Bank Consolidation and Uniform Pricing

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The views expressed in this paper do not necessarily reflect those of the Bank of Canada.

Motivation - Antitrust Policy in the Banking Industry

- **Strong Bank Consolidation in U.S. in the past 30 years mostly driven by bank mergers**

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  - Antitrust tests based on ***local* concentration measures** result in ***local* remedies**
    - No blocked mergers in the past 30 years
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- **Uniform Pricing:** Similar prices across stores/branches
  - e.g., DellaVigna and Gentzkow, 2019; Park and Penacchi, 2009; Yankov, 2018
  - Strong uniform pricing practices suggest that acquirers might not be willing to price discriminate across local areas

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- **Structural model of deposits (demand & supply)**
  - Post-merger rate convergence is driven by Uniform Pricing rather than changes in perceived **bank quality**
  - Impact **not restricted** to markets with market share gains
  - **Branch divestitures**: Not always **welfare** improving
  - **Changes in local market concentration are an ineffective metric for antitrust review decisions**

Data

Data

1. RateWatch Dataset
   - Weekly survey of deposit and loan rates at the branch level
   - Rates on many types of deposit and loan products. This presentation:
     - 12-month Certificate of Deposit with a minimum amount of $10,000 (1yrCD)
     - Savings accounts with a minimum amount of $100,000 (SAV100K)
     - Personal Unsecured Loans (Personal)
     - HELOC with LTV up to 80% and loan amount of $20,000 (HELOC)

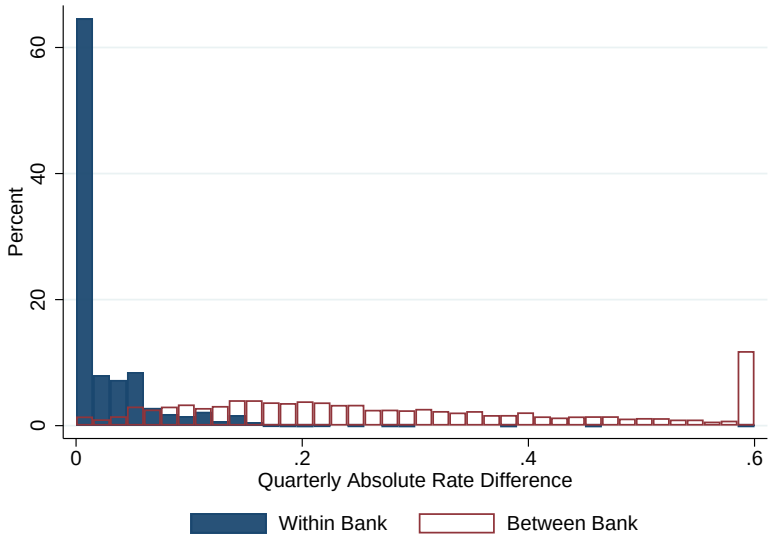
2. Summary of Deposits Dataset
   - Deposit amounts at each branch as of June 30th of every year

Sample

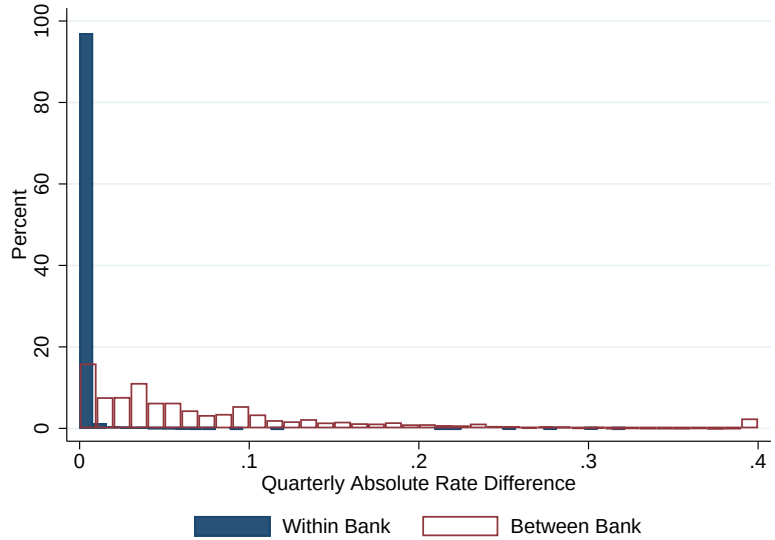
Uniform Pricing

Uniform Pricing - Absolute Quarterly Rate Differences

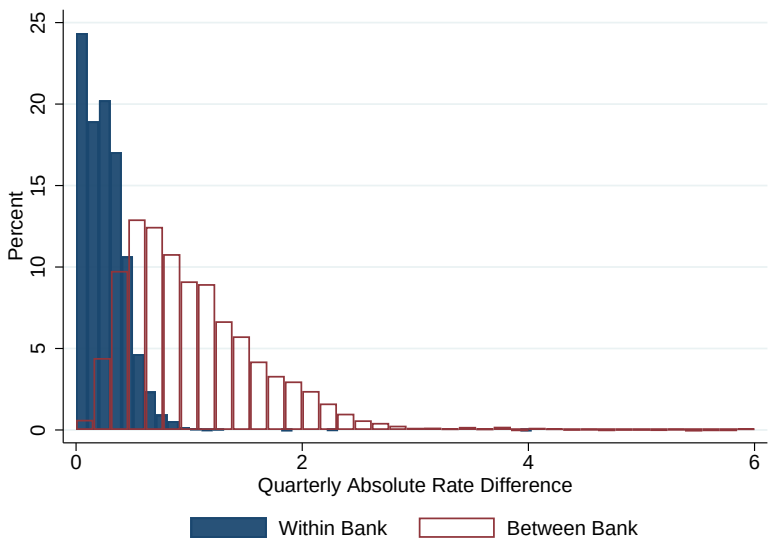
Panel A: 1yrCD



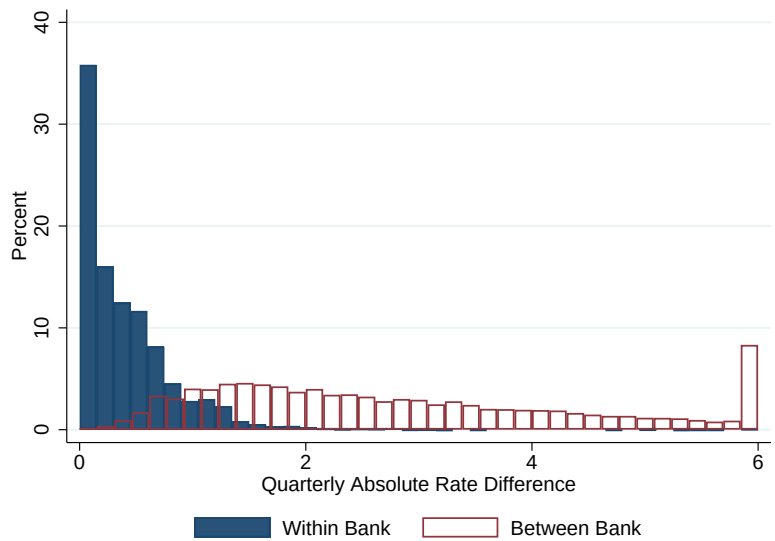
Panel B: SAV100K



Panel C: HELOC



Panel D: Personal

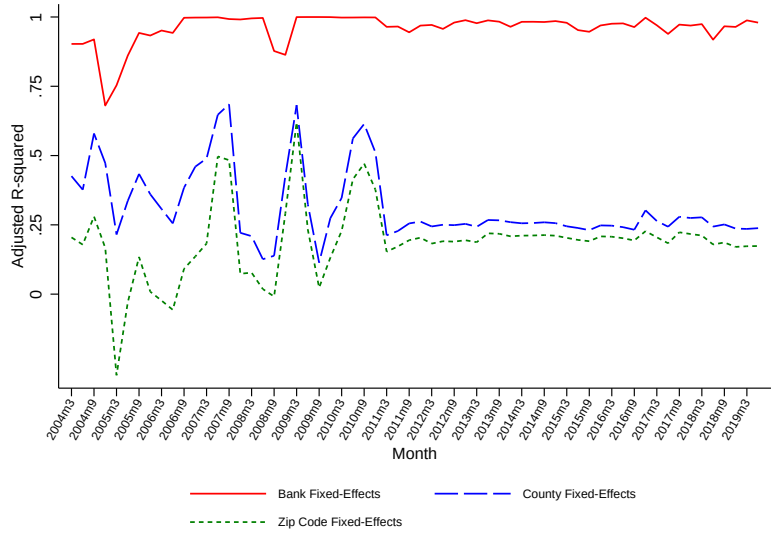


Correlations Stats Fees

Uniform Pricing - Bank Fixed Effects

Panel A: 1yrCD

Panel B: SAV100K



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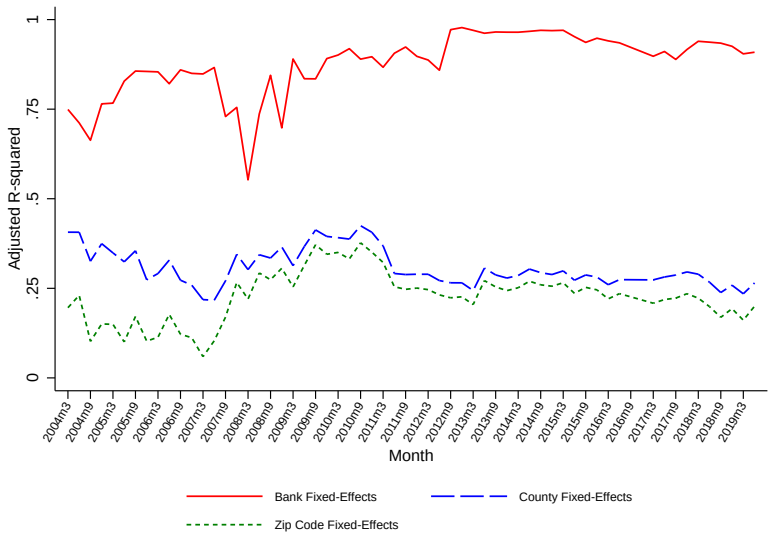

