Intergenerational transmission of homeownership status

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Motivation

- Intergenerational wealth transfers essential for wealth inequalities
- Housing a large share of the portfolio for many households
- Household financing options exploiting intergenerational (housing) link

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- Intergenerational wealth transfers essential for wealth inequalities
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Research Question

- Does parental homeownership impact children's homeownership choice inter-vivo?

Preview of Results

Does parental housing status affect children's housing status?

Theory:

1. Develop a two-period model with overlapping generations and complete markets

$\Longrightarrow$ Parental housing affects children's housing choice negatively

2. Outline of quantitative model

Empirics:

1. Empirical correlation positive.
2. No correlation with mortgage rates.
3. Negative correlation with mortgage interest rates.

Outline

Literature

Empirics

Rationalizing with a naive model

Rationalize with a quantitative model

Appendix

Literature

Literature

- **Portfolio Choice with Housing**: Cocco 2005, Eichenbaum, Rebelo, and Wong 2022, Mian and Sufi 2011, Mian, Rao, and Sufi 2013, Mian and Sufi 2014, Mian, Sufi, and Trebbi 2015

$\Longrightarrow$ **Parental role in housing choice**

- **Intergenerational Wealth Transfers**: Black et al. 2022, De Nardi 2004, De Nardi and Fella 2017, Druedahl and Martinello 2022, Koltikoff and Summers 1981, Nekoei and Seim 2023, Modigliani 1988, Ohlsson, Roine, and Waldenström 2020, Saez and Zucman 2016

$\Longrightarrow$ **Composition of inter-vivo wealth transfer**

- **Transmission of Homeownership Status**: Blanden, Eyles, and Machin 2023

Empirics

Connecting Data and Model

Is there a negative correlation in the data?

- PSID data 2003-2019 (9 biennial waves).
- Connect parental households to children.
  - Household ID, Person ID, 1968 Family ID
  - Not always a direct link between parents and children
  - Go to 1968 and track movers
- Combine with household portfolio.
  1. No Grandparents
  2. Focus on prime-age children (25-40)
  3. No Businessowner
- Currently using 30% of data

Averages across Parental Homeownership status

Table 1: Averages Across Parental Homeownership Status

Children	Parents Homeowner	Parents Renter	Overall
Observations	18266	6294	24560
% Homeowner	0.54*	0.28	0.52
% Homeowner, aged 25-30	0.41*	0.21	0.38
% Homeowner, aged 30-35	0.58*	0.28	0.53
% Homeowner, aged 35-40	0.67*	0.37	0.62
Net Family Wealth	151,000*	113,000	141,000
Net Parental Wealth	402,000*	105,000	326,000
Conditional on Homeownership			
Observations	9798	1746	11542
House Value	424,000	494,000	435,000
% Mortgage	0.85*	0.78	0.84
Net Family Wealth	190,000	181,000	189,000
Net Parental Wealth	375,000*	125,000	338,000
Conditional on Mortgage			
Observations	7493	1209	9684
Fixed Interest Rates	5.67*	6.67	5.8
Loan-to-Value Ratio	2.12	2.24	2.13
Total Mortgage Size	382,000*	362,000	380,000
Net Family Wealth	185,000	189,000	186,000
Net Parental Wealth	369,000*	143,000	338,000

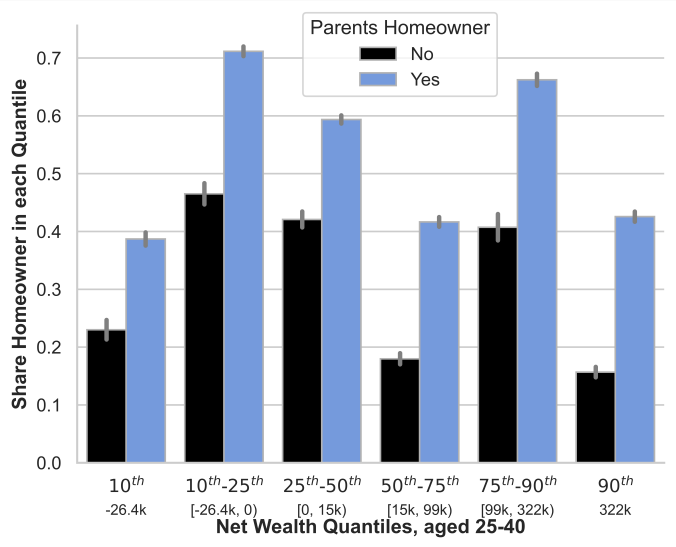
* denotes statistical significance at 5% for a t-test in means

Medians

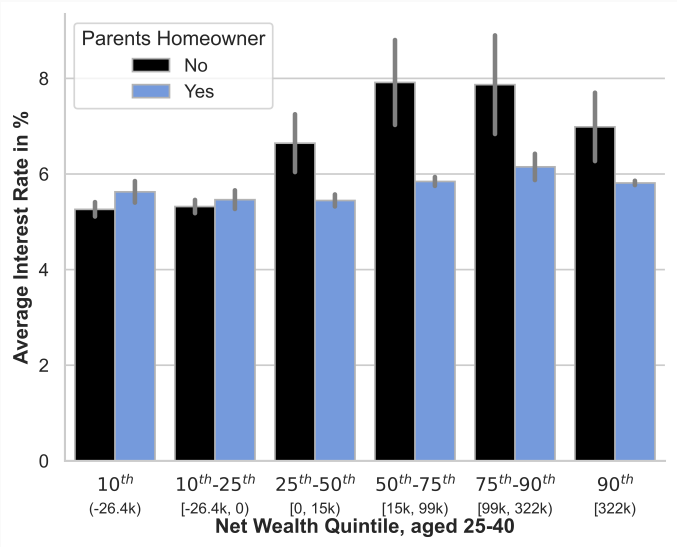
Homeowners by Wealth Quantile

Figure 1: Shares by Parental Homeownership Status and Wealth Quintile of Children

