Regulatory Arbitrage within the Firm

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Abstract

Regulation shapes the boundaries of firms. When prudential standards bind asymmetrically across subsidiaries of an integrated organization, internal capital markets become a mechanism for regulatory arbitrage. We study this in U.S. banking, where holding companies encompass both heavily regulated depository institutions and lightly regulated nonbank affiliates. Following Basel III in 2015, holding companies extract equity from nonbank subsidiaries to recapitalize their banks. Bank subsidiaries accumulate 5–8 percentage points more excess capital than comparable standalone banks, through internal transfers; consolidated equity, assets, and lending are unchanged. In response to the same regulatory shock, nonbank affiliates within these organizations exhibit declining capital ratios, deteriorating credit quality, and expansion into consumer lending. The consolidated organization remains exposed to nonbank distress. We calibrate stress scenarios to 2008-scale losses on nonbank assets. If parents were to recapitalize distressed subsidiaries, 4–6% of holding companies would exhaust their capital buffers. For the most exposed institutions, the apparent improvement in bank safety overstates the consolidated gain once implicit liabilities to nonbank affiliates are netted out. Organizational structure is a fundamental determinant of regulatory outcomes.

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1 Introduction

A fundamental question in economics is how organizations allocate resources across internal boundaries. Since Coase (1937), economists have viewed firms as arising when internal coordination economizes on transaction costs relative to market exchange. Subsequent research shows 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). However, much less is known about how regulation interacts with organizational structure. While regulations constrain the activities firms may undertake, firms can respond by reshaping their internal boundaries, and these endogenous organizational adjustments may blunt or even reverse the 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 holding companies 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: 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: do tighter capital requirements on bank subsidiaries reduce risk at the organizational level, or do they induce reallocation of risk to lightly regulated nonbank affiliates within the same 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 (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). This avoids costly external issuance, satisfies regulatory requirements, and raises consolidated profitability. The same reallocation, however, leaves nonbank affiliates with less capital, and risk concentrated on the less regulated side of the firm. This organizational adaptation has broader implications that in fact may undo the efficacy of the

regulation. If the parent recapitalizes a distressed nonbank subsidiary, it draws down the capital buffer that backstops the bank. The bank's improved capital position is therefore not fully insulated from nonbank risk.

The U.S. banking industry provides an ideal laboratory for studying this interaction. Subsidiary-level financial disclosures, sharply differentiated regulatory regimes across affiliates within the same firm, and well-identified policy shocks make bank holding companies (BHCs) a setting in which organizational responses to regulation can be cleanly identified. The mechanism extends well beyond banking, applicable to any multi-entity organization where regulation, taxation, or supervision binds asymmetrically across affiliates.[1]

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. Rather than issuing new equity, BHCs extract equity from nonbank subsidiaries and reallocate it to their banks. BHC profitability rises, external equity issuance falls, and bank capital ratios improve, but in parallel, nonbank affiliates hold less capital, face higher internal funding costs, and shift aggressively into riskier lending. Risk is not eliminated; it is relocated to the less regulated, less protected side of the firm.

These findings reframe a growing literature on regulatory arbitrage. Prior work documents how stricter bank regulation drives credit intermediation outside the banking sector toward fintech lenders, shadow banks, and nonbank financial institutions that compete with regulated depository institutions.[2] We show that much of the nonbank sector is not outside banking organizations at all: roughly one in four dollars of U.S. nonbank financial assets is held within a bank holding company. We further show that the same migration occurs *within* bank holding companies, as BHCs reallocate capital and risk toward their own nonbank affiliates. Regulatory arbitrage is therefore not only an inter-firm phenomenon but also an intra-firm one, operating under consolidated supervision rather than outside it.

For identification, we exploit cross-sectional variation in organizational complexity generated by the staggered timing of interstate banking deregulation during the 1970s–1990s. Following Strahan (2003), Jayaratne and Strahan (1996), and Kroszner and Strahan (1999), we instrument for organizational complexity using the year in which each BHC's home state removed geographic restrictions on interstate banking. States that deregulated earlier allowed BHCs more time to expand and build multi-subsidiary structures before the Riegle–Neal Act of 1994 harmonized restrictions nationwide. This historically determined variation, shaped by state-level political economy

[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., Buchak et al. (2018), Irani et al. (2021), and Buchak et al. (2024).

decades before our study period (Kroszner and Strahan, 1999), generates persistent differences in organizational structure, plausibly orthogonal to factors determining 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, BHCs with more complex organizational structures respond to tighter capital requirements by extracting equity from nonbank subsidiaries to recapitalize their bank affiliates. Using a reduced-form specification, we find that banks in BHCs from states deregulating one year earlier accumulate 0.74 percentage points more excess capital post-2015; the median 7-year gap between early and late deregulators implies roughly 5 percentage points more bank capital. The capital accumulation occurs exclusively at the bank subsidiary level; we find no corresponding increase in consolidated holding company capital, total BHC assets, or BHC lending, consistent with internal reallocation rather than external equity issuance or consolidated deleveraging.

We trace the internal reallocation through direct observation of equity investments between parent and subsidiaries: a contribution that addresses an important gap in the literature. While prior research on internal capital markets emphasizes liquidity reallocation through loans and deposits between affiliates (Cetorelli and Goldberg, 2012*a*,*b*; Gilje, Loutskina and Strahan, 2016; Cetorelli and Prazad, 2025; Bai, Campello and Muthukrishnan, 2025), the role of equity transfers, which directly affect risk-bearing capacity and regulatory capital ratios, has received limited attention. We document that equity dominates internal funding by an order of magnitude: equity investments average 10–11% of bank 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.

Post-2015, we observe systematic equity reallocation operating through 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. Equity injections from the parent, combined with reduced upstream dividend extraction, build the bank capital buffers documented in the headline result. Consistent with this internal substitution mechanism, organizationally complex BHCs sharply reduce external equity issuance rather than turning to external markets to satisfy tighter requirements. Beyond declining to raise new external equity, these BHCs also actively return surplus extracted equity to shareholders through share buybacks, implying that consolidated equity falls below the level it would have reached absent internal reallocation. Parents also charge nonbanks substan-

tially higher internal funding rates while leaving bank rates unchanged, generating a spread of roughly 300 basis points for the median BHC, indicating that internal capital markets operate subject to funding frictions that amplify the real effects of equity extraction.

This reallocation operates through an internal equity multiplier. 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 aggressively post-2015. BHCs with lower multipliers, lacking accessible internal reservoirs, instead rely more heavily 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 5%, 10%, and 15% on nonbank assets, magnitudes consistent with the substantial mark-to-market losses and balance sheet contractions experienced by broker-dealers during 2007–2009 (Adrian and Shin, 2010), and compute the equity injection needed to restore nonbank capital ratios to values around the population median, ranging from 40% to 70% of assets.

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 roughly a third of it. For tail-risk BHCs, transmission of just one-half erodes 72% of the gain, and anything higher reverses it, leaving the most exposed organizations worse off than the headline improvement suggests.

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 of capital requirements, while affiliated nonbanks become more fragile. On the bank side, internal equity injections raise capital buffers and improve performance. Return on assets increases persistently, driven by lower charge-offs and improved asset quality rather than greater risk-taking. Banks reduce exposure to risk-weighted assets, increase holdings of securities and cash, and operate with stronger capital positions relative to risk. Leverage and marginal return on equity remain unchanged, indicating that performance gains stem from improved risk composition and operating efficiency rather than from deploying additional capital into higher-yield activities.

The opposite pattern emerges among nonbank subsidiaries. As capital is extracted upstream, nonbank capital ratios decline, profitability falls, and credit quality deteriorates. Nonbanks shift away from traditionally equity-intensive activities, such as trading, venture capital, and advisory services, toward more leveraged lending businesses, particularly consumer lending, allowing balance sheets to expand despite weaker equity buffers. This strategic reorientation is accompanied by higher income volatility and a pronounced decline in distance-to-default, indicating greater exposure to adverse shocks. Taken together, these results suggest that internal capital markets redistribute 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.

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 organi-

zations and, in turn, how organizational structure determines regulatory incidence. 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). We show instead that equity transfers dominate these liquidity flows by an order of magnitude and directly affect both risk-bearing capacity and regulatory capital ratios.

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 external 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, BHCs reallocate equity from affiliated nonbanks, effectively using nonbank subsidiaries as internal equity reservoirs. Our findings show that the economic effects of regulation depend not only on the regulated entity itself but also on the organizational structure through which internal capital markets operate.

Second, we contribute to understanding the effects of 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). These studies typically treat banks as standalone entities or examine consolidated holding company responses. We show subsidiary-level heterogeneity within firms is important: identical consolidated capital requirements generate divergent outcomes across subsidiaries depending on organizational structure. This challenges the implicit assumption that consolidated oversight fully captures economic risks. Our emphasis on the holding company as the locus of capital allocation is consistent with He, Kelly and Manela (2017), who demonstrate that the equity capital of intermediary holding companies prices risk across asset classes. The divergence we document between banks and BHCs also relates to the puzzle highlighted by Sarin and Summers (2016), who show that market-based measures of bank risk did not improve after the crisis despite increases in book capital. Because equity investors price the consolidated organization, whose excess capital we find remains unchanged, improvements in safety concentrated at bank subsidiaries may not be reflected in holding-company market measures, complementing their franchise-value interpretation.

Third, we identify a distinct form of regulatory arbitrage operating through internal capital markets within financial conglomerates. Prior work has emphasized 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. In contrast, we show that regulatory arbitrage can occur within the boundaries of a single consolidated organization and under the oversight of a single regulator. When capital requirements tighten at bank subsidiaries, BHCs respond by reallocating equity and risk-bearing capacity toward affiliated nonbanks, even though both entities remain subject to consolidated supervision. This mechanism differs from existing channels in two important respects. First, the arbitrage occurs through equity rather than liquidity, making it quantitatively large and directly affecting regulatory capital. Second, the resulting risk migration creates a direct contagion channel: distress at nonbank affiliates can transmit back to affiliated banks through the same organizational links that facilitate capital reallocation. Our findings complement work by Acharya, Schnabl and Suarez (2013), Tarullo (2019), and Bai, Campello and Muthukrishnan (2025), which highlights 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 shifts 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 for regulatory arbitrage operates alongside 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).

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. 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. 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.[3] Internal reallocation is privately preferred because the BHC avoids costly external issuance and consolidated profitability rises. BHC profitability increases following Basel III, consistent with this prediction.

Proposition 2.1 (Internal Reallocation Equilibrium)**.** *When $c'(0) > \tau$ and regulation binds, the BHC optimally sets $K^* = 0$, $E_B^* = \kappa_B \cdot A_B$, and $E_N^* = E^0 - \kappa_B \cdot A_B$, yielding:*

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

We focus on the empirically relevant region in which marginal issuance costs at zero are sufficiently high to generate a corner solution, consistent with observed reliance on internal capital markets. Bank equity rises one-for-one with the regulatory requirement; nonbank equity falls in equal proportion; consolidated BHC equity is unchanged.[4]

This prediction reflects the absence of adjustment along other margins (e.g., external issuance, asset growth, or retained earnings), and provides a benchmark for assessing the extent to which BHCs rely on internal capital markets in the data. 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 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 non-

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

[4] The precise endogenous condition for the corner solution $K^* = 0$ is $c'(0) > v + \tau$, where v is the shadow value of internal funds. We state the condition as $c'(0) > \tau$ as a sufficient condition when the shadow value is small relative to the transaction cost, which is the empirically relevant case.

bank 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. The parent and its banks hold committed credit lines and intercompany claims on the nonbank, so nonbank losses impair affiliated balance sheets directly; and 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.[5] The probability of bank failure incorporates both direct shocks and contagion:

$$\Pr(\text{Bank Failure}) = F_B(-E_B) + \lambda \cdot \Pr(\theta_N < -E_N \text{ and } \theta_B > -E_B) \tag{2}$$

The second term captures the channel of interest: nonbank distress transmits to the bank even in states where the bank would otherwise survive its own shock, because the parent depletes its buffer to recapitalize the nonbank.

Proposition 2.2 (Contagion Externality)**.** *There exists a threshold λ^* such that internal reallocation is privately and socially aligned when $\lambda < \lambda^*$, and generates unpriced systemic costs when $\lambda > \lambda^*$. The BHC internalizes direct failure costs of its own subsidiaries, but not the full social cost of contagion-induced bank failure ($\lambda \cdot \Delta L_B$), leading to excessive internal reallocation when contagion is material.*

This wedge arises because the full social cost of bank failure exceeds the BHC's private losses. Formally, we decompose $L_B = L_B^{\text{priv}} + L_B^{\text{ext}}$, where L_B^{priv} is the BHC's private loss and L_B^{ext} captures systemic costs such as credit supply disruption, interbank contagion, and fiscal backstop costs that the BHC does not internalize. The BHC therefore underweights the marginal contagion cost $\lambda \cdot \Delta L_B$ relative to the social planner, leading to excessive internal reallocation when contagion is material.

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-

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

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, 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, 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. 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 aggre-

gate assets, loans, and revenues, allowing us to distinguish BHCs with and without nonbank financial subsidiary activity. Appendix Figure 1b shows that nonbank assets held within BHC structures represent approximately 25–30% of total nonbank financial assets post-2010.[6] 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.

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.[7]

[6] The sharp increase in 2008–2010 reflects the conversion of large investment banks (e.g., Goldman Sachs, Morgan Stanley) to BHC status following the financial crisis. This indicates our sample captures a substantial share of shadow banking activity.

[7] 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.

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: their capitalization was governed only by market discipline, counterparty requirements, and in some cases, state-level solvency standards for insurance affiliates.

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 activities central to our analysis.[8] 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.[9] 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

[8]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.

[9]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.

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, foreshadowing the equity-reservoir mechanism developed 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.

4 Nonbanks Inside Bank Holding Companies

Before describing the identification strategy, we document the setting and the empirical pattern 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 bank holding companies, 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 bank holding companies (BHCs) themselves (Cetorelli and Prazad, 2025). Three features are central: nonbank activity inside BHCs is economically large, rep-

resents 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.[10] 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.

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

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 mechanism. 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

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

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.[11]

Table 3 reports a median equity multiplier of 6.5×. This concentration reflects two forces: nonbanks operate with high voluntary capital ratios (median 69% equity-to-assets, versus roughly 10% at banks), and their small balance sheets mean that even modest absolute equity holdings translate into disproportionately large equity shares. The distribution is right-skewed; 12× at the 75th percentile and above 21× at the 95th, with multipliers highest for funds and asset managers and lowest for nonbank lenders, shown in Figure 3. Even a small nonbank footprint can therefore support a substantial share of the equity available for redeployment into the regulated bank. Appendix Figure E.3 provides additional visualization of the full distribution of equity multipliers across BHC-quarters and across 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

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

BHCs with and without nonbank subsidiaries. Before 2015, the two groups' bank-level series move in parallel: banks in treated BHCs sit at a higher level (approximately 13.9% versus 9.1%), but neither group trends. The pre-treatment level difference is consistent with treated BHCs systematically operating with higher capital buffers, a fact our subsequent difference-in-differences design accounts for through BHC fixed effects. Beginning in 2015Q1, banks in BHCs with nonbank subsidiaries accumulate sharply more excess capital, with the gap widening to 8–10 percentage points by 2018–2020. The consolidated picture is different. Panel (b) shows that BHC-level excess capital does not diverge between the two groups; both decline gradually as Basel III phases in.[12]

Table 4 provides a simple difference-in-differences validation of the mechanism. Relative to BHCs without nonbank subsidiaries, banks in BHCs with nonbank affiliates accumulate significantly more excess capital after 2015. Yet excess capital at the consolidated BHC level does not increase, implying a sharp rise in the share of consolidated capital held within banks. This divergence between the bank and consolidated levels is consistent with an internal reallocation of equity rather than new external capital raising or balance-sheet shrinkage. Appendix Table F.2 reports the full specification.

