Regulatory Arbitrage within the Firm

Nicola Cetorelli* Shohini Kundu†

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Abstract

Regulation often applies asymmetrically across the legally distinct entities within a firm. We study the consequences in U.S. bank holding companies, where regulated banks coexist with more lightly-regulated nonbanks. Exploiting Basel III and predetermined variation in organizational complexity, we show firms meet tighter bank capital requirements by reallocating equity from nonbank subsidiaries rather than raising new capital, leaving consolidated capital unchanged. Banks become better capitalized and safer, while nonbanks become more thinly capitalized, shift toward riskier lending, and grow more fragile. Stress tests show organizational contagion erodes these gains in bank safety and can reverse them for the most exposed institutions.

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*Federal Reserve Bank of New York and CEPR. email: nicola.cetorelli@ny.frb.org

†UCLA Anderson School of Management and CEPR. email: shohini.kundu@anderson.ucla.edu

1 Introduction

A fundamental question in economics is how organizations allocate resources within their internal boundaries. Since Coase (1937), economists have understood firms to exist because internal coordination economizes on transaction costs relative to market exchange. Subsequent research has shown that organizational form shapes resource allocation (e.g., Williamson, 1975; Grossman and Hart, 1986), capital structure (e.g., Harris and Raviv, 1991; Stein, 1997), and responses to external shocks (e.g., Gertner, Scharfstein and Stein, 1994; Scharfstein and Stein, 2000). Yet much less is known about how regulation interacts with organizational structure. Regulations constrain what firms may do, but firms can respond by reshaping their internal boundaries, and these endogenous adjustments can attenuate or even reverse a regulation's intended effects.

This interaction is particularly consequential for banking, where the central prudential constraint is capital adequacy. The canonical regulatory framework specifies minimum equity ratios, leverage constraints, and risk-weighted buffers for "the bank" as if it were a standalone entity, a structure that reflects the organizational reality of mid-twentieth-century banking. Modern banking firms, however, are complex bank holding companies (BHCs) comprising dozens of legally distinct subsidiaries, including depository institutions, broker-dealers, consumer lenders, asset managers, and insurers, that face dramatically different regulatory regimes despite operating under common ownership and integrated management. These nonbank affiliates are not peripheral to the firm: in our data, they account for roughly 20–30% of consolidated BHC assets, and approximately one-quarter of the aggregate financial assets of nonbanks operating in the United States. This raises a natural question: does tighter bank capital regulation increase the amount of capital held by the organization, or does it simply change where capital and risk reside within the firm?

The answer depends on how internal capital markets respond. In a frictionless world, reallocating equity across subsidiaries would be neutral; a dollar of capital is a dollar of capital regardless of where it sits in the organizational chart. But when raising external equity is costly (e.g. Myers and Majluf, 1984; Altınkılıç and Hansen, 2000), a profit-maximizing holding company facing tighter requirements on its bank subsidiary has a cheaper alternative: extract equity from lightly regulated nonbank affiliates and redeploy it internally, consistent with broader evidence that organizations expand internal capital markets when external markets are impaired (Matvos and Seru, 2014; Matvos, Seru and Silva, 2018).

We exploit the phased implementation of Basel III capital requirements beginning in 2015, which substantially tightened minimum capital ratios for bank subsidiaries while leaving nonbank affiliates formally unregulated. We document that, rather than issuing new equity, BHCs meet the requirement from within: they extract equity from nonbank subsidiaries and reallocate it to their banks. Bank capital ratios improve, external issuance falls, and BHC profitability rises.

In parallel, we show that nonbank affiliates hold less capital, face higher internal funding costs, and shift into riskier lending. Risk is not reduced, as per the intended objective of the regulator; it is instead relocated to the less regulated, less protected side of the firm.

The U.S. banking industry provides an ideal laboratory for studying these questions because subsidiary-level financial disclosures allow us to observe internal capital flows directly. The mechanism, however, extends well beyond banking, applicable to any multi-entity organization where regulation, taxation, or supervision binds asymmetrically across affiliates.[1] To identify these responses, we exploit historically determined variation in organizational complexity generated by the staggered deregulation of interstate banking during the 1970s–1990s, following Strahan (2003), Jayaratne and Strahan (1996), and Kroszner and Strahan (1999). States that deregulated earlier gave BHCs more time to build multi-subsidiary structures before the Riegle–Neal Act of 1994 harmonized restrictions nationwide, generating persistent differences in organizational structure shaped by state political economy decades before our study period and plausibly orthogonal to post-2015 regulatory responses. Permutation-based placebo tests confirm that neither random reassignment of the instrument nor random reassignment of the treatment timing produces significant effects.

We establish three core findings. First, organizationally complex bank holding companies satisfy tighter capital requirements by transferring equity from nonbank subsidiaries to affiliated banks. These transfers occur without increases in consolidated capital or lending, implying that regulation primarily reallocates capital within organizations rather than inducing external recapitalization. Economically, we find that banks in BHCs from states deregulating one year earlier accumulate 0.74 percentage points more excess capital post-2015; the median seven-year gap between early and late deregulators implies roughly 5 percentage points more bank capital.

We trace internal reallocation through direct observation of parent–subsidiary equity investments. This addresses an important gap in a literature that has focused primarily on liquidity reallocation through loans and deposits, while largely overlooking equity transfers—the margin that directly determines risk-bearing capacity and regulatory capital.[2] We document that equity dominates internal funding by an order of magnitude: equity investments average 10–11% of bank

[1] For example, Gandhi and Olenski (2024) document an analogous mechanism in nursing homes, where operators tunnel profits to commonly-owned real estate and management companies to obscure profitability from price regulators. Kakani et al. (2026) similarly show that vertically integrated insurers respond to profit caps in Medicare Part D by raising prices at their owned pharmacies. Giroud and Rauh (2019) document within-firm reallocation across U.S. states in response to differential taxation.

[2] See, e.g., Cetorelli and Goldberg (2012*a*), Cetorelli and Goldberg (2012*b*), Gilje, Loutskina and Strahan (2016), Cetorelli and Prazad (2025), and Bai, Campello and Muthukrishnan (2025). The closest antecedent is Pogach and Unal (2020), who show that BHCs expanding into investment banking after Gramm-Leach-Bliley funded the expansion through internal dividends drawn from their bank subsidiaries. Their evidence establishes the internal-dividend channel operating in the opposite direction: a deregulatory scope shock pulling equity out of the bank toward lightly regulated affiliates, just as the capital-requirement shock we study pulls equity toward the bank. The same mechanism moves capital toward whichever side of the firm regulation leaves unconstrained.

assets, while non-equity investments total just 1–2%. This dominance explains why organizational structure, specifically the presence of nonbank subsidiaries from which equity can be extracted, becomes a fundamental determinant of regulatory responses.

Following Basel III, we observe systematic equity reallocation operating in three steps. First, parent equity investments shift from nonbanks toward banks in equal and offsetting amounts, with no change in total investments. Second, nonbanks pay sharply higher dividends upstream to the parent, while bank dividends remain unchanged, providing the cash flows that fund the reallocation. Third, banks retain the additional earnings rather than distributing them upward, accumulating capital internally. Consistent with this internal substitution, organizationally complex BHCs sharply reduce external equity issuance, and return surplus equity to shareholders through buybacks.

This reallocation operates through an internal equity multiplier: the ratio of a nonbank subsidiary's share of consolidated equity to its share of consolidated assets. Nonbank subsidiaries hold dramatically higher equity-to-asset ratios than their affiliated banks (median 69% versus 10%), making them natural "equity reservoirs" despite small asset footprints: the median nonbank subsidiary holds 16% of consolidated equity on just 2% of consolidated assets. We confirm that the reallocation response scales directly with this extractability: BHCs with higher equity multipliers inject disproportionately more equity into banks and reduce external issuance more sharply post-2015. BHCs with lower multipliers, lacking accessible internal reservoirs, rely instead on external capital markets.

Our second core finding examines the systemic implications of internal capital reallocation using subsidiary-level stress tests. Internal equity extraction is privately optimal for BHCs because it avoids costly external financing, but it opens two channels for systemic fragility. First, depleted nonbank capital buffers leave subsidiaries more vulnerable to shocks that higher pre-extraction capitalization would have absorbed. Second, nonbank distress can transmit back to the affiliated bank, reflecting two distinct exposures. Parents support distressed nonbanks through implicit lines of credit that cannot be withdrawn costlessly, so recapitalization draws down bank capital. Separately, the parent and its banks hold intercompany claims that lose value when the nonbank does, independent of any recapitalization. Both leave the consolidated organization vulnerable to nonbank distress even as measured bank capital improves. Historical episodes of intra-firm transmission, rating-agency methodology that prices implicit parent support, and our own evidence on bank lending, bond spreads, and parent equity investments around nonbank distress events are consistent with this channel.

We quantify these risks by simulating scenarios comparable to the 2008 financial crisis. Using 2013Q1 balance sheets, we calculate losses of 1%, 5%, 10%, and 15% on nonbank assets, magnitudes consistent with the substantial mark-to-market losses and balance sheet contractions ex-

perienced by broker-dealers during 2007–2009 (Adrian and Shin, 2010), and compute the equity injection needed to restore nonbank capital ratios to targets between 20% and 70%, spanning from well below to approximately the population median of 69%; our baseline of 40% is deliberately conservative.

Under our baseline scenario of a 5% shock requiring recapitalization to 40% capital ratios, the average BHC would need to deploy 18% of its excess capital to recapitalize nonbanks. At the 95th percentile, this rises to 99% of available parent capital, and 4% of BHCs would completely exhaust capital buffers. More severe scenarios generate tail risks exceeding 100% of available BHC capital. Whether these drawdowns undermine the bank's improved capital position depends on how much of the loss is transmitted back to the resources that backstop the bank. For the typical BHC, most of the gain survives at any transmission rate, with full transmission eroding nearly 40% of it. For tail-risk BHCs, transmission of just one-half erodes 72% of the gain, and transmission above roughly 0.7 reverses it, leaving the most exposed organizations worse off than the headline improvement suggests. The reallocation is thus better than no regulation but worse than the regulation as intended. The distance between those two benchmarks, priced by the transmission parameter and concentrated in the tail of the exposure distribution, is what this paper measures.

Our third core finding is that the same regulatory wedge that drives internal capital reallocation also generates a sharp divergence in risk, performance, and business models across subsidiaries within the same holding company. Bank subsidiaries become both safer and more profitable following the post-2015 tightening, while affiliated nonbanks become more fragile. On the bank side, internal equity injections raise capital buffers, and banks shift away from lending toward cash and securities, reducing risk-weighted exposure with no change in leverage. Profitability improves through lower charge-offs and better asset quality rather than greater risk-taking: the gains reflect a safer asset mix, not the deployment of new capital into higher-yield activities.

The opposite pattern emerges among nonbank subsidiaries. As equity is extracted upstream, nonbank capital ratios decline and subsidiaries shift away from traditionally equity-intensive activities toward lending, allowing balance sheets to grow despite weaker capital buffers. This expansion is concentrated in consumer lending, which carries the highest loss rates among the major lending categories. The change in business model is accompanied by clear signs of deteriorating credit quality: serious delinquencies and loan loss provisions increase, profitability weakens, and distance-to-default falls markedly, indicating greater vulnerability to adverse shocks. At the same time, parents charge nonbank affiliates substantially higher internal funding rates while leaving bank funding rates essentially unchanged, resulting in an internal funding spread of roughly 300 basis points for the median BHC. This repricing compounds the effects of equity extraction: the entities left with the least equity also face the highest internal cost of funds. Taken together, these results indicate that internal capital markets reallocate both capital and risk away from regulated,

safety-net-protected banks and toward less regulated, uninsured nonbank affiliates.

Beyond reallocating capital, BHCs also adapt their organizational structure in response to regulatory pressure. Rather than simplifying, they expand the scope of nonbank activity after 2015, increasing the number of distinct nonbank business lines while reshuffling subsidiary portfolios through compositional churn. In particular, BHCs add nonbank lending subsidiaries while shedding high-equity-ratio insurance affiliates. This extensive-margin adjustment, together with the intensive-margin shift in nonbank business models, demonstrates that organizational structure itself responds endogenously to regulation, reshaping where risk resides within the financial conglomerate.

Overall, our findings reframe the literature on regulatory arbitrage by showing that arbitrage operates not only across firms but also within them. We show that much of the nonbank sector resides within banking organizations: roughly one in four dollars of U.S. nonbank financial assets is held within a bank holding company. A substantial share of regulatory migration therefore occurs within banking organizations, as BHCs reallocate capital and risk toward their own nonbank affiliates while remaining under consolidated supervision. The broader implication is that regulation attaches to legal entities, but capital is allocated by organizations. When legal boundaries and organizational boundaries diverge, the incidence of regulation is determined as much by firms' internal organization as by the regulation itself. Entity-level requirements therefore prove more effective at relocating capital than at increasing it. Understanding the effects of regulation therefore requires treating the organization, not the regulated legal entity, as the relevant unit of analysis.

1.1 Related Literature

This paper contributes to three strands of literature. First, we contribute to the literature on internal capital markets by showing how regulation shapes the allocation of capital within organizations. A large literature documents that diversified firms reallocate resources across business units through internal capital markets (Lamont, 1997; Shin and Stulz, 1998; Stein, 1997; Rajan, Servaes and Zingales, 2000; Stein, 2002). Within banking, prior work has focused primarily on the internal reallocation of liquidity through loans, deposits, and other intra-firm funding arrangements (Houston, James and Marcus, 1997; Campello, 2002; Ashcraft and Campello, 2007; Cetorelli and Goldberg, 2012*a*,*b*; Gilje, Loutskina and Strahan, 2016; Cetorelli and Prazad, 2025; Bai, Campello and Muthukrishnan, 2025; Bai et al., 2025; Correa, Du and Liao, 2025). We show instead that equity transfers dominate these liquidity flows by an order of magnitude and directly determine both risk-bearing capacity and regulatory capital. More broadly, firm boundaries shape how resources are allocated and how shocks propagate within organizations (Giroud and Mueller, 2015, 2019). Related work shows that firms rely more heavily on internal capital markets when exter-

nal financing becomes costly, reallocating resources internally during financial disruptions and expanding organizational scope to facilitate such transfers (Matvos and Seru, 2014; Kuppuswamy and Villalonga, 2016; Almeida, Kim and Kim, 2015; Matvos, Seru and Silva, 2018). We document an analogous response to regulatory frictions. When capital requirements tighten at bank subsidiaries, bank holding companies reallocate equity from affiliated nonbanks, using those subsidiaries as internal equity reservoirs. Our findings, therefore, show that the effects of regulation depend not only on the regulated entity but also on the organizational structure through which firms allocate capital.

Second, we contribute to the literature on bank capital regulation (Kashyap, Stein and Hanson, 2010; Admati et al., 2013, 2018; Hanson, Kashyap and Stein, 2011; Berger and Bouwman, 2013; Gropp et al., 2019; Begenau, 2020; Begenau and Landvoigt, 2022). Existing studies typically analyze banks either as standalone institutions or at the consolidated holding-company level. We instead show that subsidiary-level heterogeneity within organizations is central to understanding regulatory outcomes: identical consolidated capital requirements generate sharply different responses across subsidiaries because capital is actively reallocated within the firm. This challenges the implicit assumption that consolidated oversight fully captures the economic consequences of prudential regulation. Our emphasis on the holding company as the locus of capital allocation is consistent with He, Kelly and Manela (2017), who show that intermediary holding-company equity prices risk across asset classes. The divergence we document between bank subsidiaries and consolidated holding companies also complements the puzzle highlighted by Sarin and Summers (2016). Because investors value the consolidated organization, whose excess capital we find changes little, improvements in safety concentrated at regulated bank subsidiaries need not be reflected in market-based measures of holding-company risk.

Third, we identify a distinct form of regulatory arbitrage operating through internal capital markets within financial conglomerates. Prior work emphasizes cross-border (Houston, Lin and Ma, 2012; Ongena, Popov and Udell, 2013; Danisewicz, Reinhardt and Sowerbutts, 2017), cross-sector (Buchak et al., 2018; Irani et al., 2021), and cross-balance-sheet (Kisin and Manela, 2016) channels. We show that regulatory arbitrage also occurs within the boundaries of a single consolidated organization and under the oversight of a single regulator. When capital requirements tighten at bank subsidiaries, BHCs reallocate equity and risk-bearing capacity toward affiliated nonbanks even though both entities remain subject to consolidated supervision. Our mechanism differs from existing channels in two important respects. First, arbitrage operates through equity rather than liquidity, making it quantitatively large and directly affecting regulatory capital. Second, because the reallocation occurs within the organization, it creates a direct contagion channel through which distress at nonbank affiliates can spill back onto affiliated banks. Our findings complement work by Acharya, Schnabl and Suarez (2013), Tarullo (2019), and Bai, Campello and

Muthukrishnan (2025), highlighting the challenges of regulating complex financial conglomerates. Our paper is particularly related to Albuquerque et al. (2026), who document the reallocation of lending from bank to nonbank subsidiaries following macroprudential tightening. We instead identify an equity channel that is quantitatively dominant and that reallocates risk-bearing capacity within the organization, creating the potential for nonbank distress to spill back onto affiliated banks.

We also document substantial growth in lending and risk-taking by nonbank subsidiaries within BHCs, complementing work on nonbank financial intermediation outside the banking sector (Pozsar et al., 2010; Buchak et al., 2018; Irani et al., 2021; Jiang et al., 2020; Acharya, Cetorelli and Tuckman, 2026, Forthcoming). Buchak et al. (2024) document the secular decline of banks' share of credit intermediation as nonbanks expand. We show that regulatory pressure accelerates this migration even within the boundaries of BHCs: BHCs reallocate lending activity from regulated bank subsidiaries to lightly regulated nonbank affiliates in response to stricter capital requirements. This organizational channel complements the cross-sector reallocation emphasized in prior work and has important implications for measuring and monitoring systemic risk. Many economically important nonbanks operate as wholly owned subsidiaries of BHCs, creating direct channels for risk transmission that are invisible in sector-level data (Adrian and Ashcraft, 2012; Cetorelli and Prazad, 2025).

Taken together, these findings suggest that the effects of regulation cannot be understood by studying regulated entities in isolation. Regulation attaches to legal entities, but capital is allocated by organizations. When legal and organizational boundaries diverge, organizational structure becomes a first-order determinant of regulatory outcomes. Understanding regulation therefore requires treating the organization, not the regulated legal entity, as the relevant unit of analysis.

The rest of the paper proceeds as follows. Section 2 presents the theoretical framework that organizes our empirical analysis. Section 3 describes data sources and sample construction. Section 4 establishes the stylized facts that motivate the analysis. Section 5 presents the identification strategy. Section 6 documents internal capital reallocation and presents the subsidiary-level stress tests that quantify the contagion channel. Section 7 documents the divergent consequences for subsidiary outcomes: banks become safer while nonbanks become more fragile. Section 8 presents key robustness tests. Section 9 concludes.

2 A Framework for Internal Capital Reallocation

We develop a stylized two-subsidiary model to organize our empirical analysis and formalize the mechanism. A profit-maximizing BHC owns two subsidiaries: a regulated bank B and an unregulated nonbank N. The bank faces a capital requirement $E_B \geq \kappa_B \cdot A_B$; the nonbank faces

none.[3] The BHC can meet a tightening requirement either by raising costly external equity K at convex cost $c(K)$, or by transferring equity internally from the nonbank to the bank at transaction cost τ per dollar. The BHC begins with total equity E^0. In the second period, each subsidiary draws an independent shock θ_i with distribution F_i on $[-\bar{\theta}_i, 0]$ and fails if $E_i + \theta_i < 0$. If the marginal cost of external equity issuance at zero exceeds the BHC's shadow value of internal funds, the optimal response to the capital requirement is fully internal.[4] Internal reallocation is privately preferred because the BHC avoids costly external issuance and consolidated profitability rises. Section 7 shows that BHC profitability indeed increases following Basel III, consistent with this prediction.

Proposition 2.1 (Internal Reallocation Equilibrium)**.** *When external equity is the costlier marginal instrument (formally $c'(0) \geq \nu^*$; Assumption (A3) in Appendix B), regulation binds, and the nonbank holds sufficient extractable equity ($E^0 \geq \kappa_B \cdot A_B$), the BHC optimally sets $K^* = 0$, $E_B^* = \kappa_B \cdot A_B$, and $E_N^* = E^0 - \kappa_B \cdot A_B$, yielding:*

$$\frac{\partial E_B^*}{\partial \kappa_B} = A_B > 0, \quad \frac{\partial E_N^*}{\partial \kappa_B} = -A_B < 0, \quad \frac{\partial (E_B^* + E_N^*)}{\partial \kappa_B} = 0 \tag{1}$$

Bank equity rises one-for-one with the regulatory requirement; nonbank equity falls in equal proportion; consolidated BHC equity is unchanged.[5]

We focus on this corner region because the marginal cost of the first dollar of external issuance is empirically high, consistent with the observed reliance on internal capital markets, and we treat the corner as the analytical benchmark. The corner is a device for transparency, not a knife-edge assumption: our numerical parameterization uses the interior optimum, with modest external issuance alongside predominantly internal reallocation, for which the comparative statics of Proposition 2.1 are unchanged (Appendix B.6). Proposition 2.2 below is stated for general private optima and does not require the corner at all.

The model predicts bank equity at exactly the regulatory minimum ($E_B^* = \kappa_B \cdot A_B$), implying zero excess capital. Empirically, banks hold substantial buffers above regulatory minimums. This gap reflects forces outside the model's scope: precautionary motives under uncertainty, time-varying requirements (e.g., stress capital buffer phase-in), the minimum-across-ratios measurement of excess capital, and the fact that multiple regulatory constraints (CET1, leverage, TLAC) bind at different points. The model's key testable prediction is not the level of excess capital but

[3] We hold A_B and its risk composition fixed; empirically, banks also adjust the denominator by tilting toward low-risk-weight assets (shown later in Section 7), a margin that complements rather than substitutes for the equity transfer, since leverage-based requirements are insensitive to asset composition.

[4] A large literature documents that external equity issuance is costly. See Myers and Majluf (1984); Altınkılıç and Hansen (2000).

[5] Here ν^* is the shadow value of internal funds at the corner allocation; the simpler condition $c'(0) > \tau$ conveys the same economics, that the marginal cost of external equity exceeds the internal transfer cost τ.

its *differential* change: internal reallocation increases bank capital without increasing consolidated equity, and this differential prediction is what we test.

The systemic implications of this reallocation depend on a second consideration. When a nonbank subsidiary suffers losses, the parent must choose between injecting equity to recapitalize it, liquidating assets at potentially fire-sale prices, or allowing failure. If the parent recapitalizes, it draws down the same capital buffer that backstops the bank. The bank's improved balance sheet may therefore be partially offset by a weakened parent: the additional excess capital accumulated by the bank is implicitly at risk if the nonbank encounters distress and the parent responds by injecting equity.

We capture this through a contagion parameter $\lambda \in [0,1]$, where $\lambda = 0$ denotes perfect ring-fencing and $\lambda = 1$ denotes full transmission of nonbank distress to the bank. The parameter λ should be interpreted as a reduced-form sufficient statistic summarizing all channels through which nonbank distress depletes resources available to support the bank, including capital transfers, funding pressures, and reputational spillovers. Two features make a nonzero λ difficult to avoid. First, the parent and its banks hold committed credit lines and intercompany claims on the nonbank, so nonbank losses impair affiliated balance sheets directly. Second, implicit parent support, while nominally discretionary, cannot be withdrawn without triggering the counterparty flight it is meant to prevent. On both margins, parent and bank resources are at risk before any decision to inject fresh equity.[6] The probability of bank failure incorporates both direct shocks and contagion:

$$\Pr(\text{Bank Failure}) = F_B(-E_B) + \lambda\,\Phi, \tag{2}$$

where $\Phi \equiv \Pr(\theta_N < -E_N,\, \theta_B > -E_B) = F_N(-E_N)\,[1 - F_B(-E_B)]$ is the probability that the nonbank fails while the bank survives its own shock, the second equality using the independence of the shocks. The contagion term $\lambda\Phi$ captures the channel of interest: nonbank distress transmits to the bank precisely in states where the bank would otherwise survive, because the parent depletes its buffer to recapitalize the nonbank. Note that the reallocation raises Φ on both margins: thinning the nonbank makes it fail more often, and thickening the bank enlarges the set of states in which a surviving bank stands exposed to a failing affiliate.

Proposition 2.2 (Contagion Externality)**.** *Let* $(E_B^{pre}, E_N^{pre}, K^{pre})$ *and* $(E_B^{post}, E_N^{post}, K^{post})$ *denote the BHC's private optima under the pre- and post-Basel requirements* κ_{low} *and* κ_{high}*, and define the reallocation's effect*

[6] In Section 6.4 we argue in more detail why we should expect a nonzero λ.

on failure probabilities:

$$\Delta F_B \equiv F_B(-E_B^{pre}) - F_B(-E_B^{post}) > 0 \qquad \textit{(reduction in the bank's own-shock failure prob.)}$$

$$\Delta F_N \equiv F_N(-E_N^{post}) - F_N(-E_N^{pre}) > 0 \qquad \textit{(increase in the nonbank's failure prob.)}$$

$$\Delta\Phi \equiv F_N(-E_N^{post})\left[1 - F_B(-E_B^{post})\right] - F_N(-E_N^{pre})\left[1 - F_B(-E_B^{pre})\right] > 0 \qquad \textit{(increase in the contagion-event prob.)}$$

Because the BHC's objective omits the contagion term, its private optimum is independent of λ, while the net social benefit of the reallocation is linear and decreasing in λ:

$$\Delta W(\lambda) \;=\; \underbrace{\Delta R + L_B\,\Delta F_B - L_N\,\Delta F_N - \Delta c(K) - \Delta\tau}_{\textit{net benefit at } \lambda=0} \;-\; \lambda\, L_B\,\Delta\Phi, \tag{3}$$

where ΔR is the change in subsidiary returns, $\Delta c(K)$ the change in external equity costs, and $\Delta\tau$ the change in internal transfer costs. There exists a critical contagion threshold

$$\lambda^* \;=\; \frac{\Delta R + L_B\,\Delta F_B - L_N\,\Delta F_N - \Delta c(K) - \Delta\tau}{L_B\,\Delta\Phi} \tag{4}$$

such that internal reallocation is privately and socially aligned if $\lambda < \lambda^*$ and socially costly if $\lambda > \lambda^*$.[7]

The dominant costs of a contagion-induced bank failure, including credit supply disruption, deposit insurance losses, and fiscal backstop costs, are borne outside the firm. Writing $L_B = L_B^{\text{priv}} + L_B^{\text{ext}}$, the BHC internalizes at most L_B^{priv} of the marginal contagion cost $L_B\,\Delta\Phi$ per unit of transmission; we adopt the standard simplification that this private component is negligible relative to the systemic component, so the full contagion term enters only the planner's objective and the private optimum is independent of λ. The consequence is excessive internal reallocation whenever contagion is material.

The threshold in (4) is decreasing in L_N and increasing in L_B whenever $L_N\,\Delta F_N + \Delta c(K) + \Delta\tau > \Delta R$, with $\lambda^* \to \Delta F_B/\Delta\Phi$ as $L_B/L_N \to \infty$. The intuition is that bank failure costs scale both sides of the ledger: the contagion exposure, but also the direct safety benefit of recapitalizing the bank. At our parameterization the benefit effect dominates, so societies in which bank failures are relatively costlier tolerate more transmission before reallocation turns socially costly. Appendix Figure B.4b traces this dependence: λ^* ranges from roughly 0.3 when bank failures are twice as costly as nonbank failures to roughly 0.9 when they are twenty times as costly.

The model delivers three testable predictions that organize our empirical analysis. First, tighter bank capital requirements should raise bank excess capital through internal reallocation rather than external issuance, with no corresponding increase in consolidated BHC equity. Second, non-

[7] If the numerator of (4) is non-positive, that is, if the direct gain in bank safety and returns is exhausted by the increase in nonbank failure costs and financing costs, then $\lambda^* \leq 0$ and the reallocation is socially costly for every $\lambda \in [0, 1]$.

bank subsidiaries in the same organizations should experience declining capital ratios, higher internal funding costs, and endogenous shifts away from high-equity-ratio activities as equity extraction forces portfolio reoptimization under tighter equity constraints. Third, the systemic implications depend on λ, the degree to which nonbank distress depletes the parent resources that backstop the bank: for the average BHC under static balance sheets and the baseline failure-cost ratio $L_B/L_N = 6$, internal reallocation is socially costly only if transmission exceeds $\lambda^* \approx 0.7$.

This threshold should not be read as implying that systemic risk is limited, for three reasons. First, we do not measure λ, and the exposures documented in Appendix D do not rule out transmission above the threshold even for the average BHC. Second, the threshold characterizes the average BHC at the baseline failure-cost ratio, whereas systemic risk is driven by the upper tail of the distribution and by the correlation of losses across institutions. The institutions of greatest systemic importance occupy the right tail of the equity-at-risk distribution, where the same transmission rate translates into far larger draws on parent capital and the distance to λ^* is substantially smaller. Third, the margin to the threshold has narrowed over time. The mechanism studied in this paper reduces resilience from both directions: post-2015 equity reallocation has diminished the nonbank capital buffers available to absorb losses, while the stock of committed bank-to-nonbank credit lines has expanded steadily over the sample period (Acharya, Cetorelli and Tuckman, 2026). The relevant policy question is therefore not whether internal capital reallocation is efficient for the average BHC under 2013 balance sheets, but whether the distribution of exposures is increasingly approaching the model's contagion threshold.

The relevant counterfactual. The welfare content of the reallocation depends on the benchmark against which it is judged. Relative to no increase in the requirement, internal compliance is an improvement: the bank becomes safer against its own shocks, though this gain is gross of contagion; because the reallocation raises the contagion-exposure probability by nearly as much as it lowers the own-shock failure probability ($\Delta\Phi \approx \Delta F_B$ at our parameterization), roughly a fraction $(1 - \lambda)$ of the measured improvement survives netting. Relative to external issuance, internal compliance is inferior whenever the contagion and nonbank-failure costs it creates exceed the issuance costs it avoids: issuance adds loss-absorbing capacity to the organization, while reallocation relocates it, and the private choice between the paths prices the issuance costs but not the contagion. The reallocation is thus better than no regulation and worse than the regulation working as intended, and the distance between those benchmarks, priced by λ, is the object this paper measures. Complete derivations, proofs, and parameter choices are provided in Appendix B.

3 Data and Institutional Setting

We use regulatory filings to study changes at the BHC, bank, and nonbank levels. Our primary data sources are the FR Y-9C (consolidated BHC financials), FR Y-9LP (unconsolidated BHC financials and inter-entity flows), Call Reports (bank subsidiary financials), and FR Y-11 (nonbank subsidiary financials). We link entities across filings using the organizational structure database introduced in Cetorelli and Stern (2015).

3.1 BHC-Level Data

The FR Y-9C provides quarterly consolidated financial statements for BHCs, including balance sheets, income statements, and regulatory capital measures such as risk-weighted assets and capital ratios. We supplement the FR Y-9C with the FR Y-9LP, which reports quarterly unconsolidated data for the top-tier holding company. We use the FR Y-9LP in two primary ways. First, it provides information on nonbank activity, including the number of nonbank subsidiaries and their aggregate assets, loans, and revenues. Second, the FR Y-9LP contains detailed data on equity investments and intercompany lending, allowing us to measure internal equity and non-equity transfers within the BHC's organizational structure, and across its bank and nonbank entities.

3.2 Bank and Nonbank Subsidiary Data

Call Reports (FFIEC 031/041) provide detailed quarterly information on bank balance sheets, income statements, and regulatory capital, allowing us to observe equity and capital positions of depository institution subsidiaries. We also use Call Reports to measure bank-level lending activity across loan categories, charge-offs, and other performance indicators.

The FR Y-11 provides balance sheet information on nonbank subsidiaries, including equity, lending activity, and loss provisions. Top-tier holding companies must submit FR Y-11s for large nonbank subsidiaries at either quarterly or annual frequency. However, only a subset of nonbank subsidiaries are required to file, and reporting frequencies are not uniform across entities.

3.3 BHC Organizational Structure Database

We use a comprehensive database of BHC organizational structures covering 1970 to the present, first documented in Cetorelli and Stern (2015) and described further in Cetorelli and Prazad (2025). This database combines information from FR Y-6 and FR Y-10 filings to construct a quarterly panel of bank and nonbank subsidiary relationships and counts for each top-tier holding company. To our knowledge, this is the only dataset providing time-consistent, comprehensive coverage of organizational structure for the full population of Y-9C filing BHCs.

We use this database in two main ways. First, it allows us to link BHC-level financial data with subsidiary-level filings. Second, it records the primary business activity of each subsidiary using five-digit NAICS codes, enabling us to distinguish between different types of nonbank financial institutions within a BHC's organizational structure. We supplement this dataset with the FR Y-10 Report data, which records all changes in ownership between a BHC and its subsidiaries. The FR Y-10 notably contains details on the chain of ownership between a BHC and all its subsidiaries, including the percentage ownership, which is rounded down to the nearest whole number.[8]

3.4 Excess Capital Construction

We construct measures of excess regulatory capital at BHC and depository institution levels using FR Y-9C and Call Report data, respectively. Excess capital is defined as the amount of regulatory capital held by an institution in excess of all binding regulatory requirements, normalized by risk-weighted assets (RWA). For each institution–quarter, we compute observed capital ratios (Common Equity Tier 1, Tier 1, Total Capital, and leverage-based ratios) and compare them to the applicable regulatory minimums in effect at that time. Excess capital is defined as the minimum distance between observed capital ratios and their corresponding regulatory thresholds, ensuring that the most binding constraint determines the measure value.

Our construction accounts for changes in U.S. bank capital regulation over time, including the transition from pre-Basel III to Basel III, the phase-in of the Capital Conservation Buffer (CCB), the introduction of the Stress Capital Buffer (SCB) at the BHC level, G-SIB surcharges, and leverage-based constraints such as the Supplementary Leverage Ratio (SLR). For advanced approaches institutions, capital ratios are defined as the minimum across standardized and advanced approaches calculations. We exclude banks that opt into the Community Bank Leverage Ratio (CBLR) framework, as they do not report RWA. Full details of the regulatory framework and construction procedure are provided in Appendix C.

3.5 Regulatory Environment and Treatment Timing

The Pre-Basel III Regime. Prior to 2015, U.S. BHCs and their depository institution subsidiaries faced three minimum capital requirements: a Tier 1 capital ratio of at least 4% of risk-weighted assets (RWA), a Total Capital ratio of at least 8% of RWA, and a leverage ratio of at least 4% of total assets. These requirements applied symmetrically to both the consolidated BHC and its bank subsidiaries. Nonbank subsidiaries within BHCs faced no analogous capital requirements. Some are subject to functional regulation, including SEC net capital rules for broker-dealers and state solvency standards for insurance affiliates, but these regimes protect customers and policyholders

[8]The FR Y-10 captures voting share ownership when control exceeds 5% of any voting class, and nonvoting equity only when voting control is 5% or less.

rather than target loss absorbency, differ in stringency and design from bank capital regulation, and were not tightened by Basel III. Other nonbank types, notably finance companies and other nonbank lenders, face no capital regulation at all, their capitalization governed only by market discipline and counterparty requirements.

