Non-Profits, Competition, and Risk Segmentation in Consumer Lending Markets

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Motivation

Observations:

1. Non- and for-profits frequently interact in selection markets
   (e.g., healthcare, consumer lending)
2. Non-profits' organizational structures may lead them to deviate from profit maximization
   (Lakdawalla & Philipson, 1998; Gaynor & Vogt, 2003; Shahidinejad, 2024)

Question: How do competitive interactions between non- and for-profits shape the equilibrium allocation of risk across firms?

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Basic Framework

For-Profit Firm
(Profit-Maximizing)

Non-Profit Firm
(Profit-Deviating Incentives)

Higher-Risk Types
(Less Price Sensitive)

Lower-Risk Types
(More Price Sensitive)

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Lower-Risk Types
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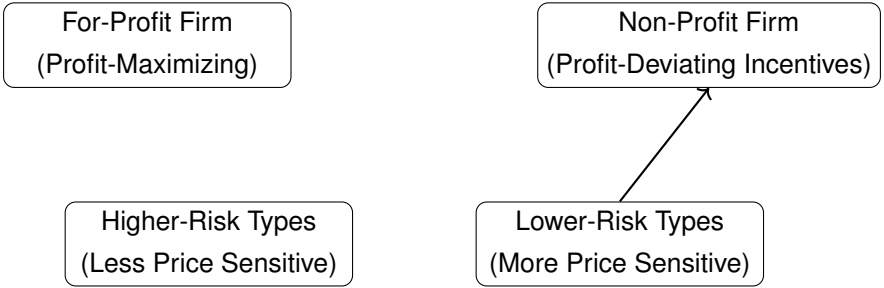
Due to profit-deviating incentives, non-profits offer advantageous terms

Basic Framework



With *adverse selection*, lower-risk types, who are relatively price sensitive, select into non-profits

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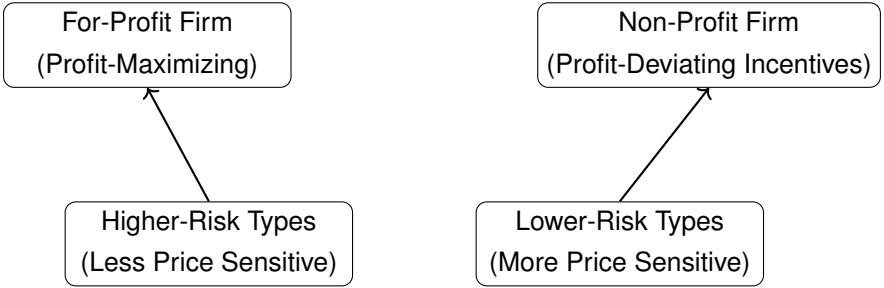

Higher-risk types, who are relatively price insensitive, select into for-profits

This Paper

Using auto lending market as a laboratory, study the loan pricing behavior of credit unions (non-profit, cooperatives) and traditional banks and the implications for equilibrium risk composition across lenders.

Two main contributions:

1. Document two stylized facts about the nature of competition between CUs and banks
   - Supply overlapping market segments, frequent borrower transitions between lender types
   - CUs originate loans with lower rates, serve lower-risk set of borrowers
2. Leverage variation in market structure due to bank mergers to study competitive interaction
   - Markets that experience large Δ concentration $\rightarrow$ bank rates $\uparrow$, CU rates $\downarrow$
   - Bank borrower default rate $\uparrow$, CU default rate $\downarrow$
   - Driven by "business stealing" rather than market expansion

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Related Literature

Competition in Selection Markets

Hauswald & Marquez (2003, 2006), Dell'Arricia & Marquez (2004), Einav et al. (2012), Mahoney & Weyl (2017), Crawford et al. (2018), Argyle et al. (2020, 2023), Grunewald et al. (2023), Yannelis and Zhang (2023), Momeni (2024)

Non-Profits and Cooperatives

Newhouse (1970), Pauly & Redisch (1973), Hansmann (1980), Lakdawalla & Phillipson (1998), Tokle & Tokle (2000), Feinberg (2001), Gaynor & Vogt (2003), Cororaton (2019), Gissler et al. (2020), van Rijn et al. (2021), Shahidinejad (2024), Chen et al. (2025), Duarte et al. (2025), Feinberg & Reynolds (2025)

Bank Mergers

Prager & Hannan (1998), Focarelli & Panetta (2003), Di Patti & Gobbi (2007), Erel (2011), Allen et al. (2014), Nguyen (2019), Benson et al. (2024), Liebersohn (2024)

