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Abstract

U.S. bank holding companies (BHCs) have developed a significant nonbank footprint over the last five decades, accounting for a sizable share of both BHC assets and the broader nonbank financial sector. We argue that this structure is partly explained by internal capital markets: when affiliates face imperfectly correlated liquidity outflows, internal transfers reduce the need for precautionary buffers. Using unique data on BHC structure and intracompany funding balances, we find evidence that affiliates provide implicit liquidity insurance through internal transfers, and that the BHC organizational scope responds to shocks that affect the value of this insurance. Our findings suggest that internal liquidity insurance plays a central role in determining both firm boundaries and asset allocation in modern financial groups.

JEL classification: G01, G21, G23, G28
Key words: banking firm, bank holding companies, firm boundaries, nonbank financial institutions, liquidity synergies, bank regulation

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To view the authors' disclosure statements, visit
https://www.newyorkfed.org/research/staff_reports/sr1118.html.

1 Introduction

A common view in the financial intermediation literature is that traditional banks are being increasingly displaced by nonbank financial institutions (NBFIs). This narrative overlooks an important structural reality: a large share of NBFI activity occurs *within* the boundaries of bank holding companies (BHCs). While it is well-known that some large BHCs operate nonbank subsidiaries, we show that organizational integration between banks and NBFIs is far deeper and more widespread than is typically recognized. This integration suggests meaningful synergies between commercial banks and NBFIs. We argue that liquidity insurance through internal capital markets is one such synergy that plays a first-order role in shaping the structure of banking firms. Building on the framework of Kashyap, Rajan and Stein (2002) (KRS), which attributes the integration of deposit-taking and lending within traditional commercial banks to liquidity synergies, we extend and generalize their insight to explain why modern banking firms integrate a broader set of financial intermediation functions.

We build a unique dataset on the organizational structure and financial reports of bank holding companies (BHCs)—the dominant legal form for conducting banking in the U.S.—to document the expansion of the banking firm's boundaries over the last five decades. The typical U.S. banking firm is no longer the deposit-taking, loan-making institution of textbook commercial banking. Since the 1980s, BHCs have added thousands of nonbank subsidiaries spanning the full range of intermediation activities, including investment funds, securities dealers, insurers, and specialty lenders. These subsidiaries now account for at least 21% of aggregate BHC assets and 20% of total NBFI assets in the United States. The presence of nonbank affiliates is widespread across the banking industry, rather than limited to a few "universal banks."

This observation raises an important question: Why do banking firms increasingly choose to integrate such a broad range of nonbank entities? Existing theories offer several plausible motives. For example, banks may pursue vertical integration to reduce transaction costs (Williamson, 1989) or expand opportunistically due to internal agency frictions (Laeven and Levine, 2007).[1] While recognizing the existence of these alternative motives, in this paper we argue that synergies related to *liquidity management* play a crucial role in shaping the nonbank footprint and that our evidence is inconsistent with alternative explanations.

Our argument builds off of the canonical contribution of KRS, who show that there are important benefits to extending credit lines and taking deposits under the same roof. Both activities involve providing contingent liquidity through the satisfaction of deposit withdrawals and credit line drawdowns. Both activities therefore require the holding of liquid asset buffers. However, as long as deposit outflows and credit line drawdowns are not perfectly correlated, then jointly conducting both activities allows banks to economize on liquid asset holdings. In other words, a traditional bank should be a "superior" organizational structure

[1] Another motive may be to combine complementary functions under one umbrella to exploit economies of scope (Penrose, 1959; Rumelt, 1982; Cetorelli, Jacobides and Stern, 2021)

to specialist institutions.

KRS interprets the bank as an institution operating with two distinct *divisions* - deposit collection and credit line extension - but their intuition and theoretical construct extend naturally to the organizational choices of the more modern U.S. banking firms that control a diversified array of bank and nonbank *subsidiaries*. Just as commercial banks are vulnerable to deposit outflows and credit line drawdowns, nonbank intermediaries can also be vulnerable to sudden liquidity demands. As long as affiliated banks and nonbanks experience relatively uncorrelated liquidity outflows, then these affiliates can provide liquidity insurance to each other, which should allow each entity to economize on liquid asset holdings. Consequently, we posit that banking firms with a more extensive nonbank footprint can more efficiently manage their liquidity needs.

More broadly, our proposed mechanism aligns with the corporate finance literature on the importance of internal capital markets for explaining the organizational choices of firms. For example, Cetorelli and Goldberg (2012*a*,*b*,*c*) show banks' use of internal capital markets on a global scale, while Matvos and Seru (2014) and Matvos, Seru and Silva (2018) argue that the exploitation of internal capital markets is a key driver of the decisions of nonfinancial firms to diversify into conglomerate structures. Thus, our argument is consistent with a general ability of integrated firms to experience benefits from making transfers across business lines.

We begin by documenting descriptive evidence on liquidity management and internal funding flows within BHCs. We show evidence of large-scale intracompany balances between commercial bank and nonbank subsidiaries within BHCs. These balances are large: borrowing from nonbank affiliates (including deposits owed to those affiliates) accounted for more than 5% of commercial bank assets on average in the pre-GFC period and reached close to 10% of assets during the GFC. Broker-dealers are a key source of internal liquidity, providing 30–40% of all intracompany funding obtained by commercial banks from nonbank affiliates. The magnitude and direction of these transfers are telling: if the coexistence of banks and nonbanks was unrelated to liquidity management, such extensive and systematic funding activity between banks and nonbanks would be difficult to explain. We also show, consistent with liquidity synergies, that commercial banks with larger nonbank affiliates and greater internal borrowing appear to economize on liquid asset holdings, even when we control for a rich set of covariates.

The mere presence of internal balances between bank and nonbank affiliates is consistent with active internal capital markets but not necessarily with KRS-style liquidity insurance. Routine transactional flows—such as deposits or centralized cash management—can generate similar patterns. To establish a liquidity insurance motive, one must show that internal funding flows are state-contingent, expanding precisely when affiliates face liquidity stress.

We provide evidence suggesting that a large portion of the intracompany transfers that we observe re-

flect ex-post usage of *implicit lines of credit*, a term we use to describe non-contractual agreements between subsidiaries to provide mutual liquidity support during periods of stress. If such implicit credit lines exist, then we should be able to observe a causal relationship between unexpected liquidity needs and the activation of internal funding flows, and especially so for those BHCs with a larger nonbank footprint. To test this hypothesis, we exploit cross-sectional variation in commercial banks' exposure to the asset-backed commercial paper (ABCP) market prior to 2007. As documented by Acharya, Schnabl and Suarez (2013), severe disruptions in the ABCP market in the summer of 2007 generated large liquidity shocks for banks that had sponsored ABCP conduits. Using a difference-in-differences-style empirical design, we find that among commercial banks with large nonbank affiliates, it was precisely those with high ex-ante exposure to ABCP liquidity stress that sharply increased intracompany borrowing during the stress period. This conditional pattern—where internal funding rises only when both the capacity (nonbank affiliates) and the need (ABCP liquidity stress) are present—is consistent with nonbank affiliates providing contingent liquidity support, akin to internal credit lines. Even more tellingly, these same banks also reduced borrowing from Federal Reserve lender of last resort (LOLR) facilities, suggesting that internal funding substituted for official sector backstops. Based on a simple counterfactual constructed using our estimated regressions, funding from nonbank affiliates worth 11.5% of commercial bank assets ($696 billion) reduced LOLR borrowing by 2.9% of assets ($176 billion).

The ABCP episode provides evidence that BHCs with a nonbank footprint rely on internal liquidity insurance during periods of stress. We next test whether BHC organizational structure responds to *ex-ante changes* in the value of this insurance, consistent with a key prediction of the KRS framework. In the original model, liquidity synergies within a commercial bank depend on the ability to freely reallocate liquidity between the deposit and credit line divisions. If regulation were to restrict transfers between these divisions, the KRS model would predict organizational separation into standalone institutions. We apply this logic to the modern BHC. If regulatory changes increase the cost of transferring liquidity across affiliates—analogous to restricting internal flows between commercial bank divisions—then the KRS framework predicts that BHCs should respond by contracting their organizational scope (the size and diversity of the nonbank footprint).

We test this prediction using the introduction of resolution planning ("living wills") under the Dodd-Frank Act. Living wills forced BHCs to submit detailed plans to regulators about reducing interdependencies between subsidiaries in order to facilitate separability during resolution and reduce systemic risk. Living wills did *not* impose any explicit restrictions on the size or scope of the nonbank footprint. Thus, we can reasonably interpret living wills as an exogenous shock that restricted internal capital markets within BHCs and increased the (regulatory) cost of intracompany liquidity insurance.

Using difference-in-differences and synthetic control methods, we find that treated BHCs significantly reduced their nonbank footprint after the regulation: they lowered their share of nonbank assets, exited

nonbank activities, and divested subsidiaries. They also reduced intracompany funding balances between banks and nonbanks. Our treatment effect estimates are economically meaningful: a simple counterfactual reveals that living wills were responsible for approximately 40% of the aggregate decline of nonbank asset holdings within the banking sector from 2010-2018. The magnitude of heterogeneous treatment responses based on a proxy for nonbank profitability suggests that liquidity synergies are also important relative to other potential drivers of the nonbank footprint.

We argue that other post-GFC regulations are unlikely to confound our results, particularly those that were initially imposed on the entire industry and thus absorbed by time fixed effects. Such industry-wide regulations include capital regulation and the Volcker rule.[2] Capital regulation specific to large banks - like G-SIB surcharges - occurred well after living wills were implemented. Consequently, we find null treatment effects when we run placebo tests with capital ratios as the outcome variable. Confounding from contemporaneous liquidity regulation (Liquidity Coverage Ratio) would not meaningfully change the interpretation of our results because liquidity regulation can also be viewed as a shock to the scope for liquidity insurance. We also show that our results are robust to controls for financial distress experienced during the GFC and to proxies for the bindingness of contemporaneous capital and liquidity regulation.

Related Literature. The literature has recently returned to the fundamental question of what defines a bank. These questions were central in motivating the 2022 Nobel Prize in Economics for contributions in financial intermediation, specifically theories of banking and the existence of bank-like intermediaries providing similar services (The Royal Swedish Academy of Sciences, 2022). Buchak et al. (2024) highlight the "secular decline" of a model of intermediation centered on deposit taking and loan making, emphasizing the emergence of NBFIs as substitutes to banks. Hanson et al. (2024) argue that competition from NBFIs has shifted the business model of banks towards the holding of long-term securities and away from traditional lending to firms. Acharya, Cetorelli and Tuckman (Forthcoming), also motivated by the emergence and growth of NBFIs, posit that the role of banks has transformed from direct lenders in the economy to providers of funding and liquidity to NBFIs. Our paper contributes to this literature by showing that much of that NBFI growth has in fact been happening *inside* the boundaries of the banking firm.

Our paper also contributes to the long-standing literature on synergies between financial activities conducted by banks. Numerous papers, including KRS, Diamond and Rajan (2001), Gatev and Strahan (2006), and more have explored the reasons why deposit-taking and risky lending might optimally occur under one roof. However, these papers conceptualize banks as institutions that only have deposit-taking and loan-making business lines. This traditional view of banking predates banks' expansion into nonbank business lines. Our paper shows that past results about liquidity management synergies between deposit-taking and

[2]The Volcker rule, moreover, only imposed restrictions on a subset of activities, proprietary trading and covered funds (e.g., hedge funds and private equity funds), with no impact on the broader set of potential nonbank activities.

loan-making can help us understand the organizational choices of the modern banking firm.

Likewise, we contribute to an emerging literature about liquidity management synergies between a variety of financial intermediaries, such as between broker-dealers and banks (Caglio, Copeland and Martin, 2021), mutual funds and banks (Afonso, Cipriani and La Spada, 2022; Jacewitz, Unal and Wu, 2022), mutual funds within the same fund family (Agarwal and Zhao, 2019), and private equity and life insurers (Foley-Fisher, Heinrich and Verani, 2023; Kirti and Sarin, 2023). These papers all explore liquidity management synergies in specific settings. Our paper suggests that these insights may apply more generally. A key aspect of the business model of most financial intermediaries is the provision of liquidity. Any pair of intermediaries that experience relatively uncorrelated liquidity demands can, in principle, engage in efficiency-enhancing transfers that allow them to economize on liquid asset holdings and be more resilient to funding shocks.

Finally, our paper is also connected to the bulging literature focusing on the rise and growth of specific NBFI sectors as substitutes of banks in providing liquidity and credit services. Examples include the role of investment funds providing liquidity services alternative to bank demand deposits (Pascual, Singh and Surti, 2021), insurance companies as providers of market liquidity (Aramonte and Mano, 2022), or specialty lenders offering credit services alternative to bank loans (e.g., Buchak et al. (2018) on mortgage products, Gopal and Schnabl (2022) on small business lending, Chernenko, Erel and Prilmeier (2022) on corporate lending). Kim, Plosser and Santos (2018) find that after supervisory scrutiny on leveraged lending by banks, nonbanks gained market share in the leveraged lending market using funding provided by banks, which provides an important example of the larger story of interconnections between banks and nonbanks put forward by this paper and Acharya, Cetorelli and Tuckman (Forthcoming). Our paper provides a complementary perspective to this literature by emphasizing the equally important growth of NBFIs within the banking sector, thus accentuating the importance of recognizing the tight interconnections and often blurred boundaries between the two sides.

The rest of the paper is organized as follows. In Section 2, we go over specific institutional features of the banking industry that are relevant for our analysis. In Section 3, we present our unique dataset of BHC organizational structure and additional datasets on BHC financials. Section 4 provides a series of important, and previously undocumented, stylized facts on the evolution of U.S. banking firms and their nonbank footprint. These stylized facts simultaneously provide novel evidence on the evolution of the nonbank footprint of banks and motivate our subsequent analysis of liquidity synergies, which is presented in the subsequent sections. Section 5 presents a broad overview of our main hypothesis regarding liquidity synergies and provides descriptive evidence. Section 6 presents evidence for the existence of implicit lines of credit within BHCs using the 2007 freeze of the ABCP market. Section 7 presents the living wills regulatory shock analysis to show that BHCs internalize the insurance value of their nonbank holdings and that liquidity synergies appear to be quantitatively important for BHCs' choice of organizational structure. Section 8 concludes and

provides closing remarks on the implications of our results.

2 Institutional Details

This section describes the institutional context that shapes the organizational structure and funding relationships of U.S. banking firms. We focus on three elements that are central to our analysis: the evolution of permissible banking activities, the post-GFC regulatory shift, and constraints on affiliate transactions under Regulation W.

2.1 The Business of Banking

We first describe the legal and regulatory structure governing the operation of banks in the United States. As is well known, the bank holding company (BHC) is the main legal vehicle in the U.S. to conduct the business of banking.

The common narrative is that the activities of BHCs and banking firms more broadly were heavily limited by the restrictions of the Glass-Steagall Act of 1933, until its partial repeal in 1999 by the Gramm-Leach-Bliley Act. In practice, however, the Bank Holding Company Act of 1956 provided ample discretion to bank regulators to dynamically define the boundaries of the "business of banking" to adapt to a changing environment. Indeed, U.S. bank regulators have often exercised such authority. By the mid 1980s, conditions were considered mature enough for regulators to define the business of banking in the broadest terms possible. For instance, an influential directive of the Office of the Comptroller of the Currency, the regulator of nationally chartered banks, stated that "... the business of banking has changed drastically ... and no one expects banks today to be restricted to [their] practices ...". The directive also stressed the importance of the "... adaptability of the national banking system ..." providing powers to banks "... so as to permit the use of new ways of conducting the very old business of banking", thus effectively opening the doors to turn banks into "financial supermarkets" (Markham, 2010).

Not only was the sentiment of regulators shifting in the 1980s with regard to permissible bank activities, but politicians were changing their views as well. In 1988, the Proxmire Financial Modernization Act proposed repealing Glass-Steagall eleven years before its eventual repeal. The Act passed the Senate with 94 votes in favor, but was not passed by the House of Representatives. This shift in political and regulatory sentiment led to two decades, up to the global financial crisis, of virtually unrestricted choice of business activities for banks.

2.2 Post GFC Regulation: Liquidity Rules and Living Wills

After a period of fairly unencumbered operations during the 1990s and the early 2000s, regulation significantly reverted in the aftermath of the global financial crisis. We focus on two components of post-GFC regulation that are especially relevant to this paper.

The first regulation relevant to liquidity synergies is the liquidity coverage ratio (LCR). This regulation was introduced as a part of Basel III in 2010 and was adopted by the U.S. in 2013. The LCR requires commercial banks and bank holding companies to hold enough high-quality liquid assets (HQLA) to cover liquidity outflows in a 30-day stress scenario. By imposing a rough floor on bank liquid asset holdings, this regulation should naturally reduce the scope for a relationship between the nonbank footprint of a BHC and the size of its liquid asset buffer.