Basel III Regime. Basel III introduced four changes that are material for our analysis. First, it added a new Common Equity Tier 1 (CET1) ratio requirement of 4.5% of RWA, a constraint that did not exist before and that could not be satisfied with hybrid capital instruments such as trust preferred securities that counted toward pre-Basel III Tier 1. Second, the Tier 1 minimum was raised from 4% to 6% of RWA. Third, a CCB of up to 2.5% of RWA was phased in between 2016 and 2019, raising the effective CET1 minimum to 7% at full implementation. Fourth, the definition of qualifying capital was narrowed: hybrid instruments such as trust-preferred securities, which had counted toward Tier 1 capital before Basel III, were phased out of regulatory capital under the Collins Amendment. Institutions that had relied on these instruments therefore faced effective capital shortfalls even absent any change in their underlying balance sheets. Table 1 summarizes these changes. See Appendix C for more details.

Table 1: Capital Requirements Before and After Basel III

Requirement	Pre-2015	2015 Minimum	Full Phase-In (2019)
CET1 / RWA	—	4.5%	7.0% (incl. CCB)
Tier 1 / RWA	4.0%	6.0%	8.5% (incl. CCB)
Total Capital / RWA	8.0%	8.0%	10.5% (incl. CCB)
Leverage (Tier 1 / Assets)	4.0%	4.0%	4.0%

Notes: The Capital Conservation Buffer (CCB) was phased in from 0.625% in 2016 to 2.5% in 2019. G-SIB surcharges and the Stress Capital Buffer (post-2020) apply additional requirements at the BHC level only. Nonbank subsidiaries faced none of these requirements.

Although the minimum requirements in Table 1 apply at both the bank and consolidated levels, the economically relevant notion of constraint is the shadow cost of capital rather than the accounting distance to the regulatory minimum. Institutions may hold substantial positive excess capital and still face meaningful costs as they approach a threshold, including heightened supervisory scrutiny, restrictions on activities and payouts, and higher funding and regulatory costs. These consequences are concentrated at the bank subsidiary. "Well-capitalized" status under Prompt Corrective Action (PCA) governs access to brokered deposits, affects deposit insurance assessment costs and supervisory treatment, and determines eligibility for financial holding company (FHC) status, the legal authority under which BHCs conduct many of the nonbank ac-

tivities central to our analysis.[9] A bank that breaches its capital conservation buffer also faces automatic restrictions on dividend payments to the parent, the parent's principal source of cash flow.[10] Because these consequences attach to the insured depository institution rather than to the holding company, the shadow cost of capital is concentrated at the bank level.

Treatment Timing. We define our treatment period as beginning in 2015Q1, when binding minimum capital ratios first took effect for the majority of banks. While the Basel III framework was initially proposed in 2010 and finalized in the U.S. via rules published in the Federal Register in October 2013, binding minimum capital ratios did not take effect until January 1, 2015. Our pre-treatment controls are measured as of 2013Q1, several quarters before the final rules were published and nearly two years before they became binding, ensuring that neither organizational structure nor BHC characteristics reflect anticipatory responses to the regulatory change. Our sample spans 2010 through 2024, covering the full pre- and post-treatment period for all BHCs filing consolidated financial statements with the Federal Reserve.

3.6 Summary Statistics

Table 2 reports summary statistics for the BHC, bank, and nonbank samples used in the empirical analysis from 2010 to 2024. BHCs are heterogeneous in size, with mean assets of $35 billion and mean risk-weighted assets of $21 billion. Within the consolidated organization, bank subsidiaries account for the bulk of assets (mean $27 billion) relative to nonbank subsidiaries (mean $8 billion), and 47% of BHCs hold at least one nonbank subsidiary. Commercial banks are typically smaller than their top-tier holding company, with mean assets of $15 billion, while nonbank subsidiaries are substantially smaller with mean assets of just $3.8 billion. The two differ sharply in capitalization: nonbanks carry far more capital per dollar of assets than banks, the basis of the equity-reservoir mechanism in Section 4.3. Balance sheet composition measures indicate that BHCs and banks are primarily deposit-funded and loan-oriented, whereas nonbanks hold relatively low loan shares (median zero) and span a range of subsidiary types, with funds, brokers, and nonbank lenders the most common.

[9] PCA applies only to insured depository institutions. FHC status requires all depository subsidiaries to be well capitalized and well managed. The smallest BHCs in our sample face no consolidated requirement under the Small Bank Holding Company Policy Statement.

[10] The conservation buffer applies at both levels, but a breach has different consequences at each: at the consolidated level it restricts distributions to BHC shareholders, whereas at the bank level it interrupts the flow of dividends from the bank to the parent on which the parent's own debt service and distributions depend.

4 Nonbanks Inside Bank Holding Companies

Before describing the identification strategy, we document the setting and the empirical patterns that motivate the analysis. Nonbank financial activity is large and growing, but the feature that matters for this paper is *where* much of it sits: inside BHCs, conducted by controlled subsidiaries that face no capital requirement of their own yet are funded and directed by the same parent that owns the regulated bank. This section documents the scale of this footprint, the balance-sheet features that make internal equity reallocation possible, and the divergence between bank and consolidated capital that emerges after 2015.

4.1 Fact #1: Nonbank Activity Occurs Inside Bank Holding Companies

Nonbank financial intermediation is often analyzed as a sector operating outside the regulated banking system (Pozsar et al., 2010; Buchak et al., 2018). In practice, however, a substantial share of nonbank activity takes place within BHCs themselves (Cetorelli and Prazad, 2025). Three features are central: nonbank activity inside BHCs is economically large, represents a meaningful share of the broader nonbank sector, and is conducted through subsidiaries that are overwhelmingly controlled by the parent organization.

Figure 1 illustrates the scale of nonbank activity from two perspectives: its importance within banking organizations and its importance within the nonbank sector as a whole. Panel (a) shows that nonbank subsidiaries account for roughly 20–30% of consolidated BHC assets in the post-2010 period, with broker-dealers representing the largest component. Panel (b) places these activities in the context of the broader financial system. The share of aggregate nonbank financial assets held within BHC structures rises from roughly 5% in the mid-1990s to a peak above 40% during the financial crisis and remains near 25% over the past decade.[11] Thus, roughly one in four dollars of nonbank financial intermediation is conducted by an entity whose parent owns a regulated bank.

These subsidiaries are not arm's-length affiliates but entities subject to direct parental control. Appendix Figure E.1 shows that 73% of nonbank subsidiary-quarters are wholly owned by the parent BHC and an additional 17% are majority owned, implying that 90% of observations fall under direct parental control. Ownership is especially concentrated among funds, where 92% of subsidiary-quarters are wholly owned, but remains substantial among broker-dealers, insurers, and nonbank lenders as well. This ownership structure gives parent BHCs effective control over subsidiary capital and dividend policies—the margin through which internal capital reallocation operates in the analysis that follows. Appendix Table F.1 reports detailed ownership distributions by subsidiary type.

[11] The 2008–2010 spike reflects the conversion of large investment banks, including Goldman Sachs and Morgan Stanley, to BHC status during the financial crisis.

Nonbank activity also rises with organizational scale on both the extensive and intensive margins, but is not confined to the largest institutions. Appendix Figure E.2 shows that 64% of BHCs with $1–10 billion in consolidated assets operate at least one nonbank subsidiary.

4.2 Fact #2: Equity Is the Relevant Internal Margin

Fact 1 establishes that substantial resources sit inside the firm under the parent's control; the question is through which margin the parent moves them. The banking internal-capital-markets literature has largely emphasized the reallocation of liquidity through loans, deposits, and other intra-firm funding flows as the primary adjustment margin within bank-affiliated organizations (Cetorelli and Goldberg, 2012*a*,*b*; Schnabl, 2012; Gilje, Loutskina and Strahan, 2016; Kundu, Park and Vats, 2021). Our evidence points to a different answer. A decomposition of parent investments in bank subsidiaries reveals that equity positions exceed non-equity positions by an order of magnitude, making equity, rather than liquidity, the primary channel through which BHCs reallocate capital across subsidiaries.

Figure 2 plots three components of parent investment in bank subsidiaries over 2005–2024, all normalized by bank assets: equity investments (common stock, goodwill, and intangibles), non-equity investments (loans, receivables, and other direct exposures), and net borrowing from related entities. Equity investments average 10–11% of bank assets throughout the sample, an order of magnitude larger than non-equity investments at 1–2%. Net intra-company borrowing hovers near zero throughout.

The dominance of the equity channel implies that organizational structure is central to internal capital allocation. BHCs with nonbank affiliates possess an internal source of equity that can be redeployed across subsidiaries, whereas BHCs without nonbanks must rely more heavily on retained earnings or external capital. The extent of this flexibility, however, depends not only on the presence of nonbanks but also on how much equity they hold.

4.3 Fact #3: Nonbank Subsidiaries Are Equity Reservoirs

Nonbank affiliates are not only the relevant internal source of equity within a BHC, they are equity-intensive relative to their size. A small nonbank footprint can therefore back a disproportionately large share of consolidated equity. We define each BHC's *equity multiplier* as the nonbank share of consolidated equity divided by the nonbank share of consolidated assets. A value above one indicates that nonbanks hold more than their proportional share of equity relative to their share of consolidated assets.[12]

[12]To construct the multiplier, we drop BHC-quarters with non-positive nonbank-asset shares or BHC capital ratios, nonbank-asset shares exceeding 95% (BHCs that operate as non-banks rather than as bank holding companies), and

Table 3 reports a median equity multiplier of 6.5×. This concentration reflects the interaction of two features: nonbanks operate with high capital ratios (median 69% equity-to-assets, versus roughly 10% at banks), and they do so on small balance sheets, so that a subsidiary holding a trivial share of consolidated assets can hold a large share of consolidated equity. The distribution is right-skewed, reaching 12× at the 75th percentile and exceeding 21× at the 95th, with multipliers highest for funds and asset managers and lowest for nonbank lenders (Figure 3). A small nonbank footprint can therefore support a substantial share of the equity available for redeployment into the regulated bank. Appendix Figure E.3 shows the full distribution across BHC-quarters and nonbank types.

4.4 Fact #4: Bank Capital Diverges from Consolidated Capital After 2015

These conditions for internal reallocation set up the post-2015 pattern that motivates the rest of the paper. Beginning in 2015, banks within BHCs that hold nonbank subsidiaries accumulate substantially more excess capital, while excess capital at the consolidated BHC level shows no such divergence.

Figure 4 plots excess capital, defined as capital above all binding regulatory minimums, for BHCs with and without nonbank subsidiaries. Before 2015, bank-level excess capital (Panel (a)) evolves in parallel across the two groups. Banks in BHCs with nonbank affiliates (the treated group) maintain higher capital buffers throughout the pre-period (approximately 14% versus 9%), but neither series exhibits a trend. This persistent level difference reflects systematic differences across BHCs and is absorbed by the BHC fixed effects in our difference-in-differences specification. Beginning in 2015Q1, the treated series breaks upward, with the gap widening to roughly 10 percentage points by 2018. The consolidated picture is markedly different. Panel (b) shows no comparable divergence in BHC-level excess capital; instead, excess capital declines gradually for both groups as Basel III is phased in.[13]

Table 4 quantifies these patterns using a simple difference-in-differences specification. Relative to BHCs without nonbank subsidiaries, banks within BHCs that own nonbank affiliates accumulate significantly more excess capital after 2015. In contrast, excess capital at the consolidated BHC level remains unchanged. The resulting increase in the share of consolidated capital held within bank subsidiaries is the pattern the regulatory wedge predicts: equity is reallocated internally

equity multipliers outside [0, 50] (extreme outliers driven by accounting eliminations or financial-distress observations). Results are robust to alternative thresholds.

[13] The decline at the BHC level in Panel (b) is not mirrored at the bank level in Panel (a) because excess capital is defined as the minimum buffer across all binding regulatory ratios. When Basel III phased in, the CET1 requirement entered this set. Whether CET1 became the binding constraint depended on the composition of the capital stack, specifically whether Additional Tier 1 plus Tier 2 capital exceeded the gap between the total-capital and CET1 requirements (approximately 3.5% of risk-weighted assets). BHCs with relatively less AT1 and Tier 2 capital therefore experienced a mechanical decline in measured excess capital after 2015.

rather than raised externally or generated through balance-sheet contraction. Appendix Table F.2 reports the full specification, while Appendix Figure A.1 provides a stylized illustration of the underlying balance-sheet mechanics.

These results are descriptive rather than causal. BHCs that own nonbank subsidiaries differ systematically from those that do not in size, business model, geographic footprint, and other observed and unobserved characteristics, and the decision to operate nonbank affiliates is itself endogenous. The next section addresses these concerns by exploiting predetermined variation in organizational complexity generated by the staggered timing of interstate banking deregulation.

5 Empirical Strategy

Identifying the response to Basel III poses two challenges. First, the regulation applied uniformly to all U.S. BHCs in 2015, so identification must come from cross-sectional differences in exposure rather than from an untreated control group. Second, BHC organizational complexity is endogenous: the presence of nonbank subsidiaries reflects deliberate corporate choices that may correlate with unobserved capital management strategies. We address both challenges by exploiting pre-determined variation in organizational complexity arising from the timing of state-level interstate banking deregulation: variation that predates Basel III by decades, supplies cross-sectional differences in exposure, and is plausibly orthogonal to the determinants of post-2015 capital responses.

5.1 Instrumental Variable Strategy

Following Jayaratne and Strahan (1996), Strahan (2003), and Rice and Strahan (2010), we use the timing of interstate branching deregulation across U.S. states as a source of quasi-experimental variation in organizational structure.[14] States deregulated at different times between the 1970s and 1990s, driven primarily by idiosyncratic political economy factors unrelated to future capital regulation.

We construct the instrument by measuring each BHC's headquarters state between 1970 and 1981 (before interstate banking was permitted) and calculating:

[14] Matvos, Seru and Silva (2018) use a related deregulation index, originally constructed by Black and Strahan (2001), as a contemporaneous shock to external credit supply for non-financial firms, finding that scope contracts as cheaper external credit lowers the demand for internal capital markets. Our setting differs because BHCs are the intermediaries directly governed by interstate deregulation, not non-financial firms responding to changes in credit supply. Pre-1994 geographic restrictions limited BHCs' ability to grow in scale, and deregulation removed those scale constraints. Cross-state variation in deregulation timing thus generates pre-determined variation in BHCs' realized organizational complexity by 2013, which we exploit in a setting where Basel III subsequently created the asymmetric capital wedge we study. The two strategies are complementary uses of the same source of regulatory variation, operating through different channels.

$$\text{Years from Dereg}_i = 1994 - \text{Interstate Dereg Year}_{\text{HQ state}(i)} \tag{5}$$

where 1994 marks the passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act, which mandated interstate banking nationwide. The instrument measures how many years elapsed between a state's interstate deregulation and the federal mandate. BHCs in states that deregulated earlier (higher values of the instrument) had more time to develop organizational complexity, including nonbank subsidiaries, before interstate expansion became universal.[15]

Reduced-Form Specification. Our baseline empirical approach estimates the reduced-form effect of deregulation timing on capital allocation outcomes:

$$Y_{it} = \alpha + \beta \cdot (\text{Years from Dereg}_i \times \text{Post}_t) + \gamma_i + \delta_t + X'_{i,2013}\boldsymbol{\theta} \cdot \text{Post}_t + \varepsilon_{it} \tag{6}$$

where Y_{it} is an outcome variable (bank capital ratios, nonbank equity, or BHC equity), Years from Dereg_i is the instrument defined in equation (5), Post_t indicates periods 2015Q1 and later, γ_i are BHC fixed effects, δ_t are quarter-year fixed effects, and $X_{i,2013}$ includes pre-treatment BHC and bank characteristics interacted with Post_t. At the BHC level, we control for log total assets, leverage, return on assets, asset growth, deposit-to-assets ratio, top-200 BHC indicator, and total subsidiary count. At the bank level, we control for log assets, leverage, return on assets, and asset growth. These controls flexibly absorb differential exposure to concurrent regulations (Dodd-Frank, Volcker Rule, CCAR/DFAST) that might differentially affect BHCs based on size, activities, or regulatory status.[16] The coefficient β captures how much more (or less) BHCs in early-deregulating states adjust capital allocation in response to Basel III, per additional year of deregulation exposure.

This reduced form specification offers a transparent interpretation: the coefficient β directly answers the question of how an additional year of pre-Riegle-Neal deregulation exposure affects

[15] A natural concern is that our instrument captures organizational complexity generated by Glass-Steagall's repeal in 1999 rather than by earlier interstate banking deregulation. The timing is mechanical: our instrument measures years elapsed between state-level deregulation and Riegle-Neal (1994), so the variation we exploit was built in the 1980s and early 1990s, predating Glass-Steagall's repeal. More fundamentally, Glass-Steagall imposed weaker constraints on BHC nonbank activity than the common narrative suggests. Cetorelli and Prazad (2025) document that the Bank Holding Company Act of 1956 granted regulators broad discretion over the permissible boundaries of banking, and that by the mid-1980s regulators were exercising this discretion expansively, inviting banks to become "financial supermarkets" (Markham, 2009). The Senate voted 94–0 to propose repealing Glass-Steagall as early as 1988. The 1999 legislation therefore ratified an organizational reality that had already emerged.

[16] We include pre-period return on assets as a control only for capital-management outcomes (e.g., excess capital, parent equity investments in subsidiaries, dividends received from subsidiaries), where it controls for pre-period heterogeneity in BHC profitability that may correlate with the parent's broader approach to capital management. We exclude it for all subsidiary-level outcomes (e.g., operating performance, portfolio composition, credit quality, intrafirm balances, lending), where pre-period profitability is a plausible mediator of post-2015 responses and including it would absorb part of the structural effect we aim to identify.

capital reallocation after Basel III. Because not all BHCs in early-deregulating states fully exploit the opportunity to build complex structures, β captures intent-to-treat (ITT) effects that are conservative relative to treatment-on-the-treated but do not rely on strong functional form assumptions. As a robustness check, Appendix Table F.18 reports 2SLS estimates that scale the reduced-form effects by the first-stage relationship.

Instrument Validity. Three sets of evidence support the validity of the instrument. First, parallel pre-trends: Figure 5 shows that BHCs in early- versus late-deregulating states exhibit parallel trends in nonbank subsidiary share from 1986 to 1994, before Riegle-Neal harmonized interstate banking nationwide. These parallel pre-trends indicate that deregulation timing is uncorrelated with differential trends in organizational structure or capital management. Appendix Figure E.4 shows the gap remains stable at approximately 8 percentage points through 2014, then widens after 2015 when Basel III capital requirements become binding, precisely the pattern expected if early deregulation creates persistent organizational differences that affect capital allocation only when the regulatory constraint tightens.

Second, balance on observables: Appendix Table F.3 compares pre-treatment characteristics between BHCs headquartered in early- versus late-deregulating states as of 2013Q1. Panel A shows that early deregulators have larger total assets and nonbank assets, reflecting greater organizational complexity developed during the deregulation period. Panel B shows balance sheet characteristics. Leverage, portfolio composition, and deposit ratios are statistically indistinguishable between groups. Importantly, the characteristics that do differ (total assets, top 200 BHC status, distinct NAICS codes, and ROA) are directly accounted for in our reduced-form specification through pre-treatment BHC controls interacted with Post. This supports the validity of our instrument: conditional on controls, variation in deregulation timing is orthogonal to factors determining post-2015 regulatory responses.

Finally, the persistence of organizational structure supports intrument validity. Appendix Table F.4 shows NBFI share exhibits high autocorrelation: a BHC with 10 percentage points higher nonbank share in year t has 7.1 percentage points higher share five years later. This means organizational complexity developed in the 1980s–1990s provides pre-determined variation today, almost three decades after Riegle-Neal eliminated regulatory differences.[17]

The instrument is strongly relevant in our data. Appendix Table F.17 shows that BHCs headquartered in early-deregulating states are substantially more likely to operate nonbank financial

[17] Appendix Figure E.4a displays the geographic and temporal variation in deregulation timing and shows that early deregulators maintain consistently higher nonbank shares throughout 1986–2024. This timing was driven by idiosyncratic political factors, including small bank lobby strength and state legislature composition, rather than economic fundamentals, size of local nonbank sector, or business cycle conditions (Kroszner and Strahan, 1999; Rice and Strahan, 2010).

subsidiaries. This first-stage relationship is consistent with prior evidence that interstate banking deregulation facilitated both organizational expansion and diversification. Mian, Sufi and Verner (2020) show that states deregulating before 1983 experienced 42 percentage points greater credit growth between 1982 and 1988 than states deregulating later, with especially pronounced increases in nonbank lending activity. Similarly, Kundu and Vats (2026) document that the share of gross domestic assets owned by out-of-state multi-BHCs rose from 6% to 47% between 1979 and 1994 in early-deregulating states, compared with only 7% to 29% in late-deregulating states. This expansion reflected not only geographic diversification but also broader diversification into nonbank financial activities.

Appendix Table F.5 reports summary statistics for the reduced-form sample, restricted to BHCs active before the 1994 Riegle-Neal Act for which deregulation timing is defined. These institutions are larger and more organizationally complex than the full population: mean assets are $98 billion (versus $35 billion in the full sample) and mean risk-weighted assets are $61 billion, and 57% hold at least one nonbank subsidiary (versus 47%). This is the population for which deregulation timing is defined, and its tilt toward larger, nonbank-active BHCs concentrates the sample on the institutions where the internal-reallocation mechanism has the most scope to operate.

6 Main Results

This section documents the organizational response to the Basel III wedge. We first show that banks in affected BHCs accumulate excess capital without a corresponding increase in consolidated capital and rule out external equity issuance as the source, leaving internal reallocation as the primary mechanism. We then trace that mechanism through equity transfers, nonbank dividend payouts, and bank earnings retention, and show that it is strongest when nonbank affiliates hold more extractable equity. Finally, we quantify the associated contagion channel by stress-testing nonbank subsidiaries and measuring the resulting depletion of parent capital that backstops the bank.

6.1 Identifying Internal Reallocation

Reduced Form Estimates. Table 5 presents estimates of internal capital reallocation at three levels: bank excess capital (column 1), BHC excess capital (column 2), and the ratio of bank to BHC excess capital (column 3). Banks in BHCs from states deregulating earlier accumulate 0.74 percentage points more excess capital per year of pre-Riegle-Neal exposure post-2015 (column 1), with no corresponding effect at the BHC level (column 2). For the median gap of seven years between early and late deregulators, this implies approximately 5 percentage points more bank capital.[18]

[18] Multiplying the coefficient of 0.74 by the median exposure of 7 years yields $7 \times 0.74 = 5.18$ percentage points.

The ratio of bank to BHC excess capital rises by 1.78 per year of exposure (column 3), roughly twice the pre-period median ratio of about one.

Large positive effects at the bank level alongside a null at the BHC level imply internal reallocation of existing equity rather than external capital issuance or balance-sheet contraction. Appendix Table F.6 reports the full specification with all intermediate columns.

Ruling Out External Equity Issuance. The bank–BHC divergence is consistent with two explanations: BHCs raise external equity and channel it to bank subsidiaries, or they reallocate existing internal equity from nonbank to bank subsidiaries. The null effect at the consolidated BHC level is indirect evidence against external issuance, which would raise consolidated equity alongside bank equity. We provide direct evidence by examining BHC equity issuance in Appendix Table F.7. Across measures of gross issuance, both direct common-stock issuance in column 1 and preferred stock issuance in column 2 fall significantly with deregulation exposure, with the broader combined measure in column 4 also declining. Column 5 shows that BHCs simultaneously increase share buybacks: per year of deregulation exposure, buybacks rise by 0.09 percentage points of equity per quarter. Because net issuance subtracts repurchases from gross issuance, the two margins compound: the net issuance series in column 3 falls by approximately the sum of the decline in gross issuance and the rise in buybacks. Rather than accessing external markets to satisfy stricter requirements, organizationally complex BHCs reduce their reliance on outside investors and actively return the equity they extracted from nonbanks in excess of bank-side capital needs. The combined effect implies that consolidated equity falls below the level it would have reached absent internal reallocation: the subsidiary-level Basel III rule binds the bank, but the firm perimeter remains a margin of arbitrage.

6.2 Tracing Internal Capital Markets

Having established the divergence between bank-level and consolidated capital, we next trace the mechanics of the internal reallocation process. The evidence reveals a three-step process: parent equity investments shift from nonbanks to banks, nonbank dividend payouts to the parent increase while bank dividends remain unchanged, and banks retain the resulting earnings rather than distributing them upstream. To focus on institutions for which this mechanism is economically meaningful, we restrict the analysis to BHCs whose nonbank subsidiaries account for at least 1% of consolidated assets.

Table 6 provides direct evidence of internal equity reallocation. Column 1 shows that parent equity investments in bank subsidiaries, measured as a share of total BHC equity, increase by 2.28 percentage points per year of deregulation exposure after 2015. Column 2 shows a nearly offsetting decline of 2.64 percentage points in parent equity investments in nonbank subsidiaries.

Column 3 confirms that this shift reflects reallocation rather than capital raising: total parent equity investments across all subsidiaries remain unchanged. The close symmetry between the increase in bank investments and the decline in nonbank investments, together with the absence of any change in aggregate investments, indicates that BHCs redistribute existing equity within the organization rather than raise new external capital.[19]

This reallocation is facilitated by asymmetric dividend and retention policies governing earnings flows between subsidiaries and the parent. Columns 4–5 show that BHCs extract earnings from nonbanks through higher dividend payouts: dividends from nonbank subsidiaries increase by 9.47 percentage points per year of deregulation exposure, while bank subsidiary dividends are unchanged. The asymmetry mirrors the equity-investment result: just as parents reallocate equity investments away from nonbanks and toward banks, they also extract earnings disproportionately from nonbanks while leaving bank earnings unchanged. As a result, earnings generated by the bank are retained within the bank subsidiary and accumulate as regulatory capital. Appendix Figure E.5 illustrates this pattern: banks in BHCs with nonbank affiliates increase retained earnings from 5% to 10% of assets between 2015 and 2020, while banks without nonbank affiliates remain flat near 5%. Appendix Table F.9 confirms the pattern in regressions, with bank retained earnings rising 0.19 percentage points per quarter per year of deregulation exposure.

6.3 Reallocation Scales with the Equity Multiplier

The mechanism traced above operates through the equity held at nonbank affiliates that the parent can redeploy. The size of that reservoir, the equity multiplier documented in Section 4.3, varies considerably across BHCs and generates a cross-sectional prediction. If extractable nonbank equity is what makes internal reallocation feasible, the response to Basel III should scale with the multiplier: BHCs with larger multipliers should reallocate more equity toward bank subsidiaries, while those with smaller multipliers should exhibit little reallocation along this margin. Table 7 tests this prediction by interacting the BHC's 2013Q1 equity multiplier with the post-2015 indicator, and Figure 6 visualizes the same relationship as a BHC-level cross-section of pre-2015 to post-2015 changes plotted against the multiplier.

The results in Table 7 confirm the predicted pattern. In column 1, the share of consolidated BHC equity invested in bank subsidiaries rises by 1.71 percentage points more per unit of equity multiplier post-2015. In column 2, the corresponding share invested in nonbank subsidiaries falls by 1.12 percentage points per unit of multiplier. The bank and nonbank responses are roughly symmetric, consistent with reallocation across the bank-to-nonbank boundary rather than expan-

[19] Appendix Table F.8 presents a robustness test using the share of total BHC equity held directly by bank subsidiaries rather than parent equity investments. The results similarly show a significant increase in bank equity shares after 2015, confirming that equity capital shifts toward banks within the BHC structure.

sion of consolidated invested equity. Column 3 verifies this directly: total parent invested equity, the sum of equity in bank, nonbank, and holding-company subsidiaries scaled by BHC equity, exhibits essentially no relationship with the multiplier. This null result rules out a level shift in consolidated invested equity.

Figure 6 displays this relationship visually. Each point represents one BHC's pre-2015 to post-2015 change in the share. Panel (a) shows that BHCs with larger 2013Q1 multipliers exhibit larger post-2015 increases in the share of equity invested at the bank, with a positive fitted slope. Panel (b) shows the mirror image on the nonbank side: BHCs with higher multipliers reduce the share allocated to nonbanks more steeply.

These results show that the size of the redeployable nonbank equity reservoir governs the margin of adjustment within the BHC: internal reallocation is not a uniform response to Basel III but scales with the amount of extractable equity available. This flexibility, however, comes at a cost. Every dollar transferred to a bank subsidiary is a dollar removed from a nonbank affiliate, leaving that affiliate with a thinner capital buffer against future losses. The central systemic question is therefore whether equity extraction leaves nonbank subsidiaries too weakly capitalized to absorb adverse shocks without drawing on the parent capital that ultimately backstops the bank. The next section quantifies this tradeoff.

6.4 Stress Testing Nonbank Subsidiaries

We quantify the exposure implied by the contagion channel in Proposition 2.2 using subsidiary-level stress tests. After establishing the institutional basis for contagion, we simulate adverse shocks to nonbank portfolios, measure the resulting draw on parent capital buffers, and evaluate the implications for the net improvement in organizational resilience.

6.4.1 Institutional Basis for the Contagion Channel

The transmission parameter λ captures the extent to which losses at nonbank subsidiaries draw on the parent capital that ultimately backstops affiliated banks. Interpreting the stress tests therefore requires establishing why such transmission should be expected. We argue that organizational contagion arises from two features of the institutional environment and is corroborated by historical episodes, credit-rating methodologies, and our own data.

Two institutional features generate this exposure. First, the parent and its affiliated banks hold contractual claims on the nonbank, including intercompany loans, receivables, and committed funding lines; these internal positions are economically large (Cetorelli and Prazad, 2025), so losses at the nonbank directly impair the balance sheets of the entities that backstop the bank. Section 7.2 later shows that as equity is extracted, nonbanks substitute borrowing from the parent

and affiliated entities on the liability side of their balance sheets. The same transactions that raise measured bank capital therefore also enlarge the stock of intercompany claims through which nonbank losses are transmitted to the resources backstopping the bank.[20]

Second, parent support is effectively non-discretionary during distress. Market participants treat parental backstops as credible commitments, and withdrawing support would trigger counterparty flight, funding disruptions, and rating downgrades that amplify losses for the organization as a whole.[21] This mechanism is explicitly recognized by bank supervisors. The Federal Reserve's *Bank Holding Company Supervision Manual* notes that "... Because the bank is usually the largest subsidiary, the holding company may attempt to draw upon the resources of the bank to aid the nonbank subsidiary. The bank can transfer a substantial portion of its capital through dividends to the parent company, which may pass these funds on to the troubled nonbank subsidiary. Also, the nonbank may attempt to sell part of its portfolio to the bank subsidiary to improve liquidity" (Section 4030.0).[22] Because the exposure is largely contractual and the supporting transfers are anticipated by the supervisory framework, λ captures the degree of effective ring-fencing rather than managerial discretion; in particular, the mechanism requires no assumption that parents voluntarily rescue distressed affiliates.

These institutional features are supported by three complementary sources of evidence. First, historical episodes provide direct evidence that parents routinely absorb losses incurred by affiliated nonbanks. Hamilton National Bank failed in 1976 after absorbing losses from its holding company's mortgage affiliate. Ally Financial supported its mortgage subsidiary ResCap for years before its 2012 bankruptcy, writing off its equity investment, holding $1.1 billion of intercompany credit exposure, and ultimately contributing $2.1 billion to the bankruptcy estate. HSBC similarly absorbed years of losses at HSBC Finance before winding the subsidiary down. The same logic extends beyond the consolidated perimeter. In 2007, Citigroup brought approximately $49 billion of structured investment vehicle assets back onto its balance sheet despite having no legal obligation to do so. Bear Stearns likewise extended $1.6 billion to one of its sponsored hedge funds. If implicit support extends even across legally separate sponsored vehicles, contractual claims on wholly owned subsidiaries should bind more strongly, not less. Appendix Table D.1 summarizes these and related episodes.

Second, credit-rating agencies explicitly incorporate expected parent support into subsidiary

[20] Intra-family funding is also large and actively managed on the liquidity side: Correa, Du and Liao (2025) show that internal repo from depository institutions funds affiliated broker-dealers at the largest BHCs, with broker-dealer subsidiaries replacing roughly $40 billion of external repo with internal borrowing from bank affiliates at quarter-ends, and Bai et al. (2025) document the pricing and volume of these internal flows in the triparty market.

[21] For example, SEC Rule 15c3-1 (the Net Capital Rule) requires broker-dealers to maintain minimum net capital; when losses threaten compliance, the parent's implicit commitment effectively converts from an off-balance-sheet backstop into a binding cash obligation.

[22] See also Pogach and Unal, 2020.

ratings. For example, S&P assigns J.P. Morgan Securities LLC a rating two notches above its parent BHC and Goldman Sachs & Co. LLC three notches above its parent group.[23]

Third, our own data provide direct evidence of this transmission mechanism. Commercial lending by affiliated banks contracts following losses at nonbank subsidiaries, BHC bond spreads widen relative to comparable institutions during stress periods, and parent equity flows shift toward distressed nonbanks and away from affiliated banks. Appendix D presents these empirical results in detail. These tests show the two sides of the organization are not independent; they do not measure how strong the transmission is, which is why all stress-test results are reported as functions of λ. Taken together, these institutional features and empirical evidence indicate that losses at nonbank subsidiaries are unlikely to remain fully ring-fenced.

6.4.2 Stress Test Design

The design reflects three features of the setting. First, nonbank subsidiaries operate with substantially higher capital ratios than banks. Second, while consolidated BHC capital requirements account for nonbank assets in risk-weighted calculations, no subsidiary-level capital requirement binds on nonbanks themselves: a nonbank can become severely undercapitalized without triggering regulatory intervention so long as consolidated ratios remain adequate. Third, when a nonbank suffers losses, the parent may inject equity to restore solvency, drawing down its consolidated capital buffer.[24]

We conduct stress tests using 2013Q1 balance sheets, before Basel III implementation. For each BHC, we simulate asset shocks of varying severity (1%, 5%, 10%, 15%) applied to all nonbank subsidiaries. Following each shock, we calculate the capital injection required to restore each subsidiary to a target capital ratio ranging from 20% to 70%.[25]

Specifically, for each nonbank subsidiary i in BHC j, we compute:

$$\text{Loss}_{ij} = \text{Shock} \times \text{Assets}_{ij,2013Q1} \tag{7}$$

$$\text{Post-Shock Equity}_{ij} = \text{Equity}_{ij,2013Q1} - \text{Loss}_{ij} \tag{8}$$

$$\text{Capital Shortfall}_{ij} = \max\left(0, \kappa \times \text{Assets}_{ij,2013Q1} - \text{Post-Shock Equity}_{ij}\right) \tag{9}$$

[23] Moody's, S&P, and Fitch all assign explicit support indicators or strategic-importance categorizations to subsidiary obligations, with up to several notches of uplift above standalone profiles. Appendix Section D discusses the methodologies and provides additional examples.

[24] The parent could alternatively liquidate subsidiary assets at depressed prices or allow subsidiaries to fail, but both alternatives carry severe consequences: fire-sale losses, reputational damage, and potential regulatory intervention.

