The Unrealized Potential of a Parent's Promise

Cosigned Mortgages and Access to Credit in the United States

Marius Grünewald

November 14, 2026

European University Institute and European Central Bank

The views expressed are those of the author and do not necessarily reflect those of the European Central Bank or the Eurosystem.

Motivation

- Household debt is important for the macroeconomy (Mian–Sufi 18)
- Lenders cannot see all risk:
  ration credit (Stiglitz–Weiss 81) or charge pool average (Einav et al. 10)

Motivation

- Household debt is important for the macroeconomy (Mian–Sufi 18)
- Lenders cannot see all risk:
  ration credit (Stiglitz–Weiss 81) or charge pool average (Einav et al. 10)
- Guarantee as access tool (Thakor 82)
  - governments, companies, families

Motivation

- Household debt is important for the macroeconomy (Mian–Sufi 18)
- Lenders cannot see all risk:
  ration credit (Stiglitz–Weiss 81) or charge pool average (Einav et al. 10)
- Guarantee as access tool (Thakor 82)
  - governments, companies, families
- Family guarantors are informed and altruistic
  - information picks out the safe borrower
  - altruism picks out the child who gains most, safe or not

Motivation

- Household debt is important for the macroeconomy (Mian–Sufi 18)
- Lenders cannot see all risk:
  ration credit (Stiglitz–Weiss 81) or charge pool average (Einav et al. 10)
- Guarantee as access tool (Thakor 82)
  - governments, companies, families
- Family guarantors are informed and altruistic
  - information picks out the safe borrower
  - altruism picks out the child who gains most, safe or not
- Why care about family guarantees?
  - Who gets credit? Do they default more?
  - How does regulation use family guarantees?

Cosigning mortgages as the window

- Family guarantees: mortgages, student loans, leases, firms
- Mortgages: where access matters most
  - housing is the main source of household wealth (Kuhn et al. 20)
  - prices outran incomes (Knoll et al. 17; Mabille 23)
- Why this window
  - guarantee and default observed
  - guarantee counted for admission by regulation, ignored for pricing
  - state guarantee implemented in many countries in different ways

Research question

Question

How do family guarantees shape access to credit?

They expand access for marginal borrowers: homeownership +0.79 pp

Research question

Question

How do family guarantees shape access to credit?

They expand access for marginal borrowers: homeownership +0.79 pp

Could they deliver more in the U.S. mortgage market?

Yes. The price ignores cosigning, introducing an overpayment of 25 bp

Research question

Question

How do family guarantees shape access to credit?

They expand access for marginal borrowers: homeownership +0.79 pp

Could they deliver more in the U.S. mortgage market?

Yes. The price ignores cosigning, introducing an overpayment of 25 bp

Mechanism

A guarantor brings the lender

- a promise to pay: a cure (–)
- knowledge of the borrower: a screen (–)

A **family** guarantor

- signs for the risky child too: adverse selection (+)

This paper

- **Data.**
  4.31 m deeds scraped combined with administrative data:
  $\Longrightarrow$ First U.S. measure of parental cosigning in mortgage markets.

This paper

- **Theory.**
  Model of asymmetric information with parents as guarantors.
  $\Longrightarrow$ Altruism adds adverse selection to screening
  $\Longrightarrow$ At low child income: Screening dominates
  $\Longrightarrow$ At higher child income: Insurance dominates
  $\Longrightarrow$ Richer parents offer and cover more but unpriced

This paper

- **Model.**
  Heterogeneous-agent OLG with asymmetric information in GE
  $\Rightarrow$ quantifies the importance of guarantee, screen and adverse selection
  $\Rightarrow$ counterfactual that prices loan performance
  $\Rightarrow$ welfare implications

Preview of results: Selection drivers in comparison

Mechanism, quantified	(default rate, pp a year)
A guarantor brings the lender	
a promise to pay: a cure	−0.70
knowledge of the borrower: a screen	−0.13
A family guarantor signs for the risky child too: adverse selection	+0.74

Preview of results: Selection drivers in comparison

Mechanism, quantified	**(default rate, pp a year)**
A guarantor brings the lender	
a promise to pay: a cure	−0.70
knowledge of the borrower: a screen	−0.13
A family guarantor signs for the risky child too: adverse selection	+0.74

$\Longrightarrow$ riskier borrowers, safer loans

Difference in default rates (pp a year, cosigned − solo)

Borrowers: +1.39

Loans: −0.12

Preview of results: The unrealized potential

	Cosigning unpriced
	level
cosigned share	5.4 %
homeownership, young adults	39.6 %
default	0.36 %
welfare	–
against no cosigning	
homeownership	+0.79 pp
welfare	+0.36 %

Preview of results: The unrealized potential

	Cosigning unpriced level	Pricing on cosigning status the unrealized potential
cosigned share	5.4 %	+11.88 pp
homeownership, young adults	39.6 %	+0.64 pp
default	0.36 %	−0.027 pp
welfare	–	+0.43 %
against no cosigning		
homeownership	+0.79 pp	+1.43 pp
welfare	+0.36 %	+0.79 %

Contribution to the literature

Intergenerational transfers and housing: Allen et al. 26; Benetton et al. 22; Black et al. 22; Blickle–Brown 19; Boar 21; Brandsaas 25; Dalla Pellegrina–Scollo 16; De Nardi 04; Engelhardt–Mayer 98; Jakučionytė–Singh 22; Kaplan 12; Nekoei–Seim 23; Paz-Pardo 22

⇒ First U.S. measure of parental cosigning, a contingent claim, not a gift

Asymmetric information and credit markets: Bester 85; Beyhaghi 22; Einav–Finkelstein 11; Garcia-Villegas 26; Ghatak 99; Ioannidou et al. 22; Lee–Persson 16; Shan et al. 25; Stiglitz–Weiss 81; Thakor 82; Tzioumis 17

⇒ A family guarantor: altruism adds adverse selection to the screen

Housing and macroprudential regulation: Bolliger et al. 25; Castellanos et al. 24; Corbae–Quintin 15; DeFusco et al. 20; Elenev et al. 16; Greenwald 18; Hurst et al. 16; Jeske et al. 13; Kaplan et al. 20

⇒ Rules blind to the family guarantee: unrealized access, cross-subsidy

Roadmap

1. Institutional Setup
2. Static model
3. Data
4. Natural experiment
5. Quantification
6. Counterfactual
7. Conclusion

Institutional Setup

The parent counts for admission, not for the deposit or the price

Cosigning: both sign; the parent pays only if the child misses ▸ diagram

Three rules govern about 65% of U.S. home mortgages:

Admission: is the loan made? (both must hold)

1. Income test (DTI)	**2. Loan-to-value test** (LTV)
payment ≤ share of income	loan ≤ share of house value

Pricing: at what rate?

3. Price
rate from credit score and leverage

Does the parent count?

✓ incomes pooled ✗ lower limit ✗ lower of two scores

Static model

Static model: the parent knows the type, the lender does not

	child's income y	parent's income y_p	**type**: safe or risky
Child (θ, y)	✓	✓	✓
Parent (y_p) altruistic	✓	✓	✓
Lender	✓	✓	✗

1. **Regulator** sets the rules; price on y only (Fact 3)

Static model: the parent knows the type, the lender does not

	child's income y	parent's income y_p	**type**: safe or risky
Child (θ, y)	✓	✓	✓
Parent (y_p) altruistic	✓	✓	✓
Lender	✓	✓	✗

1 → 2

Regulator sets the rules; price on y only (Fact 3)

Nature draws y, y_p, type

Static model: the parent knows the type, the lender does not

	child's income y	parent's income y_p	**type**: safe or risky
Child (θ, y)	✓	✓	✓
Parent (y_p) altruistic	✓	✓	✓
Lender	✓	✓	✗

1 → 2 → 3

Regulator sets the rules; price on y only (Fact 3)

Nature draws y, y_p, type

Parent guarantee, or not

▸ each actor ▸ key assumption ▸ assumptions ▸ equilibrium

Static model: the parent knows the type, the lender does not

	child's income y	parent's income y_p	**type**: safe or risky
Child (θ, y)	✓	✓	✓
Parent (y_p) altruistic	✓	✓	✓
Lender	✓	✓	✗

1 → 2 → 3 → 4

Regulator sets the rules; price on y only (Fact 3)

Nature draws y, y_p, type

Parent guarantee, or not

Child solo or cosigned (Fact 2)

▸ each actor ▸ key assumption ▸ assumptions ▸ equilibrium

Static model: the parent knows the type, the lender does not

	child's income y	parent's income y_p	**type**: safe or risky
Child (θ, y)	✓	✓	✓
Parent (y_p) altruistic	✓	✓	✓
Lender	✓	✓	✗

1 → 2 → 3 → 4 → 5

Regulator sets the rules; price on y only (Fact 3)

Nature draws y, y_p, type

Parent guarantee, or not

Child solo or cosigned (Fact 2)

Nature repay or **miss** (Fact 4)

▸ each actor ▸ key assumption ▸ assumptions ▸ equilibrium

Selection into cosigning

Parent offers cosigning for a type-θ child if (participation constraint)

$$\underbrace{\underbrace{\beta}_{\text{altruism}} \quad \underbrace{\Delta V(y,\theta)}_{\text{child's gain from the guarantee}}}_{\textbf{adverse selection}} - \underbrace{\underbrace{(1-\pi_\theta)}_{\text{chance of a miss}} \quad \underbrace{\Delta u_p(y_p)}_{\text{financial liability}}}_{\text{the } \textbf{screen}} \geq \underbrace{\eta_p}_{\text{taste shock}}$$

- y_p enters only through $\Delta u_p(y_p)$
- richer parents mind the liability less: the screen weakens, μ_{co} falls
- poorer parents screen more, price ignores y_p: their families overpay most

▸ pool formula ▸ need and screen ▸ in y_p ▸ assumptions

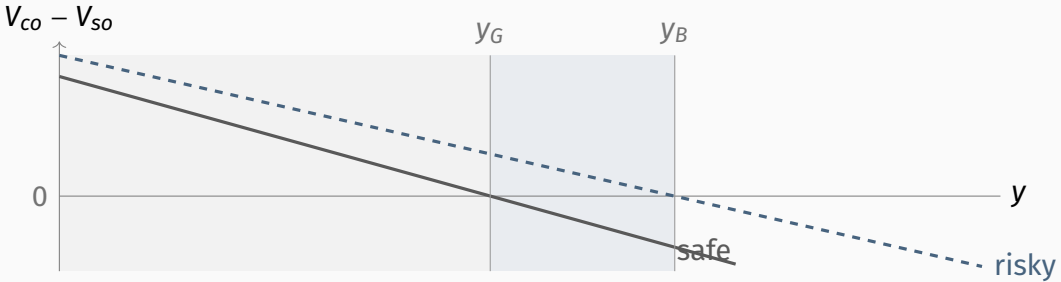
Equilibrium: why the pools differ by income

Child takes the cosigned menu if $\Delta V(y, \theta) \geq 0$, the gain from the guarantee:

$$\Delta V(y,\theta) \;=\; \pi_\theta \underbrace{\left[\, u_{co}(y) - u_{so}(y) \,\right]}_{\text{repays: the house the signature buys, shrinks with } y} \;+\; (1-\pi_\theta) \underbrace{\Delta \underline{u}}_{\text{misses: keeps the home}} \;-\; \underbrace{\phi}_{\text{cost of signing}}$$

▸ pool quality, in full

Equilibrium: why the pools differ by income



both cosign	risky only: $\mu_{co} = \pi_B$	nobody cosigns
guarantee dominates	**adverse selection dominates**	ϕ **beats both gains**
screen: $\mu_{co} = \bar{\pi}_1 > \bar{\pi}$	ϕ bites the safe child	

▸ regions

Pricing of the lender

Lender: price each file as a child with income $y_{\min}$

$$1 + r_k(y_{\min}) = \frac{1}{\bar{\pi}(y_{\min})}, \qquad \bar{\pi}(y_{\min}) \equiv \pi_B + (\pi_G - \pi_B)\,\lambda(y_{\min})$$

Compare: break even on the cosigned pool, counting the parent's cover

$$1 + \tilde{r}_{co}(y) = \frac{1}{\underbrace{\mu_{co}}_{\text{the share that repays}} + \underbrace{(1-\mu_{co})\,\bar{p}}_{\text{the parent covers what she can, } \bar{p}(y_p)}}$$

▸ admission tests ▸ the rule, formally ▸ break-even rate ▸ grid only ▸ how big

Pricing of the lender

Lender: price each file as a child with income $y_{\min}$

$$1 + r_k(y_{\min}) = \frac{1}{\bar{\pi}(y_{\min})}, \qquad \bar{\pi}(y_{\min}) \equiv \pi_B + (\pi_G - \pi_B)\,\lambda(y_{\min})$$

Compare: break even on the cosigned pool, counting the parent's cover

$$1 + \tilde{r}_{co}(y) = \frac{1}{\underbrace{\mu_{co}}_{\text{the share that repays}} + \underbrace{(1-\mu_{co})\,\bar{p}}_{\text{the parent covers what she can, } \bar{p}(y_p)}}$$

grid: as if the child were solo

grid: not counted

- The posted rate ignores the guarantee: $r_{co} = r_{so}$

▸ admission tests ▸ the rule, formally ▸ break-even rate ▸ grid only ▸ how big

Data

Measuring parental cosigning

I estimate 5.5% of mortgages are intergenerationally cosigned:

County deeds, web-scraped

31 NY counties, 4.31 million loans

Name **every** signer

Add the parent beside a couple

$\Rightarrow$ **3.5%** of purchases

Measuring parental cosigning

I estimate 5.5% of mortgages are intergenerationally cosigned:

County deeds, web-scraped

31 NY counties, 4.31 million loans

Name **every** signer

Add the parent beside a couple

$\Rightarrow$ **3.5%** of purchases

Loan records (HMDA)

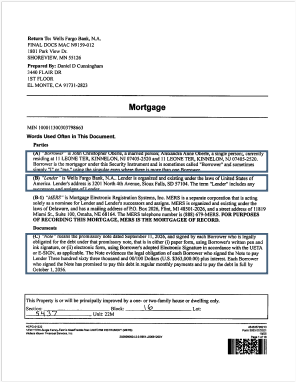
10.5 million purchases, 2018–24

Parent = co-applicant **20+ years older**

Sees at most two borrowers

$\Rightarrow$ **2.5%** of purchases

A recorded mortgage: the parties clause names every signer



Return To: Wells Fargo Bank, N.A.
FINAL DOCS MAC 9913-912
1801 Park View Dr.
SHOREVIEW, MN 55126

Prepared By: Daniel D Cunningham
1446 FLAIR DR
1ST FLOOR
EL MONTE, CA 91731-2823

Mortgage

MIN 100811300307788663

Words Used Often in This Document.

Parties

(A) "Borrower" is John Christopher Oberle, a married person; Alexandra Anne Oberle, a single person;, currently residing at 11 LEONE TER, KINNELON, NJ 07405-2520 and 11 LEONE TER, KINNELON, NJ 07405-2520. Borrower is the mortgagor under this Security Instrument and is sometimes called "Borrower" and sometimes simply "I" or "me," using the singular even where there is more than one Borrower.

(B) "Lender" is Wells Fargo Bank, N.A.. Lender is organized and existing under the laws of United States of America. Lender's address is 3201 North 4th Avenue, Sioux Falls, SD 57104. The term "Lender" includes any successors and assigns of Lender.

(B-1) "MERS" is Mortgage Electronic Registration Systems, Inc. MERS is a separate corporation that is acting solely as a nominee for Lender and Lender's successors and assigns. MERS is organized and existing under the laws of Delaware, and has a mailing address of P.O. Box 2026, Flint, MI 48501-2026, and a street address of 1819 Flight Way, Ocoee, FL 34761. MERS IS THE MORTGAGEE UNDER THIS SECURITY INSTRUMENT. FOR PURPOSES OF RECORDING THIS MORTGAGE, MERS IS THE MORTGAGEE OF RECORD.

Documents

(C) "Note" means the promissory note dated September 11, 2026, and signed by each Borrower who is legally obligated for the debt under that promissory note, that is in either (i) paper form, using Borrower's written pen and ink signature, or (ii) electronic form, using Borrower's adopted Electronic Signature in accordance with the UETA or E-SIGN, as applicable. The Note evidences the legal obligation of each Borrower who signed the Note to pay Lender Three hundred sixty three thousand and 00/100 Dollars (U.S. $363,000.00) plus interest. Each Borrower who signed the Note has promised to pay this debt in regular monthly payments and to pay the debt in full by October 1, 2056.

This Property is or will be principally improved by a one- or two-family house or dwelling only.
Description: Block: 15 Lot: 24.3.7 Unit: 22M

borrowers

> **(A)** *"Borrower"* is John Christopher Oberle, a married person; Alexandra Anne Oberle, a single person;, currently residing at 11 LEONE TER, KINNELON, NJ 07405-2520 and 11 LEONE TER, KINNELON, NJ 07405-2520. Borrower is the mortgagor under this Security Instrument and is sometimes called "Borrower" and sometimes simply "I" or "me," using the singular even where there is more than one Borrower.

lender

> **(B)** *"Lender"* is Wells Fargo Bank, N.A.. Lender is organized and existing under the laws of United States of America. Lender's address is 3201 North 4th Avenue, Sioux Falls, SD 57104. The term "Lender" includes any successors and assigns of Lender.

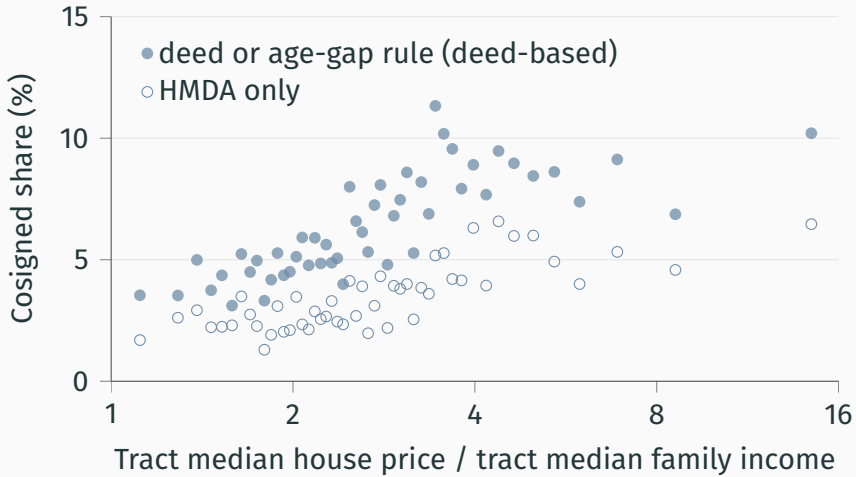
amount

> **(C)** *"Note"* means the promissory note dated September 11, 2026, and signed by each Borrower who is legally obligated for the debt under that promissory note, that is in either (i) paper form, using Borrower's written pen and ink signature, or (ii) electronic form, using Borrower's adopted Electronic Signature in accordance with the UETA or E-SIGN, as applicable. The Note evidences the legal obligation of each Borrower who signed the Note to pay Lender Three hundred sixty three thousand and 00/100 Dollars (U.S. $363,000.00) plus interest. Each Borrower who signed the Note has promised to pay this debt in regular monthly payments and to pay the debt in full by October 1, 2056.