(a) Share of Homeowners



(b) Interest Rate on Mortgage



Errorbars are standard errors

Homeownership rates by education | Mortgage Shares | Interest rate by education

Regression Model

Estimated Model:

$$Y = \beta_1 PH + \beta_2 PS + \beta_3 PSt + \beta_4 PW + X\gamma_1 + PX\gamma_2 + \delta_t + \delta_s + \epsilon$$

Y: binary variable, 1 if homeowner
PH: binary variable, 1 if parents homeowner
PW: parents net wealth per child; PSt: parents stockholders; PS: parents savers.
PX: Parental Family Controls, X: Family Controls

$\Longrightarrow$ Targeted Counterfactual: Holding Wealth in Housing vs. Liquid Assets

Control Variables

Correlation with Childrens Homeownership Status

Table 2: Pooled OLS - Linear Probability Model

	Dep. Var.: Child Homeowner	
	(I)	(II)
Parents Homeowner	0.219***	0.118***
	(0.016)	(0.019)
Parents Stockholder	0.032**	0.01
	(0.016)	(0.015)
Parents Savers	0.035***	0.006
	(0.011)	(0.012)
Control Variables	No	Yes
Time & State FE	Yes	Yes
No. Observations	15244	11421
Entities	4470	2539
Time periods	9	9
R-squared	0.09	0.28

Standard error in parenthesis are clustered at the *1968 Family* Level

***, **, * denote statistical significance at 1%, 5% and 10%, respectively

Sample Weights Probit

Correlation with Mortgage Share & Mortgage Interest Rates

Table 3: Pooled OLS - Linear Probability Model II

Dep. Var.:	Has Mortgage		Interest Rate	
	(I)	(II)	(III)	(IV)
Parents Homeowner	0.037*	0.002	−0.369*	−0.546**
	(0.019)	(0.022)	(0.22)	(0.273)
Parents Stockholder	0.03**	0.016	−0.031	−0.285
	(0.013)	(0.012)	(0.133)	(0.161)
Parents Savers	0.039***	0.038***	−0.365**	−0.265
	(0.013)	(0.013)	(0.176)	(0.16)
House Value	Yes	Yes	Yes	Yes
Mortgage Size	No	No	Yes	Yes
Other Control Variables	No	Yes	No	Yes
Time & State FE	Yes	Yes	Yes	Yes
No. Observations	7121	5802	5448	4566
Entities	4468	1623	1662	1372
Time periods	9	9	9	9
R-squared	0.1	0.17	0.06	0.1

Standard error in parenthesis are clustered at the *1968 Family* Level

***, **, * denote statistical significance at 1%, 5% and 10%, respectively

Sample Weights | Probit | Family Fixed Effects

Interaction with Income

Table 4: Pooled OLS - Interaction with Income

Dep. Var.:	(I) Child Homeowner	(II) Has Mortgage	(III) Interest Rate
Parents Homeowner	0.157***	0.059	−1.119*
	(0.028)	(0.039)	(0.605)
Parents Homeowner x Fam. Income	−0.078**	−0.065**	0.078*
	(0.035)	(0.033)	(0.042)
Parents Stockholder	0.015	0.023	−0.166
	(0.025)	(0.022)	(0.259)
Parents Stockholder x Fam. Income	−0.009	−0.004	−0.009
	(0.024)	(0.014)	(0.013)
Parents Savers	0.021	0.043**	−0.072
	(0.019)	(0.02)	(0.326)
Parents Savers x Fam. Income	−0.029	−0.005	−0.034
	(0.022)	(0.014)	(0.032)
House Value	No	Yes	Yes
Mortgage Size	No	No	Yes
Other Controls	Yes	Yes	Yes
State & Time FE	Yes	Yes	Yes
No. Observations	11421	5802	4653
Entities	2494	1623	1387
Time periods	9	9	9
R-squared	0.31	0.17	0.09

