Bank Tax and Deposit Competition: Evidence from US State Taxes

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Introduction

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- Deposit is an essential part of the financial market.
  - $17.6 trillion in the US commercial banks by March 2023.
  - Existing literature has discussed its relationship with financial fragility, monetary policy transmission, bank value, retail stock market participation, etc.

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  - Deposit pricing is localized.
  - Matching tax exposure and deposit response are empirically challenging.

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  - Deposit pricing is localized.
  - Matching tax exposure and deposit response are empirically challenging.
- We leverage staggered US states bank-specific tax changes as a quasi-experimental setting to test how local deposit prices respond to local tax shocks.
- Explore the role of deposit competition.

State bank tax

- State taxes account for 7%-42% of banks' domestic tax expenses in US.

Table: Bank current income domestic tax expenses examples (FY 2021 in millions $)

(a) National banks

Bank	Main operation	Federal	State and Local	State tax/total
JP Morgan Chase	Global	2,865	1,897	40%
Citi Group	Global	522	228	30%
Bank of America	Global	1,076	775	42%
Wells Fargo	US	5,850	849	13%
Fifth Third	Midwestern	657	102	13%

(b) State banks

Bank	Main operation	State tax type	State tax rate	State tax/total
Texas Capital	Texas	Franchise tax	0.75%	7%
Umpqua	Oregon	Income tax	7.60%	26%
Commerce	Missouri	Income tax	4.48%	13%

Results Overview

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- Banks pass on state tax burdens to local depositors by lowering deposit rates (*intensive margin*).
  - 5 - 10 basis points reduction in deposit rates for one percentage point of tax increase.
  - Deposit outflows in the first two years.

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- Competition plays an essential role in banks' tax pass-through
  - Direct channel
  - Indirect channel (*extensive margin*)

Literature

- **Deposit activities**

  Diamond and Dybvig, 1983; Goldstein and Pauzner, 2005; Berlin and Mester, 1999; Drechsler, Savov, and Schnabl, 2017; Drechsler, Savov, and Schnabl, 2021; Egan, Hortacsu, and Matvos, 2017; Egan, Lewellen, and Sunderam, 2022.

- **Tax on banks**

  Han, Park, and Pennacchi, 2015; Kang, Li, and Lin, 2017; Schepens, 2016; Capelle-Blancard and Havrylchyk 2017; De Mooij and Keen, 2016; Albertazzi and Gambacorta, 2010; Buch, Hilberg, and Tonzer, 2016.

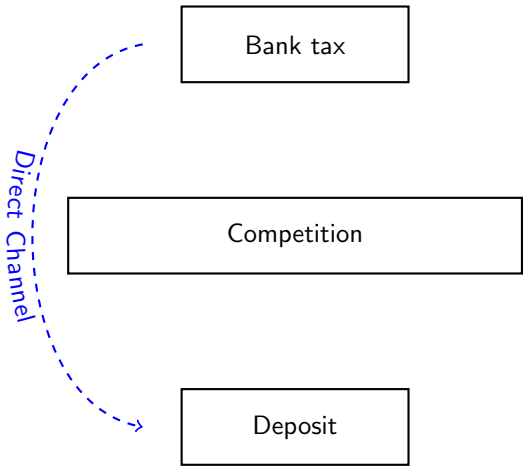
- **Tax incidence and competition** Alm, Sennoga, and Skidmore ,2009; Weyl and Fabinger, 2013; Belleflamme and Toulemonde, 2018; Cabral, Geruso, and Mahoney, 2018; Genakos and Pagliero, 2022.

- **Corporate response to local shocks**

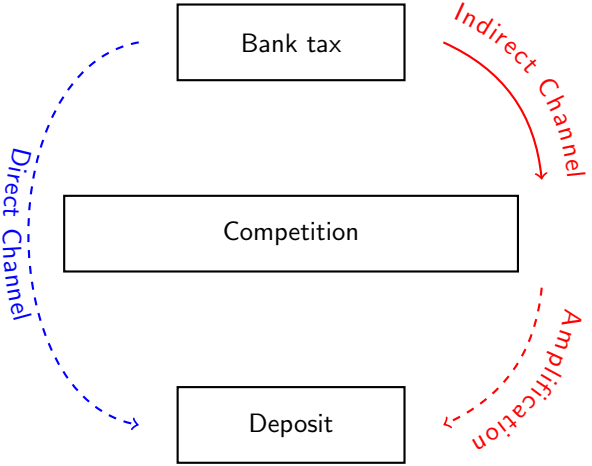
  Butters, Sacks, and Seo, 2022; Cortés and Strahan, 2017; Suárez Serrato and Zidar, 2016; DellaVigna and Gentzkow, 2019; Adams and Williams, 2019; Fuest, Peichl, and Siegloch, 2018.