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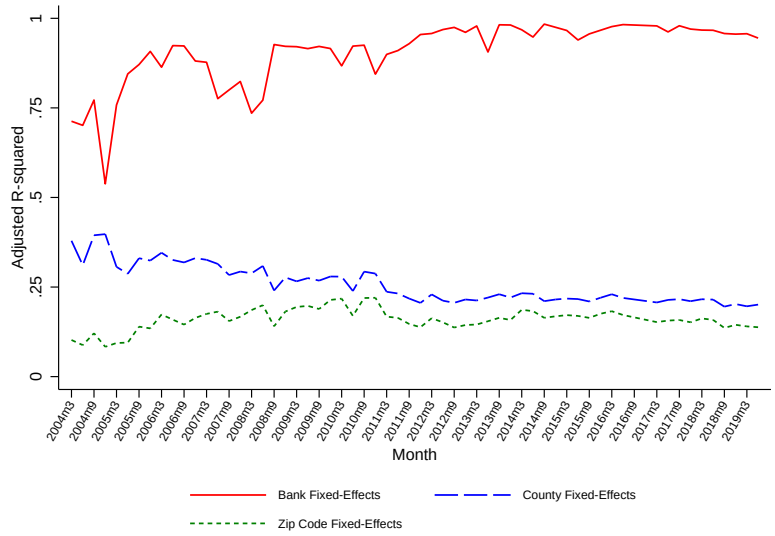


Uniform Pricing and Bank M&As

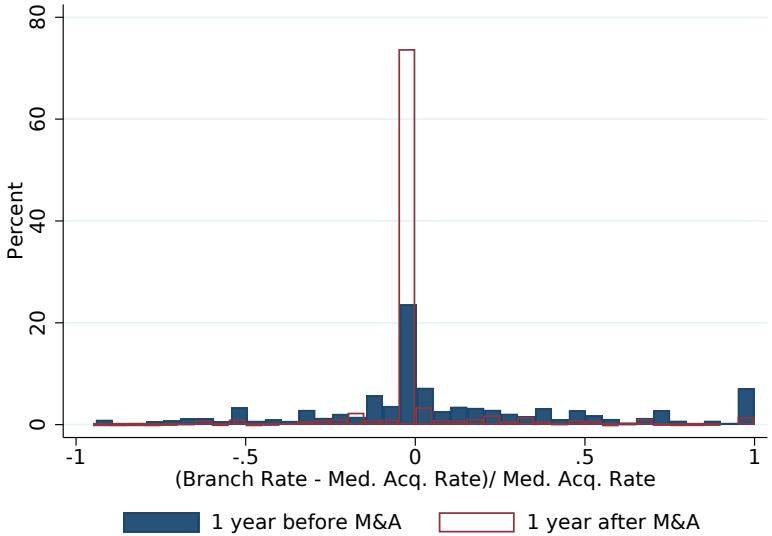
Uniform Pricing and Bank M&As

- Banks practice uniform or near-uniform deposit and loan rates across their branch network
- **How do Uniform Pricing impact the evolution of deposit and loan rates at target and acquirer branches around a merger event?**
  - Analyze a 2-year window around a merger event
  - Main variable of interest:

$$\textit{Rate-Difference}_i = \left(\frac{\textit{Branch Rate}_i - \textit{Acquirer Median Rate}_i}{\textit{Acquirer Median Rate}_i} \right)$$

Rate Differences - Histograms

Panel A: 1yrCD



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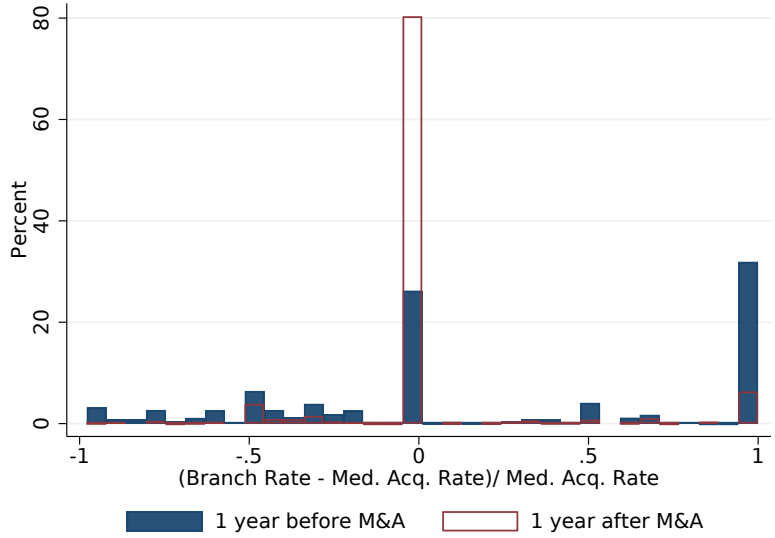

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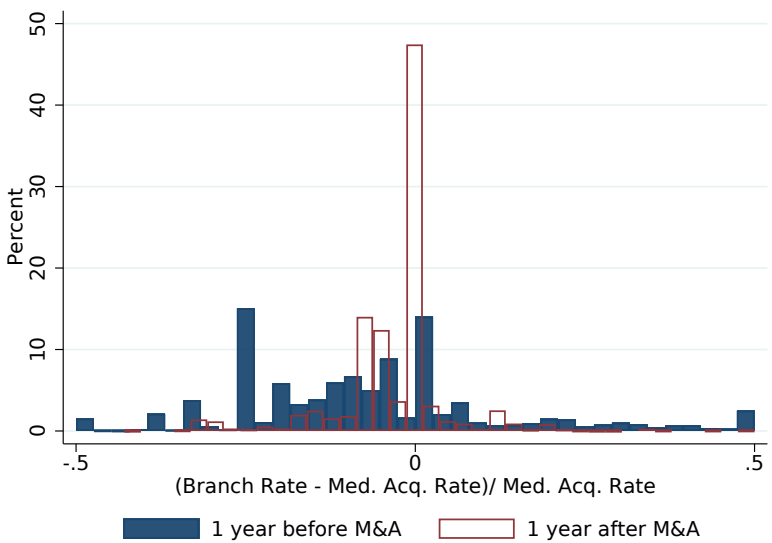

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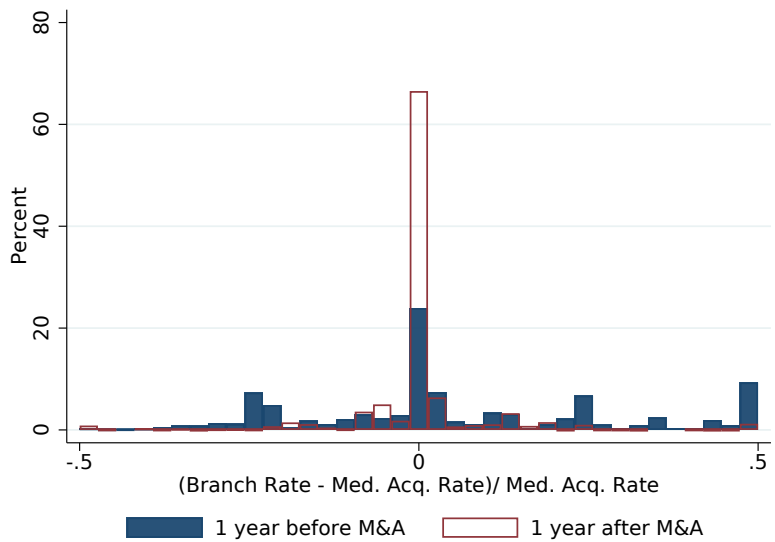
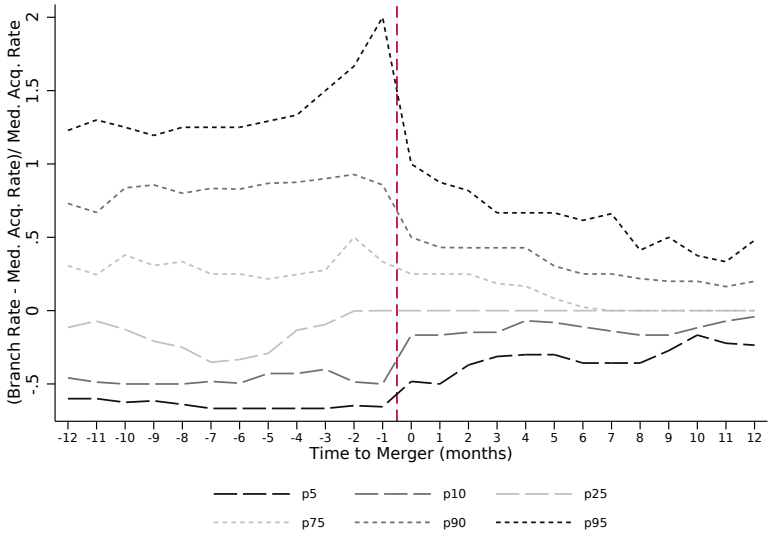