In addition, as part of the Dodd-Frank Act of 2010, bank regulators introduced mandatory resolution planning, colloquially known as "living wills". The objective of living wills is to create the conditions for a rapid and orderly resolution of a BHC in the event of financial distress, which is intended to help credibly address the Too-Big-To-Fail issue associated with the largest banking firms.[3]

Under the regulation, which began in 2012, large bank holding companies have to submit periodic, detailed plans to regulators about how they would separate and resolve their businesses in the event of failure. Note that this regulation does not impose explicit restrictions on activities, nor the requirement to divest of any specific type of affiliates. The regulation, however, explicitly requires disclosing "the interconnections and interdependencies among the covered company [the parent BHC] and its material entities ... that, if disrupted, would materially affect the ... operations of the covered company".[4] This requirement, in the context of demonstrating the ability for a "rapid and orderly resolution", thus places scrutiny on the funding connections between subsidiaries in BHCs. The rationale for this part of the guidance is that such interconnections could make BHCs more difficult to resolve and separate during bankruptcy proceedings.

Hence, we interpret living wills as imposing an exogenous shock to the ability of BHC subsidiaries to borrow from their affiliates, which is a key mechanism for the exploitation of liquidity synergies. We later use the introduction of living wills to show that this restriction on interconnectedness reduced intracompany funding volumes and led BHCs to scale back the size of their nonbank footprints.

2.3 Regulation W

This paper argues that intracompany funding is a key mechanism for experiencing liquidity synergies. However, Sections 23A and 23B of the Federal Reserve Act, implemented through Regulation W, place certain restrictions on the extent to which commercial bank subsidiaries can engage in intracompany transactions

[3]The text of the regulation can be found at the following Federal Register link: https://www.govinfo.gov/content/pkg/FR-2011-11-01/pdf/2011-27377.pdf.

[4]See paragraph 4.g. from the text of the regulation.

with affiliated entities. Specifically, commercial banks cannot engage in "covered transactions" with a single affiliate that exceed 10% of the bank's capital stock and surplus. Additionally, the bank's covered transactions with all affiliates cannot exceed 20% of its capital stock and surplus. These restrictions are intended to prevent credit losses associated with lending to nonbank affiliates and prevent banks from transferring the benefits of the government safety net (deposit insurance, lender of last resort) to their affiliates. These covered transactions are generally extensions of credit from banks to affiliates. These extensions of credit include traditional lending, as well as similar transactions like asset purchases and securities lending.

We argue that liquidity synergies can be exploited within a BHC, and evidence of them can be found in the data, despite these regulatory restrictions. First, the restrictions only apply to extensions of credit in one direction, *from* commercial banks *to* nonbank affiliates. They do not apply to transactions occurring in the opposite direction. They also do not apply to transactions between holding companies and their subsidiaries nor to transactions between affiliated nonbanks.

Second, permissible bank lending to affiliates can still represent significant amounts of funding for nonbank subsidiaries that are small relative to the commercial bank subsidiaries. For example, suppose 80% of a BHC's assets are in commercial bank subsidiaries and the other 20% are in nonbank subsidiaries. Suppose the bank has a capital ratio of 10%. Based on the Reg W limits, this bank can provide as much as $(0.2 \times 0.1 \times 0.8)/0.2 = 8\%$ of the total funding of its nonbank affiliates, a very large amount.

Third, to the extent that our empirical analysis detects the existence of active intracompany funding dynamics, regulation masks the latent liquidity synergies and thus biases our empirical results towards non-findings. This implies that our estimates provide a lower bound to the full extent BHCs with nonbank footprints can efficiently manage their liquidity needs.

Finally, member banks are able to request Regulation W waivers from the Federal Reserve Board. Historically, such waivers have been often granted. For example, during the global financial crisis, the Board granted waivers to several large financial institutions, including JP Morgan Chase, Wells Fargo, Merrill Lynch, and Wachovia.[5] Legal scholars have debated whether the Section 23A and 23B restrictions have been effective regulatory tools in limiting intracompany transactions.[6]

3 Data

Database of BHC Organizational Structure. We use a unique database of the organizational structure of all BHCs ever in existence since the 1970s, first presented in Cetorelli and Stern (2015). This database integrates BHC regulatory filings from the FR Y-6 and the FR Y-10 to form a complete, time-consistent panel

[5] A full list of waivers granted in 2008 can be found here: https://www.federalreserve.gov/supervisionreg/legalinterpretations/federalreserveact2008.htm.

[6] See, e.g., Omarova (2011).

of BHCs. For every high holder and every point in time, we observe the complete set of subsidiaries, each subsidiary's relationship with its direct parent, and the ownership path back to the top-level BHC. To our knowledge, this is the only database that offers comprehensive, time-consistent coverage of organizational structure across the full population of BHCs.

Crucially for this paper, the database also records the primary business activity of each subsidiary, classified using five-digit NAICS industry codes. This enables us to systematically identify and group entities into six major categories: commercial banks (NAICS 5221), specialty lenders (NAICS 5222, 5223), securities brokers (NAICS 523), insurers (NAICS 524), investment funds (NAICS 525), and nonfinancial subsidiaries (entities outside NAICS 52). These classifications help us analyze the scope and evolution of BHCs' nonbank footprints over time.

BHC-Level Financial Reports. We draw on four sources of regulatory financial data to measure the balance sheets of BHCs and their subsidiaries. The primary source is the FR Y-9C, which provides consolidated financial statements for BHCs and is widely used in academic research. To complement this, we use the FR Y-9LP, which reports the *unconsolidated* financials of the top-tier holding company. Although underutilized in prior work,[7] the Y-9LP is essential in our setting because it provides direct visibility into nonbank activities and internal funding flows that are netted out in the consolidated Y-9C. Specifically, it includes both the assets of nonbank subsidiaries and the gross balances of intercompany borrowing and lending across banks, nonbanks, and holding companies—including intermediate holding companies. These data allow us to track the scope of nonbank operations and the internal liquidity flows that link subsidiaries within the BHC.

FR Y-11: Subsidiary-Level Financial Reports. We also use the FR Y-11, a subsidiary-level regulatory report filed by large nonbank subsidiaries of BHCs. The Y-11 provides detailed balance sheet data at the legal-entity level, offering a level of granularity not available in the Y-9C or Y-9LP. However, reporting requirements apply only to a subset of nonbank subsidiaries, and filing frequency varies—some subsidiaries report quarterly, others annually. Due to this limited and uneven coverage, we use the Y-11 primarily to corroborate and complement our main findings from the Y-9LP, rather than as a standalone data source.

Call Reports. A central component of our analysis is measuring how nonbank affiliates affect the liquidity and lending behavior of commercial bank subsidiaries. To capture these balance sheet dynamics, we use Call Reports (FFIEC 031/041), which provide regulatory financial statements for individual commercial banks—most of which are subsidiaries of BHCs. When a BHC controls multiple commercial banks, we

[7] An exception is Caglio, Copeland and Martin (2021), who use the Y-9LP to study broker-dealer affiliates.

aggregate their financials using our organizational structure database. This data allows us to track bank-level liquidity buffers, lending activity, and other key outcomes throughout the analysis.

Flow of Funds. To benchmark the size of BHC-affiliated nonbank activities relative to the broader financial sector, we use data from the Federal Reserve's Financial Accounts of the United States, commonly known as the Flow of Funds. These data provide aggregate time series on the assets and liabilities of key NBFI sectors, including broker-dealers, mutual funds, finance companies, and insurers.

Summary Statistics. The dataset used for most of our empirical results is produced by merging the above data for the years 1995 to 2022. We choose 1995 as our starting year due to availability of certain variables in the regulatory filings. In Appendix Table A.1, we provide summary statistics for the most important variables. Data availability allows for certain descriptive results in Section 4 to have earlier starting years.

4 Evidence on the Expanding Boundaries of the Banking Firm

We begin by documenting four stylized facts—none of which, to our knowledge, have been fully documented in the literature—on the evolution of U.S. banking firm structure. These facts reveal a striking transformation: since the 1980s, U.S. bank holding companies (BHCs) have moved well beyond the traditional model of deposit-taking and lending, building an expansive and economically significant nonbank footprint.

Fact 1: BHCs have significantly departed from the traditional banking business model since the late 1980s. The bank holding company has long been the dominant legal vehicle for conducting the business of banking in the United States. In Appendix Figure B.1, we show that commercial banks operating within BHCs represent virtually all of aggregate commercial bank assets. But while the legal form has remained stable, the internal structure of the banking firm has changed dramatically.

In Figure 1, we show that over the past five decades, U.S. banking firms have dramatically expanded their boundaries to encompass a wide range of nonbank activities. The top panel plots the industry-wide ratio of nonbank subsidiary assets to total consolidated BHC assets, calculated as an asset-weighted average using FR Y9-LP data from 1995 to 2022.[8] The bottom panel disaggregates this footprint across specific business lines—including broker-dealers, insurance carriers, nonbank lenders, and mutual funds—using data from the FR Y9-C and Y9-LP.[9] While mutual fund AUM is not consolidated on BHC balance sheets, we include it to reflect the economic scale of this activity.

[8] We exclude internal balances between related institutions, making our measure a reasonable proxy for the scale of nonbank operations.

[9] We observe total assets of broker-dealer and insurance subsidiaries from the FR Y9-C; loans held by nonbank subsidiaries from the FR Y9-LP, which we interpret as a proxy for nonbank lender assets; and proprietary mutual fund AUM from the FR Y9-C. The bottom panel begins in 2003 due to data availability.

We find that nonbank subsidiaries represent very meaningful shares of banking industry assets. We find that the nonbank asset share more than doubled from 10% in 1995 to nearly 25% by 2008, rising further to over 30% in the immediate aftermath of the GFC. While some of the post-crisis spike reflects the BHC conversions of institutions like Goldman Sachs and Morgan Stanley, most of the growth preceded these conversions. After 2012—coinciding with the implementation of post-crisis regulation—the nonbank share began to decline and then plateaued through 2022. In Section 7, we show that resolution planning regulation (living wills) likely contributed to this retrenchment.

The composition of the nonbank footprint has also evolved. As of 2022, broker-dealers represent the largest consolidated nonbank line, accounting for 15% of BHC assets—up from under 10% pre-crisis. Finance companies and insurers, which were more prominent before the crisis, now play a smaller role. Notably, if we include mutual fund assets under management (AUM) as a proxy for the scale of asset management operations, the total nonbank footprint rises to nearly 50% of consolidated BHC assets. Even without AUM, nonbank subsidiaries account for a substantial share of total assets—underscoring the extent to which modern U.S. banking firms operate across a broad spectrum of financial intermediation.

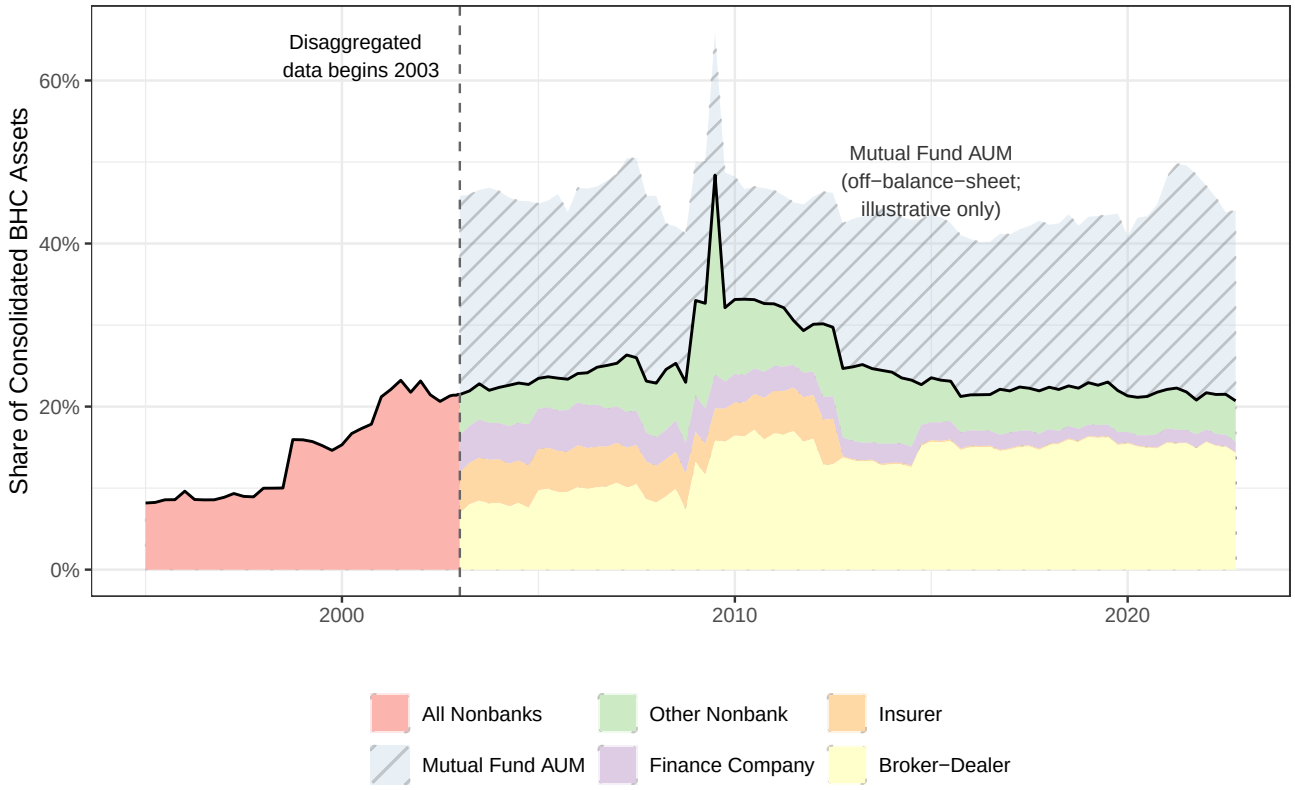

Figure 1: Asset Size of Nonbank Business Lines. This figure shows the size of nonbank business lines as a share of consolidated BHC assets. The top panel plots the ratio of total nonbank assets to BHC assets from 1995 to 2022. The bottom panel decomposes the nonbank footprint into broker-dealers, finance companies, insurers, and mutual fund AUM (included for illustrative purposes). The data comes from the FR Y-9C and FR Y-9LP.

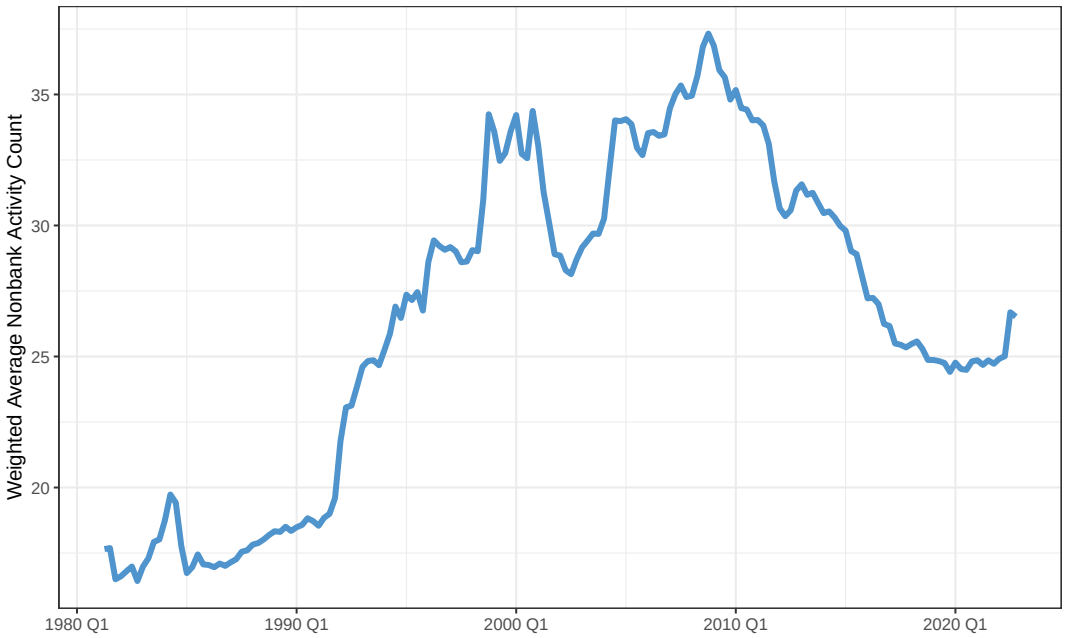

Figure 2: BHC Nonbank Activity Count. This figure plots the number of distinct nonbank business lines within BHCs, based on five-digit NAICS codes, from 1981 to 2022. The plot shows an asset-weighted average over BHCs. The typical BHC expanded from fewer than 20 unique activities in the 1980s to over 35 by 2009, before retrenching in the post-GFC period. The figure highlights the broad scope of nonbank activity and the extent to which BHCs operate across diverse segments of financial intermediation.

Fact 2: BHCs exhibit high levels of diversification across nonbank business lines. While the decomposition of nonbank assets in Figure 1 highlights the breadth of BHC involvement in nonbank financial intermediation, it aggregates subsidiaries into four broad categories. To more precisely measure the scope of nonbank activity, Figure 2 plots the number of unique five-digit NAICS codes among nonbank subsidiaries, asset-weighted over BHCs.

The figure shows a steady increase in nonbank scope throughout the 1990s and early 2000s, with the typical BHC reaching a peak of 37 distinct nonbank business lines in 2009—more than twice the level observed in the 1980s. This high level of diversification suggests that synergies between banks and nonbanks are not confined to any one line of business, but instead reflect broad complementarities across financial intermediaries. Notably, this trend predates the 2009 BHC conversions of complex institutions such as Goldman Sachs and Morgan Stanley, which confirms that the expansion of scope was not merely driven by changes in BHC population. Following the GFC, BHCs substantially reduced their nonbank scope. By 2022, the average number of nonbank business lines had declined to pre-1995 levels, consistent with the broader retrenchment in the nonbank footprint documented in Fact 1.