A mortgage as recorded in the New York City register (ACRIS); the strips are the boxed parts of the page

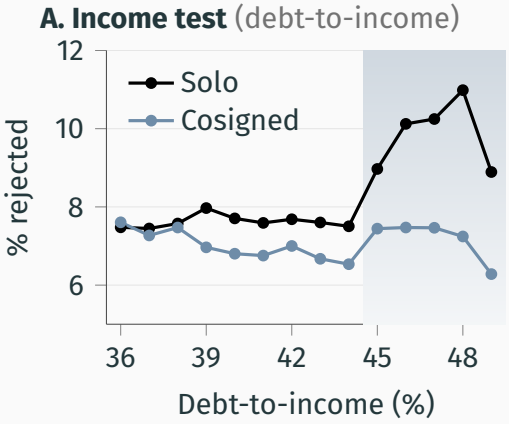
▸ web scraping ▸ deed signers

Fact 1: cosigning rises with price-to-income



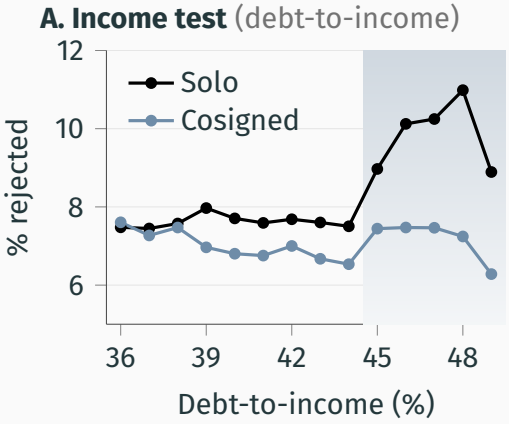
▸ U.S. counties ▸ 2024 only ▸ means ▸ controls

Fact 2: Rejection rates differ by admission test

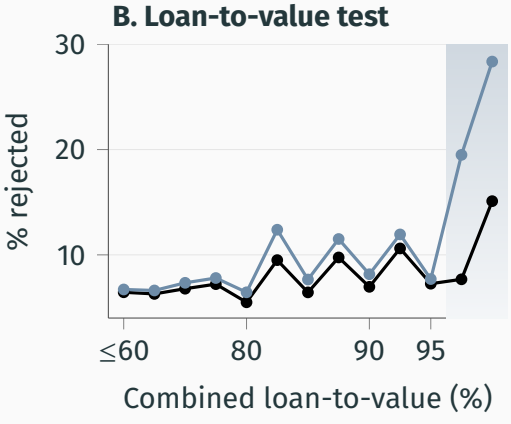


45–49: 7.1% vs. 9.8%

Fact 2: Rejection rates differ by admission test



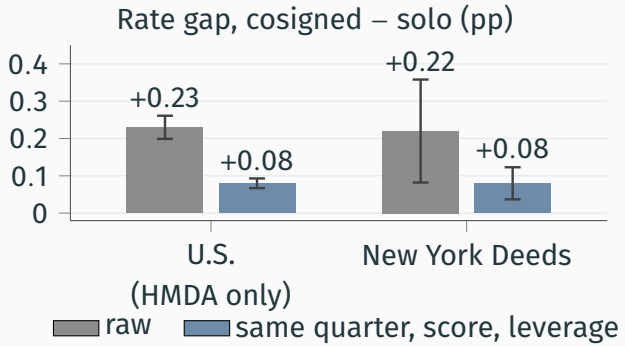
45–49: 7.1% vs. 9.8%



At 96–97: 19.5% vs. 7.7%

▸ who applies where ▸ full distribution ▸ controls ▸ why 45 and 50

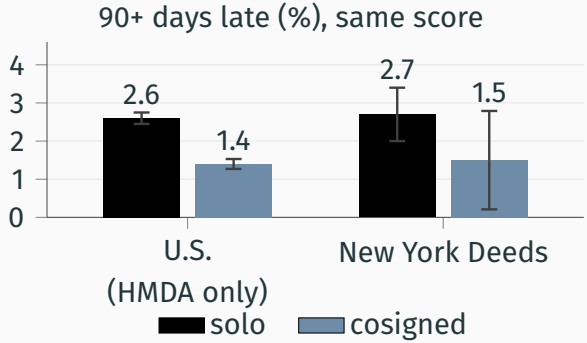
Fact 3: Cosigned and Solo borrowers pay nearly the same rate



No discount for the guarantee: +0.08 pp inside a price cell

▸ regressions ▸ data link

Fact 4: Cosigned loans default half as often



Parents cover missed payments before default

▸ 30+ days late ▸ regressions ▸ data link

Natural experiment

2022: loans above the limit pay 25–75 bp more, whoever signs



Each margin at its optimal window (±$67.1k denials, ±$20.8k rates), 95% intervals, pools estimated separately

Checks: no pre-trends; only at the real limit; no switching into cosigning

▸ design ▸ equation ▸ all windows ▸ validity ▸ switching ▸ table

Predictions: A cost shock to the lender

There are two margins of adjustment for a lender:

1. Admission: pools differ

Only solo borrowers are turned away

Cosigned files cleared the income test on two incomes (Fact 2)

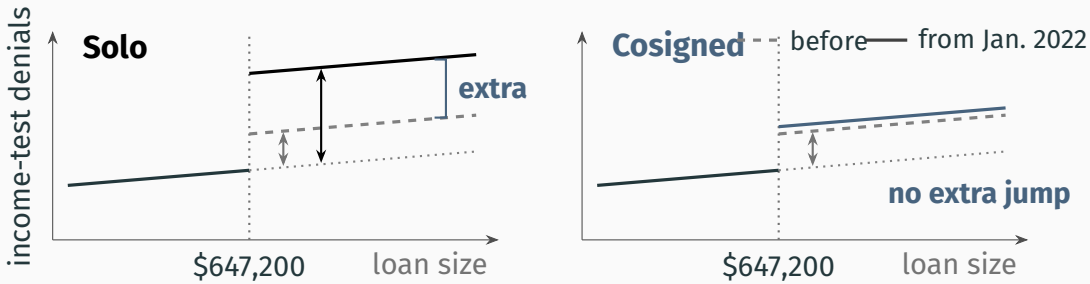
2. Rates: pools alike

The rate ignores the parent in both pools (Fact 3)

A test the model was not built for → **2022 fee change**

derivations: ▸ 1. admission ▸ 2. rates ▸ statement

A 2022 fee change raises lenders' cost on larger loans only



Key assumptions: (1) parallel trends: without the reform, the jump at the limit stays the same (continuity in differences); (2) additivity; (3) no switching into cosigning or out of the sample

▸ evidence ▸ the reform ▸ sample and design ▸ why not OLS? ▸ identification

What we estimate: how much the jump at the limit changed

$$Y_{ilt}^{k} = \beta_1^k D_{it} + \boldsymbol{\beta_3^k} (D_{it} \times Post_t) + \phi_t^k \tilde{X}_{it} + \psi_t^k \tilde{X}_{it} D_{it} + Z_{it}\gamma^k + \alpha_t^k + \delta_l^k + \epsilon_{ilt}^k$$

- $k \in \{so, co\}$: each pool estimated **separately**
- Y_{ilt}^k: income-test denial, loan i, lender l, year t
- $\tilde{X}_{it}$: running variable from threshold
- $D_{it} = \mathbb{1}\{\tilde{X}_{it} \geq 0\}$: above the limit

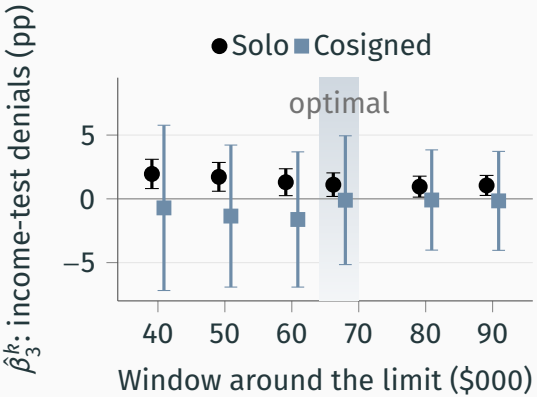
- β_1^k: the jump at the limit **before** the reform
- $\boldsymbol{\beta_3^k}$: **how much that jump changed**
  - ▸ the parameter of interest
- ϕ_t^k, ψ_t^k: each year its own slope on each side
- $Z_{it}\gamma^k$: controls
- α_t^k, δ_l^k: year and lender fixed effects

Standard errors clustered at the lender level

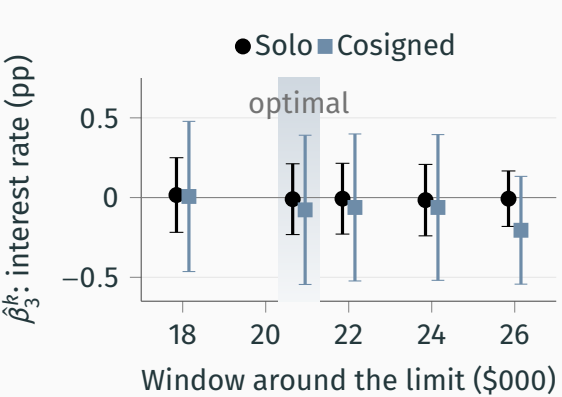
▸ sample and design ▸ why not OLS? ▸ identification

Lenders turned away solo borrowers; rates did not move

Admission: solo +1.11, cosigned −0.11

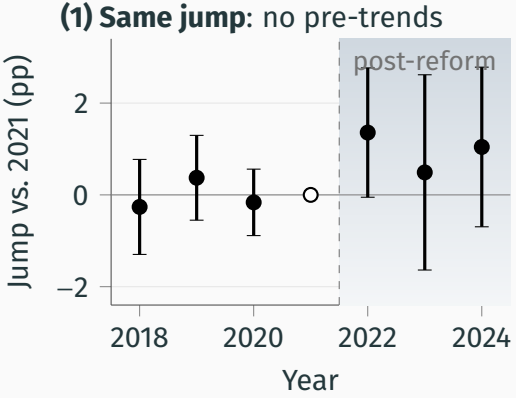


Price: solo −0.01, cosigned −0.08



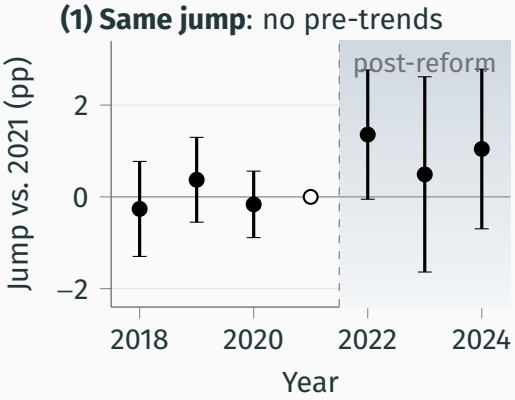
▸ near the limit ▸ denials table ▸ rates table

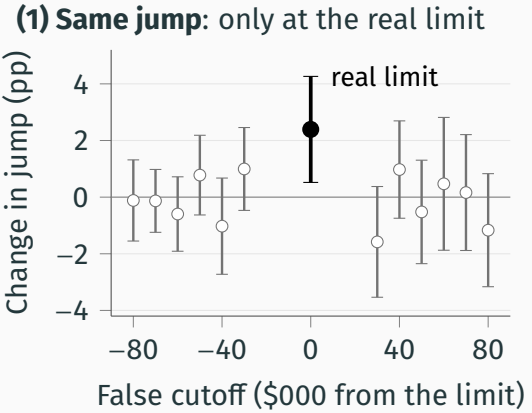
Validity: flat before 2022, and only at the real limit



▸ tables ▸ bunching ▸ 1. pre-trends ▸ 1. false cutoffs ▸ identification

Validity: flat before 2022, and only at the real limit





▸ tables ▸ bunching ▸ 1. pre-trends ▸ 1. false cutoffs ▸ identification

Validity: no switching into cosigning or out of the sample

(3) No switching: difference-in-discontinuities, $\hat{\beta}_3$ (above × post)

	into cosigning	out of the sample	
	(1)	(2)	(3)
	Loan is cosigned	Loan density, solo	Loan density, cosigned
$\hat{\beta}_3$ (above × post)	−0.26	−2.07	−1.95
	(1.05)	(3.40)	(3.50)
Unit	pp	share of loans per $1,000 bin	

Standard errors in parentheses, lender-clustered in (1); no coefficient is significant at 10% (p = 0.81, 0.54, 0.58).
(1): applications above 120% of area median income, ±$67.1k around the limit.

▸ 2. additivity ▸ 3. switching ▸ density test ▸ identification

Quantification

A lifecycle model where every child later becomes a parent

Households

- overlapping generations
- income risk
- **two risk types**: the family knows, the lender does not
- child at 36 and parent at 61
- rational beliefs about help and inheritance

Lenders

- 30-year fixed-rate annuity mortgage
- see income, house and contract, not the type
- pricing rule
- income test: both incomes if cosigned

Housing

- owner and rental housing, discrete sizes
- construction firm
- house price and rent clear in general equilibrium

Preferences: consumption and housing, an ownership premium, warm-glow bequest

▸ from the static model ▸ details ▸ market clearing ▸ construction ▸ equilibrium ▸ convergence ▸ all backups

Inside a household: state, decisions and events

State Space

- j age
- a liquid assets
- z borrower productivity
- z_p parent's productivity
- ω renter or owner
- h house size
- κ help received: none, cosign, cash, both
- ζ shut out after a solo default
- θ risk type, hidden from the lender

Inside a household: state, decisions and events

State Space

j	age
a	liquid assets
z	borrower productivity
z_p	parent's productivity
ω	renter or owner
h	house size
κ	help received: none, cosign, cash, both
ζ	shut out after a solo default
θ	risk type, hidden from the lender

Decisions and events age in years

every year	consume, save
36	**rent or buy**, which house, take an offered guarantee
37–66	each year **pay or default**: cosigned, the parent pays what she can; solo, foreclosure
61	**as parent**, sees the child's type: none, cosign, cash, both
63	inheritance
88	warm-glow bequest

Access: rent or buy, subject to two admission tests

Child at 36 (participation: renting is the outside option)

$$\underbrace{\Pr(\text{buy} \mid \mathbf{s})}_{\text{access}} = \left[1 + e^{(V_{36}^{rent} - V_{36}^{buy})/\sigma_{rb}}\right]^{-1}, \qquad V_{36}^{buy} = \max_{h} \mathcal{V}_{36}(\mathbf{s}, h) \text{ s.t. both tests}$$

Regulator both tests must hold (m: the annual payment)

$$\underbrace{(1 - \lambda_m)\, p_{own} h \leq a}_{\text{loan-to-value test: the parent does not count}} \qquad \underbrace{\frac{m}{y(z_c) + y(z_p)} \leq \bar{\omega}_{joint}}_{\text{income test, cosigned: the parent counts}}$$

- guarantee moves the **income test**; not the **deposit**

▸ the child ▸ the lender

Selection: the parent offers, the child accepts

Parent (participation constraint)

$$V_{61}(\mathbf{s},\theta) = \sigma_{help} \ln \sum_{\kappa=1}^{4} \exp\left(\frac{u_\kappa}{\sigma_{help}}\right), \qquad u_\kappa = \underbrace{V^p_{61}}_{\text{own value, liability}} + \underbrace{\lambda_\kappa(z_p)\,\Delta V_c}_{\text{altruism}\times\text{child's gain}} + \underbrace{\eta_\kappa}_{\text{cost of helping}}$$

Child (participation constraint)

$$\Pr(\text{accept} \mid \mathbf{s},\theta) = \left[1 + e^{(V^{so}_\theta - V^{co}_\theta)/\sigma_{menu}}\right]^{-1}$$

$$q_\theta(z_p) = \underbrace{\Pr(\text{offer} \mid \theta, z_p)}_{\text{parent}} \times \underbrace{\Pr(\text{accept} \mid \theta, z_p)}_{\text{child}}$$

- both sides of the family select the pool the **lender prices**

▸ the parent ▸ what she knows ▸ type and income ▸ the child ▸ the lender ▸ rate schedule ▸ pricing rule

Stability: the parent absorbs a cosigned default

Borrower each year from 37 to 66: an involuntary floor, then a choice

$$V_j^{PD} = \underbrace{(1-\tilde{\pi}_\theta)\, V_j^{def}}_{\text{involuntary}} + \underbrace{\tilde{\pi}_\theta\, \sigma_{def} \ln\left(e^{V_j^{pay}/\sigma_{def}} + e^{V_j^{def}/\sigma_{def}}\right)}_{\text{chosen}}, \qquad \tilde{\pi}_\theta = \pi_\theta^{1/M}$$

repayment incentive constraint under limited liability

What a default does depends on the contract:

Solo

Foreclosure: the house goes, renter for good
($\zeta = 1$)

Cosigned: the parent is called on

Home kept if her budget covers the payment, else foreclosure

$p_{cover} = \Pr\left(R_p \geq m(h, z_c)\right)$
R_p: income and savings, net of own housing

Targeted and Untargeted Moments

Panel A. Targeted

	Moment	Data	Model
M_1	Homeownership at 37 (%)	41.2	39.6
M_2	Default rate (%)	0.85	0.37
M_3	Cosigned share (%)	5.47	5.44
M_4	Cash-gift share (%)	25.0	24.8
M_5	Cosign gradient by score	−0.738	−0.745
M_6	Default ratio, low / high credit score	6.9	4.1
M_7	Default wedge, low score (pp)	−0.48	−0.09

▸ estimates ▸ all parameters ▸ at a glance ▸ identification

Targeted and Untargeted Moments

Panel A. Targeted

	Moment	Data	Model
M_1	Homeownership at 37 (%)	41.2	39.6
M_2	Default rate (%)	0.85	0.37
M_3	Cosigned share (%)	5.47	5.44
M_4	Cash-gift share (%)	25.0	24.8
M_5	Cosign gradient by score	−0.738	−0.745
M_6	Default ratio, low / high credit score	6.9	4.1
M_7	Default wedge, low score (pp)	−0.48	−0.09

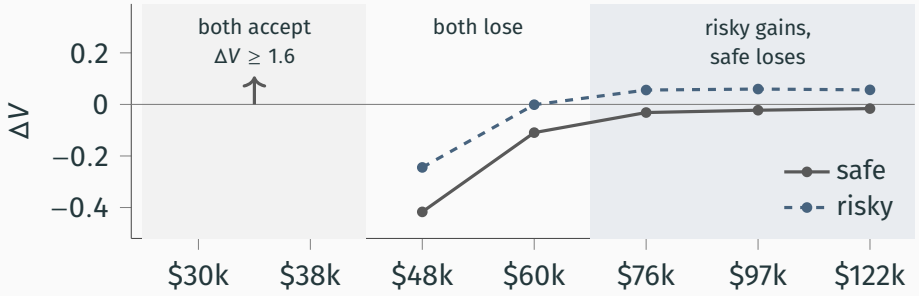
Panel B. Untargeted

	Moment	Data	Model
U_1	Parents prob. paying	0.74	0.73
U_2	Default wedge after cure (pp)	−1.00	−0.12
U_3	Default wedge, high score (pp)	+0.19	+0.04
U_4	Rate gap, no controls (pp)	+0.23	+0.07

▸ estimates ▸ all parameters ▸ at a glance ▸ identification

In the estimated model: the same two gains

$\Delta V(y, \theta) = V(\text{cosign}) - V(\text{solo})$ for a child offered a cosign at 36

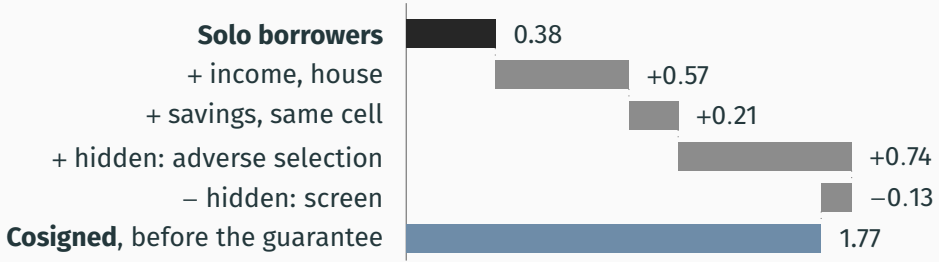


Richer parents' offers tilt further toward the risky child, as in the static model: safe-to-risky offer ratio 0.96 (poorest parents) → 0.78 (richest).