Rate Convergence - Graphical Analysis

Panel A: 1yrCD



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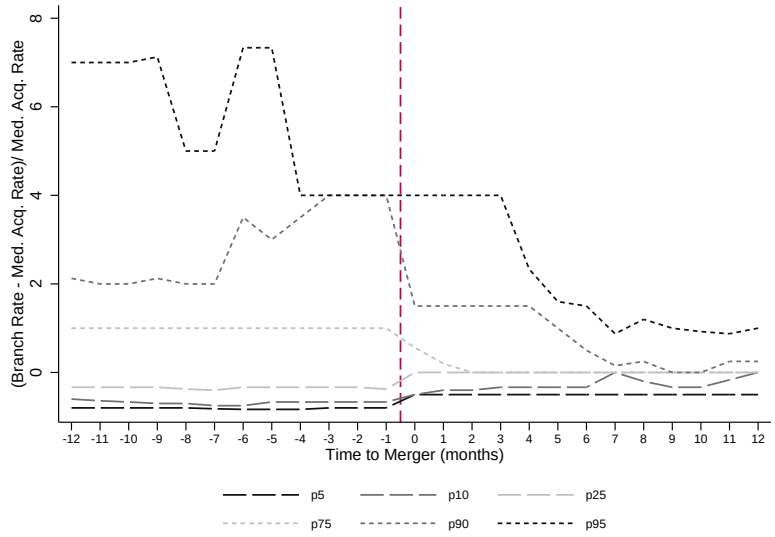

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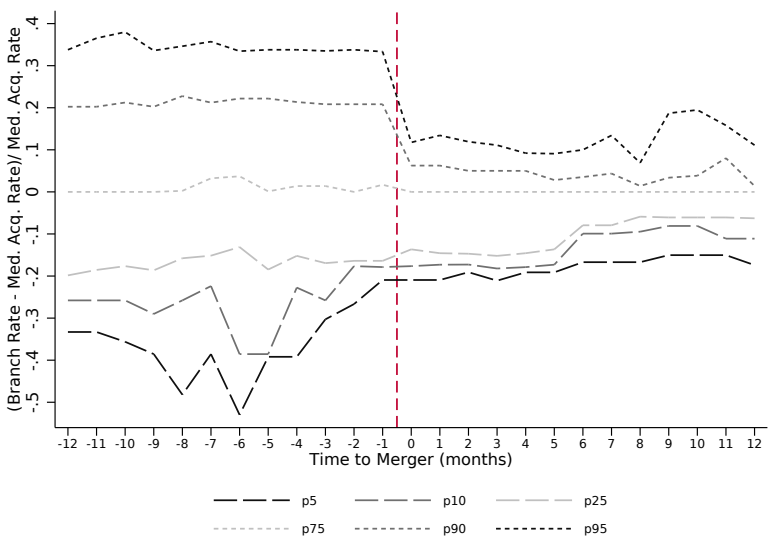

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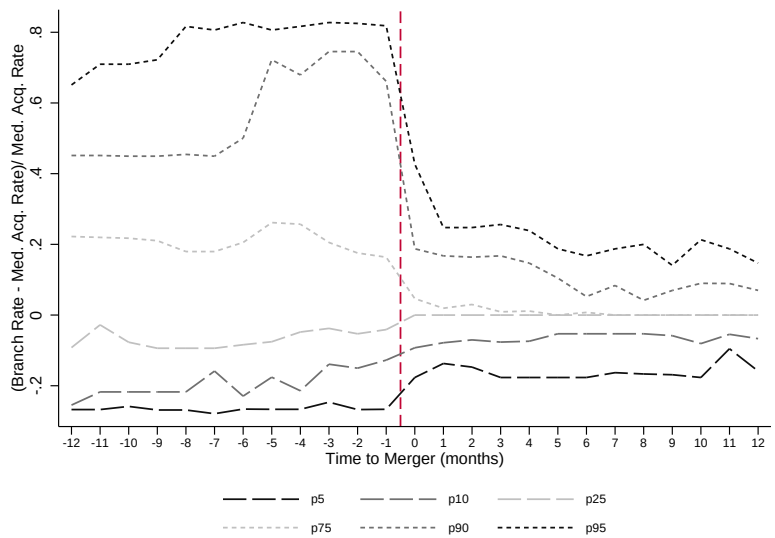


Rate Convergence - Pre-Post Analysis

$$Y_{i,t,s} = \gamma_t + \theta_i + \beta \textit{Post-Acquisition}_{i,s} + \epsilon_{i,t,s}$$

	(1)	(2)	(3)	(4)
		$\left\lvert \frac{\text{Branch Rate - Acq. Med. Rate}}{\text{Acq. Med. Rate}} \right\rvert$		
	1yrCD	SAV100K	Personal	HELOC
Post-Acquisition	-0.337***	-0.557***	-0.103***	-0.143***
	(0.043)	(0.069)	(0.011)	(0.011)
Observations	246206	65363	195541	149356
Adjusted R^2	0.582	0.743	0.797	0.829
State $\times$ Month FEs	Yes	Yes	Yes	Yes
Branch FEs	Yes	Yes	Yes	Yes

- Rate Convergence is robust to the inclusion of fixed effects and other covariates

Heterogeneity and Robustness

- Stronger Convergence when Buyer has a higher degree of Uniform Pricing Table

Different Samples:

1. Bank M&A vs Branch acquisition
2. Overlapping in the same market before M&A
3. Institutions belong to the same BHC or not
4. Bank failures are included or excluded from the sample
5. Differences in bank characteristics (size, capital ratios, etc)
6. Matched Control Sample

Potential Channels: Uniform Pricing Practices of the Acquirer

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\left\lvert \frac{\text{Branch Rate - Acq. Med. Rate}}{\text{Acq. Med. Rate}} \right\rvert$							
	1yrCD		SAV100K		Personal		HELOC	
	Below	Above	Below	Above	Below	Above	Below	Above
Post-Acquisition	-0.397***	-0.241***	-0.484***	-0.263***	-0.244***	-0.037	-0.109***	-0.023***
	(0.052)	(0.025)	(0.061)	(0.095)	(0.025)	(0.043)	(0.016)	(0.008)
Observations	110441	120036	40199	20808	17741	24887	23918	24525
Adjusted R^2	0.570	0.752	0.675	0.909	0.907	0.924	0.858	0.993
St × Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Branch FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

- Deposit Rate convergence more pronounced when acquirers have stronger uniform deposit pricing practices

Back

How is the rate convergence happening? - Decomposing Rate Convergence

	(2)	(3)	(5)	(6)
	$(\text{Branch - Acq. Med. Rate})^{Pre} > 0$		$(\text{Branch - Acq. Med. Rate})^{Pre} < 0$	
	Branch	Acq. Med.	Branch	Acq. Med.
1yrCD				
Post-Acquisition	-0.128***	0.032***	0.094***	-0.030***
	(0.014)	(0.007)	(0.011)	(0.008)
Observations	126038	126038	105508	105508
Adjusted R^2	0.981	0.989	0.983	0.990
State × Month FEs	Yes	Yes	Yes	Yes
Branch FEs	Yes	Yes	Yes	Yes

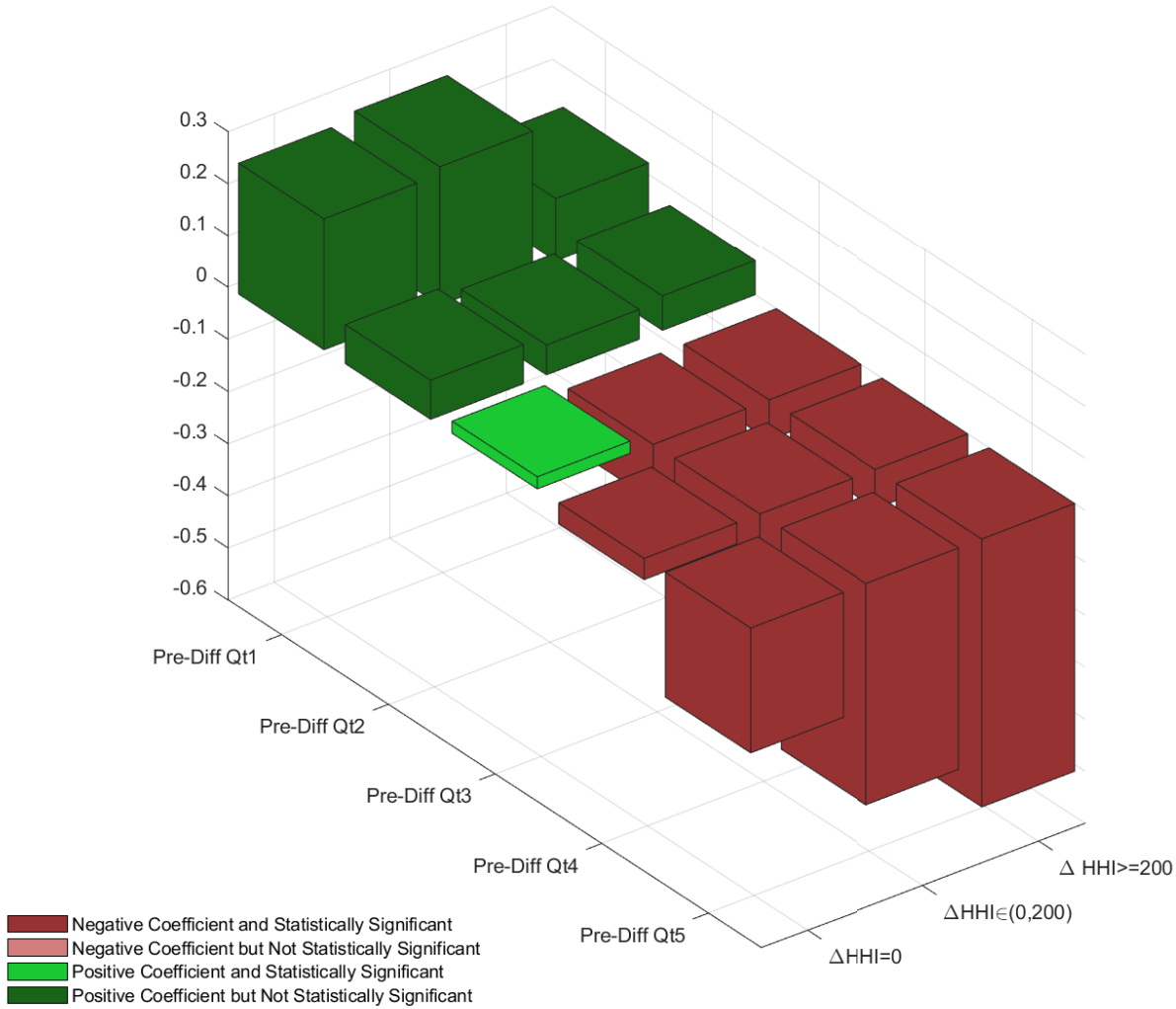
Other products

- More than 75% of the rate adjustments is explained by changes in the target branch rate