Fact 3: NBFI holdings are not limited to the largest banks. While the distribution of nonbank assets is right-tailed—dominated in dollar terms by large institutions—holdings of NBFIs are not exclusive to the

	1990 Q1	2000 Q1	2010 Q1	2020 Q1
Specialty Lenders (5222, 5223)	0.685	0.710	0.565	0.635
———-Credit Card Issuing (52221)	0.125	0.115	0.055	0.045
———-Sales Financing (52222)	0.410	0.425	0.345	0.300
———-Mortgage and Consumer Lending (52229)	0.570	0.575	0.400	0.420
———-Miscellaneous Lending Activities (5223)	0.285	0.270	0.250	0.310
Securities Brokerage (523)	0.675	0.730	0.660	0.685
———-Investment Banking (5231)	0.520	0.520	0.380	0.365
———-Miscellaneous Brokerage Activities (5232, 5239)	0.550	0.545	0.605	0.635
Insurance (524)	0.615	0.650	0.635	0.655
———-Insurance Carriers (5241)	0.480	0.365	0.275	0.305
———-Insurance Brokers (5242)	0.320	0.555	0.590	0.570
Investment Funds (525)	0.085	0.510	0.855	0.740
———-Employee Benefit Funds (5251)	0.000	0.015	0.015	0.015
———-Open-End Funds (52591)	0.020	0.040	0.080	0.075
———-Other Investment Funds (52599)	0.030	0.490	0.845	0.730

Table 1: Share of Top 200 BHCs Holding Nonbank Business Lines. This table uses the database of BHC subsidiaries described in Section 3 to determine the share of the top 200 BHCs by assets that hold at least one subsidiary within each nonbank business line listed in the table. We identify nonbank business lines using the four or five-digit NAICS code of the subsidiary. The top 200 BHCs are selected within each quarter based on consolidated BHC assets.

so-called "universal banks" like JPMorgan Chase, Bank of America, or Citigroup. In Table 1, we show that a broad cross-section of BHCs, including many medium-sized firms, have long maintained a meaningful presence in nonbank lines of business.

The figure reports the share of the top 200 BHCs (by assets) with at least one subsidiary engaged in a given nonbank business line. This sample captures the vast majority of industry assets—about 90–96% across the sample period—while excluding very small banks that may lack the scale to operate NBFIs.[10]

Nonbank activities have been prevalent across this broader set of BHCs for decades. In 1990:Q1, 69% of the top 200 BHCs operated at least one specialty lender, with considerable variation across sub-categories (e.g., 12.5% issued credit cards, 41% engaged in sales financing). Securities brokerage and insurance were also common even in the early 1990s. By 2020:Q1, the trend had continued: 64% of BHCs held at least one specialty lender, 69% a securities broker, 66% an insurance affiliate, and 74% an investment fund. These figures show that the integration of nonbank activities is a structural feature of the industry—not a pattern confined to the top tail.

Fact 4: BHC-affiliated NBFIs account for a substantial share of the NBFI industry. BHC-held nonbank subsidiaries represent a sizable share not only of consolidated BHC assets, but also of the U.S. nonbank fi-

[10] In 2000:Q1, the top 200 BHCs represented 87% of all BHC industry assets. In 2020:Q1, the figure was 96%.

nancial sector more broadly. Using asset-level proxies for BHC-affiliated broker-dealers, nonbank lenders, insurers, and proprietary mutual funds, we compare these totals to the corresponding industry segments reported in the U.S. Financial Accounts (Flow of Funds). To ensure consistency in measurement, we exclude mutual fund and ETF assets under management (AUM) from the Flow of Funds aggregates when constructing the "All Nonbanks" denominator, since AUM does not appear on BHC balance sheets and is excluded from our numerator.[11] This adjustment ensures that both the numerator and denominator reflect on-balance-sheet asset holdings only.

In Table 2, we report the BHC share of total assets for each NBFI segment and for the aggregate nonbank sector. BHC-affiliated nonbanks consistently account for a meaningful portion of the industry. As of 2020:Q1, BHC-held NBFIs represented approximately 20% of total nonbank financial assets. Their footprint is particularly large in the broker-dealer sector, where BHCs account for over 64% of assets—consistent with the post-GFC migration of stand-alone dealers into bank holding company structures. These findings underscore that BHCs are not peripheral to the nonbank system. Instead, they remain central players in shaping its structure and evolution.

	All Nonbanks	Broker-Dealers	Mutual Fund AUM	Nonbank Lenders	Insurers
2005 Q1	0.112	0.160	0.234	0.223	0.072
2010 Q1	0.272	0.532	0.192	0.277	0.083
2015 Q1	0.196	0.524	0.189	0.194	0.003
2020 Q1	0.201	0.641	0.195	0.177	0.002

Table 2: BHC-Affiliated NBFI Share of Aggregate NBFI Sector. This table reports the share of assets held by BHC-affiliated NBFIs relative to total assets in the corresponding segments of the U.S. nonbank financial sector, based on data from the FR Y9-LP, FR Y9-C, and the Federal Reserve's Financial Accounts of the United States (Flow of Funds). We report shares for four major NBFI categories—broker-dealers, mutual funds, nonbank lenders, and insurers—as well as an aggregate "All Nonbanks" measure. To ensure consistency in measurement, mutual fund and ETF assets under management (AUM), which do not appear on BHC balance sheets, are excluded from the aggregate industry denominator.

5 Descriptive Evidence for Liquidity Synergies

The previous section documented a structural transformation in the U.S. banking industry: BHCs have increasingly integrated nonbank affiliates alongside traditional commercial banking operations. What has motivated BHCs to undergo such a transformation? We argue that liquidity insurance through internal capital markets is a key synergy that plays a first-order role in shaping the structure of banking firms.

We base our hypothesis on Kashyap, Rajan and Stein (2002)—originally developed to explain the joint provision of deposits and loan commitments within commercial banks. We argue that this framework can be extended to explain the integration of banks and nonbanks within BHCs.

[11] We also exclude pension funds, central bank, and government agencies (i.e. Fannie Mae and Freddie Mac) from our definition of NBFIs when constructing the "All Nonbanks" Flow of Funds aggregate.

In the KRS framework, liquidity synergies arise when entities with imperfectly correlated liquidity demands share a common pool of liquid assets. Applying this logic to modern BHCs, commercial bank and nonbank affiliates—if exposed to uncorrelated liquidity risks—can provide one another with *liquidity insurance* via internal funding flows.

This section presents descriptive evidence consistent with that hypothesis. We document patterns in liquidity management and internal funding flows that suggest active cross-entity liquidity sharing within BHCs. While these patterns do not by themselves establish causality, they motivate the quasi-experimental analyses that follow, which use plausibly exogenous shocks to the demand for, or capacity to supply, internal liquidity insurance.

Internal Transfers. The specific mechanism that enables liquidity insurance is large-scale intracompany transfers between affiliated banks and nonbanks. Figure 3 plots intracompany borrowing and lending balances held by commercial bank subsidiaries as a share of their assets, calculated as an asset-weighted average across a balanced panel of BHCs from 1995 to 2022. We emphasize four main takeaways. First, the sheer size of intracompany balances is substantial. On average, 5% of commercial bank assets are funded with intracompany borrowing from affiliated nonbanks, growing to nearly 15% during the global financial crisis.[12] Appendix Figure B.2 further highlights the scale of internal funding by showing that intracompany balances are comparable in size to total borrowing from Federal Home Loan Banks and Federal Reserve lender of last resort facilities, both of which are considered to be important sources of liquidity for banks.

Second, most of the intracompany funding used by banks is directly sourced from nonbank affiliates rather than from holding companies.[13] Third, despite Regulation W, nonbank subsidiaries are also on the receiving end of substantial transfers from the commercial bank side. While small relative to bank assets, these balances are material for the typically smaller balance sheets of nonbank subsidiaries. Finally, other theories that could rationalize the existence of nonbank subsidiaries of BHCs - like profitability, pure diversification motive, benefits from vertical integration (i.e. cross-selling money market funds and bank deposits), or informational synergies - simply do not predict the existence of meaningful, systematic internal debt balances between commercial bank and non bank subsidiaries.

We emphasize that our ability to observe intracompany balances is relatively unique in the literature on internal capital markets. In the context of internal capital markets within commercial bank divisions, KRS could not explicitly analyze intracompany transfers because such transfers are inherently unobservable for divisions that are integrated under one firm. In contrast, our setting studies flows between distinct legal

[12]Note that the intracompany funding we are measuring is specifically *debt funding*. In principle, BHC subsidiaries can also receive additional equity funding from affiliates during stress periods, particularly from their parent holding company. Caglio, Copeland and Martin (2021) show that these "equity subsidies" can be large in magnitude.

[13]Note that our measures of intracompany funding balances also include balances between banks and *intermediate* holding companies, rather than only balances between and the top-level holding company.

entities, which are observable using the regulatory data we utilize in this paper.[14]

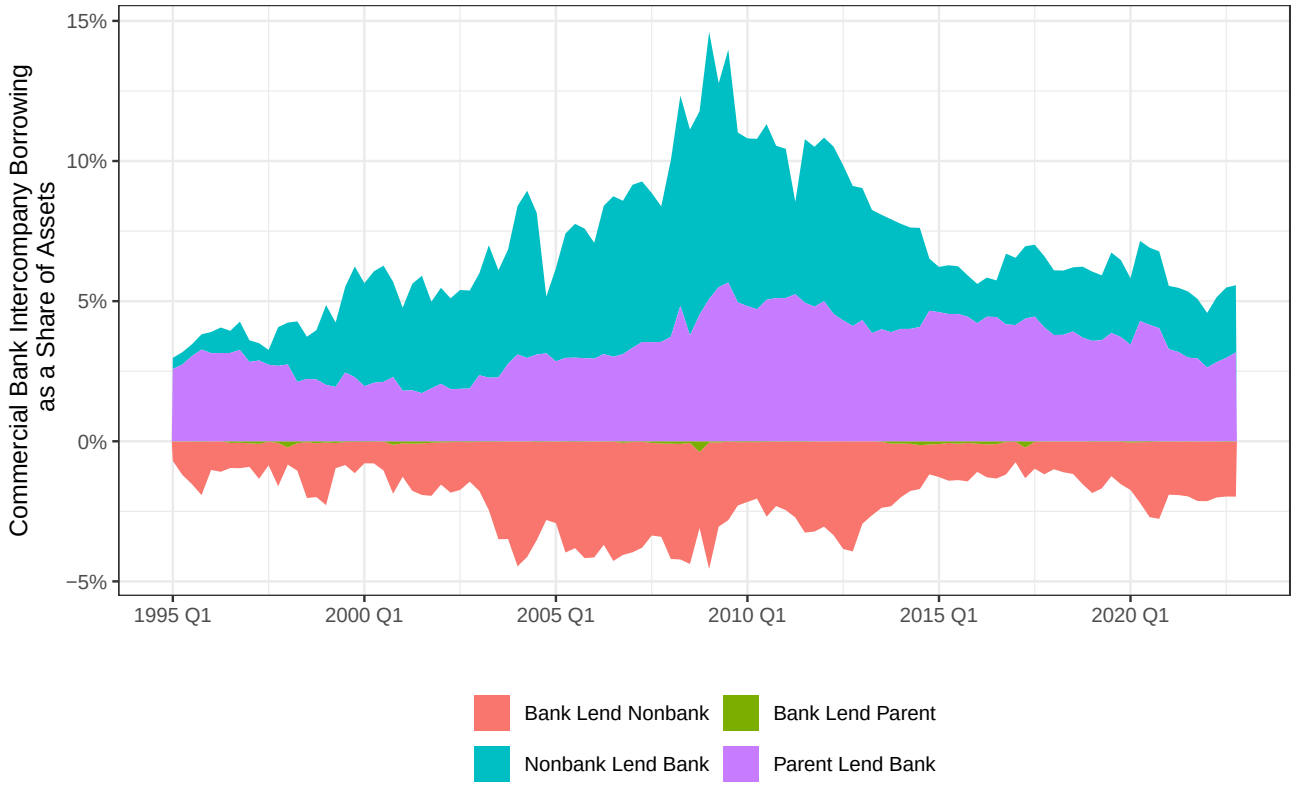

Figure 3: Intracompany Balances. This figure shows intracompany borrowing and lending by commercial bank subsidiaries, expressed as a share of their assets and averaged across a balanced panel of BHCs from 1995 to 2022. The averages are weighted by consolidated BHC assets. Balances due to affiliated nonbanks are shown in blue; balances due to affiliated holding companies in purple. Balances due from affiliated nonbanks are shown in red; balances due from affiliated holding companies in green.

The large-scale intracompany funding flows documented in Figure 3 presents aggregated flows, obscuring heterogeneity in liquidity provision across affiliate types. Due to limitations of the regulatory data, we cannot construct a full disaggregation. However, broker-dealers have reported detailed intracompany balances in the FR Y-9C since 2003. We calculate commercial bank subsidiaries' borrowing from affiliated broker-dealers *as a share* of their total intracompany borrowing. As shown in Appendix Figure B.3, broker-dealers typically provide 30-40% of all intracompany funding obtained by commercial bank subsidiaries, with this share peaking in the run-up to and during the early stages of the GFC. This implies that while broker-dealers are critical liquidity providers, they are not alone. Other nonbank affiliates also contribute meaningfully to the liquidity insurance capacity of the banking organization.

[14]Examples of existing research work that has also measured actual intracompany funding dynamics in banking is Cetorelli and Goldberg (2012*a*,*b*,*c*), but their focus was on flows between the domestic parent bank and its foreign offices, thus limited to commercial banking operations.

Intracompany Funding Rates. One potential explanation for the large intracompany funding balances documented in Figure 3 is that affiliated funding is simply cheaper than external financing. If subsidiaries face market frictions—such as limited access to wholesale funding markets or higher external borrowing costs—they may prefer to borrow internally from the parent holding company or other affiliates. To assess this possibility, Figure 4 plots the average interest rate[15] that bank and nonbank subsidiaries pay on intracompany funding from their parent holding companies.[16] These interest rate series are smoothed using a four-quarter rolling average.[17] For comparison, we also plot the federal funds rate and the high-quality market (HQM) six-month corporate bond spot rate.[18]

We find that intracompany funding rates closely track short-term market rates, with both bank and nonbank subsidiaries generally obtaining internal funding at very favorable terms. Bank subsidiaries often pay below-market rates, reflecting the fact that part of their intracompany borrowing takes the form of deposits held by the parent or other affiliates. This is noteworthy, since other wholesale funding sources available to banks—such as Federal Home Loan Bank advances or central bank liquidity facilities—typically charge rates at or above the federal funds rate. The fact that internal funding costs are lower than official liquidity backstops suggests that parent holding companies provide bank subsidiaries with a particularly inexpensive and flexible source of liquidity.

Nonbank subsidiaries, by contrast, typically pay higher rates than banks but still receive funding on terms that appear very favorable. As shown in Figure 4, the rates paid by nonbanks are often comparable to the six-month HQM corporate bond rate. Because these subsidiaries are typically smaller and riskier than the investment-grade firms underlying the HQM benchmark, this similarity suggests that parent holding companies extend funding to them at rates consistent with those available only to the safest external borrowers.

The favorable pricing of both bank and nonbank subsidiaries persists even through periods of financial stress—including the 2001 recession, the 2008–09 global financial crisis, the 2011 sovereign debt crisis, and the post-COVID monetary tightening. In particular, bank and nonbank subsidiaries did not experience a spike in internal borrowing costs during the global financial crisis, even as market borrowing costs surged. Such evidence is consistent with the view that parent holding companies provide ongoing liquidity support to affiliates, maintaining favorable funding terms even when market conditions deteriorate.

[15] The average rate is constructed as the parent's interest income from subsidiaries divided by total nonequity balances with those subsidiaries, annualized.

[16] Deposits held in subsidiary banks are included as part of the parent's intracompany balance with subsidiary banks.

[17] We apply a four-quarter rolling average because FR Y-9LP interest income is reported on a year-to-date basis, which can produce spurious quarter-to-quarter jumps when balances are reclassified, subsidiaries are merged or sold, or the reporting base resets each January. The rolling average filters out these mechanical jumps so that the series more accurately reflects underlying trends in internal funding costs.

[18] This series, constructed by the U.S. Treasury and available from FRED, reflects the yield on zero-coupon bonds for AAA, AA, and A-rated corporate issuers with six-month maturities.