Data

Equifax's Analytic Dataset

- Restrict to auto loan originations
- Includes loan amounts, maturities, payments over time, lender type Institutional Details
- Impute interest rates using original loan balance, monthly payment Price Imputation Procedure

Summary of Deposits (FDIC) and National Information Center (FFIEC)

- Identify bank mergers

YE Time Series (using data from DataAxle)

- New and used car dealership locations

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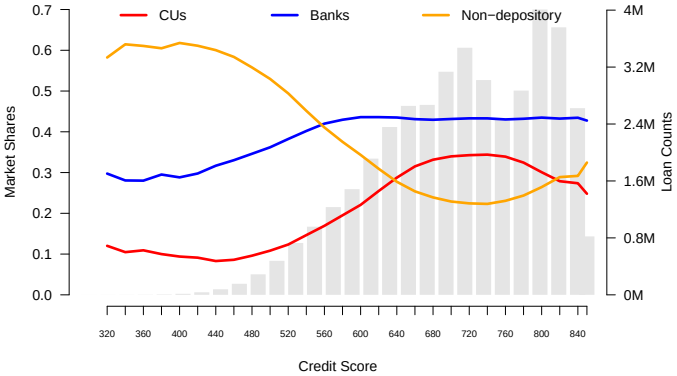
Stylized Fact #1

Banks and CUs supply overlapping market segments



CUs, banks originate auto loans to similar borrower credit score distributions

Stylized Fact #1

Banks and CUs supply overlapping market segments

		Loan n+1		
		CU	Bank	Non-depository
Loan n	CU	18.7%	9.0%	4.9%
	Bank	7.2%	24.5%	10.7%
	Non-depository	4.5%	10.4%	10.2%

(a) Unconditional Transition Probabilities

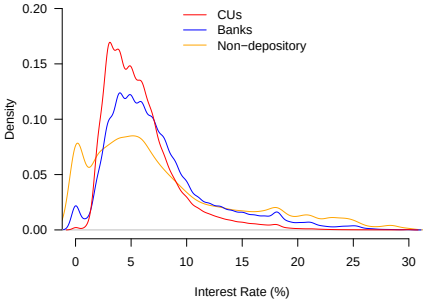
		Loan n+1		
		CU	Bank	Non-depository
Loan n	CU	57.4%	27.6%	15.0%
	Bank	17.0%	57.8%	25.2%
	Non-depository	17.9%	41.4%	40.6%

(b) Conditional Transition Probabilities

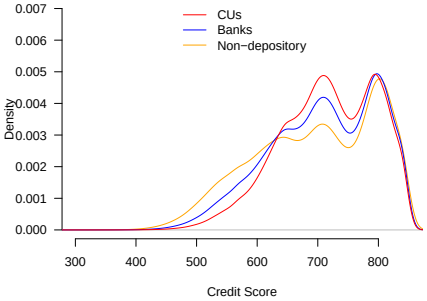
At the borrower level, substantial churn between lender types

Stylized Fact #2

CUs originate loans with lower rates, serve lower-risk set of borrowers



(a) Interest Rate Distribution



(b) Credit Score Distribution

CUs originate loans with lower rates than banks to borrowers of observably lower risk

Stylized Fact #2

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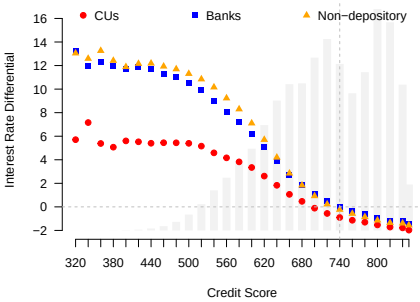
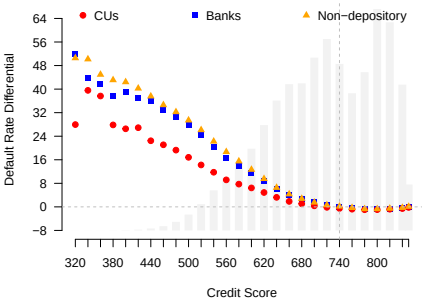


(a) Interest Rates



(b) Default Probability

Conditional on credit scores, CU borrowers receive lower interest rates, default less

Taking Stock

Descriptive evidence suggestive of two conclusions:

1. CUs and banks compete directly for large segments of auto loan borrowers
2. But...there is still risk segmentation on both *observable* and *unobservable* dimensions

