Intergenerational mortgage financing - The Role of Co-signing Mortgages

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December 1, 2025

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Research Question

Research Questions:
How does intergenerational cosigning shape the housing distributions? What are the consequences for intergenerational wealth transmission?

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

Motivation

- 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?
- Cosigning a tool to address housing affordability?
- Consequences for macroprudential stability?

Preview of Results

Empirics:

1. Intergenerationally cosigned mortgages account for about 3% of mortgages in the US ($7.4 billion p.a.).
2. Children use cosigning to address financial constraints on extensive and intensive margin.
3. Cosigning parents are relatively liquidity constraint.
4. Difference-in-Discontinuities: Banks pass-through of cost shock is heterogeneous in cosigning status.

Theory:

1. Simple model to derive prediction: Cosigning solves constraint on housing, parental liquidity constraint.
2. Quantitative model to show: Impact on housing distribution and intergenerational wealth transmission. Policy Experiment: Tax reduction for cosigning parents. (Not implemented)

Outline

Literature

Literature

- **Portfolio Choice with Housing**: Cocco 2005, Eichenbaum, Rebelo, and Wong n.d., Mian and Sufi 2011-08, Mian, Rao, and Sufi 2013, Mian and Sufi 2014, Mian, Sufi, and Trebbi 2015

$\Longrightarrow$ **Three types of mortgages: Regular, Downpayment Support, Cosigned**

- **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,

$\Longrightarrow$ **Cosigning as indirect transfer**

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

$\Longrightarrow$ **Comprehensive, quantitative analysis of cosigning for the US**

Legal Context

Definition

What's a Cosigner?
"A cosigner is not the main borrower. [...] you agree to be responsible for someone else's debt. If the main borrower misses payments, you must make the payments. If the main borrower misses payments or stops making payments [...], you must repay the loan." (**FTC**, 2025)

Cosigners don't get ownership.

Simple Model

Set Up

Modification of Allen et al. 2024 to dynamic setup.

$$U_1(c_1, h) = \ln(c_1) + \sigma \ln(h - h_0) \tag{1}$$

$$U_2(c_2, h) = \ln(c_2) + \sigma \ln(h - h_0) + \mu U_1^C(c_1^C, h^C)d \tag{2}$$

$$c_1 = y_1 - \phi ph - s \tag{3}$$

$$c_2 = y_2 - (1-\phi)(1+r_d)(1-d^P)ph - \kappa y_2 d + (1+r)s \tag{4}$$

where $d = (0, 1)$. Agents chose c_1, c_2, h, d.

$$h^* = \frac{\sigma\big[(1+\beta)(1+r)\beta y_1 + E(1-\kappa d)y_2\big] + H_0}{B(d^P) - A(d^P) + \sigma(1+r)\beta\phi} \tag{5}$$

$$PTI^* = \frac{(1-d^P)\sigma(1-\phi)(1+r_d)p\big[(1+\beta)(1+r)\beta y_1 + E(1-\kappa d)y_2\big] + H_0}{B(d^P) - A(d^P) + \sigma(1+r)\beta\phi} \tag{6}$$

with h^* increasing in d^P and PTI^* decreasing.

Contrast to Cash Transfer

No help

$$\ln(y_1 - \phi p h^0 - s^0) + \sigma \ln(h^0 - h_0) +$$
$$\beta\Big[\ln(y_2 + (1+r)s^0) + \sigma \ln(h^0 - h_0)\Big]$$

Cosigning

$$\ln(y_1 - \phi p h^1 - s^1) + \sigma \ln(h^1 - h_0) +$$
$$\beta\Big[\ln(y_2 - \kappa y_2 + (1+r)s^1) + \sigma \ln(h^1 - h_0) + \mu U_1^C(c_1^c, h^c)\Big]$$

Cash Transfer

$$\ln(y_1 - \phi p h^2 - s^2 - \kappa y_1) + \sigma \ln(h^2 - h_0) +$$
$$\beta\Big[\ln(y_2 + (1+r)s^2) + \sigma \ln(h^2 - h_0) + \mu U_1^C(c_1^c, h^c)\Big]$$

With Caution: If $\frac{1}{\beta(1+r)} y_1 = y_2$, agents should be indifferent between Cash and Cosign.