Standard error in parenthesis are clustered at the *1968 Family* Level

***, **, * denote statistical significance at 1%, 5% and 10%, respectively

Family Income is denoted in 10,000$

Sample Weights

Rationalizing with a naive model

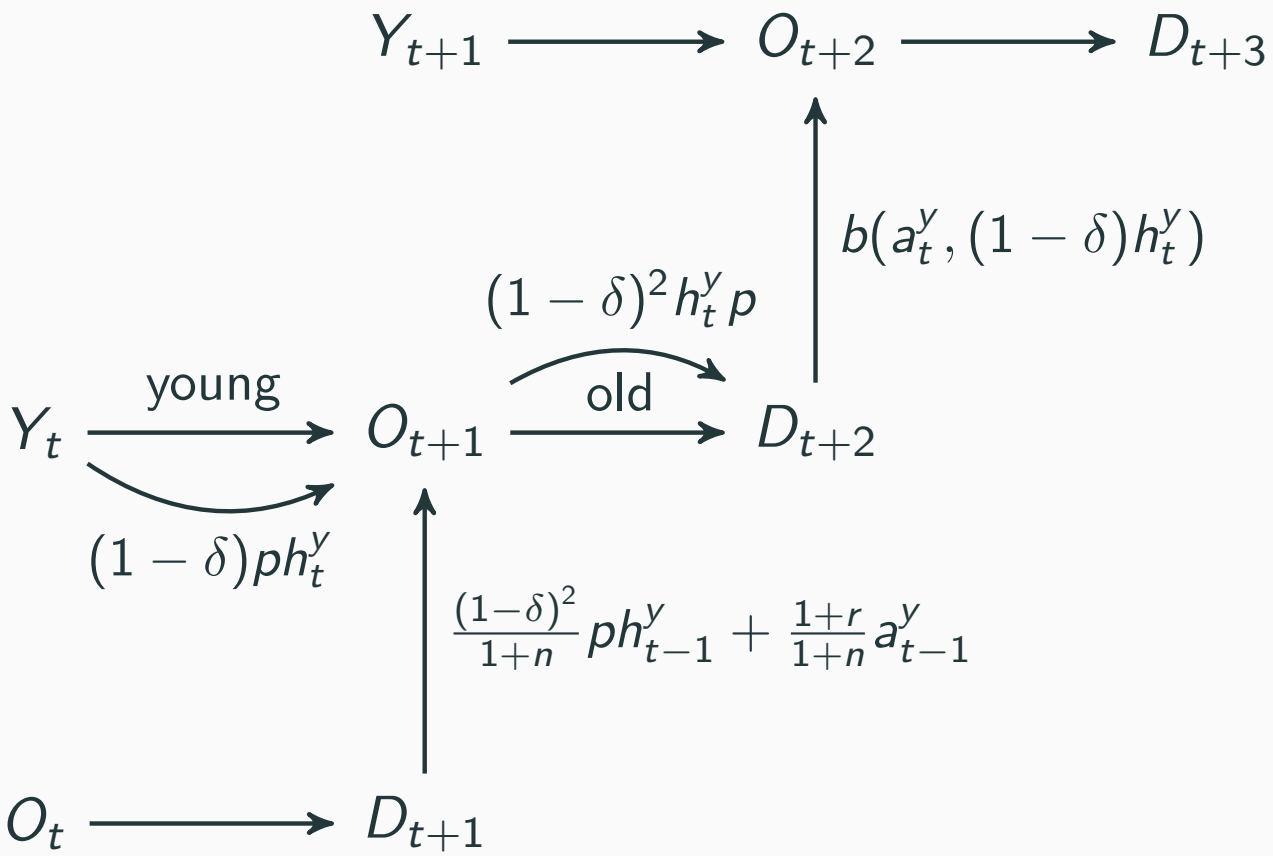
Complete Markets Model

1. Two-period model with overlapping generations
2. Discrete Choice: Renter V^{rent} or Owner V^{own}, housing always one
3. Households choose: consumption c, assets a
4. Housing depreciates δ (durable and illiquidity) **and**

   Enters utility function directly (consumption argument)
5. Inheritance with absolute certainty h^o_{t-1}, a^o_{t-1}
6. Bequest motive: Non-homothetic warm-glow

Complete Markets I

Dynamics in the toy model:



Homeowner

$$\max\{V^{rent}, V^{own}\} \tag{1}$$

$$V^{own} = \max_{c_t^o, c_{t+1}^o} u(c_t^o, h_t^o) + \beta[u(c_{t+1}^o, (1-\delta)h_t^o) + b(a_t^o, (1-\delta)h_t^o)] \tag{2}$$

$$c_t^o = w - p^o h_t^o - a_t^o \tag{3}$$

$$c_{t+1}^o = (1+r)a_t^o + \frac{1-\delta}{1+n} p^o h_{t-1}^o + \frac{1+r}{1+n} a_{t-1}^o \tag{4}$$

Renter's Problem | Intertemporal Substitution

Model Prediction

Agent, when receiving

$$\frac{(1-\delta)\theta + (1+r)(1-\theta)}{1+n} \implies \frac{\partial}{\partial\theta} = -\frac{\delta + r}{1+n} < 0 \qquad (5)$$

θ is share house inheritance $\implies$ prefer liquid assets for given wealth.

Marginal agent

$$\underbrace{\beta b(a_t^{own}, (1-\delta)h^{own}) - b(a_t^{rent}, 0)}_{\text{if } >0\text{, utility from bequeathing}} =$$

$$\sum_{i=0}^{1} \beta^i \underbrace{\left(u(c_{t+i}^{rent}, h_{t+i}^{rent}) - u(c_{t+i}^{own}, (1-\delta)^i h_{t+i}^{own})\right)}_{\text{then } >0\text{, loss of consumption}} \qquad (6)$$

$\implies$ The richer, the more important bequests/owning.

$\implies$ Children of rich parents are more likely to rent.

$\implies$ Negative correlation

Rationalize with a quantitative model

Incomplete Markets

Hypothesis:

Financial frictions matter - parents can:

a) Co-sign to reduce mortgage burden by children
b) Help with downpayment via liquid assets

The model:

- Households rent or buy, given homeowner, can pay, sell, or default
- Individual endogenous interest rate on the mortgage
- Parents can support either downpayment, collateral, both, or nothing
- Pledging collateral makes them liable but reduces the interest rate.
- Downpayment assistance gives access to a mortgage.

Households

With $S = (t, a, y)$ first Decision:

$$V(S) = \max\left\{V^{rent}(S), V^{buy}(S)\right\} \tag{7}$$

Having bought:

$$V^h(S, h^{own}, M) = \max\left\{V^{pay}(S, h^{own}, M), V^s(S), V^d(S)\right\} \tag{8}$$

Parents support mortgage if:

$$\mathbf{I}_\theta = \begin{cases} \theta & \text{if} \quad \max\{V^{p,dp}, V^{p,h,b}\} \geq V^{p,n} \\ 0 & \text{if otherwise} \end{cases}$$

$$\mathbf{I}_\chi = \begin{cases} \chi & \text{if} \quad \max\{V^{p,h,c}, V^{p,h,b}\} \geq \max\{V^{p,h,dp}, V^{p,h,n}\} \\ 0 & \text{if otherwise} \end{cases}$$

Renter Buyer Mortgage Payments Firms & Government Parents Last Period

Next Steps

- Summer: Write and compute quantitative model
- Calibration to US data
- Policy experiments
- Long-term goal: Administrative Data from Denmark

