Monetary Policy Transmission, Bank Market Power, and Income Source

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Introduction

- **Question**: How is bank non-interest income related to deposit market power?

- How to think about it
  - Classic view: banks profit off of net interest income
  - Correct but incomplete: non-interest income is 20-35% of aggregate bank revenue
  - Much of the revenue is from **depositor financial services**
    - e.g., payment services, branch access, mobile banking, etc.
  - Services **tied** to deposit accounts: must open account to access services

    $\Longrightarrow$ banks use services market power to exert market power in deposits

- Another way of saying it: non-rate bank characteristics affect deposit pricing

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This Paper

Empirical: Relate Deposit Pricing to Non-Interest Income (NII)

(1) Rate pass-through: $r \longrightarrow r^d$
- State-dependent local projections (Jordà, 2005)
- Interaction: NII share

(2) Within-bank pricing: deposit rates and services fees
- Also: fee markups via cost estimation (Berger et al, 2017, Corbae & D'Erasmo, 2021)

Theory and Counterfactual Analysis

(3) Dynamic model with heterogeneous banks
- Banks price along two demand curves (deposits + financial services)
- Quantify importance of NII for **credit supply** and **financial stability**

What We Find

Empirical Findings: banks which generate more non-interest income...

- Exhibit **lower deposit rate pass-through** from MP shocks
- Set lower deposit rates
- Set higher fees for services

Counterfactual Analysis

- Loss of NII is de-stabilizing for banks
  - Increases balance sheet risk, curtails lending
  - **Low NII banks most affected** due to lower market power
- Rate volatility reduces lending; NII mitigates this effect

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Argue: deposit demand/pricing is affected by consumer demand for bank services

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Related Literature

Bank Market Power and Non-Rate Characteristics

- d'Avernas et al (2025), Drechsler, Savov, Schnabl (2017), Wang et al (2022), Buchak et al (2022), Morelli, Moretti, Venkateswaran (2024), Allen, Clark, Houde (2019), Egan, Hortacsu, Matvos (2017), Benetton et al (2025)
- **Contribution**: Findings consistent with services as source of deposit market power

Dynamic Banking Models with Market Power

- Corbae and D'Erasmo (2021), Dempsey (2024), Ulate (2021), Pancost and Robatto (2023), Gödl-Hanisch (2023), Abadi, Koby, Brunnermeier (2023), Jamilov and Monacelli (2025)
- **Contribution**: Loan/deposit model + services with fee pricing

Bank Non-Interest Income

- Brunnermeier et al. (2020), DeYoung and Roland (2001), Lepetit et al. (2008), Stiroh (2004, 2006), Stiroh and Rumble (2006)
- **Contribution**: Non-interest income has stabilizing effect.

Empirical Analysis

Cross-Section of Bank Income

Table: Bank-Level Income Statistics: 2000-2024

Moment	Mean	5p	10p	25p	50p	75p	90p	95p
Int Income to Total Income	86.4	65.3	77.3	84.7	89.5	93.2	96.1	98
Non-Int Income (NII) to Total Income	13.2	2.1	3.8	6.5	10.1	14.7	21.6	32.8
Non-traditional NII to NII	10.5	0	0	0.4	3.9	12.5	28.3	44.2
Asset NII to NII	8.7	-12.8	-3.7	0	2.2	14.8	34.2	51.0
Other NII to NII	31.0	5.7	9.3	15.1	24.0	40.0	66.3	89.7
Depositor Services NII to NII	49.5	0	3.4	29.8	52.4	70.9	83.0	88.9
Deposit Account	88.6	62.2	69.8	81.1	93.4	100	100	100
Payments	5.2	0	0.3	2.2	4.6	7.3	10.4	12.6

Notes: Non-traditional NII includes income from brokerage, insurance, proprietary trading, and investment banking. Asset NII includes servicing fees, loan origination fees, monitoring fees, and asset value gains/losses. Depositor Services NII includes fee income generated from financial services provided to owners of deposit accounts and includes payment services, branch services, mobile banking, and penalty fees. Other NII is a residual category. Source: Call Reports.

Data

Deposit Rate Pass-Through

Local projections:

$$r_{t+h,i,c} - r_{t-1,i,c} = \alpha^h_{i,c} + \boldsymbol{\beta^h} s_t + \boldsymbol{\gamma^h} \underbrace{s_t \times X_{t,i}}_{\substack{\text{non-interest} \\ \text{income share}}} + \theta^h X_{t,i} + \eta^h Z_{t,i} + \epsilon_{t+h,i,c}$$

- Time t, bank i, branch c
- s_t: standard monetary policy surprise (Jarocinski, 2021)
- $X_{t,i}$: 5-year avg. non-interest income share
- $Z_{t,i}$: macro- and bank-level controls

Pass-through: $\beta^h + \gamma^h \underbrace{X_{t,i}}_{\substack{\text{non-interest} \\ \text{income share}}}$