Predictions

For Applicants:

1. Cosigning lowers rejection rates
2. Cosigning expands housing demand and/or
3. allows people to live in pricier areas and/or
4. (lower mortgage interest rates)

For Cosigners:

1. Cosigners are richer than not-helpers
2. Cosigners have less liquid assets than parents with cash transfer

Data

Comparison of Data Sources

Table 1: Key Features of HMDA, PSID, and Web-Scraped Data

Feature	**HMDA**	**PSID**	**Web-Scraped Data**
Scope	Near-universe of **loan-level applications** (2018–2024)	**Household data** with parental links (2019–2025, 3 waves)	Universe of **originated mortgages** in a given county (currently 30)
Key Info	**Mortgage, Borrower, Lender** characteristics; Application outcomes (originated/rejected)	**Household portfolio** (Net Wealth); Prime-age children (25–42) characteristics.	**Mortgagors, Mortgagees, Loan Amount, Geographic Area, Origination Date**
Cosigning ID	Via age structure ($\geq$ 19-year age difference between first two mortgagors)		Via more than two mortgagors listed
Focus	Non-commercial, regular mortgages of **first-time home buyers**	Connecting **parental households to children** Excludes business owners/cohabitation	Originating mortgages in a county
Drawback	Only first two mortgagors listed		No age information for mortgagors

Descriptives

HMDA - Evidence on Cosigning

- 2.6% of mortgage applications are intergenerationally cosigned. (7.4 billion USD p.a.)
- With webscraped data: 5.47%

Table 2: By Age:

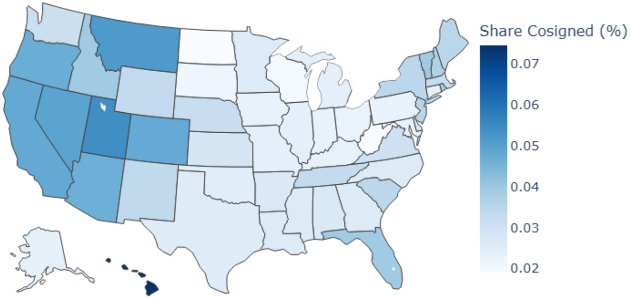
Age Bin	Cosigned (%)	/w Webscraping
<25	9.57	12.36
25-34	2.99	5.6
35-44	1.30	4.04

Table 3: By Year:

Year	Cosigned (%)	/w Webscrapi
2018	2.55	5.41
2019	2.12	4.37
2020	2.21	5.04
2021	2.41	5.16
2022	2.88	5.55
2023	3.11	5.64
2024	3.19	7.01

Varierty across states

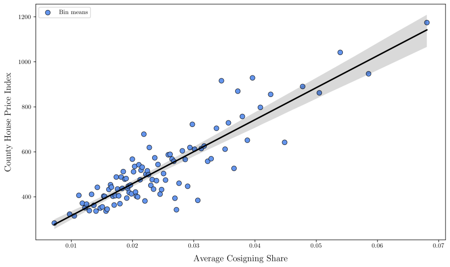
Figure 1: Share of Cosigned Mortgages, 2024



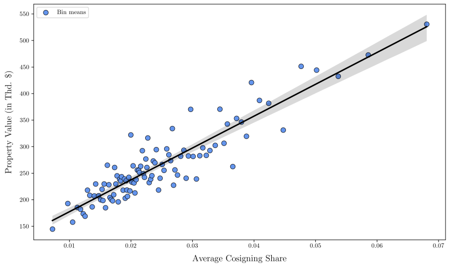
Cosigning Correlates With House Prices

Cosigning allows people to live in pricier areas

County House Price Index



Avg. Property Value



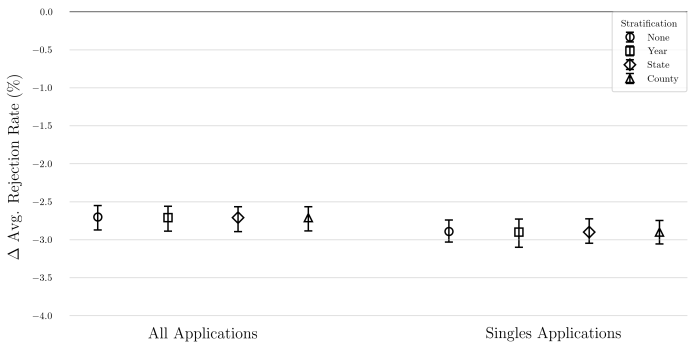
Counties with at least 100 mortgages per year only.

House Price Index Larger Counties

Application Rejection Rates

Cosigners face lower rejection rates

Figure 2: Mean Application Rejection Rates



Bootstrapped Standard Errors. Unweighted Average across Property Value x Loan Amount cell.