▸ under the reform

Result 1: A riskier pool, and the promise more than offsets it

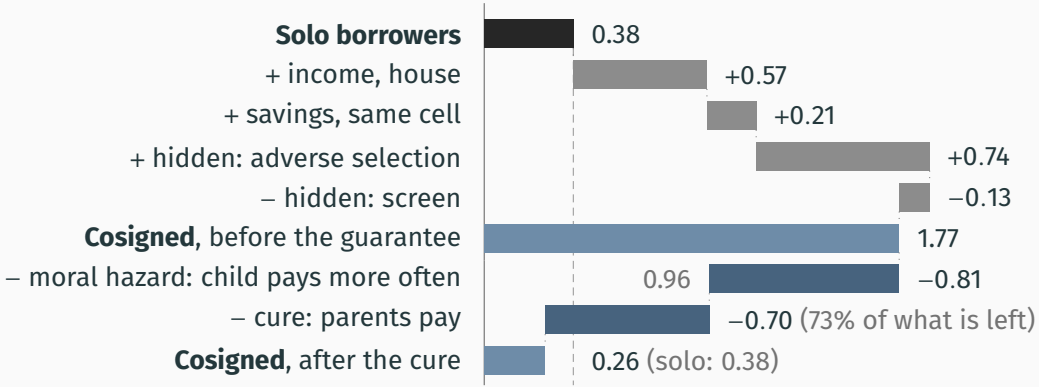
Default rate in the model, % of loans a year



▸ table

Result 1: A riskier pool, and the promise more than offsets it

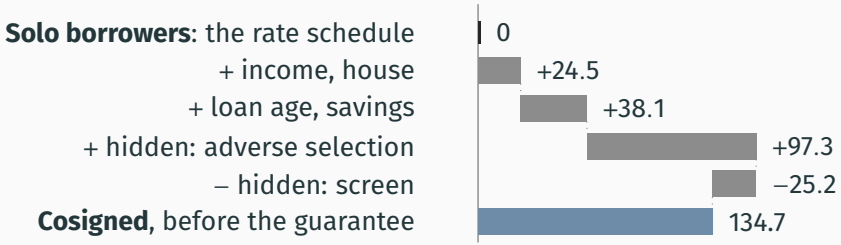
Default rate in the model, % of loans a year



▸ table

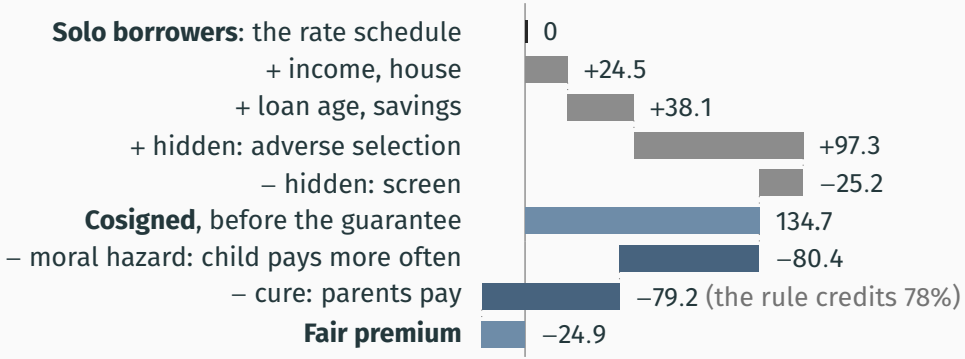
Result 1 in rates: cosigning families overpay

Premium over the solo rate, bp a year, by the lender's own pricing rule



Result 1 in rates: cosigning families overpay

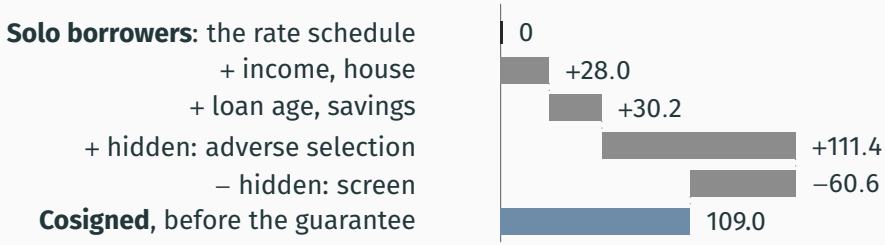
Premium over the solo rate, bp a year, by the lender's own pricing rule



Counterfactual

Counterfactual: pricing cosigning

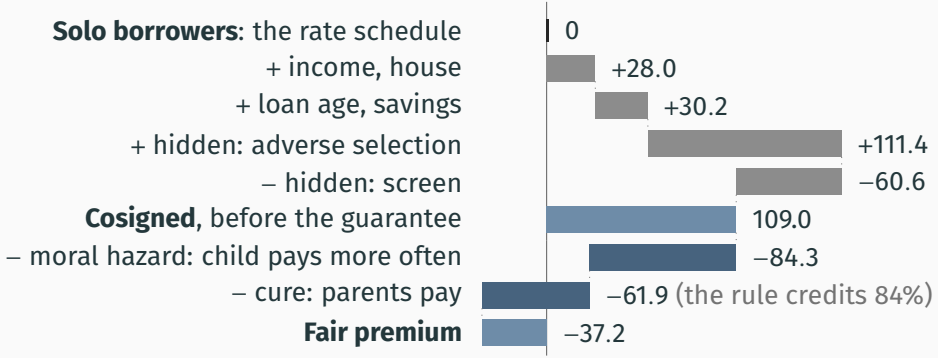
Premium over the solo rate, bp a year; the reform (L1), general equilibrium



▸ solo rate

Counterfactual: pricing cosigning

Premium over the solo rate, bp a year; the reform (L1), general equilibrium



▸ solo rate

Access: the price is the friction that binds

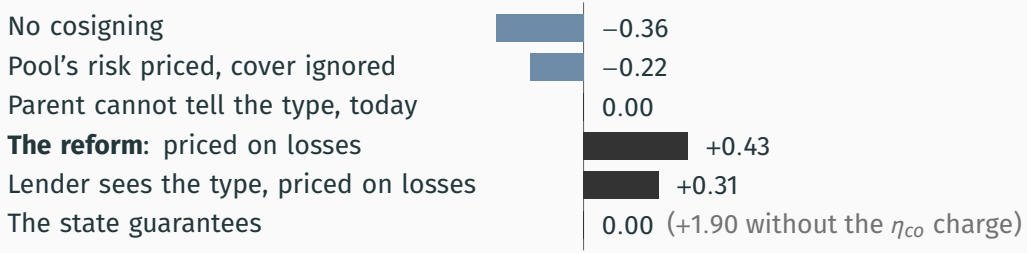
Homeownership, pp, general equilibrium



Moral hazard and the cure are both inside "the cover".

Welfare across the ladder

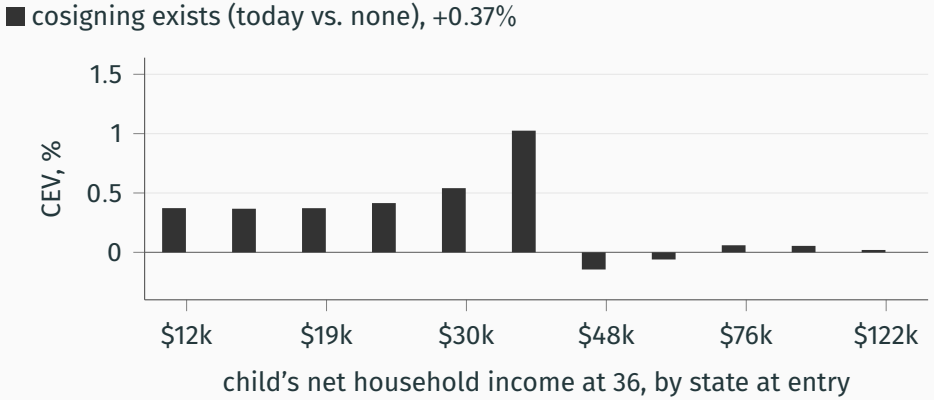
Welfare against today, CEV %, general equilibrium



Welfare by income: the lower half gains most

Criterion: % of lifetime consumption at entry (age 36), CEV $= \left(\frac{V^{CF}+gB}{V^{BL}+gB}\right)^{1/\alpha} - 1$

V: lifetime value, the economy compared (CF) vs. its reference (BL); B: discounted horizon; g, α: curvature

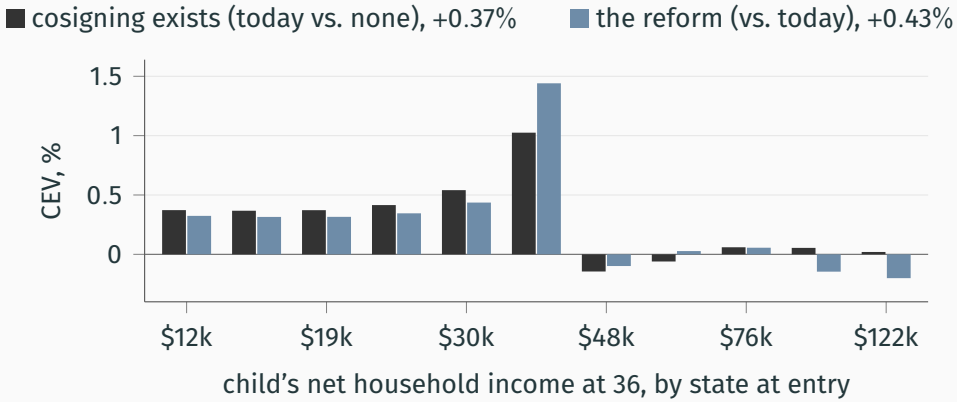


▸ children's wealth ▸ by parent income

Welfare by income: the lower half gains most

Criterion: % of lifetime consumption at entry (age 36), $\text{CEV} = \left(\frac{V^{CF}+gB}{V^{BL}+gB}\right)^{1/\alpha} - 1$

V: lifetime value, the economy compared (CF) vs. its reference (BL); B: discounted horizon; g, α: curvature



▸ children's wealth ▸ by parent income

Conclusion

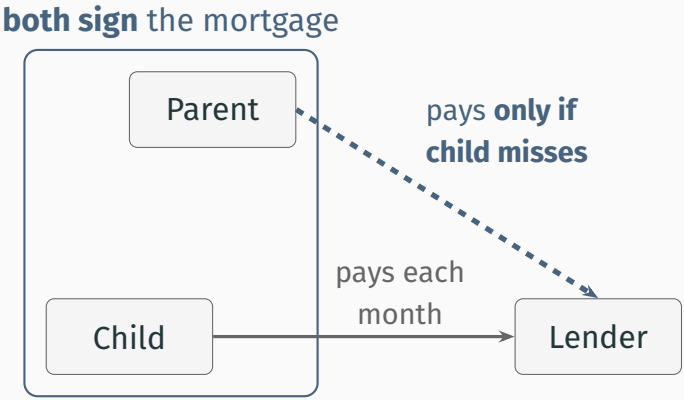
How do family guarantees shape access to credit?

Cosigning adds 0.79 pp of homeownership and raises welfare by 0.36%.

How: knowledge selects who gains most, the promise outweighs the risk
Why less than they could: pricing on solo rate

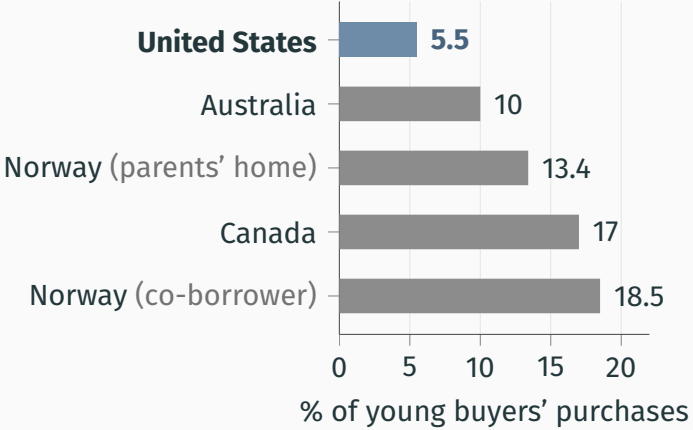
- Adverse selection stronger than screening.
- Children pay more often and parents cover 73% of misses.
- The price ignores the promise, so families overpay by 25 bp a year.
- Pricing on realized payments adds another 0.64 pp of homeownership with no more defaults, and raises welfare by 0.43%.

Backup: what a cosigned mortgage is



One loan, two signatures: the lender may collect from either, and in practice collects from the parent only when the child misses.

Backup: parental cosigning is rare in the U.S. and common abroad



- Abroad the guarantee often counts toward **deposit**
- There: 2 to 3 times as common
- U.S.: buyers under 45

▸ by country ◂ back

Backup: guarantees for young buyers, by country

Country	Share	What the guarantee reaches
A. Family guarantees		
United States	**5.5%**	**Income test only: priced on the worse borrower, deposit unm**
United Kingdom	7%	Income test only
Australia	10%	Deposit: guarantor's home lowers the loan-to-value
Norway, parents' home	13.4%	Deposit: lien counts toward the loan-to-value cap
Canada	17%	Co-borrowing; high-leverage risk insured nationally
Norway, co-borrower	18.5%	Income test only (debt $\leq 5\times$ income binds)
B. State guarantees		
Spain	15%	ICO: up to 20% of the price
Finland	19%	ASP: state guarantee on first-home loans
Italy	20%	Consap: the tranche above 80% loan-to-value
Portugal	24%	State-backed, with parents: up to 100% financing

Orders of magnitude only. U.S.: model target (range 2.8–5.8%). Spain: eligible buyers; Finland: loan volume.

back

Backup: the age-gap rule finds parents

Rule (HMDA reports ages in bins)

- Buyer under 25: co-applicant 45+
- Buyer 25–34: co-applicant 55+
- Buyer 35–44: co-applicant 65+

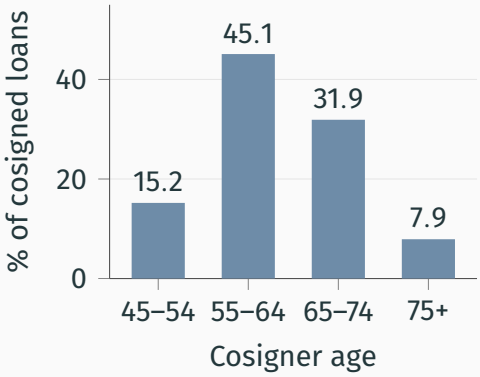
Who signs: father **58%**, mother 42%

280,649 pairs with both sexes reported

Survey check: non-occupant co-signer **4.2%**

between age-gap 3.5% and either-rule 6.5%

NSMO, 8,249 first-time buyers; deed sample



back

Backup: how the deeds are scraped and matched

1. Scrape

County clerk portals, 2018–24

Automated browser: filter to mortgages, month by month

Open every record: borrowers, lender, town, amount

→

2. Clean

Drop firms, trusts, corrections, loans < $20k

Merge name aliases

Flag: more than two borrowers

→

3. Lender

Strip MERS nominee

Standardise bank names

Match to global legal entity ID (GLEIF), as in HMDA

→

4. Match

To HMDA loans with:

Same year

Same town

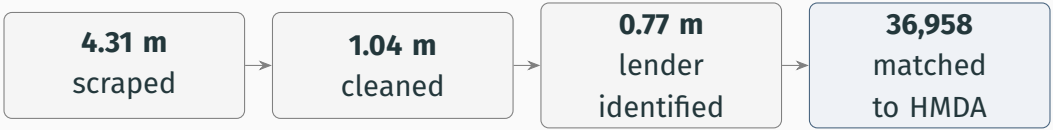
Same lender ID

Same $10k loan bracket

Keep unique matches only

back

Backup: the deed sample in numbers



Deed rule (>2 signers)	1,286
Age-gap rule	1,304
Both	178
Either	**2,412 (6.5%)**

Matched: **16%** of eligible HMDA loans in the same counties and years

from 2% (Staten Island) to 56% (Onondaga); NYC boroughs lowest

back

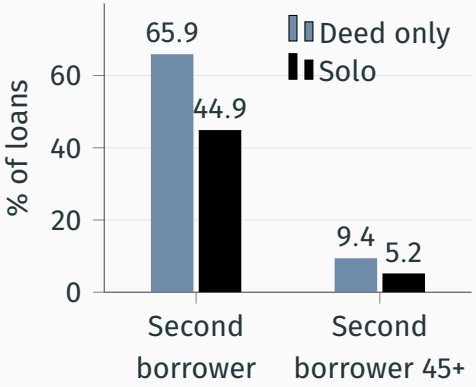
Backup: is the extra signer on the deed a parent?