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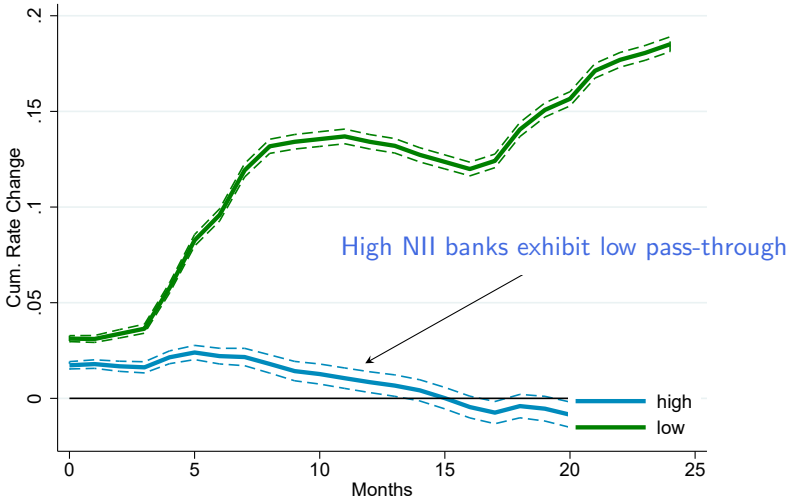
More later on *who* these banks are

Pass-through: $\beta^h + \gamma^h \underbrace{X_{t,i}}_{\substack{\text{non-interest} \\ \text{income share}}}$

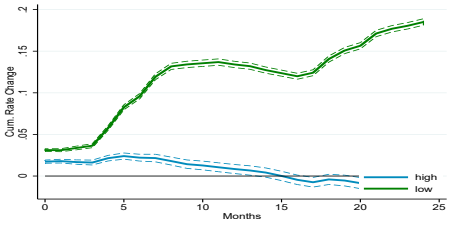
Deposit Rate Pass-Through (90p versus 10p)



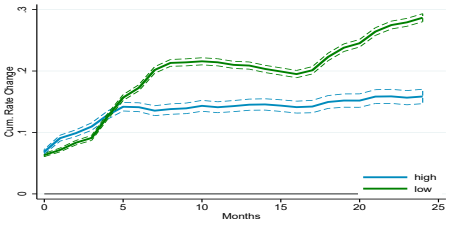
Other rates | Service % | Others % | Loan Rate Pass-through | Robust to Controls | Bank Concentration

Deposit Rate Pass-Through (90p versus 10p)

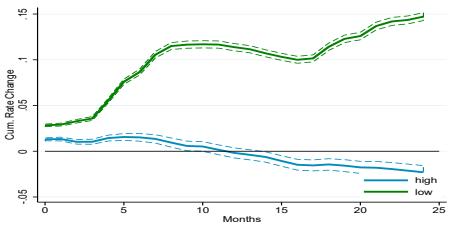
Savings (2.5K)



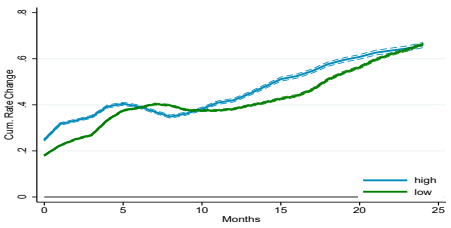
Money Market (10K)



Interest checking (2.5K)



Certificate of deposit (10K)



Comparing Low NII and High NII Banks

Table: Empirical Moments: 2000-2024

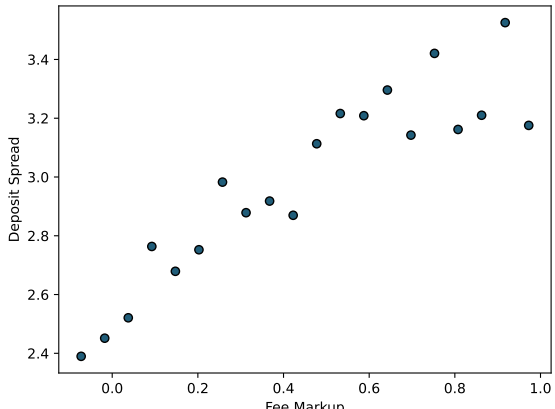
High NII banks set higher fees, lower deposit rates

	Non-Int Share		By Spread		By Fee		By Designation		
Moment	High	Low	Large	Small	Large	Small	GSIB	RBO	CBO
Fee	1.23	0.36	1.10	0.73	1.37	0.36	1.06	0.73	0.99
Deposit Spread	3.45	3.32	4.26	2.39	3.49	3.29	3.54	3.32	3.20
Deposit-to-Asset	75.0	65.3	71.5	71.9	73.9	68.7	70.5	70.9	76.0
Dividend Yield	0.68	0.58	0.70	0.58	0.72	0.54	0.68	0.68	0.48
ROE	10.0	9.5	10.0	9.7	10.5	9.0	10.3	9.7	9.1
ROA	0.98	1.00	0.98	1.00	1.03	0.93	1.00	1.00	0.95
Total NII Share	31.5	23.4	28.2	29.2	33.4	22.5	34.7	27.3	16.2
Depositor Services NII Share	9.0	3.1	8.3	5.5	9.4	3.8	6.8	7.9	5.9
TCE Ratio	7.6	9.4	7.8	8.7	7.6	9.1	7.5	8.3	9.9
RW Capital Ratio	13.6	17.7	14.5	15.7	13.7	16.8	14.4	15.1	16.4
Equity Issuance Rate	5.3	12.3	5.0	12.5	4.7	12.6	11.3	30.8	8.4

$$\text{fee}_i = \frac{\text{services NII}_i}{\text{transaction deposits accounts}_i}$$

NII Shares by Bank Size

Bank-Level Fee Markup and Deposit Spread



Notes: Bin averages are based upon bank-year observations. Source: Call Reports.

