Intergenerational mortgage financing - The Role of Co-signing Mortgages

Marius Grünewald[1]

February 21, 2025

[1]European University Institute

Research Questions: How prevalent is cosigning of mortgages? Who cosignes and why? What are the consequences of it?

Key Mechanism: Parents cosign a mortgage to offer security to banks in case of default of children. Improves access to mortgages.

- Equity is the most important financial asset for many households.

- In 2023, about 92% of sales of new houses involved a mortgage (US).

- In 2023, the total mortgage market was \$12.59 trillion or 70% of consumer debt or about 50% of GDP (US).

Why should we care?

- Wealth inequality?

- Can cosigning help financially constraint agents? Welfare?

- Consequences for macroprudential stability?

Preview of Results

Empirics:

1. Cosigning exists and it matters.
2. Children that cosign, are (somewhat) financially constraint.
3. Parents that cosign, are (somewhat) liquidity constraint.

Theory:

1. Quantitative model that allows for policy experiments and counterfactuals

Outline

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

$\implies$ **Intergenerational aspect of portfolio 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,

$\implies$ **Co-signing as new channel?**

- **Parental Support and Housing Affordability**: Allen et al. 2024 and Benetton, Kudlyak, and Mondragon 2024

Data

PSID

- PSID data 2019-2021 (2 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. Focus on prime-age children (25-42)
  2. No Businessowner
  3. No Cohabitation

Home Mortgage Disclosure Act

- Near-universe of mortgage applications on loan level from 2018 to 2021

- Around 3.57 million mortgage applications, 2,767,961 originated, 377,639 rejected

- Rich information on
  - Mortgage, Borrower, Lender characteristics
  - Application level

- Focus on non-commercial, regular mortgages of first-time home buyers

- Identify cosigning via age structure of mortgagors
- At least 19 years of age difference
- Drawback: Only first two mortgagors listed

Web-Scraped Data

- Universe of originated mortgages in a given county held by the county clerks.

- Publicly accessible information on
  - Mortgagors
  - Mortgagees
  - Loan Amount
  - Geographic Area
  - Origination Date

1. Identify cosigning as more than two mortgagors
2. Drawback: No age information

Institutional Background

Institutional Framework - US

The Mortgage Market

- Primary Mortgage Market
    1. Buy conforming loans from lenders.
    2. Banks, credit unions and mortgage lenders and brokers.
    3. Can keep or sell to...

- Secondary Mortgage Market - Federal Housing Administration (FHA), Veteran's Affair (VA), Freddie Mac and Fannie Mae
    1. Buy conforming loans from lenders to provide liquidity/risk reduction.
    2. Borrowers must meet debt-to-income ratio (DTI), credit score, ...
    3. Hard limit at 50%, soft limit at 45% (43%) DTI.

Cosigning

- "The Seller is not required to calculate or evaluate the occupant Borrower's [...] monthly debt payment-to-income ratio" - *Freddie Mac*

- "Using only the income of the occupying borrower(s) [...] the maximum allowable DTI ratio is 43%." - *Fannie Mae*

- FHA no distinction

Empirical Facts

HMDA - Evidence on Cosigning

- 2.4% of mortgage applications are intergenerationally cosigned.
- 32% of mortgage applications with co-borrower are intergenerationally cosigned.
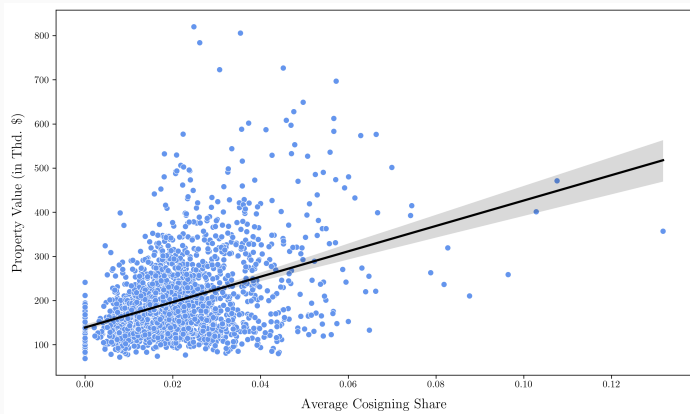
Table 1: By Age:

Age Bin	Share Cosigned
<25	6.39
25-34	2.46
35-44	1.24

Table 2: By Year:

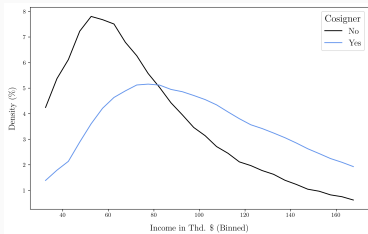| Year	Share Cosigned
2018	2.26
2019	2.31
2020	2.33
2021	2.55

Cosigning Correlates With House Prices

Figure 1: County-Level Scatterplot

Only counties plotted with at least 100 mortgages over four years.