Two plausible explanations:

1. CUs possess superior information about borrower risk, face less adverse selection (less likely in auto lending markets)
2. CUs have profit-deviating incentives, offer advantageous rates $\rightarrow$ selects for a lower-risk set of borrowers

Next: leverage quasi-exogenous variation in market structures to directly analyze competitive interaction between CUs and banks

Research Design: Large Bank Mergers

Key identification argument:

1. Large bank mergers are based on national (or regional) considerations
2. Generate geographic variation in bank concentration

Diff-in-Diff:

Diff 1: Variation in merger-induced changes to concentration:

$\Delta HHI \leq 100 :=$ **Control**	Presence of target or acquirer, but limited change in concentration
$\Delta HHI > 100 :=$ **High**	Both present, high pre-merger market shares

Diff 2: Pre- vs post-merger

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Implementation

Two big (interrelated) aspects:

1. Identifying mergers
2. Defining geographic markets

Criteria for mergers

- 2005-2023, “Large” (50+ branches transferred) mergers b/w different bank holding companies
- Restrict to mergers for which there are “clean” or “uncontaminated” controls

⇒ 12 mergers Sample

Geographic markets

- Over 80% of auto loans intermediated by dealers (Grunewald et al., 2023)

⇒ Allow dealership location to inform our geographic market definition Details

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Stacked Diff-in-Diff

Restrict sample to:

- Lenders: Banks & CUs
- Markets: affected by merger
- Time: 2-yr pre-post merger event time window
- Borrowers: credit score ≥ 580

i loan
j lender type
m market
t event time
b merger

$$Y_{ijmtb} = \beta_1 HighDHHI_{mtb} + \beta_2 CU_j \times HighDHHI_{mtb} + \alpha_{jmb} + \gamma_{jtb} + \epsilon_{ijmtb},$$

$HighDHHI_{mtb} = 1$: iff $DHHI \geq 100$ for merger b in market m, t is post b

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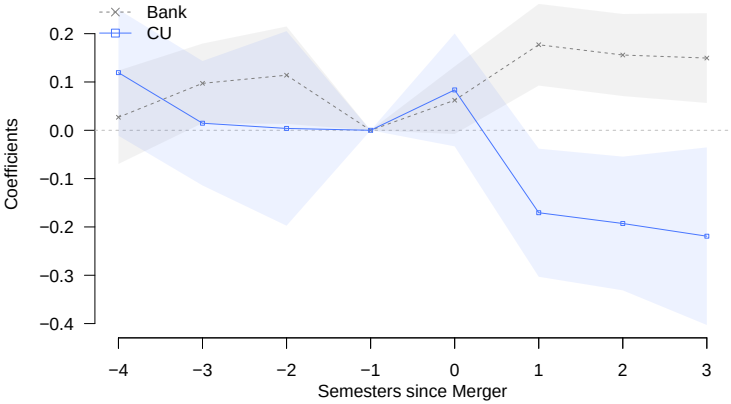
Validating Research Design

Event Study for Interest Rates (with controls for borrower and loan characteristics)



Bank, CU Interest Rates Co-Move Negatively After Mergers

	Interest Rate	Credit Score	Loan Amount	Borrower Income	Loan Term
	(1)	(2)	(3)	(4)	(5)
High DHHI	0.08**	-0.67	-0.03	-0.19	0.08
	(0.03)	(1.03)	(0.12)	(0.28)	(0.15)
CU x High DHHI	-0.24***	5.06***	0.02	0.38	0.10
	(0.06)	(1.60)	(0.25)	(0.50)	(0.29)
R^2	0.48	0.04	0.09	0.06	0.07
Borrower Controls	Yes	No	No	No	No
Observations	1,218,585	1,218,585	1,218,585	1,218,585	1,218,585
Dep. Var. Mean	5.6	730.77	24.75	56.35	65.78

Magnitude

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In high-DHHI markets, bank rates ↑ 8 b.p., CU rates ↓ 16 b.p.