This divergence is precisely the pattern predicted by the regulatory wedge: an internal transfer of equity raises bank capital while leaving consolidated equity unchanged—see Appendix Figure A.1 for a stylized example. We emphasize, however, that the evidence presented thus far is descriptive rather than causal. BHCs that operate nonbank subsidiaries differ systematically from those that do not along both observable and unobservable dimensions, including size, business model, and geographic footprint, and the decision to maintain nonbank affiliates is itself endogenous. The next section addresses these identification concerns by exploiting predetermined variation in BHC organizational complexity generated by the staggered timing of state-level 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 no untreated control group exists. 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

[12]The decline at the BHC level in Panel (b) is not mirrored at the bank level in Panel (a) because excess capital is the minimum buffer across all active regulatory ratios. When Basel III phased in, the new CET1 requirement entered this set; whether it binds depends on the capital stack, specifically, whether Additional Tier 1 plus Tier 2 capital exceeds the gap between the total-capital and CET1 requirements (about 3.5% of RWA). BHCs with less AT1 and T2 capital relative to RWA were more likely to become CET1-constrained after 2015, mechanically lowering measured excess capital.

state-level interstate banking deregulation timing, variation that predates Basel III by decades and is plausibly orthogonal to subsequent capital management decisions.

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.[13] 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:

$$\text{Years from Dereg}_i = 1994 - \text{Interstate Dereg Year}_{\text{HQ state}(i)} \tag{3}$$

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.[14]

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

$$Y_{it} = \alpha + \beta \cdot (\text{Years from Dereg}_i \times \text{Post}_t) + \gamma_i + \delta_t + X'_{i,2013}\boldsymbol{\theta} \cdot \text{Post}_t + \varepsilon_{it} \tag{4}$$

[13] 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.

[14] 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.

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 (3), 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.[15] 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 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

[15] 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.

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.

Third, persistence of organizational structure: 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.[16]

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 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 our identification strategy is relevant, and its skew toward larger, nonbank-active BHCs is precisely the segment of the industry most relevant for the internal-reallocation mechanism we study.

[16] 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).

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 7 years between early and late deregulators, this implies approximately 5 percentage points more bank capital.[17] The ratio of bank to BHC excess capital nearly doubles per year of exposure (column 3).

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. The net issuance series in column 3 falls by more than gross issuance, reflecting both margins. Rather than accessing external markets to satisfy stricter requirements, organizationally complex BHCs reduce their reliance on outside investors and actively return the equity

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

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 adjustment: 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.[18]

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

[18] 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.

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 expansion 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 placebo 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 establish that the size of the redeployable nonbank-equity reservoir governs the margin of adjustment within the BHC. The equity multiplier is not merely a descriptive statistic; it is the binding constraint on how much equity a parent can redeploy across the bank-to-nonbank boundary when bank capital regulation tightens. Internal reallocation is therefore not a uniform response to Basel III but scales with the extractable equity available to redeploy. We now turn to the systemic implications. Does the equity extracted from nonbanks leave them too thinly capitalized to absorb shocks without drawing on the parent capital that backstops the bank?

6.4 Stress Testing Nonbank Subsidiaries

We quantify the exposure underlying the contagion channel of Proposition 2.2 by simulating adverse shocks to nonbank portfolios and measuring the implied draw on parent capital buffers.

6.4.1 External Evidence on the Contagion Mechanism

The contagion mechanism in the model does not depend on the parent voluntarily rescuing the nonbank subsidiary. Parent and affiliated-bank resources are exposed before any discretionary support decision for two reasons. First, the parent and its affiliated banks already hold contractual claims on the nonbank including intercompany loans, receivables, and committed funding lines, so losses at the nonbank directly impair their balance sheets (Acharya, Cetorelli and Tuckman, 2026). Second, even nominally implicit support is effectively non-discretionary. Market participants treat parental backstops as credible commitments, and withdrawing support during distress would trigger counterparty flight, funding disruptions, and rating downgrades that amplify losses for the entire organization.[19] Because the exposure is largely contractual, λ captures the degree of effective ring-fencing rather than managerial discretion.

The contagion mechanism is further supported by three sets of evidence. Historical episodes during 2007–2008 illustrate it directly: Citigroup absorbed approximately $49 billion of structured investment vehicle assets back onto its consolidated balance sheet, Bear Stearns extended a $1.6 billion rescue loan to its affiliated hedge funds, and Wachovia's losses on Golden West Financial's option-ARM portfolio depleted parent capital and forced its emergency acquisition. Major credit rating agencies explicitly price parent support into the ratings of nonbank affiliates, generating large uplifts: S&P rates J.P. Morgan Securities LLC two notches above its parent BHC, and Goldman Sachs & Co. LLC three notches above its parent group.[20] Finally, our own data provide direct support: commercial lending at affiliated banks contracts following nonbank-affiliate losses, BHC bond spreads widen relative to non-affiliated peers during stress windows, and parent equity reallocates toward distressed nonbanks and away from affiliated banks. Appendix D reports these empirical tests in detail.

6.4.2 Stress Test Design

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

[19] 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.

[20] 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 methodology and provides additional examples.

subsidiaries. Following each shock, we calculate the capital injection required to restore each subsidiary to a target capital ratio ranging from 20% to 70%.[21]

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

$$\text{Loss}_{ij} = \text{shock} \times \text{Assets}_{ij,2013Q1} \tag{5}$$

$$\text{Post-Shock Equity}_{ij} = \text{Equity}_{ij,2013Q1} - \text{Loss}_{ij} \tag{6}$$

$$\text{Capital Shortfall}_{ij} = \max\left(0, \kappa \times \text{Assets}_{ij,2013Q1} - \text{Post-Shock Equity}_{ij}\right) \tag{7}$$

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):

$$\text{BHC Equity at Risk}_j = \frac{\sum_i \text{Capital Shortfall}_{ij}}{\text{BHC Excess Capital}_j} \times 100 \tag{8}$$

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.

The stress test design captures three key features of the sample. 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, there are no subsidiary-level capital requirements binding on nonbanks themselves, meaning nonbanks can become severely undercapitalized without triggering regulatory intervention, so long as consolidated ratios remain adequate. Third, when nonbank subsidiaries suffer losses, the parent may inject equity to restore solvency, drawing down its consolidated capital buffer.[22] Our stress tests quantify this exposure directly: we simulate adverse shocks to nonbank portfolios and measure the resulting draw on parent capital. Because bank subsidiaries share the same parent buffer, these recapitalization needs translate into implicit exposure of bank capital to nonbank losses, a form of intra-organizational contagion that consolidated capital ratios fail to capture.

Baseline Results. Table 8 presents recapitalization needs across shock severity and target capital ratio combinations. Panel A shows mean requirements. Under a baseline scenario of 5% asset shock with 40% target capital ratio, comparable to financial crisis losses for diversified fi-

[21] 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.

[22] 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.

nancial institutions, the mean BHC must deploy 17.85% of its excess capital to restore nonbank subsidiaries. This represents a substantial draw on parent resources. Panel B examines tail risk at the 95th percentile. The distribution exhibits significant right skew: under the baseline scenario, tail-risk BHCs face recapitalization needs of 99.45% of excess capital, approaching complete buffer depletion. Under more severe scenarios, defined by either larger asset shocks or higher recapitalization targets, tail-risk BHCs exceed 100% of excess capital (marked with asterisks), implying potential parent insolvency if forced to fully recapitalize subsidiaries. Appendix Figure E.6 shows sensitivity to alternative specifications.

Figure 7 visualizes the nonlinearity in stress test outcomes. Panel (a) plots recapitalization requirements against shock severity, holding the target capital ratio constant at 40%. Mean requirements (solid line) increase roughly linearly from 15.62% under 1% shocks to 23.85% under 15% shocks, but tail risk (dashed line) exhibits pronounced convexity: the 95th percentile rises from 89.36% at 1% shocks to 128.60% at 15% shocks. Panel (b) examines complete buffer exhaustion. We define a BHC as "depleted" if recapitalization needs exceed its entire excess capital buffer, leaving no cushion against further shocks. Under the baseline 5% shock scenario, 4.26% of BHCs experience complete depletion (see Panel E of Table 8). This fraction rises modestly to 5.32% under 10% shocks and 6.38% under 15% shocks. While the majority of BHCs retain some buffer capacity, the 4–6% depletion rate suggests meaningful systemic fragility: during crisis episodes when correlated shocks affect multiple BHCs simultaneously, many large financial institutions may be forced to liquidate assets, cut credit, or raise emergency capital under adverse market conditions.

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.

Concentration of Risk and Implications. Two additional findings merit emphasis. First, the concentration of risk within organizational structures amplifies systemic concerns. While Panel A of Table 8 shows that only 17.85% of BHC equity is at risk on average under baseline scenarios, Panel D shows that at the 95th percentile, 38.20% of individual nonbank subsidiaries require recapitalization. This heterogeneity indicates that some BHCs operate highly concentrated portfolios where multiple subsidiaries experience simultaneous distress following correlated shocks, similar to the scenario observed during 2008 when broker-dealers, mortgage lenders, and structured investment vehicles experienced losses simultaneously.

Second, our stress tests use 2013Q1 balance sheets, before equity extraction accelerated post-2015. As nonbank capital ratios decline in subsequent years, contemporary recapitalization needs exceed our estimates, and the 4.26% buffer depletion rate understates current vulnerability: a

shock comparable to 2008 losses would today likely deplete capital buffers for a larger percentage of BHCs.

Netting the Drawdown Against the Capital Gain. The recapitalization needs quantified above can be set against the bank-level capital gain documented in Table 5. We define the net gain as the gross gain (0.74 percentage points per year of exposure, approximately 5.2 percentage points at the median seven-year gap) less λ times the drawdown implied by the baseline scenario, where the drawdown converts the equity-at-risk share into percentage points using the group's excess capital. The share of the gross gain that survives is:

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

The offset is linear in λ, so intermediate values can be read directly; negative entries indicate that the drawdown exceeds the gross gain. For the typical BHC, the majority of the gain survives at any transmission rate, though full transmission erodes roughly 38% of it. For the most exposed institutions, more than a third of the apparent gain is offset at transmission of one-quarter and 72% at transmission of one-half; at $\lambda = 0.75$, just above the threshold $\lambda^* \approx 0.7$, the drawdown exceeds the gross gain, and at full transmission the reallocation leaves the exposed BHC worse off by nearly half the gain.

The stress tests reveal a fundamental tension between subsidiary-level and consolidated-level safety: tighter bank capital requirements strengthen the bank but draw down the nonbank buffers that contribute to consolidated loss-absorbing capacity. 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. We begin at the top. From the perspective of the holding company, internal reallocation is the profit-maximizing response to tighter regulation. Rather than tapping costly external equity markets, the BHC exploits an internal margin by extracting equity from lightly regulated nonbank affiliates and redeploying it where regulation binds. This strategy satisfies regulatory requirements while avoiding the issuance costs that would otherwise depress consolidated profitability.

Table 9 provides evidence consistent with this interpretation: consolidated return on assets (ROA) and return on equity (ROE) rise following Basel III, while charge-offs decline. Importantly,

these gains are not accompanied by meaningful changes in consolidated portfolio composition or capital structure. Appendix Table F.10 shows that both remain largely unchanged, with the exception of a modest decline in the ratio of risk-weighted to total assets. This pattern rules out the interpretation that profitability improvements reflect a shift toward riskier consolidated assets, and instead indicates that BHCs achieve higher returns by arbitraging the regulatory wedge between subsidiaries rather than by expanding overall risk-taking. The simultaneous decline in external issuance and rise in share buybacks, shown in Appendix Table F.7, imply that complex BHCs end the post-Basel III period with less consolidated equity than they would have absent internal reallocation.

Below the consolidated level, however, the consequences are asymmetric. At bank subsidiaries, capital ratios improve, asset risk declines, and profitability rises. At nonbank subsidiaries, equity ratios fall, internal funding rates rise, lending shifts toward riskier consumer segments, and high-equity-ratio fee-based activities contract. We document these divergent patterns in turn. Throughout, the relevant comparison is across subsidiaries within organizations facing the same Basel III requirement but differing in their parents' capacity to reallocate equity internally; the uniform component of the regulatory shock is differenced out by the quarter-year fixed effects.

7.1 Consequences for Bank Safety

We document two key findings. First, banks become substantially safer along multiple dimensions: profitability increases, credit quality improves, and insolvency risk declines. Second, safety improvements operate primarily through asset reallocation rather than leverage expansion. Banks shift portfolios toward lower-risk securities and cash, reducing risk-weighted assets relative to total assets, rather than expanding balance sheets to restore ROE through scale. Appendix Figure E.7 provides event-study evidence of these patterns.

Bank Performance and Portfolio Composition. Table 10 presents reduced-form estimates of bank safety improvements. Panel A documents performance gains. Column 1 shows that post-2015 ROA rises with deregulation exposure, and column 2 shows that ROE is 12 basis points higher for each additional year of exposure. The divergence between large ROA effects and modest ROE effects is consistent with the equity-injection mechanism: as parent equity flows into banks, ROE denominators rise, dampening the increase in returns to equity even as profitability on assets improves. Column 3 shows that charge-offs as a share of loans decline by 0.02 percentage points per year of exposure, indicating that ROA gains reflect improved asset quality rather than increased risk-taking.

Panel B examines portfolio composition. Column 1 shows that the loan share of assets declines by 0.60 percentage points per year of deregulation exposure, while columns 2–3 show that

securities and cash shares increase by 0.33 and 0.52 percentage points, respectively. This shift toward liquid, safe assets reduces balance sheet risk without requiring asset sales or deleveraging. Columns 4–6 demonstrate that these compositional changes are driven by differential rates of expansion rather than contraction of risky assets. The pattern of growth, i.e., cash expanding fastest, followed by securities, then loans, indicates that banks deploy additional capital conservatively rather than using higher capital ratios to support greater risk-taking.[23] What distinguishes our setting is that the lending slowdown does not translate into reduced credit supply at the consolidated BHC level: nonbank affiliates within the same organizations sharply expand lending, shown next. These findings speak to a longstanding concern that higher capital requirements may reduce bank profitability and induce risk-shifting behavior at the bank level. Instead, we find that when banks build capital through internal equity injection rather than deleveraging, safety strengthens without a corresponding rise in risk-taking, consistent with Admati and Hellwig (2024).

Panel C of Table 10 examines the balance-sheet channels through which equity injections affect bank capital ratios. Columns 1 and 2 show that total assets and total equity grow at near-identical rates of 0.08 percentage points per quarter per year of deregulation exposure on each, so the bank neither delevers nor levers up. Consistent with this, column 3 shows that bank leverage is essentially unchanged. The capital ratio nonetheless improves: column 4 shows equity relative to risk-weighted assets rises, while column 5 shows risk-weighted assets as a share of total assets fall. Equity flows in and assets grow with it, leaving the raw leverage ratio flat. As Panel B shows, the incremental assets are tilted toward low-risk-weight holdings, so the risk-weighted ratio improves. Banks thus build capital buffers and reduce balance-sheet risk simultaneously, with both effects contributing to higher capital quality.

This pattern of safer banks rather than risk-shifting reflects the distinct nature of internal versus external equity injections. When banks raise external equity, new shareholders require returns commensurate with their cost of capital, generating ROE pressure that can incentivize risk-taking to restore returns to pre-issuance levels. Internal injections from the parent face no comparable pressure: the parent optimizes across the entire holding company, with no separate bank-level ROE target on the marginal dollar of equity. Column 4 of Table 10 tests this directly by examining marginal ROE, the return on the incremental dollar of injected equity. A positive coefficient would indicate banks deployed new capital toward especially profitable opportunities, mechanically raising average ROE through portfolio reallocation. The null result rules out this channel. Combined with the modest positive coefficient on average ROE in Panel A and the decline in off-balance-sheet commitments in column 5, the evidence points to a different source of the ROE gains: reduced charge-offs and improved asset quality.

[23] The modest expansion of bank loans is consistent with the well-documented direct effect of tighter capital requirements on bank lending growth (Gropp et al., 2019).

7.2 Consequences for Nonbank Risk

We now examine how stricter bank capital regulation reshapes nonbank operations. Nonbank subsidiaries exhibit substantial changes along several dimensions post-2015: equity ratios fall, credit quality worsens, and earnings become more volatile as thinner capital buffers amplify the effect of operating shocks.

Figure 8 provides event-study evidence; all coefficients represent the marginal effect per additional year of deregulation exposure. The synchronized breaks at 2015Q1 are striking: equity-to-assets ratios fall, dividends spike, and net balances to parent surge. As nonbank capital buffers erode, their business models and performance deteriorate. Nonbanks expand lending activity, increasing the share of assets devoted to loans. However, this expansion is accompanied by higher levels of past-due and nonaccrual loans and a decline in return on equity by the end of the sample. These breaks coincide precisely with the improvements in capital observed at affiliated banks, indicating that the same regulatory shock that strengthens banks does so by drawing resources from nonbank subsidiaries.