Cost Estimation Estimation Details

Taking Stock

- High non-interest income banks
  (1) Set lower deposit rates
  (2) Set higher fees
  (3) Less responsive to MP tightening
- Evidence of market power story (via markups/deposit spreads)
- So what's going on...

Building Intuition

- Suppose consumers have demand for two bank products
  - Deposits $q^d(r^d)$ and services $q^n(f)$
  - *Primitive* demand elasticities (ϵ^d, ϵ^n)

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Building Intuition

- Suppose consumers have demand for two bank products
  - Deposits $q^d(r^d)$ and services $q^n(f)$
  - *Primitive* demand elasticities (ϵ^d, ϵ^n)
- ...but the products are **tied** $q^n \leq \phi q^d$
- ...then banks price with *effective* demand elasticity $\tilde{\epsilon}^d(r^d, f; \epsilon_d, \epsilon_n)$
- A bank with services market power (low ϵ^n) exerts market power in deposits:

$$\tilde{r}^d < r^d \quad \text{and} \quad \tilde{\epsilon}^d < \epsilon^d$$

Quantitative Model

Model Ingredients

- Partial equilibrium dynamic bank problem
- I bank types monopolistically compete for deposits, services
- Banks borrow deposits d, originate loans ℓ **and provide services** q^n
  - CES demand $(\epsilon_i^n, \epsilon_i^d)$
  - For tractability, assume separate demand functions
- Risky loan returns

$$r^\ell = r(z', z) + \Delta^\ell$$

with Taylor rule $r(z', z)$ responding to business cycle $\{z'\}$

Bank Problem

Banks maximize expected discounted dividend stream via

$$v(n_i, z_-, z; i) = \max_{\pi_i, r_i^d, f_i, \ell_i} \quad \pi_i + \beta E[v(n_i', z, z'; i)]$$

$$s.t. \quad \pi_i + \ell_i + C_i(\pi_i, q_i^n, \ell_i) = n + q^d(r_i^d; r, \epsilon_i^d) + f_i q^n(f_i; \epsilon_i^n)$$

$$s.t. \quad n_i' = \left(1 + r(z, z') + \Delta^\ell\right)\ell_i - (1 + r_i^d)q^d(r_i^d; r, \epsilon_i^d)$$

$$s.t. \quad z' = \rho_z z + \epsilon_z$$

Functional Forms

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Budget Constraint: dividends + loans + costs = networth + deposit + NII

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Networth Law of Motion: networth = loan returns - interest expense

Functional Forms

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MP rate r affects loan returns + deposit demand

Functional Forms

Calibrated Model

Set up calibration in two stages

(1) External calibration
- Two bank types (I=2): high and low NII banks in the data

(2) Internal calibration of structural parameters
- Demand elasticities
  - services ϵ_i^n: target non-interest income share
  - deposits ϵ_i^d: target deposit spreads

External Calibration Table | Internal Calibration Table | Cross-Sectional Moments | MP Pass-Through Moments

What Happens Without Fee Income?

	High NII Banks		Low NII Banks	
Object	**Fee Income**	**No Fee Income**	**Fee Income**	**No Fee Income**
Capital Ratio	8.0	5.1	12.4	8.5
Deposit Spread	3.47	3.39	3.33	3.21
Return on Equity	8.3	9.4	6.1	6.7
Z-Score	6.3	4.5	9.4	6.8
Lending	1.0	0.98	1.0	0.97
Non-Int Inc Share	34	0	23	0

Note: Z-score$=\big($Capital Ratio $+ \mathit{ROA}\big)/\sigma(\mathit{ROA})$. *Lending* normalized to 1 for baseline scenario.

Changes

What Happens Without Fee Income?

NII is a stable source of income/funding. Banks make it up through ↑ deposits, ↑ leverage.
Result is lower capital ratios, more balance sheet risk

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What Happens Without Fee Income?

Balance sheet size still shrinks; thus, lending contracts

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Changes

What Happens Without Fee Income?

Low NII banks are the most sensitive to the loss of NII! Related to low market power.

Policy implication: indirect effect of fee/NII caps.