Model

- Trade-off between tax benefit of debt and cost of equity
- Tax incidence happens when:
  - leverage is high
  - deposit is inelastic
- Competition makes deposit more elastic: lower pass-through



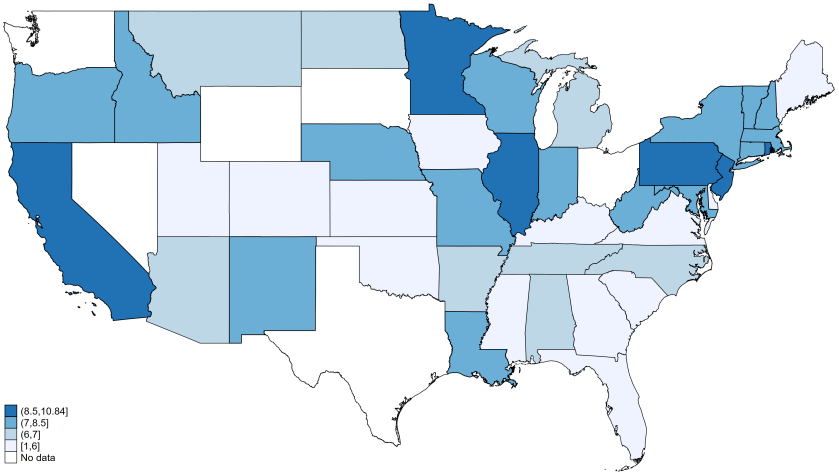
Model



- Barrier to enter: V_c
- Participation constrain:
  Post-tax value $\geq V_c$
- Tax change affects Post-tax value
- Natural monopoly
- Entry, not exit

Bank Tax By States (2011)

- On average, one-third of the bank branches in our sample experienced tax changes each year. Full data



Identifying bank's tax change exposure

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- Nexus test: is a bank liable to pay tax in a given state?
  - Physical presence nexus: widely accepted and well defined.

  or

  - Economic nexus: controversial and not universally adopted across states.

- Physical presence nexus conditions would include having an employee(s) working in the states; having tangible property in the states; or soliciting sales in the states.
- Challenges: physical presence information is difficult to obtain for general firms.

- Our setting:
  - Branch operation satisfies the physical presence nexus.
  - Directly link local tax change exposure with responses at the branch and local competition changes.

Data

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- RateWatch
  - Certificate of deposit rates (12 months 10K CD) at branch level
- Hand-collected state level non-bank & bank corporate income tax rates and personal income tax rates.
  - State Tax Handbook, Book of the States, Tax Policy Center and Tax Foundation.
  - State income tax $\neq$ Federal income tax
  - Corporate Tax $\neq$ Bank Tax
    - E.g. Iowa: the tax rate on the banks is 12% while tax on the non-banks is 5% in 1999
- Summary of Deposits branch level information
  - Geographic location, branch deposit holding, local competition, etc.
- US census - county controls: socio-economic factors
- FR Y-9C Regulatory Data - bank controls: bank holding company balance sheet
- Full sample: 43,312 Branch-Year observations between 2001-2014.

Geographic Discontinuity

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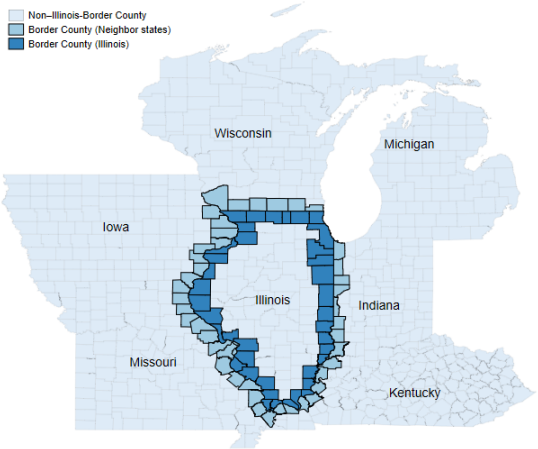
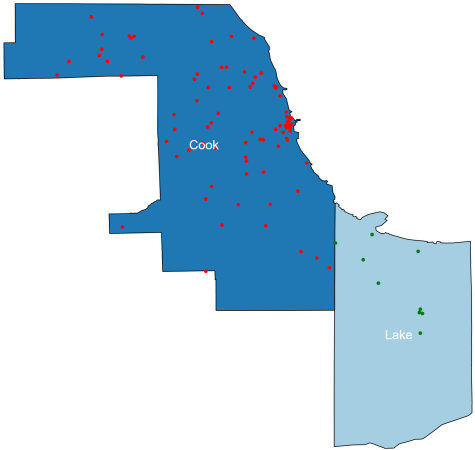
(a) Adjacent counties (Illinois 2011)