Post-Merger Evolution of Rates: Local Concentration vs Rate Convergence

Local Concentration vs Rate Convergence

- Decisions to block mergers and merger remedies based on cut-off rule: $\Delta HHI > 200$ **and** post-merger deposit HHI exceeds 1,800 points



Other Products

Structural Model of Deposit Markets

Demand for Deposits

- An individual (i) in banking market (m) chooses among the available branches in the market (Γ^m) where to deposit their deposits
- A depositor i derives the indirect utility of depositing in branch (j) located in zip-code (z) of market (m) that belongs to bank b at time t:

$$u_{i,j,z,m,b,t} = V_{j,z,m,b,t} + \epsilon_{i,j,t}$$

$$V_{j,z,m,b,t} = \alpha_m r_{j,t} + \beta_0 X_{j,t} + \beta_1 H_{b,m,t} + \delta_b + \gamma_z$$

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  - $\epsilon_{i,j,t}$ individual-branch-time utility shocks: $\epsilon_{i,j,t} \sim$ i.i.d. T1EV $\Longrightarrow$ Logit shares

$$s_{j,z,m,b,t} = \frac{exp\left(V_{j,z,m,b,t}\right)}{\sum_{k \in \Gamma^m} exp\left(V_{k,z,m,b,t}\right) + exp\left(V_{O,m,t}\right)}$$

BLP Estimation Procedure:

- **Hausman Instrumnets (1996)**: Average rates in other markets
- Uniform Pricing reinforces the relevance of these instruments Details

Supply of Deposits

- A monopolistic-competitive bank b that owns branches j across different local markets m maximize joint profits taking as given the downward sloping demand:

$$\Pi_b = \sum_{m \in \Omega_b} \sum_{j \in m} \{(R_{bm} - r_{jbm}) s_{jbm} D_m - C_{jbm}\}$$

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$$\Pi_b = \sum_{m \in \Omega_b} \sum_{j \in m} \{(R_{bm} - r_{jbm}) s_{jbm} D_m - C_{jbm}\}$$

- **Local Pricing:** Same deposit rate for all branches in the same market, $r_{jbm} = r_{bm}$:

$$R_{bm} - r_{bm} = \frac{1}{\alpha_m \left(1 - s_{bm}\left(r_{bm}, \mathbf{r}_{b'm}\right)\right)}$$

- **Uniform Pricing:** deposits priced uniformly across all markets, $r_{jbm} = r_b$:

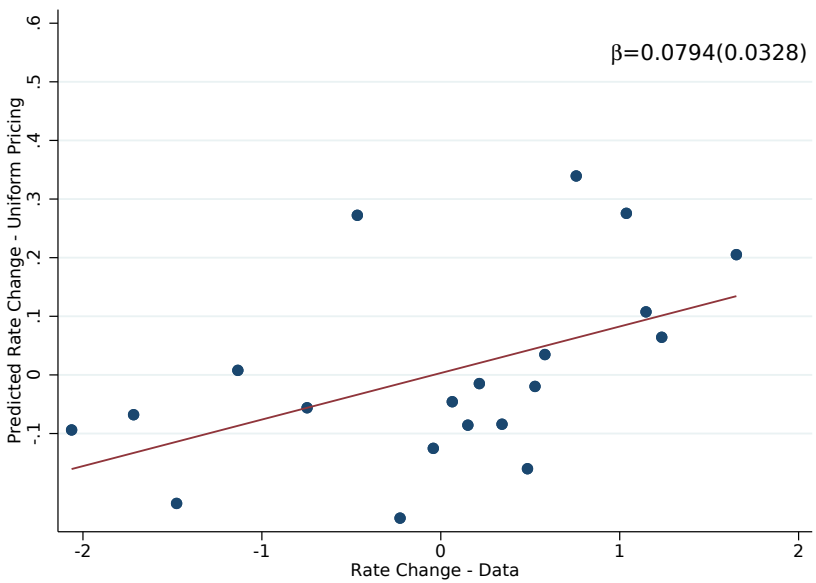
$$R_b - r_b = \frac{1}{\sum_{m \in \Omega_b} \alpha_m \left(1 - s_{bm}\left(r_b, \mathbf{r}_{b'}\right)\right) \delta_{b,m}}$$

Merger Simulations - Predicted Prices

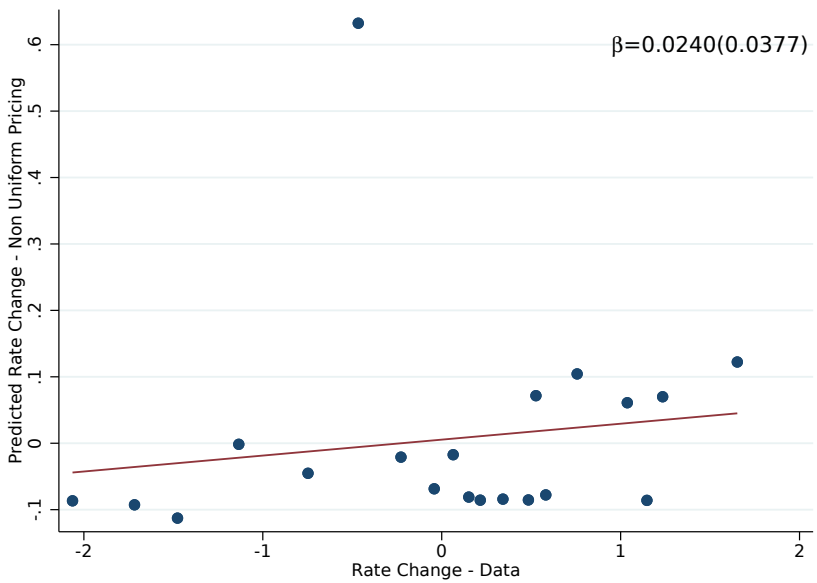
- For each observed merger, **compute equilibrium predicted prices** under Local and Uniform Pricing
  1. Obtain Returns using pre-merger data
  2. **Merger Simulation:** Acquired branches are associated with returns and characteristics of the acquirer $\Longrightarrow$ **Post-merger Predicted prices (Fixed-point)**

All branches of acquirer and acquiree

Uniform Pricing



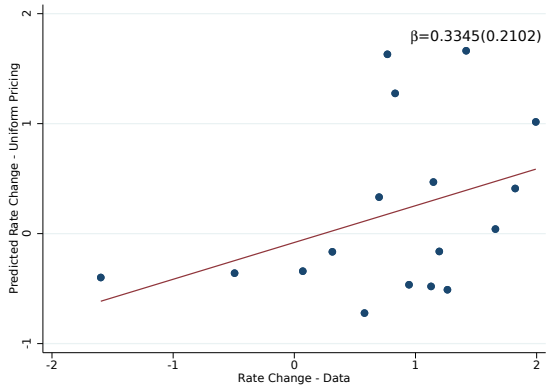
Local Pricing



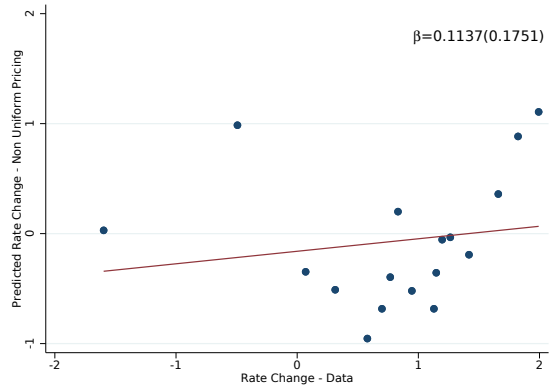
Merger Simulations - Predicted Prices

Acquiree Branches in Overlapping Markets

Uniform Pricing

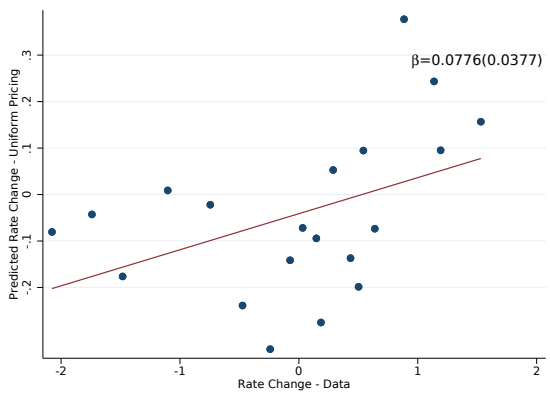


Local Pricing

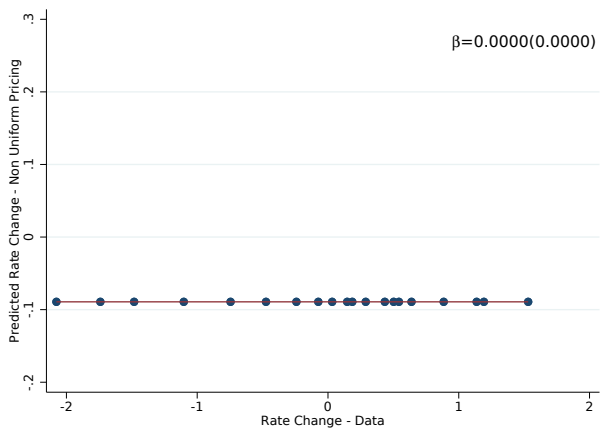


Acquirer Branches in non-overlapping markets

Uniform Pricing



Local Pricing



Welfare Impact of Mergers and Branch Divestitures - Results

- Bank and Branch characteristics change accordingly with the counterfactual in place
- Predicted Prices under Uniform pricing
- **Welfare Impact:**
  1. Merger if no divestitures imposed

$$\Delta \mathcal{W}_m^{NoDivestitures} = \mathcal{W}_m^{Merger} - \mathcal{W}_m^{NoMerger}$$

