Poverty Spreads in Deposit Markets

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Motivation and Research Questions

- Price discrimination is well-documented in consumer products
  - Higher inflation at the bottom of the income distribution (Kaplan and Schulhofer-Wohl, 2017; Argente and Lee, 2021)
  - Lower product variety (Jaravel, 2019)
- Less attention on price discrimination in *financial* consumer products such as bank deposits
  - Primary saving vehicle for most households
  - First point of entry into financial system
- Questions:
  - Do low-income households receive lower deposit rates than high-income households?
  - What drives these differences?
    - Banking competition (consistent with previous literature)?
    - Other mechanisms?

What We Do

- Match data on
  - Branch-product-year level deposit rates (from RateWatch)
  - Zipcode-year level income and breakdowns (IRS)
    - Includes sources related to nondeposit market participation
- Descriptive analysis of rates and product characteristics as functions of local income
- Propose and test channel: Banks internalize nondeposit market participation
  - How do rates vary with bank competition vs. participation?
  - How do deposit flows vary with performance of outside assets?
  - Identification: top earners' capital gains taxes

What We Find

- Evidence of income-related discrimination in deposit rates
  - Moving from bottom to top income decile increases average rates by 0.22 bps (55% of the sample median)
  - Findings hold within bank-time, county-time
  - Intensive (exact same product) and extensive (more product variety) margins

- Data supports participation channel:
  - Findings nearly uncorrelated with banking market structure
  - Only income components related to participation drive spreads
    - E.g., capital gains, interest income
  - Changes in state capital gains tax rates reduce participation, spreads

$\Rightarrow$ Banks seem to internalize differential participation in nondeposit assets along the income distribution

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$\Rightarrow$ Banks seem to internalize differential participation in nondeposit assets along the income distribution

Literature Review

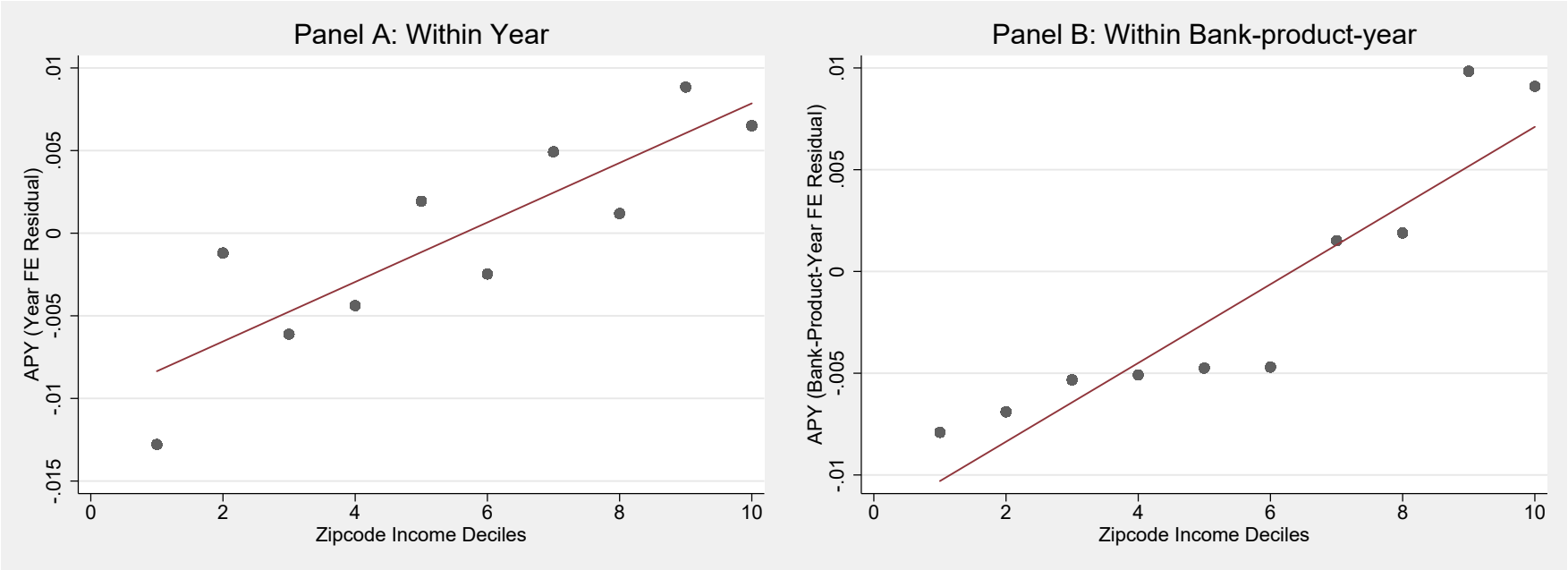
- Deposit rates and bank market power (Hannan and Berger, 1991; Neumark and Sharpe, 1992; Ben-David et al., 2017; Drechsler et al. 2017; d'Avernas et al., 2023; Oberfield et al., 2024; Yankov, 2024)
  - New evidence on participation as a source of bank market power
- Household finance and sophistication (Campbell, 2006; Calvet et al., 2007; Guiso et al., 2008; Gurun et al., 2016; Agarwal et al., 2017; Egan, 2019)
  - Banks internalize household participation
- Poverty penalty and inflation inequality (Kunreuther, 1973; Attanasio and Frayne, 2006; Kaplan and Schulhofer-Wohl, 2017; Jaravel, 2019; Argente and Lee, 2021)
  - Document similar effects (but different channel) in financial markets