Magnitude

Bank, CU Default Rates Co-Move Negatively After Mergers

	Default	Prepaid	Default	Prepaid
	(1)	(2)	(3)	(4)
High DHHI	0.37**	0.31	0.34**	0.27
	(0.16)	(0.32)	(0.15)	(0.32)
CU x High DHHI	-0.72**	-0.22	-0.59**	-0.20
	(0.29)	(0.65)	(0.26)	(0.63)
R^2	0.01	0.05	0.04	0.07
Borrower Controls	No	No	Yes	Yes
Observations	1,218,585	1,218,585	1,218,585	1,218,585
Dep. Var. Mean	2.53	88.42	2.53	88.42

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Borrower Controls	No	No	Yes	Yes
Observations	1,218,585	1,218,585	1,218,585	1,218,585
Dep. Var. Mean	2.53	88.42	2.53	88.42

In high-DHHI markets, bank default rate ↑ 0.3–0.4 p.p., CU rate ↓ 0.2–0.4 p.p.

Borrowers Switch from Banks to Credit Unions After Mergers

	log(N)	CU	Bank	Non-Depository
	(1)	(2)	(3)	(4)
High DHHI	0.00	1.99***	-1.81**	-0.18
	(0.02)	(0.71)	(0.77)	(0.51)
R^2	>0.99	0.99	0.97	0.98
Observations	724	724	724	724
Dep. Var. Mean	4.58	21.77	38.04	40.19

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	log(N)	CU	Bank	Non-Depository
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	(0.02)	(0.71)	(0.77)	(0.51)
R^2	>0.99	0.99	0.97	0.98
Observations	724	724	724	724
Dep. Var. Mean	4.58	21.77	38.04	40.19

In high-DHHI markets, CU share $\uparrow$ 2.0 p.p., bank share $\downarrow$ 1.8 p.p., total market size $\leftrightarrow$

Summary

Effects concentrated in markets where merger lead to large increases in concentration

Banks:

Interest rates:	$\uparrow$ 8 b.p.
Defaults:	$\uparrow$ 0.3 – 0.4 p.p.
Share:	$\downarrow$ 1.8 p.p.

Credit Unions:

Interest rates:	$\downarrow$ 16 b.p.
Defaults:	$\downarrow$ 0.2 – 0.4 p.p.
Share:	$\uparrow$ 2.0 p.p.

One explanation for these results:

- Banks exploit newly-gained market power, $\uparrow$ rates
- Borrowers of (unobservably) low risk opt for lower-rate CUs, shifts borrower composition across lenders Heterogeneity by Credit Score Simple Model

Discussion and Policy Implications

Our results suggest:

- CUs and banks compete for the same set of borrowers
- However, CU's advantageous pricing can contribute to borrower-driven selection on risk

Potential implications for banking merger guidelines

- Evidence suggests considering more than bank-only deposit shares when evaluating mergers
- Important to also consider merger effects on borrower composition across lenders, which might be amplified by CU presence

Similar tradeoffs apply when evaluating CU acquisitions of community banks

Thank you!

Institutional Details: Credit Unions

Back

Credit unions provide a similar basket of services as banks but differ along key dimensions:

- Member-owned cooperatives
- Tax-exempt, non-profit institutions
- Restricted to individuals within a field of membership (but weakly enforced)
  - Can be single or multiple “common bonds” or geographic-based

CU Name	Category	AUM	Membership	Field of Membership
Navy Federal	Occupational	US $149B	10 million	Armed forces & their families
Adirondack Regional	Community	US $50M	7,000	Individuals who live, work, own a business, worship, or attend school in Clinton, Essex, Franklin, or St. Lawrence counties, & their families
Holy Trinity Baptist	Associational	US $20K	100	Church members

Institutional Details: Auto Lending Back

Approximately 80% of auto loans are intermediated by car dealers (Grunewald et al., 2023)

- Informs procedure to define geographic markets

Dealers intermediate but lenders hold the loans on their balance sheets

- 15% of prime and 25% of subprime loans are securitized (Yannelis & Zhang, 2023; Klee & Shin, 2020)
- Lenders bear default and prepayment risk

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Price Imputation Procedure

We observe original loan balance b, monthly payment m, and maturity t.

Applying the standard annuity formula,

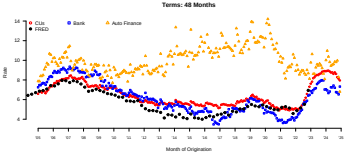
$$b = \frac{m}{r}\left(1 - \frac{1}{(1+r)^t}\right),$$

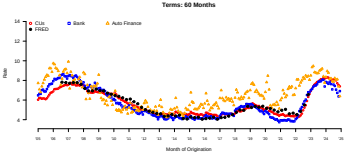
where r is the monthly interest rate.

Solve for r, compare to FRED series of auto loan rates to validate.