House Price Index   Larger Counties

Cosigning Correlates with Income

(a) Income Distribution by Cosigning Status
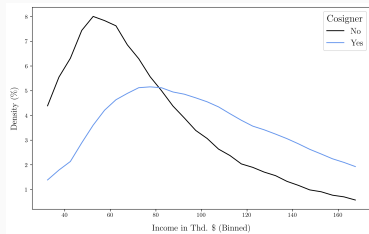
(b) Income Distribution - Single Signers Only

Figure 2: Combined Income Distribution Graphs

Cosigning is associated with richer mortgage applications.

Life Cycle Earnings Sample

Web Scraping - Evidence on Cosigning

True cosigning numbers likely higher as so far we don't observe (some) couples with third cosigner. Preliminary evidence from web-scraped county data.

**Table 3:** Comparison - Share of Mortgages Cosigned

	NY State HMDA	HMDA	Web scraping
Erie County	3.21	1.75	3.08
Albany County	3.21	2.3	3.89
Oneida County	3.21	2.21	3.67

Mostly three mortgagors but occasionally more.

Application Rejection Rates and Debt-to-Income Ratio

Assume no selection bias and groups were perfectly comparable:

Figure 3: Mean Application Rejection Rates
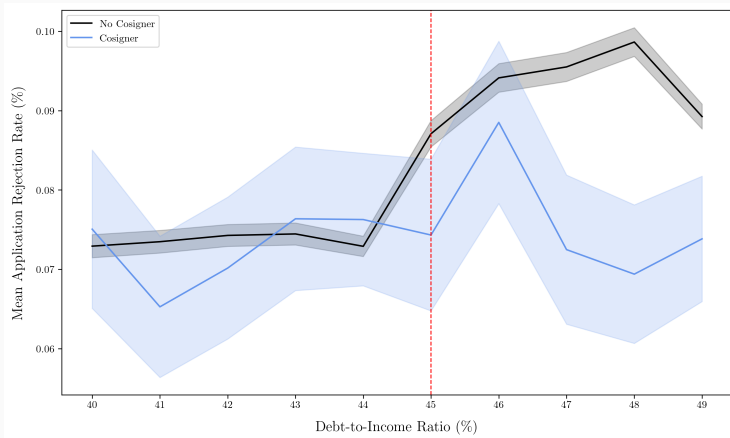
By Age Group
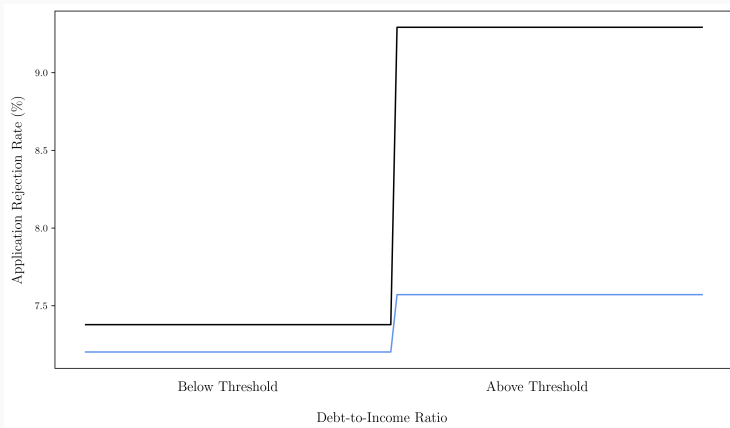
Younger people profit more:

Table 4: Difference in means around threshold

Age	Δ in Application Rejection Rates
	Narrow Definition
<25	2.09
25-34	1.87
35-44	2.31
	Broad Definition
<25	2.31
25-34	1.34
35-44	1.80