Appendix

Median

Table 5: Medians Across Parental Homeownership Status

Children	Parents Homeowner	Parents Renter
% Homeowner	0.54*	0.28
% Homeowner, *aged*25 − 30*	0.41	0.21
% Homeowner, *aged*30 − 35*	0.58	0.28
% Homeowner,*aged*35 − 40*	0.67	0.37
Net Family Wealth	151,000	113,000
Net Parents Family Wealth	402,000*	105,000
Cond. on Homeownership		
Av. House Value	167,000*	140,000
% Mortgage	1	1
Net Family Wealth	44,000*	35,000
Net Parents Family Wealth	95,000*	8,000
Cond. on Mortgage		
Fixed Interest Rates	5.25*	5.5
Loan-to-Value Ratio	1.94*	2.1
Total Mortgage Size	341,000*	315,000
Net Family Wealth	42,000*	32,000
Net Parents Family Wealth	90,000*	9,000

Renter

$$V^{rent} = \max_{c_t^r, c_{t+1}^r} u(c_t^r, h_t^r) + \beta[u(c_{t+1}^r, h_{t+1}^r) + b(a_t^r, 0)] \tag{9}$$

$$s.t.$$

$$c_t^r = w - p^r h_t^r - a_t^r \tag{10}$$

$$c_{t+1}^r = (1+r)a_t^r - p^r h_{t+1}^r + \frac{1-\delta}{1+n} p h_{t-1}^o + \frac{1+r}{1+n} a_{t-1}^o \tag{11}$$

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Intertemporal Substitution

$$\frac{dh_t^o}{dh_{t-1}^o} = -\frac{\overbrace{p^o u_{c_t^o c_t^o}(c_t^o, h_t^o)}^{<0}}{\underbrace{\beta \frac{1-\delta}{1+n}(1+r) u_{c_{t+1}^o c_{t+1}^o}(c_{t+1}^o, (1-\delta)h^o)}_{<0}} < 0 \tag{12}$$

$$\frac{dh_t^r}{dh_{t-1}^o} = -\frac{\overbrace{p^r u_{c_t c_t}(c_t^r, h_t^r)}^{<0}}{\underbrace{\beta \frac{1-\delta}{1+n}(1+r) u_{c_{t+1} c_{t+1}}(c_{t+1}^r, h_{t+1}^r)}_{<0}} < 0 \tag{13}$$

$$\frac{dh_{t+1}^r}{dh_{t-1}^o} = -\frac{\overbrace{-p^r u_{c_{t+1}^r c_{t+1}^r}(c_{t+1}^r, h_{t+1}^r)}^{>0}}{\underbrace{\frac{1-\delta}{1+n} u_{c_{t+1}^r c_{t+1}^r}(c_{t_1}^r, h_{t+1}^r)}_{<0}} > 0 \tag{14}$$

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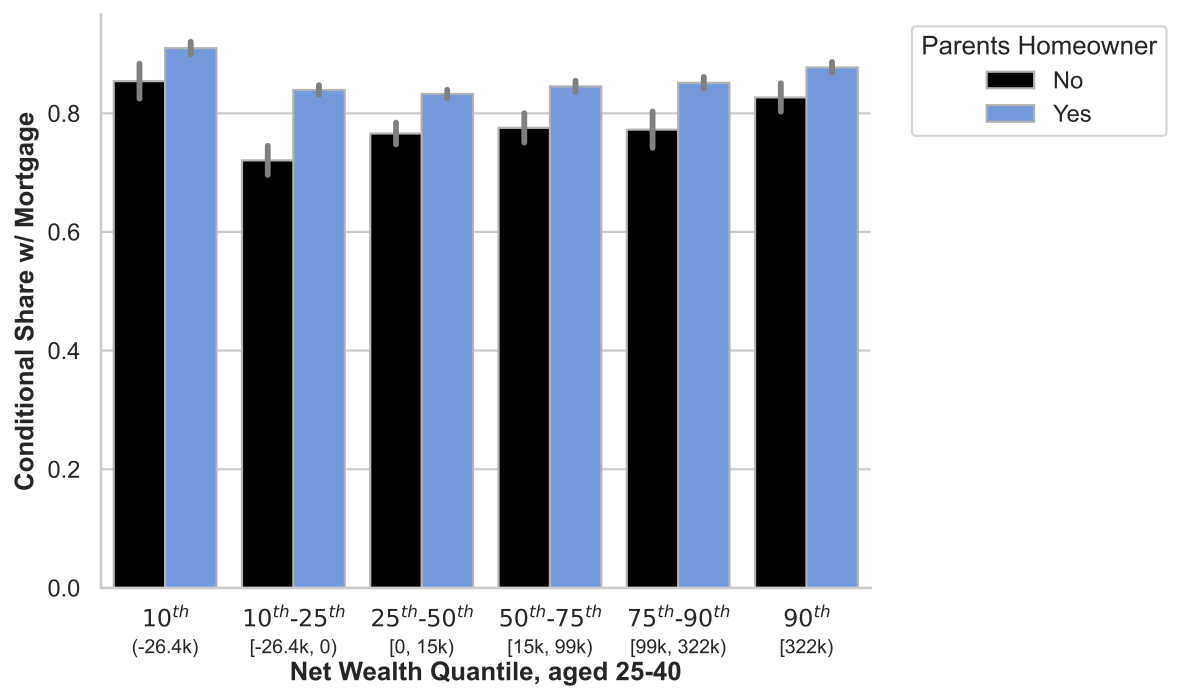
Share Mortgage by Wealth Quantile