Noise checks

- ✓ Aliases as extra rows: **0.7%** of loans
- ✓ Firms, trusts: **2.4%** of flagged
- ✗ Surnames uninformative ($p = 0.40$)

Positive test: deed-only vs. solo with county + year FE

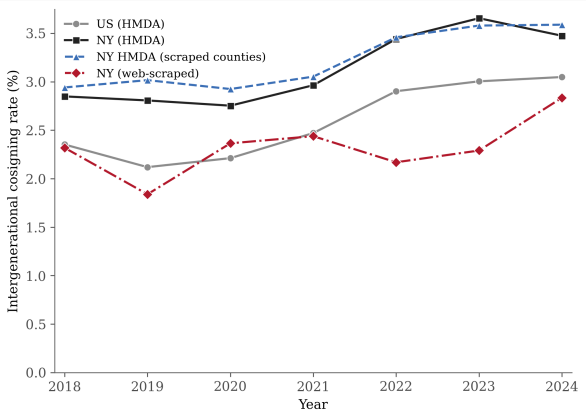
- Second borrower: +18.7 pp (s.e. 2.4)
- Second borrower 45+: +3.7 pp ($p = 0.03$)



One-sided test: with three signers and two HMDA slots, the parent can be missing from HMDA

back

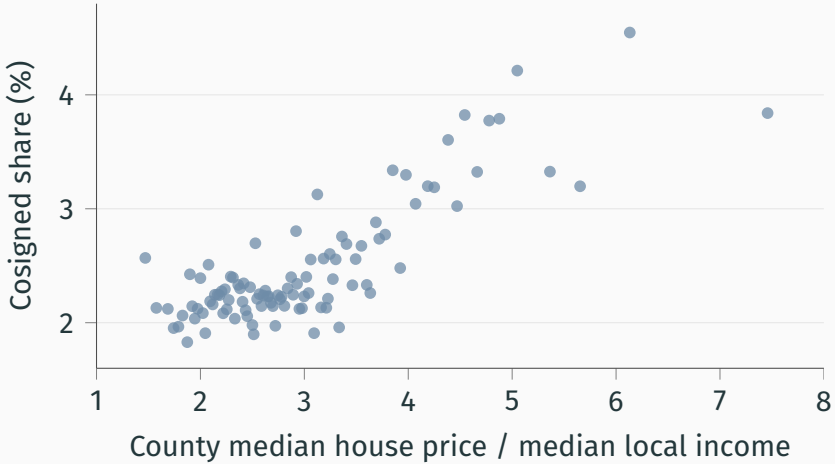
Backup: the scraped counties look like New York



Scraped counties (**blue**) ≈ all of New York (**black**), which moves with the U.S. (**grey**)

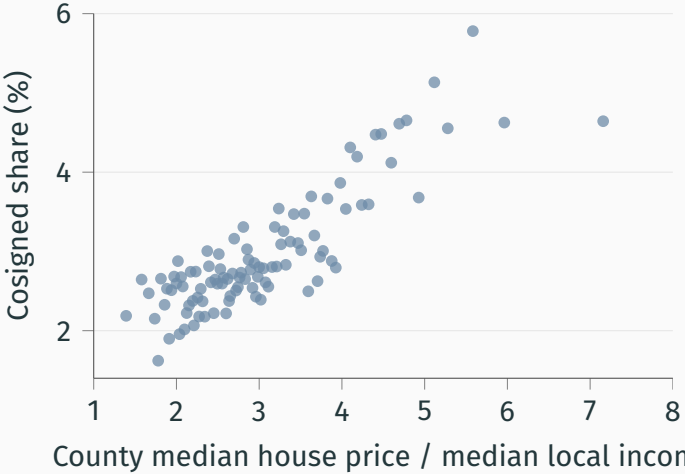
back

Backup: Fact 1 across U.S. counties



back

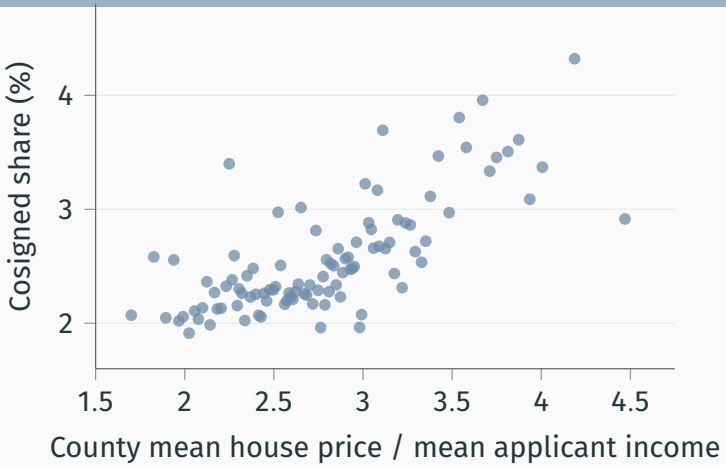
Backup: Fact 1 in 2024 alone



- 1,755 counties, 2024 only
- 100 equal-size bins
- Holds every year; **steeper since 2022**

back

Backup: Fact 1 with means



- 1,763 counties, 2018–24 pooled
- Income: mortgage applicants (no mean in the Census data)
- Same gradient: cheapest fifth 2.3%, dearest 3.3%

back

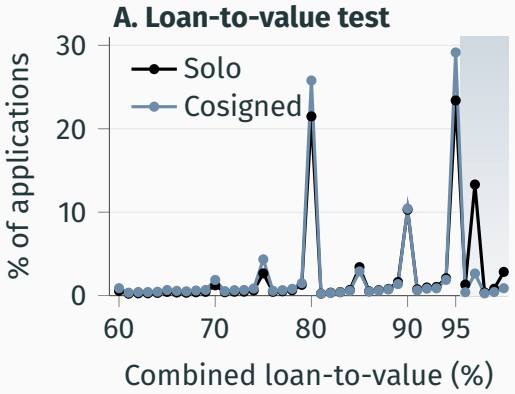
Backup: Fact 1 is not a big-city effect

	Slope	(s.e.)
Raw	+0.43	(0.04)
+ income level	+0.45	(0.07)
+ density, metro, size	+0.40	(0.07)
+ buyer age, price growth	+0.40	(0.07)
+ state fixed effects	+0.15	(0.07)

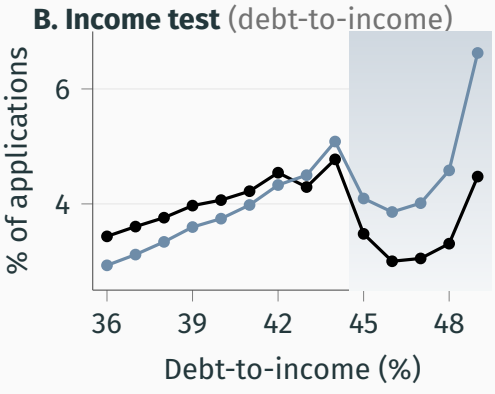
Cosigned share (pp) on price / local income; 1,740 counties, loan-weighted.
Denser counties cosign *less* (−0.13); richer counties less (−1.34 per log income).

◂ back

Backup: who applies where, on each margin



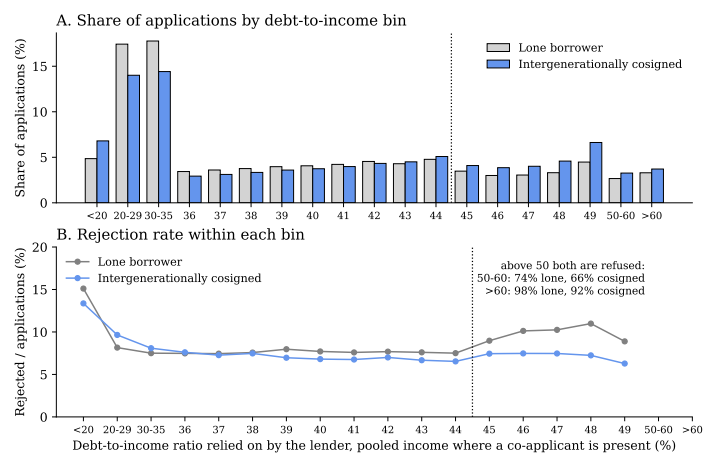
At 95: 29% vs. 23%; at 97: 2.7% vs. 13.3%



45–49: 23% of cosigned vs. 17% of solo

back

Backup: Fact 2, the full debt-to-income distribution



back

Backup: Fact 2 with controls

Dependent variable: application rejected (pp); DTI 36–49	(1)	(2)	(3)
DTI 46–49 (vs. 43–45)	+0.66***	+0.46***	+0.68***
	(0.17)	(0.17)	(0.17)
Cosigned × DTI 46–49	**−0.64****	**−0.67****	**−0.88****
	(0.32)	(0.32)	(0.41)
Year, county, lender FE		✓	✓
Borrower controls		✓	✓
Years	2018–24	2018–24	2018–21
Observations	582,539	582,539	393,424
Lender clusters	1,663	1,663	1,483
R^2	0.001	0.046	0.051

Linear probability model; s.e. clustered by lender. *** $p < 0.01$, ** $p < 0.05$.

back

Backup: why 45 and 50

Fannie Mae DTI limits

- Automated underwriting: up to **50%**
- Manual: 36%, up to **45%** with compensating factors
- Above 45, approval needs a stronger file

Where the parent enters

- Ratio on **pooled** income: the parent moves the file down the axis
- Automated system weighs risk across **all** borrowers
- Manual only: occupant's income alone, cap **43%**

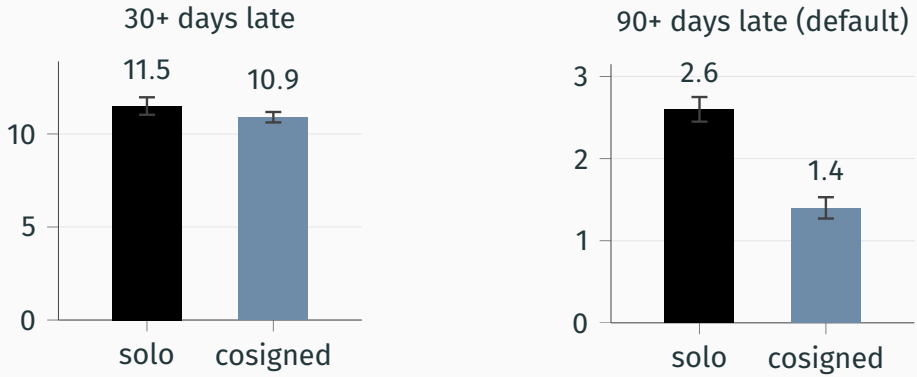
The parent acts as a compensating factor near the cap

Fannie Mae Selling Guide B3-6-02, B2-2-04

back

Backup: Fact 4, 30+ and 90+ days late

Share of loans ever late (%), same credit score



Small gap at 30 days (−0.7 pp), large at 90 (−1.2 pp, about half the solo rate)

back

Backup: Facts 3 and 4, regressions

	Fact 3	Fact 4			
Cosigned − solo (pp)	Note rate	30+ late	90+ late	Forced exit	Recovered
No controls	+**0.23*****	+2.32***	−0.31***	−1.48***	+6.27***
	(0.02)	(0.20)	(0.07)	(0.15)	(0.58)
Same credit score	+0.22***	−0.68***	−**1.23*****	−1.68***	+9.34***
	(0.02)	(0.14)	(0.07)	(0.16)	(0.56)
+ leverage	+0.25***	−0.36**	−1.00***	−1.32***	+7.47***
	(0.01)	(0.15)	(0.07)	(0.14)	(0.54)
Same price cell	+**0.08*****	−0.24	−1.00***	−1.36***	+7.58***
	(0.01)	(0.15)	(0.06)	(0.14)	(0.54)
+ DTI, state, loan size	+0.08***	−0.35**	−1.03***	−1.28***	+7.83***
	(0.01)	(0.16)	(0.06)	(0.14)	(0.50)
Solo mean	4.64%	11.5%	2.6%	2.4%	66.4%
Observations	2,295,805	2,295,805	2,295,805	234,299	176,191

Price cell: quarter × score × leverage. Last two columns: loans ever 30+ late. State-clustered s.e.

back

Backup: linking Fannie Mae loans to HMDA

Fannie Mae performance files

Monthly status: late, forbearance, exit

Both credit scores, note rate

✗ no borrower ages

HMDA

Ages of applicant and co-applicant

✓ parent–child flag (20+ years older)

✗ nothing after origination

Match on year, state, county, **exact note rate**, loan amount band, term, leverage, DTI band, co-borrower

Keep a pair only if it is **unique both ways**

- **4.56 of 6.85 million** loans matched
  67%; 55–84% by year
- Sample: **2.30 million** first-time buyers, 71,819 cosigned

- False matches: **0.3–1.4%**
  placebo: every rate shifted by $\frac{1}{8}$ point
- Forbearance months count neither as late nor as exposure

back

Backup: the three actors, formally

Constraints: child, incentive compatibility; parent and lender, participation; default, limited liability.

Child chooses the contract (cosigned only if offered); if cosigned, a miss does not cost the home

$$\max_{k \in \{so,\, co\}} V_k(y,\theta) = \pi_\theta\, u\big(y - (1+r_k)L_k,\ h_k\big) + (1-\pi_\theta)\,\underline{u}_k, \qquad \underline{u}_{co} > \underline{u}_{so}, \quad \pi_G > \pi_B$$

Parent knows θ and offers, $o = 1$, if her net gain is positive ($\eta_p \sim F_\eta$: taste shock)

$$\mathcal{U}_p(1) - \mathcal{U}_p(0) = \underbrace{\beta\,(V_{co} - V_{so})}_{\text{altruism}} - \underbrace{(1-\pi_\theta)\,\big[u(y_p) - u(y_p - \text{payment she covers})\big]}_{\text{expected liability}} - \eta_p$$

Lender does not see θ; free entry sets a break-even rate per contract

$$1 + r_k(y) = \frac{1}{\mu_k(y)}, \qquad \mu_k(y) = \mathbb{E}\big[\pi_\theta \mid y,\ k\big] : \text{the child's own repayment}$$

Backup: all assumptions of the static model

Assumption	Used for
Family knows the type, lender does not; the share of good types $\lambda(y)$ rises with income	selection; screen read through y
Free entry; rate reads y and the contract, **not** y_p or the cover $\bar{p}$	the unpriced guarantee
House price and both loan caps fixed	each menu lends the lower of the desired loan and its cap
Cost of signing $\phi > 0$, the same for both types and states	the exit at the top; cancels across types
Key: $\Delta u_p > \beta\,(\Delta \underline{u} - G)$, liability outweighs the extra altruism	the screen, $q_G > q_B$
(A1) u bounded, consumption reaches the bound; owning beats the rental floor	the gain vanishes at the top; the need
(A2) Cosigning pays at the income floor; at most one crossing	interior cutoffs
(A3) Taste shocks: support $\mathbb{R}$, dispersed, log-concave	$q_B > 0$; unique pooling rate
(A4) Parent's liability bounded below: $\bar{p} > 0$, bounded y_p	no "bad news" at the top

Backup: from the static to the lifecycle model

Static model	Lifecycle model
Two types, repayment given	Same types; default is a **choice**, with a type-specific penalty
Share of good types rises with income	Share of good types rises with the child's productivity
Parent offers or not	Parent: cosign, cash, both or nothing; child: takes it up or not
Taste shock η_p	Help cost plus extreme-value taste shocks
Key assumption gives $q_G > q_B$	**Not assumed**: type-specific expected liability, $q_G > q_B$ endogenous
Pool quality by Bayes' rule	Realised share of safe buyers in each house-size and income cell
Rate on the child's own risk	Observed rate schedule; cosigned gap by the same rule, cell by cell
Income test on pooled income	Payment-to-income cap 40% solo, 42% on joint income
Three regions by income	The trap: cells with a positive premium
One period, savings given	Saving, buying, default chosen; children become parents; prices clear

▸ model details ◂ back

Backup: equilibrium and the fixed point

A perfect Bayesian equilibrium: two cutoffs in the child's income y, rates $r_k(y)$, beliefs $\mu_k(y)$ with

1. **Parents** offer optimally at those rates: $q_\theta = F_\eta\big(\beta\,\Delta V - (1-\pi_\theta)\,\Delta u_p\big)$
2. **Children** take the contract with the higher V_k
3. **Beliefs** follow Bayes' rule on income and the contract taken, $\mu_k(y) = \mathbb{E}[\pi_\theta \mid y, k]$
4. **Rates** break even per contract, $1 + r_k(y) = 1/\mu_k(y)$

Fixed point: rate ▸ offers ▸ pool ▸ belief ▸ rate. Where both types cosign,

$$r_{co}^{pool}(y) = T_y\big(r_{co}^{pool}(y)\big), \qquad T_y(r) \equiv \frac{1}{\pi_B + \Delta\pi\,\Lambda_1(y;r)} - 1$$

$\Lambda_1(y;r)$: share of safe children among the cosigned, given who offers at rate r

▸ existence, uniqueness ▸ proof ▸ grid only: no loop ◂ back

Backup: existence and uniqueness

The pooling rate (fixed point of T_y)

- Exists: T_y maps a closed interval of rates into itself, continuously
- Unique: $|T_y'| \leq C \sup f_\eta < 1$ if taste shocks are dispersed ▸ contraction

The two cutoffs (exit of safe, then of risky children)

- Exist: cosigning pays at low income and not at high income
- Unique: the gain ΔV falls with income at its zero; risky children cross later

Beliefs: Bayes' rule on the path; off the path, the worst case π_B

Scope: unique given the pooling schedule; static model only

proofs: ▸ pooling rate ▸ cutoffs ▸ three regions ▸ equilibrium ◂ back

Backup: proof, the pooling rate exists and is unique

$$T_y(r) = \frac{1}{\pi_B + \Delta\pi\, \Lambda_1(y; r)} - 1 \quad \text{on} \quad \mathcal{R} = \text{rates between pricing at } \pi_G \text{ and at } \pi_B$$

1. **Self-map**: the belief lies in $[\pi_B, \pi_G]$ whatever parents do ▸ $T_y(r) \in \mathcal{R}$
2. **Continuous**: u smooth, F_η has a density ▸ offers $q_\theta(r)$ continuous, pool never empty
3. **Exists**: $T_y(r) - r \geq 0$ at the bottom of $\mathcal{R}$, ≤ 0 at the top ▸ a fixed point in between
4. **Unique**: $T'_y = -\dfrac{\Delta\pi}{\mu_{co}^2} \dfrac{\partial \Lambda_1}{\partial r}$; offers respond to r by at most $\sup f_\eta \cdot \beta\, \pi_\theta\, u_c\, L^*$
5. ▸ $|T'_y| \leq C \sup f_\eta < 1$ if taste shocks are dispersed ▸ contraction, iteration converges

▸ next: cutoffs ◂ back

Backup: proof, the two cutoffs

$\Delta V(y,\theta) = \pi_\theta\, G(y) + (1-\pi_\theta)\,\Delta\underline{u} - \phi$ G: gain if she repays; $\Delta\underline{u} > 0$: she keeps the home

1. **Need**: $\Delta V(B) - \Delta V(G) = \Delta\pi\,(\Delta\underline{u} - G) > 0$ at every income: a miss costs no consumption, owning beats the floor
2. **Top**: utility bounded, consumption reaches the bound ▸ $G, \Delta\underline{u} \to 0$ and $\Delta V \to -\phi < 0$
3. **Exist**: $\Delta V > 0$ at the floor, < 0 at the top, continuous ▸ a root for each type
4. **Unique**: ΔV crosses zero at most once ▸ one root per type
5. **Order**: at the safe child's cutoff the risky child still gains (step 1) ▸ $\tilde{y}_G < \tilde{y}_B$

▸ next: three regions ◂ back

Backup: proof, the three regions are an equilibrium

1. **Low income**: $\Delta V(B) > \Delta V(G) > 0$, both types cosign if offered ▸ $\mu_{co} = \bar{\pi}_1$
2. **Middle**: safe children have left ▸ $\mu_{co} = \pi_B$, rate r^{sep}; risky stay until $\Delta V(B; r^{sep}) = 0$
3. **High income**: nobody cosigns
4. **Deviations**: a safe child cosigning above her cutoff pays $r^{sep} >$ the r^{pool} she declined
5. **Deviations**: solo at low income gives up $\Delta V > 0$; an unused offer gains the parent nothing
6. **Unique**: rates by break-even, cutoffs by the two crossings, beliefs by Bayes' rule

▸ grid only: no loop ◂ back

Backup: sorting, formally (the three regions)

Two cutoffs in the child's income, where each type stops gaining from the cosigned contract:

$$\Delta V(y_G^{pool}, G;\, r_{co}^{pool}) = 0, \qquad \Delta V(y_B^{sep}, B;\, r_{co}^{sep}) = 0, \qquad y_F < y_G^{pool} < y_B^{sep}$$

Cosigned rate and belief in each region:

$$1 + r_{co}(y) = \begin{cases} 1/\bar{\pi}_1(y) & y < y_G^{pool} : \text{ both types cosign; screen } q_G > q_B \\ 1/\pi_B & y_G^{pool} \le y < y_B^{sep} : \text{ only risky children cosign} \\ \text{no cosigned contract} & y \ge y_B^{sep} \end{cases}$$

Needs: u bounded with consumption reaching the bound, a cost of signing $\phi > 0$, dispersed taste shocks, the key assumption, and risky children still cosigning at y_G^{pool} (else two regions)

▸ picture ▸ proof ◂ back

Backup: the pool behind a signature

λ = safe share of all children, q_θ = offer rate

$$\mu_{co}(y, y_p) \;=\; \pi_B + (\pi_G - \pi_B)\,\frac{\overbrace{\lambda\, q_G}^{\text{safe, with an offer}}}{\underbrace{\lambda\, q_G + (1-\lambda)\, q_B}_{\text{all with an offer}}}$$

back

Backup: what the signature reveals, by parent income

Belief of a lender who could read the parent's income y_p, with offers $q_\theta = F_\eta(a_\theta)$:

$$\Lambda_1(y, y_p) = \frac{\lambda\, q_G}{\lambda\, q_G + (1-\lambda)\, q_B}, \qquad a_G - a_B = \Delta\pi \left[\Delta u_p(y_p) - \beta\,(\Delta\underline{u} - G)\right]$$