Application Rejection Rates and Debt-to-Income Ratio

Figure 4: Mean Application Rejection Rates

Regression Model

$$Y_{icst} = \beta_0 + \beta_1 D_{icst} + \beta_2 \ln(Inc_{icst}) + \beta_3(D_{icst} \times \ln(Inc_{icst})) +$$
$$Z\gamma + \alpha_t + \delta_s + \delta_c + \varepsilon_{icst}$$

where $t =$ Year, $s =$ State, $c =$ county and $i =$ mortgage

Table 5: Regression Results: Impact of Cosigning on Mortgage Application Rejection

	Linear Probability			Logistic Regression		
	Application Rejection Rate					
Cosigning	0.02***	−0.04	−0.12**	0.02***	−0.07***	−0.09***
Cosigning x Log Income		0.01***	0.02***		0.01***	0.02***
Controls	No	No	Yes	No	No	Yes
State & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
County x Year FE	Yes	Yes	Yes	No	No	No
N			3,145,600			

Standard errors are clustered at the county level.

***, ** and * represent statistical significance on the 1%, 5% and 10% level, respectively.

Conditional on origination:

	Interest Rate (%)	Property Value ($)	Loan Amount ($)	Mortgage Payment ($)	Debt-to-Income Ratio
No Cosigning	3.79	294,857	257,631	1,200	0.199
Cosigning	3.79	316,396	269,303	1,250	0.1407

	Downpayment ($)	Total Gross Inc. (in Thd. $)	Rel. House Price Index	Loan Term (Years)
No Cosigning	37,226	80.56	100	29.48
Cosigning	47,093	145.68	113.16	29.60

Table 6: Comparison of Mortgage Details with and without Cosigning

Median   County Average

Conditional on origination:

Table 7: Regression Results: Intensive Margins Measurements, Linear Probability Model

	Loan Size (in 10k $)	Property (in 10k $)	Interest Rate	Loan Term
Cosigning	79.27***	83.08***	0.18	−2.59***
Cosigning × Log Income	−7.36***	−7.73***	−0.01	0.24***
Controls	Yes	Yes	Yes	Yes
State and Year FE	Yes	Yes	Yes	Yes
County × Year FE	Yes	Yes	Yes	Yes
N		2,767,961		

Standard errors are clustered at the county level.

***, ** and * represent statistical significance on the 1%, 5% and 10% level, respectively.

Connecting to PSID

- No direct connection from HMDA to PSID.

- Use Multiple Imputation Chain Equation (MICE) to impute cosigning in PSID

- Idea: Find N closest neighbours and match mean. Repeat N times for entire sample.

- Impute intergenerational linkages

- Predicted share of cosigned mortgages 6.2%

Table 8: Who are the parents? - Some Means

	Savings	Stocks	Total Wealth	Income	Share Owner	Share Retired	Years Educ.
Not Cosigner	58,307	130,957	874,672	105,565	85.23 (%)	0.43	13.88
Cosigner	46,614	108,903	739,702	104,997	80.29 (%)	0.32	13.77

Table 9: Who are the children? - Some Means

	Savings	Stocks	Total Wealth	Income	Years Educ
Not Cosigners	38,694	40,008	309,779	151,958	15.21
Cosigners	48,036	33,489	380,369	134,469	14.59

Rationalize with a quantitative model

Incomplete Markets

Key decision:

> Financial frictions matter for children - parents can:
> - b) Help with downpayment via liquid assets
> $\implies$ Parents have sufficient liquidity to help (conditional on rational behaviour)
> - a) Co-signing to reduce mortgage burden by children.
> $\implies$ Parents are somewhat liquidity constraint and take on risk of paying mortgage
> - c) Do nothing
> $\implies$ Parents are somewhat financially constraint
> - If cosigned: Payment-to-income ratio relaxed $\implies$ improved access but also lower mortgage payments c.p.

The model:

- Households rent or buy, given homeowner, can pay, or default; chose house size, mortgage and savings.

Households

With $S = (t, a, y; \theta)$ first decision:

$$V(S) = \max \left\{ V^{rent}(S), V^{buy}(S) \right\} \qquad (1)$$

Having bought:

$$V^h(S, h^{own}, M) = \max \left\{ V^{pay}(S, h^{own}, M), V^{def}(S) \right\} \qquad (2)$$

where θ is the cosigner status.