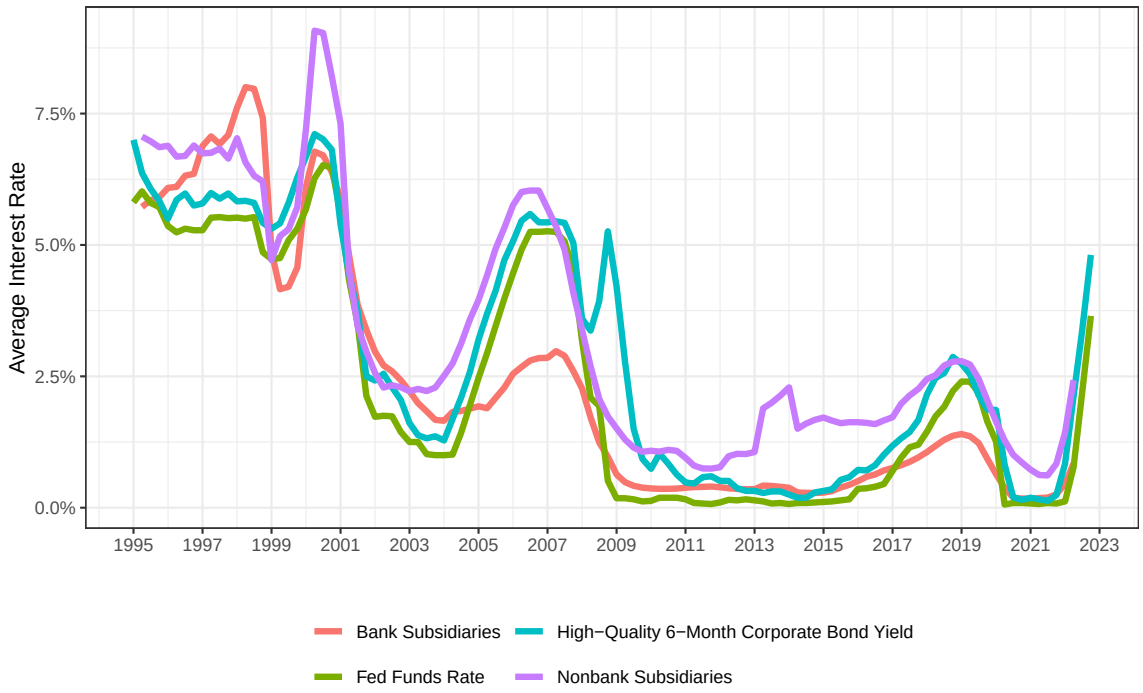

Figure 4: Intracompany Funding Rates. This figure plots the average interest rates paid on nonequity intracompany balances between holding companies and their bank and nonbank subsidiaries, based on FR Y-9LP filings for a balanced panel of BHCs from 1995 to 2022. Rates are computed as aggregate interest income divided by aggregate balances and annualized, then smoothed using a four-quarter rolling average to minimize mechanical volatility from accounting resets and structural changes. For comparison, the figure also shows the federal funds rate and the high-quality market (HQM) 6-month corporate bond spot rate.

Balance Sheet Management. Consistent with the liquidity synergy hypothesis, we also document a strong negative relationship between commercial bank liquid asset shares and the size of their affiliated nonbank operations: a larger nonbank footprint increases the capacity for internal liquidity support, thus allowing banks to hold smaller precautionary buffers.[19] The left panel of Figure 5 plots commercial bank liquid asset share against the nonbank asset share (defined as nonbank affiliate assets as a share of consolidated BHC assets), controlling for BHC and quarter fixed effects and a comprehensive set of balance sheet controls.[20] To mitigate the influence of large nontraditional BHCs with outsized nonbank footprints—such as MetLife, Goldman Sachs, and Morgan Stanley—the overlaid regression lines do not consider BHCs above the 99th percentile of the nonbank asset share distribution.

The plot reveals a clear negative correlation between liquidity buffers and nonbank asset share. Furthermore, if nonbank affiliates reduce the need for precautionary liquidity holdings, we would expect the freed-up balance sheet capacity to be reallocated toward lending. The right panel of Figure 5 supports this

[19] We follow KRS in defining liquid assets as the sum of cash (currency, central bank reserves, and balances due from commercial banks), available-for-sale (AFS) securities, and held-to-maturity (HTM) securities. Securities held in trading accounts are excluded.

[20] Controls include log deposits, log assets, the ratio of transaction deposits to total deposits, unused commitments scaled by credit exposure and by total assets, and the equity-to-asset ratio. BHC-level controls include consolidated size, capital, unused commitments, unconsolidated cash, and measures of mortgage-related exposure (e.g., nonagency MBS, CMOs, and residential real estate loans).

prediction: the commercial bank loan-to-asset ratio increases significantly with nonbank asset share, mirroring the decline in liquid assets.

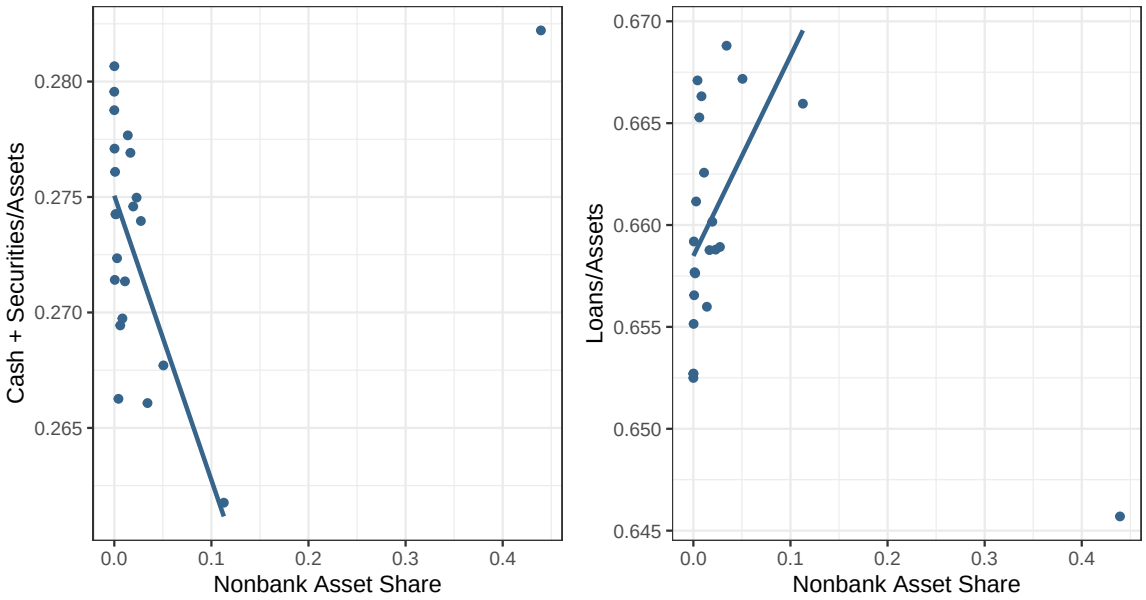

Figure 5: Liquid Asset Share vs. Nonbank Asset Share. This figure shows binscatter plots of commercial bank balance sheet composition against the nonbank asset share (defined as nonbank affiliate assets divided by consolidated BHC assets), using BHC-quarter level data from 1995 to 2022. The left panel plots the ratio of liquid assets to total assets; the right panel plots the ratio of loans to total assets. Both plots control for quarter fixed effects and a rich set of balance sheet covariates (see text). While all data is included in the plot, the overlaid regression line is estimated after trimming the independent variable at the 99th percentile to limit the influence of large, nontraditional BHCs.

We also document that increases in intracompany borrowing by commercial banks are associated with reductions in liquid asset buffers are associated with increases in intracompany borrowing, consistent with the mechanism behind the presence of liquidity synergies. Figure 6 provides a binscatter plot with liquid asset share on the vertical axis and intracompany borrowing on the horizontal axis. Both panels control for quarter fixed effects and the same same of controls as Figure 5. The left panel subsets on commercial banks and considers intracompany borrowing from affiliated nonbanks and holding companies. The right panel subsets on nonbank subsidiaries of BHCs using FR Y-11, which contains subsidiary-level financial data reported by large nonbank subsidiaries of BHCs. The panel considers intracompany borrowing by these nonbanks from affiliated commercial banks and holding companies. In both plots, we find a clear negative correlation between intracompany borrowing and liquid asset shares.

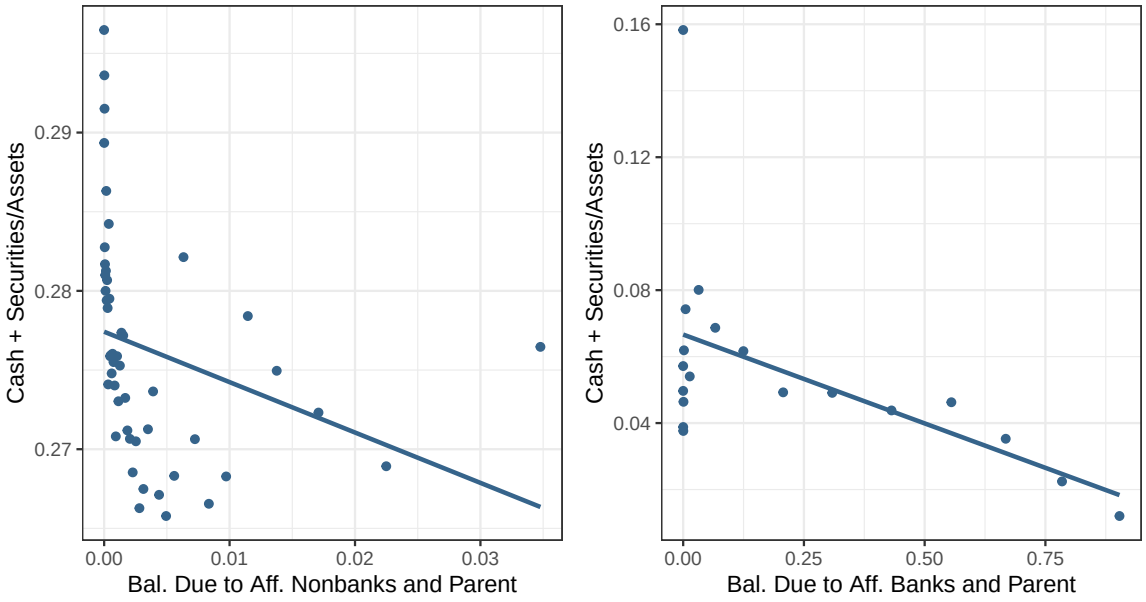

Figure 6: Liquid Asset Share vs. Intracompany Borrowing. This figure shows binscatter plots of commercial bank liquid asset share against intracompany borrowing balances as a share of assets, using BHC-quarter level data from 1995 to 2022. Both plots control for quarter fixed effects and a rich set of balance sheet covariates (see text). We trim the independent variable at the 99th percentile to limit the influence of extreme outliers.

Together, these results provide descriptive support for the idea that internal liquidity insurance affects how both banks and nonbanks manage their balance sheets. Commercial banks with a larger and more integrated nonbank footprint hold fewer liquid assets and lend more. Nonbank affiliates with access to bank-provided funding similarly reduce liquidity buffers and scale up core activities like lending and trading. The next section provides more formal tests of our claims and establishes a causal relationship between the nonbank footprint and liquidity management benefits.

6 Implicit Lines of Credit

The aggregate evidence above shows quantitatively meaningful intracompany liquidity holdings between bank and nonbank subsidiaries of BHCs. However, this pattern *per se* does not fully establish that these flows reflect purposeful liquidity synergies. For example, such positions may simply reflect operational convenience—for instance, a nonbank affiliate depositing idle cash at its commercial bank sibling, without any real coordination.[21] Regardless, affiliated deposits are still a channel of internal liquidity. Crucially, deposits simultaneously serve as liquid assets for the nonbank subsidiary and stable funding for the bank,

[21] However, these possible deposit holdings are not large enough to explain the magnitude described in the figure. While we lack direct visibility into the precise instruments underlying intracompany balances, we show in Appendix Figure B.4 that 3–7% of commercial bank deposits are owed to affiliated holding companies. Further, they certainly could not explain the existence of large borrowing *from* banks *to* nonbanks.

enabling an efficient internal liquidity arrangement without requiring formal contracts or asset reallocation. This dual role of deposits—as both liquidity buffer and funding source—enables a low-friction form of internal liquidity insurance within banking firms.

With that said, to establish a causal link between the nonbank footprint and active liquidity management, we show that internal funding flows occur *precisely* when they are most needed—consistent with a deliberate internal liquidity insurance mechanism. We argue that much of the intracompany funding activity documented in the previous section indeed reflects ex-post usage of liquidity insurance. Specifically, subsidiaries within BHCs appear to maintain relationships with their affiliates that resemble lines of credit. Commercial banks not only receive ongoing funding from nonbank affiliates, as documented in the previous section, but also have the discretion to draw upon additional funds during stress episodes. While these arrangements may not be formalized by contract, the ability to reallocate liquidity internally functions much like a drawdown on a contractual credit line. We refer to these contingent, informal liquidity commitments as *implicit lines of credit*.

To provide evidence for such implicit lines of credit, we show that intracompany funding flows increase in response to unexpected liquidity stress. We focus on a specific, plausibly exogenous shock: the 2007 collapse of the asset-backed commercial paper (ABCP) market, which imposed sudden and severe liquidity demands on certain commercial banks. As documented by Acharya, Schnabl and Suarez (2013), ABCP conduits were special purpose vehicles that issued large amounts of commercial paper using credit and liquidity guarantees from commercial bank sponsors, for whom the guarantees represented large off-balance-sheet liabilities. Importantly, there had been wide heterogeneity between commercial banks in different BHCs in terms of their exposures to ABCP conduits. When the ABCP market experienced severe stress beginning in 2007, these conduits were unable to roll over their funding, forcing commercial bank sponsors to assume the assets and liabilities of the conduits. Thus, the ABCP market stress represented a substantial liquidity shock for (differentially) exposed commercial banks, and a shock plausibly exogenous with respect to the decision of the parent banking firm to develop a given nonbank footprint. We exploit this differential exposure of commercial banks to the pre-GFC ABCP market to show that commercial banks with large nonbank affiliates experienced large increases in intracompany borrowing, *conditional on experiencing liquidity stress.*

There are three advantages to focusing on this particular episode for testing our hypothesis. First, the funding shock was unexpected, which Cetorelli and Goldberg (2012*a*) exploit in their analysis of internal capital markets within commercial banks. Second, as documented in Acharya, Schnabl and Suarez (2013), there was meaningful heterogeneity of exposure to ABCP conduits across commercial bank subsidiaries of different BHCs. Third, central banks and regulators were slow to respond to the shock, which makes this episode relatively untainted by policy responses. In contrast, other significant liquidity shocks, such as credit line drawdowns during COVID-19, were quickly met with large-scale policy measures.

Regression Specification. We estimate the following regression:

$$\frac{\text{Bank Bal Due to Nonbanks}_{it}}{\text{Bank Assets}_{it}} = \alpha_i + \alpha_t + \beta \text{ABCP Exposure}_i \times \text{Nonbank Asset Share}_{it} \times I(Post_t) + \gamma^T X_{it} + \varepsilon_{it} \quad (1)$$

In the estimated regression, we include the main effects and the nested double interactions. In the displayed equation, these terms are omitted for brevity. Bank Bal Due to Nonbanks$_{it}$ is the borrowing of the commercial bank subsidiaries of BHC i in quarter t from affiliated nonbanks, expressed as a share of commercial bank assets. ABCP Exposure$_i$ is the (pre-determined) ratio of the assets of ABCP conduits sponsored by the commercial bank subsidiaries of BHC i as a share of bank equity, as of 2006:Q4 (prior to the distress).[22] Nonbank Asset Share$_{it}$ is the ratio of nonbank assets to BHC assets. $I(Post_t)$ is a dummy for 2007:Q2 and after, when the ABCP funding shock began. α_i are BHC fixed effects and α_t are quarter fixed effects. X_{it} is a vector of time-varying controls. We restrict our sample to start in 2005:Q1 and end in 2008:Q4.

Results. The estimation results are reported in Table 3. We later discuss an event-study specification that provides evidence in support the underlying parallel trends assumptions. Columns (1) and (2) report our baseline specification with and without controls. Columns (3) and (4) test an alternative dependent variable: borrowing from Federal Reserve lender of last resort (LOLR) facilities, both scaled by commercial bank assets. The LOLR facilities include both the traditional discount window and additional facilities like the Term Auction Facility (TAF) introduced in December 2007. Note that because of Call Report reporting requirements, our LOLR borrowing variable is an approximation rather than an exact observation.[23] The outcome variable in Columns (5) and (6) is LOLR borrowing as a share of the sum of LOLR borrowing and balances due to affiliated nonbanks. This allows us to isolate substitution between sources of emergency funding, holding constant total demand for emergency funding.

We begin by examining the Nonbank Asset Share × Post interaction in Column (1), which tests whether banks with larger nonbank footprints increased their reliance on affiliated nonbank funding in the aftermath of the ABCP shock, regardless of their exposure to that shock. The small and insignificant coefficient indicates no evidence of such behavior. This null result is crucial: it shows that banks with large nonbank affiliates did not generally borrow more after the crisis—suggesting that simply having nonbank subsidiaries does not automatically trigger internal funding flows.

Now contrast this with the triple interaction in Column (1), which is large, positive, and highly significant. This result indicates that banks with larger nonbank affiliates drew more internal funding *specifically*

[22] We use data on bank exposure to ABCP conduits from Acharya, Schnabl and Suarez (2013), available on Phillipp Schnabl's website: https://pages.stern.nyu.edu/~pschnabl/data/data2.htm.