Capital Extraction. Table 11 quantifies the capital extraction documented visually. Panel A presents balance sheet changes. Equity as a share of assets declines 7.71 percentage points per year of deregulation exposure, shown in column 1. Net balances to parent and affiliates rise 13.60 percentage points, shown in column 4, indicating that nonbanks increasingly borrow from or reduce lending to affiliated entities. Total assets are statistically unchanged, shown in column 6, so the nonbank does not contract its balance sheet as equity is withdrawn; instead, its liability side shifts away from equity and toward intra-firm funding. This pattern aligns with evidence from Acharya, Cetorelli and Tuckman (2026) on how banks remain exposed to nonbanks through credit lines. Dividend payments as a share of equity increase 0.96 percentage points, shown in column 5, consistent with capital being systematically drained from nonbank subsidiaries to satisfy bank regulatory requirements. Scaled to the median seven-year gap, these differentials are large, reflecting both intensive extraction and the compositional turnover described below, as BHCs shed high-equity affiliates and add thin-equity lenders. These magnitudes are also drawn from the selected Y-11 filer universe rather than the comprehensive Call Reports underlying our bank estimates.

This capital extraction creates funding stress that extends beyond simple balance sheet effects. We construct implied interest rates on internal funding by dividing interest income received by parents from subsidiaries by the stock of non-equity investments, revealing the shadow cost of capital across differently-regulated entities. Appendix Table F.11 shows nonbank internal funding rates increase 0.52 percentage points per year of deregulation exposure post-2015, while bank rates show no significant change. The spread widens by 0.44 percentage points per year. Thus, capital-

depleted entities face sharply higher marginal funding costs precisely when their balance sheets are weakest.

Operational Restructuring toward Lending. Faced with reduced equity capital and higher internal funding costs, we find that nonbank subsidiaries fundamentally restructure operations toward lending. Table 12 documents that quarterly nonbank lending (aggregated to the BHC level) grows 7.20% per year of deregulation exposure, while bank lending shows no significant change at 0.09%. The large differential between nonbank and bank lending growth confirms that aggressive lending expansion occurs specifically within lightly-regulated nonbank subsidiaries. This migration of credit provision from banks to nonbanks within the same holding company parallels the broader secular decline in bank market share documented by Buchak et al. (2024), but occurs through internal organizational reallocation rather than competitive displacement across independent institutions.

The composition of this lending expansion is equally informative. The response extends beyond aggregate lending to portfolio, business-model, and organizational recomposition. At the portfolio level, nonbank subsidiaries reallocate toward consumer lending while reducing their exposure to commercial and real estate lending, as shown in Appendix Table F.12. The shift is particularly pronounced among specialized nonbank lenders, whose consumer lending increases by 7.46 percentage points per year of exposure, compared with 1.47 percentage points for nonbanks overall. At the business-model level, equity-constrained nonbanks retreat from capital-intensive activities, including trading, advisory, and venture capital, while relying increasingly on interest-generating lending; for the most affected BHCs, interest income nearly doubles, as shown in Appendix Table F.13. At the organizational level, BHCs expand nonbank lending subsidiaries while reducing high-equity-ratio insurance affiliates, as shown in Appendix Table F.14. Although the total number of nonbank lenders changes little, the number of distinct nonbank activity types increases, indicating strategic organizational recomposition rather than simple expansion, as shown in Appendix Table F.15.

Credit Quality Deterioration and Increased Fragility. The aggressive lending expansion comes at substantial cost to credit quality. Table 13 traces the deterioration from loan performance through profitability to insolvency risk. Columns 1–3 document loan performance: loans 90+ days past due rise by 2.66 percentage points per year of deregulation exposure, all past-due loans by 3.08 percentage points, and loss provisions as a share of loans by 9.37 percentage points, conditional on nonzero provisioning.

Columns 4 and 5 show how the deterioration in loan performance passes through to returns: ROE declines by a statistically significant 1.87 percentage points per year of exposure; the ROA

decline of 0.39 percentage points is statistically indistinguishable from zero. This asymmetry is the mechanical footprint of the capital extraction documented above. As equity is withdrawn, the equity denominator shrinks while operating performance per dollar of assets remains roughly stable, so returns to equity holders fall even absent measurable operating deterioration: thinner buffers amplify the same asset-side performance into weaker equity returns.

The combination of reduced capital, rapid lending growth, and deteriorating credit quality culminates in the fragility measures of columns 6–8. The probability of negative earnings rises 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.[24] Appendix Table F.16 shows that the underlying rise in earnings instability is concentrated in interest income: interest income volatility increases by 19.69 percentage points while non-interest income volatility is unchanged. This concentration is consistent with the reallocation toward lending, as loan portfolios carry greater earnings variability than fee-based services.[25]

These fragility measures are the empirical counterpart to the stress tests of Section 6.4. The thinly capitalized, lending-concentrated, higher-volatility nonbank that emerges after 2015 is precisely the entity whose recapitalization needs generate the tail exposure quantified there: the gains in bank capitalization following Basel III are matched by lower buffers and higher risk on the nonbank side of the same organization.

8 Robustness

This section presents additional evidence supporting our identification strategy and examines the robustness of our main findings. We provide four sets of results. First, we verify the first-stage relationship between our instrument and organizational complexity, documenting strong predictive power. Second, we present traditional two-stage least squares (2SLS) estimates as an alternative to our baseline reduced-form approach, showing larger effects, consistent with the interpretation that reduced-form estimates represent intent-to-treat effects. Third, we conduct placebo tests that randomly permute either the treatment timing or the geographic variation in our instrument, confirming that our results do not arise from spurious correlations.

First Stage Relationship. Appendix Table F.17 verifies that our instrument predicts organizational complexity.

[24] The Z-score is a standard measure of distance to default, calculated as (equity/assets + ROA) / standard deviation of ROA; the probability of default is the normal CDF of the negative Z-score.

[25] Sample sizes differ across columns by data availability: past-due measures are observed only for nonbanks with lending activity, loss provisions are conditional on nonzero provisioning, and the fragility measures require sufficient history to compute the volatility of ROA. Results are robust to estimating the profitability and fragility outcomes on the lending subsample of columns 1–2.

The dependent variable in the first stage is nonbank asset share interacted with the post-2015 indicator, capturing the presence and scale of nonbank operations in the period when capital requirements become binding. Column 1 presents the unconditional correlation: each additional year of pre-Riegle-Neal deregulation exposure increases nonbank share by 0.29 percentage points post-2015. Column 2 adds quarter-year fixed effects to control for aggregate time trends, increasing the coefficient to 0.51 percentage points. Column 3 adds bank fixed effects to absorb time-invariant heterogeneity across banks, with the coefficient remaining at 0.53 percentage points. Column 4 adds our full set of differential trends controls, yielding a coefficient of 0.35 percentage points. The first-stage F-statistics exceed conventional thresholds for weak instrument concerns.[26]

Two-Stage Least Squares Estimates. Appendix Table F.18 reports conventional 2SLS estimates as a complement to our baseline reduced-form specification. We instrument the endogenous regressor (nonbank asset share interacted with post-2015) using the interaction of years since deregulation interacted with post-2015.

Column 1 presents the unconditional 2SLS estimate: a one-percentage-point increase in nonbank share raises bank excess capital by 9.41 percentage points. Columns 2–4 introduce progressively richer sets of fixed effects and controls. Across all specifications, the estimates remain statistically significant and economically large.

Our most conservative 2SLS estimates are approximately two to three times larger than the corresponding reduced-form estimates in the baseline specifications, consistent with the reduced-form coefficients capturing intent-to-treat effects.[27]

Placebo Tests. Appendix Figures E.8 and E.9 present permutation-based placebo tests that validate our identification strategy. Appendix Figure E.8 randomly reassigns the deregulation instrument 1,000 times while maintaining the true post-2015 treatment period. If our results reflect spurious geographic correlations rather than the effect of organizational complexity, we would observe similar effects under random instrument assignment. Instead, the placebo distribution is tightly centered at zero, and none of the 1,000 permutations yields coefficients exceeding our true estimate of 0.74. The permutation p-value of 0.000 strongly rejects that our results arise by chance from random geographic variation.

[26] The Kleibergen-Paap Wald F-statistic ranges from 9.8 to 19.6 across specifications, near or above the rule-of-thumb threshold of 10.The Cragg-Donald Wald F-statistic exceeds 500 in all specifications, indicating very strong instruments. These statistics confirm that deregulation timing provides powerful variation in organizational complexity, validating the relevance condition for our instrumental variables approach.

[27] This difference is expected when moving from intent-to-treat to treatment-on-the-treated effects. The reduced form captures the average impact across all banks exposed to early deregulation, regardless of whether their BHCs ultimately develop complex organizational structures. The 2SLS estimates rescale by the first stage, recovering the effect for banks whose BHCs expand into nonbank activities.

Appendix Figure E.9 randomly reassigns the post-2015 treatment timing 1,000 times, while preserving each BHC's actual years-to-deregulation. If our results reflect pre-existing differential trends between early and late deregulators rather than a response to Basel III, we would observe similar effects when falsely assigning treatment to other years. The placebo distribution is centered at zero, and none of the 1,000 permutations yields coefficients approaching our true estimate. The permutation p-value of 0.000 confirms that the effect operates specifically through the 2015 regulatory change, not through spurious time-series patterns or pre-trends.

Together, these placebo tests provide strong evidence against alternative explanations based on omitted geographic factors or differential trends. The fact that random permutations of either the instrument or the timing produce null results, while the true specification produces large and significant effects, indicates that both dimensions of variation, cross-sectional differences in deregulation timing and the 2015 Basel III implementation, are essential to our identification.

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, parent firms optimally reallocate equity toward the regulated entities, reducing the measured risk of the bank. However, the organizational linkages that facilitate this reallocation including intercompany equity transfers, committed funding arrangements, and implicit parental support, also transmit losses from the nonbank back to the regulated bank. As a result, the reduction in measured bank risk overstates the reduction in the economic risk borne by the banking organization: risk is displaced to the affiliated nonbank but remains within the consolidated organization through internal financial linkages. Because these transmission channels operate within the firm, they are not readily captured by regulatory frameworks that evaluate regulated entities in isolation or rely primarily on subsidiary-level capital ratios.

These changes have real economic consequences. Stricter bank capital regulation reshapes the consolidated organization beyond the bank: nonbank balance sheets become thinner, internal funding becomes more expensive, and portfolio choices shift toward higher-yield, riskier activities. Credit quality and profitability deteriorate alongside these shifts. Capital regulation that targets only the bank, therefore, induces real changes in risk-taking and solvency at affiliated nonbanks, not merely accounting movements of capital across affiliates. Stress tests calibrated to 2008-scale shocks show that for the typical BHC, most of the bank capital gain survives even if nonbank distress transmits fully back to the bank, though full transmission erodes nearly two-fifths of it. For tail-risk institutions, transmission of one-half erodes 72% of the gain, and transmission above

roughly seven-tenths reverses it: the apparent improvement in bank safety is substantially overstated once implicit exposure to nonbank subsidiaries is accounted for.

The regulatory architecture creates an inconsistency. Entity-level capital requirements successfully improve bank subsidiary safety, but simultaneously incentivize the migration of traditional lending activities to nonbank affiliates within the same holding company. These nonbank lenders now originate and hold consumer credit, performing bank functions, yet operate without deposit insurance, Federal Reserve discount window access, or the comprehensive prudential oversight applied to depository institutions. The resulting migration of lending activity shifts credit provision toward entities with lower capital buffers and fewer protections against distress. This shift is particularly consequential because it is concentrated in consumer lending, where disruptions have the most direct effects on households and generate the strongest pressure for public intervention. As a result, losses that originate in lightly regulated nonbank subsidiaries may ultimately be borne by the parent organization's capital buffer and, in severe cases, create demands for public support. The migration of consumer lending from banks to nonbanks within the same holding company therefore does not simply relocate risk across legal entities; it changes where losses are absorbed and who ultimately bears them.

The broader implication is that consolidated capital requirements alone are unlikely to eliminate regulatory arbitrage when regulatory stringency differs across subsidiaries within the same holding company. Even well-capitalized groups will optimally concentrate where constraints bind most tightly, leaving lightly regulated affiliates to absorb risk. Preventing offsetting vulnerabilities elsewhere in the organization may require extending prudential standards to material nonbank subsidiaries, constraining equity extraction, and monitoring internal capital and funding flows. More generally, effective financial regulation must treat organizational structure as a fundamental determinant of regulatory incidence and systemic risk. The narrative of credit migrating from banks to nonbanks understates that much of the migration occurs within the very holding companies that consolidated supervision was designed to oversee.

While our analysis focuses on banking, the mechanism is general. Any multi-entity organization facing asymmetric regulation, taxation, or supervision across affiliates has reason to use internal capital markets to relocate activity toward less constrained units. Banking provides an unusually clean setting because subsidiary-level financials are disclosed and regulatory wedges are sharp, but the lesson that organizational structure shapes the incidence of policy applies wherever firm boundaries cross regulatory boundaries.

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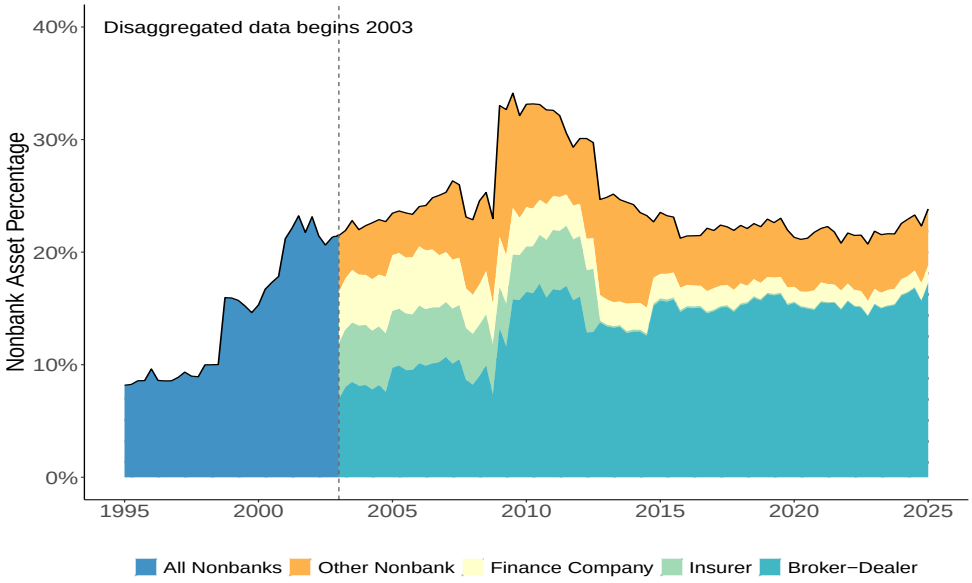
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Figure 1: Nonbank Activity Within and Across the BHC Sector

(a) Nonbank Subsidiaries as a Share of BHC Assets

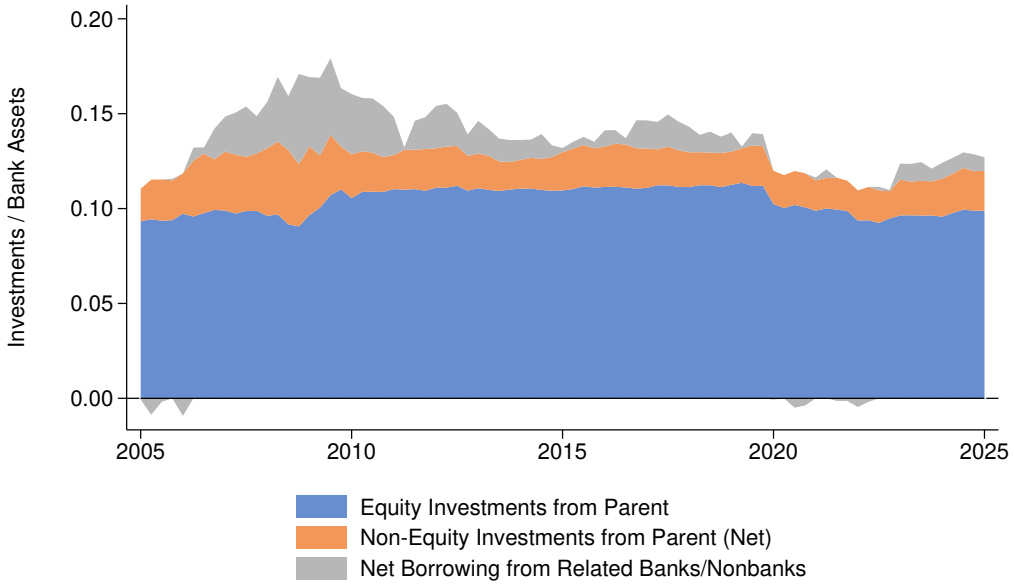


(b) Nonbank Subsidiaries of BHCs as a Share of Aggregate U.S. Nonbank Financial Assets