[25] Our recapitalization formula applies the target capital ratio to the pre-shock asset base, a standard fixed-denominator approximation in stress-testing models. Because an equity injection simultaneously increases both equity (numerator) and total assets (denominator), the exact injection required to reach the target ratio is slightly larger than our estimate. This approximation slightly underestimates recapitalization needs but does not affect the qualitative findings.

where κ represents the target capital ratio (equity-to-assets) to which the parent must restore the subsidiary. We aggregate shortfalls to the BHC level and express total recapitalization needs as a percentage of the parent BHC's excess capital buffer (capital above regulatory minimums):

$$\text{BHC Equity at Risk}_j = \frac{\sum_i \text{Capital Shortfall}_{ij}}{\text{BHC Excess Capital}_j} \times 100 \tag{10}$$

This metric directly measures the parent's financial capacity to absorb subsidiary losses. Values exceeding 100% indicate scenarios where recapitalization needs exceed available parent buffers, representing potential insolvency if the BHC fully supports its nonbank subsidiaries.

Baseline Results. Table 8 summarizes recapitalization needs across shock severities and target capital ratios. Panels A and B report the amount of parent capital at risk. Under our baseline scenario of a 5% asset shock and a 40% target capital ratio, comparable to financial crisis losses for diversified financial institutions, the average BHC must deploy 17.85% of its excess capital to recapitalize nonbank subsidiaries, representing a substantial draw on parent resources. The distribution is highly skewed: at the 95th percentile, recapitalization needs reach 99.45% of excess capital, approaching complete buffer depletion. Under more severe scenarios, recapitalization needs exceed 100% of available parent capital (marked with asterisks), implying potential parent insolvency if subsidiaries are fully recapitalized. Panels C and D show that these capital needs arise because a substantial share of nonbank subsidiaries simultaneously require recapitalization. Under the baseline scenario, the average BHC recapitalizes 7.5% of its nonbank subsidiaries, compared with more than 38% at the 95th percentile, highlighting considerable heterogeneity in organizational exposure. Panel E reports the fraction of BHCs whose recapitalization needs exceed their entire excess capital buffer. Under the baseline scenario, 4.26% of BHCs exhaust their available excess capital, with this fraction increasing under larger shocks and higher recapitalization targets.

Figure 7 visualizes the two principal dimensions of these results for a fixed 40% target capital ratio. Panel (a) plots recapitalization needs against shock severity. Mean requirements increase approximately linearly from 15.62% under a 1% shock to 23.85% under a 15% shock, whereas tail risk is markedly convex: the 95th percentile rises from 89.36% to 128.60%. Panel (b) plots the fraction of BHCs with completely depleted capital buffers. Buffer depletion remains limited under mild shocks but rises steadily with shock severity, reaching 6.38% under a 15% shock. Appendix Figure E.6 reports the full set of sensitivity analyses.

The sensitivity to target capital ratios highlights a fundamental policy tension. While higher nonbank capital requirements would reduce subsidiary vulnerability to initial losses, they also increase the capital injection needed to restore solvency following shocks, potentially exceeding parent capacity.

Interpreting the Stress Tests. Three features of the stress test results merit emphasis. First, the distribution of recapitalization needs is highly heterogeneous across organizations. While Panel A of Table 8 shows that the average BHC must deploy only 17.85% of its excess capital under the baseline scenario, Panel D shows that, at the 95th percentile, more than 38% of nonbank subsidiaries simultaneously require recapitalization. This concentration indicates that the largest recapitalization needs arise not from isolated subsidiary failures but from correlated distress across multiple nonbank affiliates, similar to the joint losses experienced by broker-dealers, mortgage lenders, and structured investment vehicles during the 2008 financial crisis.

Second, our stress tests are deliberately conservative because they use pre-Basel III (2013Q1) balance sheets, before the equity extraction documented in this paper. As nonbank capital ratios decline after 2015, the recapitalization needs implied by a given shock become larger. Consequently, the 4.26% buffer-depletion rate reported under the baseline scenario should be interpreted as a lower bound on current organizational vulnerability.

Third, the stress tests hold the transmission mechanism fixed. Section 7.2 shows that equity extraction not only reduces nonbank capital buffers but also increases borrowing from the parent and affiliated entities. As a result, the same transactions that strengthen measured bank capital simultaneously expand the stock of intercompany claims through which nonbank losses are transmitted. Our stress tests therefore isolate the direct recapitalization channel. Because intra-family exposure grows with the treatment itself, the effective transmission of nonbank losses to the resources backstopping the bank is likely larger than that implied by the pre-treatment balance sheets used in our simulations.

How Much of the Bank Capital Gain Survives? The stress tests above quantify the cost of internal reallocation: future shocks to nonbank subsidiaries draw on the same parent capital that ultimately supports affiliated banks. We now combine this cost with the bank-level capital gains documented in Table 5 to ask a simple question: how much of the apparent improvement in bank safety survives once organizational contagion is taken into account? This balance-sheet netting has a probability counterpart in the framework: the reallocation raises the bank's contagion-exposure probability by nearly as much as it lowers its own-shock failure probability, so roughly a fraction $(1 - \lambda)$ of the measured safety gain survives netting (Section 2).

Our benchmark bank-level gain is 0.74 percentage points of excess capital for each year of exposure to interstate deregulation, corresponding to approximately 5.2 percentage points for the median seven-year difference in exposure. We compare this gain with the recapitalization needs implied by our baseline stress-test scenario under alternative values of the transmission parameter λ. The top row reports results for the average BHC, while the bottom row reports the 95th percentile.

	$\lambda = 0$	$\lambda = 0.25$	$\lambda = 0.5$	$\lambda = 0.75$	$\lambda = 1$
Typical BHC	100%	90%	81%	71%	62%
95th percentile BHC	100%	64%	28%	−8%	−44%

The results illustrate how organizational contagion erodes the apparent benefits of tighter bank capital requirements. For the typical BHC, most of the capital gain survives even under substantial transmission: full transmission ($\lambda = 1$) reduces the net improvement by roughly 40%. For the most exposed institutions, however, the picture is very different. Even modest transmission substantially offsets the gains, and once λ exceeds approximately 0.7, the recapitalization drawdown outweighs the initial increase in bank capital. Under full transmission, the most exposed BHCs are left worse off than before the regulatory change.

These calculations highlight a fundamental distinction between subsidiary-level and organizational resilience. Basel III successfully increases capital at regulated bank subsidiaries, but part of that gain is offset because the same organizational response that strengthens the bank also weakens affiliated nonbanks and increases the parent's exposure to their distress. The magnitude of this tension depends on subsidiary-level outcomes, how much safer banks actually become, and how much more fragile nonbanks become as a result. We now examine each in turn.

7 Consequences of Internal Capital Reallocation

Internal equity reallocation reshapes the organization at every level. From the perspective of the holding company, reallocating equity is the profit-maximizing response to tighter regulation. Rather than issuing costly external equity, the BHC extracts capital from lightly regulated nonbank affiliates and redeploys it to the bank subsidiaries where regulatory constraints bind. This strategy satisfies regulatory requirements while avoiding the issuance costs that would otherwise reduce consolidated profitability.

Table 9 provides evidence consistent with this interpretation. Following Basel III, consolidated return on assets (ROA) and return on equity (ROE) increase, while charge-offs decline. These improvements occur with little change in the consolidated balance sheet. Appendix Table F.10 shows that portfolio composition and capital structure remain largely unchanged, apart from a modest decline in the ratio of risk-weighted to total assets. The simultaneous decline in external equity issuance and increase in share repurchases (Appendix Table F.7) further imply that organizationally complex BHCs end the post-Basel III period with less consolidated equity than they would have absent internal reallocation.

Together, these patterns indicate that holding companies increase profitability not by taking more risk, but by reallocating capital toward the subsidiaries where regulation binds. Banks re-

ceive additional equity and become safer, while nonbank affiliates finance that adjustment through thinner capital buffers and greater risk-taking. The regulation strengthens the banks within the firm; it does not strengthen the firm.

The remainder of this section traces these divergent responses across the two sides of the organization. Throughout, identification comes from differences in organizational capacity to reallocate equity internally rather than differences in exposure to the Basel III regulatory shock itself, which is absorbed by quarter-year fixed effects.

7.1 Consequences for Bank Safety

Internal equity injections make affiliated banks both safer and more profitable. Capital ratios improve, charge-offs decline, and portfolios shift toward lower-risk assets following Basel III. Importantly, these gains do not arise through changes in balance-sheet leverage. Instead, banks maintain essentially unchanged leverage while reallocating their portfolios toward lower-risk assets, reducing risk-weighted assets relative to total assets and improving regulatory capital quality. Appendix Figure E.7 provides event-study evidence consistent with these patterns.

Bank Performance and Portfolio Composition. Table 10 shows that internally recapitalized banks become both safer and more profitable. Panel A reports improvements in operating performance. Column 1 shows that post-2015 return on assets increases with deregulation exposure, while column 2 shows that return on equity rises by 12 basis points for each additional year of exposure. Column 3 shows that charge-offs decline by 0.02 percentage points as a share of loans, indicating that higher profitability reflects improved asset quality rather than greater risk-taking.

Panel B shows that these improvements reflect changes in portfolio composition rather than balance-sheet contraction. The loan share of assets declines by 0.60 percentage points per year of deregulation exposure, while the shares of securities and cash increase by 0.33 and 0.52 percentage points, respectively. Columns 4–6 show that this reallocation is driven by differential rates of expansion rather than reductions in risky assets: cash grows fastest, followed by securities and then loans. Banks therefore use the additional equity to expand conservatively, shifting toward lower-risk assets without reducing the size of the balance sheet.[26] However, the slower growth of bank lending does not translate into lower consolidated credit supply because affiliated nonbank subsidiaries expand lending within the same organization, as shown in the next section. More broadly, these findings challenge the view that tighter capital requirements necessarily reduce profitability or encourage bank-level risk taking. Instead, internally recapitalized banks become simultaneously safer and more profitable, consistent with Admati and Hellwig (2024).

[26]The slower growth of bank lending is consistent with the well-documented dampening effect of tighter capital requirements on lending growth (Gropp et al., 2019).

Panel C explains why capital ratios improve despite essentially unchanged leverage. Columns 1 and 2 show that total assets and total equity grow at nearly identical rates, leaving the leverage ratio statistically unchanged as shown in column 3. The improvement in regulatory capital therefore does not arise through deleveraging. Instead, column 4 shows that equity relative to risk-weighted assets increases because risk-weighted assets decline as a share of total assets, shown in column 5. Combined with the portfolio evidence in Panel B, these results indicate that banks deploy the injected equity toward lower-risk assets rather than shrinking their balance sheets. Internal recapitalization therefore raises both the quantity and quality of bank capital.

This distinction reflects the difference between internal and external equity injections. External equity issuance places pressure on banks to restore shareholder returns, potentially encouraging greater risk-taking. Internal equity injections do not. Because the parent optimizes at the holding-company level, there is no separate return target for the marginal dollar of bank equity. Column 6 of Panel C tests this mechanism by examining the return on the incremental equity injection. The estimated effect is essentially zero, indicating that banks do not deploy the additional capital toward unusually high-return activities. Combined with the decline in charge-offs and the absence of any increase in off-balance-sheet commitments in column 7, the evidence suggests that higher ROE reflects improved asset quality rather than increased risk-taking.

7.2 Consequences for Nonbank Risk

The improvements in bank capitalization documented above are financed by equity extracted from affiliated nonbank subsidiaries. As capital is withdrawn, nonbanks do not simply become smaller versions of themselves. They replace equity with intra-family funding, shift toward business lines that require less equity, and become progressively more fragile. We trace this adjustment from changes in balance-sheet structure to business-model choice and, ultimately, measures of credit quality and insolvency risk.

Figure 8 illustrates this sequence of adjustments. The break at 2015Q1 is immediate and synchronized across balance-sheet, funding, and operating outcomes. Equity-to-assets ratios decline sharply as dividends to the parent increase and net balances due to affiliated entities rise, consistent with systematic equity extraction. As capital buffers erode, nonbanks expand lending activity, loan performance deteriorates, and profitability weakens. These changes occur precisely when affiliated banks experience improvements in capitalization, showing that the same regulatory shock strengthens banks by drawing resources from affiliated nonbanks.

Capital Extraction and Internal Funding. Table 11 quantifies these balance-sheet adjustments. Column 1 shows that equity as a share of assets declines by 7.71 percentage points per year of deregulation exposure, while column 4 shows that net balances due to parents and affiliated enti-

ties increase by 13.60 percentage points. Column 5 shows that dividend payouts relative to equity rise by 0.96 percentage points, providing the channel through which capital is transferred upstream to satisfy bank regulatory requirements, consistent with Section 6.2. Column 6 shows that total assets remain essentially unchanged. Rather than shrinking their balance sheets, nonbanks replace extracted equity with intra-family borrowing.

This substitution is the balance-sheet counterpart of the contagion channel developed in Section 6.4. Equity withdrawn from the nonbank is replaced by claims held by the parent and affiliated banks, converting loss-absorbing capital into intercompany credit that is impaired precisely when the nonbank experiences distress. The same reallocation that strengthens measured bank capital therefore also tightens the contractual links through which future nonbank losses are transmitted to the resources backstopping the bank.

Two considerations govern the interpretation of these magnitudes. First, the estimates are based on the selected FR Y-11 reporting universe rather than the comprehensive Call Reports underlying our bank estimates. Second, they reflect both intensive-margin equity extraction from existing subsidiaries and extensive-margin organizational recomposition, as BHCs simultaneously shed high-equity affiliates and add thinner-equity nonbank lenders. We therefore interpret these coefficients as cross-cohort intent-to-treat effects rather than cumulative within-subsidiary changes.

Capital extraction changes not only the quantity of internal funding but also its price. We construct implied internal funding rates by dividing interest income received by parents from subsidiaries by the stock of non-equity investments. Appendix Table F.11 shows that internal funding costs for nonbanks rise by 0.52 percentage points per year of deregulation exposure after 2015, while funding rates charged to affiliated banks remain unchanged. The resulting spread increases by 0.44 percentage points per year, roughly 300 basis points at the median seven-year exposure gap, implying that the entities left with the least equity also face the highest internal cost of capital.

Business Model Shift. Equity-constrained nonbanks respond by shifting toward lending-intensive business models. Table 12 shows that quarterly lending by nonbank subsidiaries grows 7.20% per year of deregulation exposure, while bank lending is statistically unchanged. As a result, slower lending growth at regulated banks does not reduce consolidated credit supply (see Appendix Table F.10). Instead, credit is reallocated within the organization from regulated bank subsidiaries to affiliated nonbanks. This organizational reallocation parallels the broader decline in banks' share of credit intermediation documented by Buchak et al. (2024), but occurs within rather than across financial organizations.

The composition of this lending expansion is equally informative. Appendix Table F.12 shows that nonbanks expand primarily in consumer lending while reducing their exposure to com-

mercial and real estate lending. The shift is especially pronounced among specialized nonbank lenders, where consumer-loan growth rises by 7.5 percentage points per year of deregulation exposure. Because consumer lending carries substantially higher charge-off rates than commercial or real estate lending, the reallocation concentrates risk precisely where expected losses are greatest.

The adjustment extends beyond lending portfolios to the broader business model of the nonbank sector. Appendix Table F.13 shows that nonbanks retreat from equity-intensive activities such as trading, advisory, and venture capital while expanding interest-generating lending activities. At the organizational level, Appendix Table F.14 shows that BHCs add nonbank lending subsidiaries while shedding high-equity insurance affiliates. Although the total number of nonbank lenders changes little, Appendix Table F.15 shows that organizations operate a broader set of nonbank business lines after Basel III, indicating that organizations reconfigure the composition of their nonbank activities rather than simply expanding them.

Credit Deterioration and Fragility. The shift toward lending materially increases nonbank risk. Table 13 traces this deterioration from loan performance to profitability and ultimately insolvency risk. Columns 1–3 document the deterioration in loan performance. Loans more than 90 days past due increase by 2.66 percentage points per year of deregulation exposure, all past-due loans rise by 3.08 percentage points, and loan-loss provisions increase by 9.37 percentage points conditional on provisioning.

These changes feed through to profitability. Return on equity declines by 1.87 percentage points per year of exposure, while the decline in return on assets is small and statistically insignificant. The asymmetry follows from the funding side: with thinner equity, leverage amplifies the spread between asset returns and funding costs, and that spread deteriorates as internal funding rates rise and credit costs mount. Broadly unchanged returns on assets, funded at higher internal rates on a thinner equity base, translate into lower returns to equity holders.

The combination of reduced capital, rapid lending growth, and deteriorating credit quality culminates in substantially greater fragility. Columns 6–8 quantify the resulting increase in fragility. The probability of negative earnings increases by 15.19 percentage points per year of exposure, Z-scores decline by 8.61 points, and the implied probability of default rises by 1.68 percentage points.[27] Appendix Table F.16 shows that this increase in fragility is driven by greater volatility of interest income rather than non-interest income, consistent with the documented shift toward lending.

These findings provide the empirical counterpart to the stress tests in Section 6.4. The thinly

[27] The Z-score is calculated as $(\text{Equity}/\text{Assets} + \text{ROA})/\sigma(\text{ROA})$, and the probability of default is the normal CDF of the negative Z-score.

capitalized, lending-intensive, higher-volatility nonbank that emerges after Basel III is precisely the organization whose recapitalization needs generate the tail exposure quantified there. Every increase in bank resilience is accompanied by a corresponding reduction in nonbank resilience within the same organization.

8 Robustness

This section presents additional evidence supporting our identification strategy. We first verify that interstate banking deregulation strongly predicts organizational complexity. We then report conventional two-stage least squares (2SLS) estimates as a complement to our baseline reduced-form specification. Finally, we show that the results are robust to excluding the largest BHCs, where post-2015 regulation differs most from the rest of the sample, and to permutation-based placebo tests that randomly reassign either the instrument or the timing of the Basel III implementation.

First Stage Relationship. Appendix Table F.17 verifies the relevance of our instrument. The first stage regresses post-2015 nonbank asset share on years since interstate banking deregulation, capturing the extent to which predetermined deregulation timing predicts organizational complexity once bank capital requirements become binding. Column 1 reports the unconditional relationship: each additional year of deregulation exposure increases nonbank asset share by 0.29 percentage points after 2015. Adding quarter-year fixed effects raises the coefficient to 0.51 percentage points, while including bank fixed effects leaves it essentially unchanged at 0.53 percentage points. Our preferred specification, which additionally includes differential trend controls, yields a coefficient of 0.35 percentage points. Across all specifications, the first-stage F-statistics exceed conventional thresholds for weak instruments.[28]

Two-Stage Least Squares Estimates. Appendix Table F.18 reports conventional 2SLS estimates using the interaction of years since deregulation and the post-2015 indicator as an instrument for post-2015 nonbank asset share. The estimates remain economically large and statistically significant across specifications. In the fully specified model, a one-percentage-point increase in nonbank asset share raises bank excess capital by approximately 2 percentage points. As expected, the 2SLS estimates exceed the reduced-form estimates because they recover the treatment effect for BHCs whose organizational complexity responds to deregulation timing, rather than the intent-to-treat effect averaged across all institutions.

[28] The Kleibergen-Paap Wald F-statistic ranges from 9.8 to 19.6 across specifications, near or above the conventional threshold of 10. The Cragg-Donald Wald F-statistic exceeds 500 throughout, indicating a very strong first stage.

Size-Based Regulatory Regimes. A remaining concern is that deregulation exposure is correlated with BHC size, while several post-2015 regulatory changes applied only to the largest banking organizations, including G-SIB capital surcharges, supervisory stress testing, advanced-approaches requirements, and related size-based regulation. If high-exposure BHCs are disproportionately large, the estimated buildup in bank capital could reflect these policies rather than internal capital reallocation.

Appendix Figure E.8 addresses this concern by re-estimating the baseline specification on progressively smaller samples. Excluding BHCs with more than $100 billion in 2013 assets removes every institution subject to G-SIB surcharges, advanced-approaches requirements, and the highest categories of the tailoring framework. Excluding BHCs above $50 billion removes the entire enhanced prudential regime established under Dodd–Frank. Across these samples, the estimated effect is stable, rising slightly from 0.74 in the full sample to 0.79 and 0.82, respectively. If anything, the capital buildup is stronger among BHCs too small to face these additional regulatory requirements, indicating that the effect operates through organizational structure rather than regulation targeted at the largest institutions.

Placebo Tests. Appendix Figures E.9 and E.10 present permutation-based placebo tests that assess the two sources of identifying variation.

Appendix Figure E.9 randomly reassigns the deregulation instrument 1,000 times while preserving the true post-2015 treatment period. The resulting placebo distribution is tightly centered at zero, and none of the 1,000 permutations produces an estimate exceeding the observed coefficient of 0.74. This strongly rejects the hypothesis that the results arise from spurious geographic variation.

Appendix Figure E.10 instead randomly reassigns the timing of the Basel III implementation while preserving each BHC's actual deregulation exposure. Again, the placebo distribution is centered at zero, and none of the 1,000 permutations generates an estimate approaching the observed effect. This indicates that the estimated effect is specific to the actual timing of the Basel III implementation rather than an artifact that any post-versus-pre split would generate.

Taken together, these exercises support both the relevance and the validity of our identification strategy. Interstate banking deregulation generates meaningful variation in organizational complexity, the estimated effects are not driven by regulatory changes affecting only the largest institutions, and neither random geographic assignment nor random treatment timing reproduces the observed results. The evidence therefore points to the interaction of predetermined organizational structure and the Basel III capital shock as the source of the internal capital reallocation documented in the paper.

9 Conclusion

This paper shows that subsidiary-level capital regulation within multi-entity financial firms can reallocate risk across organizational boundaries rather than eliminate it. When capital requirements bind more tightly at regulated bank subsidiaries than at affiliated nonbanks, firms optimally reallocate equity toward the regulated entities, improving measured bank capital while leaving consolidated capital largely unchanged. The same organizational linkages that facilitate this reallocation, including intercompany equity transfers, funding arrangements, and implicit parental support, also transmit losses from nonbank subsidiaries back to the parent organization. As a result, improvements in measured bank capital overstate improvements in the resilience of the consolidated organization. Because these transmission channels operate within the firm, they are not readily captured by regulatory frameworks that evaluate legal entities in isolation or rely primarily on subsidiary-level capital ratios.

These organizational responses have important economic consequences. Rather than issuing new equity, bank holding companies satisfy tighter capital requirements by reallocating existing equity from affiliated nonbanks. Banks become better capitalized, improve asset quality, and reduce balance-sheet risk without changing leverage. The counterpart is borne by nonbank subsidiaries, which replace equity with intra-family funding, shift toward more lending-intensive business models, and become progressively more fragile. Our stress tests show that, for the typical BHC, most of the increase in bank capital survives even if nonbank distress is fully transmitted back to the bank, although nearly 40% of the apparent gain is offset. For organizations with the greatest nonbank exposure, however, organizational contagion largely eliminates, and in some cases reverses, the improvement in bank safety. Internal reallocation is therefore better than no regulation but worse than the regulation as intended.

These findings highlight a tension in the current regulatory architecture. Entity-level capital requirements successfully strengthen regulated banks, but they also encourage traditional lending activity to migrate toward affiliated nonbanks operating under less stringent prudential standards. The result is not less credit, but differently organized credit: lending increasingly occurs through entities with thinner capital buffers while remaining economically tied to the same consolidated organization. The common narrative of credit migrating from banks to nonbanks therefore understates an important organizational margin. Much of that migration occurs within the very holding companies that consolidated supervision was designed to oversee.

The policy implication is that consolidated capital requirements alone are unlikely to eliminate regulatory arbitrage when regulatory stringency differs across subsidiaries within the same organization. Even well-capitalized groups will optimally concentrate equity where regulatory constraints bind most tightly, leaving less regulated affiliates to absorb risk. Limiting these offset-

ting vulnerabilities may require greater attention to material nonbank subsidiaries, constraints on internal equity extraction, and closer supervision of internal capital and funding flows.

Although our analysis focuses on banking, the mechanism is more general. Whenever regulation, taxation, or supervision differs across legally distinct units of an integrated organization, firms have incentives to use internal capital markets to relocate activity toward less constrained affiliates. Banking provides an unusually transparent setting because subsidiary-level financial statements are available and regulatory wedges are sharp. More broadly, our findings suggest a simple principle: regulation attaches to legal entities, but capital is allocated by organizations. When the two diverge, entity-level regulation proves far more effective at moving capital than at adding it, and regulatory measurement, which observes the location of capital but not the family claims against it, records the difference as safety.

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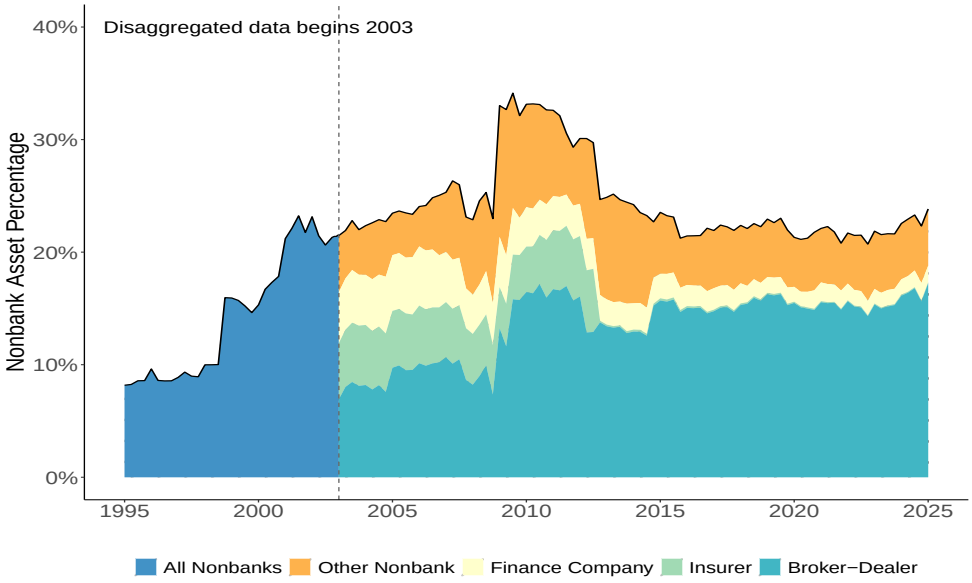
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Figure 1: Nonbank Activity Within and Across the BHC Sector

(a) Nonbank Subsidiaries as a Share of BHC Assets

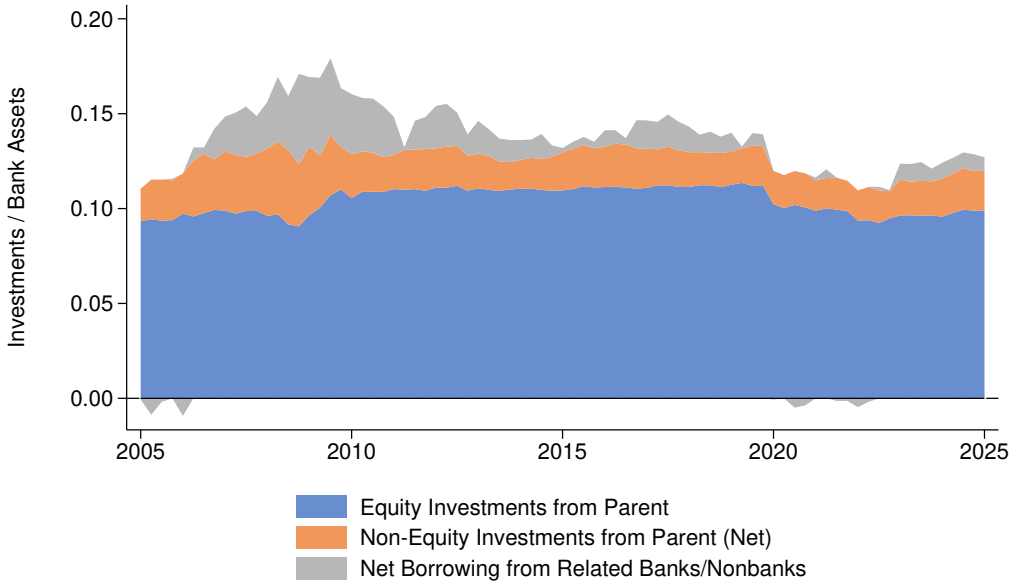


(b) Nonbank Subsidiaries of BHCs as a Share of Aggregate U.S. Nonbank Financial Assets



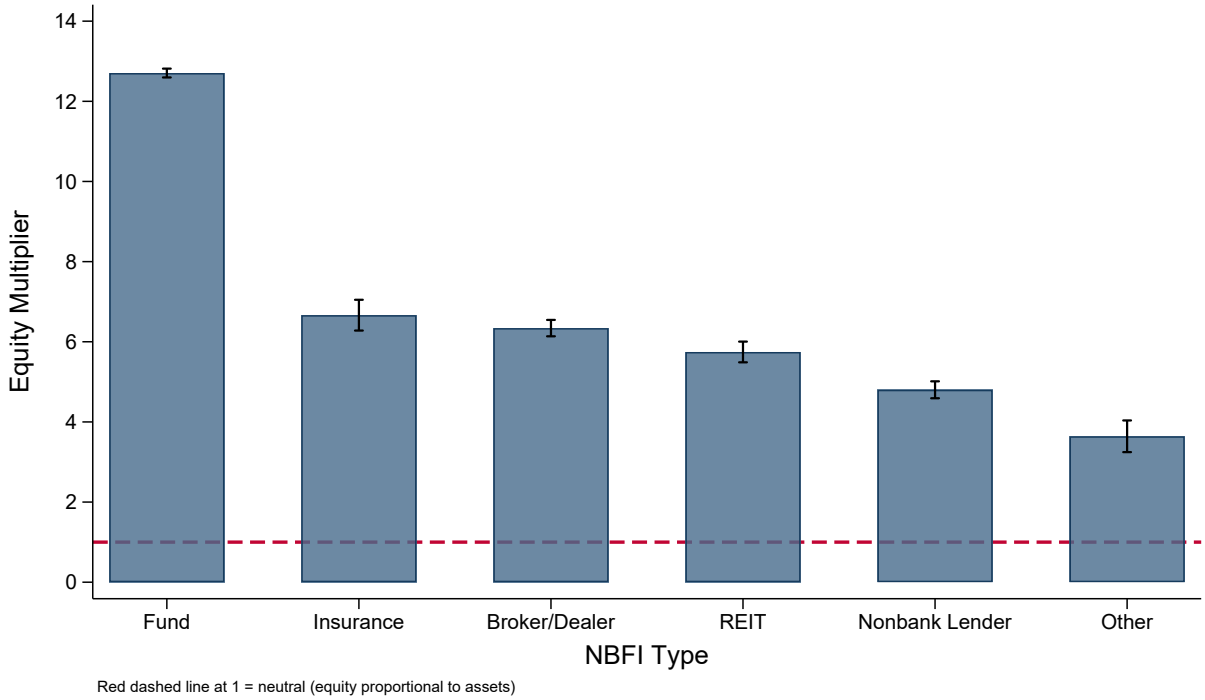
Notes: Panel (a) shows the size of nonbank business lines as a share of consolidated BHC assets from 1995 to 2025. The black line plots the ratio of total nonbank assets to BHC assets, with stacked colored areas decomposing this aggregate into broker-dealers, insurers, finance companies, and other nonbank business lines. Panel (b) presents the percent of aggregate nonbank assets attributable to BHC subsidiaries from 2005 through 2025. This measure is constructed as the ratio of BHC-affiliated nonbank assets (from the FR Y-9LP) to aggregate nonbank assets (from the Financial Accounts of the United States). The denominator is constructed using asset-level proxies for broker-dealers, ABS, equity REITs, finance companies, life insurers, mortgage REITs, other financial business, P&C insurers, and closed-end funds. Mutual fund and ETF assets under management are excluded from industry totals as they are not included in the FR Y-9LP numerator. Source: FR Y-9C, FR Y-9LP, and the Financial Accounts of the United States.

Figure 2: Parent Investments in Bank Subsidiaries: Equity vs. Non-Equity



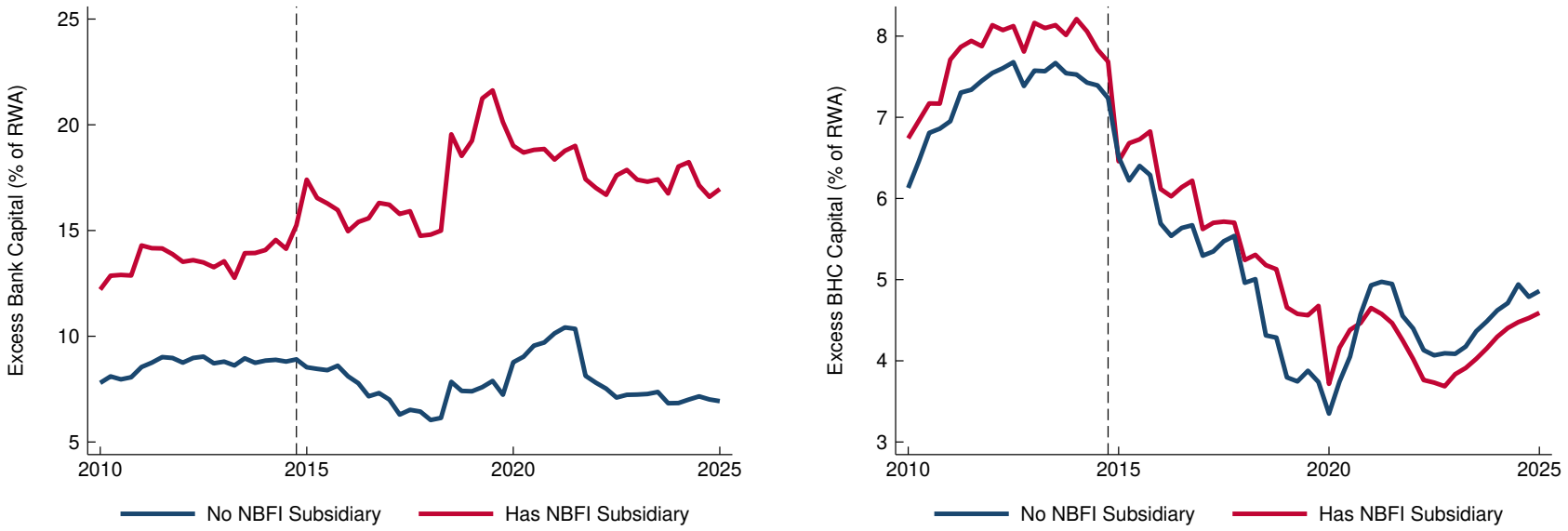
Notes: This figure shows parent BHC equity and nonequity investments in bank subsidiaries, as well as net intra-company borrowing, scaled by bank subsidiary assets. Equity investments in bank subsidiaries are defined as the sum of BHC equity investments in common stock, goodwill, and other intangibles. Nonequity investments in bank subsidiaries are defined as the sum of BHC investments in loans and other receivables and net balances due from subsidiaries (balances due from bank subsidiaries minus balances due to bank subsidiaries). Net borrowing from related banks and nonbanks is defined as balances held by subsidiary banks due to related banks and nonbanks minus balances held by subsidiary banks due from related banks and nonbanks. Variables are aggregated across all BHCs in the sample using value-weighted averages. Source: FR Y-9LP.

Figure 3: Equity Multiplier Varies by Nonbank Subsidiary Type



Notes: The figure presents the mean equity multiplier by nonbank subsidiary type. The equity multiplier is the ratio of a subsidiary's share of consolidated BHC equity to its share of consolidated BHC assets: values above one indicate that a subsidiary holds a larger share of the organization's equity than of its assets. Error bars show 95% confidence intervals around the means. Table 3 provides distributional statistics by type. Source: Authors' calculations using the FR Y-11.