Empirical Setting and Descriptive Results

Main Data Sources

- RateWatch data on deposit APYs at the branch-product-week level
  - E.g., 12-month certificates of deposit (CDs) with minimum subscription size of USD 10,000
  - Collapsed at the branch-product category-year level
  - Sample period: 2004-2020
- IRS data on average income at the zipcode-year level
  - Includes income breakdowns (salaries, capital gains, interest)

Income-based Spreads in Deposit Markets



- Average rates residualized by year and bank-product-year
- Positive relationship between income and rates
  - Even within bank-product-year

Income-based Spreads in Deposit Markets

	Dep. Variable: Deposit Product APY				
	(1)	(2)	(3)	(4)	(5)
log(Per Capita Income)	0.121***	0.129***	0.128***	0.136***	0.015***
	(0.016)	(0.015)	(0.013)	(0.014)	(0.002)
Year FE	Yes	Yes	Yes	Yes	No
Zipcode FE	Yes	Yes	Yes	No	No
Product FE	No	Yes	Yes	No	No
Bank FE	No	No	Yes	No	No
Bank × Product FE	No	No	No	Yes	No
Zipcode × Product FE	No	No	No	Yes	No
Bank × Product × Year FE	No	No	No	No	Yes
R-Squared	0.406	0.740	0.751	0.824	0.977
Observations	629,391	629,391	629,384	621,409	244,894

- From bottom to top income decile → 22 bps higher rate
  - Around 55% of sample median rate

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- From bottom to top income decile → 22 bps higher rate
  - Household level: around $175 in lost interest (0.5% of annual income)

Income-based Spreads in Deposit Markets

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- From bottom to top income decile → 22 bps higher rate
  - Aggregate: $4.86 billion extra deposit interest expense paid in top income decile zipcodes relative to bottom income decile zipcodes

Extensive Margin: Product Characteristics

	N. of Subproducts	Min. Subscription Size	CD Maturity
	(1)	(2)	(3)
log(Per Capita Income)	0.081***	0.103***	0.012*
	(0.019)	(0.030)	(0.007)
Year FE	Yes	Yes	Yes
Bank × Product FE	Yes	Yes	Yes
Zipcode × Product FE	Yes	Yes	Yes
R-Squared	0.899	0.793	0.824
Observations	621,409	547,231	130,464

- Higher product variety (number of sub-products, minimum subscription) in high-income areas
- Longer average CD maturity
  - Preliminary evidence on participation-targeting mechanism: asset duration increasing in income (e.g., Van Binsbergen, 2021; Catherine et al., 2023; Greenwald et al., 2023)

Intensive Margin: Granular Product Definitions

	Dep. Variable: Deposit Subproduct APY				
	(1)	(2)	(3)	(4)	(5)
log(Per Capita Income)	0.063***	0.061***	0.072***	0.075***	0.007***
	(0.017)	(0.016)	(0.014)	(0.015)	(0.002)
Year FE	Yes	Yes	Yes	Yes	No
Zipcode FE	Yes	Yes	Yes	No	No
Subproduct FE	No	Yes	Yes	No	No
Bank FE	No	No	Yes	No	No
Bank × Subproduct FE	No	No	No	Yes	No
Zipcode × Subproduct FE	No	No	No	Yes	No
Bank × Subproduct × Year FE	No	No	No	No	Yes
R-Squared	0.525	0.744	0.761	0.839	0.975
Observations	1,505,878	1,505,878	1,505,877	1,490,925	558,527

- Similar magnitudes as in main tests using granular definitions
  - E.g., 12-month CDs with minimum sub. size of $10k
- Spreads do not arise mechanically from extensive margin

Robustness and Additional Findings

- Results hold within county-year — Within-county
  - Suggestive of substantial depositor switching costs (Yankov, 2024)
  - Re-evaluation of county-levels measures of competition?
- Results strongest for
  - Banks below the very top of the size distribution — Bank Size
    - Consistent with uniform rate-setting by major banks (Begenau and Stafford, 2022; d'Avernas et al., 2023; Oberfield et al., 2024)
  - Non-metropolitan areas — Geography
    - Micropolitan areas, small towns, rural areas
- Results hold using income statement interest expense — Interest
  - Not only quoted, but paid rates increase in average income

Competition Within the Banking Sector

Banking Sector Competition?

	Full Sample		Competitive Zipcodes	
	(1)	(2)	(3)	(4)
log(Per Capita Income)	0.137***	0.135***	0.106***	0.101***
	(0.014)	(0.015)	(0.018)	(0.020)
Dep. HHI	0.035*			
	(0.019)			
High Dep. HHI		-0.013		
		(0.043)		
log(Per Capita Income) × High Dep. HHI		0.006		
		(0.011)		
Year FE	Yes	Yes	Yes	Yes
Bank × Product FE	Yes	Yes	Yes	Yes
Zipcode × Product FE	Yes	Yes	Yes	Yes
R-Squared	0.824	0.824	0.835	0.824
Observations	617,056	619,039	281,695	330,259

- Estimates not systematically correlated with local banking market structure

Banks Subsidizing Fee-generating Income?