Extensive Margin Controls

Table 4: Extensive Margin & Cosigning - Adding Controls

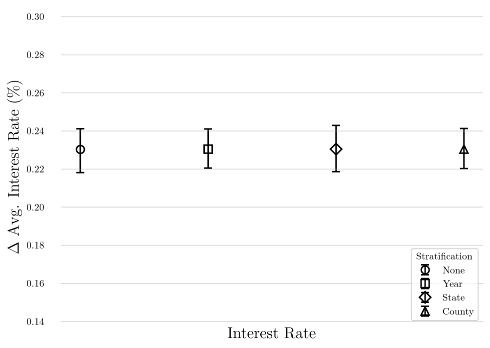
	Application Rejected				
Parental cosign	-0.0150***	-0.0434***	-0.0154***	-0.0154***	-0.0137***
	(0.0017)	(0.0019)	(0.0017)	(0.0017)	(0.0017)
County FE	No	Yes	No	No	Yes
Lender FE	Yes	No	Yes	Yes	Yes
State FE	No	No	No	Yes	No
Year FE	No	No	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes
Property Value & Loan Amount	Yes	Yes	Yes	Yes	Yes
R^2	0.009	0.086	0.009	0.009	0.008
Observations	6,672,649	6,672,649	6,672,649	6,672,649	6,672,649

Notes: Heteroskedasticity-robust standard errors in parentheses; significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.
Standard error type by column: Heteroskedasticity-robust (HC1)

Intensive Margin - Interest Rate

Cosigners face lower interest rates

Figure 3: Mean Interest Rate Difference



Bootstrapped Standard Errors. Unweighted Average across Property Value x Loan Amount cell.

Intensve Margin - Interest Rate

Table 5: Parental Cosigning on Application Rejection

	Mortgage Interest Rate				
Parental cosigning	-0.0625***	-0.1413***	-0.0513***	-0.0462***	-0.0415***
	(0.0130)	(0.0108)	(0.0106)	(0.0103)	(0.0103)
County FE	No	Yes	No	No	Yes
Lender FE	Yes	No	Yes	Yes	Yes
State FE	No	No	No	Yes	No
Year FE	No	No	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes
R^2	0.001	0.012	0.000	0.000	0.000
Observations	5,790,238	5,790,238	5,790,238	5,790,238	5,790,238

Notes: Heteroskedasticity-robust standard errors in parentheses; significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.
Standard error type: Heteroskedasticity-robust (HC1)

Intensive Margin - Loan Amount

Cosigning expands housing demand

Table 6: Parental Cosigning on Loan Amount

Log Loan Amount					
Parental cosigning	0.0591***	0.0632***	0.0579***	0.0510***	0.0380***
	(0.0027)	(0.0027)	(0.003)	(0.003)	(0.003)
County FE	No	Yes	No	No	Yes
Lender FE	Yes	No	Yes	Yes	Yes
State FE	No	No	No	Yes	No
Year FE	No	No	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes
R^2	0.297	0.151	0.280	0.163	0.084
Observations	5,795,691	5,795,691	5,795,691	5,795,691	5,795,691

Standard error type: Heteroskedasticity-robust (HC1)

Intensive Margin - Property Value

Cosigning expands housing demand

Table 7: Parental Cosigning and Property Value

Log Property Value					
Parental cosigning	0.0900***	0.0985***	0.0889***	0.0818***	0.0681***
	(0.0027)	(0.0027)	(0.0027)	(0.0027)	(0.0025)
County FE	No	Yes	No	No	Yes
Lender FE	Yes	No	Yes	Yes	Yes
State FE	No	No	No	Yes	No
Year FE	No	No	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes
R^2	0.324	0.163	0.304	0.180	0.093
Observations	5,795,691	5,795,691	5,795,691	5,795,691	5,795,691

Notes: Heteroskedasticity-robust standard errors in parentheses; significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.
Standard error type: Heteroskedasticity-robust (HC1)

Intensive Margin - w/ webscraping

Table 8: Cosigning and Intensive Margin (Webscraping)

	Log Property Value	Log Loan Amount	Interest Rate
Parental cosigning	0.1200***	0.0988***	0.1045***
	(0.0063)	(0.0066)	(0.0175)
County FE	Yes	Yes	Yes
Lender FE	No	No	No
State FE	No	No	No
Year FE	Yes	Yes	Yes
Demographics	Yes	Yes	Yes
R^2	0.562	0.481	0.398
Observations	158,354	158,354	143,307

Notes: Heteroskedasticity-robust standard errors in parentheses; significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.
Standard error type: Heteroskedasticity-robust (HC1)

Difference-in-Discontinuities

Institutional Framework - US

Primary mortgage market

- Households take out mortgages from banks, credit unions, and mortgage companies.
- Lenders screen and price loans.
- Rejections, interest rates, and cosigning are determined.