- Parent covers part ($\bar{p} < 1$): a richer parent has more at stake ▶ screen **stronger**
- Parent covers all ($\bar{p} = 1$): paying hurts a richer parent less ▶ Λ_1 **falls** in y_p
- The rate ignores y_p ▶ families with poorer parents overpay, richer ones underpay
- Very rich parent, $\Delta u_p \to 0$: $q_G < q_B$, the guarantee is **bad news** (excluded)

Estimated model: cosigned default does not rise with parent income (untargeted moment)

Backup: the two admission tests, formally

A loan L on a house worth P is made under contract k only if **both** tests hold:

$$\underbrace{(1+r_k)\,L \;\le\; \overline{\text{dti}}\;Y_k}_{\text{income test}}, \quad Y_{so}=y, \;\; Y_{co}=y+y_p \qquad\qquad \underbrace{\left(1-\overline{\text{ltv}}^{\,k}\right)P \;\le\; a}_{\text{deposit, from the child's own savings } a}$$

- The parent enters the **income test** only, through Y_{co} (Fact 2)
- **Deposit**: no y_p, no rate; cap $\overline{\text{ltv}}$ of 95% (90% manual) with a cosigner, 97% solo
- Pricing cannot undo rationing: no rate admits a buyer the deposit excludes
- Guarantee counted toward the deposit: admits exactly those buyers ▶ the reform

▸ income test in the data ◂ back

Backup: the pricing rule, formally

The rate reads y and the contract k, not the parent: neither y_p nor her cover $\bar{p}(y_p)$.
Free entry: it breaks even on what the **child** is expected to pay

$$\mu_k(y)\,\big(1 + r_k(y)\big) = 1 \qquad \Longrightarrow \qquad 1 + r_k(y) = \frac{1}{\mu_k(y)}$$

Belief: the child's own repayment probability in the pool taking contract k (Bayes' rule)

$$\mu_k(y) = \pi_B + \Delta\pi\ \Pr(G \mid y, k), \qquad \Pr(G \mid y, co) = \underbrace{\frac{\lambda\,\bar{q}_G}{\lambda\,\bar{q}_G + (1-\lambda)\,\bar{q}_B}}_{\text{where both types cosign}}$$

- Need and screen move the offer rates $\bar{q}_G, \bar{q}_B$: they are **in the rate**
- Lender collects $\big[\mu_{co} + (1-\mu_{co})\,\bar{p}(y_p)\big](1 + r_{co})$: the cover is **not in the rate**
- Not competed away: agency fee ignores the parent; off-agency loans lose liquidity

▸ fair rate ▸ grid only ◂ back

Backup: need and screen, formally

Child's gain: G if she repays, $\Delta\underline{u} > 0$ if she misses (she keeps the home); ϕ the cost of signing

$$\Delta V(y,\theta) = \pi_\theta\, G(y) + (1-\pi_\theta)\,\Delta\underline{u} - \phi, \qquad \pi_\theta = \text{repayment probability}, \quad \pi_G > \pi_B$$

Parent offers if altruism net of expected liability beats a taste shock $\eta_p \sim F_\eta$

$$q_\theta(y,y_p) = F_\eta\big(\beta\,\Delta V(y,\theta) - (1-\pi_\theta)\,\Delta u_p\big), \qquad \Delta u_p = u(y_p) - u(y_p - \text{payment she covers})$$

- **Need**: $\Delta V(y,B) - \Delta V(y,G) = \Delta\pi\,(\Delta\underline{u} - G) > 0$ where insurance outweighs G
- **Key assumption**: $\Delta u_p > \beta\,(\Delta\underline{u} - G)$ ▸ $q_G > q_B$, the **screen**
  to the parent, a riskier child adds more liability than altruistic gain
- Fails for very rich parents, $\Delta u_p \to 0$: there the guarantee is bad news

◂ model ◂ mechanism

Backup: why the net of need and screen is ambiguous

- **Low income**: both types cosign; only the screen sorts ▸ cosigned pool **safer**
- **Middle**: safe children leave first; only need sorts ▸ cosigned pool **riskier**
- **High income**: nobody cosigns

$$\bar{\mu}_{so} - \bar{\mu}_{co} = \underbrace{\int_{y_G}^{\infty} \bar{\pi}\, dF_{so} + \int_{y_G}^{y_B} (\bar{\pi}_2 - \bar{\pi})\, dF_{so} + \int_{y_G}^{y_B} (\bar{\pi} - \pi_B)\, dF_{co}}_{\textbf{need} > 0\text{: safe children leave; the solo pool gets cleaner, the cosigned pool risky}}$$

$$- \underbrace{\left[\int_{0}^{y_G} (\bar{\pi}_1 - \bar{\pi})\, dF_{co} + \int_{0}^{y_G} (\bar{\pi} - \bar{\pi}_0)\, dF_{so}\right]}_{\textbf{screen}\text{, subtracted: an offer is good news, no offer is bad news}}$$

$$+ \underbrace{\int_{0}^{y_G} \bar{\pi}\,(dF_{so} - dF_{co}) - \int_{y_G}^{y_B} \bar{\pi}\, dF_{co}}_{\textbf{weights} \lesseqgtr 0\text{: the two pools are different sizes}}$$

y_G, y_B: exits of safe, risky; $\bar{\pi}$: all buyers; $\bar{\pi}_1, \bar{\pi}_0$: with, without an offer; $\bar{\pi}_2$: solo, middle; $dF_k = \omega_k f_k dy$

▸ Sign from the data: model +0.28 pp; 30+ late, same cell, −0.24 (n.s.) rate schedule back

Backup: prediction 2, formally

A fee increase dg raises the posted rate by $dg/\mu_k(y)$, and the debt-to-income ratio by

$$dDTI_k = \frac{L}{Y_k} \cdot \frac{dg}{\mu_k(y)}, \qquad Y_{so} = y, \quad Y_{co} = y + y_p$$

Rejection probability at ratio d is $H_k(d)$; the parent is a compensating factor, $H_{co}(d) = H\big(d - \tau\,\gamma(y_p)\big)$, $H_{so} = H$

$$R'_k \equiv \frac{\partial \Pr(\text{reject} \mid k)}{\partial g} = \mathbb{E}^k\big[H'_k(DTI_k)\, L/(Y_k\,\mu_k(y))\big]$$

- **Rates**: both pools pay, $\partial r_k/\partial g = 1/\mu_k$; predicted difference under 1 bp
- **Rejections**: $R'_{co} < R'_{so}$ once $\tau \geq \tau^*$, even if the cosigned rate moves more
- Fact 2: at the same ratio cosigned files are rejected less, 7.1 vs. 9.8% at 45–49

◂ model ◂ predictions

Backup: prediction 1, derivation (rates)

1. Break-even rate on contract k: $1 + r_k(y) = \dfrac{1+g}{\mu_k(y)}$ (g: agency fee)
2. A fee change moves both rates: $\dfrac{\partial r_k(y)}{\partial g} = \dfrac{1}{\mu_k(y)}$
3. The pools differ only through pool risk: $\partial(r_{co} - r_{so})/\partial g = \dfrac{\mu_{so}(y) - \mu_{co}(y)}{\mu_{co}(y)\,\mu_{so}(y)}$
4. Pools about alike (Fact 4) ▶ the difference is a small share of dg: under 1 bp for the 2022 fee change
5. The parent's payments $\bar{p}$ enter nowhere ▶ the rate side cannot show the cure

▸ next: admission ▸ statement ◂ back

Backup: prediction 2, derivation (admission)

1. $DTI_k = (1 + r_k)\, L / Y_k$, $Y_{so} = y$, $Y_{co} = y + y_p$; fee: $dDTI_k = L\, dg / (Y_k\, \mu_k)$
2. Rejection probability $H_k(DTI_k)$ ▸ $R'_k \equiv \partial\, \mathbb{E}^k[H_k] / \partial g = \mathbb{E}^k\left[H'_k(DTI_k)\, L / (Y_k\, \mu_k)\right]$
3. Compensating factor: $H_{so} = H$, $H_{co}(d) = H\big(d - \tau\, \gamma(y_p)\big)$, H convex
4. $\Phi(\tau) \equiv \mathbb{E}^{co}\left[H'(DTI_{co} - \tau\gamma)\, L / (Y_{co}\, \mu_{co})\right]$ falls in τ; at $\tau = 0$: cosigned rejected **more**
5. ▸ one threshold: $R'_{co} < R'_{so} \iff \tau > \tau^*$ (Fact 2: flatter cosigned hazard)

▸ statement ◂ back

Backup: the unpriced guarantee, formally

Posted rate on the child's own repayment probability $\mu_k(y)$, fair rate with parental coverage $\bar{p}(y_p)$:

$$1 + r_k(y) = \frac{1}{\mu_k(y)}, \qquad 1 + \tilde{r}_{co}(y, y_p) = \frac{1}{\mu_{co}(y) + \big(1 - \mu_{co}(y)\big)\bar{p}(y_p)}$$

Fair cosigned rate below the solo rate if and only if

$$\bar{p}(y_p) \;>\; \bar{p}^*(y) \equiv \frac{\mu_{so}(y) - \mu_{co}(y)}{1 - \mu_{co}(y)}$$

- Wedge $r_{co} - \tilde{r}_{co}$ rises with coverage and with pool risk
- No rate, however low, admits a borrower the deposit excludes

▸ grid only ◂ mechanism ◂ predictions

Backup: robustness, if the lender ignores the pool

Result holds: the fair cosigned rate stays **below** the rate charged, even if the rate ignores who cosigns (agencies' grid: score and loan-to-value only)

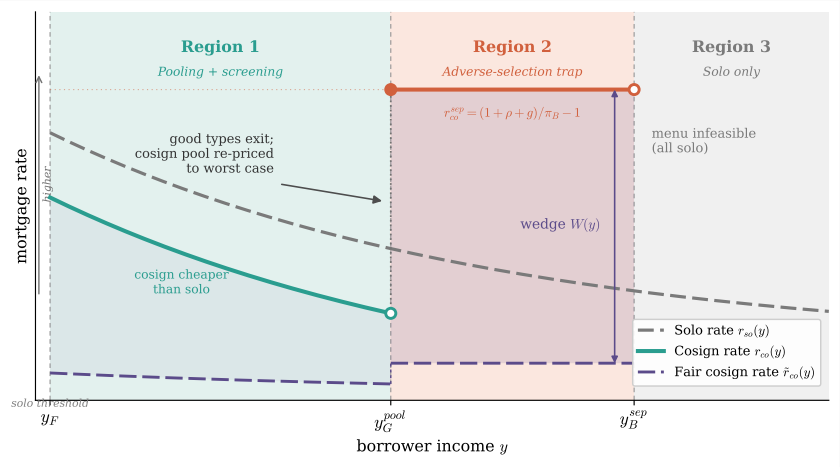
The rate considers the pool with weight α, and all buyers' repayment $\bar{\pi}$ otherwise:

$$1 + r_k = \frac{1}{\alpha\,\mu_k + (1-\alpha)\,\bar{\pi}} \qquad \text{holds if and only if} \quad \bar{p} > (1-\alpha)\,\frac{\bar{\pi} - \mu_{co}}{1 - \mu_{co}}$$

	$\alpha = 1$: **the paper**	$\alpha = 0$: **grid only**
Parent must cover more than	0	at most $\bar{p}^* \approx 0$ (Fact 4)
Pool feeds back into the rate	yes	no
Separating rate	yes	no

◂ model ◂ formal

Backup: the rate schedule across borrower income



▸ proof ◂ why ambiguous ◂ mechanism ◂ model

Backup: the 2022 fee change, institutional details

- **Who**: the FHFA, regulator of Fannie Mae and Freddie Mac
- **When**: announced 5 January 2022 (the cutoff used), in force 1 April 2022
- **What**: higher upfront fee on high-balance loans, by loan-to-value ratio **alone**
- **Which fee**: the risk-based part of the guarantee fee, paid once at sale
- **The grid**: credit score and loan-to-value; no cosigner, no income
- **Size**: 25 to 75 bp of the loan ► at most 0.19 pp of note rate
- **Which loans**: $647,200 up to the county ceiling (at most $970,800); jumbo untouched
- **Exposure**: cosigned loans are sold to the agencies more often than solo loans

▸ fee schedule ▸ exposure ▸ sample and design ◂ back

Backup: sample and design details

Each pool k separately; year effects and slopes, controls, lender effects:

$$Y_{ilt}^{k} = \beta_1^k D_{it} + \beta_3^k (D_{it} \times Post_t) + \phi_t^k \tilde{X}_{it} + \psi_t^k \tilde{X}_{it} D_{it} + Z_{it}\gamma^k + \alpha_t^k + \delta_l^k + \epsilon_{ilt}^k$$

- β_1: jump at the limit before the reform; β_3: **how much the jump changed**
- Loan size relative to that year's limit; seven yearly limits stacked, 2018–24
- After = 2022 onward, from the January 2022 announcement
- HMDA loan size in \$5,000 brackets ► cutoff at the first bracket above the limit
- Income above 120% of area median: below it, first-time buyers' fee could be waived
- Bunching below the limit: after vs. before cancels it if it did not change

Backup: what identifies the difference-in-discontinuities

Four cells, below or above the limit (s) by before or after (t), for each pool k:

$$1 + R^k_{s,t} = \frac{1 + \rho_t + g_{s,t}}{\mu^k_{s,t}}, \qquad g_{+,Post} = g_0 + \underbrace{\Delta g^{HB}}_{\text{old fee}} + \underbrace{\Delta g^{reform}}_{2022}, \qquad \rho_{Post} = \rho + \underbrace{\Delta\rho}_{\text{rate cycle}}$$

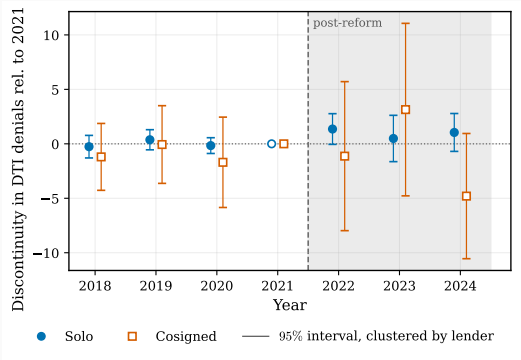
1. **Same jump** (continuity in differences): $\mu^k_{s,Post} = \mu^k_{s,Pre}$ and $\mu^k_+ \approx \mu^k_-$ ▸ the old fee, the sorting and the rate cycle cancel
2. **Additivity**: new jump = old jump + reform effect; the two do not interact
3. **No switching**: into cosigning or out of the sample (separate pools)

▸ $\beta^k_3 = \Delta g^{reform}/\mu^k$. Pool gap: $\mu_+ \approx \mu_-$ weakens to similar sorting in both pools

Checks: no pre-trends; stable, similar bunching; placebo cutoffs; no contract switching

evidence: ▸ 1 ▸ 1, placebo ▸ 2 ▸ 3 ▸ exposure ▸ evidence ▸ sample and design ◂ back

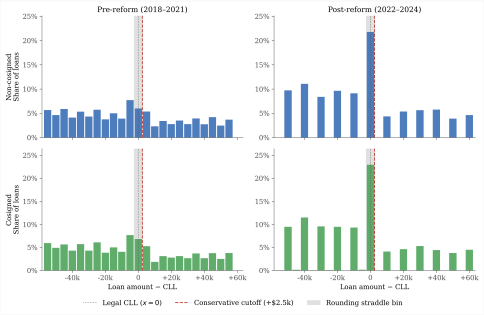
Backup: condition 1, without the reform the jump stays the same



- **No pre-trends**: the yearly jump in denials, old fee included, is flat 2018–21
  joint test $p = 0.76$ solo, 0.90 difference
- **Borrowers**: no **differential** jump in income, age, gender
  cosigned − solo, $p > 0.10$; solo income alone −0.053 (5%)
- **Bunching**: density jump unchanged
  −2.07 ($p = 0.54$) solo, −1.95 ($p = 0.58$) cosigned

▸ loan-size density ▸ next: placebo cutoffs ▸ identification ◂ back

Backup: loan-size density around the limit



The shaded bar straddles the limit and distorts the LEVEL of the jump; common to both periods, it cancels in the difference

▸ the test ▸ condition 1 ◂ back

Backup: the difference-in-McCrary test

A plain McCrary rejects here by construction: bunching is real and the \$5,000 bracket distorts its size. Test the **change** instead, bin by bin:

$$s_{b,t} = \alpha_{year} + \beta_1 \, above_b + \boldsymbol{\beta_3} \, (above_b \times Post_t) + f(x_b) + \varepsilon_{b,t}$$

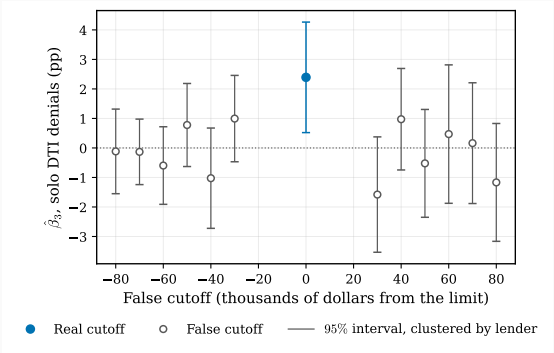
$s_{b,t}$ = share of the year's loans in \$1,000 bin b; $above_b$ = bin wholly above the limit (+\$2,500); f = own slope each side, each period

	$\hat{\beta}_3$ **(above × post)**	SE	p
Solo	−2.07	3.40	0.542
Cosigned	−1.95	3.50	0.576

- The heap cancels in the difference; **intensity did not change**

▸ the density ◂ back

Backup: condition 1 from the discontinuity side, placebo cutoffs



- **False cutoffs**: no change in the jump at \$30–80k from the limit; the real cutoff ranks first of thirteen ($p = 0.077$)
- Farther out, at \$70–160k, false jumps do appear ► the claim is local to the limit
- **False reform date**: no difference between the pools, −0.01 ($p = 0.93$) and +0.03 ($p = 0.79$)

▸ next: condition 2 ▸ identification ◂ back

Backup: condition 2, additivity

New jump = old jump **plus** the reform's effect, with no interaction:

$$1 + R^{k}_{+,Post} = \frac{1 + \rho + \Delta\rho + g_0 + \Delta g^{HB} + \Delta g^{reform}}{\mu^{k}}$$

- Fees **add** in the pricing rule: a flat amount on top of the old high-balance fee
- High-balance status switches exactly at the limit, before and after (who pays: exposure)
- Would fail if the reform changed how lenders treat the **old** fee, not just its size
- Argued from the fee schedule, not tested (Picchetti et al. 2024)

▸ next: condition 3 ▸ exposure ▸ identification ◂ back

Backup: condition 3, no switching into or out of the pools

- **Why it matters**: the two pools are estimated separately, so the reform must not change who is in them

Backup: condition 3, no switching into or out of the pools

- **Why it could fail**: a guarantee rescues a file at the income test, so a solo applicant near the cap might bring in a parent

▸ density test ▸ exposure ▸ identification ◂ back

Backup: condition 3, no switching into or out of the pools

- **Test**: change in the cosigned share of applications at the limit: −0.26 pp ($p = 0.81$)

▸ density test ▸ exposure ▸ identification ◂ back

Backup: condition 3, no switching into or out of the pools

- **Why it is plausible**: the fee is at most 0.19 pp of note rate, a small reason to ask a parent to sign

▸ density test ▸ exposure ▸ identification ◂ back

Backup: condition 3, no switching into or out of the pools

- **Out of the sample**: exits to FHA, to jumbo or out of applying would thin loans just above the limit; that density jump is unchanged

Backup: condition 3, no switching into or out of the pools

- No detectable change, so no evidence of net switching; borrower characteristics are also stable in each pool (condition 1)

▸ density test ▸ exposure ▸ identification ◂ back

Backup: exposure, who actually pays the fee

- **Status is sharp, the fee is not**: high-balance switches exactly at the limit, but only loans sold to Fannie Mae or Freddie Mac pay the fee
- So β_3^k is an **intention-to-treat**; for rates $\beta_3^k = s^k \, \Delta g^{reform} / \mu^k$, s^k = share sold to the agencies

  s^k can itself respond: a lender may keep a loan rather than pay
- Sold to the agencies: solo 53%, cosigned 59%

  all HMDA originations, in the year of origination; loans sold the next January count as not sold
- **Denials**: the more exposed pool shows no detectable response ▸ exposure works against the result
- **Rates**: exposure pushes the way the model predicts ▸ a rate gap would have to be netted of it

▸ the reform ▸ identification ◂ back

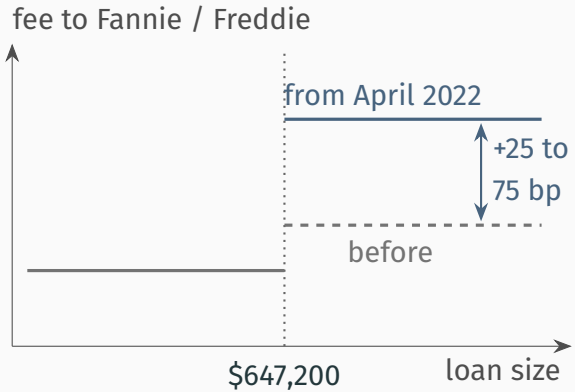
Backup: why not a simple regression?