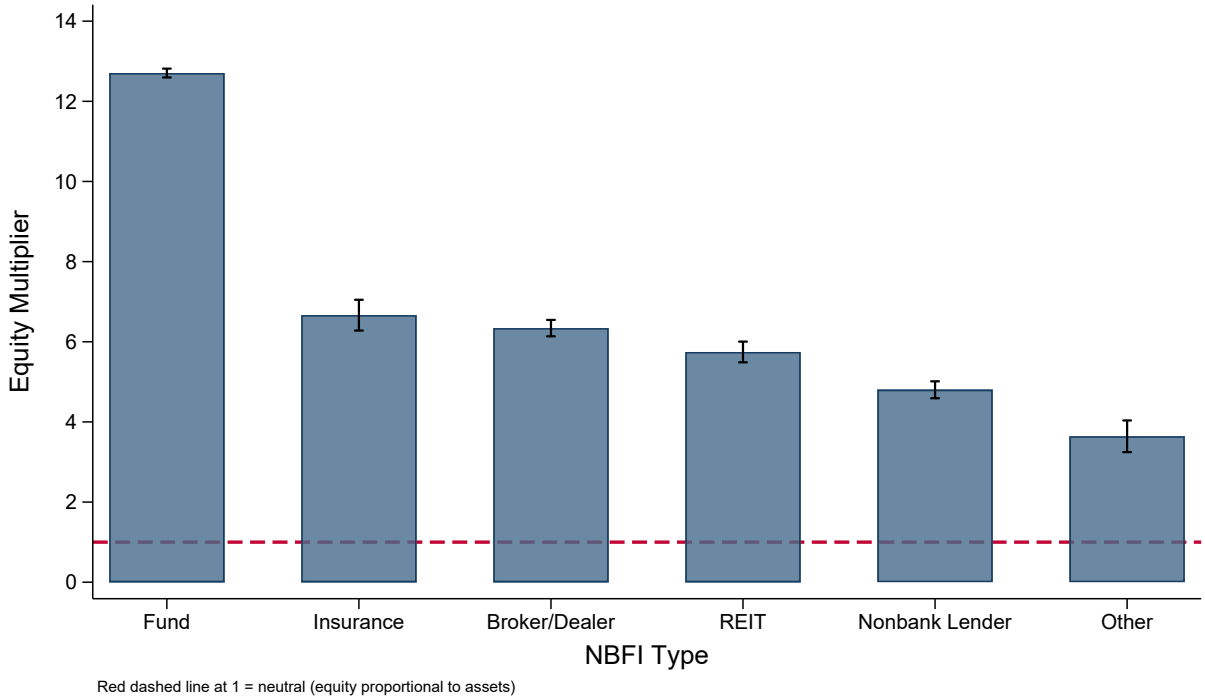
Notes: Panel (a) shows the size of nonbank business lines as a share of consolidated BHC assets from 1995 to 2025. The black line plots the ratio of total nonbank assets to BHC assets, with stacked colored areas decomposing this aggregate into broker-dealers, insurers, finance companies, and other nonbank 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



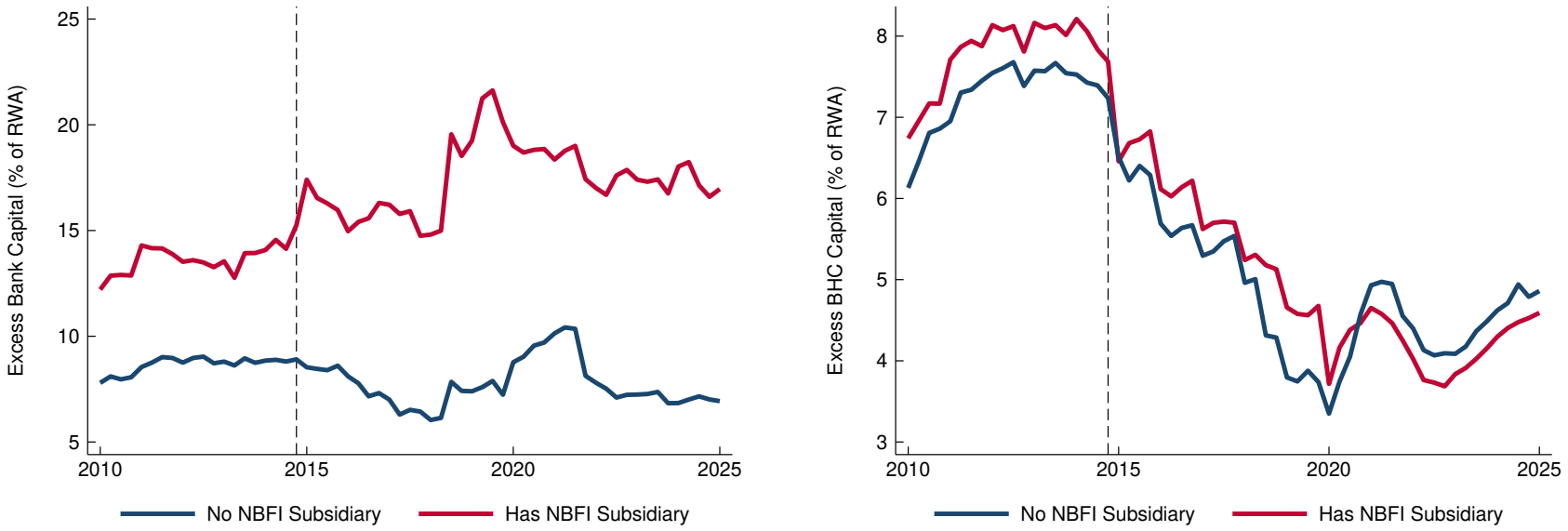
Notes: This figure shows parent BHC equity and nonequity investments in bank subsidiaries, as well as net intra-company borrowing, scaled by bank subsidiary assets. Equity investments in bank subsidiaries are defined as the sum of BHC equity investments in common stock, goodwill, and other intangibles. 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 with 95% confidence intervals. Equity multiplier is constructed as the ratio of subsidiary equity share to subsidiary asset share within BHC, measuring capital intensity. Error bars show 95% confidence intervals. Appendix Table 3 provides detailed distributional statistics by type. Source: Authors' calculations using the FR Y-11.

Figure 4: Excess Capital: Banks vs BHCs

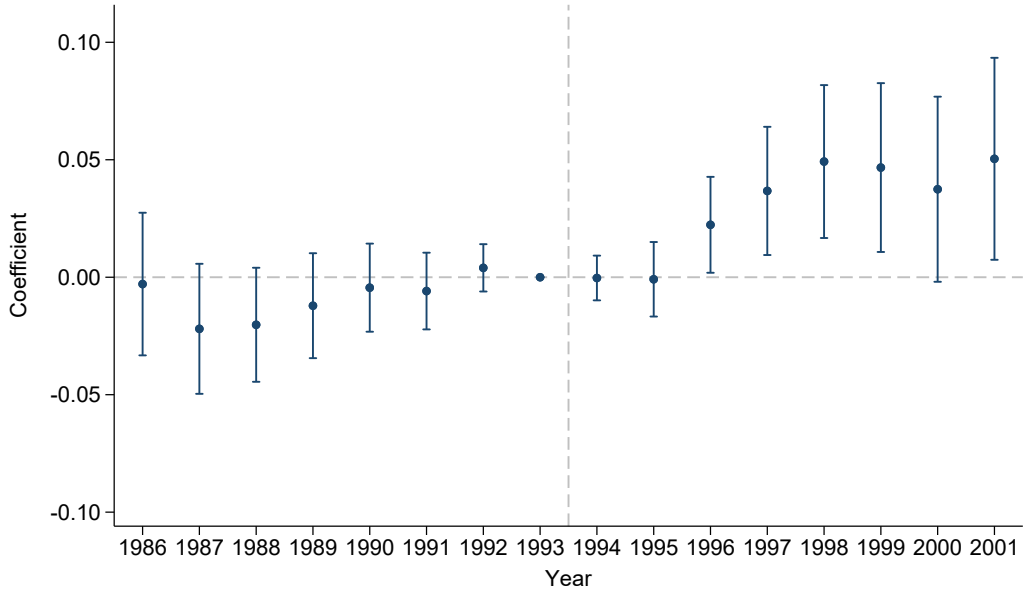


(a) Bank Excess Capital

(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 event-study estimates for excess BHC capital over the same period. Source: Authors' calculations using FR Y-9C, FR Y-9LP, and Call Reports.

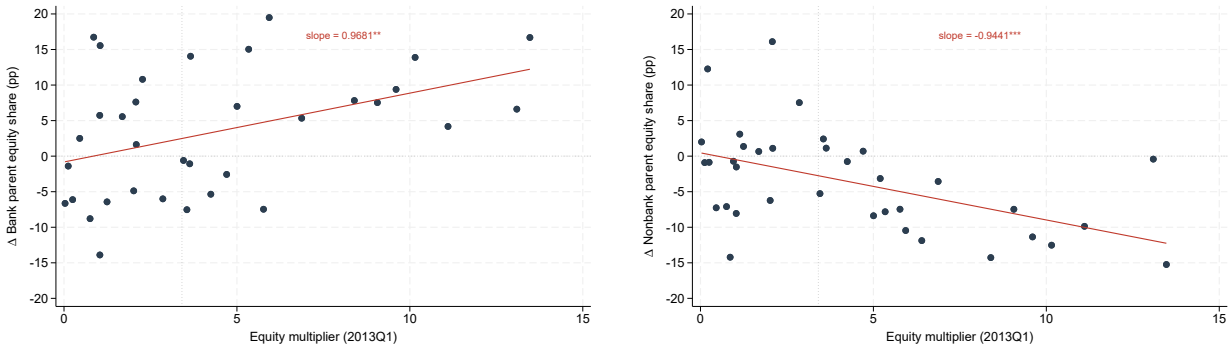
Figure 5: Deregulation Timing as an Instrument for Organizational Complexity



(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

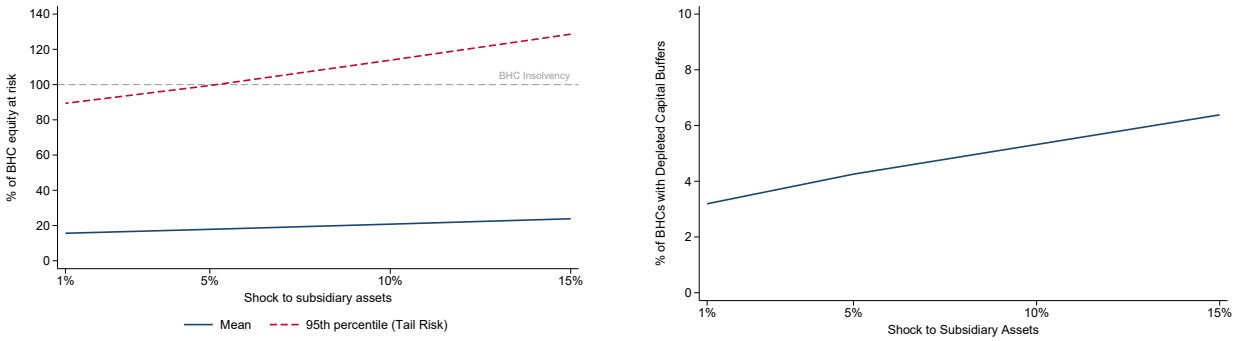


(a) Parent equity investment in banks

(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. The vertical dotted line marks the median equity multiplier across BHCs. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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

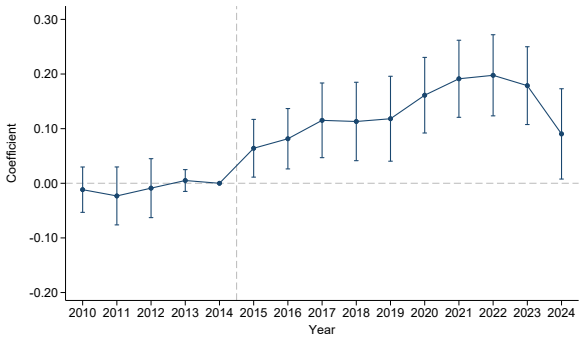


(a) Recapitalization Needs by Shock Severity

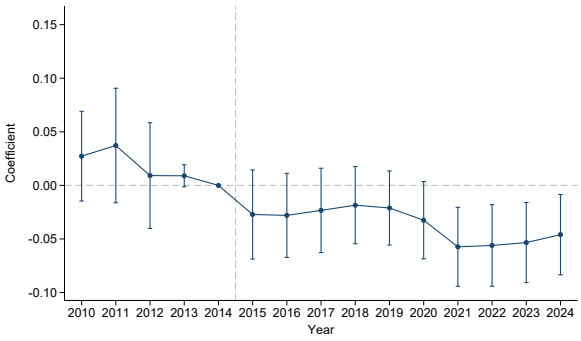
(b) Capital Buffer Depletion

Notes: The figure presents the nonbank stress test results. Panel (a) shows percentage of BHC excess capital required for recapitalization. Solid line: mean across BHCs. Dashed line: 95th percentile (tail risk). Horizontal dashed line at 100% indicates potential parent insolvency. 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.

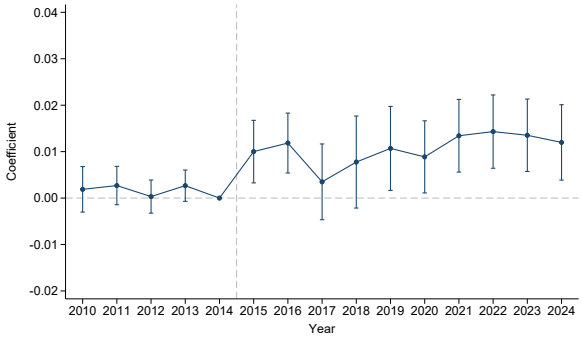
Figure 8: Nonbank Event Study around Basel III Implementation



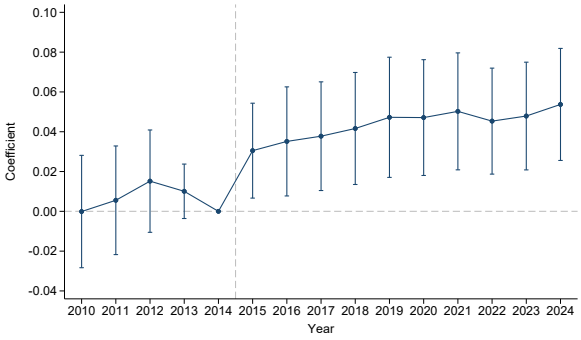
(a) Net Balance to Parent/Subs



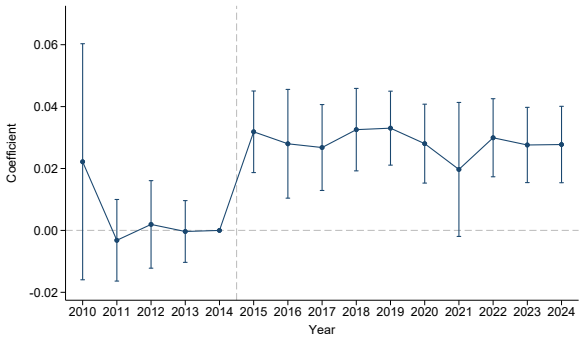
(b) Equity/Assets



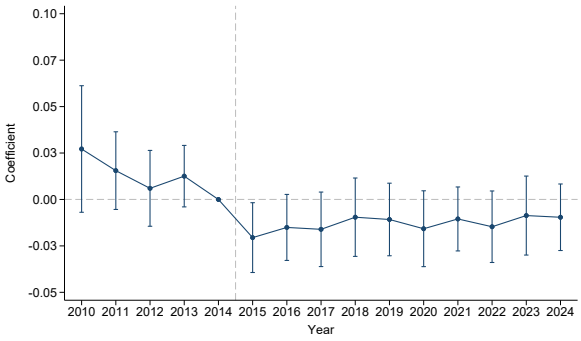
(c) Dividends



(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 equity-to-assets ratios, Panel (b) shows dividends/equity, Panel (c) shows net balances to parent/other subsidiaries, 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, included as a placebo measure of consolidated invested 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 from NBFI_Equity (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 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 Capital Extraction and Funding Constraints