Secondary mortgage market

- Lenders sell eligible loans to Fannie Mae and Freddie Mac (GSEs).
- GSEs pool loans into MBS and guarantee investors against default.
- For this guarantee, GSEs charge guarantee fees (g-fees).

Reform in the Secondary Market

Reform (FHFA pricing change)

- FHFA increased g-fees on high-balance loans (0.25 percent and 0.75 percent)
- Announced: January 5th, 2022. Implemented: April 1st, 2022.
- Increase in marginal cost of banks for these loans.
- Interpretation: Exogenous cost shock at the conforming loan limit, which shifts banks' credit supply for loans just above the cutoff.

Idea:
Exploit heterogeneity in the pass-through of increased fee by cosigning status.
Banks perception of risk by cosigning status.

Exposure to GSE | Over time | Delinquency | Interest Rates

Difference-in-Discontinuities by Cosigning Status

Setup and notation

- X_i: running variable (loan amount minus CLL), cutoff at $X_i = 0$.
- $T_i \in \{0, 1\}$: time ($0 =$ pre, $1 =$ post).
- $G_i \in \{0, 1\}$: group ($0 =$ non-cosigned, $1 =$ cosigned).
- $Y_i(z, t)$: potential rejection outcome under policy exposure $z \in \{0, 1\}$ and time $t \in \{0, 1\}$.

Causal object (by group g)

$$\tau_{\text{DiDisc}}(g) = \lim_{x \downarrow 0} \mathbb{E}\big[\, Y_i(1,1) - Y_i(0,1) \mid X_i = x,\ G_i = g\big], \quad g \in \{0, 1\}.$$

Difference-in-discontinuities estimand (observed outcomes)

$$\begin{aligned}\tau_{\text{DiDisc}}(g) = \Big(&\lim_{x \downarrow 0} \mathbb{E}[Y_i \mid X_i = x,\ T_i = 1,\ G_i = g] - \lim_{x \uparrow 0} \mathbb{E}[Y_i \mid X_i = x,\ T_i = 1,\ G_i = g]\Big) \\ &- \Big(\lim_{x \downarrow 0} \mathbb{E}[Y_i \mid X_i = x,\ T_i = 0,\ G_i = g] - \lim_{x \uparrow 0} \mathbb{E}[Y_i \mid X_i = x,\ T_i = 0,\ G_i = g]\Big), \\ &\ g \in \{0, 1\}.\end{aligned}$$

Constant Bunching Over Time

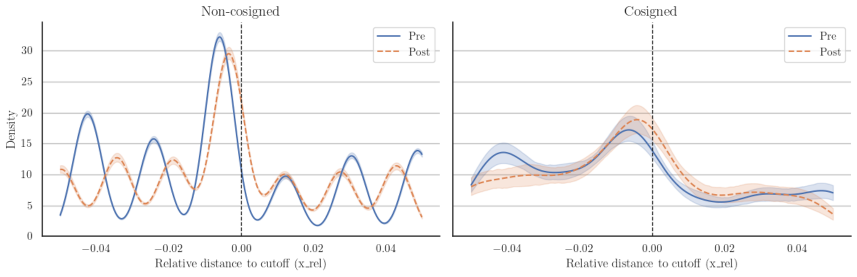


Figure 4: Density Function for 2021 and 2022 by mortgage group

McCrary-style Manipulation Test (Pre vs Post)

Setup. Running variable $X_i = \text{loan}_i - \text{CLL}_i$, cutoff at 0. Bin X_i in $[-2h, 2h]$, compute

$$y_{bt} = \log\left(\frac{\text{count}_{bt}}{\text{binwidth}}\right), \quad \text{dist}_b = \text{mid}_b, \quad \text{threshold}_b = \mathbf{1}\{\text{mid}_b \geq 0\},$$

and estimate local linear WLS with triangular kernel weights

$$y_{bt} \sim \text{dist}_b + \text{Post}_t + \text{dist}_b \times \text{Post}_t + \text{threshold}_b + \text{threshold}_b \times \text{Post}_t.$$

Coefficients of interest.

- $\beta_{\text{thr\_post}}$: change in log-density jump post vs. pre.