A simple comparison would pick up	What the design does about it
Loans above the limit differ: size, income, lender	Compare loans **just** above and below the limit
High-balance loans paid a fee before 2022 as well	Difference the jump, **after vs. before**
Borrowers bunch below the limit to avoid the fee	The same differencing cancels unchanged sorting
Rates moved 300 bp; the limit resets every year	Year effects and slopes; seven limits stacked at zero
Cosigned and solo borrowers differ	Each pool estimated **separately**, then compared

- Not hypothetical: an earlier pooled specification found a rate gap that a placebo outcome also showed; year effects flipped its sign

▸ sample and design ▸ validity ◂ back

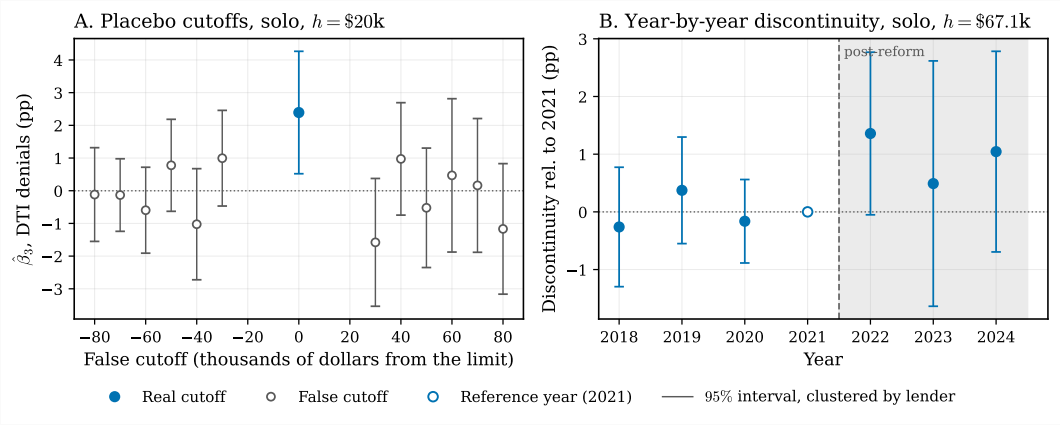
Backup: the 2022 fee change



Upfront fee on high-balance loans sold to Fannie Mae or Freddie Mac, tiered by loan-to-value ratio alone

back

Backup: natural experiment, validity



back

Backup: natural experiment, more numbers

- Solo, optimal window ($67.1k): +1.11 pp, $p = 0.018$; all windows +0.96 to +1.95
- Nearer the limit ($20k): +2.39 pp
- Bias-aware interval for the discrete loan-size variable: $[+0.37, +2.75]$
- Cosigned: -0.11 pp, 95% interval $[-5.15, +4.94]$
- Rate, cosigned − solo: -0.07 pp, $[-0.52, +0.39]$; predicted difference under 1 bp
- Sample: income above 120% of area median (fee waiver below), jumbo loans excluded

back

Backup: income-test denials, full results

	Income above area median (primary)			Full sample		
h ($000)	Solo $\hat{\beta}_3$	Cosigned $\hat{\beta}_3$	$\hat{\Delta}$	Solo $\hat{\beta}_3$	Cosigned $\hat{\beta}_3$	$\hat{\Delta}$
30	+1.73** (0.69)	+0.72 (3.84)	−1.02	+1.12 (0.77)	+1.03 (5.16)	−0.09
40	+1.95*** (0.59)	−0.71 (3.31)	−2.66	+0.91 (0.58)	−0.77 (3.69)	−1.68
50	+1.72*** (0.58)	−1.35 (2.84)	−3.07	+1.27** (0.52)	−0.95 (3.31)	−2.22
60	+1.30** (0.54)	−1.62 (2.70)	−2.92	+1.24*** (0.47)	−2.61 (3.08)	−3.85
67.1†	**+1.11**** (0.47)	**−0.11** (2.58)	**−1.22**	+0.84* (0.48)	−1.84 (3.08)	−2.68
70	+1.08** (0.47)	+0.67 (2.53)	−0.40	+0.79* (0.47)	−1.08 (3.03)	−1.87
76.6†	+0.96** (0.43)	−0.14 (2.08)	−1.11	+0.75 (0.46)	−1.82 (2.33)	−2.57
80	+0.96** (0.42)	−0.09 (2.00)	−1.05	+0.70 (0.46)	−1.86 (2.27)	−2.55
90	+1.05*** (0.40)	−0.16 (1.98)	−1.21	+0.83* (0.42)	−1.48 (2.16)	−2.31

Outcome: application denied with debt-to-income cited as a reason (HMDA), percentage points. Year-fixed-effects difference-in-discontinuities; standard errors in parentheses, clustered by lender. $\hat{\Delta}$ = cosigned − solo. † MSE-optimal windows, solo then cosigned. Samples over the paper's windows (40–90): 35,490–92,643 solo and 3,839–10,341 cosigned (primary); 76,206–213,082 and 5,147–14,433 (full). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

▸ rates table ◂ back

Backup: interest rates, full results

h ($000)	Solo $\hat{\beta}_3$	Cosigned $\hat{\beta}_3$	$\hat{\Delta}$	p_{Δ}^{WCB}	N solo	N cosigned
18	+0.0162 (0.1192)	+0.0075 (0.2403)	−0.0087 (0.2271)	0.97	22,453	2,433
20	−0.0097 (0.1136)	−0.0661 (0.2389)	−0.0563 (0.2331)	0.82	23,985	2,586
20.8†	−**0.0098** (0.1133)	−**0.0772** (0.2388)	−**0.0674** (0.2318)	0.78	24,809	2,676
22	−0.0071 (0.1133)	−0.0623 (0.2351)	−0.0552 (0.2301)	0.82	25,682	2,768
24	−0.0162 (0.1145)	−0.0625 (0.2332)	−0.0463 (0.2297)	0.84	26,882	2,880
26	−0.0073 (0.0888)	−0.2047 (0.1724)	−0.1974 (0.1813)	0.28	30,751	3,328
28	+0.0004 (0.0863)	−0.1630 (0.1650)	−0.1634 (0.1593)	0.31	32,037	3,476

Outcome: contract interest rate, percentage points. Same specification, on the primary sample (income above area median); covariates and lender fixed effects; standard errors in parentheses, clustered by lender. $\hat{\Delta}$ = cosigned − solo; p_{Δ}^{WCB} = wild-cluster-bootstrap p-value of the differential. † the solo pool's MSE-optimal window: −0.07 pp, 95% interval [−0.52, +0.39], against a predicted difference under 1 bp. No estimate is significant at 10%.

▸ denials table ◂ back

Backup: event study, full results

	h = \$20k		**h = \$67.1k** (slide)		h = \$90k	
Year	Solo	Cosigned	Solo	Cosigned	Solo	Cosigned
2018	−0.80 (1.14)	−7.29 (4.21)	−0.26 (0.53)	−1.20 (1.57)	+0.22 (0.42)	−3.53 (1.78)
2019	+0.22 (1.04)	−5.55 (8.12)	+0.37 (0.47)	−0.07 (1.82)	−0.06 (0.47)	−1.65 (1.82)
2020	−0.32 (0.78)	−10.19 (5.48)	−0.16 (0.37)	−1.70 (2.12)	−0.17 (0.30)	−1.45 (1.48)
2021	ref.	ref.	ref.	ref.	ref.	ref.
2022	+2.88 (1.63)	−6.95 (6.79)	+1.36 (0.72)	−1.13 (3.49)	+1.46 (0.58)	−1.18 (2.60)
2023	+1.21 (2.27)	+6.53 (13.69)	+0.49 (1.09)	+3.14 (4.04)	+0.05 (0.99)	−1.30 (3.26)
2024	+0.84 (1.89)	−11.53 (5.63)	+1.04 (0.89)	−4.80 (2.93)	+1.09 (0.85)	−3.12 (2.89)
Pre-reform Wald p	0.89	diff. 0.35	**0.76**	diff. 0.90	0.84	diff. 0.23

Yearly discontinuity in debt-to-income-cited denials at the conforming limit, relative to 2021, percentage points; standard errors in parentheses, clustered by lender. Last row: joint Wald test that the 2018–2020 coefficients are zero, for the solo pool and for the cosigned-minus-solo difference. Loans per year at h = \$67.1k: 5,069–14,851 solo, 561–1,785 cosigned.

▸ placebo table ▸ figure ◂ back

Backup: false cutoffs, full results

False cutoff	h = **$20k** (slide)			h = $24k		
($000 from limit)	$\hat{\beta}_3$	t	N	$\hat{\beta}_3$	t	N
−80	−0.12 (0.73)	−0.16	19,926	+0.11 (0.67)	+0.16	22,888
−70	−0.13 (0.57)	−0.23	20,328	−0.23 (0.54)	−0.43	23,344
−60	−0.60 (0.67)	−0.89	20,742	−0.49 (0.69)	−0.72	23,921
−50	+0.78 (0.72)	+1.08	20,968	+0.70 (0.72)	+0.96	24,288
−40	−1.02 (0.87)	−1.18	21,392	−0.96 (0.84)	−1.14	24,768
−30	+0.99 (0.75)	+1.33	21,913	+1.01 (0.71)	+1.41	25,498
0 (real)	+**2.39** (0.96)	+**2.50**	25,296	+**2.38** (0.95)	+**2.51**	28,354
+30	−1.58 (1.00)	−1.58	18,395	−1.68 (0.93)	−1.80	21,080
+40	+0.97 (0.88)	+1.11	19,012	+0.88 (0.85)	+1.03	21,919
+50	−0.52 (0.93)	−0.56	18,799	−0.17 (0.92)	−0.19	21,535
+60	+0.47 (1.20)	+0.39	17,725	+0.40 (1.18)	+0.34	20,505
+70	+0.16 (1.04)	+0.16	16,536	+0.00 (1.06)	+0.00	19,266
+80	−1.17 (1.02)	−1.15	15,594	−1.09 (1.00)	−1.09	18,291

Solo pool, debt-to-income-cited denials, pp; results-slide specification with the limit moved as stated; standard errors (in parentheses) clustered by lender. The real cutoff has the largest $|t|$ of thirteen at both windows: exceedance $p = 1/13 = 0.077$. Farther out ($70–160k) false jumps do appear: the claim is local.

▸ event-study table ▸ figure ◂ back

Backup: model details

- Ages 18–88; persistent income shocks, independent across generations
- One purchase decision, at 36: “ownership” = owning by the mid-thirties
- 30-year mortgage; each year pay or default, with taste shocks
- Default costs a utility penalty, lower for risky types; lower still when a parent is called on
- Parent pays the missed payment as long as her income allows
- Lender loses 25–40% of the balance on a foreclosure
- Housing supply elasticity 2.2; rental and owner markets clear

Backup: the child's problem

Away from the two decision ages, consumption and savings under survival risk:

$$V_j(\mathbf{s}_j) = \max_{a' \geq 0} \Big\{ u(c_j, h_j, \mathbb{1}_{own}) + \beta s_j \, \mathbb{E}\big[V_{j+1}(\mathbf{s}_{j+1})\big] + \beta(1 - s_j)\, \Psi(b_{j+1}) \Big\}$$

$$c_j + a' + \underbrace{\Gamma(h_j, \kappa_j, \mathbf{s}_j)}_{\text{rent } p_r h,\ \text{payment } m,\ \text{upkeep } \delta_h p_{own} h} = w\, e(z_j, j) + (1 + r) a_j + \underbrace{Tr_j(z_{p,j})}_{\text{inheritance}}$$

- $\mathbf{s} = \{j, a, z, z_p, \omega, \kappa, \zeta, h\}$: age, assets, both incomes, tenure, help type, exclusion, house
- u Cobb–Douglas over c and h, CRRA, ownership premium $\nu > 1$; Ψ warm-glow bequest
- The decision ages are on the equation slides: take-up at 36, helping at 61

▸ preferences ▸ default penalties ▸ income ◂ back

Backup: the parent's problem

At the helping age the parent picks none, cosign, cash or both under a taste shock:

$$V_{43}(\mathbf{s},\theta) = \sigma_{help} \ln \sum_{\kappa=1}^{4} \exp\left(\frac{V^{p}_{43}(\mathbf{s},\theta,\kappa) + \lambda_{\kappa}(z_p)\,\Delta V_c(\theta,z_p,\kappa) + \eta_{\kappa}}{\sigma_{help}} \right)$$

- V^p: own value, carrying the cash transfer **and** the expected liability
- Expects to pay $(1-\pi_\theta)m$, **more for a Bad child** ▸ $q_G > q_B$ is a **result**, not an assumption
- $\lambda_\kappa(z_p) = \bar{\lambda}_\kappa \big(e(z_p,43)/e(\bar{z}_p,43)\big)^{\gamma}$: altruism scaled by own income
- ΔV_c: the child's gain, over the parent's belief about its income

▸ what the parent knows ▸ the lender ◂ back

Backup: the lender's problem

No maximisation: free entry prices each pool to break even on what the rule can see.

$$\underbrace{\frac{m}{y(z_c)} \leq \bar{\omega}_{solo} = 0.40}_{\text{solo}} \qquad \underbrace{\frac{m}{y(z_c)+y(z_p)} \leq \bar{\omega}_{joint} = 0.42 \text{ and } \frac{m}{y(z_c)} \leq \bar{\omega}_{own} = 1.0}_{\text{cosigned}}$$

- The income test moves with a signature; the **deposit does not**, $(1-\lambda_m)\, p_{own} h$
- Rate: base $r_{base}(z_c)$ plus $\Delta r(h, z_c)$, break-even on each pool hazard
- Sees h, z_c and the contract ▸ never the type θ, nor what the family knows
- $\bar{\omega}_{own} = 1.0$: the only solo test on a cosigned file, it blocks certain default

▸ market clearing ▸ rate schedule ▸ pricing rule ◂ back

Backup: what the parent actually covers

On a cosigned default the parent is called on, and covers the payment if her resources reach it:

$$p_{cover}(h, z_p, z_c) = \Pr\big(R_p \geq m(h, z_c) \,\big|\, z_p\big), \qquad R_p = y(z_p) + (1+r)\, a_p - H_p$$

- m the child's annual payment; H_p her own housing (mortgage and upkeep, or rent); equity excluded
- Covered: home and mortgage kept. Not covered: **foreclosure**, the child rents for good (anticipated at take-up)
- Read at the helping age over **all** parents of income z_p ► understates cover if cosigners save more
- One year of debt service ► a **normalisation**, not an estimate

▸ what the parent knows ◂ back

Backup: what the parent knows, and the lender does not

At the helping age the parent sees its own state and the child's **type** θ, but **not** the child's income:

$$W_\theta(z_c) \;\propto\; \Phi(z_c)\,\lambda(z_c)^{\mathbb{I}\{\theta=G\}}\big(1-\lambda(z_c)\big)^{\mathbb{I}\{\theta=B\}}$$

- Φ the income distribution; $\lambda(z_c)$ the share of Good children at that income, **rising in income**
- The parent's belief tilts toward the incomes at which its child's type is common
- ΔV_c is taken over this belief, and over the child's initial assets
- The lender holds the same prior $\lambda(z_c)$ but sees neither θ nor the family's information ▶ the **screen works where pricing cannot**

Backup: the model appendix, slide by slide

The child

▸ the problem ▸ preferences ▸ income ▸ default penalties ▸ model details

The parent

▸ the problem ▸ what she knows ▸ type and income ▸ what she covers

The lender and the market

▸ the problem ▸ rate schedule ▸ pricing rule ▸ market clearing

▸ construction ▸ equilibrium ▸ convergence ▸ from the static model

Estimation

▸ identification ▸ estimates ▸ all parameters ▸ fit at a glance

◂ the model ◂ the child ◂ parent, lender

Backup: preferences and bequests

Cobb–Douglas over consumption and housing services, CRRA curvature:

$$u(c, h, \mathbb{1}_{own}) = \frac{\left[c^{1-\alpha}\,(\nu(\mathbb{1}_{own})h)^{\alpha}\right]^{1-\sigma} - 1}{1-\sigma}, \qquad \nu(\mathbb{1}_{own}) > 1 \text{ if owner, } = 1 \text{ if renter}$$

Warm glow over the estate, De Nardi 04:

$$\Psi(b) = \phi_1 \frac{(b+\phi_2)^{1-\sigma} - 1}{1-\sigma}, \qquad b = a' + (1-\delta_h)\, p_{own} h$$

- α the housing expenditure share; $\nu > 1$ is the **ownership premium**
- ϕ_1 the strength of the motive, ϕ_2 its curvature ▶ bequests are a **luxury good**
- The estate is financial assets plus the depreciated house

▸ market clearing ▸ the child ◂ back

Backup: the construction sector

Competitive builders, constant returns in land and structures:

$$H_s(p) = C\,p^{\varepsilon}, \qquad \varepsilon = \frac{\alpha_c}{1-\alpha_c} = 2.2$$

- **Baseline**: p_{own} is calibrated to the ownership rate ▸ the same as **perfectly elastic** supply
- **GE leg**: both markets clear, $H_d^{own} = C_{own} p_{own}^{\varepsilon}$ and $H_d^{rent} = C_{rent} p_{rent}^{\varepsilon}$
- ε from the land share in first-time buyers' purchases (FHFA)
- The reform's ownership gain shrinks as ε falls ▸ the elasticity is the GE lever

▸ gain by elasticity ▸ market clearing ▸ the lender ◂ back

Backup: market clearing

Credit — cell by cell in (h, z_c), on the composition at origination:

$$\Delta r(h, z_c) = \frac{R(z_c)}{\mu_{co}(h, z_c)} - \frac{R(z_c)}{\mu_{so}(h, z_c)}, \qquad \mu_k = \tilde{\pi}_B + (\tilde{\pi}_G - \tilde{\pi}_B)\, q_G^k$$

q_G^k is an **equilibrium** object for **both** pools, never the prior $\lambda(z_c)$. Thin cells keep the previous premium; the matrix updates **damped**, at $\frac{1}{2}$.