  2. Merger with divestitures

$$\Delta \mathcal{W}_m^{Divestitures} = \mathcal{W}_m^{MergerDivest} - \mathcal{W}_m^{Merger}$$

- Small and Rosen (1981), Nevo (2000):

$$\Delta \mathcal{W} = \ln\left(\sum_{i \in M} exp V_i^{post}\right) - \ln\left(\sum_{i \in M} exp V_i^{pre}\right)$$

	Welfare Difference		Rate Difference		Bank FE Difference	
	No Div	Div	No Div	Div	No Div	Div
Pre-Merger Rate Dif<0	.372	-5.943	2.867	2.251	-.301	-.328
Pre-Merger Rate Dif>0	-1.333	7.34	-3.071	2.567	.046	-.15

Conclusion

Three Empirical Facts:

- Uniform Pricing practices are pervasive in the US Banking Industry
- Uniform Pricing induce significant convergence between deposit and loan rates of acquired and acquirer following mergers
- Pre-merger difference in deposit and loan rates more important than predicted changes in local market concentration indices in explaining post-merger evolution of rates

Welfare Impact:

- On average, M&A can induce welfare gains (losses) when pre-merger deposit rate difference is negative (positive)
- On average, branch divestitures induced welfare losses: Lower deposit rates and lower bank quality

Facts and Welfare Estimation suggest that antitrust authorities should take into account the potential impact of uniform pricing practices in their merger approval decisions

Sample Formation

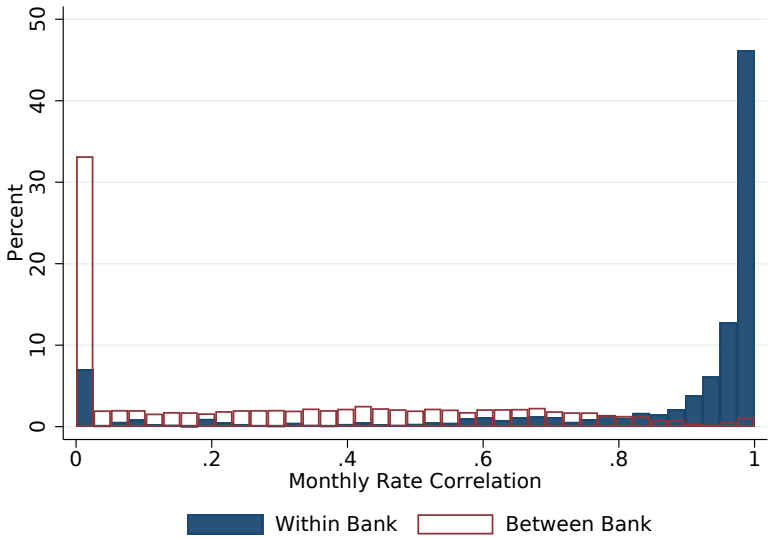
Panel A: Sample Formation

	No. Branches	No. Rate-Setters	No. Banks	No. States	No. Zips
1yrCD					
All Branches	108567	106642	9449	49	20807
Branches present for >=2 years	89102	9841	6884	49	19373
Acquired Branches	9370	2204	2006	49	6015
SAV100K					
All Branches	110824	109001	9497	49	20966
Branches present for >=2 years	81256	7482	5352	49	18792
Acquired Branches	2588	856	774	47	2132
Personal					
All Branches	63376	63170	4566	49	16320
Branches present for >=2 years	54507	4096	2803	49	15614
Acquired Branches	5666	481	444	47	4004
HELOC					
All Branches	70093	69940	4246	49	16126
Branches present for >=2 years	63217	4105	2670	49	15627
Acquired Branches	7311	488	472	49	4808

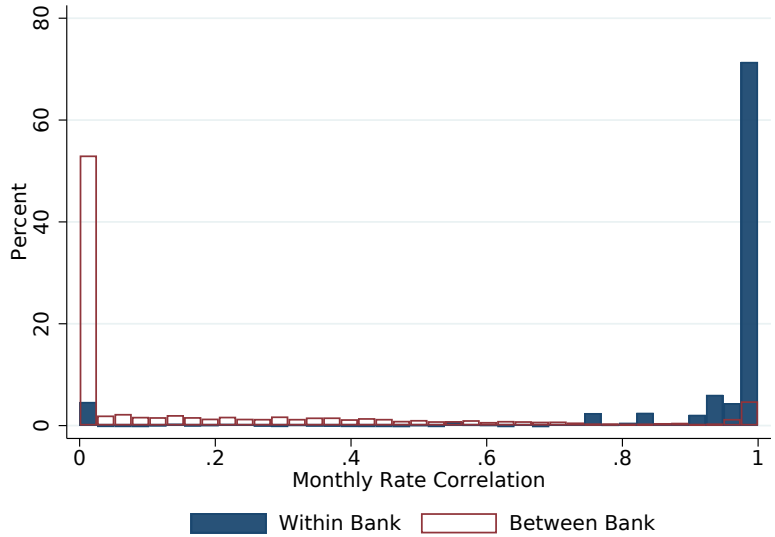
Data

Uniform Pricing - Monthly Rate Correlations

Panel A: 1yrCD



Panel B: SAV100K



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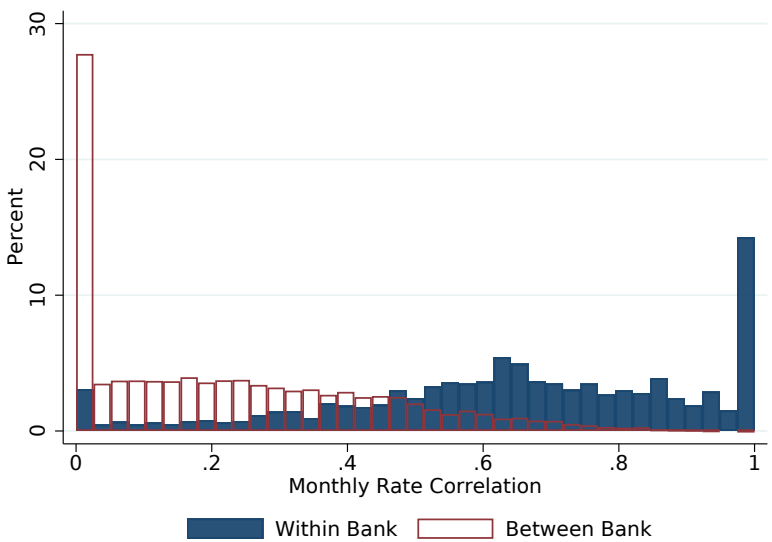
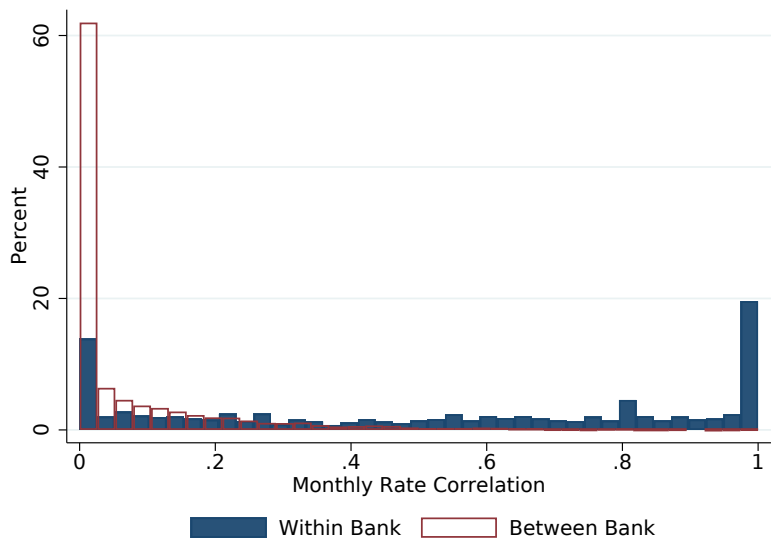


Panel D: Personal



Quarter Dif

Uniform Pricing - Similarity Rates Statistics

	Quarterly Absolute Rate Difference		**Monthly Rate Correlation**	
	Same Bank	Different Bank	Same Bank	Different Bank
		Panel A: All Branches		
12MCD10K	.023	.306	.798	.28
SAV100K	.001	.087	.903	.13
HELOC	.25	1.058	.645	.186
Personal	.405	2.929	.518	.02
		Panel C: Branches Pairs in the same Market		
12MCD10K	.002	.305	.927	.239
SAV100K	.001	.078	.977	.129
HELOC	.049	1.002	.911	.209
Personal	.031	2.865	.952	.034
		Panel D: Branches Pairs in different States		
12MCD10K	.025	.306	.784	.29
SAV100K	.001	.085	.896	.122
HELOC	.282	1.052	.6	.189
Personal	.479	2.887	.439	.022

Quarter Dif

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	$\left\lvert \frac{\text{Branch Rate - Acq. Med. Rate}}{\text{Acq. Med. Rate}} \right\rvert$							
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	(0.052)	(0.025)	(0.061)	(0.095)	(0.025)	(0.043)	(0.016)	(0.008)
Observations	110441	120036	40199	20808	17741	24887	23918	24525
Adjusted R^2	0.570	0.752	0.675	0.909	0.907	0.924	0.858	0.993
St $\times$ Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Branch FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

- Deposit Rate convergence more pronounced when acquirers have stronger uniform deposit pricing practices

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Potential Channels: Acquirer Size