	Dep. Variable: Deposit Product APY			
	(1)	(2)	(3)	(4)
log(Per Capita Income)	0.130***	0.135***	0.133***	0.133***
	(0.015)	(0.014)	(0.014)	(0.013)
log(PCI) × Noninterest Income	0.010			
	(0.013)			
log(PCI) × Fiduciary Income		-0.034		
		(0.095)		
log(PCI) × Procuct Servicing			-0.328	
			(0.276)	
log(PCI) × Brokerage Income				0.113
				(0.116)
Low Order Terms	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Bank × Product FE	Yes	Yes	Yes	Yes
Zipcode × Product FE	Yes	Yes	Yes	Yes
R-Squared	0.824	0.824	0.824	0.806
Observations	620,811	620,811	620,239	494,456

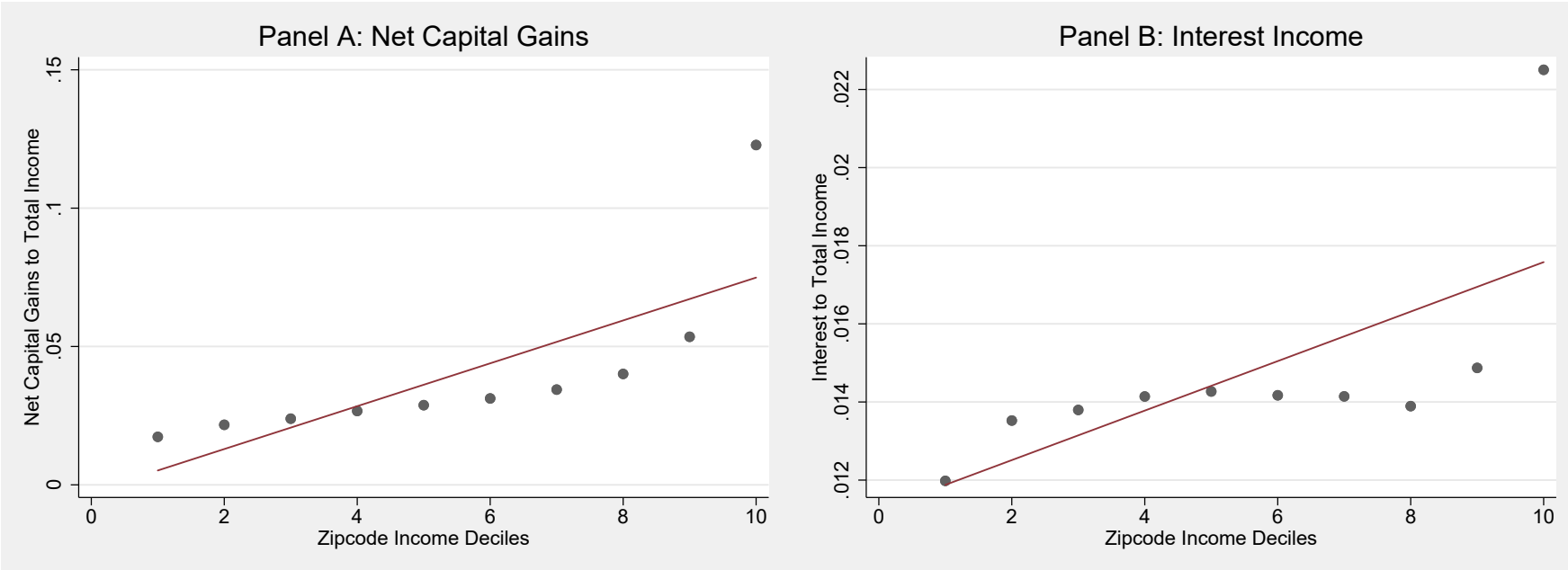
- Estimates do not vary with banks' reliance on fee-generating income

Income, Participation, and Deposit Spreads

Participation: Overview

- Break down income into sources related to participation vs. others
  - E.g., Net capital gains, interest income, salaries
- Participation and deposit flows
  - Are deposit flows more responsive to outside assets' performance in high-participation areas?
- Cross-section of deposit products
  - CDs, MMAs vs. checking and savings accounts
  - Term structure of CDs
- Quasi-exogenous variation in participation incentives:
  - Time series: state-level capital gains taxes for top earners
  - Cross-section: broker misconduct during the crisis (in the paper)

Participation and Income



- Participation proxies increasing in income
  - Net capital gains to total income, interest income to total income
  - Similar to Chodorow-Reich et al. (2021)
- Top earners participate disproportionately more (Smith et al., 2023)

Participation Spreads

	Dep. Variable: Deposit Product APY					
	(1)	(2)	(3)	(4)	(5)	(6)
NCG to Total Income	0.00387***				0.00376***	0.00373***
	(0.0004)				(0.0005)	(0.0004)
Interest to Total Income		0.02146***			0.02053***	0.02053***
		(0.0029)			(0.0029)	(0.0028)
Salaries to Total Income			-0.00146***		0.00006	
			(0.0003)		(0.0003)	
Other Income to Total Income				-0.00095***		0.00004
				(0.0003)		(0.0003)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank × Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Zipcode × Product FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.824	0.824	0.824	0.824	0.824	0.824
Observations	621,409	621,409	621,409	621,409	621,409	621,409

- Net capital gains, interest income to total income positively correlated with local rates
- Salaries and other income sources are uncorrelated
  - Income per se less relevant; low-income households participate less