[23] We observe LOLR borrowing using the "Other Borrowed Money" variable in the Call Report (Schedule RC-M, Item 5b). This item includes both borrowing from Federal Reserve Banks and miscellaneous sources of borrowing. We interpret this item as a rough proxy for total LOLR borrowing.

if they were exposed to the liquidity shock. The fact that the nonbank footprint does not predict internal funding on its own, but only *conditional* on stress, is precisely what we would expect if nonbank affiliates function as contingent liquidity providers. In short, the internal funding mechanism behaves like a credit line: unused in normal times, activated only when liquidity needs materialize.

Columns (3)-(6) provide evidence that further supports our hypothesis that internal transfers were driven by a liquidity insurance motive. If internal funding from nonbanks was intended to alleviate sudden liquidity demands, then vulnerable banks with large nonbank affiliates should also be less likely to tap LOLR facilities. This is exactly what the data shows: ABCP-exposed banks with large nonbank footprints substituted away from discount window borrowing, both as a share of total commercial bank assets and as a share of emergency funding. These patterns imply that internal liquidity support from nonbank affiliates was not just available - it was preferred. Why might commercial banks prefer to borrow from their nonbank affiliates rather than the LOLR? First, internal borrowing avoids the well-known "stigma" associated with discount window usage, but also the need to post collateral. Second, as suggested by our descriptive evidence in Figure 4, commercial banks were getting internal funding (including internal deposits) at interest rates well below the fed funds rate and thus well below the rate that the LOLR facilities would have charged. The availability of such internal funding sources may partly explain why it was difficult for regulators to encourage banks to access the discount window during the crisis.[24]

Our results on LOLR borrowing also mitigate potential concerns that internal funding flows represent a desperate "raid" on nonbank affiliates, akin to households drawing down 401(k) savings during financial distress. If that were the case, we would expect to see all sources of borrowing increase in tandem. Instead, we find that internal funding rises sharply while borrowing from LOLR falls, suggesting that intracompany flows were not a desperate response but rather a structured activation of internal liquidity commitments.

[24]For example, in August 2007, New York Fed President Tim Geithner met with the CEOs of the largest banking institutions to encourage them to access the discount window *even if they did not necessarily needed it* so to lower market stigma and encourage other institutions as well (E.g., "Use of discount window urged", Financial Times, August 17, 2007).

Dependent Variables:	Bal. Due To Nonbanks/Assets		LOLR/Assets		LOLR/(LOLR + Bal Due to Nonbanks)	
	(1)	(2)	(3)	(4)	(5)	(6)
Nonbank Asset Share	0.0098	0.0110	0.0490	0.0142	0.2366	0.1483
	(0.0068)	(0.0078)	(0.0649)	(0.0268)	(0.2699)	(0.3127)
ABCP × Nonbank Asset Share	0.0449	-0.0970	0.0369	-0.0943	-1.073	-0.3024
	(0.0752)	(0.1384)	(0.2115)	(0.1702)	(0.7606)	(0.7682)
ABCP × Post	-0.0045***	-0.0060***	0.0187***	0.0192***	0.1137**	0.1217**
	(0.0005)	(0.0006)	(0.0025)	(0.0026)	(0.0565)	(0.0567)
Nonbank Asset Share × Post	-0.0049	-0.0054	0.0275	0.0327	-0.0881	-0.0469
	(0.0060)	(0.0060)	(0.0301)	(0.0255)	(0.1026)	(0.1061)
ABCP × Nonbank Asset Share × Post	0.2619***	0.3022***	-0.1253**	-0.1131**	-1.224***	-1.464***
	(0.0170)	(0.0152)	(0.0637)	(0.0560)	(0.2247)	(0.2315)
Controls		✓		✓		✓
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,625	18,593	18,625	18,593	8,686	8,670
R^2	0.923	0.954	0.737	0.755	0.879	0.879

Table 3: Intracompany Borrowing After ABCP Shock. This table reports estimates from Equation 4, using quarterly panel data from 2005 to 2008 at the BHC level. The dependent variables are: commercial bank borrowing from affiliated nonbanks as a share of assets, borrowing from Federal Reserve lender of last resort facilities (LOLR) as a share of assets, and LOLR borrowing as a share of the sum of LOLR and internal balances due to nonbanks. The variable *Post* is a dummy equal to one for 2007:Q2 and later. *ABCP* measures the exposure to asset-backed commercial paper conduits as of 2006:Q4, scaled by commercial bank equity. *Nonbank Asset Share* is the ratio of nonbank subsidiary assets to total consolidated BHC assets. Standard errors, clustered at the BHC level, are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Event Study Specification. To examine timing and check for pre-trends, we estimate an event study version of our baseline regressions, with 2007:Q1 as the omitted base quarter. In Figure 7, we plot the coefficients associated with our two double interactions with the post dummy and our triple interaction. We find no evidence of pre-trends based on the insignificant coefficients before 2007. In the coefficient plot for the triple interaction, we find that starting in 2007:Q2, borrowing from affiliated nonbanks begins to rise, consistent with the onset of ABCP market stress. The response strengthens through late 2007, stabilizes in early 2008 with the introduction of the Fed's Term Auction Facility, and surges again after the Lehman collapse.

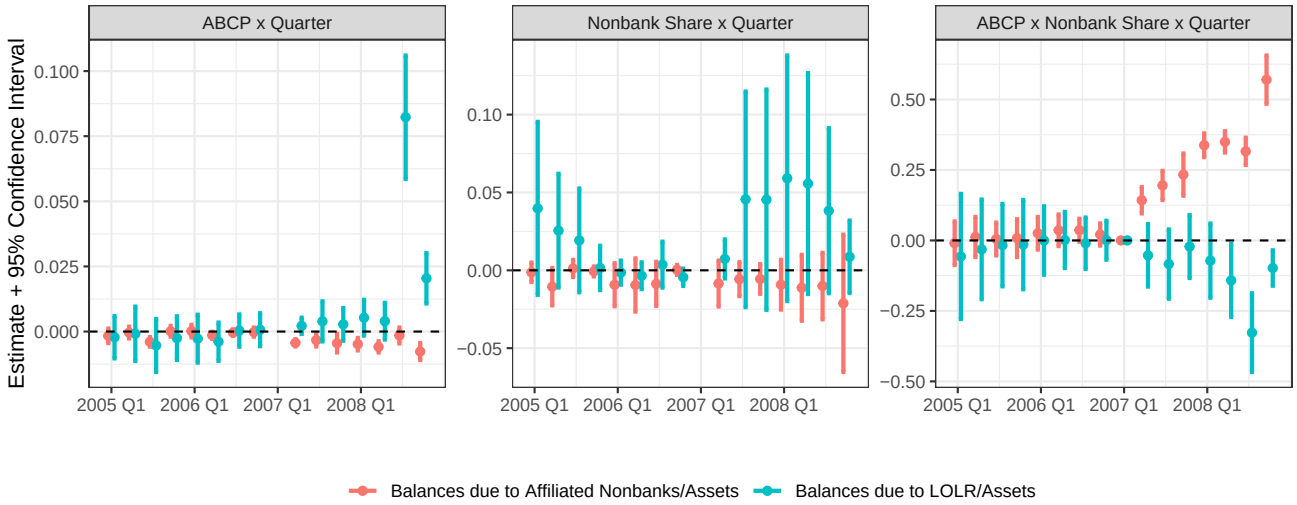

Figure 7: Event Study Coefficients. This figure shows event study coefficients from Equation 1. We plot the coefficients associated with the double interaction between ABCP Exposure and quarter dummies, the double interaction between nonbank share and quarter dummies, and the triple interaction between ABCP exposure, nonbank share, and quarter dummies. The estimated coefficients using commercial bank balances due to affiliated nonbanks as a share of assets as the outcome are denoted in red. The estimated coefficients using commercial bank balances due to LOLR as a share of assets as the outcome are denoted in red. We use 2007:Q1 as the omitted reference quarter. We include 95% confidence intervals using standard errors clustered by BHC.

Economic Significance. To quantify the economic importance of nonbank affiliates during the ABCP event, we re-estimate our baseline specifications, this time weighting each observation by BHC assets. Since ABCP-exposed BHCs were disproportionately large, asset-weighted coefficients should more appropriately capture the implications of internal funding for system-level liquidity management.

We then use these estimated coefficients to impute a simple counterfactual in which every ABCP-exposed BHC has a zero nonbank footprint. First, we note that in 2008:Q4, ABCP-exposed banks received internal transfers from nonbank affiliates worth 11.5% of assets ($696 billion). Next, we use the estimated regression to generate fitted values for LOLR borrowing as a share of assets under the assumption that the nonbank asset share is zero. The difference between actual borrowing and the counterfactual fitted values provides a bank-specific estimate of the effect that nonbank affiliates had on LOLR borrowing.

We then multiply by assets to obtain a dollar value and then sum over all of the banks. We find that the presence of nonbank affiliates and associated internal transfers reduced discount window borrowing by $176 billion (2.9% of commercial bank assets). These figures thus point at a very economically important substitution role of internal funding from nonbank affiliates vis-a-vis traditional sources of emergency liquidity available to banks.

Sources of Intracompany Funding. A limitation of our data is that we have little visibility into the types of nonbank affiliates that drive the intracompany funding response that we document. In Appendix Ta-

ble B.2, we do a limited decomposition of the aggregate funding response between broker-dealer funding and non-broker-dealer funding. We find that while broker-dealers did make some contributions to internal liquidity, non-broker-dealers made the largest contributions. These columns confirm that the broader result in Column (1) is not driven by a single affiliate type: a range of nonbank subsidiaries served as contingent liquidity providers during the shock.

Robustness. In Appendix B, we confirm that our baseline coefficient in column (1) of Table 3 is virtually unchanged when we test a variety of alternate specifications. We also show that our results are not driven by any single large bank; the baseline coefficient is highly stable to dropping any of the largest BHCs in our sample.

7 Nonbank Footprint Depends on Ex-Ante Insurance Value

A key testable implication of the liquidity synergy motive as a driver of banking firms' organizational choice is that the size of the nonbank footprint should reflect the ex-ante value of liquidity insurance provided by nonbank affiliates. If internal liquidity sharing is a central motive for integrating nonbanks into BHCs, then any regulatory shock that impairs this channel should lead firms to contract their nonbank footprint.

We test this implication by exploiting the introduction of resolution planning ("living wills") requirements within the Dodd-Frank Act. As discussed in Section 2, these rules require certain BHCs to submit periodic, detailed plans to regulators about how they would separate and resolve their businesses in the event of failure. One of the explicit goals of the regulation, exemplified by the Fed and FDIC's regulation implementing living wills, is to reduce interconnections and interdependencies between bank and nonbank subsidiaries in order to facilitate separability during resolution. Importantly, living wills did *not* impose any explicit restrictions on the size or scope of the nonbank footprint. Thus, we can reasonably interpret the introduction of living wills regulation as a specific, exogenous shock to the cost of liquidity insurance.

Narrative evidence from the language of BHCs' resolution plans reinforces this interpretation. For example, Goldman Sachs' 2015 plan (Goldman Sachs, 2015) describes the importance of "pre-positioning", i.e. the holding of "substantial liquidity in many of our material operating entities" [both bank and nonbank subs] (p. 11), as one of the pillar of their resolution strategy. These local pools of liquidity in each of their main subsidiaries was effectively a response to the regulation, so to minimize the need to engage in intra-company transactions. And later in their Plan: "We have devoted substantial resources to reducing ... the number of internal transactions which transfer risk and positions from one GS Group entity to another" (p. 29). Similarly, JP Morgan Chase in its 2019 plan (JPMC, 2019): "Among other enhancements, we have positioned liquidity at Material Legal Entities, in many cases through new term funding arrangements, and we executed actions to simplify material intercompany funding relationships and reduce interconnectedness."

(p. 93).

This setting also allows us to address an important alternative interpretation of our results: that intracompany transfers are incidental or opportunistic, rather than reflecting a core strategic motive for organizing bank and nonbank entities under a common BHC umbrella. Under this view, observed internal transfers are simply a convenient fallback mechanism—a byproduct of co-location—rather than a driver of organizational design. However, this interpretation makes a sharp prediction: if internal liquidity sharing is incidental, then a regulatory shock that impairs it should have little or no effect on BHC structure. In contrast, if internal liquidity insurance is a first-order motive, then a reduction in its ex-ante value should lead BHCs to reoptimize—specifically, by scaling back their nonbank footprints. The empirical response of BHCs to the living wills regulation provides a clean test of these competing views.

7.1 Identification Strategy

To determine the effects of these regulations on the liquidity synergy and nonbank footprint, we exploit the natural experiment created by the introduction of living wills. In November 2011, the Federal Reserve and the FDIC jointly released a rule requiring all BHCs with greater than $50 billion in assets to submit resolution plans.[25] We analyze the impact of regulation on four main outcomes related to the nonbank footprint of BHCs: nonbank asset share (nonbank assets as a share of total BHC assets), the number of unique nonbank business lines, the number of nonbank subsidiaries, and intracompany funding flows between banks and nonbanks.

We estimate treatment effects using both traditional difference-in-differences (DID) and the synthetic difference-in-differences (SDID) estimator from Arkhangelsky et al. (2021). We restrict our sample to 2010:Q1 to 2018:Q1. We end our sample period in 2018:Q1 to avoid any influence of the Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018, which modified and tailored the Dodd-Frank Act.[26] We balance our panel and identify 23 BHCs with assets greater than $50 billion as of 2011:Q4. We drop three BHCs that exceed the $50 billion asset threshold later in the sample and are thus eventually treated. Our pool of control units are the top 200 BHCs within our sample by 2011:Q4 assets, excluding treated units. We set the treatment to begin in 2011:Q4.

Several regulatory reforms were introduced around the same time as living wills, particularly capital and liquidity regulation. We later use a variety of robustness checks and placebo tests to show that these contemporaneous reforms are unlikely to confound our results.

[25] Treated banks received a different compliance date based on their size. BHCs with at least $250 billion in assets were required to submit plans by July 2012. BHCs with assets between $100 billion and $250 billion were required to comply by July 2013. BHCs with assets between $50 billion and $100 billion were required to comply by December 2013.

[26] The Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018 modified the Dodd-Frank Act such that only BHCs above $250 billion in assets would be subject to regulations like living wills. In the original iteration of Dodd-Frank, BHCs above $50 billion in assets were subject to living wills.

7.2 Baseline Results

Synthetic Difference-in-Differences. Our baseline approach estimates treatment effects using a synthetic difference-in-differences (SDID) approach from Arkhangelsky et al. (2021). SDID improves on traditional synthetic control methods by matching on pre-treatment trends, making it especially useful for outcomes such as subsidiary counts, where treated and control BHCs differ in levels. Figure 8 plots the trajectories of each outcome for the treated group and its corresponding synthetic control. By construction, the synthetic control closely matches the treated group's pre-treatment trend. For clarity, we vertically shift the synthetic control series so the pre-treatment paths are overlaid. This makes the divergence in post-treatment outcomes visually sharper. The vertical line at 2011:Q3 marks the final quarter before the regulation was announced.

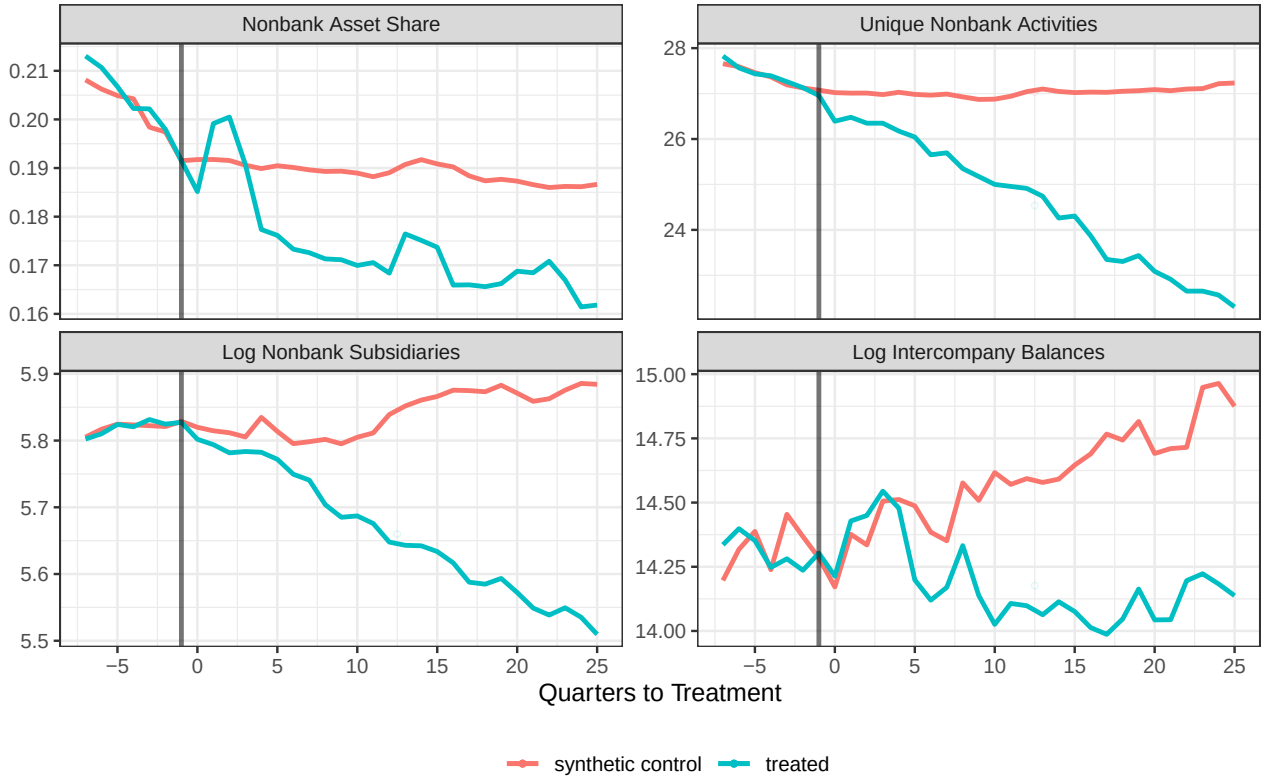

Figure 8: Synthetic Difference-in-Differences Plots. This figure provides the trajectories of our outcome variables for the treatment group and for the synthetic control group associated with each outcome. Plots are generated by the "synthdid" R package. To make parallel trends more apparent, we vertically shift the synthetic control trajectory so that the pre-treatment trajectories of the synthetic control and the treatment are overlaid on top of each other. The vertical line corresponds to 2011:Q3, which is the final pre-treatment period.