	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. Panel A shows balance sheet changes. Dependent variable in column 1 is equity divided by lagged assets. Column 2 is balances due from subsidiaries (amounts nonbanks owe to parents/affiliates) divided by lagged assets. Column 3 is balances due to subsidiaries (amounts parents owe to 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 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

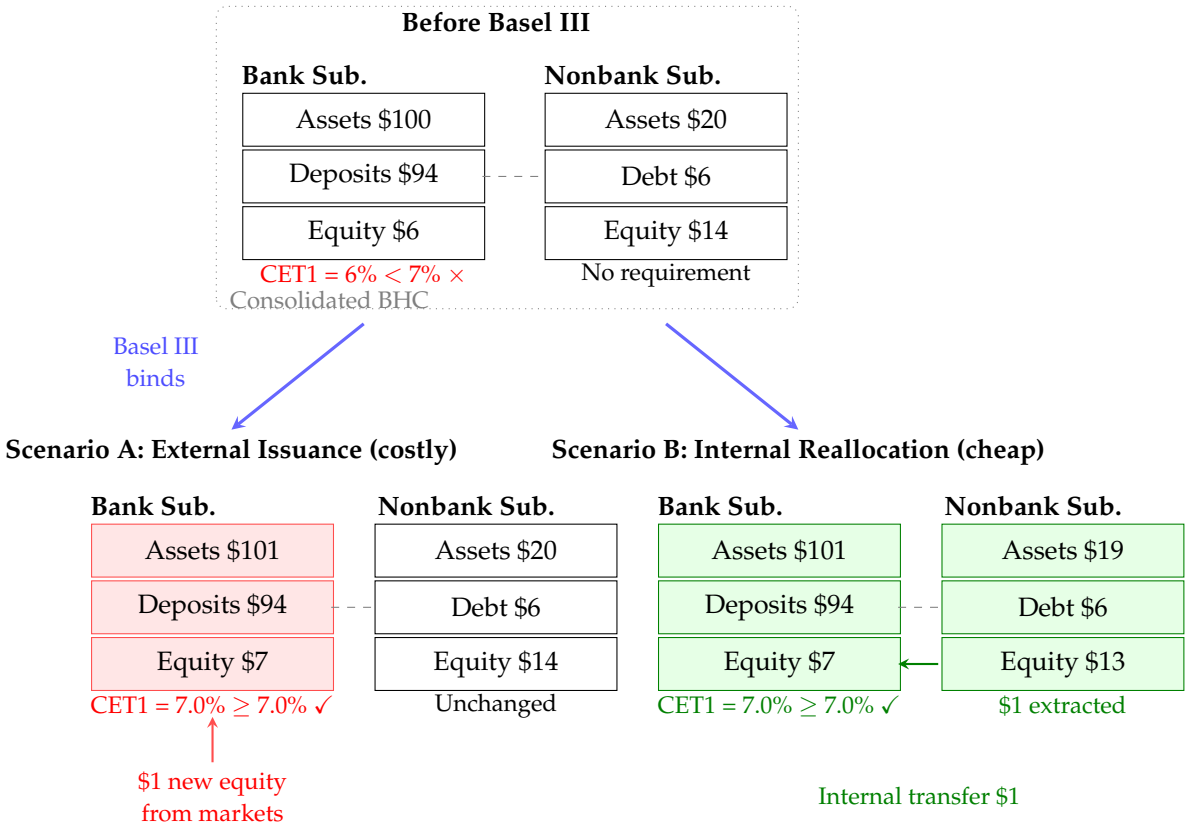


Figure A.1: Internal Capital Reallocation in Response to Basel III. The top panel shows a stylized BHC before Basel III. The bank subsidiary holds $6 in equity against $100 in assets (CET1 = 6%), which falls short of the new 7% minimum (inclusive of the Capital Conservation Buffer) introduced by Basel 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; 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.

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 $R_i(E_i, A_i)$ 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.[28]

Shocks and Failure. In period 2, each subsidiary faces an idiosyncratic shock $\theta_i \sim F_i(\theta)$ with support $[-\bar{\theta}_i, 0]$. 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 further decompose $L_B = L_B^{\text{priv}} + L_B^{\text{ext}}$, 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

[28] In practice, τ is small relative to external equity costs. Our calibration suggests $\tau \approx 0$ to 0.05, while external equity costs exceed 5% of capital raised.

L_N is internalized in full. The BHC's objective uses L_B^{priv} throughout; the social planner replaces L_B^{priv} with $L_B = L_B^{\text{priv}} + L_B^{\text{ext}}$. When the distinction is immaterial (e.g., in the private FOCs and in Proposition B.1), we suppress the superscript and write L_B.

We assume shocks are independent across subsidiaries: $\theta_B \perp \theta_N$. Under independence, the joint probability $\Pr(\theta_N < -E_N \text{ and } \theta_B > -E_B) = F_N(-E_N) \cdot [1 - F_B(-E_B)]$, which simplifies the externality expressions below.

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)

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

$$\Pr(\text{Bank Failure}) = F_B(-E_B) + \lambda \cdot \Pr(\theta_N < -E_N \text{ and } \theta_B > -E_B) \tag{B.4}$$

The probability of nonbank failure is:

$$\Pr(\text{Nonbank Failure}) = F_N(-E_N). \tag{B.5}$$

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:

$$\max_{E_B, E_N, K} \quad \mathbb{E}[R_B(E_B, A_B) + R_N(E_N, A_N)] - \Pr(\text{Failure})_B \cdot L_B - \Pr(\text{Failure})_N \cdot L_N - c(K) - \tau \cdot |E_B - E_B^0| \tag{B.6}$$

subject to:

$$E_B \geq \kappa_B \cdot A_B \qquad \text{(regulatory constraint)} \tag{B.7}$$

$$E_B + E_N \leq E^0 + K \qquad \text{(resource constraint)} \tag{B.8}$$

$$E_B, E_N, K \geq 0 \qquad \text{(non-negativity)} \tag{B.9}$$

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; equity injections above this baseline incur the transfer cost τ per dollar. Internal equity transfers from nonbank to bank incur a transaction cost $\tau \geq 0$ per dollar transferred, reflecting administrative frictions and potential tax considerations associated with intercompany transfers.

B.3 Optimal Capital Allocation

We characterize the solution through three cases.

Case 1: Slack Regulation. When $\kappa_B \cdot A_B < E_B^*$ (where E_B^* is 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:

$$R_B'(E_B) + L_B \cdot f_B(-E_B) = R_N'(E_N) + L_N \cdot f_N(-E_N) \tag{B.10}$$

This represents standard portfolio allocation with no regulatory distortion.

Case 2: External Financing. When regulation binds ($\kappa_B \cdot A_B > E_B^*$) 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 3.2% of total BHC assets under this scenario.

Case 3: Internal Reallocation. When external equity is prohibitively costly relative to internal transfers ($c'(0) > \tau$), the BHC meets the regulatory requirement through internal reallocation: $K^* = 0$ and $E_B = \kappa_B \cdot A_B$.

Proposition B.1 (Internal Reallocation Equilibrium)**.** *When external equity is costly ($c'(0) > \tau$) and regulation binds ($\kappa_B \cdot A_B > E_B^{unc}$), where E_B^{unc} denotes the unconstrained optimal bank equity, the BHC optimally chooses:*

$$E_B^* = \kappa_B \cdot A_B \tag{B.11}$$

$$E_N^* = E^0 - \kappa_B \cdot A_B \tag{B.12}$$

$$K^* = 0 \tag{B.13}$$

with comparative statics:

$$\frac{\partial E_B^*}{\partial \kappa_B} = A_B > 0 \qquad \textit{(bank equity increases with requirements)} \tag{B.14}$$

$$\frac{\partial E_N^*}{\partial \kappa_B} = -A_B < 0 \qquad \textit{(nonbank equity decreases one-for-one)} \tag{B.15}$$

$$\frac{\partial (E_B^* + E_N^*)}{\partial \kappa_B} = 0 \qquad \textit{(consolidated BHC equity unchanged)} \tag{B.16}$$

Proof of Proposition B.1. Form the Lagrangian, incorporating the contagion term from equation (B.4):

$$\begin{aligned}\mathcal{L} = {} & \mathbb{E}[R_B(E_B, A_B) + R_N(E_N, A_N)] - [F_B(-E_B) + \lambda \cdot \Pr(\theta_N < -E_N,\, \theta_B > -E_B)] \cdot L_B \\ & - F_N(-E_N) \cdot L_N - c(K) - \tau \cdot (E_B - E_B^0) + \mu \cdot (E_B - \kappa_B \cdot A_B) + \nu \cdot (E^0 + K - E_B - E_N)\end{aligned}$$

where $\mu \geq 0$ is the multiplier on the regulatory constraint (B.7) and $\nu \geq 0$ is the multiplier on the resource constraint (B.8). The term $\tau \cdot (E_B - E_B^0)$ captures internal reallocation costs, which are positive when regulation binds and equity flows from nonbank to bank ($E_B > E_B^0$). The absolute value $|E_B - E_B^0|$ in (B.6) simplifies to $(E_B - E_B^0)$ because, as established in Step 2 below, a binding regulatory tightening induces $E_B^* > E_B^0$ at the private optimum.

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:

$$\frac{\partial \mathcal{L}}{\partial E_B} = R_B'(E_B) + L_B \cdot f_B(-E_B) - \lambda \cdot \frac{\partial \Pr(\theta_N < -E_N,\, \theta_B > -E_B)}{\partial E_B} \cdot L_B - \tau + \mu - \nu = 0 \tag{B.17}$$

$$\frac{\partial \mathcal{L}}{\partial E_N} = R_N'(E_N) + L_N \cdot f_N(-E_N) - \lambda \cdot \frac{\partial \Pr(\theta_N < -E_N,\, \theta_B > -E_B)}{\partial E_N} \cdot L_B - \nu = 0 \tag{B.18}$$

$$\frac{\partial \mathcal{L}}{\partial K} = -c'(K) + \nu = 0 \tag{B.19}$$

Let $\Phi(E_B, E_N) \equiv \Pr(\theta_N < -E_N,\, \theta_B > -E_B)$ denote the joint probability of nonbank distress and bank survival. Note that $\partial\Phi/\partial E_B > 0$: higher bank equity expands the set of states in which the bank survives its own shock, increasing the probability that nonbank distress coincides with bank survival and thus raises exposure to contagion.

Step 1: Show $K^* = 0$. The corner $K^* = 0$ requires that the marginal cost of external equity at zero exceeds the BHC's shadow value of internal funds, $c'(0) \geq \nu$. The simpler condition $c'(0) > \tau$ stated in the proposition is sufficient under standard restrictions, as we now make precise. From equation (B.19), any interior solution with $K^* > 0$ requires $\nu = c'(K^*)$. Since c' is increasing, $K^* > 0$ implies $\nu > c'(0)$.

But from equation (B.18), the shadow value of funds is:

$$\nu = R_N'(E_N) + L_N \cdot f_N(-E_N) - \lambda \cdot \frac{\partial \Phi}{\partial E_N} \cdot L_B \tag{B.20}$$

For $K^* > 0$ to be optimal, we would need $\nu > c'(0)$—that is, the marginal benefit of additional funds (captured by ν) must exceed the marginal cost of external equity. When $c'(0)$ is sufficiently large relative to the marginal returns and risk reduction benefits in equation (B.20), this condition fails and the BHC optimally chooses $K^* = 0$. With $K^* = 0$, the complementary slackness condition holds with inequality: $c'(0) \geq \nu$. The condition $c'(0) > \tau$ in Proposition 2.1 is sufficient under the regularity assumption that, at the binding constraint $E_B^* = \kappa_B A_B$, the implied $E_N^* = E^0 - \kappa_B A_B$ satisfies $\nu(E_N^*) \leq \tau$; this holds whenever marginal returns and contagion-adjusted failure-cost reductions at the nonbank are small relative to τ, which is the empirically relevant region under our calibration.

Step 2: Show the regulatory constraint binds. Suppose the constraint does not bind ($\mu = 0$). From (B.17) and (B.18):

$$R_B'(E_B) + L_B \cdot f_B(-E_B) - \lambda \cdot \frac{\partial \Phi}{\partial E_B} \cdot L_B - \tau = R_N'(E_N) + L_N \cdot f_N(-E_N) - \lambda \cdot \frac{\partial \Phi}{\partial E_N} \cdot L_B \tag{B.21}$$

This is the unconstrained optimum E_B^*. Under concavity of R_i and reasonable regularity on f_i, the system has a unique interior solution E_B^{unc}. When regulation binds ($\kappa_B \cdot A_B > E_B^*$), the constraint must bind at the optimum, so $E_B = \kappa_B \cdot A_B$ and $\mu > 0$. Throughout we maintain the empirically relevant restriction $E^0 > \kappa_B A_B$, which guarantees feasibility ($E_N^* \geq 0$).

Step 3: Solve for E_N^*. With $K^* = 0$ and $E_B^* = \kappa_B \cdot A_B$, the resource constraint (B.8) gives:

$$E_N^* = E^0 - E_B^* = E^0 - \kappa_B \cdot A_B \tag{B.22}$$

Step 4: Comparative statics. Differentiating (B.11)–(B.12) with respect to κ_B:

$$\frac{\partial E_B^*}{\partial \kappa_B} = A_B > 0 \tag{B.23}$$

$$\frac{\partial E_N^*}{\partial \kappa_B} = -A_B < 0 \tag{B.24}$$

$$\frac{\partial (E_B^* + E_N^*)}{\partial \kappa_B} = A_B - A_B = 0 \tag{B.25}$$

These hold for any $A_B > 0$. □

These predictions match our empirical findings exactly: 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. Panel (a) shows that as bank capital requirements increase from 6% to 16%, bank capital ratios (blue line) rise from 6% to 17%, while nonbank capital ratios (red line) decline from 33% to 8%, the "waterbed effect" where regulatory pressure on one subsidiary causes risk to migrate to another. Appendix Figure B.1 presents the model's counterfactual prediction that external equity financing would increase only modestly with tighter regulation (from approximately 1.3% to 3.2% of BHC assets), 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 (avoiding costly external equity), it may be socially suboptimal due to a contagion externality. Let $\Delta E \equiv \kappa_B \cdot A_B - E_B^0 > 0$ denote the required equity transfer from nonbank to bank—the gap between the regulatory requirement and the bank's initial equity.

Private Optimum. From the Case 3 analysis, the BHC chooses internal reallocation over external equity when the marginal cost of external financing exceeds the transaction cost of internal transfer:

$$c'(0) > \tau \tag{B.26}$$

Social Optimum. A regulator additionally accounts for the systemic costs of contagion. Internal reallocation reduces E_N by ΔE, increasing the probability of nonbank failure and, through contagion, the probability of bank failure. Internal reallocation is efficient only if the saved external financing costs exceed the increase in expected systemic losses. Holding bank capital at the regulatory minimum, internal reallocation affects the externalities through changes in nonbank risk and contagion, while the direct stability benefits of higher bank equity are already embedded in the binding regulatory constraint.

$$c'(0) \cdot \Delta E > \tau \cdot \Delta E + \Delta L_N + \lambda \cdot \Delta L_B \tag{B.27}$$

where:

$$\Delta L_N \equiv L_N \cdot [F_N(-E_N + \Delta E) - F_N(-E_N)] \geq 0 \quad \text{(expected nonbank failure costs)} \tag{B.28}$$

$$\Delta L_B \equiv L_B \cdot [F_N(-E_N + \Delta E) - F_N(-E_N)] \cdot \Pr(\theta_B > -E_B) \geq 0 \quad \text{(expected bank failure costs via contagion)} \tag{B.29}$$

ΔL_N captures the direct increase in expected nonbank failure costs from reducing nonbank equity by ΔE. ΔL_B captures the increase in expected bank failure costs through contagion: the additional probability of nonbank failure $[F_N(-E_N + \Delta E) - F_N(-E_N)]$ multiplied by the probability the bank would otherwise survive $\Pr(\theta_B > -E_B)$, scaled by bank failure costs L_B.