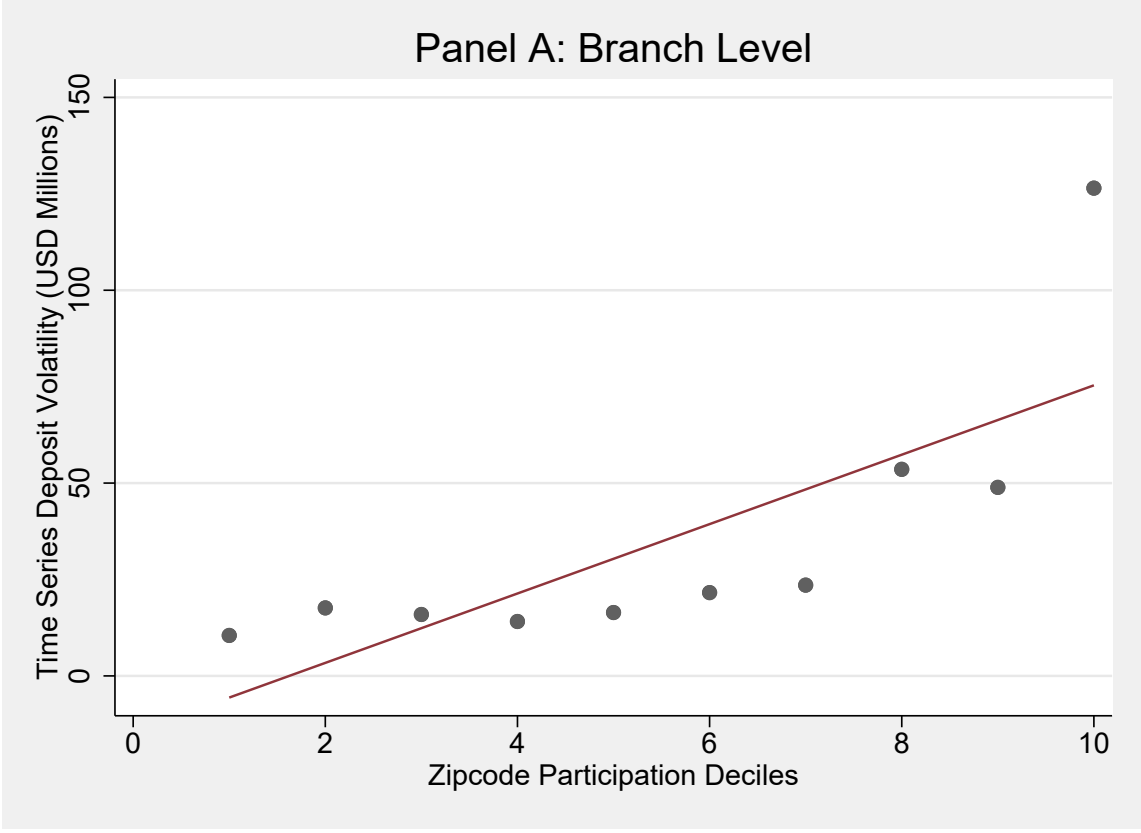
Participation Spreads: Controlling for Local Income

	Dep. Variable: Deposit Product APY			
	(1)	(2)	(3)	(4)
NCG to Total Income	0.0024***	0.0042***	0.0043***	0.0033***
	(0.000)	(0.001)	(0.001)	(0.000)
Income Level Controls	Yes	Yes	Yes	No
Year FE	Yes	Yes	Yes	Yes
Bank × Product FE	Yes	Yes	Yes	Yes
Zipcode × Product FE	Yes	Yes	Yes	Yes
Income Decile FE	No	No	No	Yes
R-Squared	0.824	0.824	0.824	0.824
Observations	621,409	617,730	617,675	621,409

- Participation results hold even *conditional on income*
  - For example, within income buckets
  - Inconsistent with channels purely related to income (deposit servicing costs; depositor risk)

Participation and Deposit Flows

Deposit Flows: Volatility



- Deposit base volatility increasing in participation
  - Deposits are *less* volatile in low-income areas

Depositor Flows and Stock Market Performance

	Branch Dep. Growth		Zipcode Dep. Growth	
	(1)	(2)	(3)	(4)
Ex. Market Return	-0.079***		-0.037***	
	(0.005)		(0.005)	
High Participation	0.041***			
	(0.011)			
Ex. Market Return × High Participation	-0.046***	-0.045***	-0.035***	-0.035***
	(0.007)	(0.007)	(0.008)	(0.008)
Year FE	No	Yes	No	Yes
Branch FE	Yes	No	No	No
Zipcode FE	No	No	Yes	Yes
Branch × Zipcode FE	No	Yes	No	No
R-Squared	0.123	0.155	0.097	0.126
Observations	221,084	220,909	126,604	126,604

- Good stock market performance associated with deposit outflows; more so in high-participation areas
- Results hold with other outside options (local stocks, munis) Outside

Cross-section of Deposit Products

Product Breakdowns

	Checking and Savings	Money Market Acc.	CDs
	(1)	(2)	(3)
NCG to Total Income	-0.0004	0.0046***	0.0066***
	(0.0004)	(0.0008)	(0.0006)
Year FE	Yes	Yes	Yes
Bank (× Product) FE	Yes	Yes	Yes
Zipcode (× Product) FE	Yes	Yes	Yes
R-Squared	0.734	0.789	0.959
Observations	255,735	161,048	130,464

- Spreads only in MMAs, CDs
  - Closer to nondeposit investment opportunities (MMFs, bonds)
- Demand for checking and savings accounts is inelastic (e.g., Driscoll and Judson, 2013)

Deposit Flows and CD Maturity

	Full Sample		Short Maturity		Long Maturity	
	(1)	(2)	(3)	(4)	(5)	(6)
Ex. Market Return	-0.186**	-0.175**	-0.139	-0.138	-0.233*	-0.215*
	(0.075)	(0.072)	(0.095)	(0.093)	(0.115)	(0.113)
Bank FE	No	Yes	No	Yes	No	Yes
R-Squared	0.006	0.059	0.006	0.099	0.006	0.062
Observations	285,622	285,597	143,858	143,533	141,764	141,429

- Study outflows in the cross-section of CD maturity
- *Long-maturity* CDs' flows more sensitive to stock market performance
  - Closer substitutes to stocks (Van Binsbergen, 2021)?