Housing — (p_{own}, p_{rent}) clears both markets against iso-elastic supply $H_s(p) = C\, p^{\varepsilon}$:

$$H_d^{own}(p_{own}, p_{rent}) = C_{own}\, p_{own}^{\varepsilon}, \qquad H_d^{rent}(p_{own}, p_{rent}) = C_{rent}\, p_{rent}^{\varepsilon}$$

Solved **jointly in logs**: $x = (\log p_{own}, \log p_{rent})$,
$F(x) = \big(\log H_d^{own} - \log H_s^{own},\ \log H_d^{rent} - \log H_s^{rent}\big)$; safeguarded Broyden, $\|F\|_\infty < 10^{-3}$ in 7–9 solves. Baseline = prices fixed, the $\varepsilon \to \infty$ case.

Inheritance — estates pooled by (z_p, z_c), paid to children at $j = 45$:

$$Tr_{inherit}(z_p, z_c) = \frac{1}{\Omega} \sum_{j=G}^{J} \int (1 - s_j)\, b_j(\mathbf{s}_j)\, \mathbb{1}\{z_{c,j} = z_c\}\, d\mathcal{M}_j(\mathbf{s}_j \mid z_p)$$

▸ parental help ▸ construction ▸ equilibrium ▸ the lender ◂ back

Backup: consistency conditions on parental help

Help type — beliefs at $j = 18$ match what parents do at $j = 43$, for $\kappa \in \{\text{Cosign}, \text{Cash}, \text{Both}\}$:

$$\pi_\kappa(z_p, z_c) = \frac{\int \mathbb{1}\{\text{parent chooses } \kappa\}\, d\mathcal{M}_{43}(\mathbf{s}_{43} \mid z_p, z_c)}{\int d\mathcal{M}_{43}(\mathbf{s}_{43} \mid z_p, z_c)}$$

Each type also carries a **house-size** distribution π^h_κ, for cosigning resolved **by type** ($\pi^h_{cos,\theta}$): the two types buy differently.

Cash — a fraction of the *parent's* income at $j = 43$, scaled by house size (not of the house value):

$$\bar{\psi}_{cash}(z_p, h) = \psi_{cash} \cdot w \cdot e(z_p, 43) \cdot h$$

Cosigning liability — carried in the parent's budget in expectation, child and house integrated out:

$$L(z_p) = \mathbb{E}_{z_c,h}\left[\, \varphi\ \bar{d}(z_p, z_c, h)\ p_{cover}(h, z_p, z_c)\ m(h, z_p, z_c) \,\right]$$

▸ adding up ▸ market clearing ▸ equilibrium ◂ back

Backup: the help transfers add up

Cash — paid by parents at $j = 43$, received by children at $j = 18$:

$$\underbrace{\int \bar{\psi}_{cash}\ \mathbb{1}\{\kappa \in \{\text{Cash}, \text{Both}\}\}\ d\mathcal{M}_{43}}_{\text{given}} \;=\; \underbrace{\int \psi_{cash}\, w\, e(z_p, 43)\, h\ \mathbb{1}\{\text{buys with cash}\}\ d\mathcal{M}_{18}}_{\text{received}}$$

Cosigning — the counterparty is the **lender**, not the child:

$$\underbrace{\sum_{j=44}^{73} \int L(z_p)\ \mathbb{1}\{\kappa \in \{\text{Cosign}, \text{Both}\}\}\ d\mathcal{M}_j}_{\text{paid by parents}} \;=\; \underbrace{\sum_{j=19}^{18+M} \int \varphi\ p_{cover}\ m\ \mathbb{1}\{\text{cosigned miss}\}\ d\mathcal{M}_j}_{\text{collected on the mortgage}}$$

Cash is bilateral, so it clears inside the two budget constraints — no pooling, and no $\frac{1}{\Omega}$. The cosigned flow is the -52 to -84 bp the rate never prices.

▸ what the lender keeps ▸ parental help ◂ back

Backup: what the stationary equilibrium requires

- Households optimise given prices, the rate schedule and their beliefs
- **Beliefs are right**: $\pi_\kappa(z_p, z_c)$ matches how often parents actually choose κ
- … and the **house-size distributions** behind them, **by type** for cosigning
- The cash cost and the **expected liability** match the policies they induce
- Premiums $\{\Delta r(h, z_c)\}$ match the pool compositions they cause
- Inheritance flow = the windfall children get; in the GE leg both housing markets clear

Every block updates **damped**: the pool-composition block has an unstable best response, so an undamped update **cycles**

▸ market clearing ▸ convergence ◂ back

Backup: type and income, $\lambda(z_c)$

Logistic in log income relative to the median at the purchase age:

$$\lambda(z_c) = \Pr(\theta = G \mid z_c) = \left[1 + \exp\left(-\lambda_\alpha \log[e(z_c, 18)/\tilde{e}]\right)\right]^{-1}$$

- $\lambda' > 0$, and $\lambda(\tilde{e}) = \frac{1}{2}$: the median earner is a coin flip
- Informative only through **relative** position in the income distribution
- $\lambda_\alpha = \sqrt{1 - \rho_z^2}/\sigma_\varepsilon \approx 2.55$: a one-sd income move shifts the log-odds by one
- Steep λ on a narrow grid = flat λ on a wide one ▶ this **fixes the units**
- With $\Delta\pi$, the **information primitives**, both set outside the estimation

▸ the parent's belief ▸ income process ◂ back

Backup: the income process

Labour income is $w\,e(z, j)$: a deterministic age profile times a persistent productivity state.

- Age profile P_j from the **PSID**: head labour income by three-year age group, 2003–2021
- Net of year means, non-retired heads (no retirement stage); model age j = age − 18
- z persistent, $(\rho_z, \sigma_\varepsilon)$, and **independent across generations**: the child draws from the stationary distribution
- The same $(\rho_z, \sigma_\varepsilon)$ pin the steepness λ_α

▸ type and income ▸ the child ◂ back

Backup: the risk-based rate schedule

The base rate is a schedule on the persistent income state, applied before the pool premium.

- From the **NSMO rate-by-FICO gradient**, conventional first-time solo borrowers
- 4.75% at the bottom falling to 4.26% at the top (lowest states: no buyer mass)
- **Why z_c?** The LLPA grid is scored on **score and LTV, not income**, and the model has no score state ► they are mapped **by rank**
- The two-track rule: **DTI gates admission, the score prices the loan**
- A DTI-priced schedule is a robustness leg (inert: ~95% of both pools in one bucket)

Backup: when the fixed point counts as solved

Max-norm change below tolerance on **every** block: default policy, premium, help probabilities, cash cost, pool composition. The map is **not a contraction**, so:

- **Inhabited-cell norm**: an empty cell can flip forever without unsettling the equilibrium (which norm certified a solve is recorded)
- **Consecutive** iterations: met once fits a **cycle** through the band as well as a fixed point
- States settle **before** the moments ► no certification while a reported moment still moves

A plateau rule aborts a solve whose inhabited norm stops improving

▸ equilibrium ▸ the lender ◂ back

Backup: which moment identifies which parameter

Parameter	M_1 HO	M_2 Default	M_3 Cosign%	M_4 Cash%	M_5 Type ratio	M_6 Wedge
$\bar{\xi}$ penalty level	○	●				○
$\Delta\xi$ penalty spread		○			●	
div invocation penalty						●
p_{own} price/income	●	○				
η_{cosign}			●			
η_{cash}			○	●		

● primary, ○ secondary. Six parameters, six moments: **just-identified**

The standard errors in the moment table are **weighting tolerances** in the units of the target, not sampling errors

▸ estimates ◂ back

Backup: the default penalties

- π_θ: the **involuntary** floor; the lender prices it only through pool quality μ_k
- ξ_θ: the **stigma**, charged every time the child defaults, entering V^{def} directly and holding default down
- $\xi_{G,B} = \bar{\xi} \pm \Delta\xi/2$ with $\xi_G > \xi_B$ ▶ the **Good type suffers more**, which is what makes default type-informative
- $\kappa = \bar{\xi}/\mathrm{div}$ per **invocation** on a cosigned default: the price of calling the parent
- $\bar{\xi}$, $\Delta\xi$ and div are all **estimated** (the penalty level, its spread, and the invocation penalty)

▸ identification ◂ back

Backup: parameter estimates

Parameter	Symbol	Estimate
Default penalty, level	$\bar{\xi}$	4.8
Default penalty, type spread	$\Delta\xi$	4.99
Penalty divisor when the parent is called on	div	1.27
House price / income	p_{own}	12.26
Cost of cosigning	η_{cosign}	−1.10
Cost of a cash gift	η_{cash}	−0.53

▸ all parameters

◂ back

Backup: every parameter and where it comes from (1/3)

Parameter	Symbol	Value	Source
From the literature, or fixed with literature motivation			
Involuntary repayment gap	Δ_π	0.05	Gupta–Hansman 22
Altruism elasticity	γ	1.00	De Nardi 04; Lockwood 12 (conservative)
Discount factor	β	0.960	Cocco 05; Nakajima–Telyukova 20
Return on savings	r	0.030	Jordà et al. 19
Risk aversion	σ	1.50	Bacher 22 (low end of the range)
Housing expenditure share	θ	0.25	Davis–Ortalo-Magné 11
Housing depreciation	δ_h	0.015	Harding et al. 07
Income persistence	ρ	0.96	Heathcote et al. 10 (PSID)
Income innovation s.d.	σ_ϵ	0.110	Heathcote et al. 10
Age profile of income	P_j	PSID	PSID family files 2003–21

▸ institutional and internal

◂ back

Backup: every parameter and where it comes from (2/3)

Parameter	Symbol	Value	Source
Institutional design			
Loan-to-value limit, solo	λ_m	0.90	US conforming, 10% down; Benetton et al. 22
Loan-to-value limit, cosigned	λ_m^{co}	0.90	**equal**: NSMO shows no cosigned–solo gap
Recourse fraction	φ	1.00	cosigner jointly and severally liable
Mortgage term (years)	M	30	30-year fixed
Conforming-limit house tier	h^{CLL}	3	tier at which the limit binds
Calibrated to an internal target			
Bad-type repayment prob.	π_B	0.90	aggregate default level
Rent-to-price ratio	p_{rent}/p_{own}	0.090	quality-adjusted yield, Urban Institute 25
Owner utility premium	ν	1.100	the homeownership rate
Cash-transfer size	ψ_{cash}	0.100	PSID transfer distribution, Brandsås 25
Rental-grid cap	h_{rent}^{max}	0.40	makes HO(z) monotone (cost: size ratio)
Type–income gradient scale	λ_α	2.545	normalisation, $\sqrt{1-\rho^2}/\sigma_\epsilon$

▸ taste and numerical

◂ back

Backup: every parameter and where it comes from (3/3)

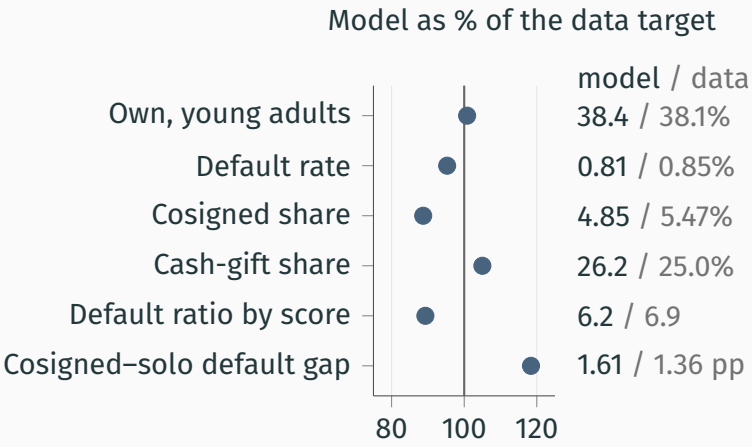
Parameter	Symbol	Value	Source
Taste, and numerical settings			
Parental-help dispersion	σ_{help}	0.50	structural; below 0.1 cosigning vanishes
Choice smoothing	$\sigma_{def}, \sigma_{rb}, \sigma_{menu}$	0.100	logit smoothing, not calibrated
Grid points	n_a, n_z, n_h	30, 11, 6	discretisation
Lifespan (periods)	J	70	ages 1–70

The six estimated parameters are on the previous backup: ▸ estimates

▸ back to 1/3

◂ back

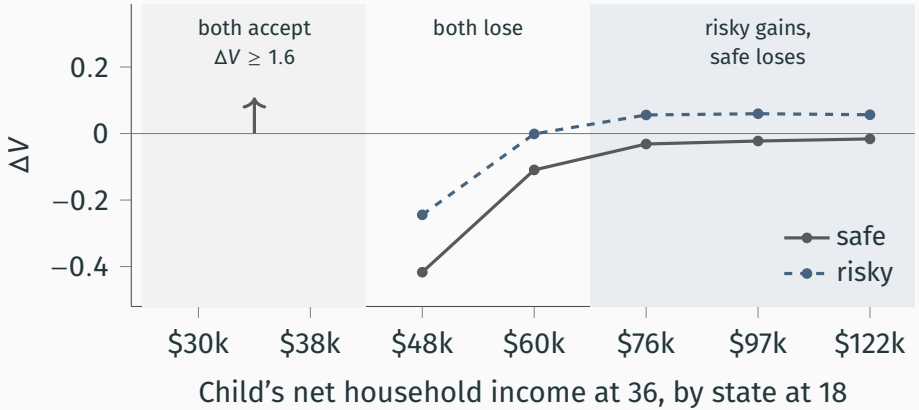
Backup: the targeted moments at a glance



back

Backup: the two gains under the reform

$\Delta V(y, \theta) = V(\text{cosign}) - V(\text{solo})$ for a child offered a cosign at 18

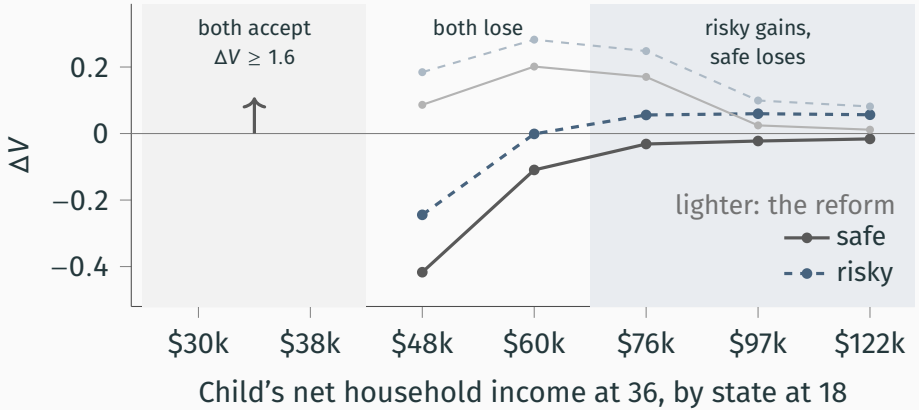


Dark lines: today; lighter lines: the reform, priced on losses, general equilibrium.

back

Backup: the two gains under the reform

$\Delta V(y, \theta) = V(\text{cosign}) - V(\text{solo})$ for a child offered a cosign at 18

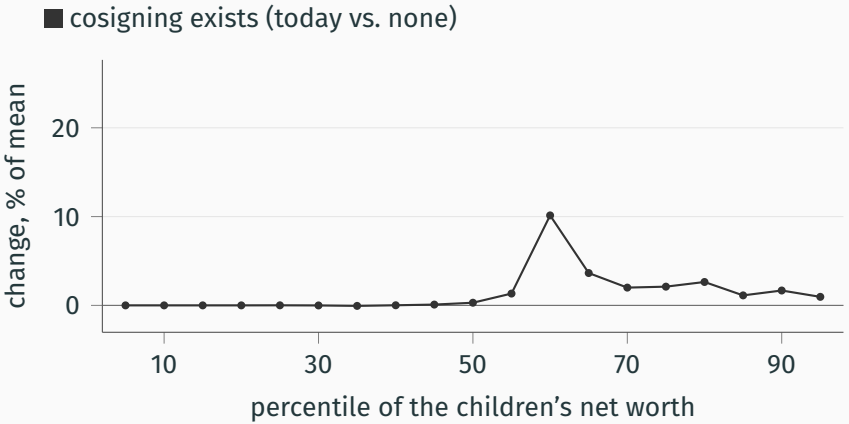


Dark lines: today; lighter lines: the reform, priced on losses, general equilibrium.

back

Backup: how cosigning shapes the children's wealth

Children's net worth, ages 19–42: change at each percentile, general equilibrium

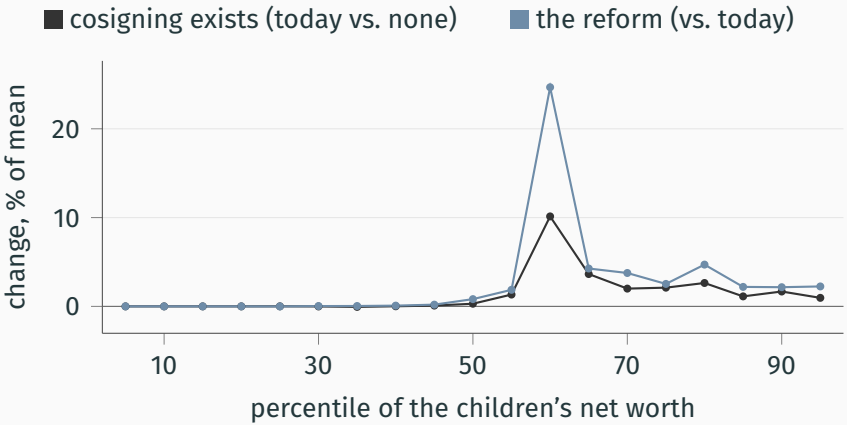


The jump is the ownership margin: the child there turns from renter into owner.

back

Backup: how cosigning shapes the children's wealth

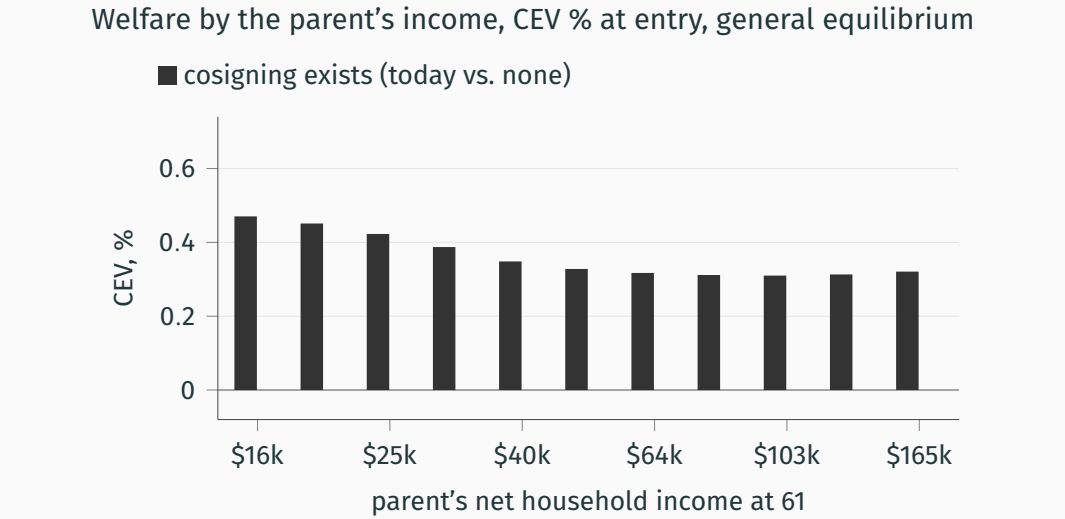
Children's net worth, ages 19–42: change at each percentile, general equilibrium