(b) Bank branches

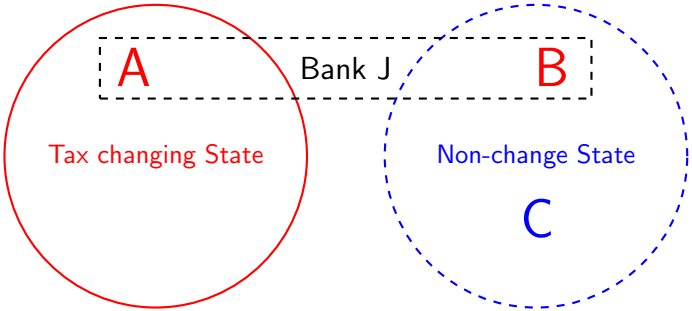


Stacked DID analysis: Deposit Rates

- Branches offer lower deposit rates after increases in the local bank tax rates.

	Dependent variable: bank branch deposit rate				
	(1) Full sample	(2)Adjacent	(3) One tax	(4)Personal tax	(5) Dynamics
Post×Treat	-8.23***	-5.96*	-10.96**	-8.28***	
	(2.18)	(3.48)	(5.51)	(2.19)	
Year 0×Treat					-13.42***
					(2.31)
Year 1×Treat					-5.82***
					(2.08)
Year 2×Treat					-8.46***
					(2.77)
Year 3×Treat					-8.59***
					(2.54)
Non-bank tax	1.82***	1.36	1.38	1.61**	3.29***
	(0.70)	(1.00)	(1.19)	(0.73)	(0.78)
Personal tax				0.82	
				(0.68)	
Constant	-70.77	-110.46	271.45	-70.37	-73.46
	(98.30)	(337.97)	(209.59)	(98.38)	(98.56)
Controls and fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	61,107	5,610	18,836	61,107	61,107
Adjusted R^2	0.92	0.94	0.86	0.92	0.92

Spillover Effects



- A: affected branch
- B: spillover branch
- C: unaffected branch
- Bank J: parent bank of branch A and branch B

- No spillover sample: Results remain consistent after dropping spillover branches in the control group (A v.s C).
- Spillover test: No spillover effect on those branches within the affected network (B v.s C).

Absence of Spillover

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	Bank branch deposit rate		
	(1) No spillover sample	(2) No spillover sample	(3) Spillover
Post×Tax change	-7.05***		
	(2.36)		
Year 0×Tax change		-13.06***	
		(2.40)	
Year 1×Tax change		-4.66**	
		(2.19)	
Year 2×Tax change		-7.26**	
		(2.98)	
Year 3×Tax change		-7.17***	
		(2.75)	
Post×Spillover			-0.97
			(1.81)
Non-bank tax	1.64**	3.38***	2.13**
	(0.76)	(0.82)	(1.06)
Constant	-56.61	-60.47	-65.40
	(100.53)	(100.82)	(197.74)
Controls and fixed effects	Yes	Yes	Yes
Observations	56,385	56,385	26,503
Adjusted R^2	0.92	0.92	0.91

Stacked DID Analysis: Deposit Flows

- Counties experience deposit outflows within the first two years of local tax changes.

	Dependent variable: county deposit flow	
	(1) Full sample	(2) Dynamics
Post×Treat	-0.01*	
	(0.00)	
Year 0×Treat		-0.03***
		(0.01)
Year 1×Treat		-0.01**
		(0.00)
Year 2×Treat		-0.00
		(0.00)
Year 3×Treat		0.00
		(0.00)
Non-bank tax	0.00	0.01***
	(0.00)	(0.00)
Controls and fixed effects	Yes	Yes
Observations	20,562	20,562
Adjusted R^2	0.18	0.18

Additional analysis

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- Placebo test Full Table
  - Credit Unions
- Cross-sectional analysis Full Table
  - Branch level NIM
  - National bank
  - Bank profitability
- Loan products Full Table
  - Personal unsecured loans & Mortgages
  - No pass-through to retail borrowers
    - Asymmetric pass-through in the two-sided market
    - Inelastic deposit v.s. elastic loans.
    - Other channels for banks to pass through tax cost changes in the loan market.