Buyer

$$V^{own}(S) = \max_{c, h^{own\prime}, k\prime, M\prime} u(c, h^{own}) + \beta s_t \mathbf{E}_y V^h(S\prime, h^{own\prime}, M\prime) \quad (3)$$

It is subject to

$$\begin{aligned}
c + k\prime + (1 - \iota)p^o h^{own} &= wy + (1 + r)k + M\prime \\
h^{rent\prime} &= 0 \\
h^{own} &\in \mathcal{H}^{own} \\
M\prime &\leq (1 - \iota)p^o h^{own} \\
k\prime &\geq 0
\end{aligned} \quad (4)$$

Mortgage

Choice variable

- Duration: Fixed at 30 periods.
- Total amount borrowed: $M = m\left[\sum_{k=1}^{30} \frac{1}{(1+R^m)^k}\right]$
- Law of Motion: $M' = M(1 + R^m) - m$
- Interest rate: $R^m = \frac{1}{(M-\chi)^\sigma}$, collateral χ
- $\chi = p^o(h^{own} + h^{own,p})$ sum of parents and children

Making Payments

$$V^{pay}(S, h^{own}, M) = \max_{c,k'} u(c, (1 - \delta_h)h^{own}) + \beta s_t \mathbf{E}_y V^h(S', h^{own\prime}, M') \quad (5)$$

$$s.t.$$
$$c + k' + m = wy + (1 + r)k + (1 - \delta_h)p^{own}h^{own} \quad (6)$$
$$h^{own} \in \mathcal{H}^{own}$$
$$M' = M(1 + R^m) - m \quad (7)$$
$$h^{own\prime} = (1 - \delta_h)h^{own}$$
$$k' \geq -\lambda(p^o h^{own} - M)$$
$$h^{rent\prime} = 0$$

Default

$$V^{def}(S, h^{own}, M) = \max_{c,k'} u(c, (1 - \delta_h)h^{rent}) + \beta s_t \mathbf{E}_y V^h(S')$$

$$s.t.$$

$$c + k' + p^r + m = wy + (1 + r)k$$

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

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

$$k' \geq 0$$

Parental Support Decision

At a fixed age, parents have a once-in-a-lifetime chance to support inter-vivo:

$$V_{\varnothing}^{j=J^{\theta}}(S,\varsigma) = \max_{c,\varsigma',k'} u(c,\varsigma) + \beta s_t \mathbf{E}_y V^h(S',\varsigma') \tag{8}$$

$$V_{cos}^{j=J^{\theta}}(S,\varsigma) = \max_{c,\varsigma',k'} u(c,\varsigma) + \phi(a_{cos}) - \mathbf{E}p^{def}M' + \beta s_t \mathbf{E}_y V^h(S',\varsigma') \tag{9}$$

$$V_{cash}^{j=J^{\theta}}(S,\varsigma) = \max_{c,\varsigma',k'} u(c,\varsigma) + \beta\phi(a_{cos}) - a_{cos} + \beta s_t \mathbf{E}_y V^h(S',\varsigma') \tag{10}$$

where $\varsigma = (h^{own}, h^{rent}, M)$ and a_{cos} is the equivalent utility

Conclusion

Appendix

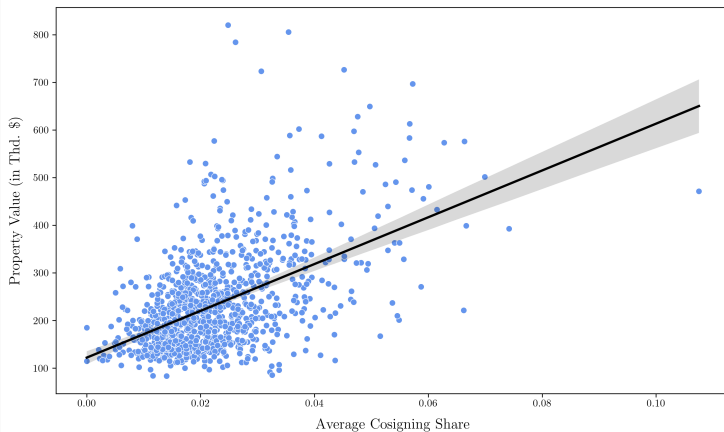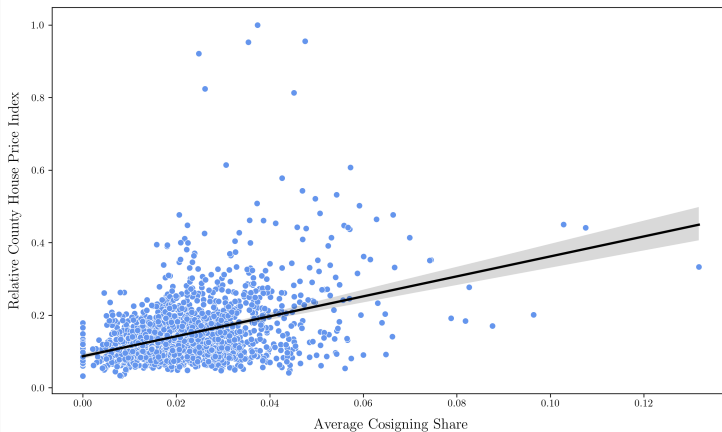# Property Prices - Larger Counties