Figure 4: Excess Capital: Banks vs BHCs

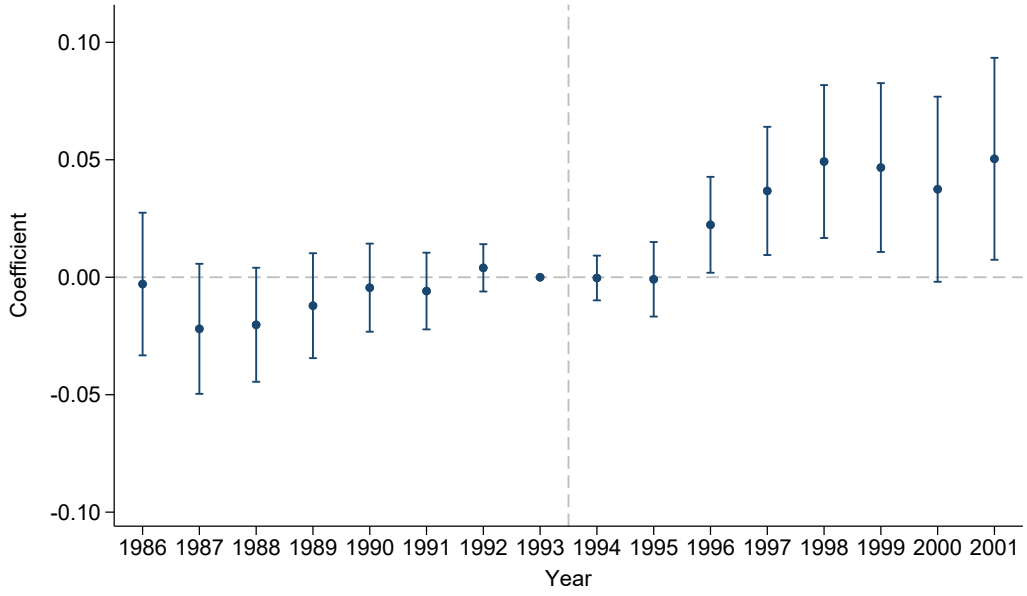


(a) Bank Excess Capital

(b) BHC Excess Capital

Notes: The figure compares average excess bank and BHC capital for BHCs with nonbank exposure and those without exposure. Panel (a) compares average excess bank capital from 2010 through 2024 for BHCs with nonbank exposure to BHCs without nonbank exposure, based on 2005 exposure status, which ensures the classification is pre-determined relative to both the 2013Q1 baseline used in regressions and the 2015Q1 treatment date. Panel (b) presents the corresponding comparison for excess BHC capital over the same period. Source: Authors' calculations using FR Y-9C, FR Y-9LP, and Call Reports.

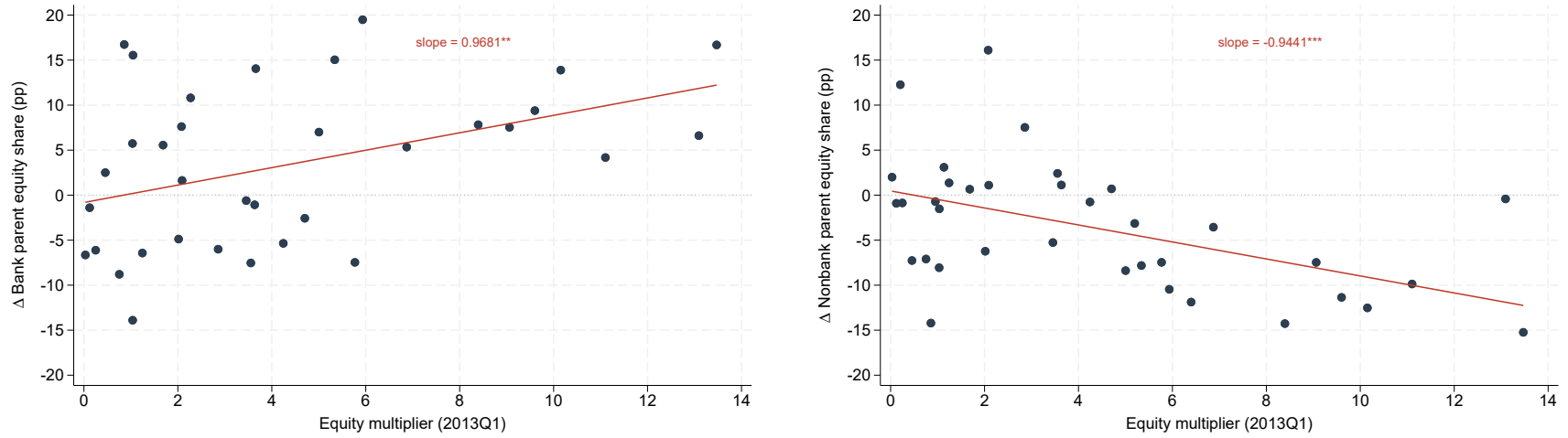
Figure 5: Deregulation Timing as an Instrument for Organizational Complexity



(a) Parallel Pre-Trends (1986–1994)

Notes: The figure shows the trends in nonbank financial subsidiary share from 1986–1994, between BHCs headquartered in early-deregulating states and late-deregulating states. Early deregulators are defined as states with median interstate deregulation year before 1986. Source: BHC Organizational Structure Database described in Section 3.

Figure 6: Reallocation of Parent Equity Investments Scales with the Equity Multiplier

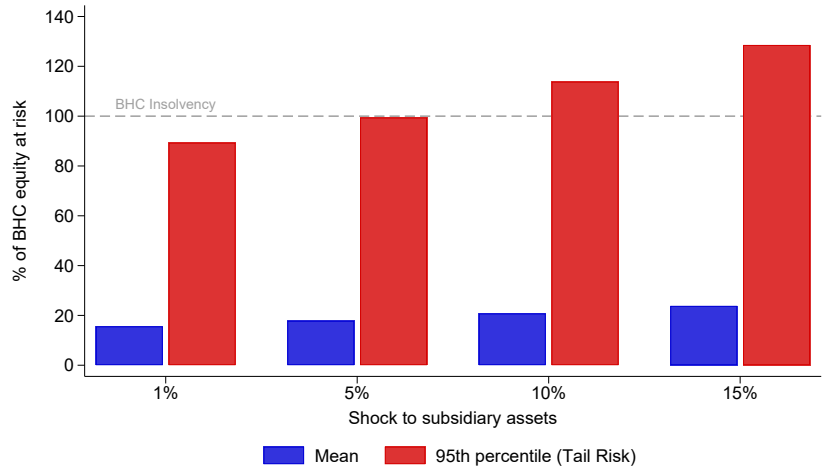


(a) Parent equity investment in banks

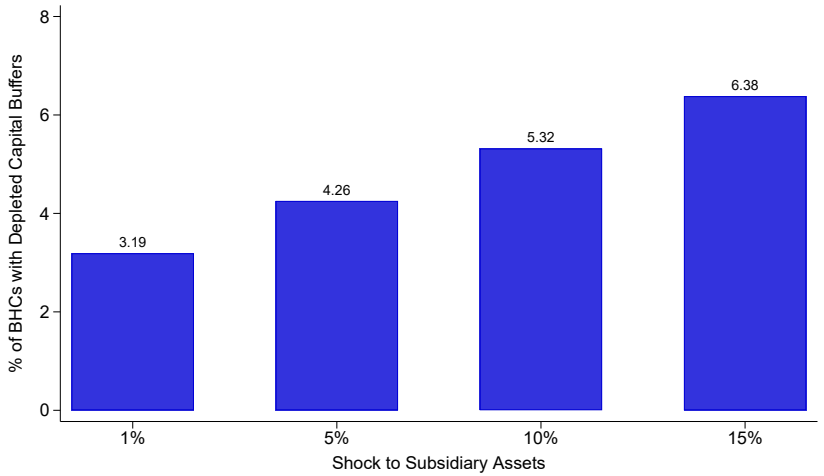
(b) Parent equity investment in nonbanks

Notes: The figure plots each BHC's pre-post mean difference in the outcome variable against the BHC's 2013Q1 equity multiplier. Panel (a) shows the change in parent equity invested in bank subsidiaries as a share of consolidated BHC equity. Panel (b) shows the change in parent equity invested in nonbank subsidiaries as a share of consolidated BHC equity. Both outcomes are expressed in percentage points. The sample consists of BHCs with at least 1% nonbank asset share in 2013Q1. For visual clarity, the scatter is restricted to BHCs whose pre-post change is within ± 20 percentage points; the fitted line and the slope reported in each panel are simple OLS estimates on this restricted cross-section.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 7: Nonbank Stress Tests: Recapitalization Needs and Buffer Exhaustion



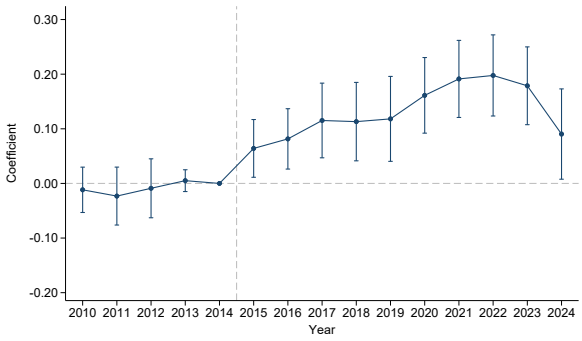
(a) Recapitalization Needs by Shock Severity



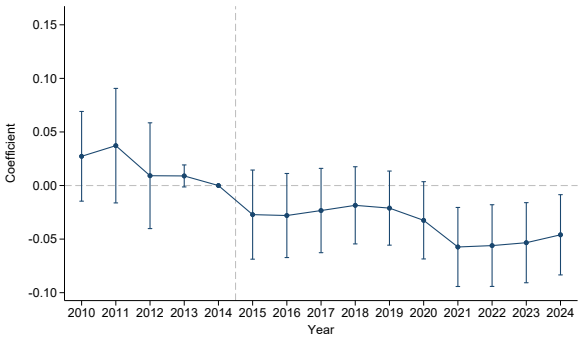
(b) Capital Buffer Depletion

Notes: The figure presents the nonbank stress test results. Panel (a) shows percentage of BHC excess capital required for recapitalization. Blue bars: mean across BHCs. Red bars: 95th percentile (tail risk). The horizontal dashed line at 100% indicates potential parent insolvency. In Panel (b), values are labeled above each bar. Panel (b) shows percentage of BHCs with completely depleted capital buffers (recapitalization needs exceed available excess capital). Both panels assume nonbank subsidiaries target 40% capital ratio following asset shocks. Appendix Figures E.6a and E.6b show sensitivity to alternative target capital ratios.

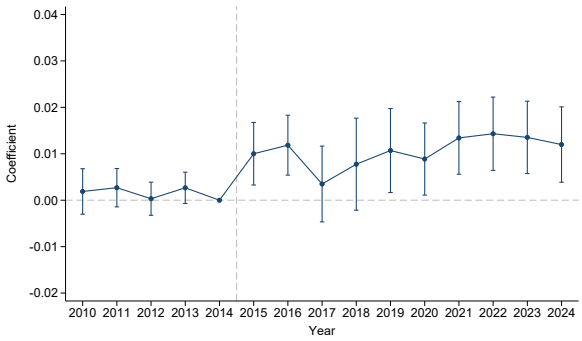
Figure 8: Nonbank Event Study around Basel III Implementation



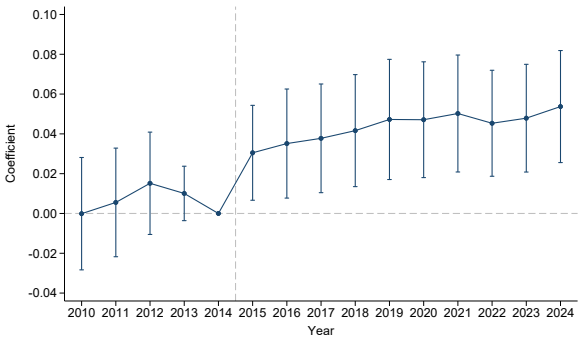
(a) Net Balance to Parent/Subs



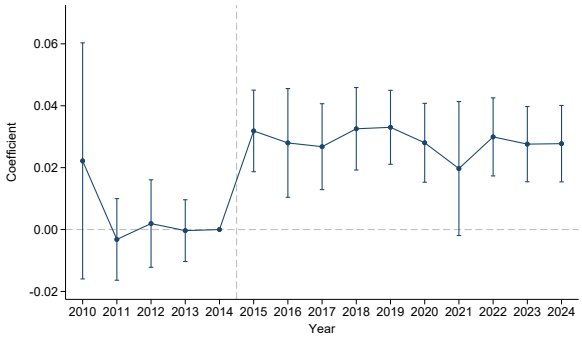
(b) Equity/Assets



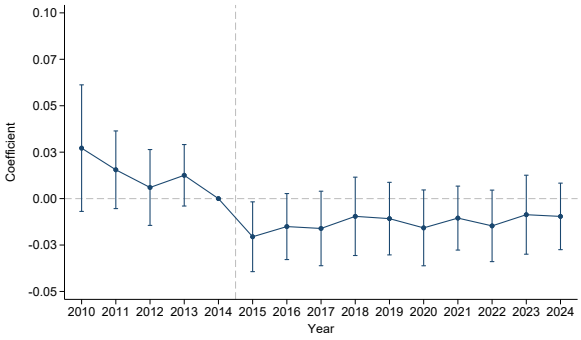
(c) Dividends



(d) Loan Share



(e) Past Due & Nonaccrual



(f) ROE

Notes: The figure presents event study estimates of nonbank outcomes relative to 2014 baseline. Panel (a) shows net balances to parent and other subsidiaries, Panel (b) shows equity-to-assets ratios, Panel (c) shows dividends/equity, Panel (d) shows loan shares, Panel (e) shows past-due and nonaccrual loans, and Panel (f) shows return on equity. Coefficients estimated from specification including nonbank subsidiary fixed effects, industry-quarter-year fixed effects, and BHC controls (top 200 BHC indicator, log assets, leverage, deposits/assets, asset growth, subsidiary count measured 2013Q1) interacted with post-2015 indicator. Standard errors clustered at BHC level. Error bars indicate 90% confidence intervals.

Table 2: Summary Statistics

	N	Mean	SD	p5	p25	p50	p75	p95
Panel A: BHCs								
2013 Controls								
2013 BHC Assets (Billions)	29,921	28.287	189.400	0.503	0.774	1.312	3.282	44.512
2013 BHC Leverage	29,921	9.847	6.248	5.423	7.539	9.081	10.768	15.528
2013 BHC Deposit Share	29,921	0.805	0.107	0.663	0.782	0.827	0.863	0.899
2013 BHC Asset Growth	29,294	0.038	0.090	-0.098	-0.007	0.031	0.072	0.195
2013 BHC Subsidiary Count	29,921	48.197	301.781	1.000	3.000	5.000	10.000	66.000
Has Nonbank Subsidiary	29,921	0.467	0.499	0.000	0.000	0.000	1.000	1.000
Time-Varying Variables								
BHC Assets (Billions)	29,921	34.817	225.200	0.511	0.833	1.664	5.476	64.695
BHC RWA (Billions)	29,804	21.223	126.400	0.321	0.574	1.187	4.038	47.965
BHC Capital (Billions)	29,921	3.493	21.410	0.037	0.078	0.162	0.567	7.117
Excess BHC Capital (%)	29,804	6.402	4.615	1.178	3.650	5.533	7.928	14.190
BHC Net Income (Billions)	29,921	0.083	0.583	-0.001	0.001	0.004	0.014	0.170
BHC Leverage	29,921	0.102	0.048	0.056	0.084	0.099	0.116	0.152
BHC Deposit Share	29,921	0.805	0.482	0.664	0.778	0.822	0.858	0.896
BHC Loan Share	29,921	0.648	0.139	0.392	0.578	0.668	0.744	0.832
BHC Securities Share	29,921	0.210	0.118	0.046	0.125	0.193	0.277	0.428
BHC Nonbank Assets (Billions)	29,903	8.300	75.393	0.000	0.000	0.000	0.011	0.685
BHC Bank Assets (Billions)	29,921	27.420	179.900	0.497	0.819	1.622	5.274	53.484
BHC Direct Issuance	29,921	0.008	0.042	0.000	0.000	0.000	0.001	0.030
BHC Net Issuance	29,921	0.008	0.051	-0.021	0.000	0.000	0.000	0.055
BHC External Equity	29,921	0.012	0.050	0.000	0.000	0.000	0.002	0.066
BHC Equity Inv. Bank Share	29,903	1.072	0.324	0.784	0.972	1.033	1.151	1.468
BHC Equity Inv. Nonbank Share	29,903	0.035	0.106	0.000	0.000	0.005	0.017	0.156
BHC Equity Inv. Total Share	29,903	1.177	0.425	0.893	0.993	1.066	1.205	2.054
BHC Div. Yield Bank	28,872	0.012	0.017	0.000	0.000	0.007	0.016	0.043
BHC Div. Yield Nonbank	21,405	0.016	0.071	0.000	0.000	0.000	0.007	0.064
Panel B: Banks								
Bank Assets (Billions)	57,188	14.549	127.400	0.101	0.534	0.976	2.281	21.357
Bank RWA (Billions)	55,056	10.103	80.413	0.056	0.346	0.691	1.710	15.892
Bank Capital (Billions)	57,188	1.520	12.584	0.013	0.054	0.102	0.240	2.565
Excess Bank Capital (%)	57,156	15.948	56.318	1.175	3.462	5.380	8.150	23.326
Excess Bank to BHC Capital Ratio (%)	39,250	4.997	32.758	0.538	0.829	0.963	1.121	10.914
Bank Net Income (Billions)	57,188	0.040	0.364	-0.000	0.001	0.002	0.006	0.062
Bank Leverage	57,187	0.866	0.149	0.812	0.879	0.896	0.909	0.929
Bank Deposit Share	57,187	0.802	0.166	0.640	0.795	0.840	0.873	0.907
Bank Loan Share	57,187	0.625	0.185	0.234	0.556	0.665	0.746	0.837
Bank Securities Share	57,187	0.214	0.143	0.018	0.116	0.191	0.286	0.476
Panel C: Nonbanks								
Nonbank Assets (Billions)	25,666	3.806	10.285	0.010	0.286	1.071	2.748	16.108
Nonbank Capital (Billions)	25,666	1.938	4.885	0.000	0.072	0.448	1.499	9.718
Nonbank Net Income (Billions)	25,664	0.043	0.212	-0.038	0.000	0.008	0.043	0.249
Nonbank Leverage	21,412	0.415	1.779	0.000	0.005	0.193	0.758	0.999
Nonbank Loans Share	20,378	0.118	0.290	0.000	0.000	0.000	0.000	0.949
Nonbank Securities Share	25,666	0.017	0.093	0.000	0.000	0.000	0.000	0.036
Broker (NAICS 523)	25,667	0.191	0.393	0.000	0.000	0.000	0.000	1.000
Nonbank Lender (NAICS 5222, 5223)	25,667	0.119	0.324	0.000	0.000	0.000	0.000	1.000
Insurer (NAICS 524)	25,667	0.003	0.058	0.000	0.000	0.000	0.000	0.000
Fund (NAICS 525)	25,667	0.346	0.476	0.000	0.000	0.000	1.000	1.000
Real Estate (NAICS 531)	25,667	0.029	0.169	0.000	0.000	0.000	0.000	0.000

Notes: Percentiles are computed at the 5th, 25th, 50th, 75th, and 95th levels. The sample period ranges from 2010 to 2024. Only BHCs that filed an FR Y-9C in 2013Q1 and their bank/nonbank subsidiaries are included in the samples. Sources: FR Y-9C and FR Y-9LP for BHC Panel, Call Reports for Bank Panel, FR Y-11 for Nonbank Panel.

Table 3: Nonbank Capital Structure and Equity Multiplier

Panel A: Summary Statistics (All BHCs)

	N	Mean	SD	5%	25%	50%	75%	95%
NBFI Asset Share	6,596	0.07	0.13	0.00	0.01	0.02	0.05	0.32
NBFI Equity Share	6,596	0.21	0.21	0.01	0.06	0.16	0.30	0.68
NBFI Capital Ratio	6,596	0.69	0.59	0.04	0.26	0.69	0.99	1.40
BHC Capital Ratio	6,596	0.11	0.07	0.05	0.08	0.09	0.11	0.17
Equity Multiplier	6,596	8.24	7.68	0.30	2.33	6.46	11.95	21.56

Panel B: Equity Multiplier by Nonbank Type

NBFI Type	Mean Mult	Median Mult	SD	25th Pct	75th Pct	Capital Ratio	Equity Share	N
Fund	12.71	12.83	4.68	10.59	15.28	0.931	0.289	6,924
Management	7.78	7.67	3.68	5.52	9.96	0.787	0.242	1,809
Insurance	6.66	6.31	2.81	5.34	8.10	0.702	0.060	206
Broker/Dealer	6.34	6.05	4.01	3.18	9.35	0.607	0.108	1,476
Real Estate (REIT)	5.75	5.23	3.63	2.76	8.47	0.642	0.054	758
Nonbank Lender	4.80	2.89	5.02	1.66	6.73	0.493	0.162	2,172
Other Financial	3.64	3.08	2.05	2.07	5.01	0.442	0.103	103

Notes: The table documents capital structure asymmetry between bank and nonbank subsidiaries within BHCs. Panel A shows summary statistics for all BHC–quarter observations from 2010–2024 with nonbank subsidiaries. "NBFI Asset Share" is nonbank assets divided by total BHC assets. "NBFI Equity Share" is nonbank equity divided by total BHC equity. "NBFI Capital Ratio" is nonbank equity divided by nonbank assets. The Equity Multiplier is constructed as the "NBFI Equity Share" divided by "NBFI Asset Share" and measures capital intensity. Values above one indicate that nonbanks hold disproportionately large equity relative to their asset footprint. Appendix Figure E.3 shows full distributions by type. Sources: FR Y-9LP, FR Y-9C, FR Y-11.

Table 4: Internal Capital Reallocation: Difference-in-Differences Estimates

	Bank Excess Capital (1)	BHC Excess Capital (2)	Bank/BHC Excess Ratio (3)
$\mathbb{1}[\text{NBFI Sub}] \times \text{Post}$	2.0646**	0.4333	2.9060***
	(0.8277)	(0.2931)	(0.9498)
Observations	54,814	29,267	39,052
R^2	0.9401	0.7838	0.4185
Bank FE	✓		✓
BHC FE		✓	
Quarter-Year FE	✓	✓	✓
Controls $\times$ Post	✓	✓	✓

Notes: The table presents difference-in-differences estimates of internal capital reallocation within BHCs, comparing BHCs that held any nonbank financial subsidiary as of 2013Q1 (treated) to those that did not (control). Dependent variable in column 1 is bank excess capital (equity relative to regulatory minimum). Column 2 is BHC excess capital. Column 3 is the ratio of bank to BHC excess capital. $\mathbb{1}[\text{NBFI Sub}] \times \text{Post}$ indicates BHCs with nonbank financial subsidiaries as of 2013Q1 interacted with the Post indicator. Post indicates 2015Q1 and later. All specifications include entity fixed effects (bank or BHC) and quarter-year fixed effects. Controls measured 2013Q1 and interacted with Post. Columns 1 and 3 control for bank size, leverage, ROA, and asset growth. Column 2 controls for BHC top 200 indicator, size, leverage, ROA, asset growth, deposits/assets, and subsidiary count. Standard errors clustered at bank level (columns 1, 3) or BHC level (column 2). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Internal Capital Reallocation: Reduced-Form Estimates

	Bank Excess Capital (1)	BHC Excess Capital (2)	Bank/BHC Excess Ratio (3)
Years from Dereg × Post	0.7395*	0.0058	1.7766***
	(0.3992)	(0.0721)	(0.6211)
Observations	12,558	6,079	9,873
R^2	0.9502	0.7913	0.6934
Bank FE	✓		✓
BHC FE		✓	
Quarter-Year FE	✓	✓	✓
Controls × Post	✓	✓	✓

Notes: The table presents reduced-form estimates of internal capital reallocation within BHCs, exploiting variation in deregulation timing. Dependent variable in column 1 is bank excess capital (equity relative to regulatory minimum). Column 2 is BHC excess capital. Column 3 is the ratio of bank to BHC excess capital. Years from Dereg measures years between a BHC's headquarters state interstate branching deregulation and the 1994 Riegle-Neal Act (headquarters state measured as of 1981). Post indicates 2015Q1 and later. All specifications include entity fixed effects (bank or BHC) and quarter-year fixed effects. Controls measured 2013Q1 and interacted with Post. Columns 1 and 3 control for bank size, leverage, ROA, and asset growth. Column 2 controls for BHC top 200 indicator, size, leverage, ROA, asset growth, deposits/assets, and subsidiary count. Standard errors clustered at bank level (columns 1, 3) or BHC level (column 2). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Internal Equity Reallocation: Parent Investments and Subsidiary Dividends

	Parent Equity Investments			Dividends/Equity	
	Bank Share (1)	Nonbank Share (2)	Total Share (3)	Bank Div./ Equity (4)	Nonbank Div./ Equity (5)
Years from Dereg × Post	0.0228**	-0.0264**	0.0045	0.0000	0.0947**
	(0.0093)	(0.0114)	(0.0104)	(0.0005)	(0.0459)
Observations	1,334	1,334	1,334	1,334	1,334
R^2	0.8101	0.6687	0.9115	0.1638	0.0698
BHC FE	✓	✓	✓	✓	✓
Quarter-Year FE	✓	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓	✓

Notes: The table presents reduced-form estimates of internal equity reallocation within BHCs. Dependent variable in column 1 is equity investments in bank subsidiaries divided by total BHC equity. Column 2 is equity investments in nonbank subsidiaries divided by BHC equity. Column 3 is total equity investments in all subsidiaries divided by BHC equity. Equity investments include common stock, preferred stock, goodwill, and other intangibles. Column 4 is quarterly dividends received by parent from bank subsidiaries divided by lagged equity investment in banks. Column 5 is dividends from nonbank subsidiaries divided by lagged equity investment in nonbanks. Years from Dereg measures years between BHC headquarters state's interstate branching deregulation and 1994 Riegle-Neal Act. Post indicates 2015Q1 and later. All specifications include BHC fixed effects and quarter-year fixed effects. BHC controls include top 200 BHC indicator, log assets, leverage, ROA, deposits/assets, asset growth, and subsidiary count, all measured as of 2013Q1 and interacted with Post. Standard errors clustered at BHC level. Sample restricted to BHCs with nonbank asset share exceeding 1%. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Reallocation of Parent Equity Investments Scales with the Equity Multiplier

	Bank Equity Share (1)	Nonbank Equity Share (2)	Total Parent Investment (3)
Equity Multiplier × Post	1.7127**	−1.1234*	0.0053
	(0.6583)	(0.5610)	(0.0063)
Observations	2,171	2,171	2,171
R^2	0.9176	0.8544	0.9459
BHC FE	✓	✓	✓
Quarter-Year FE	✓	✓	✓
Controls × Post	✓	✓	✓

Notes: The table presents reduced-form estimates of how the cross-sectional response of parent equity investments to Basel III scales with the BHC's 2013Q1 equity multiplier. Dependent variable in column 1 is parent equity investments in bank subsidiaries divided by total BHC equity. Column 2 is parent equity investments in nonbank subsidiaries divided by BHC equity. Column 3 is total parent equity investments (in bank, nonbank, and holding-company subsidiaries) divided by BHC equity. The outcomes in columns 1 and 2 are expressed in percentage points; the placebo measure in column 3 is expressed as a decimal proportion. Equity Multiplier is the BHC's 2013Q1 equity multiplier, constructed as the nonbank share of consolidated equity divided by the nonbank share of consolidated assets. Post indicates 2015Q1 and later. All specifications include BHC fixed effects and quarter-year fixed effects. BHC controls include top 200 BHC indicator, log assets, leverage, ROA, deposits/assets, asset growth, and subsidiary count, all measured as of 2013Q1 and interacted with Post. Standard errors clustered at BHC level. Sample restricted to BHCs with nonbank asset share exceeding 1%. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Stress Test Results: BHC Equity at Risk and Nonbank Recapitalization Needs

Panel A: Mean BHC Equity at Risk (%)

	Target Capital Ratio					
Shock to Assets	20%	30%	40%	50%	60%	70%
1%	6.86	10.81	15.62	21.40	27.66	34.89
5%	8.40	12.67	17.85	23.85	30.47	38.07
10%	10.40	15.10	20.79	26.99	34.12	42.29
15%	12.67	17.85	23.85	30.47	38.07	46.80

Panel B: 95th Percentile BHC Equity at Risk (%)

	Target Capital Ratio					
Shock to Assets	20%	30%	40%	50%	60%	70%
1%	42.52	65.59	89.36	116.79*	146.30*	175.81*
5%	51.75	74.82	99.45	128.60*	158.11*	194.28*
10%	63.28	86.84	113.84*	143.35*	172.86*	233.94*
15%	74.82	99.45	128.60*	158.11*	194.28*	274.64*

Panel C: Mean Percentage of Nonbank Subsidiaries Requiring Recapitalization

	Target Capital Ratio					
Shock to Assets	20%	30%	40%	50%	60%	70%
1%	2.93	4.44	6.53	9.10	12.05	15.53
5%	3.47	5.21	7.53	10.23	13.34	17.09
10%	4.27	6.28	8.83	11.73	15.15	19.28
15%	5.21	7.53	10.23	13.34	17.09	21.68

Panel D: 95th Percentile of Nonbank Subsidiaries Requiring Recapitalization

	Target Capital Ratio					
Shock to Assets	20%	30%	40%	50%	60%	70%
1%	17.06	27.06	36.78	44.20	54.20	64.20
5%	21.06	31.06	38.20	48.20	58.20	68.20
10%	26.06	36.06	43.20	53.20	63.20	73.20
15%	31.06	38.20	48.20	58.20	68.20	78.20

Panel E: BHCs with Completely Depleted Capital Buffers (%)

	Target Capital Ratio					
Shock to Assets	20%	30%	40%	50%	60%	70%
1%	2.13	3.19	3.19	5.32	7.45	9.57
5%	3.19	3.19	4.26	6.38	9.57	10.64
10%	3.19	3.19	5.32	7.45	9.57	10.64
15%	3.19	4.26	6.38	9.57	10.64	10.64

Notes: The table presents stress test results using 2013Q1 balance sheets (FR Y-9C and FR Y-9LP). Panels A–B show percentage of BHC excess capital required to recapitalize nonbank subsidiaries following asset shocks (rows) to restore target capital ratios (columns). Panel A shows the mean across BHCs. Panel B shows the 95th percentile (tail risk), with asterisks (*) indicating scenarios where recapitalization exceeds 100% of parent excess capital. Panels C–D show the percentage of nonbank subsidiaries falling below the target capital ratio following shocks. Panel C reports the mean; Panel D reports the 95th percentile, highlighting concentration of risk. Panel E shows percentage of BHCs with completely depleted capital buffers (recapitalization needs exceed available excess capital). Calculations assume full BHC ownership and 100% loss recognition.