Effects of Competition

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- We further examine the role of competition.
  - Does the observed tax pass-through varies with local competition?
  - Does tax change directly affect local competition?

- Competition plays an essential role in banks' tax pass-through
  - **Direct channel**:
    - Local competition reduces the impact of taxes incidence on depositors. Full Table
  - **Indirect channel**:
    - But higher taxes also weaken competition (*extensive margin*). Full Table
    - Weaker competition is due to fewer new entries, not more exits. Full Table

Conclusions

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- Tax incidence on deposits
  - Banks pass tax burdens to depositors by offering lower deposit rates.
  - Consequently, deposits flow out of high-tax regions.
  - Tax pass-through tends to be localized.

- Role of competition
  - High levels of competition mitigate the banks' tax pass-through.
  - Tax raise would also erode local competition and amplify the tax cost pass-through.
  - Highlights the importance of entry barriers and their interaction with tax changes.

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Appendix

Controls

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(a) County information

Variable	Data source	Details
Real GDP	BEA	ln(Annual county real GDP)
GDP growth	BEA	Real GDP growth
House price	U.S. Census	Average housing pricing
Median income	U.S. Census	ln(Median Household Income)
Establishments	BLS	ln(Number of establishments)
Unemployment	BLS	County unemployment rate
Population	U.S. Census	ln(Total population)

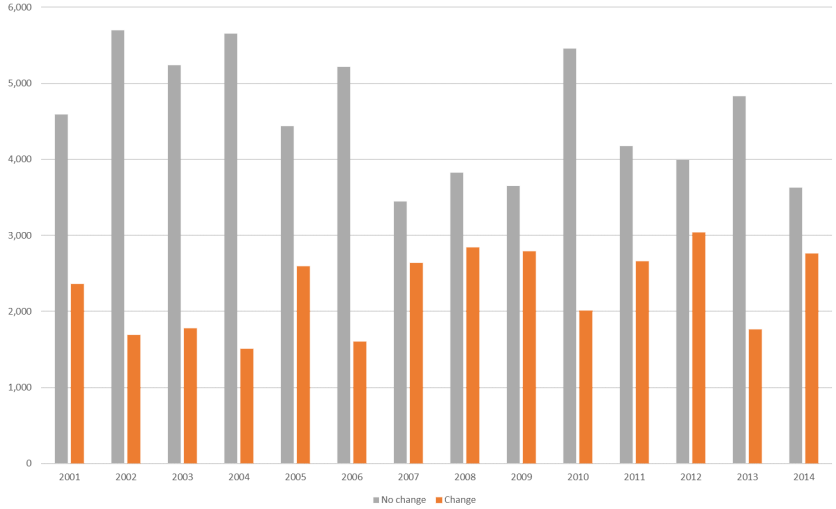
(b) Local competition (county)

Variable	Data source	Details
Branch HHI	SOD	HHI of branch deposit holdings
County branch count	SOD	Number of branch in the county
Bank HHI	SOD	HHI of bank deposit holdings
County bank count	SOD	Number of bank in the county

(c) Commercial bank and credit union controls

Variable	Data source	Details
Age	Call reports and SNL	Number of years since establishment
Credit risk	Call reports and SNL	(Loan provisions)/(Total Loans)
Profitability	Call reports and SNL	ROA=Net incomes / Total assets
Size	Call reports and SNL	ln(Total assets)

Tax Changes By Year



Branches affected by bank tax changes by year 2001-2014 Back

Model

- Stylized facts:
  - Banks lower deposit rates in response to a tax increase
  - The pass-through is stronger when there is less competition
- Consider an economy with N symmetric banks that compete on deposit rates
- Each bank also pays a charter cost V_c
- Face linear demand for deposits

$$r^d(D) = \alpha + \beta D = \alpha + \beta N d$$

with $\alpha, \beta > 0$

- Raise equity at return r^e from outside investors

$$\frac{\partial r^e}{\partial e} < 0, \ \frac{\partial^2 r^e}{\partial (e)^2} < 0$$