Proposition B.2 (Contagion Externality)**.** *The BHC internalizes contagion at the private failure cost L_B^{priv} but does not internalize the externality component L_B^{ext}. The resulting wedge between private and social incentives is increasing in λ and in L_B^{ext}. There exists a critical contagion threshold:*

$$\lambda^* = \frac{(c'(0) - \tau) \cdot \Delta E - \Delta L_N}{L_B^{ext} \cdot [F_N(-E_N + \Delta E) - F_N(-E_N)] \cdot \Pr(\theta_B > -E_B)} \tag{B.30}$$

such that internal reallocation is:

- ***Privately and Socially Aligned*** *if $\lambda < \lambda^*$ (ring-fencing effective, contagion costs small relative to saved financing costs)*
- ***Socially Costly*** *if $\lambda > \lambda^*$ (contagion costs exceed saved external equity costs)*

If the numerator of (B.30) is non-positive, i.e., if $\Delta L_N \geq (c'(0) - \tau)\Delta E$, then $\lambda^* \leq 0$ and internal reallocation is socially costly for every $\lambda \in [0, 1]$, including the ring-fencing baseline $\lambda = 0$. At our calibration ($c'(0) = 0.07$, $\tau = 0.02$, $\Delta E \approx 2.5$, $L_N = 10$), the numerator is strictly positive, so the threshold is well-defined; we report a numerical check in the Calibration subsection below.

Proof of Proposition B.2. The social condition (B.27) requires saved financing costs $(c'(0) - \tau) \cdot \Delta E$ to exceed increased systemic risk costs $\Delta L_N + \lambda \cdot \Delta L_B^{\text{ext}}$, where ΔL_B^{ext} is the externality component the planner internalizes but the BHC does not. Rearranging to isolate λ, internal reallocation is efficient if and only if:

$$\lambda < \frac{(c'(0) - \tau) \cdot \Delta E - \Delta L_N}{\Delta L_B^{\text{ext}}} \tag{B.31}$$

Substituting the definition of ΔL_B from (B.29), with L_B replaced by the externality component L_B^{ext} yields equation (B.30). The BHC's private condition (B.26) does not internalize $\lambda \cdot \Delta L_B^{\text{ext}}$ at all; it internalizes ΔL_N and $\lambda \cdot \Delta L_B^{\text{priv}}$ in full. The wedge between private and social optima is therefore $\lambda \cdot \Delta L_B^{\text{ext}}$, scaling with both contagion intensity λ and the externality component L_B^{ext}.

□

Interpretation. When ring-fencing is effective (λ small), internal reallocation is both privately and socially optimal. BHCs meet regulatory requirements without incurring costly external financing, 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 total BHC equity 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 total equity to restore nonbank solvency, while the 95th percentile BHC requires 99.45% of total equity. 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.6a 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, raising welfare by approximately 4% of assets. The BHC saves external issuance costs and no externality offsets the saving. The net benefit declines linearly in λ, crosses zero at $\lambda^* \approx 0.74$, and becomes increasingly negative thereafter, reaching approximately -2% of assets at complete contagion ($\lambda = 1$). 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 welfare consequences of reallocation turn 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.6b explores how λ^* varies with the ratio L_B/L_N. When bank failures are only twice as costly as nonbank failures ($L_B/L_N = 2$), $\lambda^* \approx 0.2$, and reallocation becomes socially costly even at low 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:

$$\mathcal{S} \equiv F_B(-E_B) \cdot L_B + F_N(-E_N) \cdot L_N + \lambda \cdot F_N(-E_N) \cdot [1 - F_B(-E_B)] \cdot L_B \tag{B.32}$$

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):

$$\frac{\partial \mathcal{S}}{\partial \kappa_B} = A_B \Bigg[\underbrace{-f_B \cdot L_B(1 - \lambda F_N)}_{<0 \text{ (banks safer)}} + \underbrace{f_N \cdot [L_N + \lambda \cdot L_B(1 - F_B)] + \lambda \cdot F_N \cdot f_B \cdot L_B}_{>0 \text{ (nonbank risk, contagion, exposure)}} \Bigg] \tag{B.33}$$

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.

Heterogeneity in External Financing Costs. The condition $c'(0) > \tau$ determines whether a BHC operates in Case 3 (internal reallocation) or Case 2 (external financing). BHCs with higher external financing costs are more likely to satisfy this condition, and therefore more likely to rely on internal reallocation rather than raising external equity. Appendix Figure B.4 illustrates this mechanism by varying the marginal cost of external equity $c'(0)$ from 0% to 20%. When external equity is cheap ($c'(0) < 5\%$), BHCs raise approximately 1.80% of assets externally and the nonbank capital ratio falls by 7.01 percentage points. As external costs rise to 15–20%, external issuance falls to 1.69% of assets and the nonbank capital ratio decline increases to 7.05 percentage points.

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 $c'(0) = 0.07 > \tau = 0.02$ confirms that Case 3 (internal reallocation) applies at baseline.

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 welfare gap in Figure B.6a 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.6b shows that the externality threshold λ^* is robust 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.6) 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 calibration ($E^0 = 0.11 \cdot 130 = 14.3$, $A_B = 100$, $A_N = 30$), this yields $E_B^0 = 11$. The post-Basel binding capital $\kappa_{\text{high}} \cdot A_B = 10.5$ falls slightly

below this baseline; the transfer cost activates for tighter requirements ($\kappa_B > 0.11$), which is the empirically relevant region for 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; sensitivity in Appendix Figure B.6b
$\bar{\theta}_N$	Maximum nonbank shock magnitude	15	Assumed; sensitivity in Appendix Figure B.6b
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 $c'(0) = 0.07 > \tau = 0.02$ confirms that Case 3 (internal reallocation) applies at baseline. Appendix Figure B.6b reports sensitivity of the externality threshold λ^* to L_B/L_N and shock parameters.

B.7 Model Figures

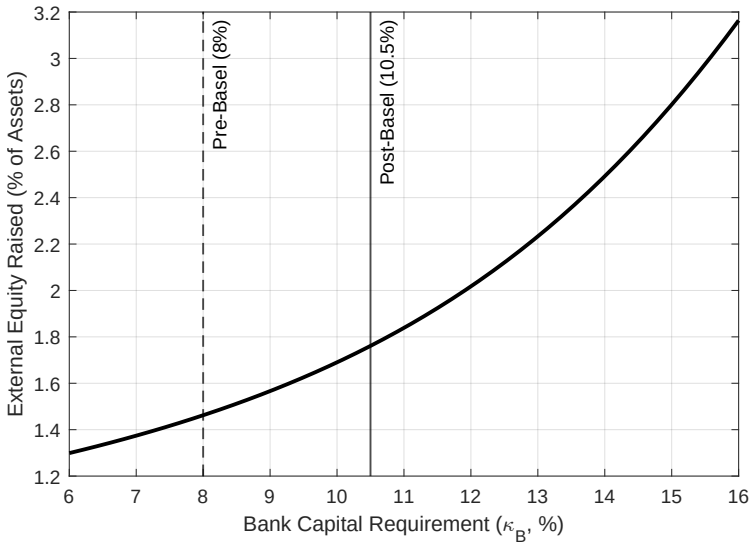


Figure B.1: External Equity Counterfactual

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 financing cost avoided through internal capital markets.

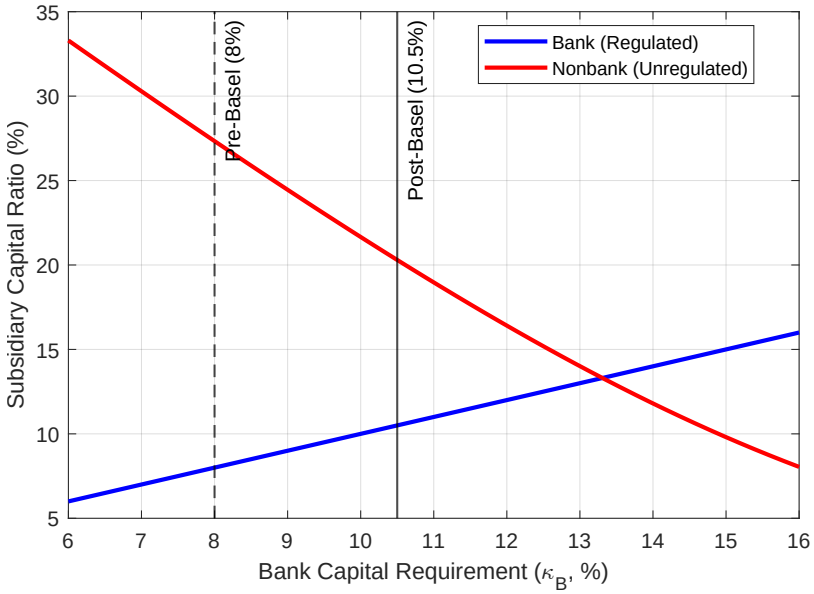


Figure B.2: The "Waterbed Effect" of Entity-Level Regulation

Notes: The figure compares the subsidiary capital ratio for bank and nonbank subsidiaries as a function of the bank capital requirement.

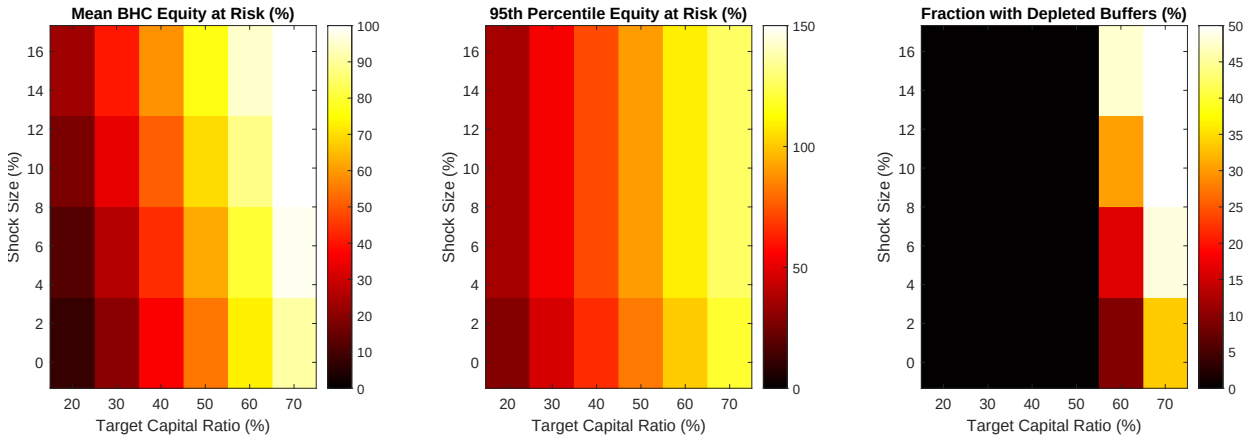


Figure B.3: Stress Test: BHC Equity at Risk

Notes: The figure presents stress test results showing BHC equity at risk under various shock scenarios. The three heatmaps display (left to right): mean BHC equity needed to recapitalize nonbanks as percentage of total BHC equity, 95th percentile (tail risk), and fraction of BHCs with completely depleted capital buffers. Colors range from dark red (low risk) to bright yellow (high risk).

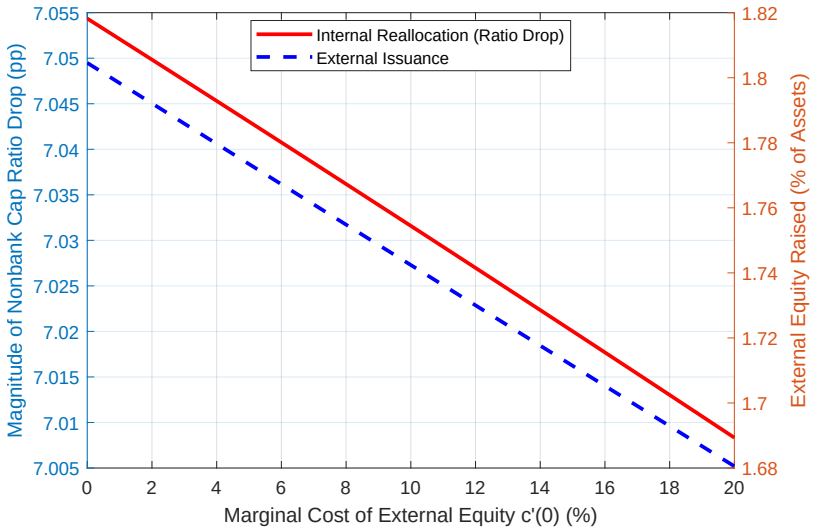
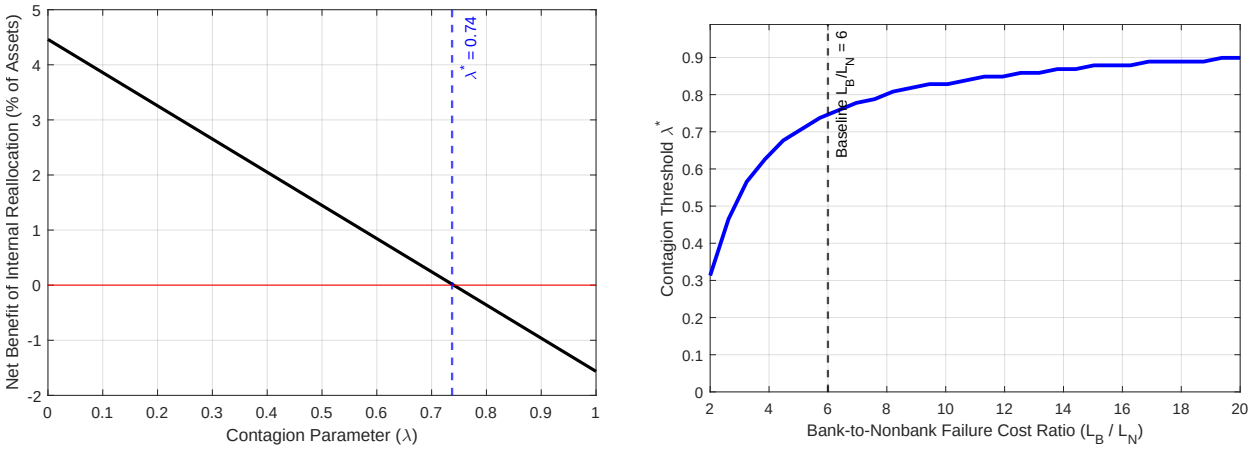


Figure B.4: Heterogeneity by External Financing Costs

Figure B.5: Internal Reallocation: Mechanism and Systemic Implications

Notes: The figure shows how the internal reallocation mechanism varies with external financing costs. The red line (left axis) shows the magnitude of nonbank equity extraction, while the blue dashed line (right axis) shows external equity issuance.



(a) Contagion Externality

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

Figure B.6: Systemic Implications Analysis and Model Calibration

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 saved financing costs exceed expected 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).

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).

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.[29]

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

[29] 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[30] 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.

[30] 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

D.1 External Evidence

Historical episodes. Several well-documented cases illustrate how distress at non-depository affiliates can deplete parent capital and indirectly weaken the affiliated bank. In 2007–2008, Citigroup absorbed approximately $49 billion of structured investment vehicle assets back onto its consolidated balance sheet, 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 its affiliated hedge funds when they collapsed, with parent funding pressures culminating in the firm's 2008 failure. Wachovia's 2006 acquisition of Golden West Financial, a nonbank thrift specializing in option-ARM mortgages, generated severe consolidated losses in 2007–2008 that depleted parent capital and contributed to Wachovia's near-failure and emergency acquisition by Wells Fargo. In each of these episodes, nominally separate non-depository entities were absorbed by the consolidated organization in distress, with the parent's capital position (and ultimately the bank subsidiary's) impaired as a result.

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.[31] 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.[32] 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 unit of observation, the source of identifying variation, and the stress windows are common across the three tests.

[31] Moody's Banks Methodology assigns a Support Indicator to subsidiary obligations; 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.

[32] 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.

Stress windows. We define stress as the union of two episodes of system-wide intermediary distress: COVID 2020Q1–Q3 and the 2023 financial conditions regime, 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 regime is not a bank-specific event but a sustained period of intermediary fragility with parallel bank and nonbank channels.