Our results show that treated banks reduced the size and scope of their nonbank footprint. We find that by 2018, treated banks reduced their nonbank asset shares by 2.5 percentage points, exited 5 nonbank activities, and cut their nonbank subsidiary count by nearly 30%. All three of these results are statistically

significant. We also find that treated BHCs reduce total intracompany funding balances between banks and nonbanks by about 40%. Our treatment effects are summarized in Table 4.

Difference-in-Differences. We also show robustness to the following traditional difference-in-differences event study specification:

$$Y_{it} = \alpha_i + \alpha_t + \sum_{k \neq 2011:Q3} \beta_k \times \text{TreatedBank}_i \times I(t = k) + X_{it}^T \gamma + \varepsilon_{it}$$

In this specification, Y_{it} is the outcome variable, α_i are BHC fixed effects, α_t are time fixed effects. In Figure B.7, we plot the β_k coefficients for each of our four outcome variables. For each coefficient, we include a 95% confidence interval using standard errors clustered at the BHC level. For all outcomes, we find statistically insignificant coefficients prior to the treatment, which generally supports the underlying parallel trends assumption. In Table 4, we summarize our quarter-by-quarter estimates into a single treatment effect estimate by interacting TreatedBank_i with a post-treatment indicator. All results are consistent with our main SDID results.

One concern about our results is that despite parallel trends, there are unobserved risk characteristics that drive the post-treatment divergence between treated and control BHCs. To address this concern, we first note that our parallel trends hold during pre-treatment quarters marked by significant macrofinancial stress, including the 2011 U.S. debt ceiling standoff and the European sovereign debt crisis. If risk characteristics were truly driving our post-treatment results, we should expect to see clear violations of parallel trends during these stress episodes.

Second, we add a set of BHC-level controls, which includes regulatory capital ratios, liquid asset ratios, the ratio of transaction deposits to total deposits, and the ratio of unused commitments to assets. These controls are intended to capture time-varying risk tolerance, particularly with respect to liquidity risk. We find that our estimated treatment effects, summarized in Table 4, are almost identical in magnitude and statistical significance when we include these controls.

Finally, we show robustness to including controls that proxy for stress experienced by BHCs during the financial crisis that could have left lasting effects on risk tolerance and other unobserved characteristics. Specifically, we augment our specification with an interaction between the post dummy and each bank's cumulative equity return during 2008. This lets the untreated counterfactual outcome include a bank-specific level shift after 2011 that is proportional to its crisis-era performance. We find that our results remain robust to this control as well. Since this specification can only be run on the publicly traded subset of our main sample, we include these results in Appendix Table B.3.

Dependent Variables	Synthetic DID (1)	DID (2)	DID with controls (3)
Nonbank Asset Share	−0.015**	−0.0252**	−0.0253**
	(0.007)	(0.0100)	(0.0102)
Unique Nonbank Activities Count	−2.493***	−2.7362***	−2.6306***
	(0.663)	(0.6649)	(0.6198)
Log Nonbank Subsidiary Count	−0.181***	−0.1714**	−0.1599**
	(0.071)	(0.0715)	(0.0681)
Log (Sum Intracompany Balances)	−0.428**	−0.4198**	−0.4298**
	(0.202)	(0.1988)	(0.1943)

Table 4: Living Will Treatment Effects. This table reports estimated effects of the 2011 introduction of resolution planning ("living wills") on measures of the nonbank footprint and internal funding. Column (1) presents results from a traditional difference-in-differences (DiD) specification. Column (2) adds controls for pre-treatment capital and liquidity ratios (see main text for details). Column (3) implements synthetic difference-in-differences (SDID), following Arkhangelsky et al. (2021), using the `synthdid` R package. The outcomes are: (1) nonbank assets as a share of total BHC assets, (2) the number of unique nonbank business lines, (3) log count of nonbank subsidiaries, and (4) log of the total intracompany balances between banks and nonbanks. Intracompany balances are defined as the sum of commercial bank balances due to and due from nonbank affiliates. Standard errors (in parentheses) are clustered by BHC for DiD and jackknifed for SDID. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Contemporaneous Regulation. One potential concern about our findings is that other post-crisis banking regulations, particularly liquidity and capital requirements, could be partly driving our results. The Liquidity Coverage Ratio (LCR), introduced around the same time as living wills, required large banks to hold more high-quality liquid assets against potential outflows. However, the LCR is not a threat to our findings because even if the LCR was fully responsible for our estimated treatment effects, our interpretation would be unaffected. Both living wills and the LCR reduce the value of internal liquidity insurance, and our estimates capture the organizational response to that change—regardless of which regulation was binding. Nonetheless, our augmented DID specification controls for interactions between the post-treatment dummy and 2011 average high-quality liquid asset (HQLA) ratios, which proxy for the degree to which the LCR constraint was likely to bind.[27]

Second, we argue that confounding from capital regulation is very unlikely. Basel III raised minimum capital on the entire banking industry after 2010; this aggregate effect is absorbed by quarter fixed effects. Capital regulation specific to large banks (e.g. GSIB surcharges) were not finalized until 2015, well after the first living will-submissions. Our coefficient plots and time series suggest that the treatment and control groups had already started to diverge by 2013. Our augmented DID specification also controls for interactions between the post-treatment dummy and 2011 average regulatory capital ratios and equity-to-assets ratios.

To further mitigate concerns about capital regulation, Figure 9 presents event study coefficient plots

[27] We calculate HQLA ratios as the sum of cash, Treasury securities, securities issued by government agencies, and agency mortgage-based securities, divided by commercial bank assets. Note that this calculation differs slightly from the regulatory definition of HQLA, which involves a more complex set of weightings of different types of securities.

where the ratio of regulatory capital to risk-weighted assets and the ratio of book equity to (unweighted) assets are used as placebo outcomes. We find no evidence that living wills were meaningfully associated with changes in both measures of capital.

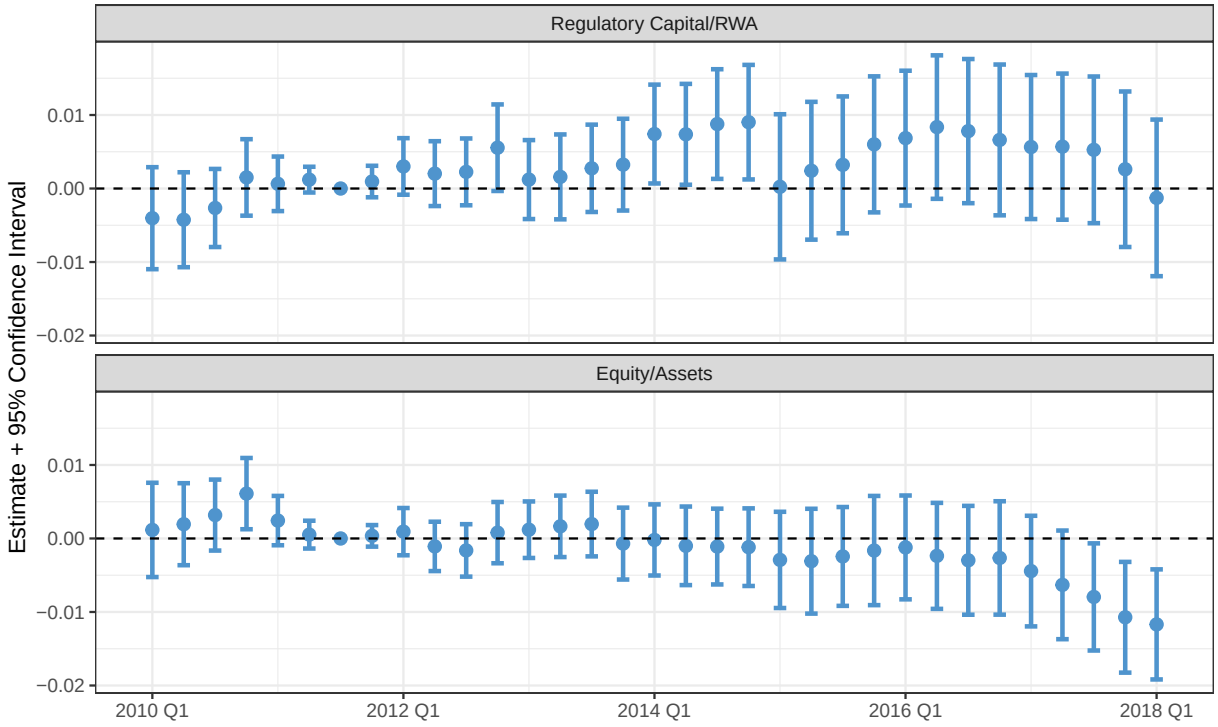

Figure 9: Placebos with Capital Ratios as Outcome. This figure presents event-study coefficient plots where we re-run our baseline difference-in-differences specification but with the ratio of regulatory capital to risk-weighted assets and the ratio of book equity to assets as outcomes.

7.3 Economic Importance

A natural question raised by our preceding results is whether liquidity synergies, while clearly present, are *first-order* drivers of BHC organizational structure. That is, even if BHCs respond to shocks to internal liquidity insurance capacity, are the magnitudes of these responses economically meaningful — both on their own and relative to other potential drivers of the nonbank footprint?

Aggregate Counterfactual. To assess economic significance, we first conduct a simple partial equilibrium counterfactual using our baseline difference-in-differences estimates. Specifically, we add BHC asset weights to our baseline difference-in-differences specification and obtain the fitted values from setting the treatment indicator equal to zero. These fitted values yield counterfactual nonbank asset shares at the BHC-quarter level. We then take the asset-weighted average of these counterfactuals across BHCs each quarter to trace

the hypothetical evolution of the industry-level nonbank asset share in a world without living wills. We plot this counterfactual against the actual time series in Figure 10.

Between 2010 and 2018, the actual industry nonbank asset share declined from 30.6% to 24.1%. Our counterfactual suggests that in the absence of living will regulation, the share would have declined only to 26.4%. This implies that roughly 35% of the total drop in nonbank footprint over this period can be attributed to living will requirements, suggesting that liquidity synergies played a quantitatively meaningful role.

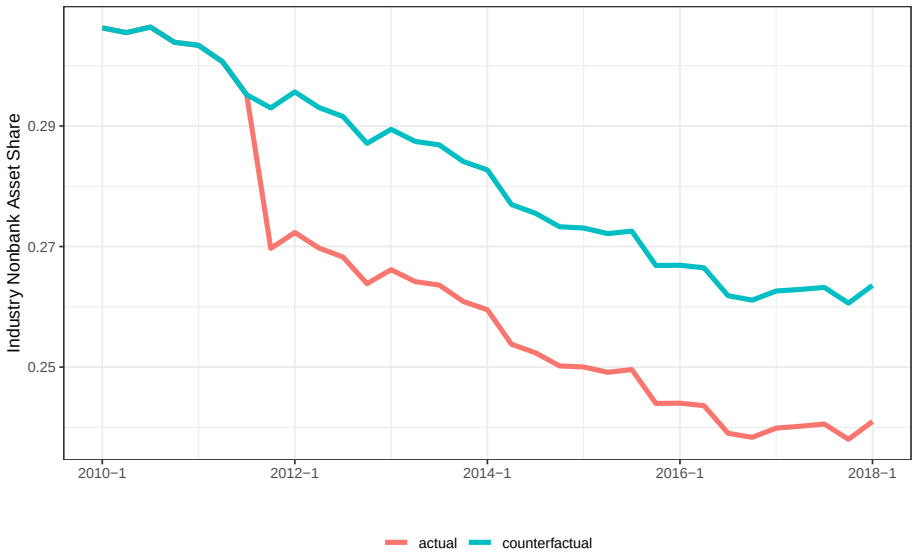

Figure 10: Counterfactual Industry Nonbank Asset Shares. This figure displays our estimated counterfactual nonbank asset share for the BHC industry in the absence of living will regulation.

Liquidity Synergies vs. Profitability. Second, we provide suggestive evidence that liquidity synergy motives are as important as other potential drivers of the nonbank footprint. While many alternative motives could matter, we focus on one: the pre-regulation profitability of nonbank subsidiaries. We examine whether our treatment effects vary with a BHC-level proxy for the aggregate profitability of nonbank subsidiaries. Specifically, we compute "revenue productivity" as aggregate nonbank operating income divided by aggregate nonbank assets (from the FR Y-9LP). Although this measure omits operating expenses due to data limitations, it offers a consistent benchmark for pre-treatment profitability across BHCs.[28]

Table 5 shows the results. We find that while BHCs with less productive nonbanks reduced their nonbank footprint sharply after the regulation, those with highly productive nonbanks responded less—indicating that productivity of nonbank subsidiaries can partially offset the lost value of liquidity synergies. To assess the relative strength of the liquidity insurance versus profitability motives for the nonbank footprint, we calculate the break-even level of nonbank productivity that would fully offset the negative treatment effect of

[28] We calculate revenue productivity as an average over 2011 to ensure it reflects pre-treatment conditions.

the regulation. In other words, how productive would a nonbank affiliate have to be for a BHC to not reduce its nonbank footprint in response to the regulation? We find that this break-even productivity lies around the 75th percentile of the pre-regulation productivity distribution. That is, a BHC's nonbank subsidiaries had to be in the top 25% of productivity to fully resist the liquidity-based motives for shrinking in response to the regulation. Thus, liquidity synergies appear to be quantitatively important for explaining BHCs' nonbank footprint choice.

Dependent Variables:	Nonbank Asset Share (1)	Unique Nonbank Activity Count (2)	Log(Nonbank Sub Count) (3)	Log (Sum Intracompany Bal) (4)
Treat x Post	-0.0337**	-3.464***	-0.2252**	-0.6820***
	(0.0131)	(0.7490)	(0.0896)	(0.2205)
Treat x Post × Nonbank ROA	0.0834**	6.313***	0.5513	1.803***
	(0.0324)	(2.245)	(0.3523)	(0.5412)
Breakeven Productivity (pp)	40%	55%	41%	38%
Breakeven Productivity Percentile	72.3%	77.7%	71.9%	76.8%
BHC FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Observations	4,290	4,290	4,224	1,848
R^2	0.980	0.977	0.977	0.971

Table 5: 2011 Living Will Treatment Effect Heterogeneity. This table reports heterogeneous treatment effects from difference-in-differences regressions estimating the impact of the 2011 living wills regulation on four outcomes: nonbank asset share, nonbank activity count, log number of nonbank subsidiaries, and log sum of intracompany funding balances. Each specification includes BHC and time fixed effects. The triple interaction term—treatment × post × nonbank productivity—tests whether BHCs with more revenue-productive nonbank affiliates were less likely to contract their nonbank footprint in response to the regulation. Nonbank revenue productivity is defined as the ratio of operating revenue to assets. We report the productivity threshold (in percentile terms) at which the predicted treatment effect reaches zero. Standard errors are clustered at the BHC level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

8 Conclusion

This paper shows that liquidity management synergies are a first-order driver of the organizational structure of U.S. banking firms. Since the 1980s, bank holding companies (BHCs) have systematically expanded their boundaries to integrate nonbank financial institutions (NBFIs)—including specialty lenders, broker-dealers, insurers, and asset managers—alongside traditional deposit-taking and lending operations. We document this transformation and provide new evidence that it is shaped by the ability of firms to reallocate liquidity internally.

During the quarter-century between deregulation in the 1980s and the global financial crisis, BHCs operated with broad flexibility in their choice of business lines. In this period, the industry added thousands of nonbank subsidiaries across virtually every segment of the nonbank financial sector. These structural changes imply that the textbook model of a deposit-funded commercial bank no longer describes the typical U.S. banking firm. Left to operate without tight structural constraints, banks have consistently chosen to integrate specialized intermediaries into their corporate boundaries.

These results offer an alternative, complementary perspective to the observed evolution in financial in-

termediation and the rise and growth of nonbanks: looking more closely, it appears that a significant component of this nonbank growth has in fact taken place over the years inside the boundaries of U.S. banking firms.