Figure 2: Share of Homeowners with Mortgage by Wealth Quantile

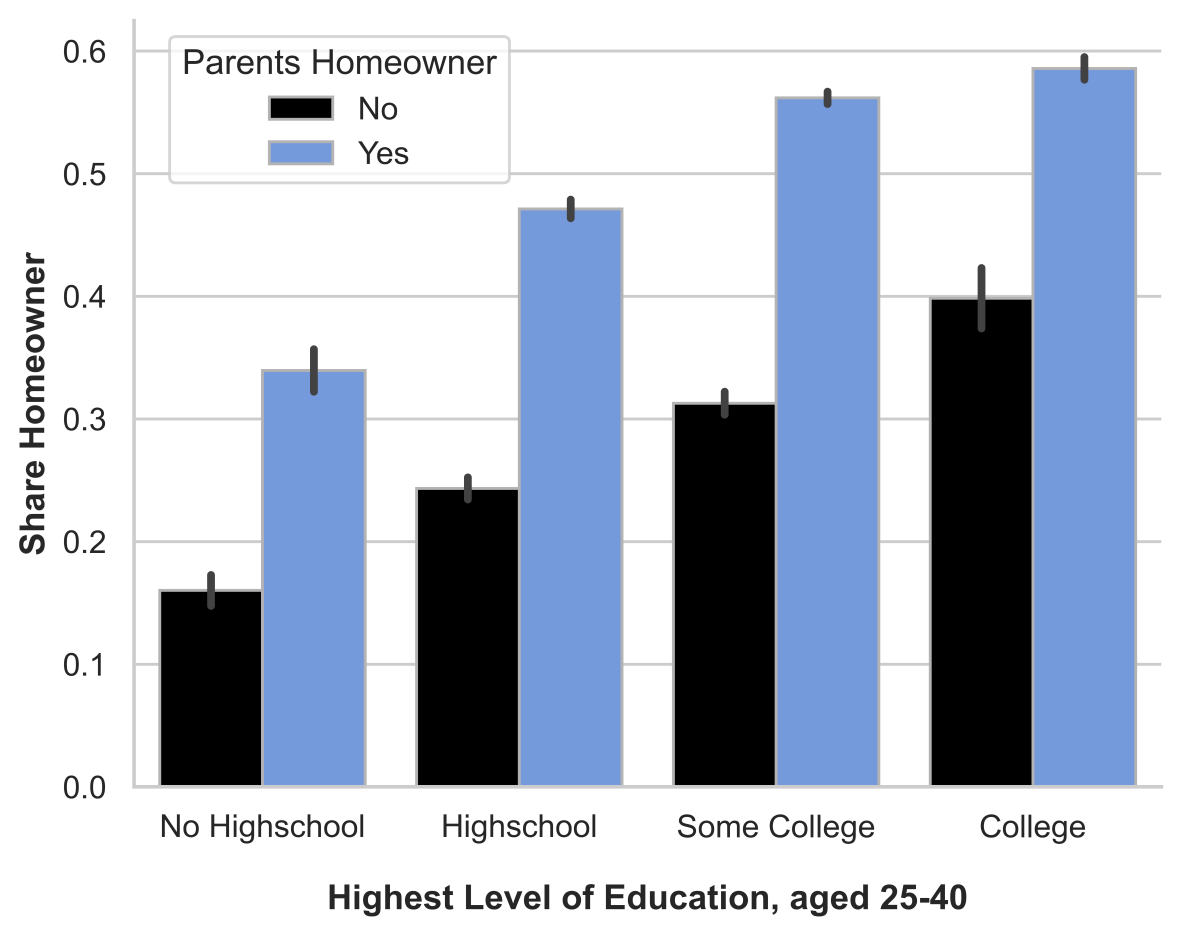


Errorbars are standard errors

By education Back

Homeowners by Education

Figure 3: Share of Homeowners by Education



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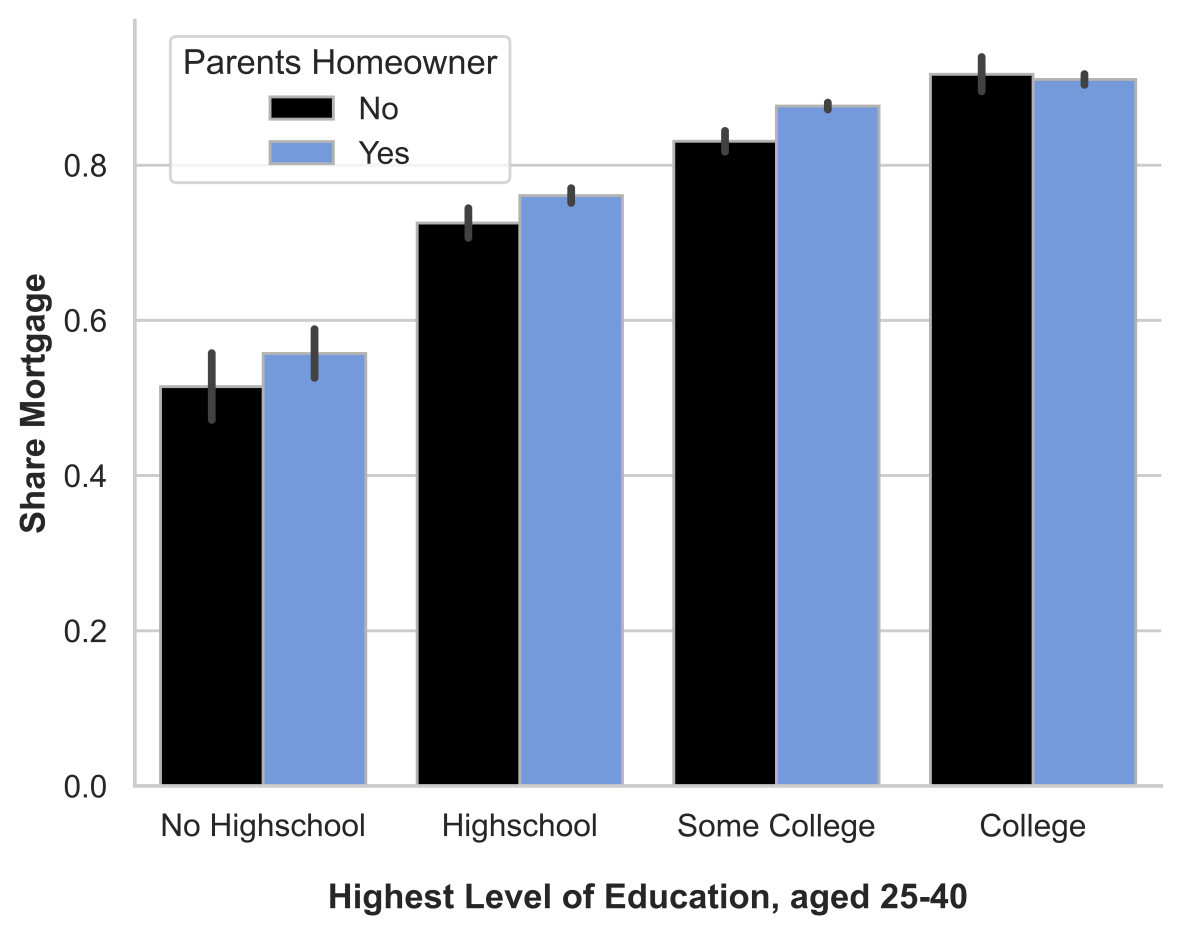
Mortgage by Education

