

Deposit Funding Shocks and Credit Supply: Bank-Level IV Estimates and Heterogeneous Responses

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1 Introduction

Rapid tightening since March 2022 has renewed interest in how monetary policy transmits through banks to the real economy. A rising strand emphasizes the deposit channel: when policy rates increase, deposit spreads widen, deposit growth slows, and banks partly replace core deposits with more expensive wholesale liabilities, which still leaves assets and loan supply lower (Drechsler et al. 2016). This perspective fits within the broader credit-channel research program that tighter policy raises banks' funding costs and tightens loan supply (Bernanke and Gertler 1995). Following Drechsler et al. (2016), a large body of recent work documents substantial cross-sectional variation in deposit rate pass-through and deposit outflows, shaped by factors such as bank size and depositor sophistication. The foundational branch-level evidence on the "deposit channel" showed that when policy rates rise, banks in less competitive deposit markets raise rates more slowly and lose fewer deposits, while others face larger outflows and higher funding costs. Later studies questioned how well such local designs capture bank-level behavior. Evidence that large institutions price deposits uniformly across geographies raises concerns about county-level identification and suggests strong liability substitution at the largest banks(Begenau and Stafford 2023; Begenau and Stafford 2024). Related work shows depositor composition matters for pass-through and outflows and concentration indexes largely proxy deposit composition rather than market power, shifting attention from local market structure to who the depositors are. Against this backdrop, much less is known about the subsequent impact of higher funding costs on how much credit banks supply (Narayanan and Ratnadiwakara 2024).

The deposit channel rests on three testable premises. First, deposits are imperfect substitutes for other liabilities at the margin, so policy rate hikes raise both marginal and average funding costs for a meaningful subset of banks (Bernanke and Gertler 1995; Drechsler et al. 2016). Second, higher marginal funding costs shift banks' loan-supply schedules inward rather than being fully offset by repricing, fees, or operating adjustments (Bernanke and Gertler 1995). Third, borrowers face frictions in replacing relationship lenders, so bank-level supply contractions translate into lower aggregate credit availability (Erel et al. 2023). Each premise is contestable. Large banks can reoptimize liability structures at relatively low cost, dampening the effective increase in funding costs (Begenau and Stafford 2023). On the second premise in particular, the mapping from funding-cost shocks to bank credit supply remains

underdeveloped in both theory and evidence; two canonical frameworks motivate quantity (and terms) tightening without one-for-one price pass-through: credit-rationing logic, where higher loan rates worsen selection and incentives, making nonprice and quantity restrictions optimal (Stiglitz and Weiss 1981), and bank-capital models, where lower net interest margins slow retained-earnings accumulation and raise the likelihood of binding capital constraints (Van den Heuvel 2002). This paper does not attempt to identify these microfoundations; it estimates the reduced-form, bank-level local average treatment effect of policy-induced increases in effective funding costs on credit supply.

The paper estimates the bank-level local average treatment effect of policy-induced changes in deposit funding conditions on credit supply for the set of banks whose funding is shifted by the instrument. Identification uses a bank-level 2SLS design with instruments that interact predetermined, pre-2021 exposures with quarterly changes in the federal funds rate. Working at the bank rather than branch level and instrumenting both funding costs and outflows—while absorbing local demand with deposit-weighted region-by-quarter fixed effects and controlling for time-invariant heterogeneity with bank fixed effects—directly addresses uniform-pricing and aggregability critiques. The analysis reports elasticities for total and portfolio-level lending and examines size heterogeneity to test whether small and community banks contract credit more for a comparable policy-driven shift in funding conditions. The contribution is direct, reduced-form causal evidence on the linkage from policy-induced bank-specific deposit funding conditions to bank credit supply, without committing to a specific micro-mechanism.