Our analysis connects this organizational pattern to a core economic mechanism: liquidity insurance. Extending the logic of Kashyap, Rajan and Stein (2002), we argue that internal funding flows between affiliates can create insurance-like benefits when subsidiaries face imperfectly correlated liquidity demands. We provide evidence of large-scale intracompany transactions between banks and nonbanks, and show that these flows intensify during stress periods—consistent with the existence of implicit lines of credit internal to the BHC. BHCs appear to internalize the value of these liquidity synergies when choosing the scope of their nonbank footprint and when managing their liquidity buffers. Our empirical estimates point at robust evidence of a causal link between the establishment of a nonbank footprint and the active management of liquidity needs internal to a BHC. Moreover, the results suggest that these liquidity synergies are economically very significant.

These results also have normative implications for regulatory design. Interventions that constrain the organizational integration of banks and nonbanks—ranging from resolution planning requirements to proposals for a modern Glass-Steagall Act—may reduce risk to insured deposits, but they also come at a cost. By restricting the use of internal liquidity insurance, such interventions may impair the efficiency with which capital is allocated inside financial conglomerates. This trade-off is analogous to the arguments made by KRS with regard to narrow banking proposals, which would separate banks into entities resembling finance companies and money market funds. KRS argue that even if money market funds are a superior savings vehicle for depositors, the benefits of narrow banking may not outweigh the costs of reducing the liquidity synergies that allow banks to be robust providers of credit lines. In our setting, the same logic applies at the level of the firm boundary: rules that force banks and NBFIs into separate entities may weaken inter-affiliate liquidity channels that support efficient intermediation.

More broadly, our findings suggest that the benefits of liquidity synergies are not limited to divisions within commercial banks, but generalize to a wide range of financial intermediaries. Liquidity provision is a core function across the financial sector, and any pair of entities facing uncorrelated funding shocks may benefit from internal insurance arrangements. As the industry continues to evolve—with the rise of hybrid intermediaries such as private equity-backed insurers and shadow bank–bank partnerships—these considerations become increasingly relevant for understanding the structure of the financial system.

Finally, our analysis offers a firm-level complement to recent work documenting system-wide liquidity interdependencies between banks and nonbanks (Acharya, Cetorelli and Tuckman, Forthcoming). Whereas that work highlights market-level funding relationships, our study shows how similar interdependencies are embedded inside financial firms. In doing so, we underscore a broader point: regulation may succeed

in redrawing the legal boundaries between banks and nonbanks, but it cannot easily sever the underlying economic connections that liquidity demands create. The interdependence between banks and nonbanks is not just a feature of market structure—it is a consequence of the core liquidity services that financial intermediaries provide.

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Appendix

The appendix is structured as follows. Appendix A provides details about the construction of the main variables used in our empirical analysis. Appendix B presents additional figures and tables.

A Data Appendix

A.1 Variable Construction

Nonbank Asset Variables from FR Y9-LP. These variables are reported only by the parent holding company with respect to their consolidated nonbank subsidiaries. Thus, we only use the Y9-LP report filed by the top-holder.

1. **Total Assets of Nonbank Subsidiaries:** This variable is derived from the FR Y9-LP, specifically line item BHCP 4778. This line item is the dollar value of all assets of nonbank subsidiaries of the parent holding company. This line item defines nonbank subsidiary as any direct or indirect nonbank subsidiary of the parent BHC, excluding commercial banks and subsidiaries of commercial banks.
2. **Loans and Leases of Nonbank Subsidiaries:** This variable is derived from the FR Y9-LP, specifically line item BHCPC427. This line item is the dollar value of total combined loans and leases on the books of nonbank subsidiaries. Past due loans are included. Balances due from related institutions are excluded. Sold or charged-off loans are excluded. Allowances for losses are not deducted.

Intracompany Balance Variables from FR Y9-LP. The following line items are reported on the unconsolidated balance sheets of holding companies. Importantly, these line items are reported by both top-tier holding companies and intermediate holding companies. All holding companies, including intermediate holding companies, report intracompany balances between any direct or indirect subsidiary of the top-tier holding company. Thus, these line items include intracompany balances between subsidiaries that are directly held by different holding companies within the same consolidated bank holding company.

1. **Balances held by subsidiary banks due from affiliated nonbanks:** This variable is derived from the FR Y9-LP, specifically line item BHCP6793. This line item is the dollar value of intracompany balances with affiliated nonbanks booked as assets on the balance sheet of subsidiary banks. In other words, this line item is the dollar value of bank lending to nonbank affiliates.
2. **Balances held by subsidiary banks due to affiliated nonbanks:** This variable is derived from the FR Y9-LP, specifically line item BHCP6795. This line item is the dollar value of intracompany balances with affiliated nonbanks booked as liabilities on the balance sheet of subsidiary banks. In other words, this line item is the dollar value of bank borrowing from nonbank affiliates. This line item includes funds that nonbank subsidiaries hold in deposits at affiliated banks.
3. **Balances held by subsidiary banks due to affiliated holding companies:** This variable is derived from the FR Y9-LP, specifically line item BHCP0533. This line item is the dollar value of intracompany balances with affiliated holding companies booked as liabilities on the balance sheet of subsidiary

banks. In other words, this line item is the dollar value of bank borrowing from affiliated holding companies. We add line item BHCP5993, which records deposits that the holding company keeps at affiliated depository institutions.

4. **Balances held by subsidiary nonbanks due to affiliated holding companies:** This variable is derived from the FR Y9-LP, specifically line item BHCP0537. This line item is the dollar value of intracompany balances with affiliated holding companies booked as liabilities on the balance sheet of subsidiary nonbanks. In other words, this line item is the dollar value of nonbank borrowing from affiliated holding companies.

5. **Balances held by subsidiary banks due from affiliated holding companies:** This variable is derived from the FR Y9-LP, specifically line item BHCP3605. This line item is the dollar value of intracompany balances with affiliated holding companies booked as assets on the balance sheet of subsidiary banks. In other words, this line item is the dollar value of bank lending to affiliated holding companies.

6. **Balances held by subsidiary nonbanks due from affiliated holding companies:** This variable is derived from the FR Y9-LP, specifically line item BHCP3606. This line item is the dollar value of intracompany balances with affiliated holding companies booked as assets on the balance sheet of subsidiary nonbanks. In other words, this line item is the dollar value of nonbank lending to affiliated holding companies.

Nonbank Asset Variables from FR Y9-C.

1. **Net Assets of Broker-Dealer Subsidiaries:** This variable is derived from the FR Y9-C, specifically line item BHCKC252. This line item is the dollar value of assets of broker-dealer subsidiaries of the parent holding companies, excluding balances due from intracompany affiliates.

2. **Assets Under Management in Proprietary Mutual Funds and Annuities:** This variable is derived from the FR Y9-C, specifically line item BHCKB570. This line item is the dollar value of assets under management of mutual funds or annuities for which the reporting holding company or a subsidiary of the holding company acts as investment advisor.

Intracompany Balance Variables from FR Y9-C.

1. **Balances held by subsidiary broker-dealers due from affiliated banks:** This variable is derived from the FR Y9-C, specifically line item BHCK4833. This line item is the dollar value of intracompany balances with affiliated banks, and subsidiaries of affiliated banks, booked as assets on the balance sheet of broker-dealer subsidiaries.

2. **Balances held by subsidiary broker-dealers due from affiliated nonbanks:** This variable is derived from the FR Y9-C, specifically line item BHCK4834. This line item is the dollar value of intracompany balances with affiliated nonbanks booked as assets on the balance sheet of broker-dealer subsidiaries.

3. **Balances held by subsidiary broker-dealers due from parent holding company:** This variable is derived from the FR Y9-C, specifically line item BHCK4832. This line item is the dollar value of intracompany balances with the parent company booked as assets on the balance sheet of broker-dealer subsidiaries.

4. **Balances held by subsidiary broker-dealers due to affiliated banks:** This variable is derived from the FR Y9-C, specifically line item BHCK5043. This line item is the dollar value of intracompany balances with affiliated banks, and subsidiaries of affiliated banks, booked as liabilities on the balance sheet of broker-dealer subsidiaries.

5. **Balances held by subsidiary broker-dealers due to affiliated nonbanks:** This variable is derived from the FR Y9-C, specifically line item BHCK5045. This line item is the dollar value of intracompany balances with affiliated nonbanks booked as liabilities on the balance sheet of broker-dealer subsidiaries.

6. **Balances held by subsidiary broker-dealers due to parent holding company:** This variable is derived from the FR Y9-C, specifically line item BHCK5041. This line item is the dollar value of intracompany balances with the parent company booked as liabilities on the balance sheet of broker-dealer subsidiaries.

A.2 Summary Statistics

Almost all of our results are based on our main sample spanning the years 1995 to 2022. Our analysis of the ABCP shock and living wills use subsets of this main sample. We begin our sample in 1995 due to availability of some variables in the regulatory filings that we use. In Table A.1, we provide summary statistics for these liquid asset variables and nonbank asset shares. We also provide summary stats for transaction deposit shares and unused credit line exposure, which are key control variables in some of our empirical tests. We note that the distribution of nonbank asset shares is very right-tailed. This is not surprising, reflecting the fact - as shown in the table - that the U.S. banking industry historically displays a very right-tailed distribution for *total* assets, and that expanding scope by acquiring nonbank assets naturally requires sufficient scale in terms of balance sheet size.

Variable	Obs	Mean	SD	Min	25th	Median	75th	90th	95th	99th
All BHCs										
BHC Assets ($B)	112975	11.74	115.27	0	0.26	0.57	1.43	5.63	15.60	184.21
Bank (Cash + Securities)/Assets	112975	0.28	0.13	0	0.19	0.26	0.35	0.44	0.51	0.67
Nonbank Assets/BHC Assets	112975	0.02	0.08	0	0.00	0.00	0.00	0.03	0.05	0.36
Broker-Dealer Assets/BHC Assets	66680	0.00	0.03	0	0.00	0.00	0.00	0.00	0.00	0.02
Mutual Fund AUM/BHC Assets	80950	0.02	0.33	0	0.00	0.00	0.00	0.00	0.01	0.40
Nonbank Loans/BHC Assets	112975	0.00	0.03	0	0.00	0.00	0.00	0.00	0.00	0.07
Unique Nonbank Activities Count	112975	2.99	5.02	0	1.00	2.00	3.00	7.00	11.00	24.00
Bank Bal Due to Aff. Nonbanks/Assets	112975	0.00	0.09	0	0.00	0.00	0.00	0.00	0.00	0.02
Bank Bal Due From Aff. Nonbanks/Assets	112975	0.00	0.20	0	0.00	0.00	0.00	0.00	0.00	0.01
Bank Bal Due to Holding Companies/Assets	112975	0.01	0.28	0	0.00	0.00	0.00	0.01	0.02	0.04
Bank FHLB Advances/Assets	112975	0.02	0.04	0	0.00	0.00	0.01	0.06	0.10	0.16
Bank Discount Window Borrowing/Assets	112975	0.00	0.01	0	0.00	0.00	0.00	0.00	0.00	0.05
Nonbank Assets > 0										
BHC Assets ($B)	47542	26.36	176.62	0	0.41	0.94	3.29	17.94	60.66	589.39
Bank (Cash + Securities)/Assets	47542	0.27	0.13	0	0.18	0.25	0.33	0.43	0.50	0.71
Nonbank Assets/BHC Assets	47542	0.04	0.11	0	0.00	0.01	0.02	0.06	0.18	0.71
Broker-Dealer Assets/BHC Assets	30876	0.01	0.05	0	0.00	0.00	0.00	0.00	0.00	0.18
Mutual Fund AUM/BHC Assets	36315	0.05	0.50	0	0.00	0.00	0.00	0.00	0.13	1.08
Nonbank Loans/BHC Assets	47542	0.01	0.04	0	0.00	0.00	0.00	0.00	0.02	0.17
Unique Nonbank Activities Count	47542	5.29	6.85	0	2.00	3.00	6.00	12.00	17.00	40.00
Bank Bal Due to Aff. Nonbanks/Assets	47542	0.00	0.13	0	0.00	0.00	0.00	0.00	0.01	0.06
Bank Bal Due From Aff. Nonbanks/Assets	47542	0.01	0.30	0	0.00	0.00	0.00	0.00	0.00	0.05
Bank Bal Due to Holding Companies/Assets	47542	0.02	0.43	0	0.00	0.00	0.01	0.02	0.03	0.06
Bank FHLB Advances/Assets	47542	0.02	0.04	0	0.00	0.00	0.02	0.07	0.10	0.17
Bank Discount Window Borrowing/Assets	47542	0.00	0.02	0	0.00	0.00	0.00	0.00	0.01	0.07

Table A.1: Summary Statistics. This table shows summary statistics of selected variables used in our analysis. The sample period is 1995 to 2022. Panel A shows summary statistics for the universe of BHCs. Panel B shows summary statistics for the set of BHCs with positive nonbank assets.

B Additional Figures and Tables

B.1 Section 4: Descriptive Evidence

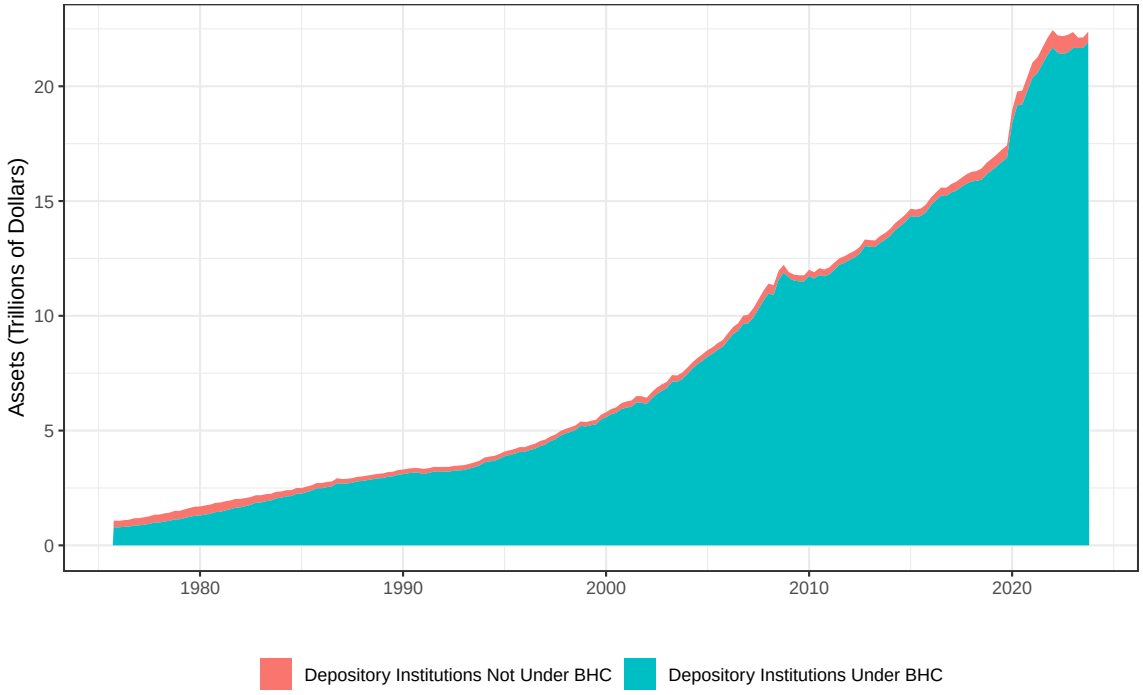

Figure B.1: Assets of Commercial Banks Held by BHCs vs. Stand-Alone Commercial Banks. This figure calculates the assets of commercial banks that are held within bank holding companies and the assets of "stand-alone" depository institutions that are not held within bank holding companies. Our data source is the Call Reports. We identify depository institutions held by BHCs by merging the Call Reports with our database of BHC organizational structure.

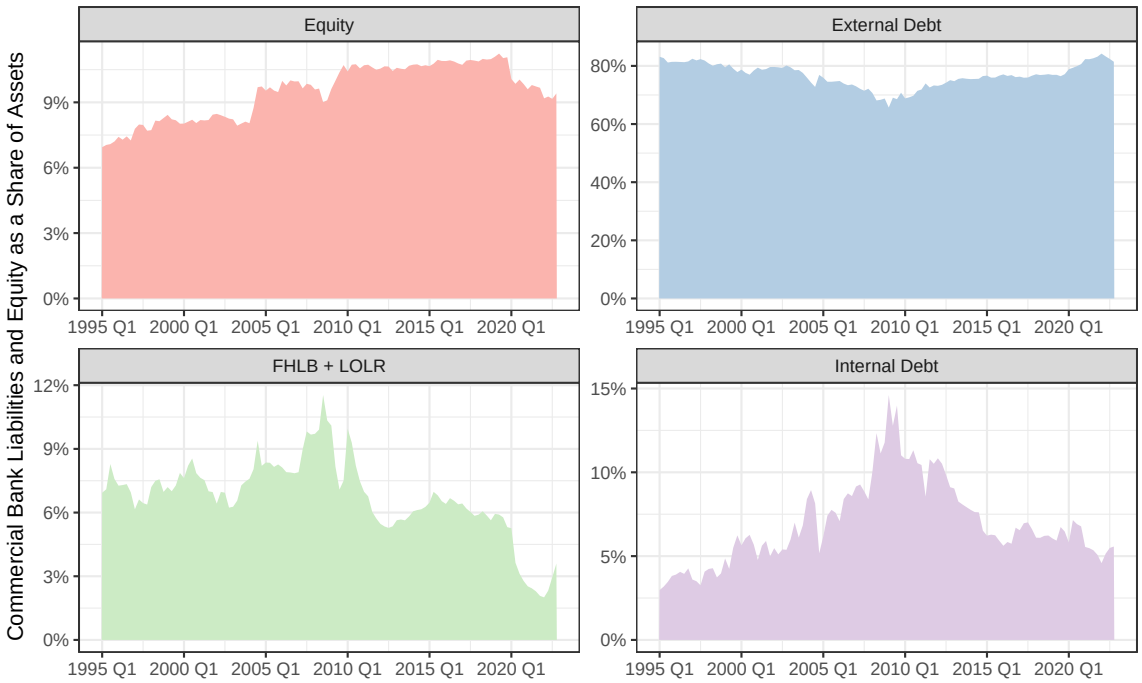

Figure B.2: Commercial Bank Liability Structure. This figure uses Call Report and FR Y9-LP data to plot commercial bank equity, internal debt balances due to affiliated nonbanks and holding companies, and borrowings from Federal Home Loan Banks and Federal Reserve ("FHLB + LOLR"), all as a share of assets. External debt as a share of assets is calculated as a residual category.