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 the binary indicator $\text{LAG1_NB}_{j(i),t}$, equal to one if BHC $j(i)$ had a nonbank-loss event in the prior quarter. The estimating equation is

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

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), 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.1 reports five specifications: NB-loss alone (column 1), bank-loss placebo (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 robust across specifications. In the horse-race column, lending growth contracts by 0.63 percentage points in the quarter following a nonbank-affiliate loss, controlling for the bank's own loss history. The clean-window restriction confirms 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.

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, 2022-only, and the 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 post-Q1 2023 distress regime alone produces a directionally consistent point estimate of 32 basis points but the cluster-robust standard errors are wide given the heterogeneity of BHC-level exposure during the regime. The union of the two stress windows recovers a 30 basis-point widening at conventional significance levels.

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 post-Q1 2023 intermediary distress regime), 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 rise to approximately 1.1 to 1.4 percent of lagged BHC equity over $t = +2$ through $t = +4t$, while parent equity investment in the bank affiliate moves in the opposite direction over the same window, with the largest negative coefficient at $t = +2t$ 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 0.65 percentage points in the following quarter, providing the precisely identified estimate of the downstream cost at the bank.

Table D.1: 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}	-0.0065***		-0.0063***		-0.0074*
	(0.0024)		(0.0024)		(0.0042)
Bank Loss_{t-1}		-0.0180***	-0.0178***		-0.0173***
		(0.0058)	(0.0058)		(0.0061)
Loss_{t-1}				-0.0056**	
				(0.0024)	
Observations	23,848	23,848	23,848	23,848	22,102
R^2	0.1807	0.1815	0.1818	0.1806	0.1867
Bank FE	✓	✓	✓	✓	✓
Quarter FE	✓	✓	✓	✓	✓

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 $\text{Loss}_{t-1} = 1$ and Bank $\text{Loss}_{t-1} = 0$. 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 the 2013 bank-level controls (log assets, leverage, asset growth, return on assets). Standard errors, in parentheses, are clustered at the BHC level. $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

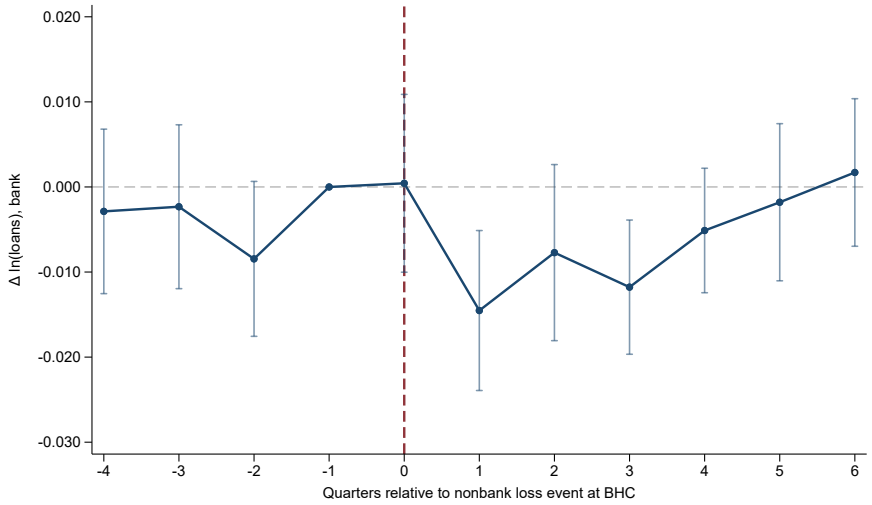


Figure D.1: Lending event study around nonbank-loss events at the BHC. Two-way fixed effects estimator on first-spell events. Base period $t = -1$. 90% confidence intervals clustered at the BHC level.

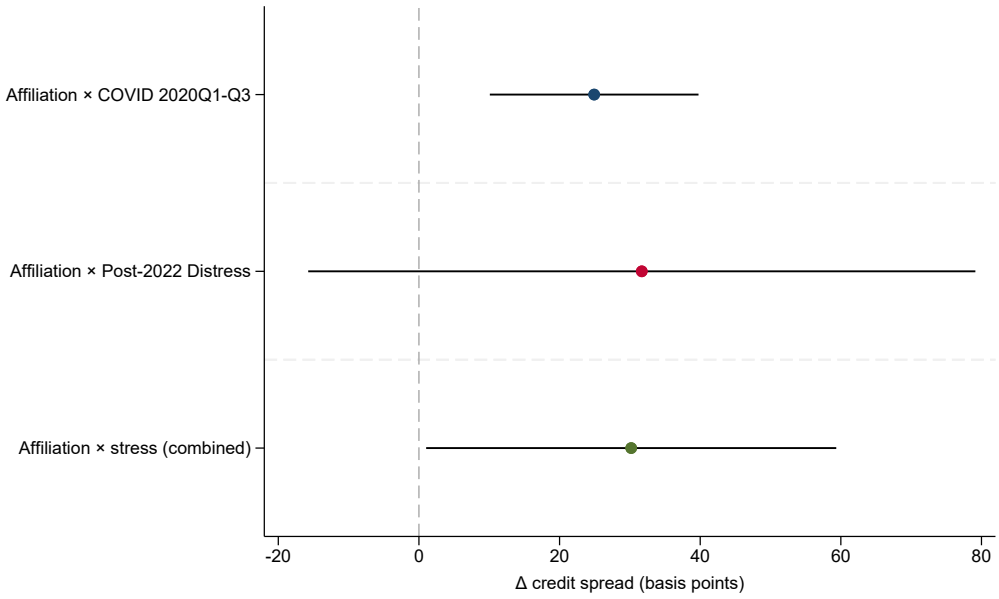


Figure D.2: Bond contagion: differential spread reaction at affiliated bonds during stress. Each marker is the affiliation × stress coefficient with 90% confidence interval.

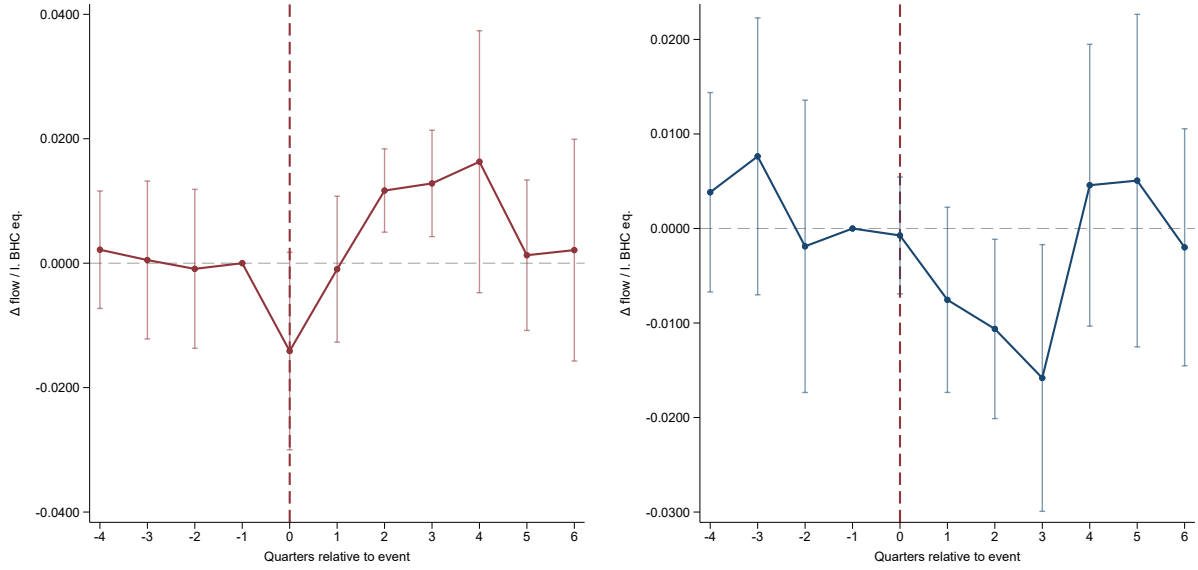
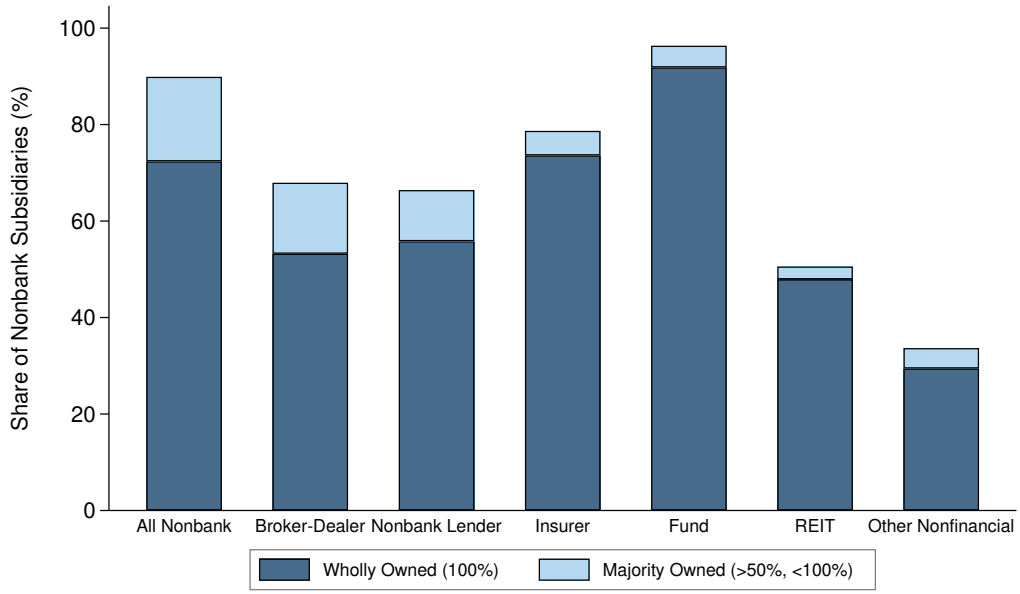


Figure D.3: Parent equity investment: nonbank recapitalization vs. bank drain. Sample restricted to BHCs with nonbank-loss events whose $t = 0$ falls in COVID 2020Q1–Q3 or the post-Q1 2023 intermediary distress regime (2023Q1–2024Q4). Base $t = -1$, 90% CI clustered at BHC level.

Appendix E Additional Empirical Figures

E.1 BHC Ownership of Nonbank Subsidiaries

Figure E.1: BHC Ownership of Nonbank Subsidiaries

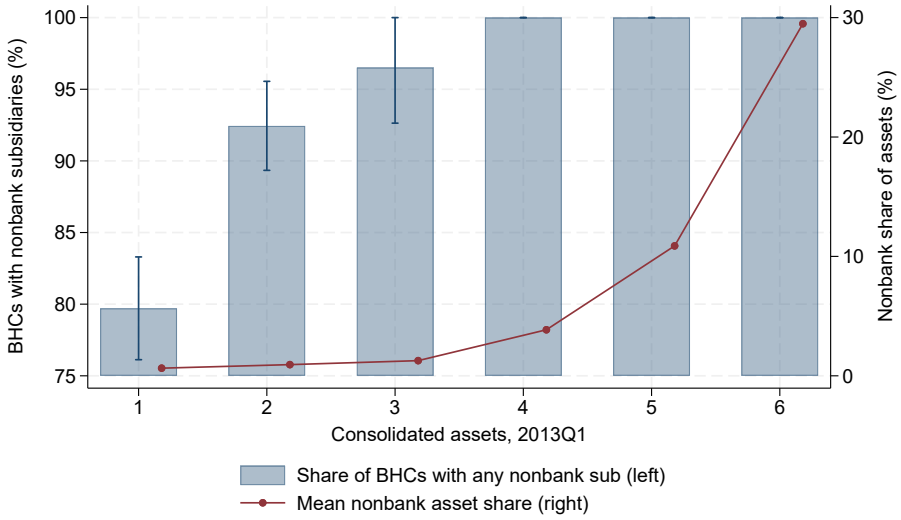


Notes: This figure shows the share of direct nonbank subsidiaries that are wholly owned by their parent BHC and the share that are majority owned by their parent BHC. The sample period is 2010-2024. Only nonbanks in the BHC's direct ownership chain are considered. Subsidiary types are classified by NAICS 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.

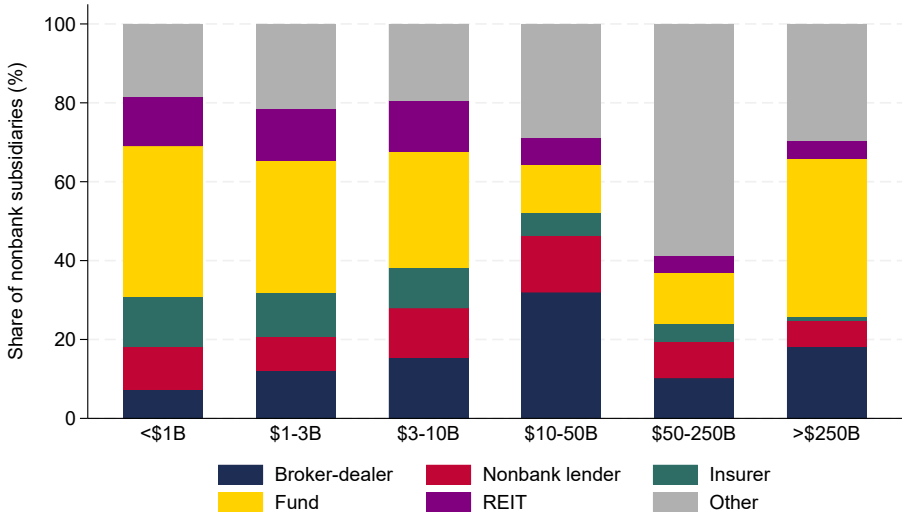
E.2 Nonbank Activity Across the BHC Size Distribution

