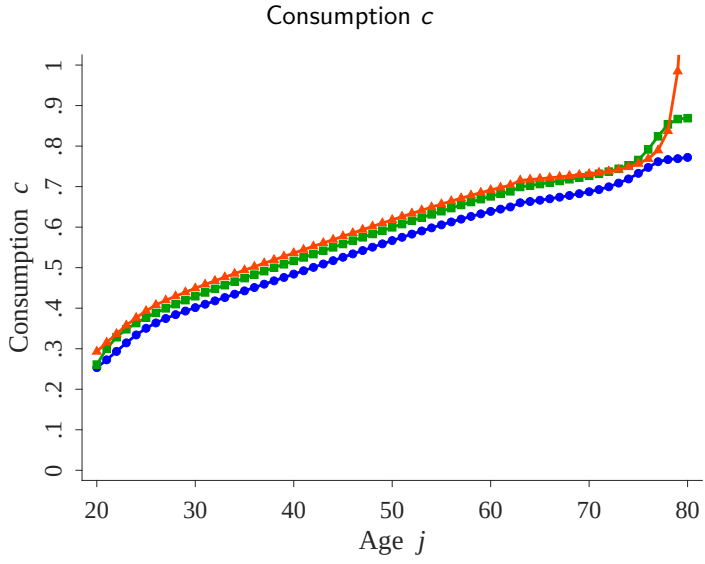

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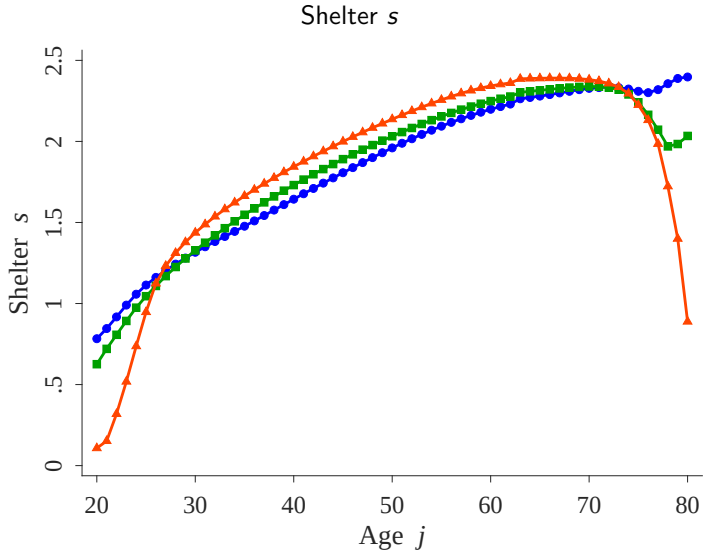

Back