Table 9: Internal Reallocation and BHC Profitability

	ROA	ROE	Charge-Offs
	(1)	(2)	(3)
Years from Dereg × Post	0.0001**	0.0011**	-0.0001**
	(0.0000)	(0.0005)	(0.0000)
Observations	5,896	5,896	5,896
R^2	0.4774	0.3293	0.4848
BHC FE	✓	✓	✓
Quarter-Year FE	✓	✓	✓
Controls × Post	✓	✓	✓

Notes: The table presents reduced-form estimates of BHC-level profitability. Dependent variable in column 1 is quarterly net income divided by lagged total assets (ROA). Column 2 is quarterly net income divided by lagged equity (ROE). Column 3 is quarterly charge-offs divided by lagged total loans. All dependent variables are measured at the consolidated BHC level. Years from Dereg measures the number of years between the interstate branching deregulation of the BHC headquarters state and the 1994 Riegle-Neal Act. Post is an indicator equal to one for 2015Q1 and later. All specifications include BHC fixed effects and quarter-year fixed effects. BHC controls include an indicator for top 200 BHCs, log total assets, leverage, deposits-to-assets, asset growth, and subsidiary count, all measured as of 2013Q1 and interacted with Post. Standard errors are clustered at the BHC level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Bank Subsidiaries: Performance, Portfolio Composition, and Capital Quality

Panel A: Performance

	ROA (1)	ROE (2)	Charge-Offs (3)
Years from Dereg × Post	0.0001***	0.0012***	-0.0002***
	(0.0000)	(0.0003)	(0.0000)
Observations	12,054	12,054	12,054
R^2	0.2769	0.3752	0.3504
Bank FE	✓	✓	✓
Quarter-Year FE	✓	✓	✓
Controls × Post	✓	✓	✓

Panel B: Portfolio Composition and Growth

	Shares			Growth Rates		
	Loan Share (1)	Securities Share (2)	Cash Share (3)	Δln(Loans) (4)	Δln(Sec) (5)	Δln(Cash) (6)
Years from Dereg × Post	-0.0060***	0.0033*	0.0052**	0.0008*	0.0023**	0.0046**
	(0.0021)	(0.0019)	(0.0024)	(0.0005)	(0.0011)	(0.0021)
Observations	13,333	13,333	13,333	11,774	11,774	11,774
R^2	0.9185	0.8830	0.8769	0.1318	0.1002	0.0760
Bank FE	✓	✓	✓	✓	✓	✓
Quarter-Year FE	✓	✓	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓	✓	✓

Panel C: Capital Quality

	Δln(Assets) (1)	Δln(Equity) (2)	Leverage (3)	Equity/RWA (4)	RWA/Assets (5)	Marginal ROE (6)	Off-BS (7)
Years from Dereg × Post	0.0008**	0.0008**	-0.0011	0.0113***	-0.0067***	0.0085	-0.0017
	(0.0004)	(0.0004)	(0.0007)	(0.0039)	(0.0016)	(0.0090)	(0.0018)
Observations	11,442	11,442	11,442	11,442	11,442	11,442	11,442
R^2	0.1103	0.2004	0.9725	0.9582	0.8961	0.0472	0.8282
Bank FE	✓	✓	✓	✓	✓	✓	✓
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓	✓	✓	✓

Notes: Panel A shows bank performance measures. Dependent variable in column 1 is quarterly net income divided by lagged total assets (ROA). Column 2 is quarterly net income divided by lagged equity (ROE). Column 3 is quarterly charge-offs divided by lagged total loans. Panel B shows portfolio composition and growth. Columns 1–3 show asset shares (loans, securities, and cash as shares of total assets). Columns 4–6 show quarter-on-quarter growth rates (log changes in loans, securities, and cash holdings). Panel C examines the balance-sheet channels through which equity injections affect bank capital ratios. Columns 1–2 are quarter-on-quarter growth rates (log changes in total assets and total equity); columns 3–7 are levels. Column 1 is the growth rate of total assets. Column 2 is the growth rate of total equity. Column 3 is total liabilities divided by equity (leverage). Column 4 is equity divided by risk-weighted assets. Column 5 is risk-weighted assets divided by total assets. Column 6 is marginal return on equity, calculated as the change in net income over the past four quarters divided by the change in equity over the same period. Column 7 is unused loan commitments divided by total assets. Years from Dereg measures years between the BHC headquarters state's interstate branching deregulation and the 1994 Riegle-Neal Act. Post indicates 2015Q1 and later. Bank controls include log assets, leverage, and asset growth, all measured as of 2013Q1 and interacted with Post. Standard errors clustered at bank level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 11: Nonbank Subsidiaries: Capital Extraction and Funding Substitution

	Equity/ Assets (1)	Bal From Subs (2)	Bal To Subs (3)	Net Bal to Subs (4)	Dividends /Equity (5)	ln(Assets) (6)
Years from Dereg × Post	-0.0771**	-0.0667*	0.0693**	0.1360***	0.0096**	0.0454
	(0.0363)	(0.0374)	(0.0324)	(0.0439)	(0.0037)	(0.1539)
Observations	4,697	4,697	4,697	4,697	4,697	4,697
R^2	0.8548	0.8902	0.8083	0.8669	0.2994	0.9294
Nonbank FE	✓	✓	✓	✓	✓	✓
Industry-Qtr-Year FE	✓	✓	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓	✓	✓

Notes: The table documents capital extraction from nonbank subsidiaries and its replacement with internal liabilities. Dependent variable in column 1 is equity divided by lagged assets. Column 2 is balances due from subsidiaries (amounts nonbanks are owed from parents/affiliates) divided by lagged assets. Column 3 is balances due to subsidiaries (amounts parents/affiliates are owed from nonbanks) divided by lagged assets. Column 4 is net balances to parent and subsidiaries, calculated as (balances due to subs - balances due from subs) divided by lagged assets; positive values indicate net borrowing from or reduced lending to affiliates. Column 5 is cash dividends declared divided by lagged equity. Column 6 is log total assets. Years from Dereg measures years between BHC headquarters state's interstate branching deregulation and 1994 Riegle-Neal Act. Post indicates 2015Q1 and later. All specifications include nonbank subsidiary fixed effects and industry-quarter-year fixed effects (NAICS code × quarter-year). BHC controls include top 200 BHC indicator, log assets, leverage, deposits/assets, asset growth, and subsidiary count, all measured as of 2013Q1 and interacted with Post. Standard errors clustered at BHC level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 12: Lending Growth: Nonbank vs Bank Subsidiaries

$\Delta \ln(\text{Lending})$	Nonbank Lending (1)	Bank Lending (2)
Years from Dereg $\times$ Post	0.0720***	0.0009
	(0.0151)	(0.0019)
Observations	760	760
R^2	0.1067	0.1716
BHC FE	✓	✓
Quarter-Year FE	✓	✓
Controls $\times$ Post	✓	✓

Notes: The table compares lending growth between nonbank and bank subsidiaries at the BHC level. Dependent variable is quarter-on-quarter log change in total lending aggregated across all nonbank subsidiaries (column 1) or all bank subsidiaries (column 2) within each BHC. Years from Dereg measures years between BHC headquarters state's interstate branching deregulation and 1994 Riegle-Neal Act. Post indicates 2015Q1 and later. Both specifications include BHC fixed effects and quarter-year fixed effects. BHC controls include top 200 BHC indicator, log assets, leverage, deposits/assets, ROA, asset growth, and subsidiary count, all measured as of 2013Q1 and interacted with Post. Standard errors clustered at BHC level. Sample restricted to BHC-quarters with non-missing lending data for both nonbank and bank subsidiaries. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Nonbank Subsidiaries: Credit Quality, Profitability, and Fragility

	Credit Quality			Profitability		Fragility		
	90+ Days Past Due	All Past Due	Loss Provisions	ROA	ROE	Negative Earnings	Z-Score	Prob (Default)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Years from Dereg × Post	0.0266***	0.0308***	0.0937***	-0.0039	-0.0187*	0.1519***	−8.6147***	0.0168**
	(0.0069)	(0.0085)	(0.0142)	(0.0054)	(0.0464)	(0.0341)	(2.4028)	(0.0058)
Observations	1,548	1,548	571	4,711	4,711	2,714	2,714	2,714
R^2	0.6761	0.6851	0.7656	0.4024	0.3678	0.4349	0.9767	0.0661
Nonbank FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry-Qtr-Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The table documents nonbank credit quality deterioration, profitability decline, and increased fragility. Column 1 is loans 90+ days past due divided by lagged loans. Column 2 is all past-due loans (30+ days) divided by lagged loans. Column 3 is loan loss provisions divided by lagged loans, conditional on nonzero provisioning. Column 4 is quarterly net income divided by lagged assets (ROA). Column 5 is quarterly net income divided by lagged equity (ROE). Column 6 is an indicator equal to one if quarterly net income is negative. Column 7 is the Z-score, calculated as (equity/assets + ROA) / standard deviation of ROA; higher values indicate lower default risk. Column 8 is the probability of default, calculated using the Merton model as the normal CDF of the negative Z-score. Sample sizes differ across columns by data availability: past-due measures are reported only for nonbanks with lending activity, loss provisions are conditional on nonzero provisioning, and the Z-score and derived measures require a rolling window of ROA observations. Years from Dereg measures years between the BHC headquarters state's interstate branching deregulation and the 1994 Riegle-Neal Act. Post indicates 2015Q1 and later. All specifications include nonbank subsidiary fixed effects, industry-quarter-year fixed effects, and BHC controls (top 200 BHC indicator, log assets, leverage, deposits/assets, asset growth, subsidiary count, measured as of 2013Q1) interacted with Post. Standard errors clustered at BHC level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Online Appendix for:

"Regulatory Arbitrage within the Firm"

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Appendix A Example of Internal Capital Reallocation

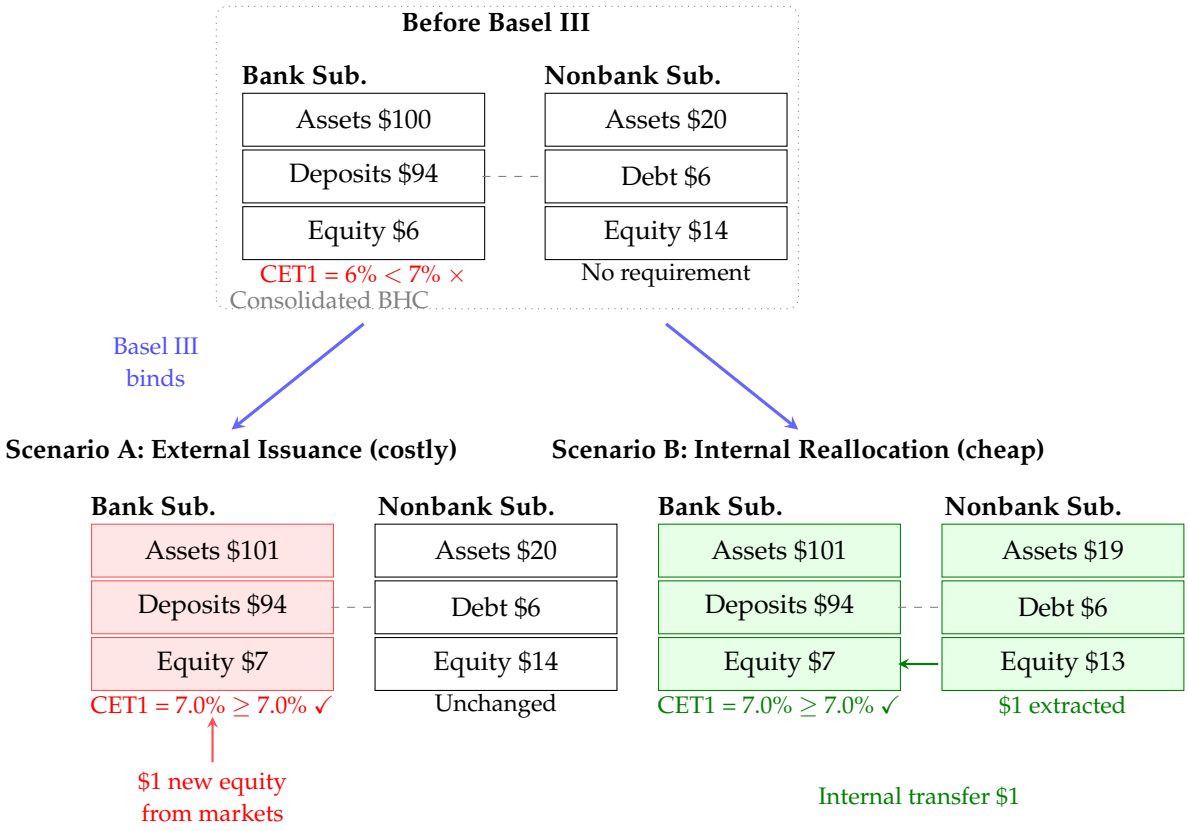


Figure A.1: Internal Capital Reallocation in Response to Basel III. The top panel shows a stylized BHC before Basel III. The bank subsidiary holds $6 in equity against $100 in assets (CET1 = 6%), which falls short of the new 7% minimum (inclusive of the Capital Conservation Buffer) introduced by Basel III. Importantly, the requirement applies at both the bank and consolidated BHC level; here the consolidated BHC is already compliant, so the binding constraint is at the bank subsidiary level alone. At the consolidated level, the BHC already holds $20 in total equity ($6 in the bank sub and $14 in the nonbank sub), which is more than sufficient to cover the $1 shortfall. The problem is not a lack of capital, but that the capital is sitting in the wrong entity. When the 7% CET1 minimum becomes binding, the BHC faces two options. Scenario A: raise $1 in costly external equity from markets, expanding consolidated assets. Scenario B: transfer $1 in equity from the nonbank subsidiary, which faces no capital requirement, to the bank subsidiary, satisfying the CET1 constraint without external issuance and without changing consolidated equity or assets. Both scenarios achieve identical bank-level capital ratios (for expositional simplicity, the displayed ratios abstract from the mechanical effect of the injected dollar on the asset denominator, which is second order at these magnitudes); the difference lies entirely in whether the BHC exploits its internal capital market (Scenario B) or turns to external markets (Scenario A).

Appendix B Theoretical Framework: Complete Derivations

This appendix provides complete derivations and proofs for the propositions stated in Section 2, along with comparative statics, calibration details, and model figures. The notation follows Section 2 throughout. We use E_B^{unc} for the unconstrained optimal bank equity and reserve starred variables (E_B^*, E_N^*, K^*) for the constrained optimum.

B.1 Model Setup

Consider a BHC that owns two subsidiaries: a regulated bank (B) and an unregulated nonbank financial institution (N). The BHC operates over two periods, $t \in \{1, 2\}$.

Assets and Equity. Each subsidiary $i \in \{B, N\}$ operates with exogenous assets $A_i > 0$ and chooses equity level $E_i \geq 0$ in period 1. Total BHC equity is $E = E_B + E_N$. Subsidiaries generate returns $R_i(E_i)$, where we suppress the dependence on the fixed A_i, with standard properties:

$$\frac{\partial R_i}{\partial E_i} > 0, \quad \frac{\partial^2 R_i}{\partial E_i^2} < 0 \tag{B.1}$$

Higher equity increases returns by reducing expected distress costs, but with diminishing marginal benefits.

Regulation. The bank faces a capital requirement

$$E_B \geq \kappa_B \cdot A_B \tag{B.2}$$

where κ_B is the regulatory minimum capital ratio. The nonbank faces no binding capital requirement ($\kappa_N = 0$), consistent with the institutional setting where Basel III applies only to depository institutions.

Financing. The BHC can raise external equity $K \geq 0$ at convex cost $c(K)$ with $c(0) = 0$, $c'(K) > 0$, and $c''(K) > 0$. This captures well-established pecking order preferences: internal funds are cheaper than external equity due to issuance costs, asymmetric information, and market timing considerations (Myers and Majluf, 1984; Fazzari, Hubbard and Petersen, 1988).

Internal equity transfers from nonbank to bank incur a small transaction cost $\tau \geq 0$ per dollar transferred, reflecting administrative frictions and potential tax considerations.[29]

Shocks and Failure. In period 2, each subsidiary faces an idiosyncratic shock $\theta_i \sim F_i(\theta)$ with support $[-\bar{\theta}_i, 0]$. Each F_i is continuously differentiable with density f_i, and we restrict attention to allocations with $0 < E_i < \bar{\theta}_i$, so failure probabilities are interior and the first-order conditions below are well defined; the parameterization in Section B.6 satisfies this restriction at both the pre- and post-Basel optima. Subsidiary i fails if its equity cushion is insufficient:

$$E_i + \theta_i < 0 \tag{B.3}$$

Failure of subsidiary i generates a deadweight social loss $L_i > 0$, where $L_B > L_N$ reflects the greater systemic importance of regulated depository institutions. For the bank, we decompose

[29] In practice, τ is small relative to external equity costs.

$L_B = L_B^{\text{priv}} + L_B^{\text{ext}}$, where L_B^{priv} is the private loss internalized by the BHC and $L_B^{\text{ext}} \geq 0$ captures the externality component (deposit insurance fund exposure, payment-system disruption, fire-sale, and interbank contagion costs) that the BHC does not internalize. The nonbank loss L_N is internalized in full. The BHC internalizes the direct failure costs of its subsidiaries and at most the private component L_B^{priv} of the contagion channel introduced below; we adopt the simplification $L_B^{\text{priv}} \approx 0$ throughout, so the contagion term enters only the planner's objective. This convention is innocuous on the direct margin in the region we study: bank equity is pinned by the binding requirement, so the private allocation is invariant to the internalized share of the direct bank failure cost.

We assume shocks are independent across subsidiaries: $\theta_B \perp \theta_N$.

Contagion. We model contagion through spillover parameter $\lambda \in [0, 1]$:

- $\lambda = 0$: Perfect ring-fencing (nonbank failure fully contained)
- $\lambda = 1$: Full contagion (nonbank failure triggers bank failure)

Let $\Phi(E_B, E_N) \equiv \Pr(\theta_N < -E_N \text{ and } \theta_B > -E_B)$ denote the joint probability of nonbank distress and bank survival. Under independence, $\Phi(E_B, E_N) = F_N(-E_N) \cdot [1 - F_B(-E_B)]$. Note that $\partial\Phi/\partial E_B = F_N(-E_N) \cdot f_B(-E_B) > 0$: higher bank equity expands the set of states in which the bank survives its own shock, raising the probability that nonbank distress coincides with bank survival and thus the exposure to contagion. Conversely, $\partial\Phi/\partial E_N = -f_N(-E_N) \cdot [1 - F_B(-E_B)] < 0$.

The total probability of bank failure incorporates both direct shocks and contagion:

$$\Pr(\theta_B < -E_B \text{ or contagion}) = F_B(-E_B) + \lambda \cdot \Phi(E_B, E_N) \tag{B.4}$$

The probability of nonbank failure is:

$$\Pr(\theta_N < -E_N) = F_N(-E_N) \tag{B.5}$$

This captures that nonbank distress can transmit to the bank even when the bank would otherwise survive its own shock, consistent with channels including funding pressure, reputation damage, and consolidated capital depletion.

B.2 BHC Optimization

The BHC chooses equity allocations (E_B, E_N) and external equity K to maximize expected value:

$$\begin{aligned} \max_{E_B, E_N, K} \quad & R_B(E_B) + R_N(E_N) - \left[F_B(-E_B) + \lambda \cdot \Phi(E_B, E_N) \cdot \tfrac{L_B^{\text{priv}}}{L_B} \right] \cdot L_B \\ & - F_N(-E_N) \cdot L_N - c(K) - \tau \cdot \max\{0,\, E_B - E_B^0\} \end{aligned} \tag{B.6}$$

Under the maintained simplification $L_B^{\text{priv}} \approx 0$, the contagion term drops from the private problem, which becomes:

$$\max_{E_B, E_N, K} \quad R_B(E_B) + R_N(E_N) - F_B(-E_B) \cdot L_B - F_N(-E_N) \cdot L_N - c(K) - \tau \cdot \max\{0,\, E_B - E_B^0\} \tag{B.7}$$

subject to:

$$E_B \geq \kappa_B \cdot A_B \qquad \text{(regulatory constraint)} \tag{B.8}$$

$$E_B + E_N \leq E^0 + K \qquad \text{(resource constraint)} \tag{B.9}$$

$$E_B, E_N, K \geq 0 \qquad \text{(non-negativity)} \tag{B.10}$$

where E^0 denotes initial BHC equity and $E_B^0 \equiv E^0 \cdot A_B/(A_B + A_N)$ denotes the proportional asset-weighted allocation of initial BHC equity to the bank. This baseline represents the unconstrained equity split when capital requirements are slack and serves as the reference point for measuring internal reallocation. The transfer cost $\tau \cdot \max\{0, E_B - E_B^0\}$ applies to equity injected into the bank above this baseline; the one-sided specification captures that upward reallocation into the regulated entity is the costly administrative action of interest, and implies the cost is inactive when the binding requirement lies below the proportional baseline, as under our baseline parameterization (see the Transfer-Cost Baseline paragraph in Section B.6).

B.3 Optimal Capital Allocation

We characterize the solution through three cases. Cases 2 and 3 describe the two corner solutions; the optimization also permits interior solutions in which both margins are active. Proposition B.1 characterizes the Case 3 corner analytically. The numerical parameterization in Section B.6 does not satisfy Assumption (A3) below and its optimum is interior, with modest external issuance alongside predominantly internal reallocation; the model figures report this interior solution, for which the qualitative comparative statics of the proposition continue to hold.

Case 1: Slack Regulation. When $\kappa_B \cdot A_B < E_B^{unc}$ (where E_B^{unc} is the unconstrained optimum), the constraint does not bind and the BHC allocates equity to equate marginal risk-adjusted returns. Because $\Pr(\theta_i < -E_i) = F_i(-E_i)$, increasing E_i by one unit reduces the failure probability by $f_i(-E_i)$, so the marginal value of equity at subsidiary i is $R_i'(E_i) + L_i \cdot f_i(-E_i)$. Equating across subsidiaries:

$$R_B'(E_B) + L_B \cdot f_B(-E_B) = R_N'(E_N) + L_N \cdot f_N(-E_N) \tag{B.11}$$

This represents standard portfolio allocation with no regulatory distortion.

Case 2: External Equity. When regulation binds ($\kappa_B \cdot A_B > E_B^{unc}$) but external equity is relatively cheap, the BHC raises external capital: $K^* > 0$. The regulatory constraint binds with $E_B = \kappa_B \cdot A_B$, and minimal internal reallocation occurs. Appendix Figure B.1 shows that satisfying the 10.5% Basel III requirement would require external equity equal to approximately 1.8% of total BHC assets under this scenario, rising to 3.2% at a 16% requirement.

Case 3: Internal Reallocation. When external equity is sufficiently costly relative to the shadow value of internal funds (formalized in Assumption (A3) below), the BHC meets the regulatory requirement through internal reallocation: $K^* = 0$ and $E_B = \kappa_B \cdot A_B$.

Assumptions. The following conditions are maintained for Proposition B.1:

(A1) *Strict concavity and monotone shadow value.* The objective in (B.7) is strictly concave in (E_B, E_N, K), and the shadow value $\nu(E) \equiv R_N'(E) + L_N \cdot f_N(-E)$ is strictly decreasing in E. Under

the uniform shock specification of Section B.6, both properties follow from strict concavity of R_i and convexity of c, since the densities f_i are constant; more generally, monotonicity of ν holds whenever the density f_N is non-decreasing on its support, since $\nu'(E) = R_N''(E) - L_N \cdot f_N'(-E)$.

(A2) *Feasibility.* $E^0 > \kappa_B \cdot A_B$, so the corner allocation leaves the nonbank with positive equity.

(A3) *Costly external finance.* $c'(0) \geq \nu^*$, where

$$\nu^* \equiv R_N'(E^0 - \kappa_B A_B) + L_N \cdot f_N\big(-(E^0 - \kappa_B A_B)\big) \tag{B.12}$$

is the shadow value of internal funds evaluated at the corner allocation.

Condition (A3) is the formal requirement for the corner: external equity must be costlier at the margin than the nonbank's marginal value of funds at the corner allocation. The main text's shorthand $c'(0) > \tau$ conveys the qualitative feature that external equity is the costlier marginal instrument, but is weaker than (A3); the two conditions coincide when the nonbank's marginal value of funds at the corner is small.

Proposition B.1 (Internal Reallocation Equilibrium)**.** *Under (A1)–(A3), when regulation binds ($\kappa_B \cdot A_B > E_B^{unc}$), the BHC optimally chooses:*

$$E_B^* = \kappa_B \cdot A_B \tag{B.13}$$

$$E_N^* = E^0 - \kappa_B \cdot A_B \tag{B.14}$$

$$K^* = 0 \tag{B.15}$$

with comparative statics:

$$\frac{\partial E_B^*}{\partial \kappa_B} = A_B > 0 \qquad \textit{(bank equity increases with requirements)} \tag{B.16}$$

$$\frac{\partial E_N^*}{\partial \kappa_B} = -A_B < 0 \qquad \textit{(nonbank equity decreases one-for-one)} \tag{B.17}$$

$$\frac{\partial (E_B^* + E_N^*)}{\partial \kappa_B} = 0 \qquad \textit{(consolidated BHC equity unchanged)} \tag{B.18}$$

Proof of Proposition B.1. Form the Lagrangian of the simplified private problem (B.7). We derive first-order conditions in the region $E_B > E_B^0$, where the transfer cost is differentiable with derivative τ; when $\kappa_B A_B \leq E_B^0$, the transfer term is inactive at the constrained optimum and the argument below holds with $\tau = 0$:

$$\begin{aligned}\mathcal{L} = {} & R_B(E_B) + R_N(E_N) - F_B(-E_B) \cdot L_B - F_N(-E_N) \cdot L_N \\ & - c(K) - \tau \cdot (E_B - E_B^0) + \mu \cdot (E_B - \kappa_B \cdot A_B) + \nu \cdot (E^0 + K - E_B - E_N)\end{aligned} \tag{B.19}$$

where $\mu \geq 0$ is the multiplier on the regulatory constraint (B.8) and $\nu \geq 0$ is the multiplier on the resource constraint (B.9).

The first-order conditions (using $\partial F_i(-E_i)/\partial E_i = -f_i(-E_i)$, so that the marginal failure-cost

reduction from higher equity enters with a positive sign) are:

$$\frac{\partial \mathcal{L}}{\partial E_B} = R_B'(E_B) + L_B \cdot f_B(-E_B) - \tau + \mu - \nu = 0 \tag{B.20}$$

$$\frac{\partial \mathcal{L}}{\partial E_N} = R_N'(E_N) + L_N \cdot f_N(-E_N) - \nu = 0 \tag{B.21}$$

$$\frac{\partial \mathcal{L}}{\partial K} = -c'(K) + \nu = 0 \tag{B.22}$$

Step 1: Show $K^* = 0$. From (B.21), the shadow value of internal funds at any candidate optimum is

$$\nu(E_N) = R_N'(E_N) + L_N \cdot f_N(-E_N), \tag{B.23}$$

which is strictly decreasing in E_N by (A1). Suppose, toward a contradiction, that $K^* > 0$. Then the resource constraint gives $E_N = E^0 + K^* - \kappa_B A_B > E^0 - \kappa_B A_B$, so by monotonicity $\nu(E_N) < \nu(E^0 - \kappa_B A_B) = \nu^*$. But (B.22) requires $\nu(E_N) = c'(K^*) > c'(0) \geq \nu^*$ by convexity of c and (A3), a contradiction. Hence $K^* = 0$; the KKT condition at the corner is $\nu \leq c'(0)$.

Step 2: Show the regulatory constraint binds. Since the objective is strictly concave by (A1), the unconstrained solution E_B^{unc}, characterized by (B.11) with $\mu = 0$, exists and is unique. By hypothesis $\kappa_B \cdot A_B > E_B^{unc}$, so the unconstrained optimum is infeasible; strict concavity then implies the constrained optimum lies on the boundary of the feasible set, $E_B^* = \kappa_B \cdot A_B$, with $\mu > 0$.

Step 3: Solve for E_N^*. The multiplier $\nu = R_N'(E_N) + L_N f_N(-E_N) > 0$, so the resource constraint binds. With $K^* = 0$ and $E_B^* = \kappa_B \cdot A_B$, (B.9) gives:

$$E_N^* = E^0 - E_B^* = E^0 - \kappa_B \cdot A_B \geq 0 \tag{B.24}$$

where non-negativity follows from (A2).

Step 4: Comparative statics. Differentiating (B.13)–(B.14) with respect to κ_B:

$$\frac{\partial E_B^*}{\partial \kappa_B} = A_B > 0 \tag{B.25}$$

$$\frac{\partial E_N^*}{\partial \kappa_B} = -A_B < 0 \tag{B.26}$$

$$\frac{\partial (E_B^* + E_N^*)}{\partial \kappa_B} = A_B - A_B = 0 \tag{B.27}$$

These hold for any $A_B > 0$. □

These predictions match our empirical findings: banks accumulate equity (column 1 of Table 5), nonbanks lose equity (column 1 of Table 11), and BHCs do not raise external capital (column 2 of Table 5). Appendix Figure B.2 visualizes these comparative statics. As the bank capital requirement rises from 6% to 16%, the bank's capital ratio (blue line) rises one for one with the requirement, while the nonbank's capital ratio (red line) declines from 33% to 8%: the "waterbed effect," in which regulatory pressure on one subsidiary drains capital from another. The two ratios do not offset point for point for two reasons: each transferred dollar moves them by $1/A_B$ and $1/A_N$ respectively, and modest external issuance absorbs part of the tightening. Appendix Figure B.1 presents the corresponding counterfactual: the external equity that would be required if internal reallocation were unavailable rises only modestly with the requirement, consistent with the empirical finding that BHCs rely primarily on internal reallocation rather than external capital

markets.

B.4 Systemic Implications and Externalities

While internal reallocation is privately optimal for BHCs (economizing on costly external equity), it may be socially suboptimal due to a contagion externality. The planner evaluates allocations with the full bank failure cost and the contagion channel:

$$\begin{aligned} W(E_B, E_N, K; \lambda) =& R_B(E_B) + R_N(E_N) - [F_B(-E_B) + \lambda\, \Phi(E_B, E_N)]\, L_B - F_N(-E_N)\, L_N \\ & - c(K) - \tau \cdot \max\{0,\, E_B - E_B^0\} \end{aligned} \tag{B.28}$$

where $\Phi(E_B, E_N) = F_N(-E_N)\,[1 - F_B(-E_B)]$ under independence. Evaluating W at the private optima under the pre- and post-Basel requirements and differencing yields the net social benefit of the reallocation, equation (3) in Proposition 2.2.

Proof of Proposition 2.2. Substituting $(E_B^{pre}, E_N^{pre}, K^{pre})$ and $(E_B^{post}, E_N^{post}, K^{post})$ into (B.28) and differencing:

$$\Delta W(\lambda) = \Delta R + L_B\, \Delta F_B - L_N\, \Delta F_N - \Delta c(K) - \Delta\tau - \lambda\, L_B\, \Delta\Phi,$$

which is equation (3): ΔW is linear in λ with slope $-L_B\, \Delta\Phi < 0$, since the reallocation thins the nonbank and thickens the bank, so $\Delta\Phi > 0$. Because the private optima do not depend on λ, the reallocation occurs for all λ, while $\Delta W(\lambda)$ crosses zero exactly once, at the λ^* in (4); the degenerate case $\lambda^* \leq 0$ follows when the numerator is non-positive. For the comparative statics, write $\lambda^* = (a + L_B\, \Delta F_B)\,/\,(L_B\, \Delta\Phi)$ with $a \equiv \Delta R - L_N\, \Delta F_N - \Delta c(K) - \Delta\tau$. Then $\partial\lambda^*/\partial L_N = -\Delta F_N/(L_B\, \Delta\Phi) < 0$ and $\partial\lambda^*/\partial L_B = -a/(L_B^2\, \Delta\Phi)$, which is positive if and only if $a < 0$, that is, whenever $L_N\, \Delta F_N + \Delta c(K) + \Delta\tau > \Delta R$. As $L_B/L_N \to \infty$, $\lambda^* \to \Delta F_B/\Delta\Phi$. □

Numerical Check. Under the parameter values in Appendix Table B.1, the shocks are uniform, so $\Delta F_B = (E_B^{post} - E_B^{pre})/\bar{\theta}_B = 2.5/20 = 0.125$ and $\Delta F_N = (E_N^{pre} - E_N^{post})/\bar{\theta}_N = 2.11/15 = 0.141$. The components of (4) are $\Delta R = 0.55$, $L_B\, \Delta F_B = 7.50$, $L_N\, \Delta F_N = 1.41$, $\Delta c(K) = 0.84$, and $\Delta\tau = 0$ (the post-Basel binding requirement lies just below the proportional baseline E_B^0, so the one-sided transfer cost is inactive in both regimes), giving a numerator of 5.80 against $L_B\, \Delta\Phi = 7.83$ and hence $\lambda^* = 0.74$, the threshold shown in Appendix Figure B.4a. The bank-safety term $L_B\, \Delta F_B$ exceeds the entire numerator: absent the direct gain in bank safety, the reallocation would be socially costly at every λ, which is why λ^* rises with L_B/L_N in Appendix Figure B.4b.

Interpretation. When ring-fencing is effective (λ small), internal reallocation is both privately and socially optimal. BHCs meet regulatory requirements while economizing on costly external equity, and contagion costs are contained. However, when contagion risk is material ($\lambda > \lambda^*$), the social cost of increased systemic fragility outweighs the private benefit of avoided issuance costs.

Empirical Calibration. Our stress test analysis provides empirical discipline for the model. Appendix Figure B.3 presents heatmaps showing BHC equity at risk under various shock scenarios. The three panels show: (i) mean equity required as a percentage of BHC excess capital to recapitalize nonbank subsidiaries, (ii) 95th percentile equity at risk, and (iii) the fraction of BHCs experiencing complete buffer depletion. At our baseline scenario of a 5% shock to nonbank assets (consistent with 2008-level losses) combined with a 40% target recapitalization ratio, the average

BHC requires 17.85% of excess capital to restore nonbank solvency, while the 95th percentile BHC requires 99.45% of excess capital. If nonbanks were perfectly ring-fenced ($\lambda = 0$), this BHC-level vulnerability would not exist; the evidence in Appendix D indicates transmission is material.

Appendix Figure B.4a plots the net social benefit of internal reallocation as a function of λ, expressed as a percentage of total BHC assets. When contagion is negligible ($\lambda = 0$), reallocation is unambiguously beneficial, yielding a net social benefit of approximately 4.5% of assets. The gain reflects the direct improvement in bank safety and subsidiary returns, net of higher nonbank failure risk and issuance costs. The net benefit declines linearly in λ, crosses zero at $\lambda^* \approx 0.74$, and becomes increasingly negative thereafter, reaching approximately -1.5% of assets at complete contagion ($\lambda = 1$). The bank's own break-even transmission rate is $\Delta F_B / \Delta\Phi = 0.125/0.131 \approx 0.96$: below it, a fraction $1 - \lambda \cdot \Delta\Phi/\Delta F_B \approx (1 - \lambda)$ of the measured reduction in the bank's failure probability survives netting against contagion exposure, which is also the limit to which λ^* converges as L_B/L_N grows. We do not take a stand on where λ lies; the figure characterizes the full mapping. We stress, moreover, that the threshold is computed for the average BHC. The systemically relevant institutions occupy the right tail of the equity-at-risk distribution, where the same transmission rate implies far larger draws on parent capital, so the net social benefit of reallocation turns negative at lower λ than the average-based threshold suggests.

The externality threshold λ^* is sensitive to assumptions about relative failure costs. Appendix Figure B.4b explores how λ^* varies with the ratio L_B/L_N, holding L_N fixed at its baseline value. When bank failures are only twice as costly as nonbank failures ($L_B/L_N = 2$), $\lambda^* \approx 0.3$, and reallocation becomes socially costly even at modest contagion. At the baseline ratio of $L_B/L_N = 6$, the threshold rises to $\lambda^* \approx 0.7$, and at very high systemic cost ratios ($L_B/L_N = 20$) to approximately 0.9. The threshold thus spans most of the unit interval over plausible failure-cost ratios: because λ is not estimated, the figure should be read as characterizing which combinations of transmission and relative failure costs make reallocation socially costly, not as locating the economy on either side of the threshold.

B.5 Comparative Statics and Additional Predictions

The model generates several additional predictions that align with our empirical findings.

Effect of Stricter Regulation. Define system-wide expected failure costs as:

$$\mathcal{S} \equiv F_B(-E_B) \cdot L_B + F_N(-E_N) \cdot L_N + \lambda \cdot F_N(-E_N) \cdot [1 - F_B(-E_B)] \cdot L_B \tag{B.29}$$

The first two terms capture direct failure costs; the third captures contagion, the probability that the nonbank fails while the bank survives its own shock, triggering bank failure.

Using $E_B^* = \kappa_B \cdot A_B$ and $E_N^* = E^0 - \kappa_B \cdot A_B$ from Proposition B.1, and applying the chain rule (including the product rule on the contagion term):

$$\frac{\partial \mathcal{S}}{\partial \kappa_B} = A_B \Big[\underbrace{-f_B \cdot L_B}_{<0 \text{ (banks safer)}} + \underbrace{f_N \cdot [L_N + \lambda \cdot L_B(1 - F_B)] + \lambda \cdot F_N \cdot f_B \cdot L_B}_{>0 \text{ (nonbank risk, contagion, exposure)}} \Big] \tag{B.30}$$

The net effect on system-wide risk is ambiguous and depends on the magnitude of contagion and nonbank failure costs relative to direct bank safety improvements.

B.6 Model Parameterization

Parameter Values. Table B.1 summarizes the baseline parameter values. The model is a stylized framework intended to illustrate the internal reallocation mechanism and derive qualitative comparative statics; it is not a structural estimation. Parameters are chosen to be broadly consistent with the data and existing literature where possible, and assumed otherwise.

Regulatory Parameters. $\kappa_{\text{low}} = 0.08$ and $\kappa_{\text{high}} = 0.105$ match pre- and post-Basel III total capital requirements exactly, including the 2.5% capital conservation buffer.

External Equity Cost ($c'(0)$). Altınkılıç and Hansen (2000) estimates direct costs of 4–7% for seasoned equity offerings, with additional indirect costs from dilution and adverse selection. We set $c'(0) = 0.07$, consistent with this range.

Transaction Cost (τ). Internal equity transfers incur administrative and tax frictions. We set $\tau = 0.02$, consistent with the assumption that internal transfer costs are small relative to external equity costs. The condition $c'(0) = 0.07 > \tau = 0.02$ ensures that internal transfers are the cheaper marginal source of funds; at the baseline parameterization the optimum features modest external issuance alongside predominantly internal reallocation, close to the Case 3 corner; the transfer cost itself is inactive in the Basel experiment (see the Transfer-Cost Baseline paragraph below).

Contagion Parameter (λ). We do not estimate λ, and no baseline value is assigned. The stress tests in Section 6.4 involve no assumption about λ: they measure the potential draw on parent capital from recapitalizing shocked nonbanks unconditionally, whereas λ governs how much of that draw depletes the resources backstopping the bank, which the exercise does not identify. All λ-dependent results (the net social benefit in Appendix Figure B.4a and the netting exercise in Section 6.4) are reported as functions of λ over $[0, 1]$.

Failure Costs and Remaining Parameters. $L_B/L_N = 6$ is assumed as a baseline reflecting the greater systemic importance of regulated depository institutions. Appendix Figure B.4b reports how the externality threshold λ^* varies across a wide range of L_B/L_N ratios. Asset parameters (A_B, A_N), return parameters (α_B, α_N), and shock parameters ($\bar{\theta}_B$, $\bar{\theta}_N$) are chosen to produce capital ratios and failure probabilities broadly consistent with the data, and are not calibrated to specific empirical moments.