2 Literature Review

The “standard interest-rate channel” is the textbook mechanism in which a policy-induced increase in the federal funds rate passes through to borrowing rates, raising the user cost of credit and reducing interest-sensitive spending (Bernanke and Gertler 1995). An earlier alternative emphasized a “reserve channel,” under which the central bank’s control of bank reserves and a stable reserve multiplier constrained loan supply (Bernanke and Blinder 1988; Balbach 1981). In practice, that mechanism weakened or had never been effective as financial innovation, regulatory change, and modern operating procedures decoupled lending from contemporaneous reserve quantities: banks reconfigured liability mixes and reserve requirements became less binding, while central banks accommodated aggregate reserve demand in order to target the overnight policy rate (Minsky 1957; Moore 1991). In the early 1990s, the discussion was recast as a “credit channel” comprising a balance-sheet channel—tightening weakens borrower cash flow and collateral, raising external-finance premia—and a bank-lending channel—reserve drains or funding-cost increases reduce core deposits and, when nondeposit liabilities are imperfect or costly substitutes, shift banks’ loan-supply schedules inward, tightening bank credit supply (Bernanke and Gertler 1995; Kashyap and Stein, n.d.).

A complementary bank-capital channel traces how capital requirements and payout rules shape lending. Since Basel I (1988), risk-weighted capital standards have tied balance-sheet growth to capital; Basel II increased risk sensitivity, and Basel III added conservation and countercyclical buffers (Basel Committee on Banking Supervision 1988, 2011). Early credit-

crunch evidence showed that thinly capitalized banks slowed loan growth as they adjusted to standards (Bernanke and Lown 1991; Hancock and Wilcox 1994). Quasi-experimental work finds that tighter, bank-specific capital requirements contract lending at affected banks, with some migration to less-regulated lenders (Aiyar et al. 2014). Risk-sensitive rules can be procyclical: in downturns, higher measured default probabilities and losses given default raise required capital just as earnings weaken, amplifying credit retrenchment (Kashyap and Stein 2004; Gordy and Howells 2006; Heid 2007; Repullo and Suárez 2013). Importantly, banks need not be at regulatory minima to pull back: when margins compress, value-maximizing banks may conserve capital and smooth dividends, raising the shadow cost of capital and shifting loan supply inward even without a binding constraint (Van den Heuvel 2002).

The modern deposit channel begins with Drechsler et al. (2016), which builds on classic evidence that deposit pricing is sluggish and more so where banks face less competition (Hannan and Berger 1997; Neumark and Sharpe 1992). In DSS, a policy-rate increase lifts outside short rates; with search frictions and deposit-market power, deposit rates adjust only partially, widening the funds-deposit spread and inducing households to shift out of checking and savings. The gradients are strongest where competition is weak: spreads rise more and deposit growth falls more in high-HHI counties, a price-quantity pattern that identifies a supply shift rather than demand. They establish causality with a within-bank design that interacts policy moves with county HHI under bank-time fixed effects, relying on internal capital markets that equalize marginal lending returns across branches so branch lending is independent of local deposit taking. A weekly event study shows spreads step up at FOMC enactment with no pre-trends, and expected and unexpected rate changes have similar effects, ruling out Fed-information stories. Aggregation follows from funding arithmetic: core deposits, which are about four-fifths of bank liabilities, fall on net, banks only partly substitute into wholesale or large time deposits, total liabilities mirror the core-deposit decline, and assets and loans contract. Because deposits are households' primary liquid claim, the systemwide shrinkage raises the liquidity premium, a macro link they document via the tight comovement between the aggregate deposit spread and the T-bill liquidity premium.

A newer wave refines mechanism and magnitudes. On mechanics, retail deposits provide a built-in duration hedge: when deposit rates adjust only slowly to policy, the deposit franchise behaves like a negative-duration asset. Banks pair that hedge with long-duration, fixed-rate assets, keeping NIM and ROA relatively stable around rate moves; as a result, tightening transmits mainly through funding-quantity pressure and the liquidity premium rather than large net-worth swings (Drechsler et al. 2021). If imperfect passthrough causes core deposit outflow and banks could not substitute deposit with similar duration liabilities with low friction or cost, then this could cause banks to reduce duration risk taking. On magnitudes, a decomposition of bank valuations shows that liability "productivity" explains most cross-bank value; for the median bank roughly two-thirds of value is attributable to deposit productivity, and a one-standard-deviation increase in deposit productivity raises market-to-book by roughly 0.2–0.8 points; savings-deposit capability is the tightest link to value (Egan et al. 2021). Deposit betas are state-dependent, rising with the level of rates, which shortens effective deposit duration and amplifies balance-sheet sensitivity in hiking cycles (Greenwald et al. 2023). Market structure and technology shift the first stage: online/national banks pass through more and attract inflows, while smaller institutions face sharper outflows, real-