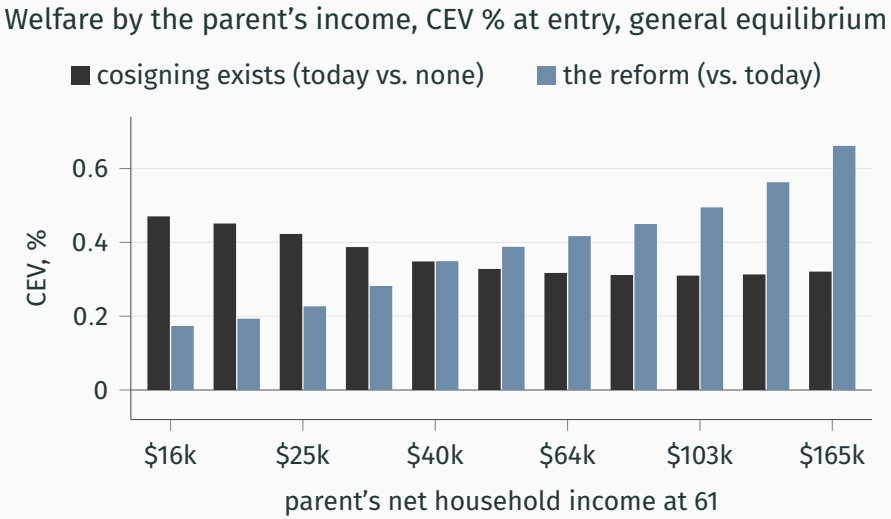
The jump is the ownership margin: the child there turns from renter into owner.

back

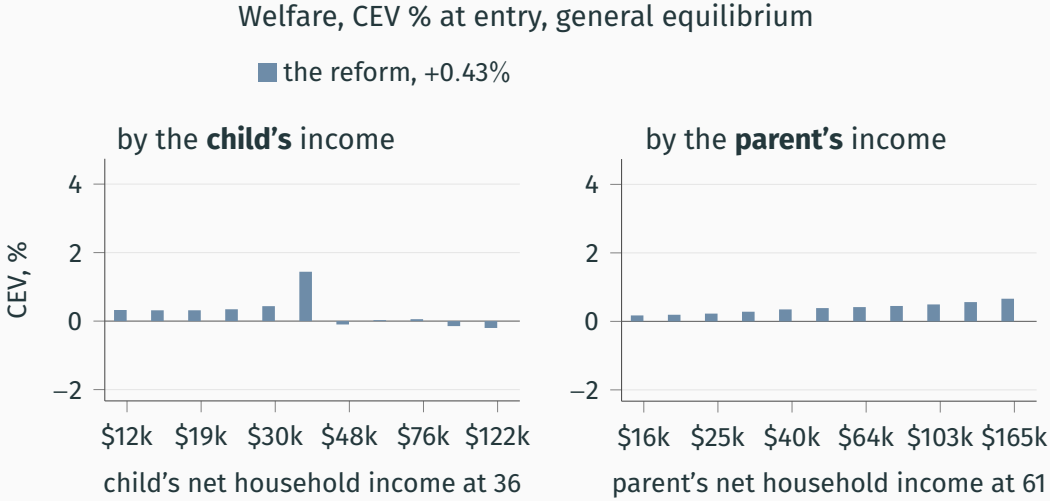
Backup: cosigning favours poorer parents, the reform richer ones



Backup: cosigning favours poorer parents, the reform richer ones

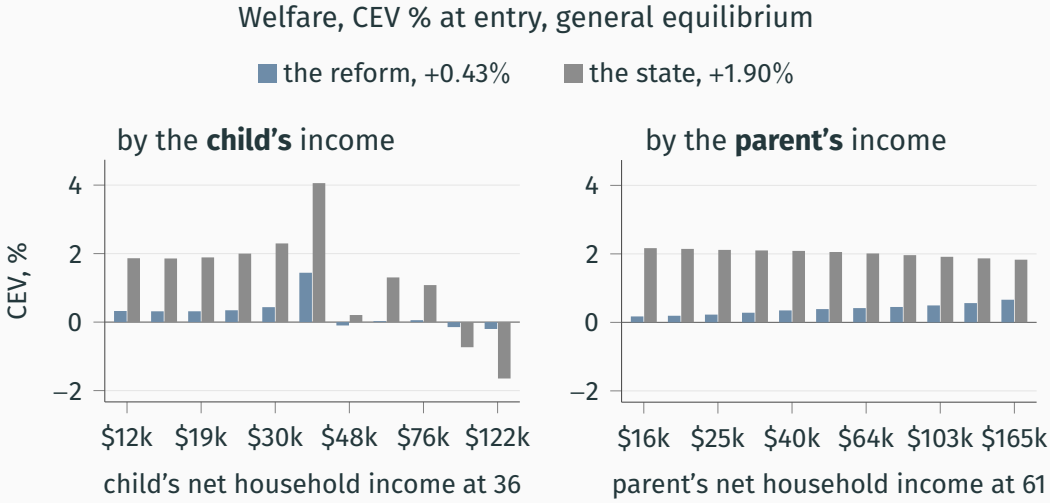


Backup: the reform vs. the state, who gains



back

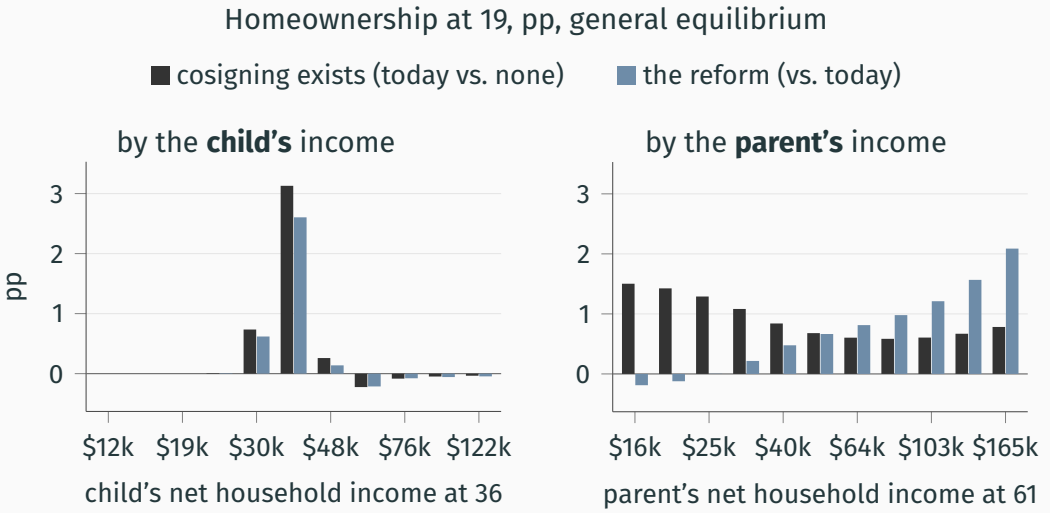
Backup: the reform vs. the state, who gains



Note: the state guarantees every buyer, counted in the deposit; no cosigning cost for parents.

back

Backup: who gets in, by the child's and the parent's income



back

Backup: anatomy of the default gap

	% of loans a year
Solo borrowers	0.38
across cells: where cosigners buy (income, house)	+0.57
within cells: savings (same loan age)	+0.21
within cells: hidden type	+0.61
adverse selection (need)	+0.74
screen	−0.13
Cosigned, if they behaved as solo borrowers	1.77
moral hazard: the child pays more often	−0.81
the cure: parents pay 73% of what is left	−0.70
Cosigned, after the cure	0.26

▸ after the reform

◂ back

Backup: the fair premium, and what it hangs on

Basis points per year	$\ell = 0.25$	$\ell = 0.40$
Composition charge (riskier pool)	+35.1	+56.2
Recovery credit (guarantee)	−52.2	−83.6
Actuarially fair premium	−17.1	−27.4
Premium actually charged	+0.4	
Retained by the lender	+17.5	+27.8

Sign turns on parental coverage alone: negative above $\bar{p} = 0.66$, and over **91%** of the range. Model $\bar{p} = 0.95$.

At the survey floor, $\bar{p} = 0.631$, the fair premium is +2.0 to +3.2 bp and the transfer closes.

pp to bp back

Backup: from default rates to basis points

bp a year = default rate a year × share not repaid × loss given default ℓ

	Default rate a year	Not covered by a parent	Uncovered rate	bp a year, lender loses 25%	40%
Solo	0.81%	all	0.81%	20.2	32.3
Cosigned	2.41%	5%	0.12%	3.1	4.9
Fair premium (cosigned − solo)				**−17.1**	**−27.4**
The same number, split as on the slide					
Riskier pool	2.21 − 0.81 = +1.40 pp			+35.1	+56.2
Parents pay	0.12 − 2.21 = −2.09 pp			−52.2	−83.6

Parents cover 95% of what a cosigned child misses. 2.21%: the cosigned pool's default rate with no parent behind it. Rates rounded, basis points computed before rounding. Loss given default: Qi–Yang 09. The slide's bars are not these inputs: they split a gap measured on another weighting (+0.95 pp, against +1.40 here); do not multiply the bars by ℓ.

▸ fair premium ◂ back

Backup: the solo rate in the counterfactuals

Every step reprices the cosigned loan only. The solo loan keeps the data's rate schedule. The premium already nets both pools' losses; only the solo *level* is pinned.

	Solo default, pp a year	Solo good-type share, pp
Today, level	0.38 %	76.0 %
against today, general equilibrium		
The reform (L1)	+0.006	+0.4
Counted in the deposit (L2)	−0.002	–
No cosigning (N0)	−0.013	–

A solo rate priced on its own pool moves 0.6 bp at zero recovery, 0.3 bp at a 40% loss.
Not built (no funding cost to break even against); the next re-run prices both legs.

back

Backup: the pool the reform delivers

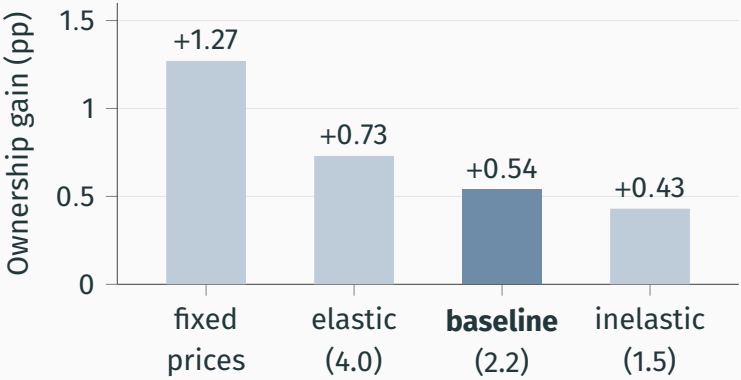
	Baseline	After	Δ
Need-based adverse selection (pp)	1.48	2.05	+0.57
Parental screening correction (pp)	−1.20	−1.40	−0.20
= hidden-type composition (pp)	0.28	0.65	+0.37
Invocation margin (pp)	0.02	0.29	+0.27
Safe-type share, cosigned pool	0.721	0.662	−0.059
Cosign share (%)	4.84	9.74	+4.90
House size at origination, $E[h]$	0.6061	0.6059	−0.0003

Twice the pool and riskier, and the screen grows with it. House size does not move.

Unpriced, the invocation margin rises +0.65 instead. About half the new cosigned loans replace solo loans that would have been made anyway.

back

Backup: the ownership gain by housing supply elasticity



Welfare: +0.237 / +0.113 / +0.074 / +0.050%

back

Backup: if parents pay less, and deposit relief for everyone

Reform (changes, pp)	Owners	Missed payments	Foreclosures, parents cover 95%	63%
Cosigned 97.5%, guarantee priced	+1.27	+0.23	−0.03	+0.07
Cosigned 97.5%, not priced	+1.17	+0.25	−0.02	+0.09
Fair price only	+0.14	+0.02	−0.01	0.00
97.5% for every buyer	+9.28	+0.27	+0.19	+0.22

Fixed house prices. 63% is the survey floor for parental coverage. The 97.5%-for-all row is pending a re-run.

back

Backup: why the deposit, not the price

- Price alone: rate −24 bp, cosigning +1.20 pp, ownership only +0.14 **pp** (most of the take-up is solo borrowers switching contract)
- Deposit alone: ownership +1.17 **pp**, eight times the price leg
- With a parent, joint debt-to-income never exceeds **0.29** against a cap of **0.42** ▶ the income test is slack, the deposit is not
- λ_m^{co} from 0.90 to 0.975 cuts required assets **28 to 48%** where cosigning is common, and leaves the solo contract alone
- Can fund the deposit at $z_c = 4$: **2.5%**; at $z_c = 7$: **70%**

◂ back

Backup: what survives when house prices adjust (1/2)

	Baseline	Fixed	Market clearing, by supply elasticity		
	pre-reform	prices	$\varepsilon = 4.0$	$\varepsilon = 2.2$	$\varepsilon = 1.5$
Panel A. The credit market					
Homeownership rate (pp)	38.40	+1.27	+0.73	+0.54	+0.43
Cosign share (pp)	4.84	+4.89	+4.64	+4.63	+4.62
Cosign income gradient	−0.012	−0.482	−0.479	−0.474	−0.470
Average cosigned rate (bp)	4.32%	−22.1	−22.3	−22.2	−22.2
Aggregate default rate (pp)	0.807	0.000	−0.004	−0.002	+0.001
Invoked guarantee (pp)	2.41	+1.34	+1.32	+1.31	+1.31
Cosigned pool risk (pp)	2.21	+0.98	+1.01	+1.01	+1.01

Baseline is the pre-reform level in each row's own units; every other column is a change. $\varepsilon = 2.2$ is the calibrated value.

▸ wealth, welfare, prices

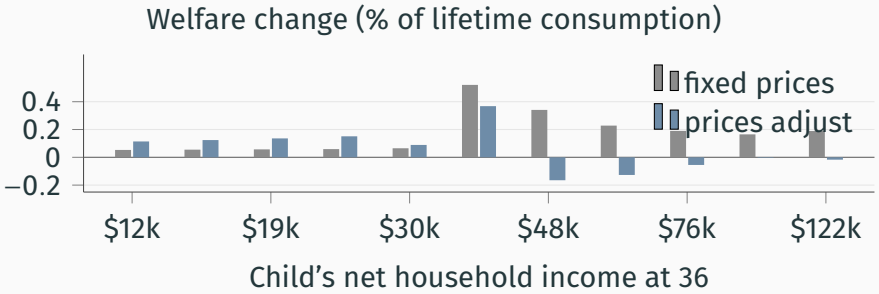
◂ back

Backup: what survives when house prices adjust (2/2)

	Baseline	Fixed	Market clearing, by supply elasticity		
	pre-reform	prices	$\varepsilon = 4.0$	$\varepsilon = 2.2$	$\varepsilon = 1.5$
Panel B. Wealth, welfare and transfers					
Mean wealth (%)	1.889	+2.63	+1.84	+1.62	+1.43
Wealth Gini (points)	73.19	−0.65	−0.40	−0.30	−0.24
Top-10% share (points)	43.25	−1.07	−0.65	−0.47	−0.37
Bequests (%)	6.164	+3.72	+2.80	+2.50	+2.24
Aggregate welfare, CEV (%)	—	+0.237	+0.113	+0.074	+0.050
Parent-income ownership gap	0.388	+0.574	—	+0.487	—
Parent-wealth ownership gap	0.002	+0.115	—	+0.116	—
House price, owner-occupied	12.26	—	+0.51%	+0.68%	+0.79%
Rent	1.10	—	−0.15%	−0.21%	−0.23%
Price-to-rent ratio	11.11	—	+0.66%	+0.90%	+1.02%
Rental housing stock	—	—	−0.60%	−0.47%	−0.35%

back

Backup: welfare before house prices adjust



Fixed prices +0.237%, no state loses, peak +0.520 at the mode.

Clearing +0.074%: the bottom gains more, states 7 to 11 pay, at most −0.17.

▸ against the literature

◂ back

Backup: welfare against the literature

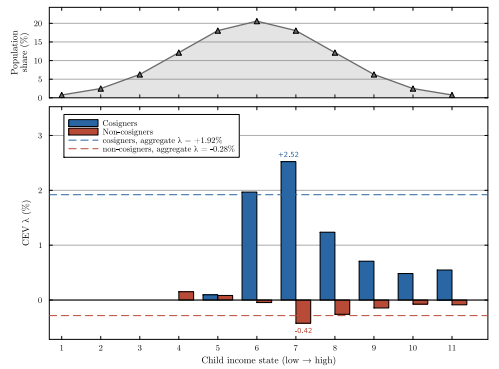
	Repricing	Reaches	CEV (%)
Jeske et al. (2013), subsidy removed	30 bp	all mortgages	+0.50
Elenev et al. (2016), GSE phase-out	255 bp	all mortgages	+0.68
leverage cap, underpricing kept	—	all mortgages	+0.11
This reform	26 bp	5–10% of loans	+0.074

Normalised by the share of the market each one reaches, the same order, and bought with a rule change rather than a transfer.

Both benchmarks are tax-financed; in Jeske et al. too, the poorer gain most.

back

Backup: welfare, users vs. everyone else



Cosigners +1.92%, everyone else who buys −0.28%; cosigners are 4.8% of buyers, 2.1% of the entry cohort.

Compares owning from 36 with never owning, so the users' gain is an upper bound

back

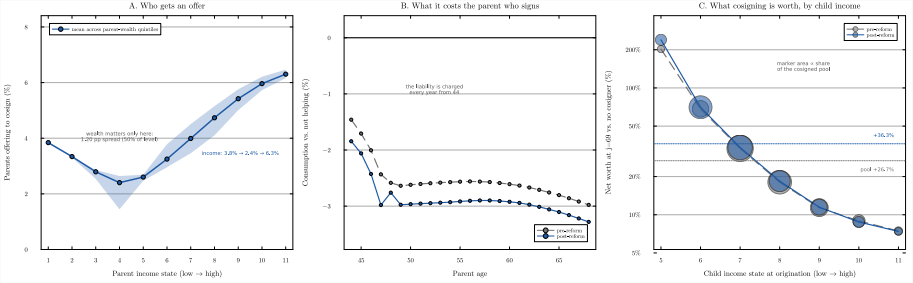
Backup: family vs. state guarantee

	Baseline	Family	State	State, net of tax
Ownership, fixed prices (%)	38.40	39.67	41.38	41.21
Guaranteed share (%)	4.8	9.7	21.3	21.3
Safe-type share, guaranteed pool	0.721	0.662	0.662	0.663
Outlay (bp of labour income)	0.79	2.64	5.90	5.85
Welfare, fixed prices (%)		+0.237	+0.374	+0.219
Welfare, prices adjust (%)		+0.074	+0.071	−0.046

Invocations beyond what the pool's risk explains rise +0.27 pp under either provider; only where the liability lands differs.

back

Backup: who has a parent to ask



A. Offers peak at 6.3% at the top parent income, 3.8 at the bottom; cash gifts 22.9 → 26.6%.

B. The cosigner consumes 2.6% less every year after: 0.71 **of a year's consumption**, 0.80 post-reform.

C. Worth 70% **more net worth at** $j = 69$ at $z_c = 6$, 11% at $z_c = 9$, under 8% at $z_c = 11$.

back