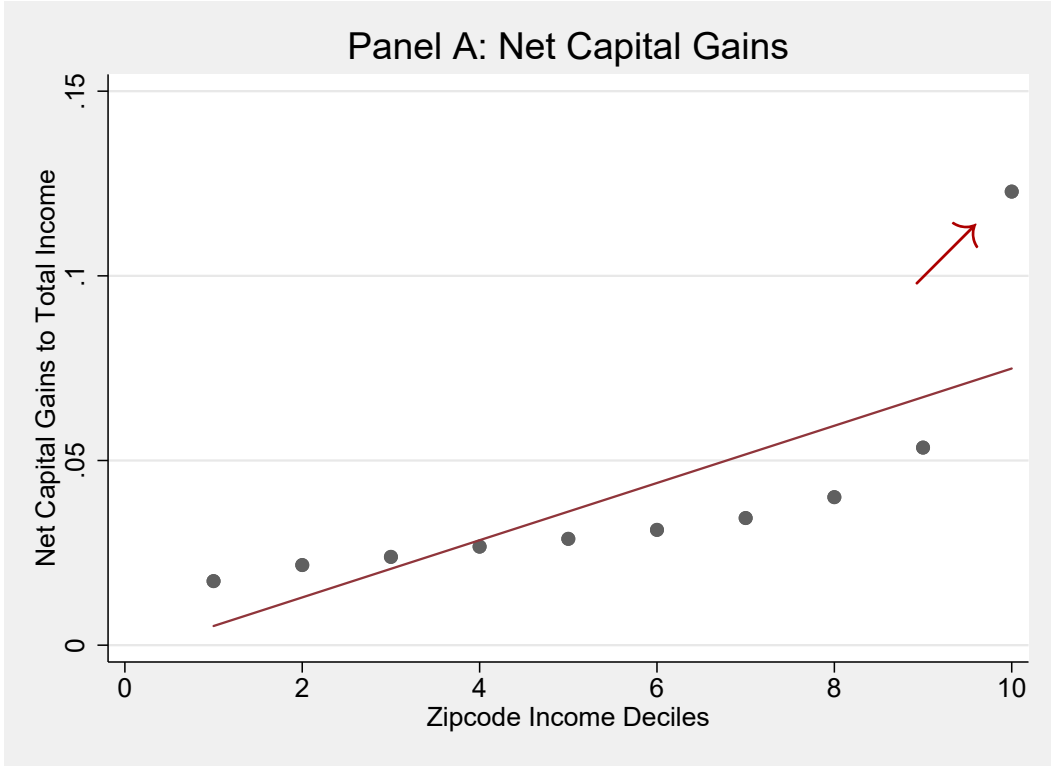
Deposit Flows and the Term Structure of CD Rates

	12–3 Months	24–3 Months	36–3 Months
	(1)	(2)	(3)
NCG to Total Income	0.176***	0.131**	0.105*
	(0.054)	(0.057)	(0.063)
Year FE	Yes	Yes	Yes
Zipcode FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
R-Squared	0.696	0.697	0.719
Observations	119,221	114,926	110,454

- Spreads higher for long-term CDs
  - Consistent with banks competing with long-duration outside assets
  - Inconsistent with explanations related to rate levels, but not slopes

Identification

Identification: Top Earners' Capital Gains Taxes



- Idea: Capital gains taxes change participation incentives for top earners/ participants
- Test: Two-stage least squares
  - First stage: top earners' state taxes on participation measures
  - Second stage: Instrumented participation on deposit rates

2SLS: Results

	Net Capital Gains		Interest		Salaries	
	(1)	(2)	(3)	(4)	(5)	(6)
State Rate, Long Gains	-0.137***		-0.079***		0.030	
	(0.039)		(0.017)		(0.049)	
NCG to Total Income		0.636***				
		(0.196)				
Interest to Total Income				1.095***		
				(0.162)		
Salaries to Total Income						-2.888
						(4.797)
Zipcode FE	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic		12.438		21.676		0.380
Observations	629,384	629,384	629,384	629,384	629,384	629,384

- NCG second-stage results line up with main findings

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- Similar first-stage results for interest to total income

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- Results disappear for salaries
- Similar findings in DiD around large tax changes