locating credit supply across balance sheets (Erel et al. 2023; d’Avernas et al. 2023). Outside the U.S., the 2022–23 cycle shows that larger deposit outflows map into quantity rationing—especially for fixed-rate, longer-maturity loans—and the effect is stronger at banks entering with larger duration gaps (Bank 2024). Dynamic models microfound deposit demand and market power through search frictions, implying that reductions in frictions or better outside options weaken transmission (Choi and Rocheteau 2021). Finally, structural estimates link the deposits and capital channels: deposit-market power shapes pass-through to lending and interacts with capital requirements, potentially delivering a low “reversal rate” when cuts erode equity (Wang et al. 2020).

There are some important critiques for the deposit channel. A first set concerns uniform pricing: large networks often post near-uniform retail deposit rates across geographies, so pricing is effectively national rather than local. If so, county concentration (HHI) is a weak proxy for deposit-market power and within-bank cross-county designs risk attributing pass-through and outflows to “local competition” when they largely reflect head-office rate sheets (Begenau and Stafford 2023; d’Avernas et al. 2023). A related specification critique emphasizes depositor composition: who the customers are, not where they bank, predicts pass-through and run-off in 2022–23 (Narayanan and Ratnadiwakara 2024). The deeper challenge is aggregation: the mechanism has macro bite only if substitution from core deposits into time deposits and non-deposit debt is incomplete; asset-weighted analyses suggest that at the largest institutions substitution is ample, so cross-sectional gradients may reallocate intermediation across balance sheets rather than contract it in the aggregate (Begenau and Stafford 2023). Even so, distributional effects remain first order: if bank-dependent borrowers cannot easily substitute away from relationship lending, such as small businesses, or if smaller banks face higher marginal costs of wholesale replacement, policy can still tighten credit where those relationships bind, producing partial aggregation on the small-business margin (Erel et al. 2023; Kashyap and Stein, n.d.; d’Avernas et al. 2023).

The main gap is a clean mapping from policy-induced, bank-specific changes in funding conditions to lending. A substantial literature offers cross-sectional explanations of deposit-rate pass-through and deposit outflows, but far fewer papers quantify how a given bank-level increase in funding costs or a standardized deposit outflow translates into credit supply; even flagship contributions relate deposit movements to lending in reduced form rather than recovering a causal elasticity with instruments (Drechsler et al. 2016; Narayanan and Ratnadiwakara 2024). This paper addresses that gap with a bank-level 2SLS design: predetermined, pre-2021 exposures to deposit-rate sensitivity and to deposit-flow sensitivity are interacted with quarterly federal funds rate changes to instrument, respectively, each bank’s change in its effective deposit rate and its deposit outflow; deposit-weighted region-by-quarter fixed effects absorb local demand and common shocks, and bank fixed effects absorb time-invariant heterogeneity. The second stage maps the instrumented funding-cost shock and the instrumented outflow into total and portfolio-level lending, delivering a bank-level LATE for the credit-supply response. By construction, the design speaks to uniform-pricing and aggregability critiques by shifting identification away from county concentration and by reporting size-split elasticities that test whether substitution at large institutions mutes macro transmission (Begenau and Stafford 2023).