	$\hat{\beta}_{\text{thr\_post}}$
Non-cosigned	-4.57 (3.19), $p = 0.17$
Cosigned	-3.13 (2.85), $p = 0.29$

Effect of Reform on Cosigning at the Cutoff

$$\begin{aligned}\text{intgen\_cosign}_{i\ell tg} = \alpha + \beta_{\text{above}}\,\text{cutoff}_{i\ell t} + \beta_{\text{Post}}\,\text{Post}_t + \\ \beta_{\text{above:Post}}\left(\text{cutoff}_{i\ell t} \times \text{Post}_t\right) \\ + \gamma_1\, x_{i\ell tg} + \gamma_2\left(x_{i\ell tg} \times \text{cutoff}_{i\ell t}\right) \\ + X'_{i\ell tg}\,\theta + \lambda_t + \varepsilon_{i\ell tg}, g \in (0,1)\end{aligned}$$

Quantity (at $x \to 0$)	**Intgen.**	**Cosign**
Pre jump in cosigning at cutoff	β_{above}	0.001^{***}
Reform effect below cutoff	β_{Post}	0.001^{**}
Change in jump post vs pre	$\beta_{\text{above:Post}}$	-0.0023^{***}
Implied post jump at cutoff	$\beta_{\text{above}} + \beta_{\text{above:Post}}$	≈ -0.0013

Rejection Rates Around the CLL by Cosigning Status

Pass-through of Reform by Cosigning Status - Extensive Margin

$Y_{i\ell t}$ = Application Rejection		
	Non-cosigned	Cosigned
Above cutoff (above_cutoff)	0.032***	0.038***
	(0.008)	(0.009)
Post-reform (Post)	0.094***	0.073***
	(0.025)	(0.019)
Above cutoff × Post	−0.031***	−0.033***
	(0.010)	(0.011)
Log property value, log loan amount	Yes	Yes
Controls & Year FE	Yes	Yes
Observations	916,361	34,813
R^2	0.063	0.043

Cluster-robust SEs in parentheses (clustered by lender).

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

$$\Delta^{non}_{above} = 0.0942 + (-0.0313) = 6.29 \text{ p.p.}$$
$$\Delta^{cosigned}_{above} = 0.0734 + (-0.0329) = 4.05 \text{ p.p.}$$

Interest Rates Around the CLL by Cosigning Status

Pass-through of Reform by Cosigning Status - Intensive Margin

$Y_{i\ell t}$ = Mortgage Interest Rate		
	Non-cosigned	Cosigned
Above cutoff (above_cutoff)	0.02	0.006
	(0.033)	(0.021)
Post-reform (Post)	1.002***	0.981***
	(0.0326)	(0.0392)
Above cutoff × Post	−0.04	0.036
	(0.041)	(0.056)
Log property value, log loan amount	Yes	Yes
Controls & Year FE	Yes	Yes
Observations	845,433	31,937
R^2	0.018	0.790

Cluster-robust SEs in parentheses (clustered by lender).

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

$$\Delta^{non}_{above} = 1.002 + (-0.04) = 0.962 \text{ p.p.}$$

$$\Delta^{cosigned}_{above} = 0.981 + 0.036 = 1.017 \text{ p.p.}$$

Loan Size Around the CLL by Cosigning Status

Pass-through of Reform by Cosigning Status - Intensive Margin

$Y_{i\ell t}$ = Loan Amount	(1) Non-cosigned	(2) Cosigned
Above cutoff (above_cutoff)	0.018^{*}	0.052^{***}
	(0.010)	(0.007)
Post-reform (Post)	0.523^{***}	0.52^{***}
	(0.005)	(0.007)
Above cutoff × Post	-0.238^{***}	-0.239^{***}
	(0.006)	(0.009)
Log property value, log loan amount	No	No
Controls & Year FE	Yes	Yes
Observations	845,433	31,937
R^2	0.903	0.886

Cluster-robust SEs in parentheses (clustered by lender).

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Property Value effects of CLL reform

Pass-through of Reform by Cosigning Status - Intensive Margin

	$Y_{i\ell t}$ = Property Value	
	(1) Non-cosigned	(2) Cosigned
Above cutoff (above_cutoff)	0.05*	0.081***
	(0.009)	(0.008)
Post-reform (Post)	0.496***	0.465***
	(0.007)	(0.01)
Above cutoff × Post	-0.251^{***}	-0.234^{***}
	(0.007)	(0.011)
Log property value, log loan amount	No	No
Controls & Year FE	Yes	Yes
Observations	845,433	31,937
R^2	0.903	0.886

Cluster-robust SEs in parentheses (clustered by lender).

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Who are cosigners?

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 7.48%

Who are the parents?

Table 9: Who are the parents? - Some Means

	Savings*	Total Wealth	Income	Share Owner***	Years Mortgage	Years Educ.
Not Cosigner	67,304	997,398	118,239	73.6 (%)	7.14	13.85
Cosigner	48,481	926,186	128,885	69.8 (%)	7.39	13.85

Who are the children?