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\left\lvert \frac{\text{Branch Rate - Acq. Med. Rate}}{\text{Acq. Med. Rate}} \right\rvert$							
	1yrCD		SAV100K		Personal		HELOC	
	Larger	Smaller	Larger	Smaller	Larger	Smaller	Larger	Smaller
Post-Acquisition	-0.362***	-0.317***	-0.509***	-0.908**	-0.099***	-0.469***	-0.061***	-0.184***
	(0.043)	(0.096)	(0.088)	(0.444)	(0.026)	(0.090)	(0.012)	(0.025)
Observations	134211	43261	47005	15490	26516	13458	23773	20518
Adjusted R^2	0.706	0.539	0.790	0.720	0.884	0.712	0.872	0.987
St $\times$ Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Branch FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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Potential Channels: Banking Market Overlap

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\left\lvert \frac{\text{Branch Rate - Acq. Med. Rate}}{\text{Acq. Med. Rate}} \right\rvert$							
	1yrCD		SAV100K		Personal		HELOC	
	Ovl	NoOvl	Ovl	NoOvl	Ovl	NoOvl	Ovl	NoOvl
Post-Acquisition	-0.471***	-0.237***	-0.505***	-0.429***	-0.336***	-0.143***	-0.120***	-0.063***
	(0.099)	(0.022)	(0.099)	(0.056)	(0.060)	(0.030)	(0.023)	(0.020)
Observations	70649	165158	25732	36943	15180	27829	15680	32889
Adjusted R^2	0.440	0.735	0.686	0.825	0.763	0.844	0.962	0.897
St $\times$ Mth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Branch FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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Potential Channels: Bank Merger vs Branch Acquisition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				$\left\lvert\frac{\text{Branch Rate - Acq. Med. Rate}}{\text{Acq. Med. Rate}}\right\rvert$				
	1yrCD		SAV100K		Personal		HELOC	
	Bank	Branch	Bank	Branch	Bank	Branch	Bank	Branch
Post-Acquisition	-0.306***	-0.330***	-0.661***	-0.407***	-0.094***	-0.251***	-0.020**	-0.149***
	(0.045)	(0.031)	(0.097)	(0.062)	(0.028)	(0.042)	(0.008)	(0.028)
Observations	92419	151779	20276	44482	12414	31863	14811	35518
Adjusted R^2	0.620	0.636	0.754	0.799	0.948	0.753	0.929	0.893
State × Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Branch FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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Potential Channels: Excluding Bank Fails

	(1)	(2)	(3)	(4)
		$\left\lvert \frac{\text{Branch Rate - Acq. Med. Rate}}{\text{Acq. Med. Rate}} \right\rvert$		
	1yrCD	SAV100K	Personal	HELOC
Post-Acquisition	-0.346***	-0.503***	-0.051*	-0.021*
	(0.045)	(0.104)	(0.027)	(0.012)
Observations	158074	49463	34114	40218
Adjusted R^2	0.686	0.782	0.918	0.897
State $\times$ Month FEs	Yes	Yes	Yes	Yes
Branch FEs	Yes	Yes	Yes	Yes

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Potential Channels: Only Different BHC

	(1)	(2)	(3)	(4)
		$\left\lvert \frac{\text{Branch Rate - Acq. Med. Rate}}{\text{Acq. Med. Rate}} \right\rvert$		
	1yrCD	SAV100K	Personal	HELOC
Post-Acquisition	-0.280***	-0.024	0.016**	-0.111***
	(0.038)	(0.029)	(0.008)	(0.022)
Observations	21810	18462	17631	19991
Adjusted R^2	0.759	0.854	0.841	0.879
State $\times$ Month FEs	Yes	Yes	Yes	Yes
Branch FEs	Yes	Yes	Yes	Yes

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Potential Channels: Excluding Acquired Banks with Low Tier1 Ratio

	(1)	(2)	(3)	(4)
		$\left\lvert \frac{\text{Branch Rate - Acq. Med. Rate}}{\text{Acq. Med. Rate}} \right\rvert$		
	1yrCD	SAV100K	Personal	HELOC
Post-Acquisition	-0.372***	-0.471***	-0.259***	-0.131***
	(0.040)	(0.076)	(0.055)	(0.018)
Observations	157256	52319	34533	39036
Adjusted R^2	0.605	0.799	0.746	0.978
State $\times$ Month FEs	Yes	Yes	Yes	Yes
Branch FEs	Yes	Yes	Yes	Yes

- Results are not driven by Acquired Banks having low Tier1 Ratio

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Decomposing Rate Convergence

	(1)	(2)	(3)	(4)	(5)	(6)
	$(\text{Branch - Acq. Med. Rate})^{Pre} > 0$			$(\text{Branch - Acq. Med. Rate})^{Pre} < 0$		
	Br - Acq. Med.	Branch	Acq. Med.	Br - Acq. Med.	Branch	Acq. Med.
1yrCD						
Post-Acquisition	-0.160***	-0.128***	0.032***	0.125***	0.094***	-0.030***
	(0.014)	(0.014)	(0.007)	(0.011)	(0.011)	(0.008)
Observations	126038	126038	126038	105508	105508	105508
Adjusted R^2	0.714	0.981	0.989	0.886	0.983	0.990
SAV100K						
Post-Acquisition	-0.051***	-0.049***	0.002	0.040***	0.035***	-0.005***
	(0.006)	(0.006)	(0.001)	(0.004)	(0.004)	(0.002)
Observations	29955	29955	29955	26212	26212	26212
Adjusted R^2	0.746	0.835	0.939	0.799	0.887	0.944
Personal						
Post-Acquisition	-1.732***	-1.446***	0.285***	1.073***	1.094***	0.021
	(0.170)	(0.201)	(0.099)	(0.137)	(0.155)	(0.072)
Observations	86707	86707	86707	50760	50760	50760
Adjusted R^2	0.891	0.941	0.969	0.852	0.943	0.975
HELOC						
Post-Acquisition	-0.720***	-0.687***	0.034	0.331***	0.208***	-0.122***
	(0.054)	(0.052)	(0.021)	(0.073)	(0.049)	(0.045)
Observations	47863	47863	47863	134138	134138	134138
Adjusted R^2	0.850	0.937	0.952	0.924	0.963	0.979
State $\times$ Month FEs	Yes	Yes	Yes	Yes	Yes	Yes
Branch FEs	Yes	Yes	Yes	Yes	Yes	Yes

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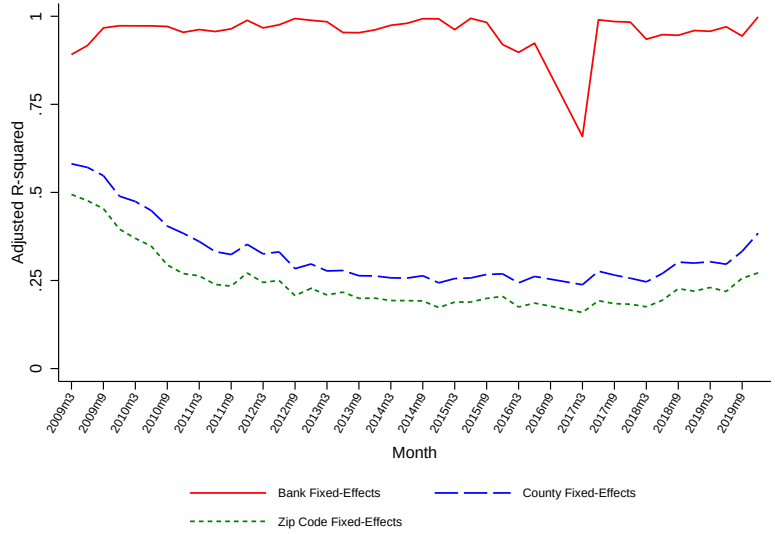
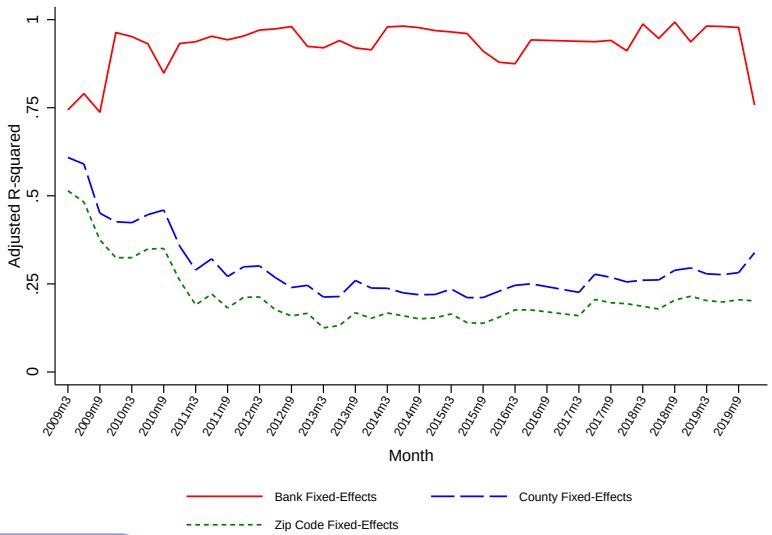
Uniform Fees - Bank Fixed Effects