Figure 4: Share of Homeowners with Mortgage by Education



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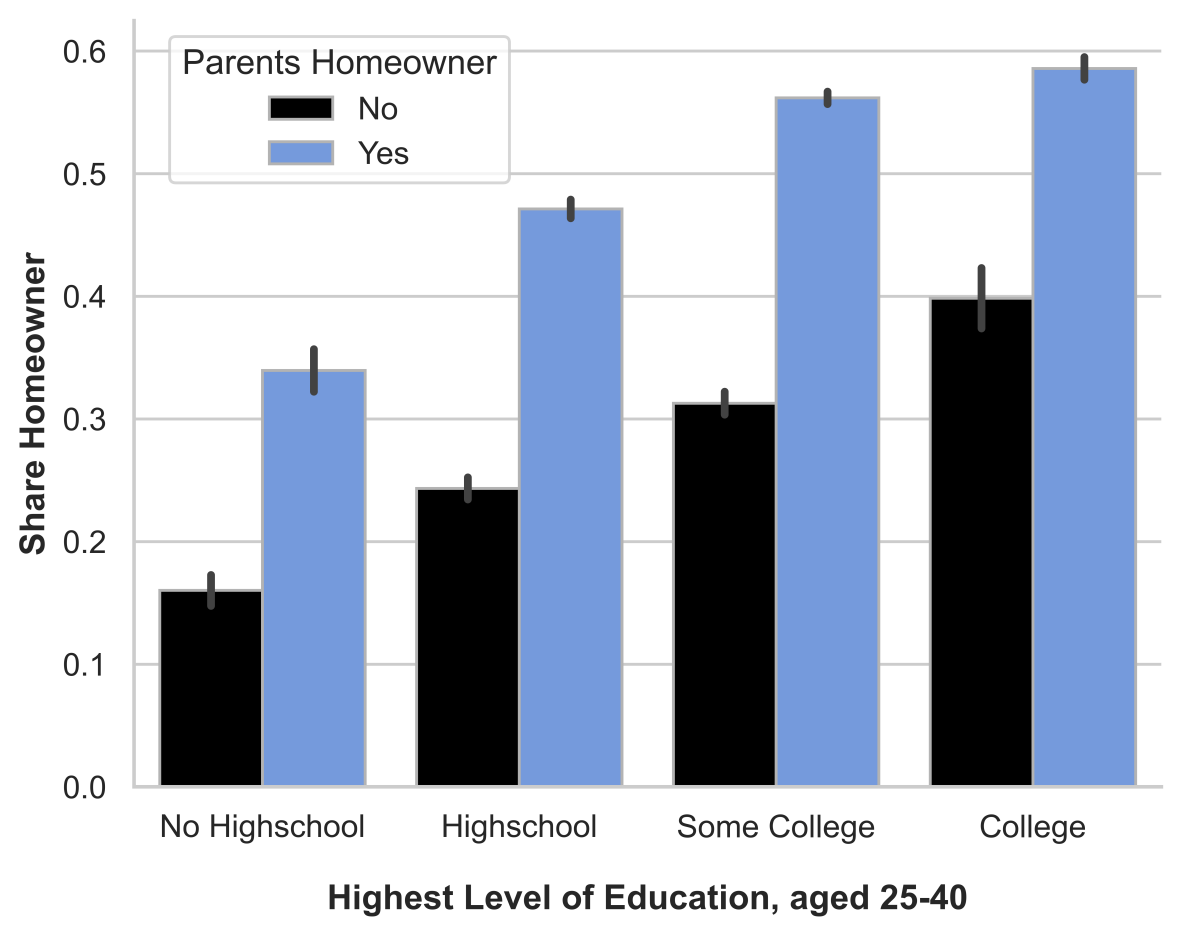
Interest Rate by Education

Figure 5: Average Interest Rate on Mortgage by Education



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Control Variables

- X: Family Control Variables
  Income, Children, Marital Status, Education Dummies, Own Wealth, House Prices Index, Age, Year Dummies, Urban Indicator, Occupation, Vehicle Value, Inheritance, Unemployment, Student, Disabled, Poor Health, Credit Card Debt, Student Loan Debt, Medical Debt, Legal Debt
- PX: Parental Control Variables
  Parental Income, Parents' Durables, Parents' Retirement Savings, Parental Education Dummies, Age, Age Parents sq., Parents Inheritance, Parent's urban, Parents' Occupation, and Parents' Gift
- δ_t, time-fixed effects; δ_s, state-fixed effects.