Back

Price Imputation Procedure





Back

Final Sample of Mergers

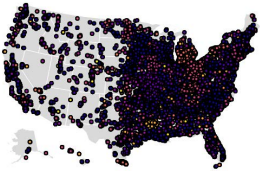
Year	Date	Avg. HHI	Avg. DHHI	Max. HHI	Max. DHHI	Branches Acquired	Target	Acquirer	2-Yr Sample	1-Yr Sample
2006	2006-11-04	287.4	65.6	7095.1	1409.7	699	AMSOUTH BANCORP.	REGIONS FIN. CORP.	Yes	Yes
2007	2007-09-22	363.1	2.5	8296.1	378.2	50	PLACER SIERRA BANCSHARES	WELLS FARGO & CO.	No	Yes
2011	2011-06-05	122.7	22.6	1649.6	186.0	168	WHITNEY HOLDING CORP.	HANCOCK HOLDING CO.	No	Yes
2011	2011-07-06	91.9	8.6	909.9	138.5	367	MARSHALL & ILSLEY CORP.	BANK OF MONTREAL	No	Yes
2013	2013-04-01	114.1	3.9	760.5	50.4	60	WEST COAST BANCORP	COLUMBIA BANKING SYSTEM, INC.	No	Yes
2014	2014-04-19	261.5	38.2	4261.9	2047.0	171	STERLING FIN. CORP.	UMPQUA HOLDINGS CORP.	Yes	Yes
2014	2014-05-10	274.2	41.1	2183.1	453.6	56	STELLARONE CORP.	UNION FIRST MKT. BANKSHARES CORP.	No	Yes
2015	2015-10-02	150.4	25.3	1582.5	552.2	96	SKBHC HOLDINGS LLC	BANNER CORP.	No	Yes
2016	2016-08-16	113.0	30.4	1031.8	484.1	370	FIRSTMERIT CORP.	HUNTINGTON BANCSHARES INC.	No	Yes
2016	2016-10-08	132.9	24.0	3225.7	546.2	407	FIRST NIAGARA FIN. GRP INC.	KEYCORP	Yes	Yes
2016	2016-11-11	387.9	24.4	1908.1	450.7	71	TALMER BANCORP INC.	CHEMICAL FIN. CORP.	Yes	Yes
2017	2017-12-01	90.3	16.8	890.3	442.5	152	CAPITAL BANK FIN. CORP.	FIRST HORIZON NATIONAL CORP.	Yes	Yes
2018	2018-04-01	286.1	78.7	3115.4	1053.9	101	MAINSOURCE FIN. GRP, INC.	FIRST FIN. BANCORP	Yes	Yes
2018	2018-06-25	86.4	15.9	807.6	159.6	63	BANK MUTUAL CORP.	ASSOCIATED BANC-CORP	Yes	Yes
2019	2019-07-01	197.9	4.7	4803.6	156.3	69	FIDELITY SOUTHERN CORP.	AMERIS BANCORP	Yes	Yes
2019	2019-09-01	168.0	0.3	1158.2	8.5	103	COOPERATIEVE RABOBANK UA	2011 TCRT	Yes	Yes
2019	2019-11-01	254.1	17.1	1780.9	374.7	54	UNITED FIN. BANCORP INC.	PEOPLE'S UNITED FIN., INC.	Yes	Yes
2019	2019-12-07	294.7	61.6	4251.7	814.5	1243	SUNTRUST BANKS INC.	BB&T CORP.	No	Yes
2022	2022-01-04	112.5	0.1	2100.1	2.5	84	CIT GRP INC.	FIRST CITIZENS BANCSHARES INC.	No	Yes
2022	2022-02-01	191.1	3.8	2114.9	276.8	175	GREAT WESTERN BANCORP INC.	FIRST INTERSTATE BANCSYSTEM, INC.	Yes	Yes
2022	2022-02-16	178.2	8.4	1649.7	394.6	109	FIRST MIDWEST BANCORP INC.	OLD NATIONAL BANCORP	Yes	Yes

Back

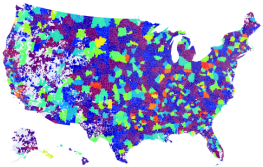
Defining Auto Loan Markets Around Dealership Clusters

1: Identify dealership clusters

- Density-Based Spatial Clustering of Applications w/Noise (DBSCAN) algorithm of Ester et al. (1996)
- Does not require pre-setting a # of clusters
- No shape restriction to clusters
- Requires min-distance parameter (varying by state)