Panel A: Monthly Fee on Interest Checking

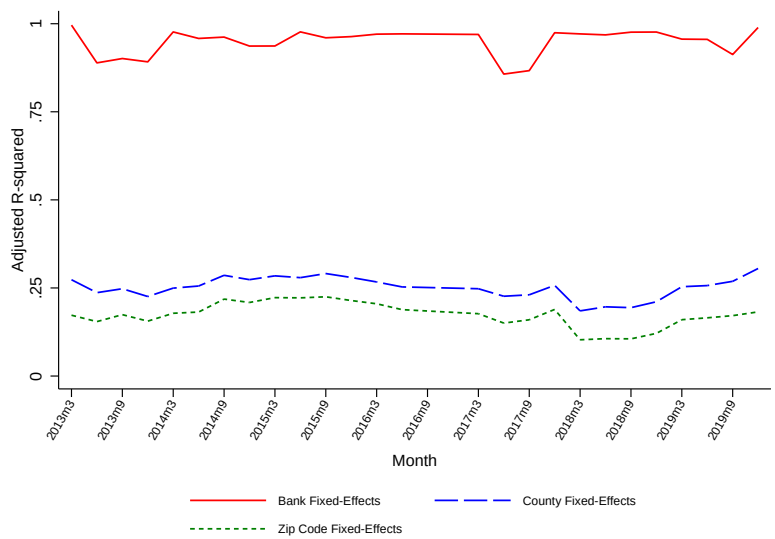
Panel B: Stop Payment Fees



Panel C: ATM Out of Network Transaction Fee



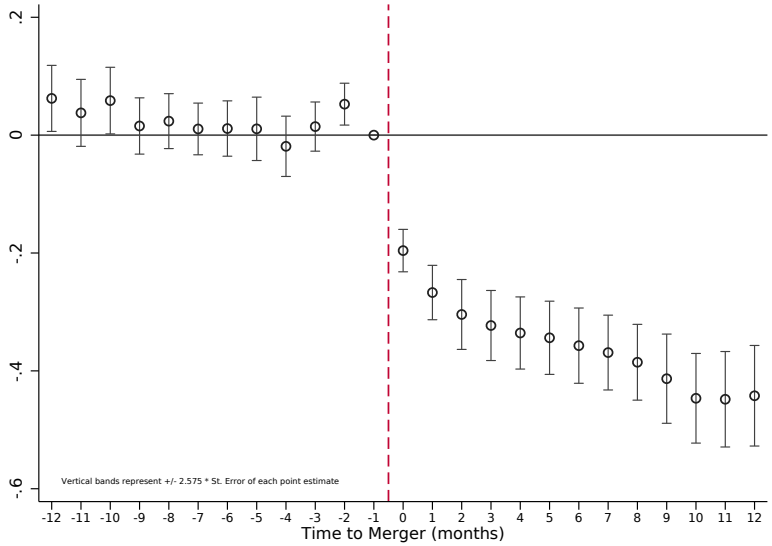
Panel D: Overdraft Fee - Returned Deposit Item



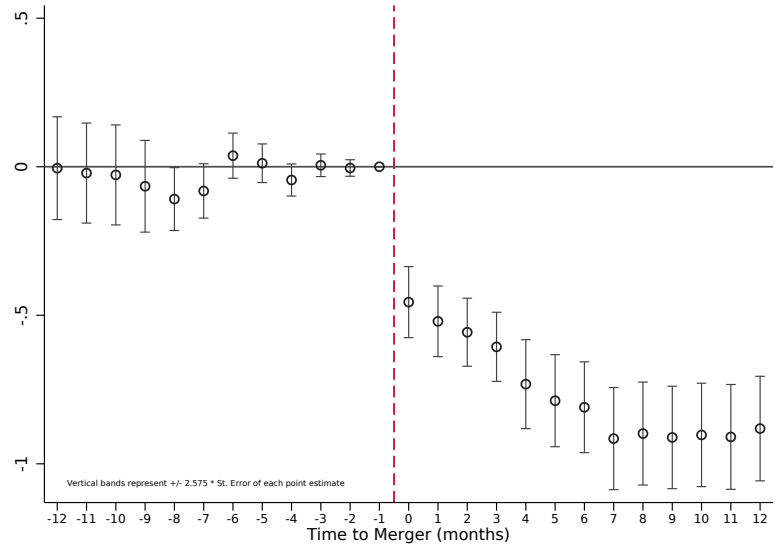
Quarter Dif

Differences-in-Differences: Tracing the Effects over Time

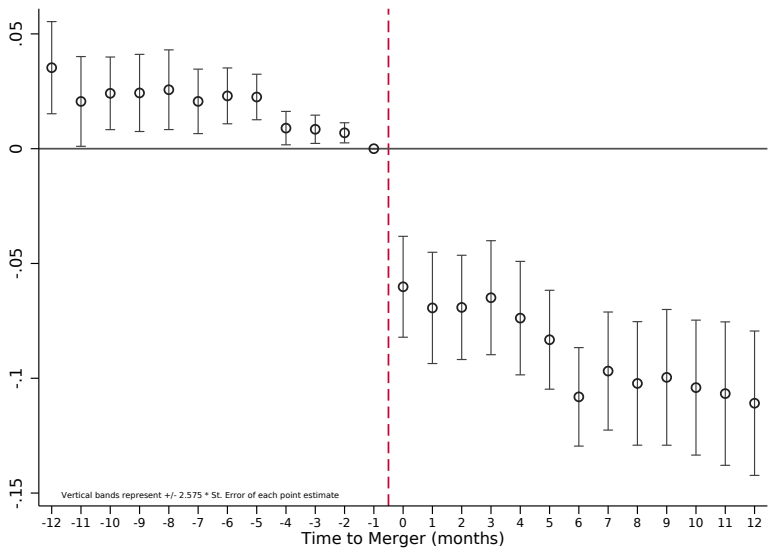
Panel A: 1yrCD



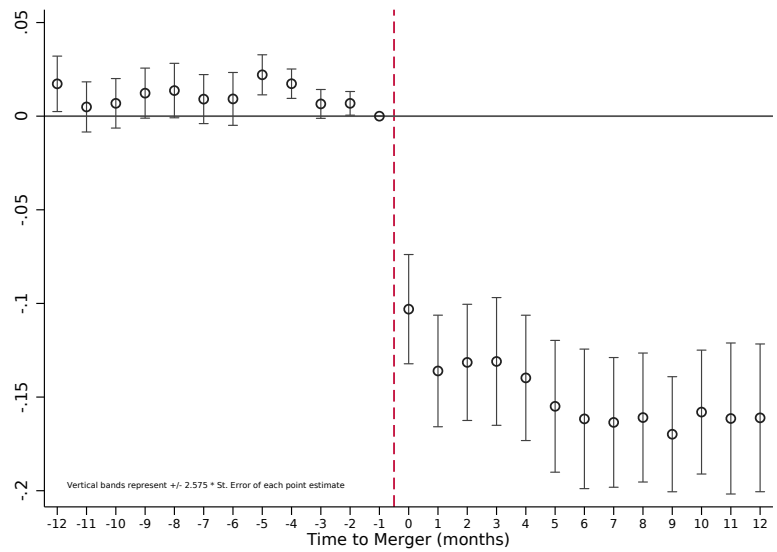
Panel B: SAV100K



Panel C: HELOC



Panel D: Personal



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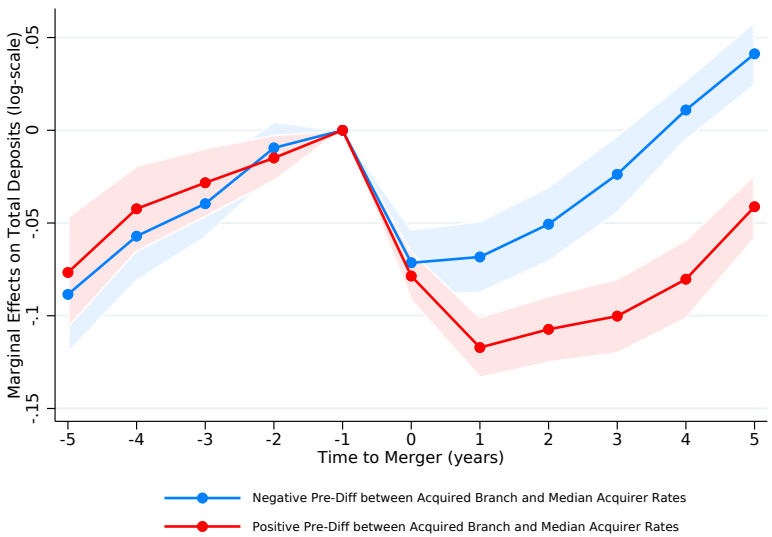
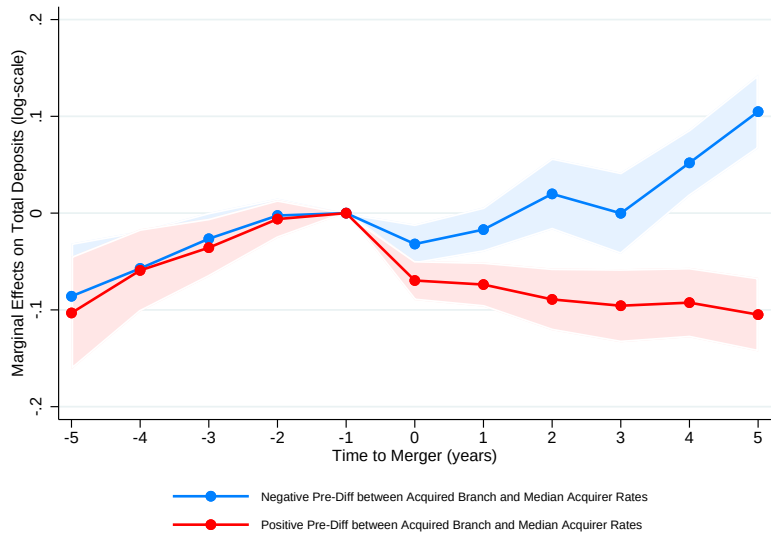
Deposits evolution depends on pre-merger rate differences

$$Y_{i,t,s} = \gamma_t + \theta_i + \sum_{s=-5}^{s=5} \beta_s \delta_s + \sum_{s=-5}^{s=5} \lambda_s \delta_s \times \frac{(Branch\ Rate\ -\ Acq.\ Med.\ Rate)}{Acq.\ Med.\ Rate}_i^{Pre} + \epsilon_{i,t,s}$$

Panel A: 1yrCD



Panel B: SAV100K



- Target branches recover deposit quantities faster when branch rates increase as a result of uniform pricing practices