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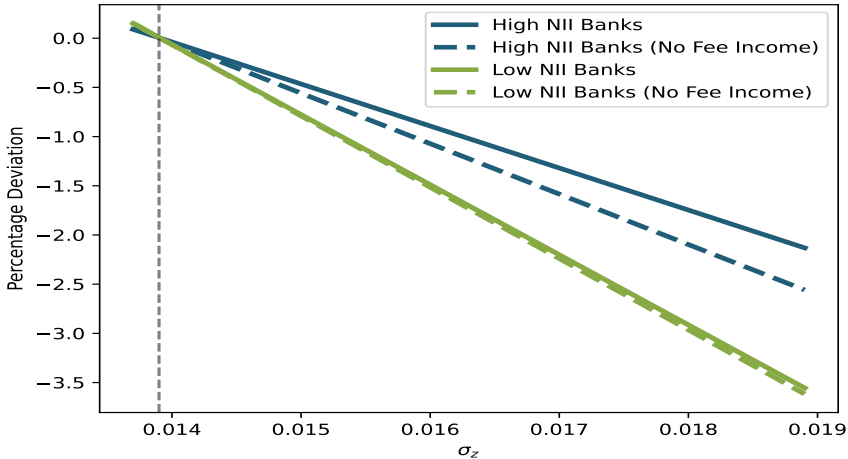
Changes

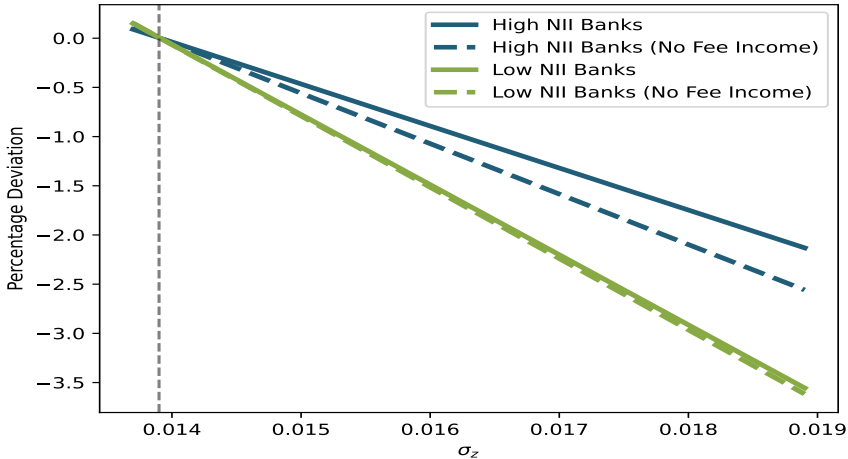
Elevated Rate Volatility: Lending Response



Note: This figure shows the percentage change in lending as rate/return uncertainty σ_z increases.

Elevated Rate Volatility: Lending Response

All banks respond to rate uncertainty with lower lending. High NII banks more insulated.



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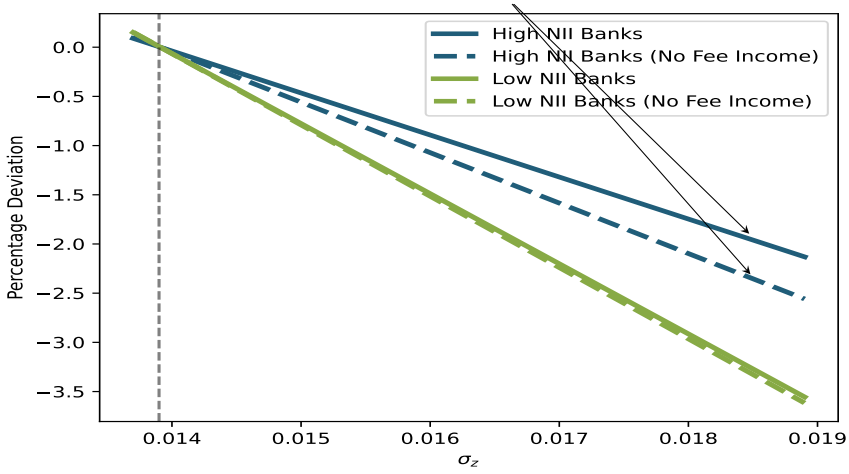
Elevated Rate Volatility: Lending Response

Same effect occurs intra-bank with *No NII* Counterfactual ⇒ NII stabilizes lending



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Thank You!

Appendix

Data

- Primary sources
  - Ratewatch (branch- and product-level rates, fees)
  - Call Reports (bank non-interest income, characteristics)
  - Time period: 2000-2024

- Bank income statement

$$\text{Profit} = \underbrace{R^a * \text{Assets}}_{\text{Int Income}} - \underbrace{R^d * \text{Debt}}_{\text{Int Expense}} + \underbrace{\text{Fees}}_{\text{Non-Int Income}} - \text{Costs}$$

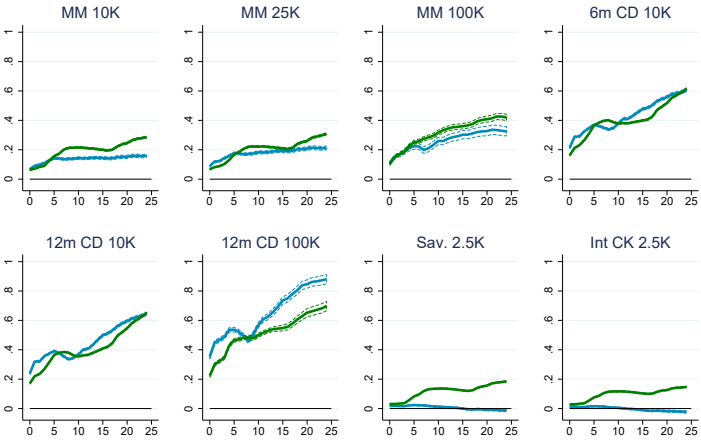
- Non-interest income share

$$\text{Non-Int Share} = \frac{\text{Fees}}{R^a * \text{Assets} + \text{Fees}}$$

- **Focus** on non-interest income related to deposit accounts
  - Wire transfers, overdraft fees, subscription fees, etc.