DiD

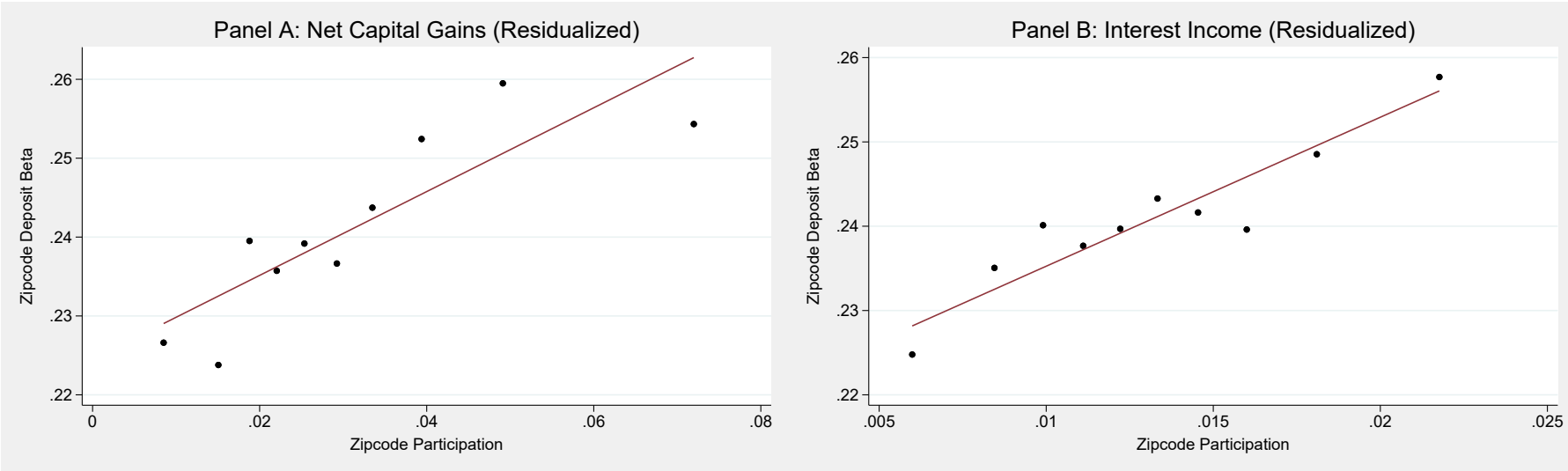
Broker Misconduct and Identification

- In the paper, we also exploit broker misconduct during the crisis for identification (Egan et al., 2019)
  - Independent variable: Share of city-level brokers charged of misconduct during the crisis
  - Dependent variables: Participation (first-stage), rates (second-stage)
- We find similar results to state taxes:
  - Crisis misconduct decreases participation incentives
  - Instrumented participation explains spreads

Broker Results

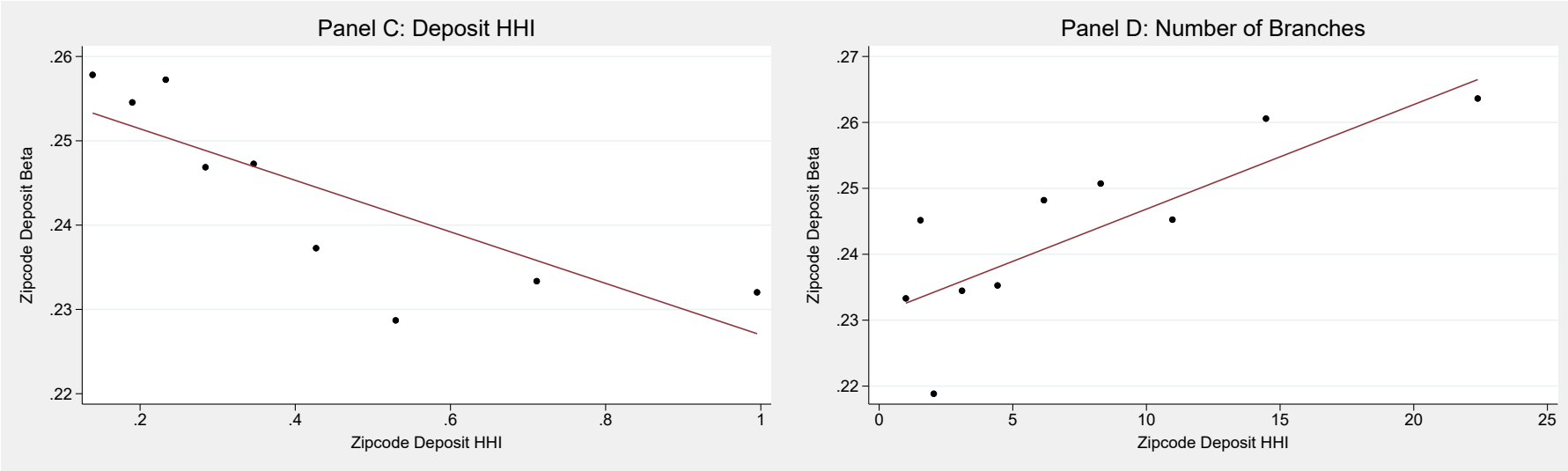
Implications: Deposit Market Power

Participation and Deposit Market Power



- Participation explains variation in local deposit betas
  - Measures of deposit market power based on Fed funds rate pass-through (Drechsler et al., 2021)
- Betas are residualized on deposit HHI, branch count
  - Participation is a source of banks' market power *independent of banking concentration*

Participation and Deposit Market Power



- Quantitatively, participation explains as much variation in local betas as "traditional" deposit HHI and branch presence

Conclusions

- We document income-related price discrimination in deposit markets
  - Low-income households face systematically low rates, product variety
- Banks seem to internalize households' participation:
  - Results only for participation-related income components
  - Deposits in low-income areas less reactive to performance of nondeposit assets
  - Top earners' capital gain tax changes support causal interpretation
- Microfound lack of participation as source of deposit market power

Appendix

Within County-year Results

	Dep. Variable: Deposit Product APY			
	(1)	(2)	(3)	(4)
log(Per Capita Income)	0.050***	0.045***	0.033**	0.033**
	(0.018)	(0.016)	(0.014)	(0.014)
Zipcode FE	Yes	Yes	Yes	Yes
Product FE	No	Yes	Yes	Yes
Bank FE	No	No	Yes	No
Bank × County FE	No	No	No	Yes
County × Year FE	Yes	Yes	Yes	Yes
R-Squared	0.418	0.751	0.760	0.762
Observations	629,224	629,224	629,217	629,022