Table 10: Who are the children? - Some Means

	Savings	Total Wealth	Income**	Years Educ***
Not Cosigners	40,024	379,534	166,779	15.23
Cosigners	36,644	408,635	150,694	14.42

Rationalize with a quantitative model

Incomplete Markets

Life-cycle model with overlapping generation.

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
   - If cosigned: Payment-to-income ratio relaxed $\implies$ improved access and lower interest rates
c) Do nothing
   $\implies$ Parents are somewhat financially constraint

The model:

- Households rent or buy, if homeowner, can pay, or default; choose house size, assets, and to help their children (not/cash/cosign).

Households

With $S = (t, a, z, z^p; \theta)$ first decision:

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

Having bought:

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

where θ is the cosigner status.

Buyer

$$V^{own}(S) = \max_{c, h^{own\prime}, k'} u(c, h^{own}) + \tag{9}$$

$$\beta s_t \mathbf{E}_{y', y^{P\prime}} \left[\sum_{j \in \varnothing, cos, cash} \mathbf{P}(j \mid S^p) V^h(S', h^{own\prime}, M') \right] \tag{10}$$

It is subject to

$$c + k' + (1 - \iota) p^o h^{own} = wy + (1 + r)k + M'$$

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

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

$$M' \leq (1 - \iota) p^o h^{own} \tag{11}$$

$$k' \geq 0$$

Mortgage

Choice variable

- Duration: Fixed at 30 periods.
- Total amount borrowed: $M = m\Big[\sum_{k=1}^{30} \frac{1}{(1+R^m)^k}\Big]$
- Law of Motion: $M' = M(1 + R^m) - m$
- If $pti > 0.4$, mortgage rejected
- Interest rate: $R^m = 0.02 + 0.06 \min\{\frac{pti}{0.4}, 1.0\}$

Making Payments

$$V^{pay}(S, h^{own}, M) = \max_{c,k'} u(c, h^{own}) + \beta s_t \mathbf{E}_y V^h(S', h^{own\prime}, M') \tag{12}$$

$$\begin{aligned} s.t. & \\ c + k' + m &= wy + (1+r)k + p^{own} h^{own} \qquad (13) \\ h^{own} &\in \mathcal{H}^{own} \\ M' &= M(1 + R^m) - m \\ k' &\geq -\lambda(p^o h^{own} - M) \end{aligned}$$

Default

$$
\begin{aligned}
V_j^{def}(S, h^{own}, M) &= \max_{c,k'} u(c, h^{rent}) - \zeta + \beta s_t \mathbf{E}_y V^h(S') \\
s.t. & \\
c + k' + p^r h^r &= wy + (1+r)k \\
h^{own\prime} &= 0 \\
h^{rent} &\in \mathcal{H}^{rent} \\
k' &\geq 0
\end{aligned}
$$

if $j = \emptyset, cash$

Renter | Firms & Government | Last Period

Default

$$
\begin{aligned}
V^{def}_{cosign}(S, h^{own}, M) &= \max_{c,k'} u(c, h^{rent}) - \zeta + \beta s_t \mathbf{E}_y V^h(S', h^{own\prime}, M') \\
s.t. & \\
c + k' + m &= wy + (1+r)k + p^{own} h^{own} \\
M' &= M(1+R^m) - m \\
h^{own\prime} &= 0 \\
k' &\geq 0
\end{aligned}
$$

Parental Support Decision

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

$$V_{\varnothing}^{j=J^{\theta}}(S,\varsigma) = \max_{c,\varsigma',k'} u(c,\varsigma) + \beta s_t \mathbf{E}_y V^h(S',\varsigma') \tag{14}$$

$$V_{cos}^{j=J^{\theta}}(S,\varsigma) = \max_{c,\varsigma',k'} u(c,\varsigma) + \beta s_t \mathbf{E}_y V^h(S',\varsigma') \tag{15}$$

$$V_{cos}^{j>J^{\theta}}(S,\varsigma) = \max_{c,\varsigma',k'} u(c,\varsigma) - \mathbf{E} p_{z,z^p,h}^{def} m + \beta s_t \mathbf{E}_y V^h(S',\varsigma') \tag{16}$$

$$V_{cash}^{j=J^{\theta}}(S,\varsigma) = \max_{c,\varsigma',k'} u(c,\varsigma) + \phi(a_{cos}) - a_{z^p} + \beta s_t \mathbf{E}_y V^h(S',\varsigma') \tag{17}$$

Market Clearing

Three markets need to clear:

1. Inheritance
2. Cosigning
3. Cash

all else fixed (partial equilbirium).