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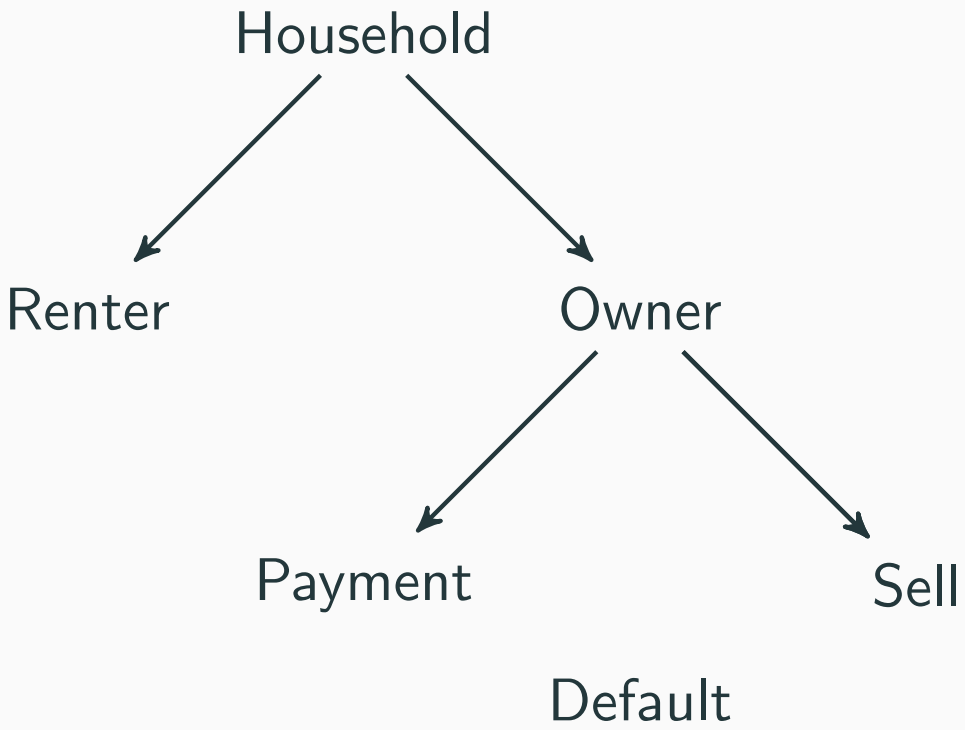
Incomplete Markets: Households



Renters

$$V^{rent}(t,a,y) = \max_{c,h^{rent\prime},k'} u(c,h^{rent}) + \beta \mathbf{E}_y V(t+1,a',y') \quad (15)$$

It is subject to

$$\begin{aligned} c + k' + p^r h^{rent} &= (1-\tau_l)wy + (1+r(1-\tau_k))k \quad (16)\\ h^{own\prime} &= 0 \\ h^{rent} &\in \mathcal{H}^{rent} \\ k' &\geq 0 \end{aligned}$$

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Buyer

$$V^{own}(t,a,y) = \max_{c,h^{own\prime},k',M} u(c,h^{own}) + \beta \mathbf{E}_y V^h(t+1,a',y',h^{own\prime},M') \tag{17}$$

It is subject to

$$\begin{aligned} c + k' + (1-\mathbf{1}_\theta)\iota p^o h^{own} + (1-\iota)p^o h^{own} = & \\ (1-\tau_l)wy + (1+r(1-\tau_k))k + M & \quad (18) \\ h^{rent\prime} = 0 & \\ h^{own} \in \mathcal{H}^{own} & \\ M \leq (1-\iota)p^o h^{own} & \quad (19) \\ k' \geq 0 & \end{aligned}$$

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Mortgage

- Duration: $d_t = T - t$
- Total amount borrowed: $M = m\left[\sum_{k=1}^{d_t} \frac{1}{(1+R^m)^k}\right]$
- Law of Motion: $M' = M(1 + R^m) - m$
- Interest rate: $R^m = \frac{1}{(M-\chi)^\sigma}$, collateral χ
- $\chi = p^o(h^{own} + h^{own,p})$ can be split between parents and children

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Making Payments

$$V^{pay}(S, h^{own}, M) = \max_{c,k'} u(c, (1-\delta_h)h^{own}) + \beta \mathbf{E}_y V^h(S', h^{own\prime}, M') \tag{20}$$

$$s.t.$$

$$c + k' + m = (1-\tau_l)wy + (1 + r(1-\tau_k))k \tag{21}$$

$$h^{own} \in \mathcal{H}^{own}$$

$$M' = M(1 + R^m(\mathbf{1}_\chi)) - m \tag{22}$$

$$h^{own\prime} = (1-\delta_h)h^{own}$$

$$k' \geq -\lambda(p^o h^{own} - M)$$

$$h^{rent\prime} = 0$$

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Firms

Firms:

$$\Pi(K; L) = AK^{\alpha}L^{1-\alpha} - (r - \delta)K - wL \tag{23}$$

- A - productivity, r - interest rate on capital, δ - depreciation of capital

Government:

$$\tau_l wL + \tau_k rK + \tau_b^k b(k) = \Theta \sum_{t=T^{ret}}^{T} \mu_t \ \forall t \tag{24}$$

τ_l labour income tax, τ_k capital gains tax, τ_b^k bequest tax

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Parents

$$\text{Parents, only downpayment: } V^{p,dp} = V(t, (1-\theta)k, y)$$

$$\text{Parents, both: } V^{p,h,dp} = V^h(t, (1-\theta)k, y, h^{own}, M)$$

$$\text{Parents, only collateral: } V^{p,h,c} = V^h(t, k, y, \underline{h}^{own}, M)$$

$$\text{Parents, both: } V^{p,h,b} = V^h(t, (1-\theta)k, y, \underline{h}^{own}, M)$$

$$\text{Parents, nothing: } V^{p,h,n} = V^h(t, k, y, h^{own}, M)$$

$$\text{Parents, nothing: } V^{p,n} = V(t, k, y)$$

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Last Period - Renter

$$
\begin{aligned}
V^J(t,a,y) = & \max_{c,h^{rent\prime},k'} u(c,h^{rent}) + \beta\phi(a_T,0) s.t. \\
c + k' + p^r h^{rent} = & (1-\tau_l)wy + (1+r(1-\tau_k))k \qquad (25) \\
h^{rent} \in & \mathcal{H}^{rent} \\
k' \geq & 0
\end{aligned}
$$