Back

Bank Size

	All	Bottom 90th	Top 10th	Bottom 95th	Top 5th
	(1)	(2)	(3)	(4)	(5)
log(Per Capita Income)	0.300***	0.170***	0.037*	0.165***	0.024
	(0.036)	(0.019)	(0.020)	(0.018)	(0.021)
log(Assets)	0.045***				
	(0.011)				
log(PCI) × log(Assets)	-0.011***				
	(0.002)				
Year FE	Yes	Yes	Yes	Yes	Yes
Bank × Product FE	Yes	Yes	Yes	Yes	Yes
Zipcode × Product FE	Yes	Yes	Yes	Yes	Yes
R-Squared	0.833	0.830	0.855	0.832	0.855
Observations	573,136	418,788	149,071	462,128	106,241

Back

Geographic Variation

	All		Bottom 90th	Top 10th	Bottom 95th	Top 5th
	(1)	(2)	(3)	(4)	(5)	(6)
log(PCI)	0.102***	0.110***	0.132***	0.031	0.131***	0.016
	(0.016)	(0.014)	(0.021)	(0.020)	(0.020)	(0.021)
RUCA × log(PCI)	0.009***					
	(0.002)					
RUCA Score=2 × log(PCI)		0.073***	0.071**	0.080*	0.074**	0.049
		(0.024)	(0.032)	(0.045)	(0.030)	(0.053)
RUCA Score=3 × log(PCI)		0.138***	0.143***	0.058	0.142***	0.097
		(0.025)	(0.030)	(0.050)	(0.029)	(0.059)
RUCA Score=4 × log(PCI)		0.042*	0.032	0.034	0.030	0.122*
		(0.023)	(0.027)	(0.069)	(0.026)	(0.065)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank × Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Zipcode × Product FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.824	0.824	0.830	0.855	0.832	0.855
Observations	621,374	621,374	418,788	149,071	462,128	106,241

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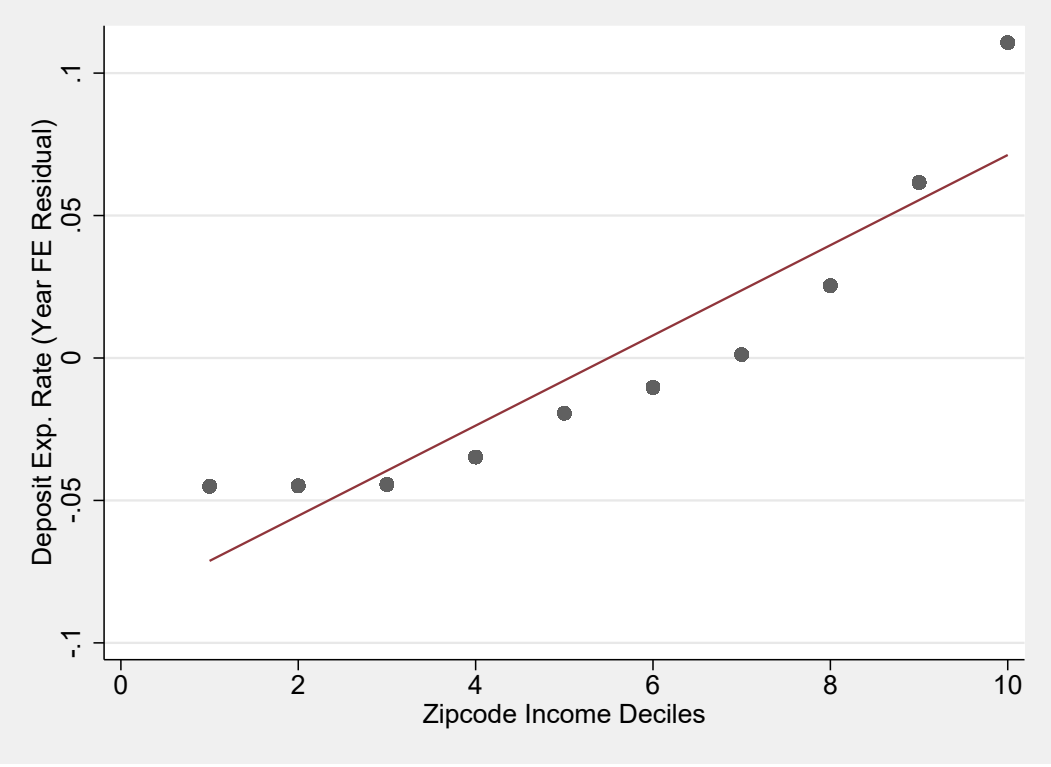
Bank-level Deposit Interest Expense Ratios



- Bank-level interest expense ratios increasing in average income across branches

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Deposit Flows and Other Outside Options

	Dep. Variable: Zipcode Deposit Growth			
	(1)	(2)	(3)	(4)
Local Portfolio Ex. Ret.	-0.026***			
	(0.004)			
Local Portfolio Ex. Ret. × High Participation	-0.016***	-0.015**		
	(0.006)	(0.006)		
Buy Local Stocks (%)			-0.016***	
			(0.001)	
Buy Local Stocks (%) × High Participation			-0.007***	-0.006***
			(0.002)	(0.002)
Zipcode FE	Yes	Yes	Yes	Yes
State × Year FE	No	Yes	No	Yes
R-Squared	0.096	0.146	0.099	0.146
Observations	126,604	126,604	126,604	126,604