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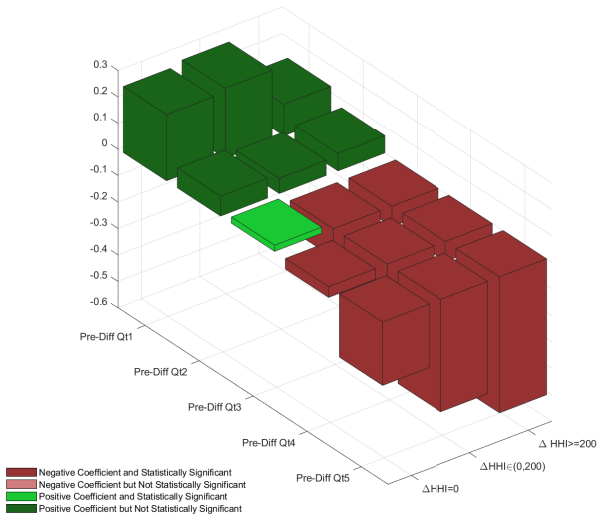
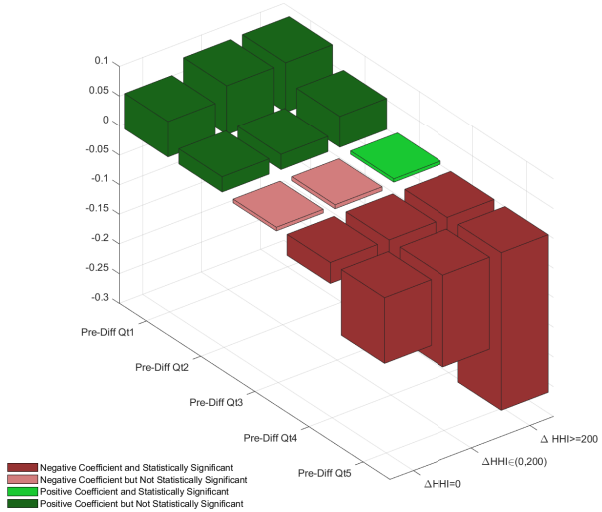
Local Concentration vs Rate Convergence

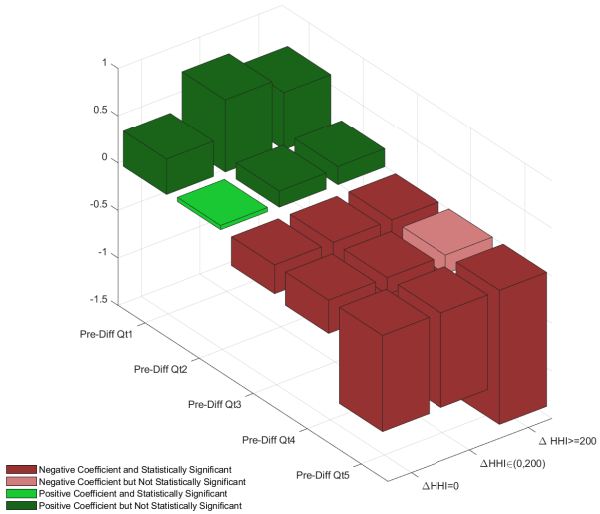
Panel A: 1yrCD



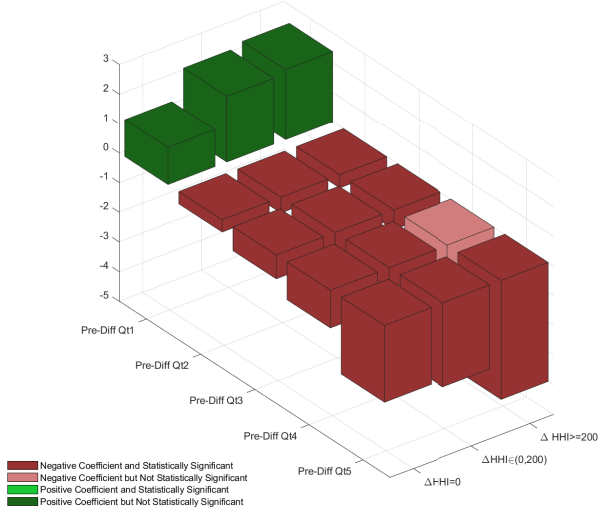
Panel B: SAV100K



Panel C: HELOC



Panel D: Personal



Model Estimation and Data

- Following Egan-Hortacsu-Seru (AER, 2017), we normalize the benefits of the outside option to $\delta_O = 0$

$$\ln s_{j,z,m,b,t} - \ln s_{O,m,t} = \alpha \left(r_{j,t} - r_{O,t} \right) + \beta_0 X_{j,t} + \beta_1 \left(H_{b,m,t} - H_{O,m,t} \right) + \delta_b + \gamma_z$$

- By including market-time FE, that absorbs the outside option in each market, the specification collapses to:

$$\ln s_{j,z,m,b,t} = \alpha r_{j,t} + \beta_0 X_{j,t} + \beta_1 H_{b,m,t} + \delta_b + \gamma_z + \chi_{m,t}$$

Model Estimation and Data

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Instruments

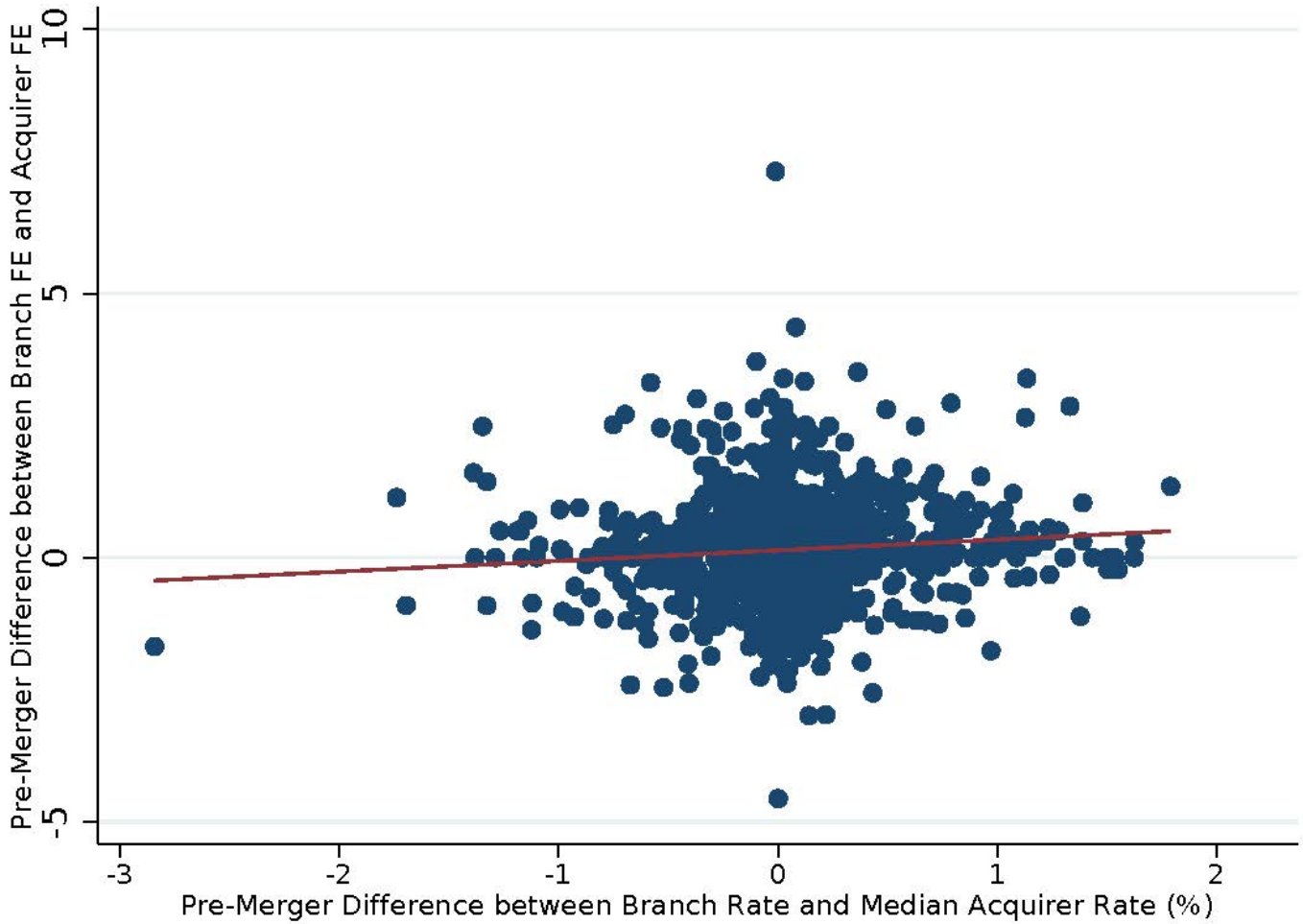
- Hausman (1996): Average rates in other markets
- Uniform Pricing reinforces the relevance of these instruments Back

Demand Estimation - Results

	(1)	(2)	(3)	(4)	(5)	(6)
			Branch Share			
	OLS	IV	OLS	IV	OLS	IV
12M10K	0.037***	0.025**	0.031***	0.017*	0.042***	0.028***
	(0.010)	(0.010)	(0.009)	(0.010)	(0.009)	(0.008)
Observations	855520	817189	855520	817189	855520	817189
Adjusted R^2	0.877		0.877		0.891	
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Market Controls			Yes	Yes	Yes	Yes
Branch Controls					Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Zip Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Market $\times$ Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

- Branch Level Deposits [SOD]
- Deposit Rates: 12 Month CD [RateWatch]
- Bank Controls [Call reports]: Assets, Total Loans, NPL, ROE, Tier1
- Market Controls: Bank Branches and presence (years) in market [SOD]
- Branch Controls: Branch age [SOD]

Convergence in rates or convergence in qualities



- Sorting pattern does not indicate a strong pre-merger correlation between differences in rates and differences in perceived qualities (δ_b)

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