Return

Deposit Rate Pass-Through



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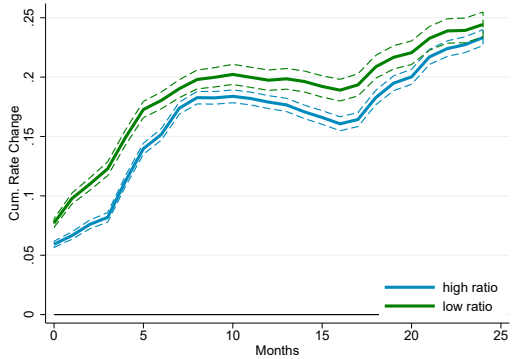
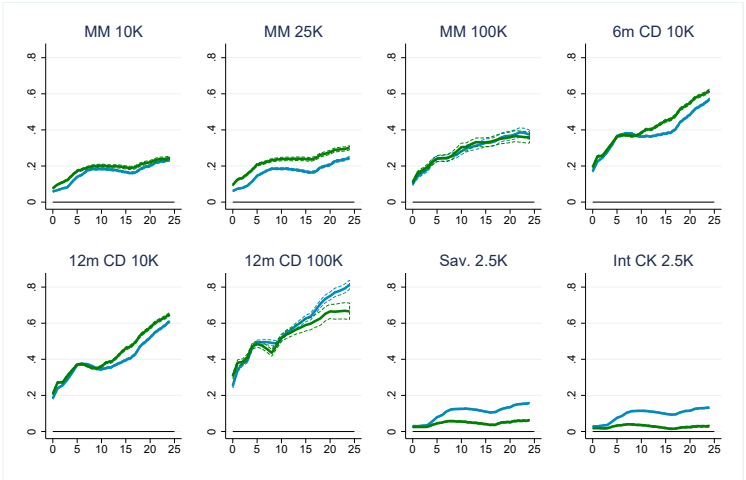
Deposit Rate Pass-Through



- Interaction term defined as 5-year avg. of service charges on deposit accounts over total non-interest income

back

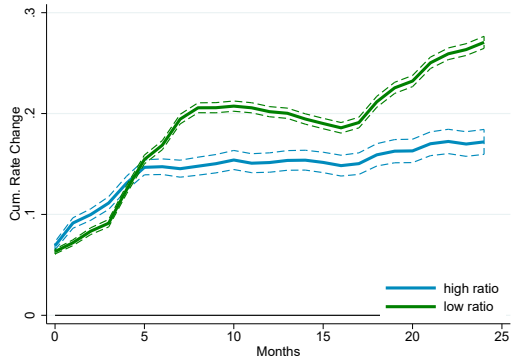
Deposit Rate Pass-Through



- Interaction term defined as 5-year avg. of *service charges* on deposit accounts over total non-interest income

back

Deposit Rate Pass-Through



- Interaction term defined as 5-year avg. of *additional* non-interest income over total non-interest income

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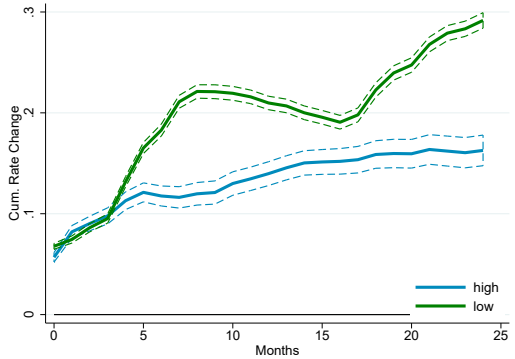
Deposit Rate Pass-Through



- Controlling for size (lag of log assets dev.) and leverage (lag of equity capital to assets dev.)

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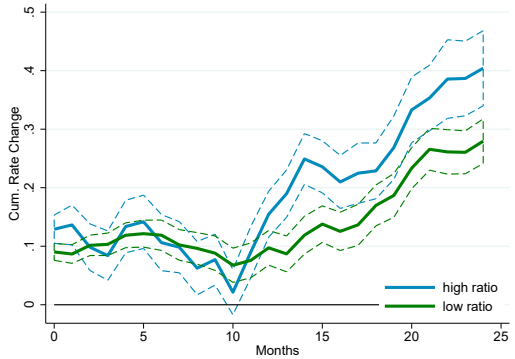
Loan Rate Pass-Through