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

(a) Prevalence and Intensity of Nonbank Activity



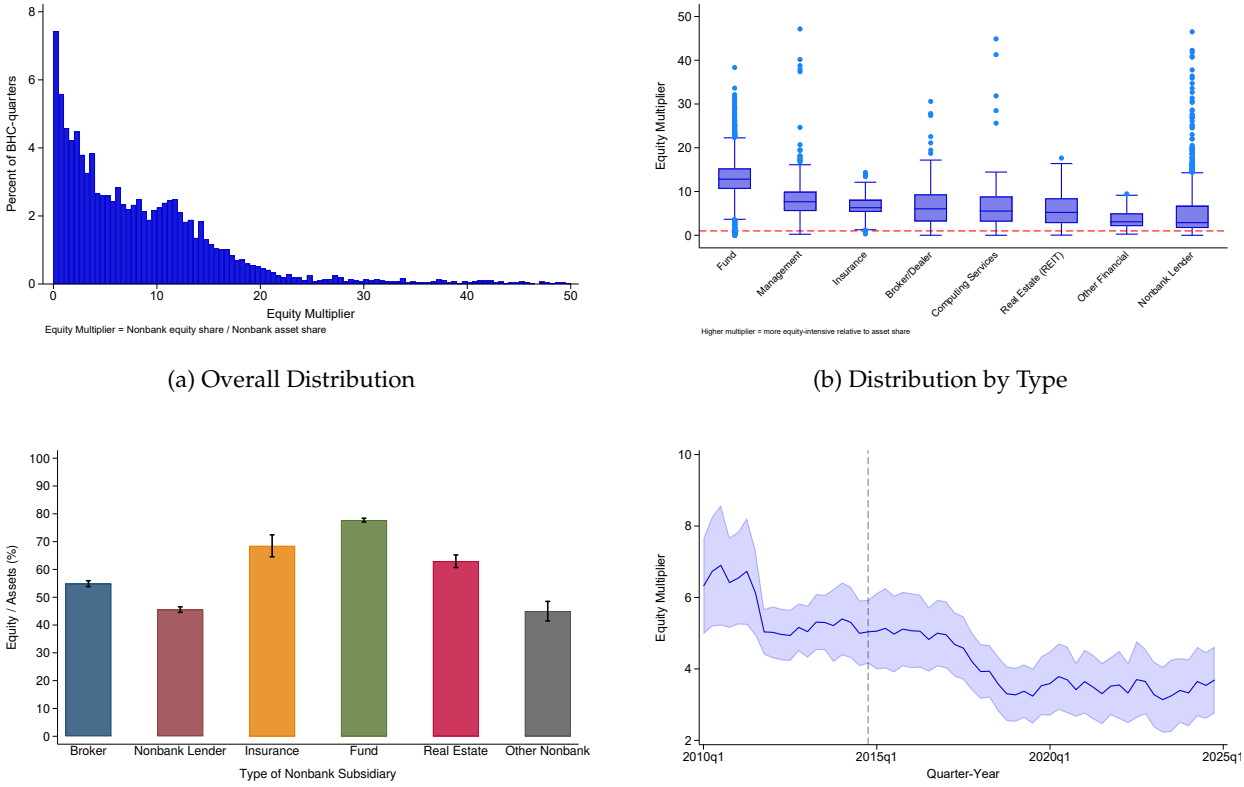
(b) Composition of Nonbank Subsidiaries



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

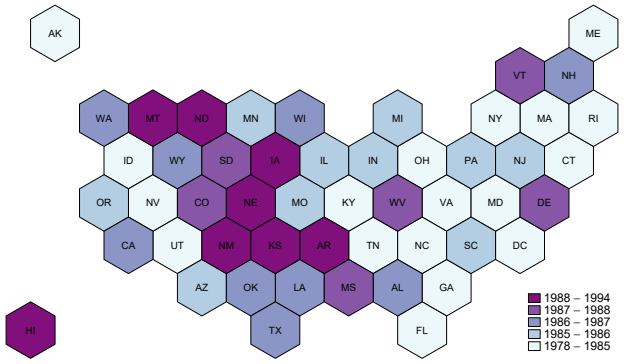
(c) Capital Ratios by Type

(d) Multiplier Over Time

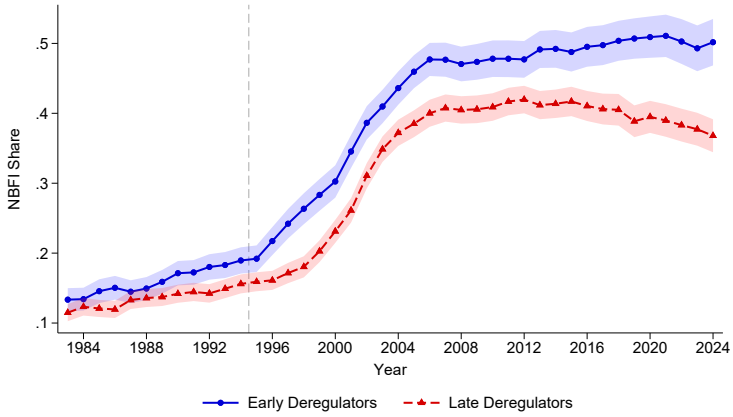
Notes: The figure provides a comprehensive view of equity multiplier distributions and dynamics. Panel (a) shows a histogram of equity multiplier across all BHC-quarters. Panel (b) shows box plots by subsidiary type (see heterogeneity documented in Table 3) Panel (c) shows mean capital ratios by type. 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

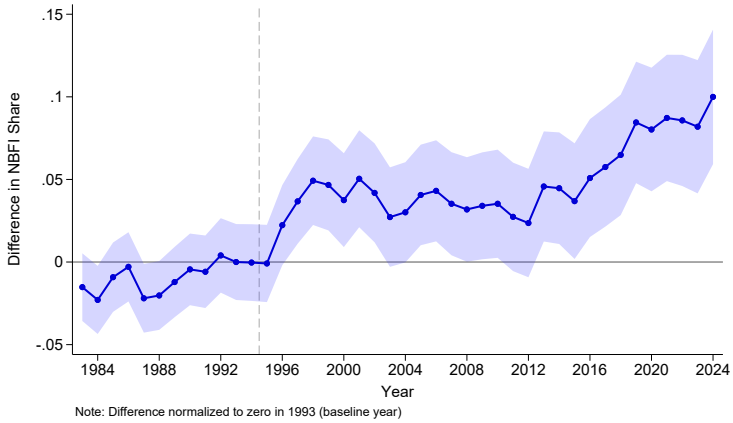
Figure E.4: Interstate Banking Deregulation and Nonbank Financial Exposure



(a) Interstate Deregulation Timing by State



(b) Nonbank Share: Early vs Late Deregulators

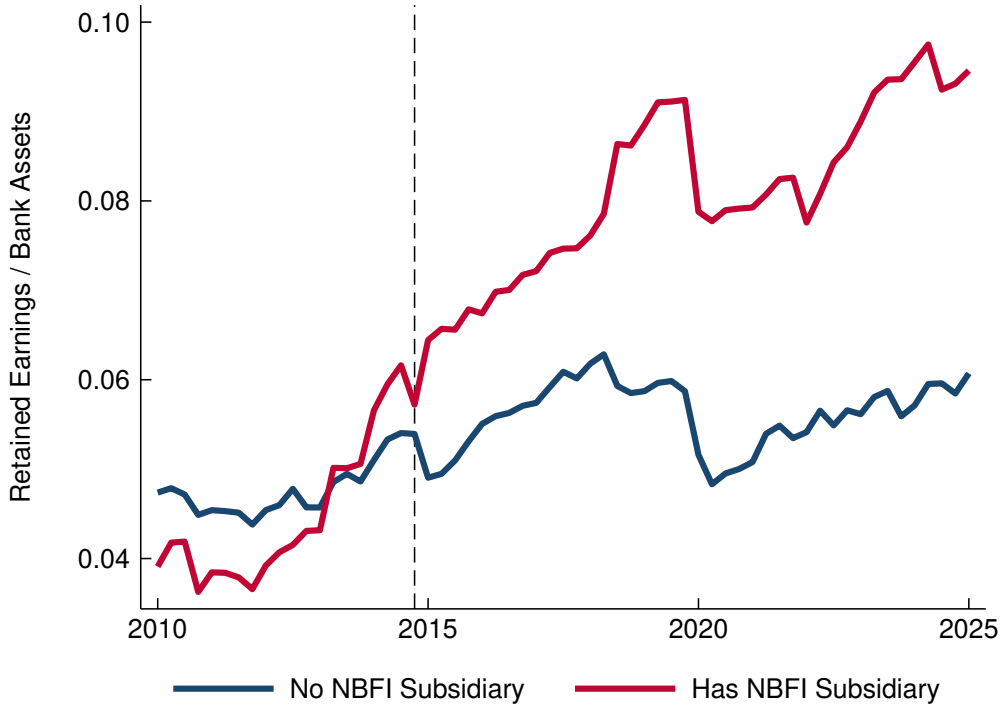


(c) Difference-in-Differences: Early - Late

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 over time.

E.5 Retained Earnings by BHC Nonbank Status

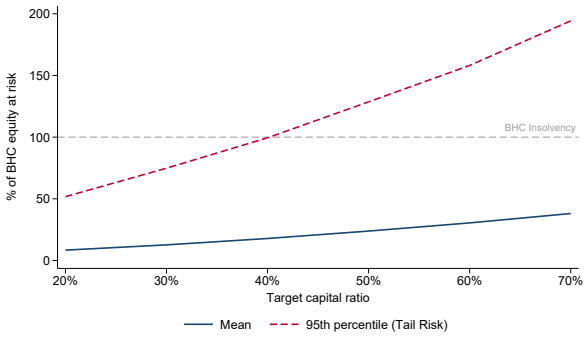
Figure E.5: Bank Retained Earnings as a Share of Bank Assets by BHC Nonbank Status



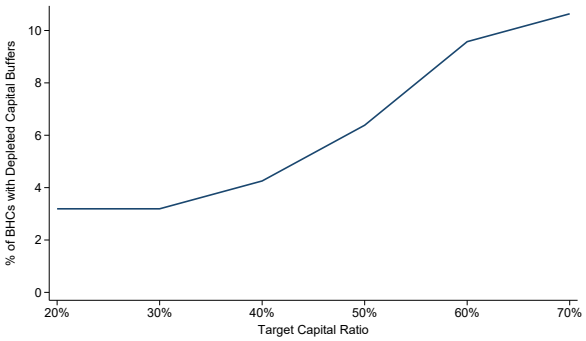
Notes: The figure shows average bank retained earnings as share of bank assets over time, comparing banks in BHCs with nonbank subsidiaries as of 2005 (red line) versus banks in BHCs without nonbank affiliates (blue line). Retained earnings measured as quarterly undistributed subsidiary income scaled by bank assets in that quarter. 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

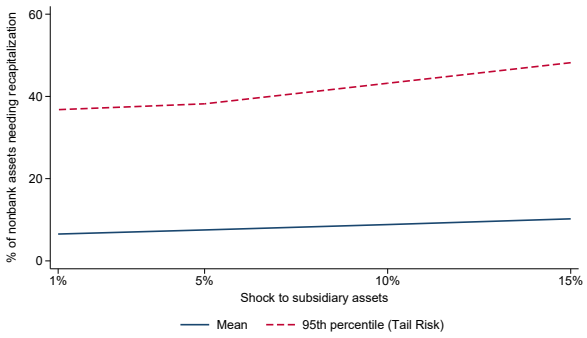
Figure E.6: Stress Test Sensitivity Analysis



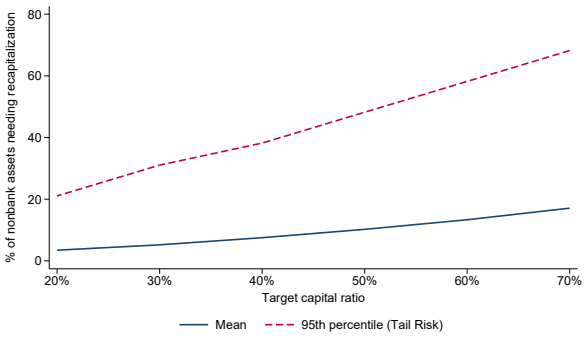
(a) BHC Equity at Risk by Capital Target



(b) Buffer Depletion by Capital Target



(c) Nonbank Assets at Risk by Shock

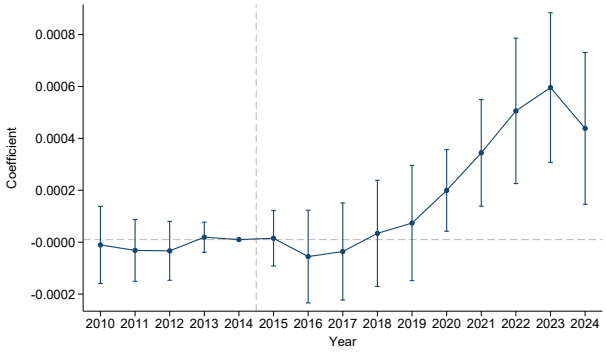


(d) Nonbank Assets at Risk by Target

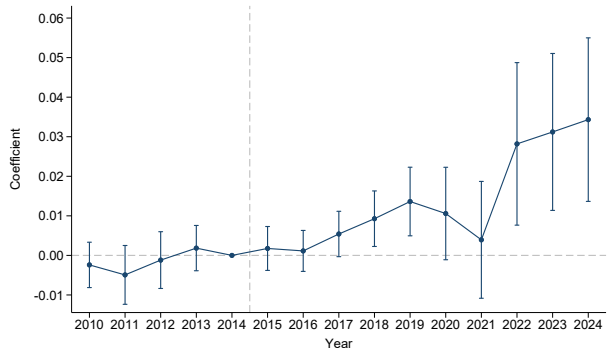
Notes: The table presents the stress test sensitivity analysis. Panel (a) shows percentage of BHC excess capital required to restore nonbanks to varying capital ratio targets following a 5% asset shock. Panel (b) shows percentage of BHCs with completely depleted capital buffers under varying targets (5% shock). Panel (c) shows percentage of nonbank assets requiring recapitalization by shock severity (40% target). Panel (d) shows nonbank assets at risk across capital targets (5% shock). Solid line: mean. Dashed line: 95th percentile. Horizontal dashed line at 100% marks potential parent insolvency. All panels use 2013Q1 balance sheets.

E.7 Bank Event Studies

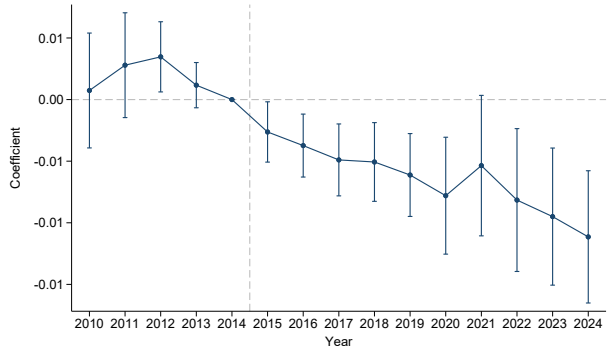
Figure E.7: Bank Event Studies: Safety and Profitability Improvements



(a) ROA



(b) Equity/RWA

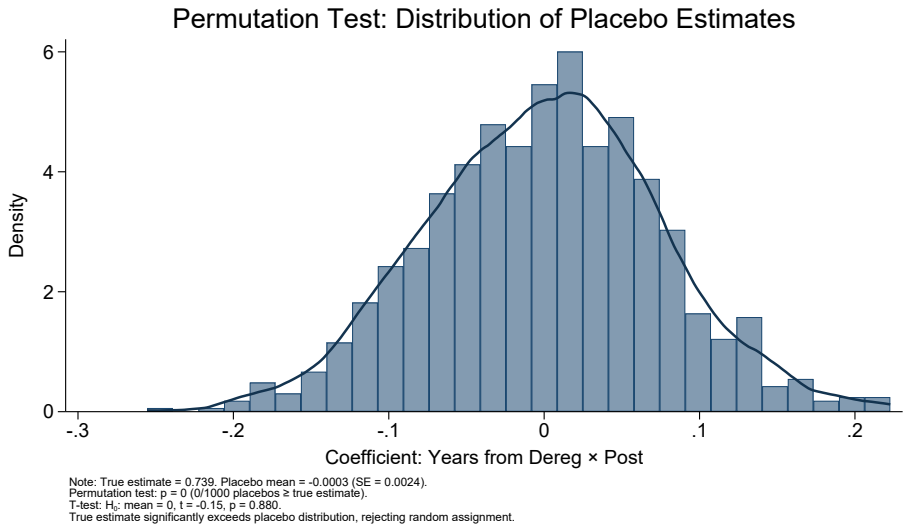


(c) RWA/Assets

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.

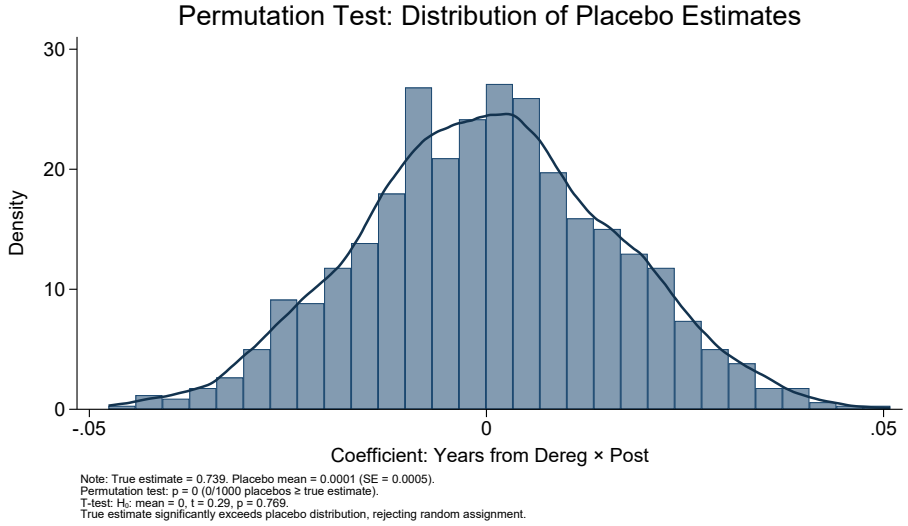
E.8 Placebo Tests

Figure E.8: 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.9: 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	-0.0610	0.0067**	0.0025	0.0017	0.0016
	(0.0431)	(0.0030)	(0.0022)	(0.0245)	(0.0035)
Observations	6,155	6,155	6,155	6,155	6,155
R^2	0.0662	0.0657	0.0914	0.2374	0.0541

Panel C: Removals (Decrease from Prior Quarter)

	Broker (1)	Lender (2)	Insurer (3)	Fund (4)	REIT (5)
Years from Dereg × Post	-0.1781	0.0171	0.0134**	-0.0670	-0.0132
	(0.1378)	(0.0208)	(0.0059)	(0.0801)	(0.0144)
Observations	6,155	6,155	6,155	6,155	6,155
R^2	0.0907	0.2487	0.0792	0.0729	0.2479
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. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.