Crap results so far

Per-capita inheritance: 0.0025% of annual income.

Table 11: Homeowners by help type

Help Type	Share (%)
No Help	49.25
Cosigning	39.64
Cash	11.11
Total	100.0

Conclusion

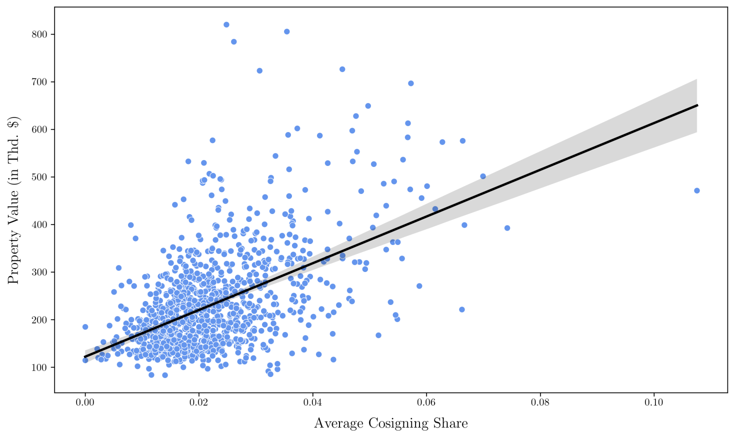
Conclusion


APPLIED MICRO CROWD
ME TRYING TO SPREAD THE GOSPEL OF MACRO...
BUT IT'S WINE IN THE OFFICE
imgflip.com

Appendix

Property Prices - Larger Counties

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



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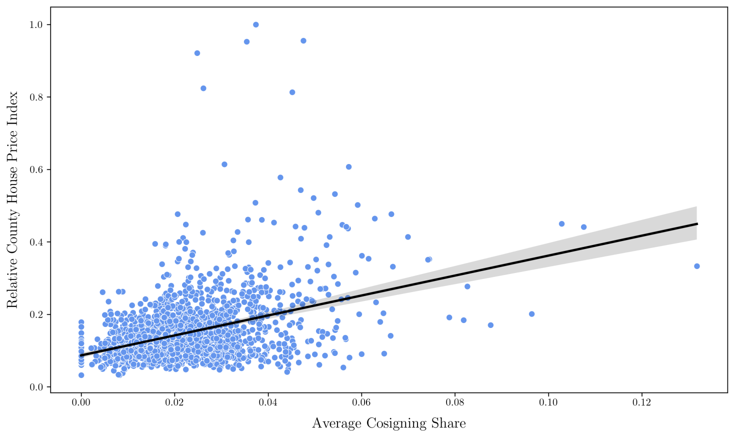
Property Price Index

Figure 6: House Price Index



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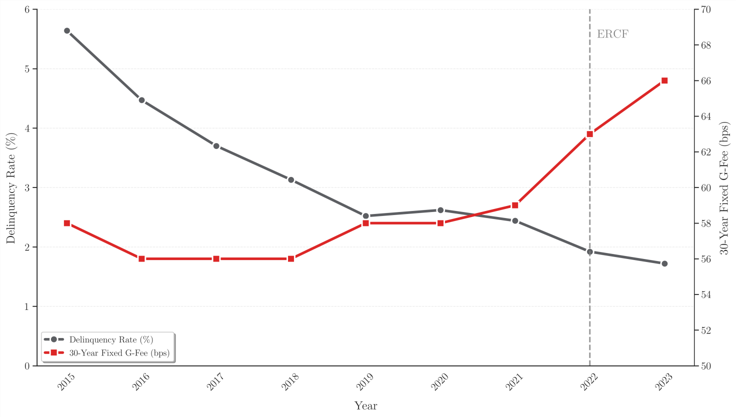
Guarantee Fees I

Figure 7: Guarantee Fees and Delinquency rates



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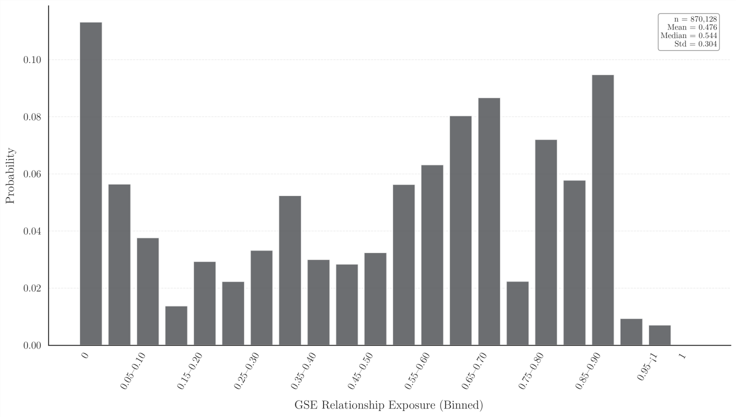
Exposure to GSE