Transfer-Cost Baseline (E_B^0). The transfer cost in (B.7) is measured relative to the proportional asset-weighted baseline $E_B^0 = E^0 \cdot A_B/(A_B + A_N)$, which represents the unconstrained equity split when capital requirements are slack. At our parameterization ($E^0 = 0.11 \cdot 130 = 14.3$, $A_B = 100$, $A_N = 30$), this yields $E_B^0 = 11$. The post-Basel binding capital $\kappa_{\text{high}} \cdot A_B = 10.5$ falls slightly below this baseline, so the transfer cost is inactive in the Basel experiment, consistent with $\Delta\tau = 0$ in the Numerical Check; it activates for tighter requirements ($\kappa_B > 0.11$), which is the relevant region for the upper range of the comparative statics in Appendix Figure B.2.

Table B.1: Model Calibration

Parameter	Description	Value	Source
Assets and Initial Equity			
A_B	Bank assets (normalized)	100	—
A_N	Nonbank assets	30	Illustrative; see notes
$E^0/(A_B + A_N)$	Initial consolidated equity ratio	11%	Sample mean, pre-2015
Regulatory Parameters			
κ_{low}	Pre-Basel III capital requirement	8%	Basel I/II
κ_{high}	Post-Basel III capital requirement	10.5%	Basel III + CCB
Return Function: $R_i(E_i) = \alpha_i \log(1 + E_i)$			
α_B	Bank return parameter	15	Chosen to produce qualitatively reasonable capital ratios
α_N	Nonbank return parameter	12	Chosen to produce qualitatively reasonable capital ratios
Frictions and Costs: $c(K) = c'(0) \cdot K + 0.5 \cdot K^2$			
τ	Internal transfer cost per dollar	0.02	Assumed small; $\tau \in [0, 0.05]$
$c'(0)$	Marginal cost of external equity	0.07	Altınkılıç and Hansen (2000); range $[0.05, 0.10]$
Failure Costs and Shock Distribution: $\theta_i \sim Uniform[-\bar{\theta}_i, 0]$			
L_B	Social cost of bank failure	60	Assumed; $L_B/L_N = 6$ baseline
L_N	Social cost of nonbank failure	10	Normalized
$\bar{\theta}_B$	Maximum bank shock magnitude	20	Assumed
$\bar{\theta}_N$	Maximum nonbank shock magnitude	15	Assumed
Contagion			
λ	Contagion parameter	—	Not assigned; results reported as a function of λ

Notes: The model is a stylized framework intended to illustrate the internal reallocation mechanism and derive qualitative comparative statics; it is not a structural estimation. Assets are normalized so $A_B = 100$. $A_N = 30$ is chosen to produce economically meaningful nonbank operations and is not calibrated to a specific sample moment. Return parameters α_B and α_N are chosen so the model produces capital ratios broadly consistent with the data (pre-period bank capital ratios of approximately 8% and nonbank capital ratios substantially higher). Regulatory parameters κ_{low} and κ_{high} match Basel I/II and Basel III total capital requirements exactly. The contagion parameter λ is not assigned. The condition $c'(0) = 0.07 > \tau = 0.02$ ensures that internal transfers are the cheaper marginal source of funds; the baseline optimum features modest external issuance alongside predominantly internal reallocation. Appendix Figure B.4b reports sensitivity of the externality threshold λ^* to L_B/L_N.

B.7 Model Figures

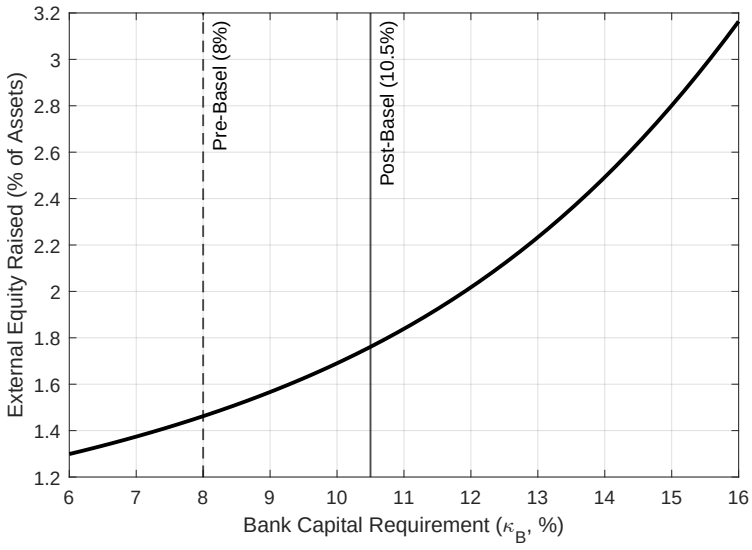


Figure B.1: External Equity Counterfactual

Notes: The figure shows external equity that would be required to satisfy bank capital requirements if internal reallocation were not available, expressed as a percentage of total BHC assets. The line plots external equity raised as a function of the bank capital requirement κ_B. The slope represents the marginal external equity cost avoided through internal capital markets.

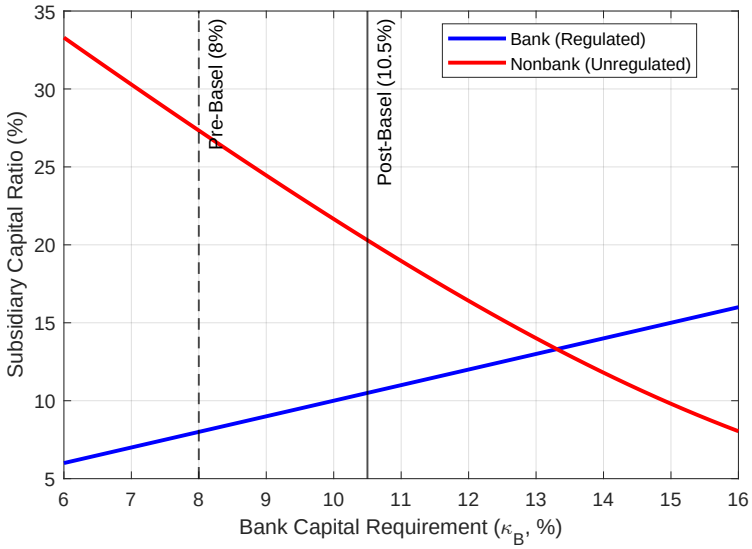


Figure B.2: The "Waterbed Effect" of Entity-Level Regulation

Notes: The figure compares the subsidiary capital ratio for bank and nonbank subsidiaries as a function of the bank capital requirement. The two ratios do not offset point for point; see the discussion following the proof of Proposition B.1.

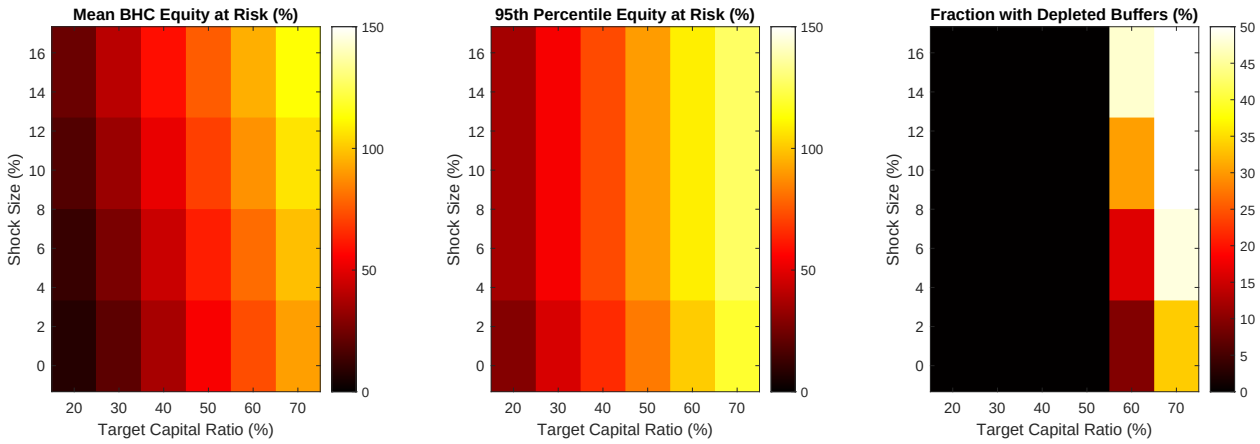
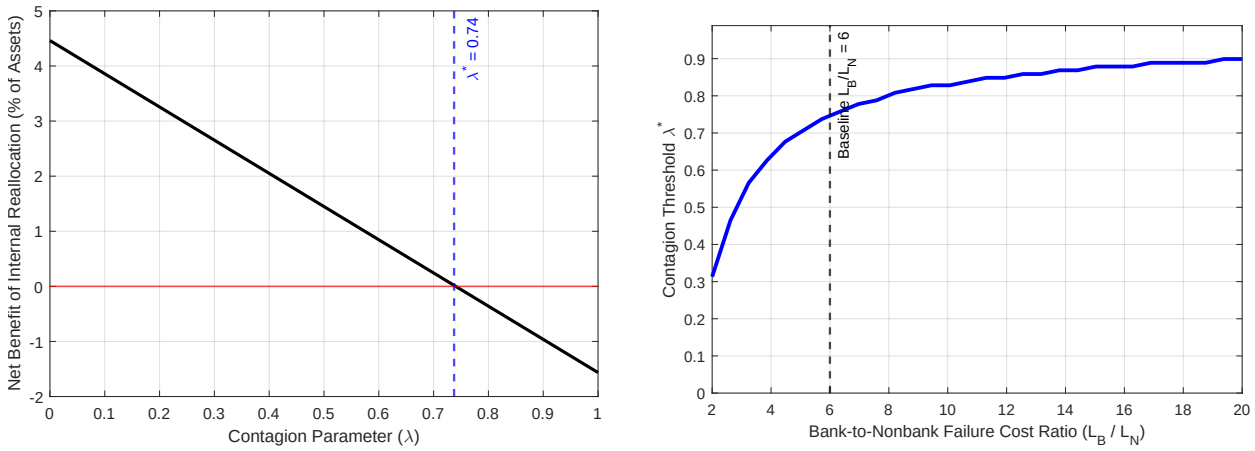


Figure B.3: Stress Test: BHC Equity at Risk

Notes: The three heatmaps display (left to right): mean equity required as a percentage of BHC excess capital to recapitalize nonbank subsidiaries, the 95th percentile (tail risk), and the fraction of BHCs with completely depleted capital buffers.



(a) Net Social Benefit of Internal Reallocation

(b) Sensitivity: λ^* vs. Failure Cost Ratio

Figure B.4: Net Social Benefit and Threshold Sensitivity

Notes: Panel (a) plots the net social benefit of internal reallocation as a function of the contagion parameter λ, expressed as a percentage of total BHC assets. The net benefit is positive for $\lambda < 0.74$, where the direct gains in bank safety and subsidiary returns exceed the nonbank and contagion costs, crosses zero at $\lambda^* \approx 0.74$, and is negative for $\lambda > 0.74$. Panel (b) shows how the externality threshold λ^* varies with the ratio of bank-to-nonbank failure costs (L_B / L_N), holding L_N fixed at its baseline value.

Appendix C Data Construction

This section describes the construction of the excess capital measure used in the analysis for both BHCs and depository institution (DI) subsidiaries. Excess capital is computed separately at the BHC-quarter level using FR Y-9C data and at the DI-quarter level using Call Report data, applying the regulatory requirements relevant to each institutional level.

Definition

Excess capital is defined as the amount of regulatory capital held by an institution (either a BHC or a depository institution) in excess of all binding regulatory requirements, normalized by that institution's risk-weighted assets (RWA). Formally, for institution i in quarter t, excess capital is constructed as the minimum distance between the institution's observed capital ratios and the applicable regulatory minimums across different capital categories.

Regulatory Capital Framework

Over the sample period, U.S. bank capital regulation is characterized by two main periods (Federal Reserve Bank of Cleveland, 2024). See Appendix Figure C.1 for a summary.

Pre-Basel III (1992–2014). Banks (both holding companies and depository institution subsidiaries) were subject to three minimum capital requirements:

- Tier 1 Capital Ratio: Tier 1 Capital $\geq$ 4% of RWA;
- Total Capital Ratio: Total Capital $\geq$ 8% of RWA;
- Leverage Ratio: Tier 1 Capital $\geq$ 4% of Total Consolidated Assets.

Basel III (2015–present). Beginning in 2015, banks are subject to:

- Common Equity Tier 1 (CET1) Capital Ratio: CET1 Capital $\geq$ 4.5% of RWA;
- Tier 1 Capital Ratio: Tier 1 Capital $\geq$ 6% of RWA;
- Total Capital Ratio: Total Capital $\geq$ 8% of RWA;
- Leverage Ratio: Tier 1 Capital $\geq$ 4% of Total Consolidated Assets.

In addition, banks must satisfy the Capital Conservation Buffer (CCB), which is added to the minimum CET1, Tier 1, and Total capital ratios. The CCB was phased in between 2016 and 2019, reaching its full value of 2.5% of RWA in 2019. Banks must maintain these buffers to avoid limitations on capital distributions and discretionary payments.[30]

For most institutions, the CCB was phased in as follows:

- 2015: CCB = 0% of RWA
- 2016: CCB = 0.625% of RWA
- 2017: CCB = 1.25% of RWA
- 2018: CCB = 1.875% of RWA

[30] The countercyclical capital buffer is also in principle included in regulatory capital requirements, but remains zero throughout the sample.

TABLE 5—REGULATORY CAPITAL LEVELS FOR ADVANCED APPROACHES BANKING ORGANIZATIONS

	Jan. 1, 2014 (percent)	Jan. 1, 2015 (percent)	Jan. 1, 2016 (percent)	Jan. 1, 2017 (percent)	Jan. 1, 2018 (percent)	Jan. 1, 2019 (percent)
Capital conservation buffer	.....	.....	0.625	1.25	1.875	2.5
Minimum common equity tier 1 capital ratio + capital conservation buffer	4.0	4.5	5.125	5.75	6.375	7.0
Minimum tier 1 capital ratio + capital conservation buffer	5.5	6.0	6.625	7.25	7.875	8.5
Minimum total capital ratio + capital conservation buffer	8.0	8.0	8.625	9.25	9.875	10.5
Maximum potential countercyclical capital buffer	.....	.....	0.625	1.25	1.875	2.5

TABLE 6—REGULATORY CAPITAL LEVELS FOR NON-ADVANCED APPROACHES BANKING ORGANIZATIONS

	Jan. 1, 2015 (percent)	Jan. 1, 2016 (percent)	Jan. 1, 2017 (percent)	Jan. 1, 2018 (percent)	Jan. 1, 2019 (percent)
Capital conservation buffer	.....	0.625	1.25	1.875	2.5
Minimum common equity tier 1 capital ratio + capital conservation buffer	4.5	5.125	5.75	6.375	7.0
Minimum tier 1 capital ratio + capital conservation buffer	6.0	6.625	7.25	7.875	8.5
Minimum total capital ratio + capital conservation buffer	8.0	8.625	9.25	9.875	10.5

Figure C.1: Regulatory Requirements for AA and Non-AA Banking Organizations

- 2019-Present: CCB = 2.5% of RWA

In 2020, the Fed implemented the stress capital buffer (SCB) which replaces the CCB at the BHC level. The SCB is floored at the CCB of 2.5% but additionally requires BHCs to hold enough capital to cover stress test losses and four quarters of dividends. Global Systemically Important Banks (G-SIBs) face an additional capital surcharge applied at the holding company level, on top of the CCB (or SCB post-2020).

Advanced Approaches Institutions

Advanced Approaches (AA) institutions are required to compute risk-weighted assets under both standardized and internal-risk rating (AA) models (Congressional Research Service, 2023). Large, complex banking organizations[31] and their depository institution subsidiaries must use advanced approaches framework. For these banks, regulatory compliance is assessed using the lower of the capital ratios calculated under the standardized and advanced approaches. Accordingly, for each AA institution, CET1, Tier 1, and Total capital ratios are defined as the minimum across standardized and AA calculations in each quarter. This procedure is applied symmetrically at the BHC and depository institution levels, using the relevant standardized and advanced approach calculations reported for each entity.

Leverage Constraints and the Supplementary Leverage Ratio

Beginning in 2018, large banks are additionally subject to the Supplementary Leverage Ratio (SLR), defined as Tier 1 capital divided by total leverage exposure, which includes off-balance-sheet items. Advanced approaches banks must meet a 3% SLR at the BHC and depository subsidiary levels. G-SIBs and their depository institution subsidiaries are subject to an enhanced SLR (ESLR) of 5% at the BHC level and 6% at the depository subsidiary level.

[31] Until 2019, all banks that had at least $250 billion in total consolidated assets or at least $10 billion in total on-balance sheet foreign exposure were required to use the AA framework. After 2019, only Category I and II banks are required to use the AA framework, though other banks can elect to if they wish (Congressional Research Service, 2023).

Community Bank Leverage Ratio (CBLR) Framework

Beginning in 2020, qualifying community banks may opt into the Community Bank Leverage Ratio (CBLR) framework. Electing banks are exempt from all risk-based capital requirements and are instead subject only to a Tier 1 leverage ratio requirement of at least 9%. These banks do not report RWA while in the CBLR regime, and are hence dropped from the sample.

Construction Procedure

Excess bank capital is constructed in four steps:

1. *Observed capital ratios.* For each institution-quarter, CET1 (post-2015), Tier 1, Total Capital, and Leverage Ratios are computed from FR Y-9C (for BHCs) or Call Report (for depository institution subsidiaries) data. For AA institutions, capital ratios reflect the minimum across standardized and advanced approaches.
2. *Applicable regulatory minimums.* Regulatory minimum capital ratios (inclusive of the CCB, GSIB-surcharge, or SCB for BHCs when applicable) are assigned based on the regulatory regime in place in quarter t.
3. *Accounting for the leverage ratio.* To account for potentially binding leverage constraints, for each institution-quarter, we compute the minimum amount of Tier 1 capital required to satisfy their applicable leverage ratio (Tier 1 leverage ratio, SLR, or ESLR). If this implied Tier 1 requirement exceeds the Tier 1 capital implied by risk-based requirements, the leverage-based requirement is treated as binding. The implied minimum Tier 1 capital is then expressed as a ratio of the institution's RWA, allowing leverage-based and risk-based constraints to be compared on a common scale.
4. *Excess capital.* Excess CET1, Tier 1, and Total capital are defined as the difference between observed ratios and their respective regulatory minimums. Excess capital is the minimum of these three values.

Appendix D Empirical Tests of Contagion

The evidence in this appendix serves a deliberately modest purpose. The stress tests in Section 6.4 report all results as functions of the transmission parameter λ, which we do not estimate. What the tests require is only that λ is not zero: that the two sides of the organization are not run independently, so that distress on the nonbank side draws on the resources backstopping the bank. The analyses below corroborate this premise from three directions: bank lending contracts after losses at affiliated nonbanks, market prices of affiliated BHCs reprice in stress, and parent equity visibly reroutes toward distressed nonbanks. None of these exercises identifies the magnitude of λ, and because nonbank losses are not exogenous events, we interpret the estimates as conditional correlations rather than causal effects of nonbank distress. The designs nonetheless cut against the leading alternative, a common shock striking both sides of the organization: the lending tests control for the bank's own contemporaneous losses, and the equity-flow evidence shows parent investment moving in *opposite* directions across the two arms, a rotation that a common shock would not produce. Taken together, the evidence is difficult to reconcile with the ring-fencing assumption $\lambda = 0$.

D.1 External Evidence

Historical episodes. Several well-documented cases illustrate how distress at non-depository affiliates draws on parent capital and indirectly weakens the affiliated bank. Appendix Table D.1 summarizes them. The oldest episode predates the modern framework: in 1976, Hamilton National Bank failed after absorbing, through intercompany loan participations, the bad real-estate loans of its holding company's nonbank mortgage affiliate, then among the largest bank failures since the Depression. The cleanest recent cases involve consolidated subsidiaries. Ally Financial supported Residential Capital (ResCap), its consolidated mortgage subsidiary, from 2007 onward; when ResCap filed for Chapter 11 in May 2012, Ally wrote its $442 million equity interest to zero, held $1.13 billion of intercompany credit exposure, and ultimately contributed $2.1 billion to the bankruptcy estate in exchange for releases of ResCap-related claims, with the parent acknowledging that continued support would have substantially delayed repayment of the U.S. Treasury's investment. HSBC's 2003 acquisition of Household International created HSBC Finance, a consumer-lending subsidiary whose subprime losses beginning in 2007 prompted the group's first profit warning, absorbed parent capital support for years, and led the group to begin winding the unit down in 2009. Notably, support has also flowed to entities outside the consolidation perimeter, where no contractual claim compelled it. In 2007–2008, Citigroup absorbed approximately $49 billion of structured investment vehicle assets back onto its consolidated balance sheet, although the SIVs were off-balance-sheet conduits with no consolidation requirement, depleting parent capital and contributing to its eventual reliance on TARP support (Pozsar et al., 2010). In mid-2007, Bear Stearns extended a $1.6 billion rescue loan to one of its two affiliated hedge funds when they collapsed, with parent funding pressures culminating in the firm's 2008 failure; Bear Stearns was not a bank holding company, so the episode illustrates the parent-support mechanism rather than transmission to an affiliated bank. That support flowed even across formal legal separation makes these episodes a fortiori evidence: contractual claims on wholly owned subsidiaries, the setting we study, bind more strongly, not less. In each episode, losses at nominally separate non-depository entities drew on the parent's resources, impairing the consolidated capital position that backstops the affiliated bank.

Table D.1: Historical Episodes of Parent Support for Distressed Nonbank Affiliates

Parent	Nonbank affiliate	Draw on family resources	Resolution
Panel A: Consolidated subsidiaries			
Hamilton Bancshares	Hamilton Mortgage Corporation (HMC)	Losses on Atlanta real-estate lending at the nonbank affiliate were transmitted to affiliated banks through intercompany loan participations. After the Comptroller barred Hamilton National from purchasing further HMC loans, further participations were routed through a sister bank. The lead bank borrowed $11.1 million from the Federal Reserve days before failing	Hamilton National Bank declared insolvent and placed in FDIC receivership, February 1976; parent in bankruptcy
HSBC	HSBC Finance (consumer lender; ex-Household International, acq. 2003)	Rising losses on subprime loans prompted the group's first-ever profit warning in 2007; the parent subsequently provided repeated capital support to sustain the unit's operations	Wind-down began 2009; run-off over the following decade
Ally Financial (BHC from Dec. 2008)	Residential Capital (mortgage originator and servicer)	Parent support from 2007; parent wrote off $442 million equity interest in the nonbank affiliate; ResCap also owed $1.13 billion under parent-funded intercompany facilities; parent contributed $2.1 billion to the bankruptcy settlement in exchange for releases of ResCap-related claims	Chapter 11, May 2012; deconsolidated
Citigroup	CitiFinancial (consumer lender; ex-Associates First Capital, acq. 2000)	Losses absorbed within the Citi Holdings run-off segment from 2009	Multi-year wind-down; renamed OneMain Financial and sold in 2015
Panel B: Beyond the consolidation perimeter			
Citigroup	Structured investment vehicles (off-balance-sheet conduits)	Approximately $49 billion of SIV assets taken onto the consolidated balance sheet (Dec. 2007) despite no legal obligation, contributing to reliance on TARP support	Vehicles wound down
Bear Stearns	High-Grade Structured Credit Strategies Fund (sponsored hedge fund)	$1.6 billion secured facility extended to one of two sponsored funds (June 2007) as external financing fled	Funds in bankruptcy, July 2007; parent acquired by JPMorgan in Fed-assisted rescue, March 2008

Notes: The table summarizes documented episodes in which distress at nonbank affiliates drew on the resources of the parent and, in the earliest episode, its affiliated banks directly. Panel A lists consolidated subsidiaries, where the exposure operates through the contractual and equity claims studied in this paper. Panel B lists entities outside the consolidation perimeter: support flowed even where legal separation was complete, making these episodes a fortiori evidence on implicit support. Bear Stearns was not a bank holding company; the episode illustrates the parent-support mechanism rather than transmission to an affiliated bank.

Rating-agency methodology and observed uplift. Major credit rating agencies explicitly incorporate expected parent support into their ratings of nonbank affiliates of bank holding companies.[32] The economic significance of implicit parent support has also been litigated: in *General Electric Capital Canada, Inc. v. The Queen (2009)*, the court accepted that implicit parent support is a meaningful economic phenomenon and based the valuation of an explicit guarantee fee on the incremental benefit above implicit support that markets already priced in. This methodology produces observable rating differentials. As of late 2024, S&P rated J.P. Morgan Securities LLC, JPMorgan Chase & Co.'s broker-dealer subsidiary, at AA-, two notches above the parent BHC's A rating. The differential is even larger at Goldman Sachs: S&P rated Goldman Sachs & Co. LLC, the broker-dealer subsidiary, at A+, three notches above the parent group's BBB+ rating.[33] These differentials reflect rating agencies' assessments that the broker-dealer affiliates would be supported by their parent BHCs in distress, precisely the contagion-direction transmission the model formalizes.

D.2 Empirical Approach

The model predicts that nonbank-affiliate losses transmit to the affiliated bank through depletion of the parent's equity buffer. This section tests the prediction directly using three outcomes at the affiliated bank: commercial lending growth, the credit spread on outstanding bond debt, and the parent's internal equity-flow response. The lending test identifies off nonbank-loss events directly and does not depend on calendar stress windows; the bond and equity-flow tests use a common pair of stress windows, defined next.

Stress windows. We define stress as the union of two episodes of system-wide intermediary distress: COVID 2020Q1–Q3 and the 2023–24 intermediary-stress window, 2023Q1–2024Q4. The first is a pandemic-driven shock affecting both bank and nonbank intermediaries: mortgage REIT margin calls, money-market fund outflows, BDC NAV declines, and securities lending dislocations. The second, while widely associated with the March 2023 regional bank failures (Silicon Valley Bank, Signature Bank, First Republic), is more accurately understood as a system-wide intermediary stress episode that affected bank and nonbank entities throughout the period. Nonbank-specific manifestations include sustained commercial real estate writedowns at office-heavy nonbank lenders and CMBS-related vehicles, redemption gates at open-end real estate funds, declining mortgage origination volumes at nonbank originators, distress at fixed-income asset managers exposed to duration risk, and elevated default rates in private credit and middle-market lending. Bank-specific manifestations include the regional bank failures themselves, the Bank Term Funding Program, persistent deposit-pricing pressure, AOCI realization at affiliated BHCs, and the New York Community Bancorp episode in early 2024. Both windows therefore capture stress affecting bank- and nonbank-affiliated intermediaries simultaneously; the 2023–24 window is not a bank-specific event but a sustained period of intermediary fragility with parallel bank and nonbank channels.

[32] Moody's Banks Methodology incorporates affiliate support through joint default analysis; S&P's Group Rating Methodology categorizes subsidiaries on a five-tier scale of strategic importance, with "Core" subsidiaries effectively rated at the group credit profile and others receiving up to several notches of uplift; Fitch's bank holding company criteria distinguish "Support-Driven" from "Standalone" ratings on the same logic.

[33] Ratings as of late 2024 from S&P Global Ratings. Goldman Sachs & Co. LLC and J.P. Morgan Securities LLC are the SEC-registered broker-dealer subsidiaries through which their parent BHCs conduct U.S. securities and trading activities. Both are non-depository affiliates and would carry lower standalone credit profiles absent expected parent support.

Affiliation indicator. The affiliation indicator AFFILIATION_j is a pre-determined cross-sectional measure equal to one if BHC j had a nonbank financial subsidiary as of 2013, zero otherwise. Fixing affiliation in 2013 mirrors the identification strategy used elsewhere in the paper and rules out endogenous changes in BHC structure during the sample window (2010–2024).

D.3 Lending Contagion

We test whether commercial lending growth at affiliated banks contracts following nonbank-affiliate loss events at the parent BHC. The unit of observation is the bank-quarter; the outcome is the quarterly change in log total loans, $\Delta \ln(\text{LOANS})_{i,t}$. Treatment is NB $\text{Loss}_{j(i),t-1}$, an indicator equal to one if BHC $j(i)$ had a nonbank-loss event in the prior quarter. The estimating equation is

$$\Delta \ln(\text{LOANS})_{i,t} = \beta \cdot \text{NB Loss}_{j(i),t-1} + \gamma' \left(X_i \times \text{Post}_t\right) + \alpha_i + \alpha_t + \varepsilon_{i,t}, \tag{D.1}$$

where α_i and α_t are bank and quarter fixed effects, X_i is a vector of 2013 bank controls (log assets, leverage, asset growth, ROA) interacted with a post-2015 indicator, and standard errors are clustered at the BHC level. The sample is restricted to BHCs with nonbank affiliates, so that β identifies the within-affiliated-BHC response.

Appendix Table D.2 reports five specifications: NB-loss alone (column 1), bank-loss (column 2), horse-race against bank-side loss (column 3), the clean subset where the bank itself did not also have a loss in the same quarter (column 4), and the clean-window restriction excluding bank-quarters with overlapping prior NB events (column 5). The point estimate is stable across specifications. In the horse-race column, lending growth contracts by 0.56 percentage points in the quarter following a nonbank-affiliate loss, controlling for the bank's own loss history. The clean-window restriction yields a similar point estimate (0.64 percentage points), estimated less precisely in the smaller sample, indicating that the result is not driven by overlapping prior episodes at the same BHC. Notably, the lending result does not depend on stress-window definitions. It identifies off any nonbank-loss event at the parent BHC and is therefore robust to alternative stress framings used in subsequent tests.

Appendix Figure D.1 reports a non-parametric event study using a first-spell event indicator (the BHC's first NB-loss quarter following at least four quarters of non-distress), with the omitted base period at $t = -1$. We use the first nonbank-loss event to avoid mechanical pre-trends from clustered prior events at the same BHC, following the convention in event-study designs with recurring treatments. The contraction is concentrated in the immediate post-event quarters. This pattern provides direct event-study evidence that nonbank distress at the BHC transmits to bank lending in subsequent quarters, consistent with the contagion mechanism we model. Because loss events are not randomly assigned, these estimates are conditional correlations; the horse-race and clean-window specifications address the most direct confound, a shock hitting bank and nonbank simultaneously, by conditioning on the bank's own loss realization and isolating focal events, though shocks that depress bank lending without producing a bank loss cannot be fully excluded.

D.4 Bond Market Contagion

We test whether the credit spreads on outstanding bonds of affiliated BHCs widen in stress periods relative to non-affiliated BHC bonds. The outcome is the change in credit spread (in basis points), measured as the corporate yield less the duration-matched Svensson-fitted Treasury yield. We estimate

$$\Delta s_{c,t} = \beta \cdot \text{AFFILIATION}_{j(c)} \times \text{STRESS}_t + \delta \cdot \text{AFFILIATION}_{j(c)} + \alpha_t + \alpha_b + \alpha_s + \varepsilon_{c,t}, \tag{D.2}$$

where $j(c)$ is the issuing BHC of cusip c, α_t is the month fixed effect, α_b is the bond-type fixed effect, α_s is the security-level fixed effect, and STRESS_t takes one of three definitions across columns: COVID only, the 2023–24 intermediary-stress window only, and their union. Standard errors are clustered at the BHC level.

Appendix Figure D.2 reports the three specifications. The interaction Affiliation $\times$ Stress identifies the differential widening in spreads at affiliated bonds during stress, relative to non-affiliated bonds in the same months. The COVID-only window produces a 25 basis-point differential widening, statistically significant at the 1% level. The 2023–24 intermediary-stress window alone produces a nearly identical point estimate of 24 basis points, though the cluster-robust standard errors are wide given the heterogeneity of BHC-level exposure during the window. The union of the two windows recovers a 27 basis-point widening, short of statistical significance at conventional levels ($p = 0.13$). The stability of the point estimate across the three definitions, at 24 to 27 basis points, indicates that the differential repricing of affiliated bonds is a general feature of intermediary stress rather than an artifact of the COVID episode, with the statistical precision concentrated in the sharper COVID window. Affiliation is fixed at 2013 and its level effect is absorbed, so the estimate is a differential repricing within the same months; selection of stress-sensitive BHCs into nonbank affiliation remains a possible confound, which is why we read the spread evidence as corroborative of, rather than independent proof of, the transmission channel.

D.5 Stress-Window Event Study: Parent Equity Investment

To document the mechanism directly, we examine the parent's internal equity-investment response. Restricting to BHCs whose nonbank-loss event $t = 0$ falls in a stress window (COVID 2020Q1–Q3 or the 2023–24 intermediary-stress window, 2023Q1–2024Q4), we estimate event-study regressions of two affiliate-level investment outcomes around the event quarter: the change in the parent's equity investment in the nonbank affiliate, and the change in the parent's equity investment in the bank affiliate, both normalized by lagged BHC equity.

Appendix Figure D.3 reports the leads and lags. Pre-event coefficients at $t = -4$ through $t = -2$ are not statistically distinguishable from zero on either panel, ruling out pre-trends in either nonbank or bank-affiliate investment ahead of the loss event. Beginning at $t = +1$, the offsetting reallocation pattern emerges and is the central evidence of this subsection: equity investment into the distressed nonbank affiliate rises to approximately 1.1 to 1.4 percent of lagged BHC equity over $t = +2$ through $t = +4$, while parent equity investment in the bank affiliate moves in the opposite direction over the same window, with the largest negative coefficient at $t = +2$ of roughly -2 percent of lagged BHC equity. The equity evidence pairs with the lending result in Appendix Section D.3: as the parent shifts equity from the bank to the distressed nonbank, commercial lending growth at the bank contracts by 0.56 percentage points in the following quarter, providing the precisely identified estimate of the downstream cost at the bank.