Banker's Problem

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- Balance sheet constraint $\ell = d + e$
- Leverage constraint $\ell/e \leq \bar{\lambda}$, with $\bar{\lambda} > 1$
- Each banker $i = 1, ..., N$ maximizes the value of inside equity

$$\max_{\ell_i, d_i} (1 - \tau) \left(r^{\ell}(L)\, \ell_i - r^{d}(D)\, d_i \right) - r^{e}(e_i)\, e_i$$

  Given the constraints, where τ is the tax rate

- Each bank operates if and only if its net profits are above the charter value $V_c > 0$

$$(1 - \tau) \left(r^{\ell}(L)\, \ell_i - r^{d}(D)\, d_i \right) - r^{e}(e_i)\, e_i - V_c \geq 0$$

Results: Taxes and Deposit Rates

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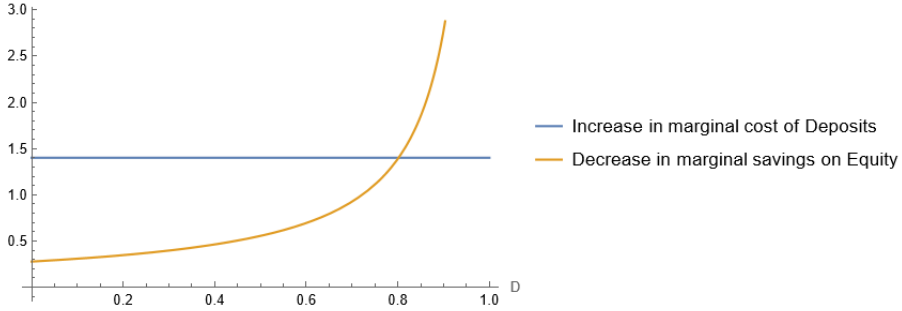
- Normalize aggregate loans $L = 1$, take return $r^{\ell}(1)$ as given
- Assume the leverage constrain is not binding
- First order condition with respect to deposits

$$\underbrace{r^e + \frac{\partial r^e}{\partial e}\frac{1-D}{N}}_{\text{Marginal savings on equity costs}} = \underbrace{(1-\tau)\left(r^d + \beta D\right)}_{\text{Marginal cost of additional deposits}}$$

- Use implicit function theorem to show where $\partial r^d / \partial \tau < 0$
- Deposit rates are decreasing in taxes if and only if

$$\underbrace{-\frac{\partial^2 r^e}{\partial (e)^2}\frac{\partial D}{\partial r^d}\frac{1-D}{N^2} - \frac{2}{N}\frac{\partial r^e}{\partial e}\frac{\partial D}{\partial r^d}}_{\text{Decrease in marginal savings of equity wrt } r^d} > \underbrace{2(1-\tau)}_{\text{Increase in the marginal cost of deposits wrt } r^d}$$

Visual Interpretation



- Banks pass through their tax burden when leverage is high

Results: Taxes and Competition

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- Assume we are in the pass-through region $\partial r^d / \partial \tau < 0$
- This pass-through in decreasing in the number of banks N
- Individual banks' profits are also decreasing in taxes τ and N
- Because of the fixed charter cost, there exists a maximum number of banks $\bar{N}$
- A sufficiently large tax increase reduces $\bar{N}$, thus reducing competition

Summary: Pass-through and Market Conditions

	Number of Banks	Leverage	Deposit Demand Elasticity	Deposit Demand Curvature	Equity Return Slope	Equity Return Curvature
Pass-through	$\downarrow$	$\downarrow$	?	$\downarrow$	$\downarrow$	$\downarrow$

How could bank tax affect bank deposits?

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- Tax benefit of debt:
  - When tax rate increases, banks would lower the equity levels to increase ROE.
  - Higher deposit rate to compensate stronger deposit demand and higher default risk.
  - High bank tax $\rightarrow$ high deposit rate.
- Tax incidence:
  - Banks pass through the tax costs to depositors by lowering the deposit rates.
  - High bank tax $\rightarrow$ low deposit rate.
- Tax irrelevance:
  - Banks' pricing decision is a *pre-tax* profitability maximization problem.
  - Tax rate is a scaling factor and does not affect bank's pricing decision.
  - High bank tax $\rightarrow$ deposit rate unchanged.