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Stacked Difference in Differences

$$
\begin{aligned}
d_{ipb(zs)ot} \quad = \quad & \beta_1 log(PerCapitaIncome)_{zt} \\
& + \beta_2 Treated_{so} \times Post_{ot} \times log(PerCapitaIncome)_{zt} + X_{LO} + \gamma_{FE} + \varepsilon_{ipb(zs)ot}
\end{aligned}
$$

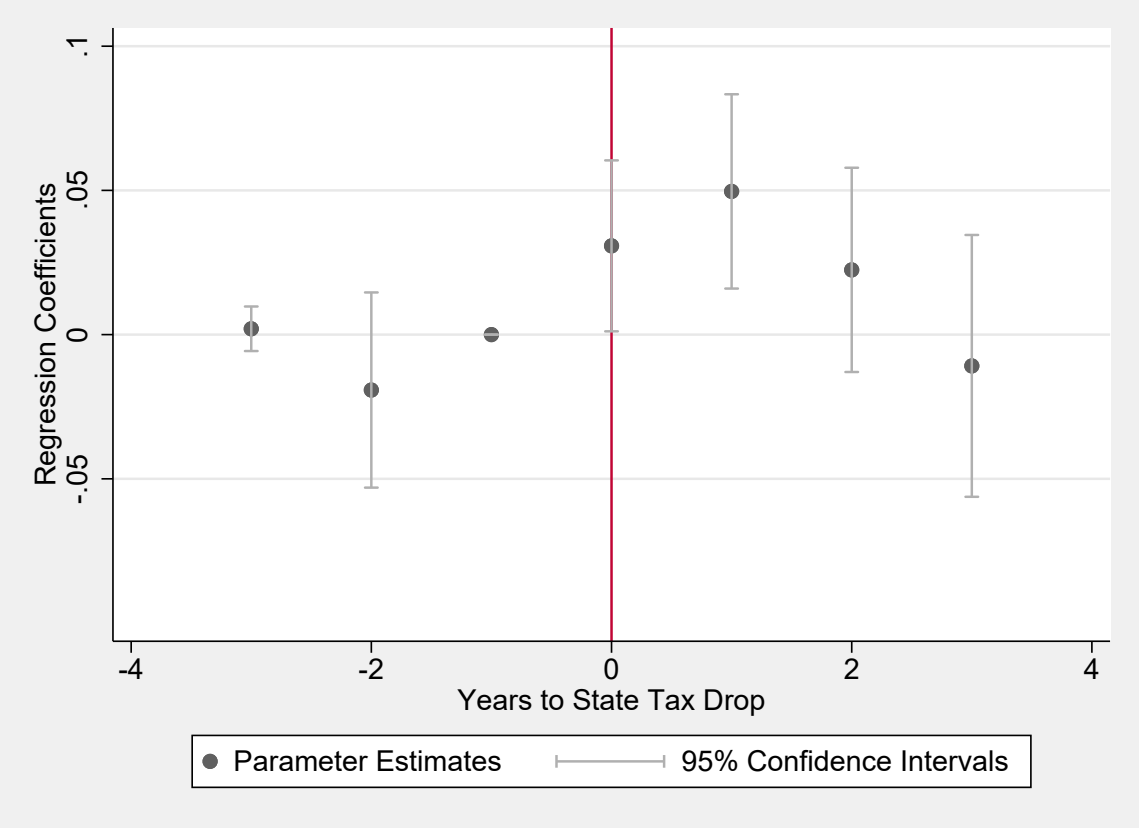
- i, p, and o index banks, products, and cohorts, respectively
- $b(zs)$ indexes branch b located in zipcode z, state s
- $Treated_{so}$ equal to one if state s implements first tax cut in cohort o
  - Control group: states not implementing cuts, in-sample or in-cohort
- $Post_{ot}$ indicates years following the tax cut
- β_2 measures changes in deposit rate-income sensitivity

Stacked Difference in Differences

	Dep. Variable: Deposit APY			
	(1)	(2)	(3)	(4)
log(Per Capita Income)	0.195***	0.191***	0.178***	0.177***
	(0.020)	(0.020)	(0.020)	(0.021)
Post × Treated × log(Per Capita Income)	0.031**	0.032**	0.032**	0.033**
	(0.013)	(0.014)	(0.014)	(0.015)
Low-Order Terms	Yes	Yes	Yes	Yes
Cohort FE	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	No
Zipcode FE	Yes	No	No	No
Bank FE	Yes	No	No	No
Cohort × State FE	No	No	Yes	Yes
Cohort × Year FE	No	No	No	Yes
Bank × Product FE	No	Yes	Yes	Yes
Zipcode × Product FE	No	Yes	Yes	Yes
R-Squared	0.413	0.852	0.852	0.852
Observations	1,045,156	1,039,906	1,039,906	1,039,906

- State tax cuts increase spreads

Stacked Difference in Differences: Dynamics



- Dynamics of β_2 around state tax drop
  - Jump around tax cut
  - No evidence of pre-trends

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Broker Misconduct

	Net Capital Gains		Interest		Salaries	
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis Misconduct (%)	-0.223***		-0.012***		0.165*	
	(0.055)		(0.004)		(0.093)	
NCG to Total Income		0.005**				
		(0.002)				
Interet to Total Income				0.098**		
				(0.049)		
Salaries to Total Income						-0.007
						(0.005)
No Misconduct FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank $\times$ Product FE	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic		16.405		7.176		3.105
Observations	223,573	223,573	223,573	223,573	223,573	223,573

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