Figure 5: Property Prices - At least 100 MOrtgages per Year

Figure 6: House Price Index

Cosigning Correlates with Income II

Stylized Life-Cycle Profile

Table 10: Average Income by Cosigner Age

	<25	25-34	35-44	45-54	55-64	65-74	>74
Mean income (Thd. $)	74.77	111.15	129.83	133.90	144.34	128.76	103.50

Mortgages without any Cosigner: 76.81

Median:

	Interest Rate (%)	Property Value ($)	Loan Amount ($)	Mortgage Payment ($)	Debt-to-Income Ratio
No Cosigning	3.5	255,000	235,000	1,072	0.190
Cosigning	3.5	275,000	245,000	1,131	0.122

	Downpayment ($)	Total Gross Inc. (in Thd. $)	Rel. House Price Index	Loan Term (Years)
No Cosigning	10,000	67	100	30
Cosigning	20,000	111	111.76	30

Table 11: Comparison of Mortgage Details with and without Cosigning

Back

HMDA - Evidence on Cosigning

County averages:

	Interest Rate (%)	Property Value ($)	Loan Amount ($)	Mortgage Payment ($)	Debt-to-Income Ratio
No Cosigning	4.1	188,700	169,729	814	0.171
Cosigning	4.0	201,191	178,292	844	0.116

	Downpayment ($)	Total Gross Inc. (in Thd. $)	Rel. House Price Index	Loan Term (Years)
No Cosigning	18,971	63	100	28.87
Cosigning	22,899	113	109.9	29.28

Table 12: Comparison of Mortgage Details with and without Cosigning

Renters
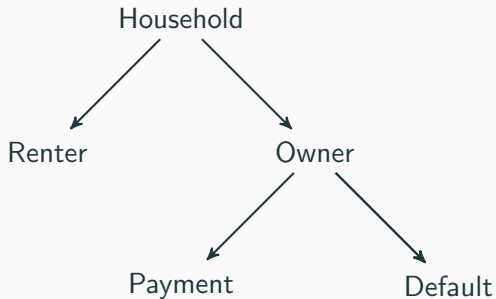
$$V^{rent}(t, a, y) = \max_{c, h^{rent\prime}, k\prime} u(c, h^{rent}) + \beta s_t \mathbf{E}_y V(S\prime) \qquad (11)$$

It is subject to

$$c + k\prime + p^r h^{rent} = wy + (1 + r)k \qquad (12)$$
$$h^{own\prime} = 0$$
$$h^{rent} \in \mathcal{H}^{rent}$$
$$k\prime \geq 0$$

Firms

Firms:

$$\Pi(K; L) = AK^{\alpha}L^{1-\alpha} - (r - \delta)K - wL \tag{13}$$

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

Government:

$$\tau_l wL + \tau_k rK + \tau_b^k b(k) = \Theta \sum_{t=T^{ret}}^{T} \mu_t \ \forall t \tag{14}$$

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

Back

Parents

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

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

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

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

Last Period - Renter

$$V^J(t, a, y) = \max_{c, h^{rent\prime}, k\prime} u(c, h^{rent}) + \beta\phi(a_T, 0)s.t.$$

$$c + k\prime + p^r h^{rent} = (1 - \tau_l)wy + (1 + r(1 - \tau_k))k \qquad (15)$$

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

$$k\prime \geq 0$$