Figure 8: GSE Exposure



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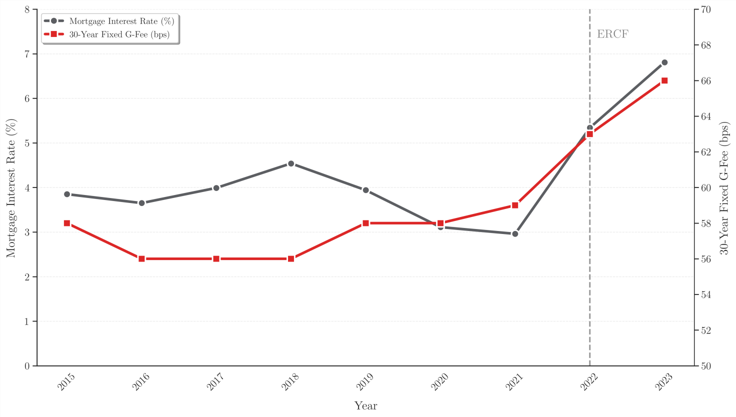
Guarantee Fees II

Figure 9: Guarantee Rates and Interest Rates



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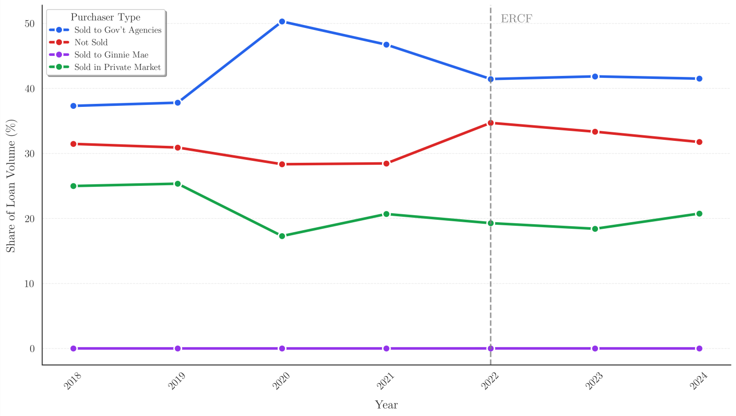
Loan Shares

Figure 10: Loan Shares



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Cosigning Correlates with Income II

Stylized Life-Cycle Profile

Table 12: 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

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HMDA - Evidence on Cosigning

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 13: Comparison of Mortgage Details with and without Cosigning

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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 14: Comparison of Mortgage Details with and without Cosigning

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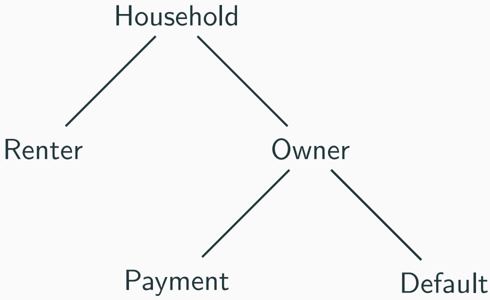
Incomplete Markets: Households



Renters

$$V^{rent}(t,a,y) = \max_{c, h^{rent\prime}, k'} u(c, h^{rent}) + \beta s_t \mathbf{E}_y V(S') \tag{18}$$

It is subject to

$$\begin{aligned} c + k' + p^r h^{rent} &= wy + (1+r)k \\ h^{own\prime} &= 0 \\ h^{rent} &\in \mathcal{H}^{rent} \\ k' &\geq 0 \end{aligned} \tag{19}$$

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Firms

Firms:

$$\Pi(K;L) = AK^{\alpha}L^{1-\alpha} - (r-\delta)K - wL \tag{20}$$

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

Government:

$$\tau_l wL + \tau_k rK + \tau_b^k b(k) = \Theta \sum_{t=T^{ret}}^{T} \mu_t \ \forall t \tag{21}$$

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

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Parents

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

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

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

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

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Last Period - Renter

$$
\begin{aligned}
V^J(t,a,y) &= \max_{c,h^{rent\prime},k'} u(c,h^{rent}) + \beta\phi(a_T,0) s.t. \\
c + k' + p^r h^{rent} &= (1-\tau_l)wy + (1 + r(1-\tau_k))k \qquad (22) \\
h^{rent} &\in \mathcal{H}^{rent} \\
k' &\geq 0
\end{aligned}
$$

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