- 1-year adjustable mortgage rate

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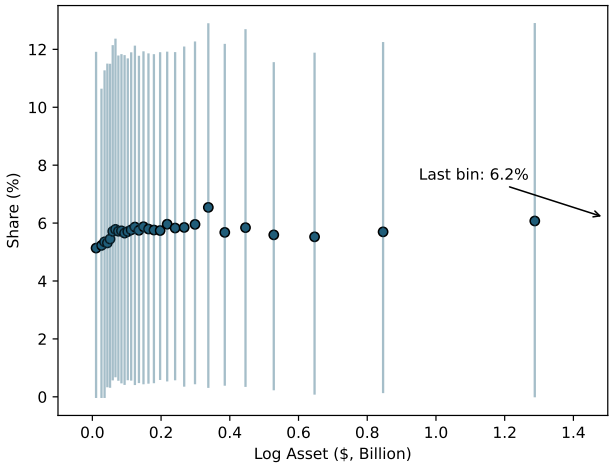
Depositor Services NII and Bank Size



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Concentration, NII, and Deposit Rate Pass-Through

- Drechsler, Savov, Schnabl (2017) find banking market with high concentration → lower pass-through from MP
- We use their methodology and incorporate NII
- Branch-level regression

$$\Delta r_{t,i,c} = \alpha_c + \zeta_{c(i)} + \delta \Delta FF_t + \gamma_1 \Delta FF_t \times HHI_{t-1,i,c} + \gamma_2 \Delta FF_t \times NII_{t,i} + \nu X_t + \varepsilon_{t,i,c}$$

where

- ΔFF_t denotes change in the federal funds rate
- $HHI_{t-1,i,c}$ is the county-level concentration measure
- $NII_{t,i}$ is the five-year average of the non-interest income share of bank i
- α_c and $\zeta_{c(i)}$ are county and branch fixed effects
- X_t are macroeconomic controls

Concentration, NII, and Deposit Rate Pass-Through

Panel A: Money Market (25K)

HHI × dFF	-0.0719***		-0.0609***
	(-5.36)		(-4.64)
NII × dFF		-0.111***	-0.112***
		(-7.38)	(-7.39)
r2	0.0942	0.0946	0.0948

Panel B: Certificate of deposit (10K)

HHI × dFF	-0.0507***		-0.0435**
	(-3.43)		(-2.81)
NII × dFF		-0.178***	-0.179***
		(-9.90)	(-9.87)
r2	0.229	0.232	0.232

Panel C: Savings (2.5K)

HHI × dFF	-0.00281		0.000464
	(-0.43)		(0.07)
NII × dFF		-0.147***	-0.147***
		(-23.17)	(-23.12)
r2	0.0769	0.0816	0.0816

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Translog Cost Estimation

- Three input prices (labor, physical capital, interest expense)
- Estimate

$$\begin{aligned} log\left(\text{Non-Int Expense}_{it}\right) =& \beta_1 log(q_{it}^{\ell}) + \beta_2 log(q_{it}^{d}) + \beta_3 log(q_{it}^{\ell})^2 + \beta_4 log(q_{it}^{d})^2 + \\ & \beta_5 log(q_{it}^{\ell}) log(q_{it}^{d}) + \sum_{j=1}^{3} \gamma_j^{\ell} log(w_{ijt}) log(q_{it}^{\ell}) + \\ & \sum_{j=1}^{3} \gamma_j^{d} log(w_{ijt}) log(q_{it}^{d}) + \sum_{j=1}^{3} \sum_{k=1}^{3} \phi_{jk} log(w_{ijt}) log(w_{ikt}) \\ & + \xi_i + \xi_t + \epsilon_{it} \end{aligned}$$

- Marginal cost term

$$\widehat{mc}_{it}^{services} = \frac{\text{Non-Int Expense}_{it}}{q_{it}^{d}} \left[\hat{\beta}_2 + 2\hat{\beta}_4 log(q_{it}^{d}) + \hat{\beta}_5 log(q_{it}^{\ell}) + \sum_{j=1}^{3} \hat{\gamma}_j^{d} log(w_{ijt})\right]$$

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Functional Forms

- Deposit demand for bank i

$$q^d(r_i^d; r, \epsilon_i^d, \xi_i^d) = \frac{exp(\epsilon_i^d r_i^d + \xi_i^d)}{exp(\epsilon_i^d r) + exp(\epsilon_i^d r_i^d + \xi_i^d)}$$

- Cost function

$$C_i(\pi_i, q_i^n, \ell_i) = \phi_i^\pi (\pi_i - \bar{\pi}_i)^2 + q^n(f_i; \epsilon_i^n) mc^f + mc^\ell \ell_i^2$$

- Taylor Rule

$$1 + r' = (1 + r^*) \left(\frac{z'}{z} \right)^{\phi_z} \epsilon^r$$

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External Calibration

External Calibration Parameters

Parameter	Label	Value	Source/Target
β	Discount Factor	0.995	2% annual rate
ρ_z	Agg Shock Persistence	0.89	Fernald (2014)
σ_z	Agg Shock Volatility	0.0138	Real GDP Growth (1980s-Present)
ϕ_z	MP Exponential Term	0.9	Literature
Δ	Loan Spread	0.016	Corporate Loan Spread BofA

Note: Model parameters are set for a model in quarterly frequency.