Placebo tests: Credit Unions

- Tax changes have no effect on tax-exempt credit unions. Back

	Dependent variable: credit union branch deposit rate	
	(1) Full sample	(2) Dynamics
Post×Treat	-2.30	
	(3.54)	
Year 0×Treat		1.12
		(5.40)
Year 1×Treat		-3.83
		(3.34)
Year 2×Treat		1.21
		(4.21)
Year 3×Treat		-4.99
		(4.00)
Non-bank tax	1.72	0.82
	(1.32)	(1.68)
Constant	908.67***	911.33***
	(196.43)	(194.98)
Controls and fixed effects	Yes	Yes
Observations	22,912	22,912
Adjusted R^2	0.95	0.95

DID Analysis: cross section

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- High profitability banks pass through less. Back

	Bank branch deposit rate		
	(1) High branch NIM	(2)National bank	(3) High bank ROA
Post×Treat	-13.17***	-9.62***	-10.95***
	(4.52)	(2.02)	(2.38)
High branch NIM×Post×Treat	5.72		
	(5.19)		
National bank×Post×Treat		7.88	
		(7.79)	
High bank ROA×Post×Treat			5.56***
			(2.15)
Non-bank tax	2.34	1.96***	2.08***
	(1.60)	(0.72)	(0.72)
Constant	-735.05**	-118.70	-80.18
	(307.72)	(97.64)	(97.75)
Controls and fixed effects	Yes	Yes	Yes
Observations	7,918	58,424	61,107
Adjusted R^2	0.92	0.92	0.92

DID Analysis: loan products

- Banks do not pass through their tax burdens to retail borrowers. Back

	Bank branch loan rate			
	Unsecured personal loans		Mortgages	
	(1) Full sample	(2) Dynamics	(3) Full sample	(4) Dynamics
Post×Treat	-1.05		-2.17	
	(20.45)		(2.66)	
Year 0×Treat		-38.56		13.74
		(25.81)		(11.12)
Year 1×Treat		-0.61		-5.42
		(22.54)		(3.93)
Year 2×Treat		10.28		-0.55
		(24.08)		(3.97)
Year 3×Treat		2.30		-2.25
		(26.23)		(2.93)
Non-bank tax	-0.66	8.94	2.16	-3.56
	(6.92)	(9.64)	(1.54)	(4.60)
Constant	2,079.28**	2,047.24*	838.46***	842.12***
	(1,051.39)	(1,053.11)	(184.34)	(184.73)
Controls and fixed effects	Yes	Yes	Yes	Yes
Observations	22,744	22,744	11,441	11,441
Adjusted R^2	0.42	0.42	0.88	0.88

DDD analysis: Effects of Competition

- Tax pass-through is weaker in high-competition markets. Back

	Bank branch deposit rate	
	(1) Full sample	(2)Adjacent counties
Post × Treat × High competition	8.46***	14.77**
	(3.19)	(6.24)
Post × Treat	-12.71***	-12.71***
	(2.15)	(4.51)
Non-bank tax	1.67**	1.16
	(0.71)	(1.00)
Constant	-80.22	-158.49
	(99.09)	(327.73)
Controls and fixed effects	Yes	Yes
Observations	60,316	5,610
Adjusted R^2	0.92	0.94

Tax impact on local competition

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- Local competition becomes weaker after local tax increases. Back

	Dependent variable: local competition			
	(1) Branch HHI	(2) Bank HHI	(3) Branch No.	(4) Bank No.
Post×Treat	99.76**	108.23***	-2.88***	-0.58***
	(41.68)	(39.51)	(0.52)	(0.10)
Non-bank tax	-15.17**	-11.97*	0.26**	0.05**
	(6.63)	(6.93)	(0.11)	(0.03)
Constant	3,238.84***	5,980.40***	-226.73***	-35.31***
	(1,173.09)	(1,279.50)	(40.19)	(5.03)
Controls and fixed effects	Yes	Yes	Yes	Yes
Observations	21,721	21,721	21,721	21,721
Adjusted R^2	0.94	0.94	0.99	0.99

Exit and Entry

- Local competition change is driven by fewer entries. Back

	County branch exit/entry			
	(3) Entry/total	(4) Exit/total	(1) Entry No.	(2) Exit No.
Post×Treat	-0.03***	0.00	-0.60*	-0.03
	(0.01)	(0.00)	(0.31)	(0.11)
Non-bank tax	-0.01*	-0.00*	-0.09	-0.03
	(0.01)	(0.00)	(0.10)	(0.04)
Constant	0.17	-0.06	-54.98***	-16.48***
	(0.40)	(0.10)	(8.77)	(4.81)
Controls and fixed effects	Yes	Yes	Yes	Yes
Observations	21,715	21,715	21,721	21,721
Adjusted R^2	0.31	0.04	0.78	0.69