References

- Aiyar, Shekhar, Charles W. Calomiris, and Tomasz Wieladek. 2014. “Does Macro-Prudential Regulation Leak? Evidence from a UK Policy Experiment.” *Journal of Money, Credit and Banking* 46 (S1): 181–214.
- Balbach, James H. 1981. “How Controllable Is Money Growth?” *Federal Reserve Bank of St. Louis Review*.
- Bank, European Central. 2024. “Flighty Deposits: The Impact of Deposit Outflows on Credit Supply.” *European Central Bank Working Paper*.
- Basel Committee on Banking Supervision. 1988. *International Convergence of Capital Measurement and Capital Standards*. Bank for International Settlements.
- Basel Committee on Banking Supervision. 2011. *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems*. BCBS 189. Bank for International Settlements.
- Begenau, J., and E. Stafford. 2023. *Uniform Rate Setting and the Deposit Channel*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4839754.
- Begenau, Juliane, and Erik Stafford. 2024. *BANK CONSOLIDATION AND UNIFORM PRICING*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3488035.
- Bernanke, B. S., and A. S. Blinder. 1988. *Credit, Money, and Aggregate Demand*.
- Bernanke, B. S., and M. Gertler. 1995. “Inside the Black Box: The Credit Channel of Monetary Policy Transmission.” *Journal of Economic Perspectives* 9 (4): 27–48.
- Bernanke, Ben S., and Cara S. Lown. 1991. “The Credit Crunch.” *Brookings Papers on Economic Activity* 1991 (2): 205–48.
- Choi, M., and G. Rocheteau. 2021. *A Model of Retail Banking and the Deposits Channel of Monetary Policy*.
- d’Avernas, A., A. L. Eisfeldt, C. Huang, R. Stanton, and N. Wallace. 2023. *The Deposit Business at Large Vs. Small Banks*. NBER Working Paper. no. 31865.
- Drechsler, I., A. Savov, and P. Schnabl. 2016. *The Deposits Channel of Monetary Policy*. NBER Working Paper. no. 22152.
- Drechsler, I., A. Savov, and P. Schnabl. 2021. “Banking on Deposits: Maturity Transformation Without Interest Rate Risk.” *The Journal of Finance* 76 (3): 1091–143.

Egan, M., S. Lewellen, and A. Sunderam. 2021. *The Cross Section of Bank Value*. <https://ssrn.com/abstract=2938065>.

Erel, I., J. Liebersohn, C. Yannelis, and S. Earnest. 2023. *Monetary Policy Transmission Through Online Banks*. NBER Working Paper. no. 31380.

Gordy, Michael B., and Bradley Howells. 2006. “Procyclicality in Basel II: Can We Treat the Disease Without Killing the Patient?” *Journal of Financial Intermediation* 15 (3): 395–417.

Greenwald, E., S. Schulhofer-Wohl, and J. Younger. 2023. *Deposit Convexity, Monetary Policy, and Financial Stability*. Working Paper. no. 2315. <https://doi.org/10.24149/wp2315>.

Hancock, Diana, and James A. Wilcox. 1994. “Bank Capital and the Credit Crunch: The Roles of Risk-Weighted and Unweighted Capital Regulations.” *Real Estate Economics* 22 (1): 59–94.

Hannan, T. H., and A. N. Berger. 1997. “The Rigidity of Prices: Evidence from the Banking Industry.” *Journal of Reprints for Antitrust Law and Economics* 27 (1): 245–54.

Heid, Frank. 2007. “The Cyclical Effects of the Basel II Capital Requirements.” *Journal of Banking & Finance* 31 (12): 3885–900.

Kashyap, Anil K., and Jeremy C. Stein. 2004. “Cyclical Implications of the Basel II Capital Standards.” *Economic Perspectives* 28 (1): 18–31.

Kashyap, Anil K., and Jeremy C. Stein. n.d. “What Do a Million Banks Have to Say about the Transmission of Monetary Policy?” *NBER Working Paper*.

Minsky, H. P. 1957.

Moore, B. J. 1991.

Narayanan, R. P., and D. Ratnadiwakara. 2024. *Depositor Characteristics and Deposit Stability*.

Neumark, D., and S. A. Sharpe. 1992. “Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits.” *Quarterly Journal of Economics* 107 (2): 657–80.

Repullo, Rafael, and Javier Suárez. 2013. “The Procyclical Effects of Bank Capital Regulation.” *Review of Financial Studies* 26 (2): 452–90.

Stiglitz, J. E., and A. Weiss. 1981. “Credit Rationing in Markets with Imperfect Information.”

- tion.” *American Economic Review* 71 (3): 393–410. <https://doi.org/10.2307/1802787>.
- Van den Heuvel, Skander J. 2002. “Does Bank Capital Matter for Monetary Transmission?” *Economic Policy Review* 8 (1): 259–65.
- Wang, Y., T. M. Whited, Y. Wu, and K. Xiao. 2020. *Bank Market Power and Monetary Policy Transmission: Evidence from a Structural Estimation*. NBER Working Paper. no. 27258.