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Internal Calibration

Internal Calibration Parameters

Parameter	Label	Value	Target	Data	Model
ϵ^d_{high}	Rate Elasticity	1.77	Deposit Spread	3.45	3.47
ϵ^n_{high}	Services Elasticity	1.025	Non-Int Share	32	34
ξ^d_{high}	Deposit Shifter	1.12	Deposit-Asset Ratio	75	75
ϕ^π_{high}	Dividend Adjustment	0.27	Dividend Ratio	1.55	1.12
ϵ^d_{low}	Rate Elasticity	1.64	Deposit Spread	3.32	3.33
ϵ^n_{low}	Services Elasticity	1.055	Non-Int Share	23	23
ξ^d_{low}	Deposit Shifter	0.67	Deposit-Asset Ratio	65	62
ϕ^π_{low}	Dividend Adjustment	0.42	Dividend Ratio	1.51	1.15
mc^ℓ	Loan Cost	0.014	Return on Equity	10	8.3

Note: Model parameters are set for a model in quarterly frequency. Data and Model moments are quoted in annualized terms.

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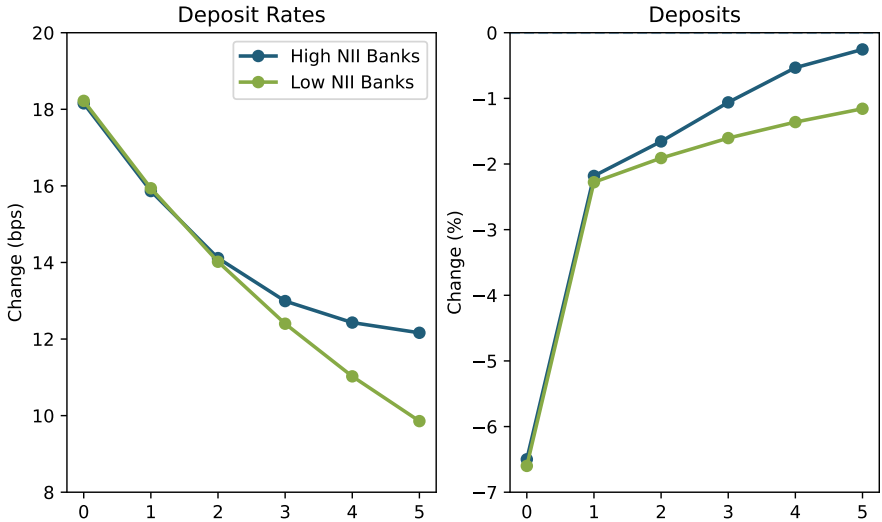
Response to 100bp Monetary Policy Shock



No Fee Income Counterfactual (Changes)

	High Share Banks		Low Share Banks	
Object	**Fee Income**	**No Fee Income**	**Fee Income**	**No Fee Income**
Capital Ratio	–	-2.9	–	-3.9
Deposit Spread	–	-0.08	–	-0.12
Return on Equity	–	+1.1	–	+0.62
Z-Score	–	-1.8	–	-2.6
Lending	–	-1.9	–	-2.8
Non-Int Inc Share	–	-34	–	-22

Note: Z-score=$\big($Capital Ratio $+ \, ROA\big)/\sigma(ROA)$. All changes reported as level changes, except for lending which is reported as percentage change.

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Counterfactual: Changing Rate Environment

- MP rate r fluctuates around a *neutral rate* r^*

$$1 + r' = (1 + r^*)\left(\frac{z'}{z}\right)^{\phi_z} \epsilon^r$$

- MP affects
  - Loan returns: $r^\ell = r + \Delta^\ell$
  - Deposit demand: $q^d(r_i^d, r; \epsilon_i^d)$ with $\frac{\partial q_i^d}{\partial r} \leq 0$

- We consider
  (1) Lower neutral rate: 100bp decrease in r^*
  (2) Flatter curve: 50bp decrease in Δ^ℓ

Changing Rate Environment

Low versus High Interest Rate Environment

	High Share Banks		Low Share Banks	
Object	**Low r***	**Flatter Curve**	**Low r***	**Flatter Curve**
Capital Ratio	-9.2	-4.4	-10.8	-3.5
Deposit Spread	-.42	+0.05	-.47	+0.06
Return on Equity	+.64	-0.39	+1.71	+0.2
Z-Score	-5.6	-2.79	-7.1	-2.44
Lending	-1.1	-6.84	-3.5	-6.69
Non-Int Inc Share	+0.3	+1.63	+0.69	+1.27

Note: This table reports the change in the level of model moments. The *Low r** scenario corresponds to a 100 basis point decrease in the annual neutral interest rate $r*$ and the *Flatter Curve* scenario corresponds to a 50 basis point drop in bank loan spreads Δ^{ℓ}. Change in lending is reported as *percentage change* relative to the baseline scenario.