Table D.2: Lending Contagion: Bank Loan Growth on Lag-1 Nonbank Loss Event

	(1) NB only	(2) Bank only	(3) Horse race	(4) NB w/o bank loss	(5) Clean window
NB Loss$_{t-1}$	-0.0058**		-0.0056**		-0.0064
	(0.0024)		(0.0024)		(0.0042)
Bank Loss$_{t-1}$		-0.0156***	-0.0154***		-0.0150**
		(0.0056)	(0.0056)		(0.0059)
Loss$_{t-1}$				-0.0050**	
				(0.0024)	
Observations	23,848	23,848	23,848	23,848	22,102
R^2	0.1906	0.1912	0.1915	0.1905	0.1966
Bank FE	✓	✓	✓	✓	✓
Quarter FE	✓	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓	✓

Notes: The dependent variable is the quarterly change in log total loans, $\Delta \ln(\text{loans})$, at the bank-quarter level. The sample comprises bank-quarters between 2010Q1 and 2024Q4 at bank holding companies (BHCs) with at least one nonbank financial subsidiary. NB Loss$_{t-1}$ is an indicator equal to one if the BHC's nonbank affiliate(s) experienced a loss event in the prior quarter. Bank Loss$_{t-1}$ is an indicator equal to one if the bank itself recorded a loss in the prior quarter. Loss$_{t-1}$ equals one if NB Loss$_{t-1}$ = 1 and Bank Loss$_{t-1}$ = 0. Column 3 is the horse-race specification, identifying the contagion effect controlling for the bank's own loss history. Column 4 restricts the sample to bank-quarters where the BHC's nonbank had a loss at $t-1$ but the bank itself did not. Column 5 restricts to bank-quarters with no nonbank-loss event at $t-2$, $t-3$, or $t-4$, isolating focal events from overlapping prior episodes. All specifications include bank and quarter fixed effects and 2013 bank-level controls (log assets, leverage, asset growth, return on assets) interacted with a post-2015 indicator. Standard errors, in parentheses, are clustered at the BHC level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

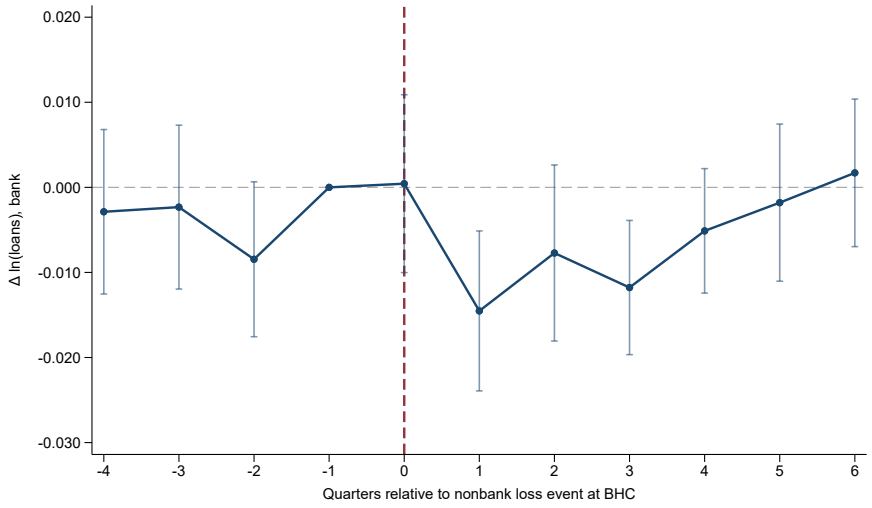


Figure D.1: Lending event study around nonbank-loss events at the BHC. Two-way fixed effects estimator on first-spell events. Base period $t = -1$. 90% confidence intervals clustered at the BHC level.

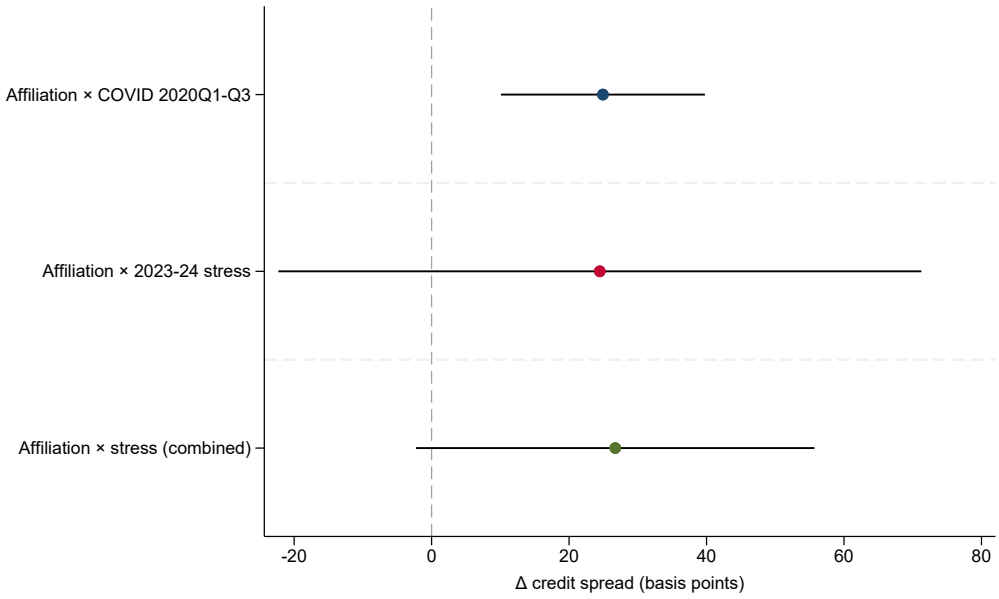


Figure D.2: Bond contagion: differential spread reaction at affiliated bonds during stress. Each marker is the affiliation × stress coefficient with 90% confidence interval.

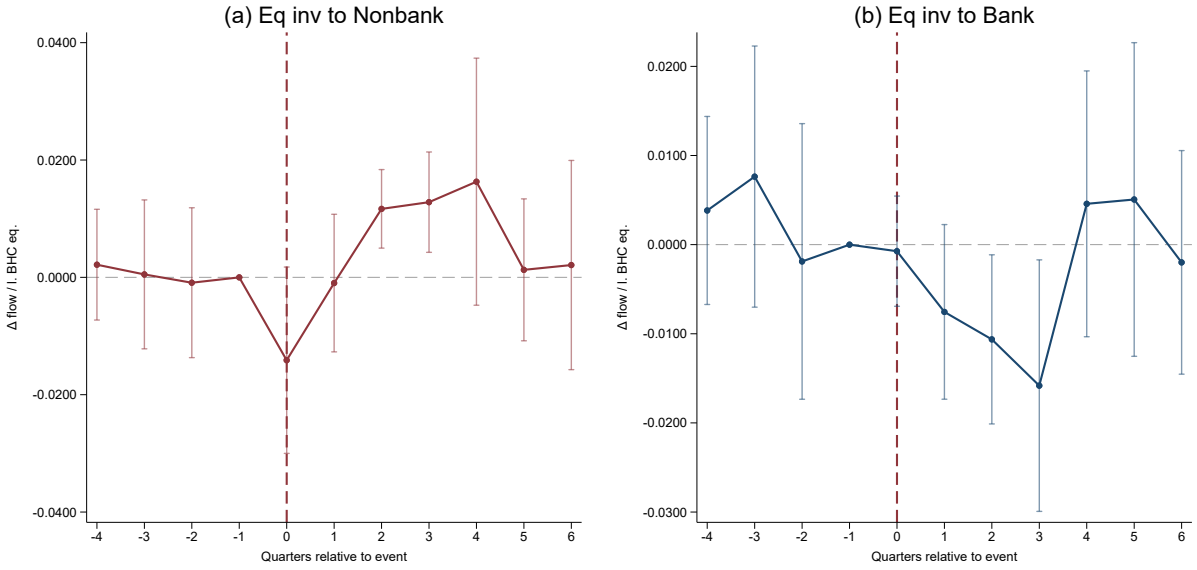
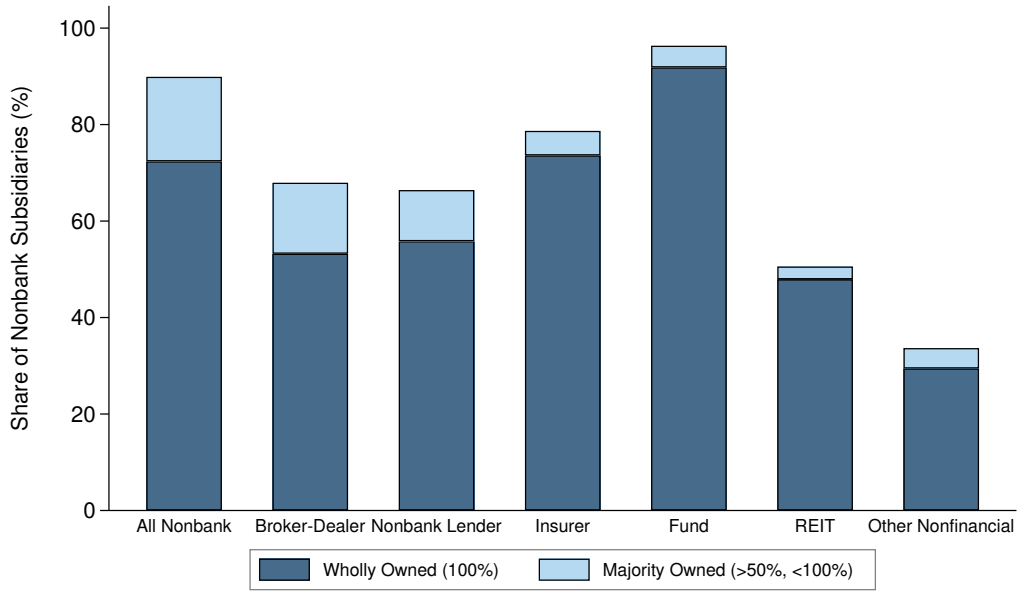


Figure D.3: Parent equity investment: nonbank recapitalization vs. bank drain. Sample restricted to BHCs with nonbank-loss events whose $t = 0$ falls in COVID 2020Q1–Q3 or the 2023–24 intermediary-stress window (2023Q1–2024Q4). Base $t = -1$, 90% CI clustered at BHC level.

Appendix E Additional Empirical Figures

E.1 BHC Ownership of Nonbank Subsidiaries

Figure E.1: BHC Ownership of Nonbank Subsidiaries

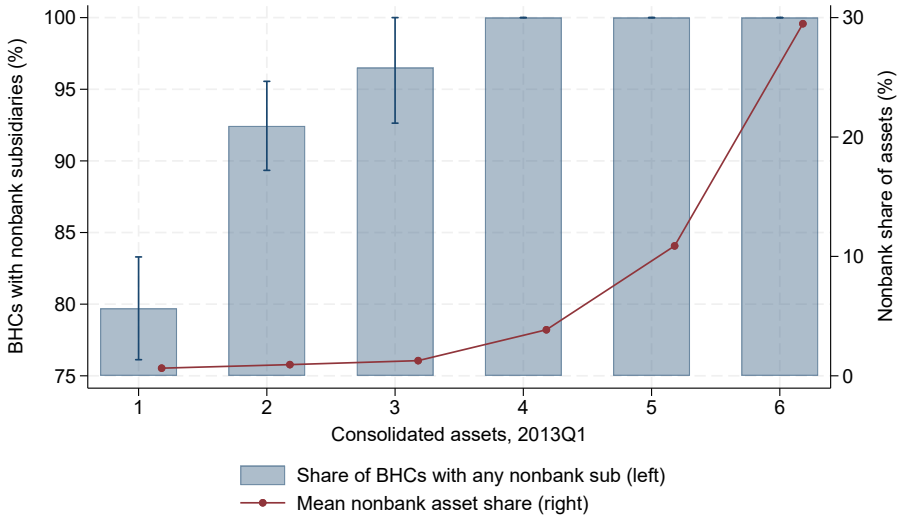


Notes: This figure shows the share of direct nonbank subsidiaries that are wholly owned by their parent BHC and the share that are majority owned by their parent BHC. The sample period is 2010-2024. Only nonbanks in the BHC's direct ownership chain are considered. Subsidiary types are classified by NAICS codes: Broker (523), Nonbank Lender (5222-5223), Insurer (524), Fund (525), and REIT (531). For additional summary statistics on BHC ownership shares in nonbank subsidiaries, see Appendix Table F.1. Source: FR Y-10.

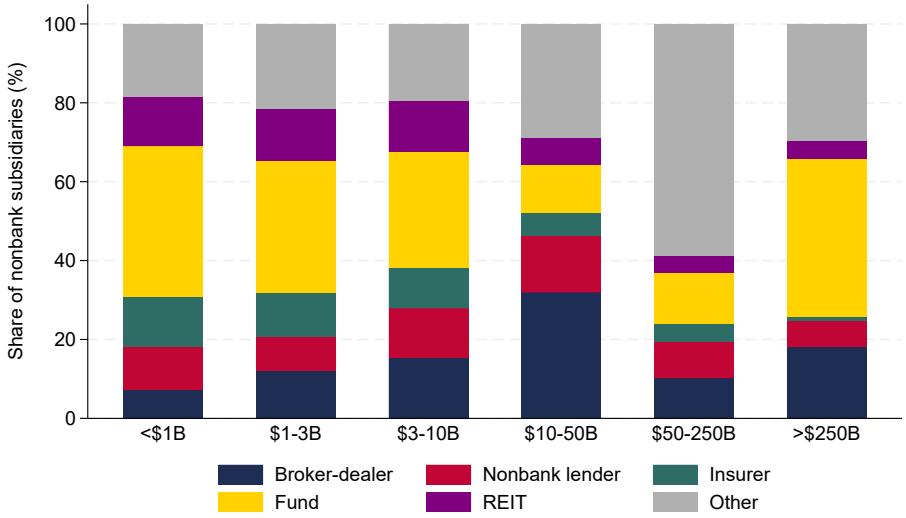
E.2 Nonbank Activity Across the BHC Size Distribution

Figure E.2: Nonbank Activity Across the BHC Size Distribution

(a) Prevalence and Intensity of Nonbank Activity



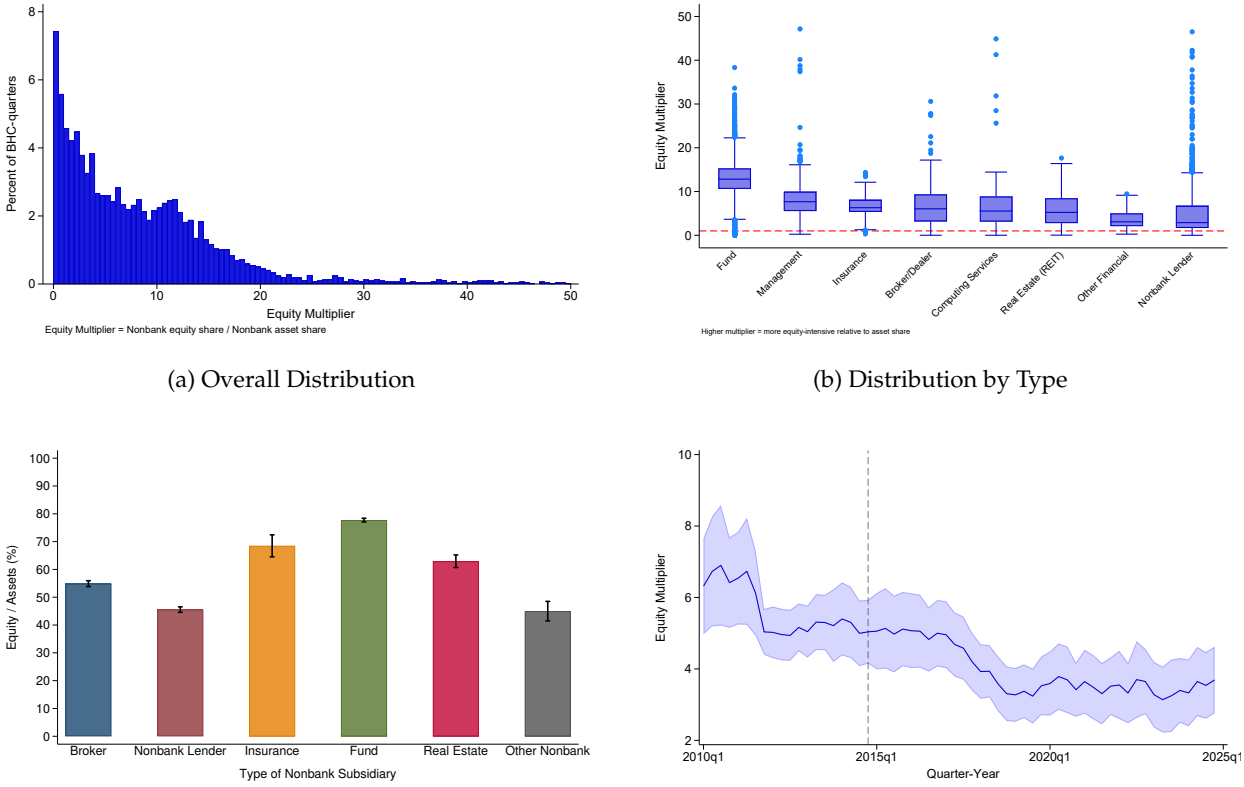
(b) Composition of Nonbank Subsidiaries



Notes: The figure presents the prevalence and intensity of nonbank activity, using the 2013Q1 cross-section of Y-9C filing BHCs, sorted into six consolidated-asset buckets. In Panel (a), bars (left axis) report the share of BHCs operating at least one nonbank financial subsidiary, measured from the FR Y-10 organizational structure database; the connected line (right axis) reports the mean nonbank share of consolidated assets from the FR Y-9LP. Panel (b) reports the composition of nonbank subsidiaries by type within each size bucket, weighted by subsidiary counts; "Other" comprises nonbank subsidiaries outside the five classified categories. Mean subsidiary counts per BHC are reported below the figure. Source: FR Y-9C, FR Y-9LP, BHC Organizational Structure Database.

E.3 Equity Multiplier

Figure E.3: Equity Multiplier: Distributions and Dynamics



(a) Overall Distribution

(b) Distribution by Type

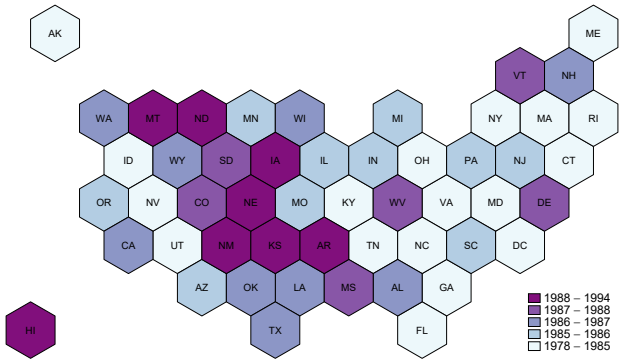
(c) Capital Ratios by Type

(d) Multiplier Over Time

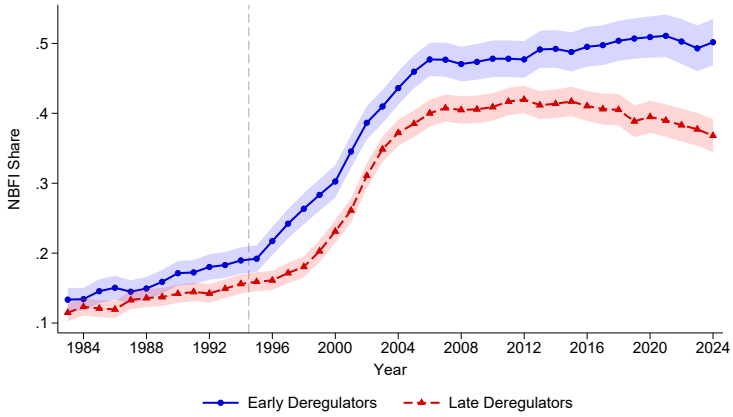
Notes: The figure provides shows the distribution and dynamics of the equity multiplier. Panel (a) shows a histogram of equity multiplier across all BHC-quarters. Panel (b) shows box plots by subsidiary type (see heterogeneity documented in Table 3) Panel (c) shows the average equity-to-assets percentage by type. Panel (d) shows time-series of aggregate equity multiplier. Shaded region shows 90% confidence interval. Source: Authors' calculations using FR Y-11.

E.4 Interstate Banking Deregulation and Nonbank Financial Exposure

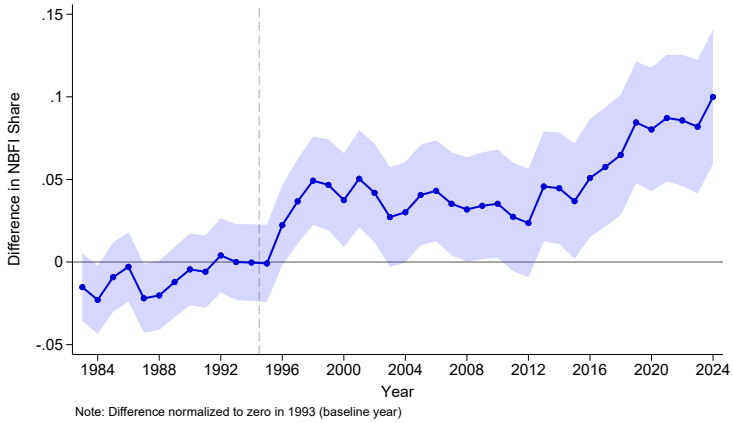
Figure E.4: Interstate Banking Deregulation and Nonbank Financial Exposure



(a) Interstate Deregulation Timing by State



(b) Nonbank Share: Early vs Late Deregulators

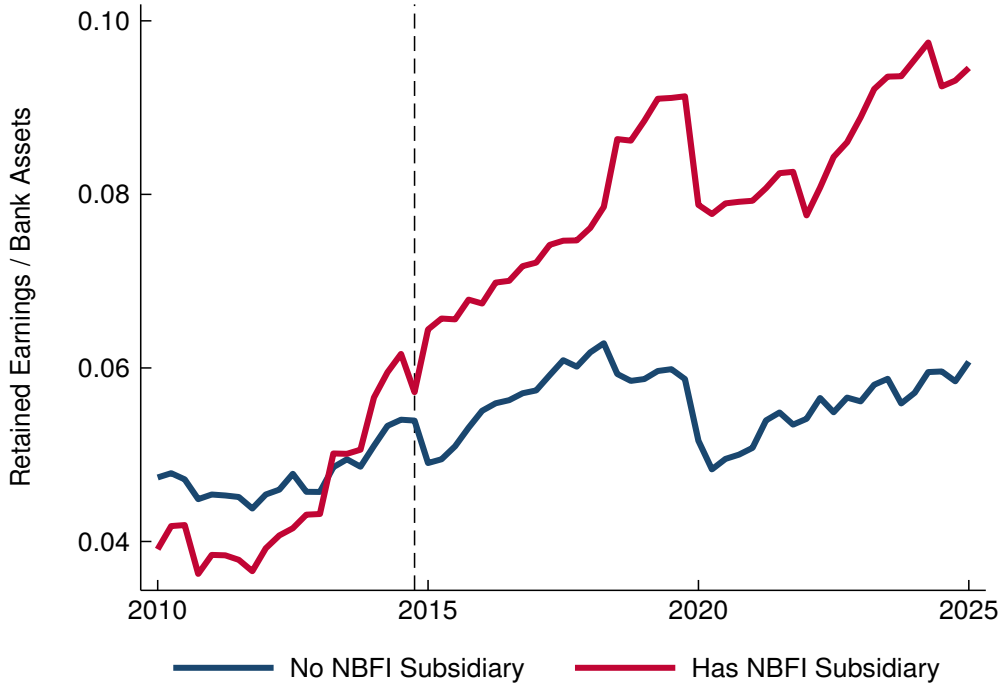


(c) Difference-in-Differences: Early - Late

Notes: Panel (a) displays the year each state removed restrictions on interstate banking. Lighter shading indicates earlier deregulation while darker shading indicates later deregulation. Panel (b) shows compares the nonbank share between BHCs headquartered in early-deregulating states and BHCs in late deregulating states. Panel (c) plots the difference in nonbank share between early and late deregulators.

E.5 Retained Earnings by BHC Nonbank Status

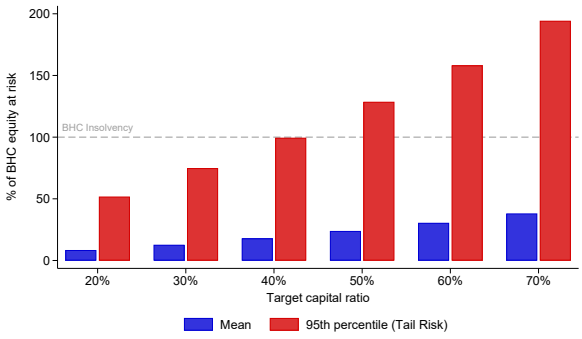
Figure E.5: Bank Retained Earnings as a Share of Bank Assets by BHC Nonbank Status



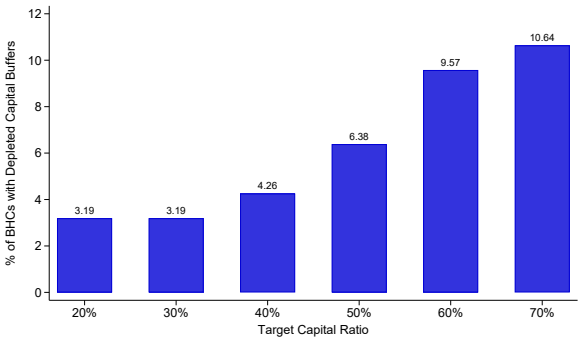
Notes: The figure shows average bank retained earnings as share of bank assets over time, comparing banks in BHCs with nonbank subsidiaries as of 2005 (red line) versus banks in BHCs without nonbank affiliates (blue line). Retained earnings measured as quarterly undistributed subsidiary income scaled by bank assets in that quarter. The scaled retained earnings are averaged across banks in BHCs with nonbank subsidiaries as of 2005 and banks in BHCs without nonbank affiliates by quarter. Vertical dashed line indicates 2015Q1 (Basel III implementation). Source: Call Reports, FR Y-9LP.

E.6 Assets and Equity at Risk

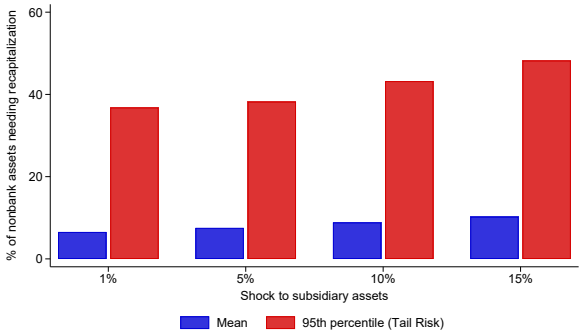
Figure E.6: Stress Test Sensitivity Analysis



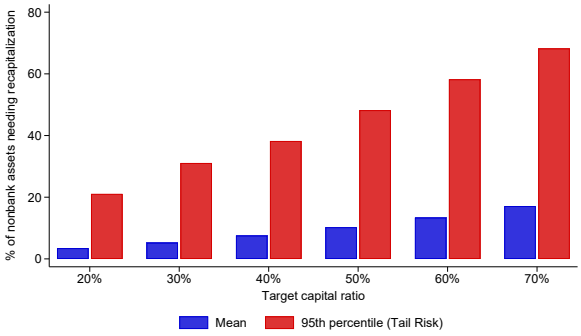
(a) BHC Equity at Risk by Capital Target



(b) Buffer Depletion by Capital Target



(c) Nonbank Assets at Risk by Shock

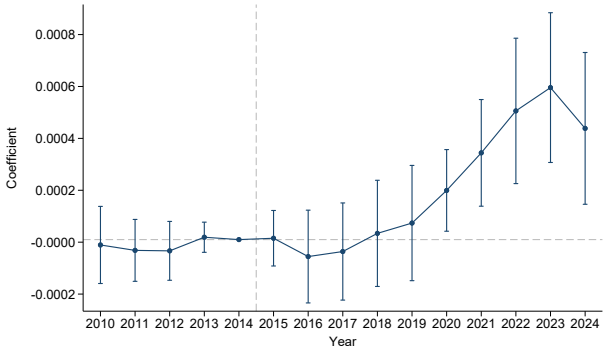


(d) Nonbank Assets at Risk by Target

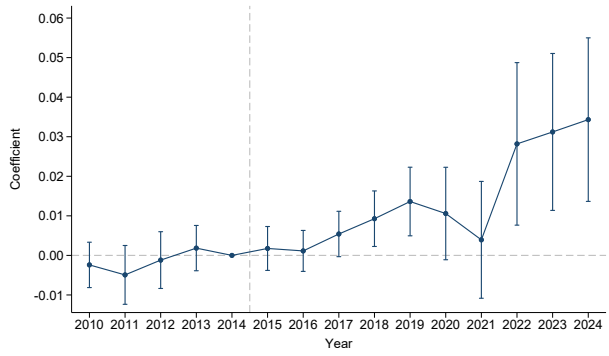
Notes: The table presents the stress test sensitivity analysis. Panel (a) shows percentage of BHC excess capital required to restore nonbanks to varying capital ratio targets following a 5% asset shock. Panel (b) shows percentage of BHCs with completely depleted capital buffers under varying target capital ratios (5% shock). Panel (c) shows percentage of nonbank assets requiring recapitalization by shock severity (40% target). Panel (d) shows nonbank assets at risk across target capital ratios (5% shock). In Panels (a), (c), and (d), blue bars show the mean across BHCs and red bars the 95th percentile (tail risk); in Panel (b), bars show the share of BHCs with fully depleted buffers, with values labeled above each bar. The horizontal dashed line at 100% in Panel (a) marks potential parent insolvency.

E.7 Bank Event Studies

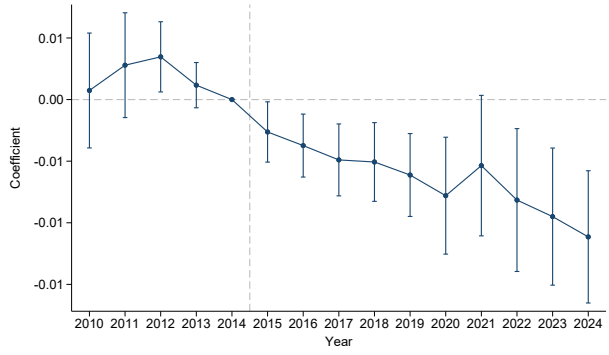
Figure E.7: Bank Event Studies: Safety and Profitability Improvements



(a) ROA



(b) Equity/RWA

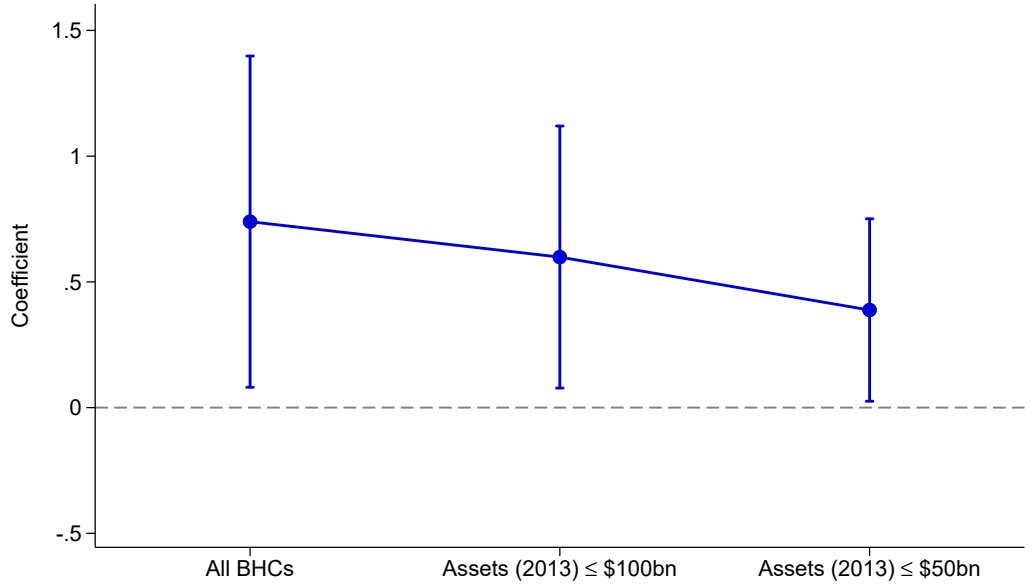


(c) RWA/Assets

Notes: The figure presents event study estimates of bank outcomes relative to 2014 baseline. Panel (a) shows return on assets, Panel (b) shows equity-to-RWA ratios, and Panel (c) shows RWA-to-assets ratio. Coefficients estimated from specification including bank fixed effects, quarter-year fixed effects, and bank controls (log assets, leverage, asset growth measured as of 2013Q1) interacted with post-2015 indicator. Standard errors clustered at bank level. Error bars indicate 90% confidence intervals. Source: Call Reports.

E.8 Heterogeneity by Bank Size

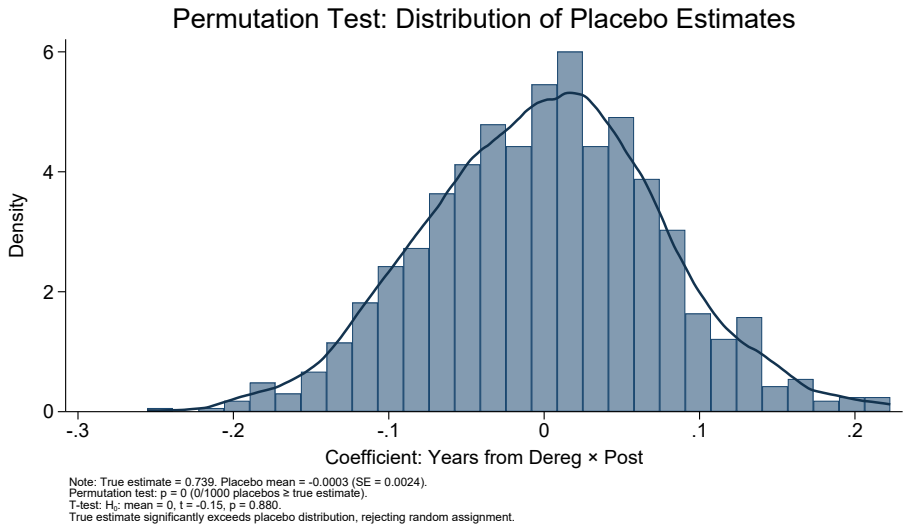
Figure E.8: Robustness to Excluding Large BHCs



Notes: The figure plots the coefficient on Years-from-Deregulation × Post from the baseline specification (Column 4 of Appendix Table F.6) estimated on the full sample and on samples excluding BHCs above $100 billion and $50 billion in 2013 assets. Point estimates are shown above each marker. Error bars indicate 90% confidence intervals; standard errors are clustered at the bank level. All specifications include bank and quarter fixed effects and 2013 controls interacted with the post indicator.

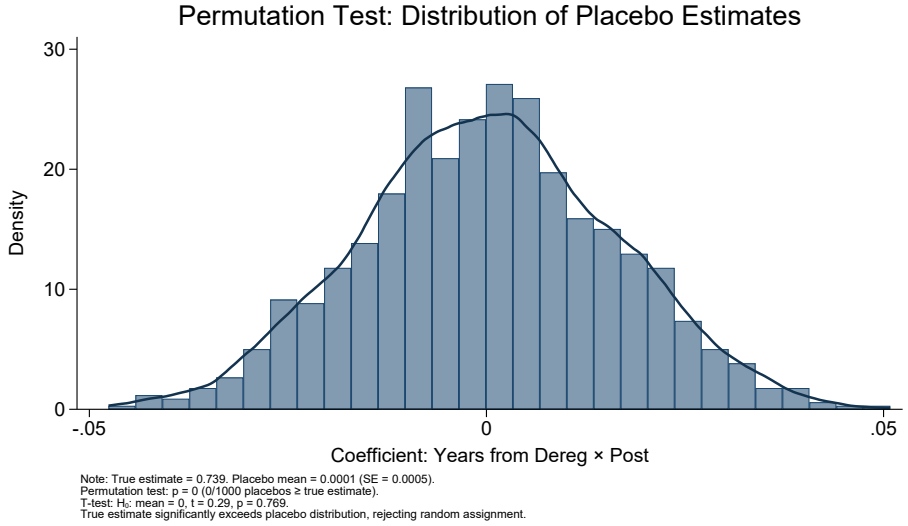
E.9 Placebo Tests

Figure E.9: Placebo Test: Randomized Deregulation Timing



Notes: The figure presents permutation-based placebo test. Distribution shows coefficients from 1,000 regressions where years from deregulation (instrument) is randomly reassigned to BHCs. Specification uses bank fixed effects, quarter-year fixed effects, and differential trends controls matching column 1 in Table 5. Placebo distribution tightly centered at zero: mean = -0.0003, standard error = 0.0024, t-statistic = -0.15, p-value = 0.880. True estimate of 0.74 percentage points (not shown to preserve scale) falls far in right tail.