2: Market := Set of zipcodes with the same nearest dealership cluster centroid



Back

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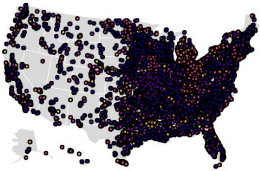

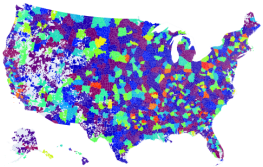

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Back

Economic Magnitudes in Context of CU Income and Expense

	Income Statement	(bps)
+	Interest Revenue from Assets	406
−	Interest Cost of Assets	105
=	**Gross Spread**	**301**
+	Other Income	109
−	Operating Expense	291
=	**Net Spread**	**120**
−	Loss Provision	40
=	**Net Income**	**80**

Source: ACUs, 2024

Back

Heterogeneity by Credit Score

Back

	Interest Rate	Credit Score	Loan Amount	Borrower Income	Loan Term	Default	Prepaid	Default	Prepaid
A: Near-Prime	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
High DHHI	0.12***	-0.91	-0.21	-0.38	0.11	0.57**	0.37	0.50*	0.34
	(0.04)	(0.65)	(0.15)	(0.37)	(0.15)	(0.27)	(0.41)	(0.26)	(0.40)
CU x High DHHI	-0.27***	1.98**	0.09	0.52	0.11	-1.00**	0.31	-0.91*	0.29
	(0.08)	(0.98)	(0.30)	(0.49)	(0.35)	(0.50)	(0.74)	(0.47)	(0.71)
Observations	648,523	648,523	648,523	648,523	648,523	648,523	648,523	648,523	648,523
R^2	0.38	0.03	0.09	0.02	0.1	0.01	0.05	0.03	0.06
Dep. Var. Mean	6.92	674.24	23.55	42.23	67.01	4.36	89.08	4.36	89.08
B: Prime	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
High DHHI	0.01	-0.59*	0.21	0.13	0.10	0.12	0.30	0.12	0.28
	(0.03)	(0.33)	(0.18)	(0.54)	(0.18)	(0.11)	(0.54)	(0.11)	(0.57)
CU x High DHHI	-0.24***	2.07***	-0.18	-0.79	0.20	-0.19	-0.59	-0.18	-0.65
	(0.06)	(0.79)	(0.31)	(0.74)	(0.31)	(0.13)	(0.94)	(0.13)	(0.95)
Observations	570,062	570,062	570,062	570,062	570,062	570,062	570,062	570,062	570,062
R^2	0.44	0.04	0.09	0.09	0.07	0	0.06	0.01	0.08
Dep. Var. Mean	4.09	795.09	26.11	72.4	64.39	0.46	87.67	0.46	87.67

Model

Back

Lender j's payoff:

$$\Pi_j = \alpha_j \pi_j(r_j, r_{-j}) + (1 - \alpha_j)\tilde{S}(r_j, r_{-j}) \text{ subject to } \pi_j(r_j, r_{-j}) \geq 0$$

- π_j: lender j's expected profit of originating a loan with rate r_j given competitor offers r_{-j}
- $\tilde{S}$: expected borrower surplus for loans that are repaid
- α_j: weight that a lender of type j places on profit relative to borrower surplus (assume $\alpha_{BANK} = 1$)

Pricing Expression (Unconstrained) Back

$$r_j = \underbrace{c_j \frac{\int \frac{\partial s_j}{\partial r_j} f_\tau(\tau)\, d\tau}{\int \frac{\partial s_j}{\partial r_j}(1 - d(\tau)) f_\tau(\tau)\, d\tau}}_{\text{Effective Marginal Cost}} - \underbrace{\frac{\int (1 - d(\tau))\left(s_j + \frac{1-\alpha_j}{\alpha_j} \frac{\partial CS}{\partial r_j}\right) f_\tau(\tau)\, d\tau}{\int \frac{\partial s_j}{\partial r_j}(1 - d(\tau)) f_\tau(\tau)\, d\tau}}_{\text{Incentive-Adjusted Markup}}$$

- τ: borrower risk, $d(\cdot)$: default probability, s_j: lender j's market share, c_j: lending cost
- Effective marginal cost: captures lender's cost of funds and default risk of marginal borrowers
- Markup: depends on shape of demand/borrower surplus, extent of profit deviation

When profit deviation is *greater*, lender offers lower markups. At sufficiently low levels of α_j, participation constraint binds, lender sets rate such that they earn zero expected profit.