Aggregate Non-Interest Income (NII) Shares

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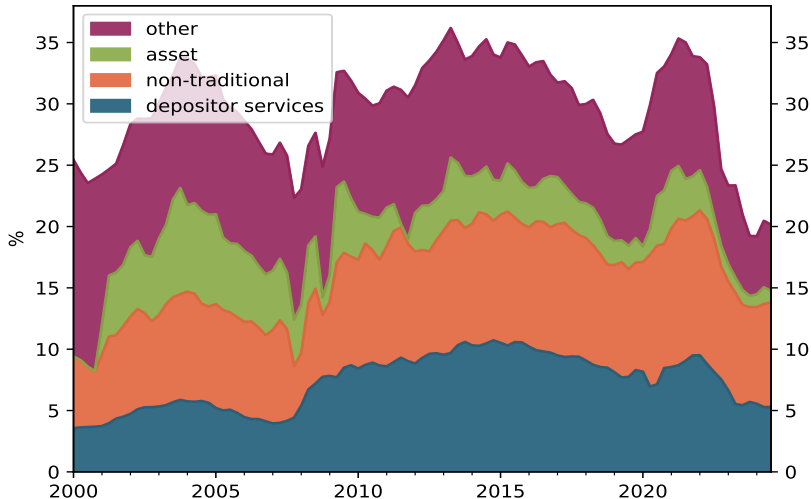

Fee Markup Estimation

- Question: are high fees associated with high markups?
- Approach: estimate translog cost function

$$log(\text{Non-Int Expense}_{it}) \sim \beta_1 log(q_{it}^d) + \beta_2 log(q_{it}^\ell) + ... + \epsilon_{it}$$

- Assume depositor services q_{it}^n (unobservable) is proportional to deposits q_{it}^d
- Given estimate $\hat{mc}_{it}^{\text{services}}$
  - compute markup $\frac{f_{it} - \hat{mc}_{it}^{\text{services}}}{\hat{mc}_{it}^{\text{services}}}$
  - compare to deposit spread $r - r_{it}^d$

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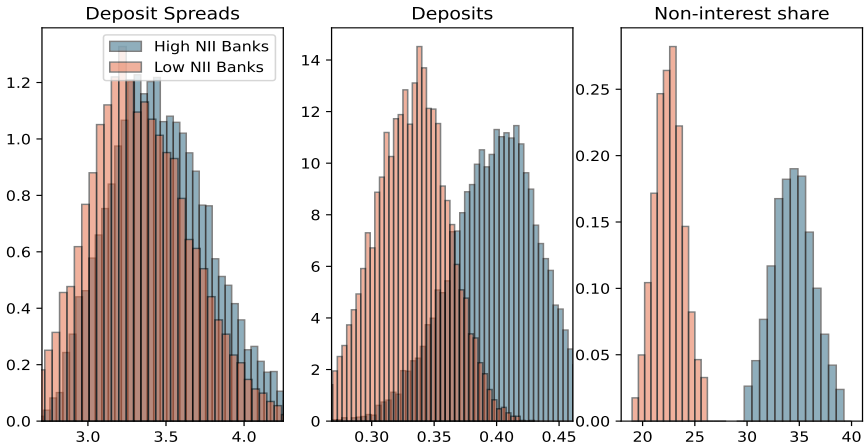
Changing Rate Environment: r^* and Yield Curve slope

	High NII Banks		Low NII Banks	
Object	**Low r***	**Flatter Curve**	**Low r***	**Flatter Curve**
Capital Ratio	-9.2	-4.4	-10.8	-3.5
Deposit Spread	-.42	+0.05	-.47	+0.06
Return on Equity	+.64	-0.39	+1.71	+0.2
Z-Score	-5.6	-2.79	-7.1	-2.44
Lending	-1.1	-6.84	-3.5	-6.69
Non-Int Inc Share	+0.3	+1.63	+0.69	+1.27

Note: This table reports the change in the level of model moments, for both the *high non-interest income share* and *low non-interest income share* banks. The *Low r** scenario corresponds to a 100 basis point decrease in the annual neutral interest rate and the *Flatter Curve* scenario corresponds to a 50 basis point drop in bank loan spreads. Change in lending is reported as *percentage change* relative to the baseline scenario. Reported capital ratios are adjusted to account for non-deposit debt funding.

Simulated Cross-Sectional Moments



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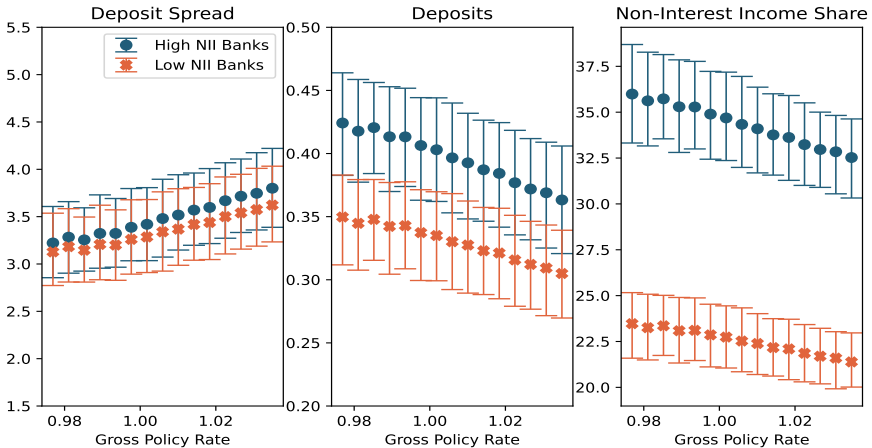
Simulated Monetary Policy Trends



Return MP Shock