Figure E.10: Placebo Test: Randomized Treatment Timing



Notes: The figure presents permutation-based placebo test validating the temporal variation in our identification strategy. Distribution shows coefficients from 1,000 regressions where post-period indicator is randomly assigned to years 2010-2024. Specification uses bank fixed effects, quarter-year fixed effects, and differential trends controls matching column 1 in Table 5. Placebo distribution centered at zero: mean = 0.0001, standard error = 0.0005, t-statistic = 0.29, p-value = 0.769. True estimate of 0.74 percentage points (not shown to preserve scale) falls far in right tail.

Appendix F Additional Empirical Tables

F.1 BHC Ownership Stakes in Nonbank Subsidiaries

Table F.1: BHC Ownership Stakes in Nonbank Subsidiaries

	N	Mean	SD	P5	P25	Median	P75	P95
Panel A: All BHCs, 2010-2024								
All Nonbanks	22631	88.33	24.26	26.67	88.89	100.00	100.00	100.00
Brokers	5503	69.28	39.52	0.00	45.25	100.00	100.00	100.00
Funds	19192	96.31	15.50	80.00	100.00	100.00	100.00	100.00
Insurers	5562	79.85	37.24	0.00	85.00	100.00	100.00	100.00
Nonbank Lenders	4072	67.40	42.78	0.00	6.67	100.00	100.00	100.00
REITs	3051	55.24	46.20	0.00	0.00	66.67	100.00	100.00
Other Nonbanks	496	32.82	46.28	0.00	0.00	0.00	100.00	100.00
Panel B: IV Sample of BHCs, 2010-2024								
All Nonbanks	4672	83.61	26.53	14.29	71.43	100.00	100.00	100.00
Brokers	1838	67.88	37.33	0.00	50.00	80.00	100.00	100.00
Funds	3635	92.66	20.35	33.33	100.00	100.00	100.00	100.00
Insurers	1759	80.70	37.65	0.00	100.00	100.00	100.00	100.00
Nonbank Lenders	1236	68.07	39.92	0.00	50.00	88.89	100.00	100.00
REITs	1057	71.64	39.50	0.00	50.00	100.00	100.00	100.00
Other Nonbanks	195	50.26	50.13	0.00	0.00	100.00	100.00	100.00

Notes: This table reports summary statistics on the ownership share (percentage of equity owned) of nonbank subsidiaries by all BHCs. For BHCs with multiple subsidiaries of the same type in a given quarter, we report the mean ownership share across those subsidiaries. Panel A shows the full sample of BHCs, Panel B shows the subset of BHCs used in the instrumental variable analysis. Subsidiary types are classified by NAICS codes: Broker (523), Nonbank Lender (5222-5223), Insurer (524), Fund (525), and REIT (531). Source: FR Y-10 Relationships Table, FR Y-9LP, BHC Organizational Structure Database.

F.2 Internal Capital Reallocation: NBFI Presence

Table F.2: Internal Capital Reallocation and Organizational Complexity

Panel A: Bank Excess Capital

	(1)	(2)	(3)	(4)
$\mathbb{1}$[NBFI Sub] × Post	4.8312**	4.8349**	2.0532*	2.0646**
	(2.3535)	(2.3377)	(1.0553)	(0.8277)
$\mathbb{1}$[NBFI Sub]	15.2740***	15.2727***		
	(3.0533)	(3.0547)		
Post	-1.7105***			
	(0.5685)			
Constant	9.1104***			
	(0.8462)			
Observations	54,814	54,814	54,814	54,814
R^2	0.0248	0.0251	0.9395	0.9401

Panel B: BHC Excess Capital

	(1)	(2)	(3)	(4)
$\mathbb{1}$[NBFI Sub] × Post	-0.1793	-0.0362	-0.0066	0.4333
	(0.3183)	(0.3121)	(0.2679)	(0.2931)
$\mathbb{1}$[NBFI Sub]	0.6165*	0.6231*		
	(0.3202)	(0.3201)		
Post	-2.5508***			
	(0.2017)			
Constant	7.2883***			
	(0.1927)			
Observations	29,267	29,267	29,267	29,267
R^2	0.0791	0.1003	0.7722	0.7838

Panel C: Bank-to-BHC Excess Capital Ratio

	(1)	(2)	(3)	(4)
$\mathbb{1}$[NBFI Sub] × Post	7.0730***	6.2445***	4.4044***	2.9060***
	(2.1569)	(1.9833)	(1.3521)	(0.9498)
$\mathbb{1}$[NBFI Sub]	2.3452***	2.3505***		
	(0.5541)	(0.5558)		
Post	0.9603			
	(0.7678)			
Constant	1.4776***			
	(0.1621)			
Observations	39,052	39,052	39,052	39,052
R^2	0.0163	0.0254	0.4031	0.4185
Bank FE			✓	✓
Quarter-Year FE		✓	✓	✓
Controls × Post				✓

Notes: The dependent variable is bank excess capital (Panel A), BHC excess capital (Panel B), and the ratio of bank to BHC excess capital (Panel C). $\mathbb{1}$[NBFI Sub] indicates BHCs with nonbank financial subsidiaries as of 2013Q1. Post equals one for 2015Q1 and later. Controls are measured in 2013Q1 and interacted with Post. Panel A and C controls include 2013Q1 bank size, leverage, ROA, and asset growth. Panel B controls include 2013Q1 BHC top 200 indicator, size, leverage, ROA, asset growth, deposits/assets, and subsidiary count. Standard errors are clustered at the bank level (Panels A and C) or BHC level (Panel B). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F.3 Balanced Panel Analysis

Table F.3: Balance Table: Pre-Treatment Characteristics as of 2013Q1

	Early Dereg	Late Dereg	Difference
Number of BHCs	75	89	14
Panel A: Size and Organizational Complexity			
Log(Total Assets)	15.188	14.211	0.976^{***}
Asset Growth	0.021	0.040	-0.019
Top 200 BHC	0.347	0.191	0.156^{**}
Log(Nonbank Assets)	11.514	8.252	3.262^{***}
Nonbank # Distinct NAICS	0.348	0.421	-0.074^{**}
ROA	0.002	0.003	-0.001^{**}
Panel B: Balance Sheet Characteristics			
Leverage	9.852	9.760	0.092
Loan Share	0.599	0.594	0.005
Securities Share	0.233	0.265	-0.032
Deposits/Assets	0.807	0.821	-0.014
Cash Share	0.083	0.081	0.002

Notes: The table compares pre-treatment characteristics of BHCs headquartered in early-deregulating states (those that removed interstate branching restrictions by 1986 or earlier) versus late-deregulating states. The fraction of observations in the Early Dereg sample does not significantly differ from the Late Dereg sample (difference in proportions test, $p = 0.27$.) All variables are measured as of 2013Q1, before the publication of final Basel III rules (July 2013) and approximately two years before they became binding in 2015Q1. Panel A reports size and organizational complexity measures. Panel B reports balance sheet composition measures. The "Difference" column reports differences in means. Statistical significance is indicated by asterisks based on t-test equality of means. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

F.4 Persistence of Nonbank Exposure

Table F.4: Persistence of Nonbank Financial Subsidiary Exposure

	Dependent Variable: NBFI Share$_t$ (% of Total Assets)				
	1-Year Lag (1)	2-Year Lag (2)	3-Year Lag (3)	4-Year Lag (4)	5-Year Lag (5)
NBFI Share$_{t-1}$	0.8999***				
	(0.0246)				
NBFI Share$_{t-2}$		0.8575***			
		(0.0278)			
NBFI Share$_{t-3}$			0.8047***		
			(0.0357)		
NBFI Share$_{t-4}$				0.7575***	
				(0.0441)	
NBFI Share$_{t-5}$					0.7087***
					(0.0530)
Observations	44308	39029	34510	30585	26957
R^2	0.9221	0.8846	0.8460	0.8177	0.7896
Quarter FE	✓	✓	✓	✓	✓

Notes: The table examines the persistence of nonbank financial subsidiary (NBFI) exposure over time by regressing current NBFI share on lagged values at 1-, 2-, 3-, 4- and 5-year horizons. The dependent variable in all columns is the share of nonbank financial assets as a percentage of total BHC assets in quarter t. Each column includes quarter fixed effects to control for aggregate time trends. Standard errors are clustered at the BHC level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

F.5 Summary Statistics: BHCs in Reduced-Form Sample (Active Pre-1994)

Table F.5: Summary Statistics: BHCs in Reduced-Form Sample (Active Pre-1994)

	N	Mean	SD	p5	p25	p50	p75	p95
Panel A: BHCs								
2013 Controls								
2013 BHC Assets (Billions)	6,086	78.950	347.246	0.532	1.027	2.415	11.520	217.853
2013 BHC Leverage	6,086	0.098	0.053	0.060	0.076	0.087	0.110	0.165
2013 BHC Deposit Share	6,086	0.805	0.089	0.673	0.781	0.822	0.853	0.901
2013 BHC Asset Growth	6,067	0.036	0.072	-0.091	-0.001	0.036	0.074	0.141
2013 BHC Subsidiary Count	6,086	103.919	409.576	1.000	4.000	7.000	18.000	628.000
Has Nonbank Subsidiary	6,086	0.568	0.495	0.000	0.000	1.000	1.000	1.000
Time-Varying Variables								
BHC Assets (Billions)	6,086	97.842	421.591	0.529	1.061	3.268	15.884	323.587
BHC RWA (Billions)	6,086	60.949	239.729	0.330	0.713	2.286	10.548	257.297
BHC Capital (Billions)	6,086	9.667	40.060	0.041	0.101	0.299	1.652	35.045
Excess BHC Capital (%)	6,086	6.184	3.977	1.298	3.632	5.500	7.920	13.146
BHC Net Income (Billions)	6,086	0.237	1.114	-0.000	0.002	0.008	0.040	0.823
BHC Leverage	6,086	0.100	0.031	0.057	0.083	0.100	0.116	0.148
BHC Deposit Share	6,086	0.801	0.080	0.676	0.767	0.814	0.853	0.896
BHC Loan Share	6,086	0.616	0.149	0.351	0.537	0.637	0.719	0.820
BHC Securities Share	6,086	0.239	0.130	0.054	0.145	0.221	0.316	0.489
BHC Nonbank Assets (Billions)	6,086	14.594	90.103	0.000	0.000	0.000	0.036	9.600
BHC Bank Assets (Billions)	6,086	86.695	358.393	0.521	1.057	3.271	15.556	319.482
BHC Direct Issuance	6,086	0.005	0.032	0.000	0.000	0.000	0.000	0.010
BHC Net Issuance	6,086	0.002	0.039	-0.033	-0.001	0.000	0.000	0.025
BHC External Equity	6,086	0.009	0.038	0.000	0.000	0.000	0.003	0.044
BHC Equity Inv. Bank Share	6,086	1.051	0.352	0.803	0.954	1.009	1.125	1.509
BHC Equity Inv. Nonbank Share	6,086	0.031	0.066	0.000	0.000	0.006	0.026	0.148
BHC Equity Inv. Total Share	6,086	1.215	0.557	0.881	0.986	1.056	1.239	2.189
BHC Div. Yield Bank	5,913	0.015	0.019	0.000	0.000	0.012	0.021	0.045
BHC Div. Yield Nonbank	4,533	0.025	0.180	0.000	0.000	0.000	0.011	0.094
Panel B: Banks								
Bank Assets (Billions)	10,086	52.167	274.008	0.046	0.374	1.141	6.180	157.290
Bank RWA (Billions)	10,085	34.172	167.106	0.012	0.214	0.768	4.263	111.788
Bank Capital (Billions)	10,086	5.314	26.754	0.013	0.050	0.132	0.728	17.937
Excess Bank Capital (%)	10,085	37.350	100.365	1.823	4.085	6.190	10.097	330.314
Excess Bank to BHC Capital Ratio (%)	9,962	9.910	36.370	0.476	0.801	0.961	1.263	64.406
Bank Net Income (Billions)	10,086	0.143	0.787	0.000	0.001	0.003	0.019	0.482
Bank Leverage	10,086	0.195	0.255	0.074	0.093	0.107	0.132	0.973
Bank Deposit Share	10,086	0.727	0.265	0.000	0.759	0.819	0.860	0.902
Bank Loan Share	10,086	0.551	0.241	0.000	0.463	0.613	0.718	0.836
Bank Securities Share	10,086	0.223	0.164	0.000	0.101	0.208	0.314	0.529
Panel C: Nonbanks								
Nonbank Assets (Billions)	6,738	4.474	10.522	0.011	0.380	1.419	3.809	17.761
Nonbank Capital (Billions)	6,738	2.514	5.942	0.000	0.078	0.570	1.920	13.112
Nonbank Net Income (Billions)	6,738	0.054	0.289	-0.067	-0.000	0.008	0.056	0.364
Nonbank Leverage	6,738	0.569	0.568	0.001	0.235	0.698	0.976	1.000
Nonbank Loans Share	5,762	0.119	0.292	0.000	0.000	0.000	0.007	0.983
Nonbank Securities Share	6,738	0.013	0.070	0.000	0.000	0.000	0.000	0.049
Broker	6,738	0.255	0.436	0.000	0.000	0.000	1.000	1.000
Nonbank Lender	6,738	0.182	0.386	0.000	0.000	0.000	0.000	1.000
Insurer	6,738	0.009	0.094	0.000	0.000	0.000	0.000	0.000
Fund	6,738	0.115	0.319	0.000	0.000	0.000	0.000	1.000
Real Estate	6,738	0.037	0.189	0.000	0.000	0.000	0.000	0.000

Notes: Percentiles are computed at the 5th, 25th, 50th, 75th, and 95th levels. The sample period ranges from 2010 to 2024. Only BHCs alive prior to the year 1994 (Deregulation year) and that filed an FR Y-9C in 2013Q1 and their bank/nonbank subsidiaries are included in the samples. Sources: FR Y-9C and FR Y-9LP for BHC Panel, Call Reports for Bank Panel, FR Y-11 for Nonbank Panel. Broker refers to NAICS 523, Nonbank Lender refers to NAICS 5222 and 5223, Insurer refers to NAICS 524, Fund refers to NAICS 525, Real Estate refers to NAICS 531.

F.6 Internal Capital Reallocation: Deregulation Timing

Table F.6: Internal Capital Reallocation and Deregulation Timing

Panel A: Bank Excess Capital				
	(1)	(2)	(3)	(4)
Years from Dereg × Post	2.6967*	2.6954*	0.7634*	0.7395*
	(1.4094)	(1.4062)	(0.4225)	(0.3992)
Years from Dereg	6.0085***	6.0063***		
	(1.7622)	(1.7659)		
Post	-13.3012*			
	(7.0483)			
Constant	-12.0218			
	(8.6498)			
Observations	12,558	12,558	12,558	12,558
R^2	0.0474	0.0490	0.9500	0.9502
Panel B: BHC Excess Capital				
	(1)	(2)	(3)	(4)
Years from Dereg × Post	0.0061	0.0157	-0.0583	0.0058
	(0.1028)	(0.0988)	(0.0680)	(0.0721)
Years from Dereg	-0.1331	-0.1310		
	(0.0986)	(0.0989)		
Post	-2.4567***			
	(0.8104)			
Constant	8.2797***			
	(0.7489)			
Observations	6,079	6,079	6,079	6,079
R^2	0.1009	0.1428	0.7860	0.7913
Panel C: Bank-to-BHC Excess Capital Ratio				
	(1)	(2)	(3)	(4)
Years from Dereg × Post	3.3797**	3.1142**	2.0478**	1.7766***
	(1.3785)	(1.3162)	(0.8339)	(0.6211)
Years from Dereg	1.0960***	1.0989***		
	(0.2996)	(0.3008)		
Post	-13.3325*			
	(7.9656)			
Constant	-2.7111*			
	(1.4704)			
Observations	9,873	9,873	9,873	9,873
R^2	0.0712	0.0993	0.6697	0.6934
Bank FE			✓	✓
Quarter-Year FE		✓	✓	✓
Controls × Post				✓

Notes: The table presents reduced-form difference-in-differences estimates relating excess capital to deregulation timing. The dependent variable is bank excess capital (Panel A), BHC excess capital (Panel B), and the ratio of bank to BHC excess capital (Panel C). Years from Dereg measures the number of years between a BHC's headquarters state interstate branching deregulation and the 1994 Riegle–Neal Act; headquarters state is measured as of 1981. Post equals one for 2015Q1 and later. Controls are measured in 2013Q1 and interacted with Post. Panel A and C controls include 2013Q1 bank size, leverage, ROA, and asset growth. Panel B controls include 2013Q1 BHC top 200 indicator, size, leverage, ROA, asset growth, deposits/assets, and subsidiary count. Standard errors are clustered at the bank level (Panels A and C) or BHC level (Panel B). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F.7 External Equity Issuance Following Basel III

Table F.7: External Equity Issuance and Share Buybacks Following Basel III

	Direct Issuance	Preferred Issuance	Net Issuance	External Equity	Buybacks
	(1)	(2)	(3)	(4)	(5)
Years from Dereg × Post	−0.0011***	−0.0005*	−0.0026***	−0.0015***	0.0009***
	(0.0004)	(0.0003)	(0.0006)	(0.0005)	(0.0003)
Observations	6,155	6,155	6,155	6,155	6,155
R^2	0.1710	0.1297	0.2174	0.1861	0.3836
BHC FE	✓	✓	✓	✓	✓
Quarter FE	✓	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓	✓

Notes: This table presents reduced-form estimates of the effect of organizational complexity on external equity activity following Basel III implementation. The dependent variables are: direct common stock issuance normalized by lagged equity (column 1), preferred stock issuance normalized by lagged equity (column 2), net equity issuance equal to gross issuance minus buybacks normalized by lagged equity (column 3), total external equity equal to the sum of common stock, preferred stock, and treasury stock issuance normalized by lagged equity (column 4), and share buybacks defined as treasury stock repurchases normalized by lagged equity (column 5). Years from Dereg measures years between a BHC's headquarters state interstate branching deregulation and the 1994 Riegle-Neal Act, with headquarters state measured as of 1981. Post indicates 2015Q1 and later. BHC controls include top 200 BHC indicator, log assets, leverage, ROA, deposits/assets, asset growth, and subsidiary count, all measured as of 2013Q1 and interacted with Post. Standard errors clustered at the BHC level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F.8 Bank/BHC Equity Share

Table F.8: Bank Equity as Share of BHC Equity

Bank Equity Share	(1)	(2)
Years from Dereg × Post	0.0199*	0.0194**
	(0.0100)	(0.0075)
Observations	1,400	1,400
R^2	0.7667	0.7997
BHC FE	✓	✓
Quarter-Year FE	✓	✓
Controls × Post		✓

Notes: The table presents alternative measure of internal equity reallocation using bank equity stock rather than parent equity investments. Dependent variable is bank subsidiary equity divided by total BHC equity. This measures equity held by bank subsidiaries as share of consolidated BHC equity, complementing the parent equity investment measures in Table 6. Years from Dereg measures years between BHC headquarters state's interstate branching deregulation and 1994 Riegle-Neal Act. Post indicates 2015Q1 and later. Column 2 includes BHC controls (top 200 BHC indicator, log assets, leverage, ROA, deposits/assets, asset growth, subsidiary count) measured as of 2013Q1 and interacted with Post. Standard errors clustered at BHC level. Sample restricted to BHCs with nonbank asset share exceeding 1%. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F.9 Bank Retained Earnings

Table F.9: Bank Retained Earnings

Bank Retained Earnings	(1)	(2)	(3)	(4)
Years from Dereg × Post	0.0054**	0.0054**	0.0020**	0.0019**
	(0.0021)	(0.0021)	(0.0008)	(0.0009)
Years from Dereg	0.0035	0.0035		
	(0.0032)	(0.0032)		
Post	-0.0130			
	(0.0106)			
Constant	0.0525***			
	(0.0157)			
Observations	12,558	12,558	12,558	12,558
R^2	0.0190	0.0209	0.9500	0.9529
Bank FE			✓	✓
Qtr-Year FE		✓	✓	✓
Controls				✓

Notes: The table presents the bank-level regression of retained earnings on organizational complexity. Dependent variable is bank retained earnings as share of bank assets, measured as quarterly undistributed subsidiary income scaled by beginning-of-quarter assets. Years from Dereg measures years between BHC headquarters state's interstate branching deregulation and 1994 Riegle-Neal Act. Post indicates 2015Q1 and later. Specification includes bank fixed effects, quarter-year fixed effects, and bank controls (log assets, leverage, ROA, asset growth) all measured as of 2013Q1 and interacted with Post. Standard errors clustered at bank level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F.10 BHC Balance Sheet

Table F.10: BHC-Level Balance Sheet: Consolidated Effects

Panel A: Portfolio Composition

	Loan Share (1)	Securities Share (2)	Cash Share (3)
Years from Dereg × Post	-0.0019	0.0016	0.0010
	(0.0028)	(0.0031)	(0.0010)
Observations	6,067	6,067	6,067
R^2	0.9157	0.8934	0.7750
BHC FE	✓	✓	✓
Quarter-Year FE	✓	✓	✓
Controls × Post	✓	✓	✓

Panel B: Capital Structure

	Leverage (1)	Equity/RWA (2)	RWA/Assets (3)	Marginal ROE (4)	Off-BS (5)
Years from Dereg × Post	0.0363	0.0003	-0.0054**	0.0179	-0.0009
	(0.0568)	(0.0010)	(0.0026)	(0.0260)	(0.0015)
Observations	5,388	5,388	5,388	5,388	5,388
R^2	0.7180	0.8713	0.8802	0.0393	0.8760
BHC FE	✓	✓	✓	✓	✓
Quarter-Year FE	✓	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓	✓

Panel C: Consolidated Scale

	Log Assets (1)	Asset Growth (2)
Years from Dereg × Post	0.0114	0.0003
	(0.0097)	(0.0004)
Observations	5,388	5,387
R^2	0.9939	0.1336
BHC FE	✓	✓
Quarter-Year FE	✓	✓
Controls × Post	✓	✓

Notes: The table reports estimates using BHC-level (consolidated) balance sheet data. Panel A presents portfolio composition measures: loan share, securities share, and cash share. Panel B presents capital structure measures: leverage, equity-to-risk-weighted-assets, risk-weighted-assets-to-assets, marginal ROE, and off-balance-sheet loan commitments. Panel C presents consolidated scale measures: log total assets and quarterly asset growth. Controls in Panel C exclude log total assets from the control interactions to avoid controlling for the pre-period level of the dependent variable. BHC profitability results are reported separately in Table 9. Years from Dereg measures the number of years between the interstate branching deregulation of the BHC headquarters state and the 1994 Riegle-Neal Act. Post is an indicator equal to one for 2015Q1 and later. All specifications include BHC fixed effects and quarter-year fixed effects. BHC controls include an indicator for top 200 BHCs, log total assets, leverage, deposits-to-assets, asset growth, and subsidiary count, all measured as of 2013Q1 and interacted with Post, except where noted. Standard errors are clustered at the BHC level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F.11 BHC Internal Funding Rates

Table F.11: BHC Internal Funding Rates: Banks and Nonbanks

	Nonbank Rate (1)	Bank Rate (2)	Spread Rate (NB - Bank) (3)
Years from Dereg × Post	0.0052**	0.0008	0.0044*
	(0.0024)	(0.0008)	(0.0025)
Observations	992	992	992
R^2	0.5304	0.5480	0.5187
BHC FE	✓	✓	✓
Quarter-Year FE	✓	✓	✓
Controls × Post	✓	✓	✓

Notes: The table reports regression estimates of internal funding rate differentials. The dependent variable in column 1 is the annualized interest rate on internal funding to nonbank subsidiaries following the construction of Cetorelli and Prazad (2025), calculated as quarterly interest income from nonbank subsidiaries multiplied by four and divided by the stock of nonequity internal funding to nonbank subsidiaries (the sum of internal loans, parent affiliate deposits, and net balances due from nonbank subsidiaries). Column 2 reports the corresponding annualized interest rate on internal funding to bank subsidiaries, calculated analogously using interest income from bank subsidiaries and the stock of nonequity internal funding to bank subsidiaries. Column 3 reports the internal funding spread, defined as the nonbank funding rate minus the bank funding rate. Years from Dereg measures the number of years between the interstate branching deregulation of the BHC headquarters state and the 1994 Riegle–Neal Act. Post is an indicator equal to one for 2015Q1 and later. All specifications include BHC fixed effects and quarter-year fixed effects. BHC control variables include top 200 BHC indicator, log total assets, leverage, deposits-to-assets, asset growth, and subsidiary count, all measured as of 2013Q1 and interacted with Post. Standard errors are clustered at the BHC level. The sample is restricted to BHCs with non-missing internal funding rate measures for both bank and nonbank subsidiaries. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F.12 Nonbank Shift to Consumer Lending

Table F.12: Loan Composition: Shift Toward Consumer Lending

Panel A: All Nonbank Subsidiaries

	Real Estate Growth (1)	C&I Growth (2)	Consumer Growth (3)	Non-US Growth (4)
Years from Dereg × Post	-0.0114	-0.0932**	0.0133***	0.0054
	(0.0125)	(0.0354)	(0.0042)	(0.0092)
Observations	4,932	4,932	4,932	4,912
R^2	0.0320	0.0512	0.0980	0.0458
Nonbank FE	✓	✓	✓	✓
Industry-Qtr-Year FE	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓

Panel B: Nonbank Lenders Only

	Real Estate Growth (1)	C&I Growth (2)	Consumer Growth (3)	Non-US Growth (4)
Years from Dereg × Post	-0.0290	0.0230	0.0746***	-0.0471
	(0.0166)	(0.0400)	(0.0067)	(0.0554)
Observations	851	851	851	851
R^2	0.0631	0.0845	0.4349	0.0825
Nonbank FE	✓	✓	✓	✓
Industry-Qtr-Year FE	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓

Notes: The table reports regression estimates of loan growth by loan category for nonbank subsidiaries. The dependent variables are quarter-on-quarter log changes in loans by type: real estate (column 1), commercial and industrial (column 2), consumer (column 3), and loans to non-U.S. borrowers (column 4). Panel A includes all nonbank subsidiaries with lending activity. Panel B restricts the sample to subsidiaries classified as nonbank lenders, including finance companies, mortgage companies, and other specialized lending entities. Years from Dereg measures the number of years between the interstate branching deregulation of the BHC headquarters state and the 1994 Riegle–Neal Act. Post is an indicator equal to one for 2015Q1 and later. All specifications include nonbank subsidiary fixed effects and industry–quarter–year fixed effects. BHC control variables include an indicator for top 200 BHCs, log total assets, leverage, deposits-to-assets, asset growth, and subsidiary count, all measured as of 2013Q1 and interacted with Post. Standard errors are clustered at the BHC level. Source: FR Y-11. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F.13 Nonbank Business Model Changes

Table F.13: Business Model Changes: Shift from Fees to Interest Income

Panel A: Decline in High-Equity-Ratio Activities

	Trading Revenue (1)	Advisory/Fiduciary (2)	Venture Capital (3)
Years from Dereg × Post	-0.0005***	-0.0066*	-0.0005*
	(0.0002)	(0.0037)	(0.0003)
Observations	4,496	4,496	4,496
R^2	0.2787	0.9186	0.2539
Nonbank FE	✓	✓	✓
Industry-Qtr-Year FE	✓	✓	✓
Controls × Post	✓	✓	✓

Panel B: Shift to Interest Income

	ln(Interest Income) (1)	ln(Non-Interest Income) (2)
Years from Dereg × Post	0.9351***	-0.2755
	(0.3125)	(0.2310)
Observations	2,387	2,387
R^2	0.7753	0.8091
Nonbank FE	✓	✓
Industry-Qtr-Year FE	✓	✓
Controls × Post	✓	✓

Notes: The table reports regression estimates of changes in nonbank subsidiary business model composition. Panel A presents measures of fee-based and investment-related activities. The dependent variables, all scaled by lagged assets, are trading revenue (column 1), advisory and fiduciary revenue (column 2), and venture capital revenue (column 3). Panel B presents measures of income composition. The dependent variables are log interest income (column 1) and log non-interest income (column 2). Years from Dereg measures the number of years between the interstate branching deregulation of the BHC headquarters state and the 1994 Riegle–Neal Act. Post is an indicator equal to one for 2015Q1 and later. All specifications include nonbank subsidiary fixed effects and industry–quarter–year fixed effects. BHC control variables include an indicator for top 200 BHCs, log total assets, leverage, deposits-to-assets, asset growth, and subsidiary count, all measured as of 2013Q1 and interacted with Post. Standard errors are clustered at the BHC level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table F.14: Extensive Margin: Changes in Subsidiary Composition

Panel A: Net Change in Subsidiary Count

	Broker (1)	Lender (2)	Insurer (3)	Fund (4)	REIT (5)
Years from Dereg × Post	0.1222	-0.0107	-0.0113**	0.0670	0.0160
	(0.1025)	(0.0224)	(0.0053)	(0.0999)	(0.0175)
Observations	5,982	5,982	5,982	5,982	5,982
R^2	0.0434	0.2345	0.0310	0.0523	0.2124

Panel B: Additions (Increase from Prior Quarter)

	Broker (1)	Lender (2)	Insurer (3)	Fund (4)	REIT (5)
Years from Dereg × Post	-0.0637	0.0067**	0.0025	0.0018	0.0014
	(0.0452)	(0.0030)	(0.0022)	(0.0262)	(0.0036)
Observations	5,982	5,982	5,982	5,982	5,982
R^2	0.0685	0.0662	0.0931	0.2459	0.0546

Panel C: Removals (Decrease from Prior Quarter)

	Broker (1)	Lender (2)	Insurer (3)	Fund (4)	REIT (5)
Years from Dereg × Post	-0.1858	0.0174	0.0138**	-0.0651	-0.0145
	(0.1440)	(0.0225)	(0.0061)	(0.0805)	(0.0154)
Observations	5,982	5,982	5,982	5,982	5,982
R^2	0.0945	0.2563	0.0805	0.0733	0.2568
BHC FE	✓	✓	✓	✓	✓
Quarter-Year FE	✓	✓	✓	✓	✓
Controls × Post	✓	✓	✓	✓	✓

Notes: This table examines changes in subsidiary composition at the extensive margin. Dependent variables measure quarter-to-quarter changes in subsidiary counts by type. Panel A shows net changes (current count minus prior quarter count, which equals additions minus removals). Panel B shows additions only (maximum of zero and the change, capturing only increases). Panel C shows removals only (maximum of zero and negative change, capturing only decreases). Years from Dereg measures years between BHC headquarters state's interstate branching deregulation and 1994 Riegle-Neal Act. Post indicates 2015Q1 and later. All specifications include BHC fixed effects, quarter-year fixed effects, and BHC controls (top 200 BHC indicator, log assets, leverage, deposits/assets, asset growth, total subsidiary count measured as of 2013Q1) interacted with Post. Standard errors clustered at BHC level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table F.15: Organizational Complexity: Number of Distinct NBFI Types

ln(NBFI Types)	(1)	(2)
Years from Dereg × Post	0.0821***	0.0270*
	(0.0107)	(0.0157)
Observations	5,558	5,558
R^2	0.1084	0.9636
BHC FE		✓
Quarter-Year FE		✓
Controls × Post		✓

Notes: The table examines changes in organizational complexity measured by number of distinct nonbank activity types within BHC. Dependent variable is log of number of distinct NAICS-based nonbank subsidiary types. Column 1 shows pooled OLS. Column 2 includes BHC fixed effects, quarter-year fixed effects, and BHC controls (top 200 BHC indicator, log assets, leverage, deposits/assets, asset growth, subsidiary count) measured as of 2013Q1 and interacted with Post. Years from Dereg measures years between BHC headquarters state's interstate branching deregulation and 1994 Riegle-Neal Act. Post indicates 2015Q1 and later. Standard errors clustered at BHC level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F.14 Nonbank Income Volatility

Table F.16: Nonbank Income Volatility

	σ(Int Inc) (1)	σ(Non-Int) (2)
Years from Dereg $\times$ Post	0.1969***	0.0422
	(0.0660)	(0.1030)
Observations	2,714	2,714
R^2	0.6934	0.5513
Nonbank FE	✓	✓
Industry-Qtr-Year FE	✓	✓
Controls $\times$ Post	✓	✓

Notes: The table presents rolling income volatility measures. Column 1 is the rolling 8-quarter standard deviation of log interest income. Column 2 is the rolling 8-quarter standard deviation of log non-interest income. Years from Dereg measures years between BHC headquarters state's interstate branching deregulation and 1994 Riegle-Neal Act. Post indicates 2015Q1 and later. All specifications include nonbank subsidiary fixed effects, industry-quarter-year fixed effects, and BHC controls (top 200 BHC indicator, log assets, leverage, deposits/assets, asset growth, subsidiary count measured as of 2013Q1) interacted with Post. Standard errors clustered at BHC level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

F.15 2SLS Design

Table F.17: First-Stage Relationship: Deregulation Timing and Organizational Complexity

NBFI Share × Post	(1)	(2)	(3)	(4)
Years from Dereg × Post	0.2877***	0.5105***	0.5269***	0.3461***
	(0.0649)	(0.1419)	(0.1389)	(0.1044)
Observations	12,558	12,558	12,558	12,558
R^2	0.1083	0.1300	0.6360	0.6861
Bank FE			✓	✓
Quarter-Year FE		✓	✓	✓
Controls × Post				✓

Notes: The table presents first-stage estimates verifying that deregulation timing predicts organizational complexity. Dependent variable is nonbank asset share (nonbank assets / total BHC assets) interacted with Post indicator (2015Q1 and later). Years from Dereg measures years between BHC headquarters state's interstate branching deregulation and 1994 Riegle-Neal Act. Column 1 presents unconditional correlation. Column 2 adds quarter-year fixed effects. Column 3 adds bank fixed effects. Column 4 adds differential trends controls at the bank level: log assets, leverage, ROA, and asset growth measured as of 2013Q1 and interacted with Post. Standard errors clustered at bank level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table F.18: Two-Stage Least Squares Estimates

Excess Bank Capital	(1)	(2)	(3)	(4)
NBFI $\widehat{\text{Share}} \times$ Post	9.4067***	5.2805*	1.4489*	1.9582*
	(3.4466)	(2.7473)	(0.8095)	(1.0279)
Observations	12,558	12,558	12,558	12,558
First-Stage Diagnostics:				
Kleibergen-Paap LM Statistic	16.458	11.385	12.257	8.894
Cragg-Donald Wald F Statistic	1524.187	534.417	1161.075	505.361
Kleibergen-Paap Wald F Statistic	19.635	12.940	14.384	9.784
Bank FE			✓	✓
Quarter-Year FE		✓	✓	✓
Controls $\times$ Post				✓

Notes: The table presents two-stage least squares (2SLS) estimates using deregulation timing as instrument for organizational complexity. Dependent variable is excess bank capital, defined as bank equity capital ratio minus regulatory minimum. Endogenous regressor is nonbank asset share interacted with Post (2015Q1 and later). Instrument is years from state deregulation to Riegle-Neal interacted with Post. Column 1 presents unconditional 2SLS. Column 2 adds quarter-year fixed effects. Column 3 adds bank fixed effects. Column 4 adds differential trends controls (log assets, leverage, ROA, asset growth measured as of 2013Q1 interacted with Post). Standard errors clustered at bank level in parentheses. First-stage diagnostics reported at bottom. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.