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Correlation with Childrens Homeownership Status

Table 6: Sample Weights - Child Homeownership

	Dep. Var.: Child Homeowner	
	(I)	(II)
Parents Homeowner	0.206***	0.111***
	(0.021)	(0.023)
Parents Stockholder	0.025	0.018
	(0.019)	(0.018)
Parents Savers	0.025*	0.01
	(0.015)	(0.015)
Control Variables	No	Yes
Time & State FE	Yes	Yes
No. Observations	15244	11421
Entities	4470	2539
Time periods	9	9
R-squared	0.09	0.29

Standard error in parenthesis are clustered at the *1968 Family* Level

***, **, * denote statistical significance at 1%, 5% and 10%, respectively

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Mortgage Share & Mortgage Interest Rates - Sample Weights

Table 7: Pooled OLS - Linear Probability Model II

Dep. Var.:	Has Mortgage		Interest Rate	
	(I)	(II)	(III)	(IV)
Parents Homeowner	0.037*	0.001	−0.369*	−0.7714***
	(0.019)	(0.024)	(0.22)	(0.367)
Parents Stockholder	0.03**	0.024*	−0.031	−0.359
	(0.013)	(0.014)	(0.133)	(0.228)
Parents Savers	0.039***	0.025*	−0.365**	−0.476*
	(0.013)	(0.015)	(0.176)	(0.251)
House Value	Yes	Yes	Yes	Yes
Mortgage Size	No	No	Yes	Yes
Other Control Variables	No	Yes	No	Yes
Time & State FE	Yes	Yes	Yes	Yes
No. Observations	7121	5802	5448	4566
Entities	4468	1623	1662	1372
Time periods	9	9	9	9
R-squared	0.1	0.18	0.06	0.11

Standard error in parenthesis are clustered at the *1968 Family* Level

***, **, * denote statistical significance at 1%, 5% and 10%, respectively

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Interaction with Income - Sample Weight

Table 8: Pooled OLS - Interaction with Income

Dep. Var.:	(I) Child Homeowner	(II) Has Mortgage	(III) Interest Rate
Parents Homeowner	0.173***	0.061	−0.971
	(0.034)	(0.042)	(0.767)
Parents Homeowner x Fam. Income	−0.11**	−0.063*	0.069
	(0.044)	(0.035)	(0.047)
Parents Stockholder	0.024	0.028	−0.433
	(0.03)	(0.024)	(0.288)
Parents Stockholder x Fam. Income	−0.013	−0.003	−0.003
	(0.028)	(0.012)	(0.014)
Parents Savers	0.028	0.031	−0.25
	(0.023)	(0.022)	(0.378)
Parents Savers x Fam. Income	−0.02	−0.006	−0.037
	(0.023)	(0.012)	(0.04)
House Value	No	Yes	Yes
Mortgage Size	No	No	Yes
Other Controls	Yes	Yes	Yes
State & Time FE	Yes	Yes	Yes
No. Observations	11421	5802	4653
Entities	2494	1623	1387
Time periods	9	9	9
R-squared	0.33	0.18	0.11

Standard error in parenthesis are clustered at the *1968 Family* Level

***, **, * denote statistical significance at 1%, 5% and 10%, respectively

Family Income is denoted in 10,000$

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Probit

Table 9: Probit at Median - Marginal Effects

	Dep. Var.: Child Homeowner	
	(I)	(II)
Parents Homeowner	0.211***	0.144***
	(0.013)	(0.012)
Parents Stockholder	0.03***	0.005
	(0.011)	(0.015)
Parents Savers	0.035***	0.01
	(0.009)	(0.012)
Control Variables	No	Yes
Time & State FE	Yes	Yes
No. Observations	15244	11421
Entities	4470	2539
Time periods	9	9

Standard error in parenthesis are clustered at the *1968 Family* Level

***, **, * denote statistical significance at 1%, 5% and 10%, respectively

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Mortgage Share & Mortgage Interest Rates - Probit

Table 10: Probit At Median

Dep. Var.:	Has Mortgage	
	(I)	(II)
Parents Homeowner	0.046***	0.001
	(0.016)	(0.018)
Parents Stockholder	0.042**	0.019
	(0.018)	(0.02)
Parents Savers	0.048***	0.048***
	(0.014)	(0.016)
House Value	Yes	Yes
Other Control Variables	No	Yes
Time & State FE	Yes	Yes
No. Observations	7121	5802
Entities	4468	1623
Time periods	9	9

Standard error in parenthesis are clustered at the *1968 Family* Level

***, **, * denote statistical significance at 1%, 5% and 10%, respectively

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Introducing Family Fixed Effects

Table 11: Pooled OLS - Linear Probability Model II

Dep. Var.:	Child Homeowner (I)	Has Mortgage (II)	Interest Rate (III)
Parents Homeowner	0.055**	−0.049	−0.565
	(0.025)	(0.032)	(0.581)
Parents Stockholder	−0.004	0.008	−0.03
	(0.015)	(0.014)	(0.124)
Parents Savers	0.008	0.014	−0.35*
	(0.011)	(0.012)	(0.196)
House Value	No	Yes	Yes
Mortgage Size	No	No	Yes
Other Control Variables	Yes	Yes	Yes
Time & State FE	Yes	Yes	Yes
No. Observations	11421	5802	4566
Entities	2240	1483	1274
Time periods	9	9	9
R-squared	0.17	006	0.02

Standard error in parenthesis are clustered at the *1968 Family* Level

***, **, * denote statistical significance at 1%, 5% and 10%, respectively

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