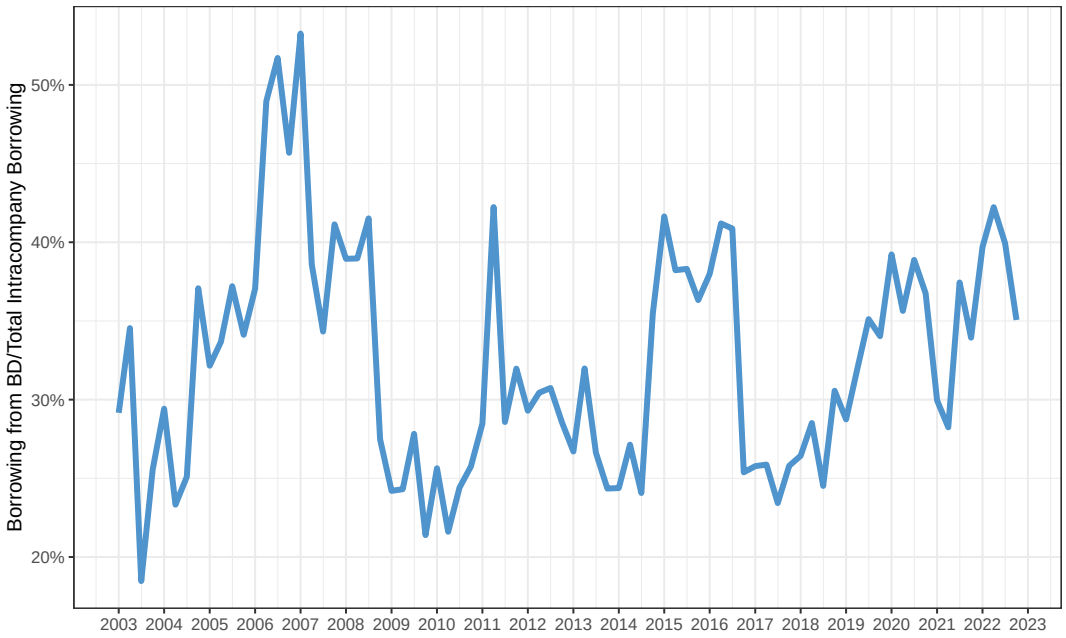

Figure B.3: Bank Borrowing from Affiliated Broker-Dealers as Share of All Intracompany Borrowing. This figure reports the share of total intracompany funding received by commercial banks that originates from affiliated broker-dealers. The sample runs from 2003 to 2023 and is constructed using FR Y-9C data. Broker-dealers typically account for 30–40% of all intracompany borrowing obtained by commercial bank subsidiaries from nonbank affiliates, with this share rising significantly in the run-up to and during the global financial crisis.

B.2 Section 5: ABCP Shock

Importance of Deposits from Affiliates. Figure B.4 shows that a large portion of commercial bank deposits are owed to affiliated holding companies, which suggests that many intracompany balances held by commercial banks may simply reflect deposits held by nonbank affiliates.

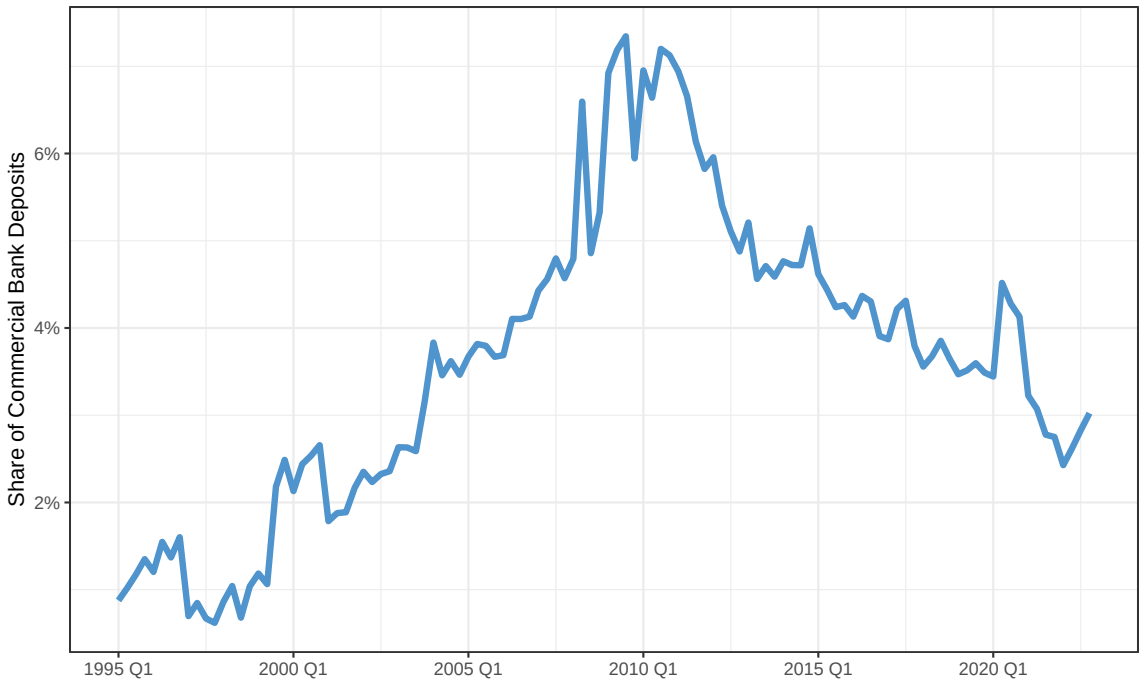

Figure B.4: Share of Commercial Bank Deposits Owed to Affiliated Holding Companies. This figure shows the ratio of deposit balances due from commercial bank subsidiaries to holding companies over total commercial bank deposits. The data are reported by holding companies in the FR Y-9LP and cover the period from 1995 to 2022. These affiliated deposits represent an internal source of funding for commercial banks and a liquid asset for the holding company.

Event Study Coefficients. In Section 5, we provide a plot of event study coefficients for our baseline result from column (1) of Table 3, which regresses internal funding from nonbanks on the triple interaction between ABCP exposure, nonbank asset share, and post dummy. In Figure B.5, we provide analogous event study plots for the remaining specifications in Table 3, corresponding to columns (3) and (5). These plots confirm parallel trends for these alternate specifications.

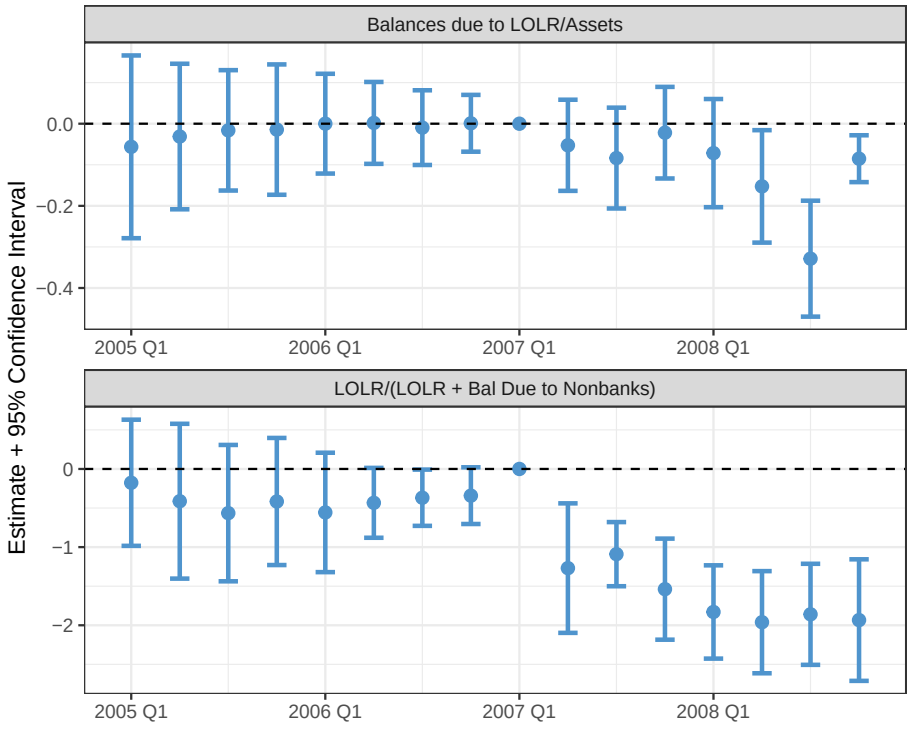

Figure B.5: Coefficient Plots for ABCP Results. This figure shows event study coefficients from regressions of commercial bank funding sources on the triple interaction between ABCP exposure, nonbank asset share, and a post-shock indicator (see Table 3). The top panel uses the ratio of lender-of-last-resort balances (LOLR) to commercial bank assets and the bottom panel uses the ratio of LOLR balances to the sum of LOLR and internal balances due to affiliated nonbanks. We use 2007:Q1 as the omitted reference quarter. We include 95% confidence intervals using standard errors clustered by BHC.

Alternate Specifications. This table reports coefficient estimates and standard errors for the triple-difference term—ABCP exposure × nonbank asset share × post-shock dummy—from the baseline regression specification in Column (1) of Table 3. Each row corresponds to a robustness check relative to the baseline regression (Row 1). Row 2 restricts the sample to BHCs with a strictly positive nonbank footprint. Row 3 restricts the sample to the top 50 BHCs by assets in each quarter. Rows 4 through 6 re-weights the regression by BHC assets, log BHC assets, and inverse asset rank, respectively. Across all specifications, the estimated triple-difference coefficient remains extremely stable.

Specification	β_1	SE
1. Baseline	0.2619***	0.0170
2. Nonbank Asset Share > 0	0.2618***	0.0170
3. Top 50 BHCs	0.2518***	0.0145
4. Weight by BHC Assets	0.2375***	0.0153
5. Weight by Log BHC Assets	0.2605***	0.0166
6. Weight by Inverse Asset Rank	0.2244***	0.0159

Table B.1: Robustness Checks for ABCP Baseline Regression. This table presents robustness checks for the triple interaction term in Table 3: ABCP exposure × nonbank asset share × post-shock dummy. Each row reports coefficient estimates and standard errors from a variant of the baseline regression in Table 4. Specifications include alternative trimming thresholds, a log-transformed specification, restriction to BHCs with nonzero nonbank footprint, and the inclusion of additional controls such as balance sheet size, liquidity, and external funding sources. Across all variants, the triple-difference coefficient remains statistically significant and consistent in sign and magnitude. Standard errors are clustered at the BHC level. *** p<0.01, ** p<0.05, * p<0.1.

Leave-One-Out Analysis. To assess whether our triple-difference results are disproportionately driven by any single large treated institution, we perform a leave-one-out analysis. Specifically, we take out baseline triple-difference regression with balances due to affiliated nonbanks as the outcome, iteratively drop each of the ten largest treated BHCs by asset size as of 2007:Q1, and re-estimate the regression. Figure B.6 plots the resulting triple difference coefficients and their 95% confidence intervals. The dashed vertical line indicates the baseline estimate using the full sample. Across all iterations, the estimates remain statistically significant and economically meaningful. This confirms that the main effect is not driven by any single institution and that the result is robust to the exclusion of the most systemically important BHCs.

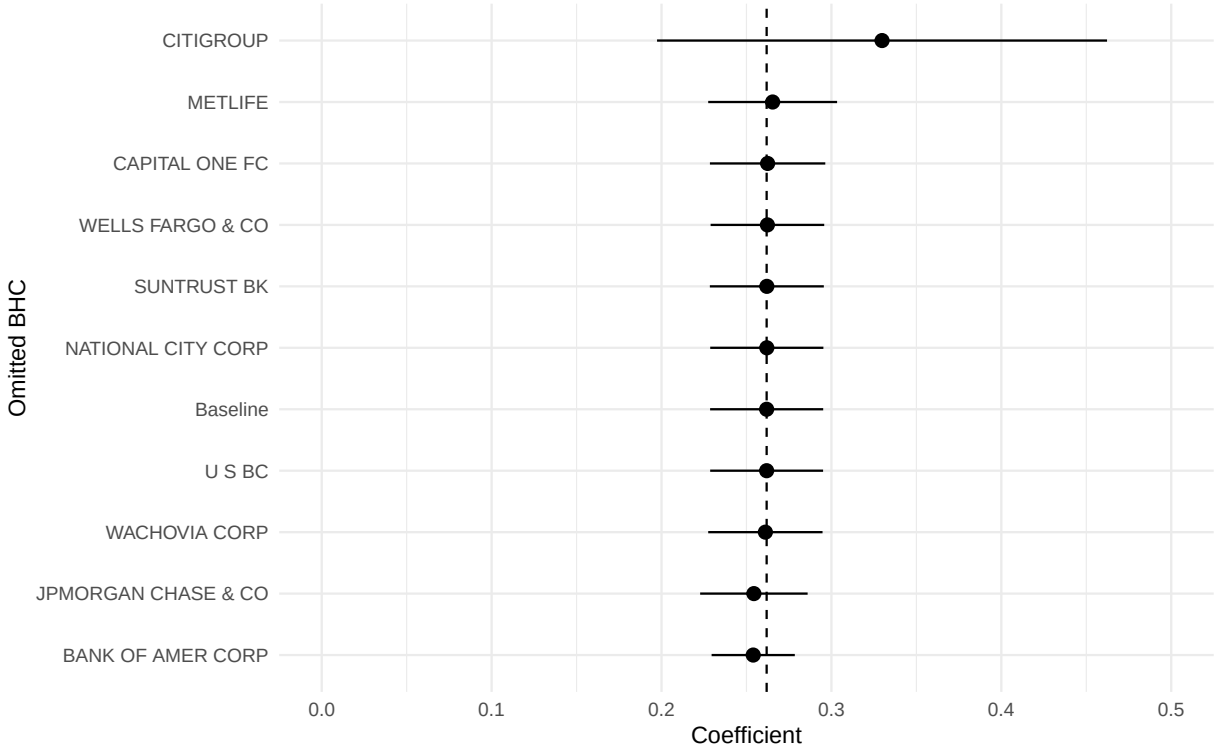

Figure B.6: Leave-One-Out Robustness for ABCP Results. This figure shows how the estimated coefficient on the triple interaction term (ABCP exposure × nonbank asset share × post-shock dummy) for the balances due to nonbanks outcome changes when the largest treated BHCs are excluded one at a time. Each point reflects the estimate obtained when omitting one of the ten largest treated BHCs by asset size as of 2007:Q1. Vertical lines denote 95% confidence intervals based on standard errors clustered at the BHC level. The dashed vertical line shows the baseline estimate using the full sample. The stability of the estimates indicates that no single large institution is disproportionately driving the results.

Sources of Intracompany Funding. Table B.2 provides a limited decomposition of the aggregate intracompany funding response between broker-dealer funding and non-broker-dealer funding. Due to data limitations, we cannot further decompose non-broker-dealer funding. We find that while our estimates for broker-dealer funding are statistically significant, non-broker-dealers accounted for a greater share of the total intracompany funding response.

Dependent Variables:	(Bal. Due To Nonbanks)/Assets	Broker-Dealers	Non-BD Nonbanks
	(1)	(2)	(3)
Nonbank Asset Share	0.0098	0.0004	0.0094
	(0.0068)	(0.0015)	(0.0067)
ABCP × Nonbank Asset Share	0.0449	0.0819	-0.0376
	(0.0752)	(0.0906)	(0.0362)
ABCP × Post	-0.0045***	-0.0004	-0.0041***
	(0.0005)	(0.0005)	(0.0005)
Nonbank Asset Share × Post	-0.0049	0.0008	-0.0057
	(0.0060)	(0.0007)	(0.0060)
ABCP × Nonbank Asset Share × Post	0.2619***	0.0477**	0.2142***
	(0.0170)	(0.0227)	(0.0148)
BHC FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Observations	18,625	18,197	18,197
R^2	0.923	0.909	0.920

Table B.2: ABCP Funding Response by Affiliate. Column (1) presents our baseline regression specification from Column (1) of Table 3. Column (2) uses commercial bank balances due to affiliated broker-dealers as a share of commercial bank assets as the outcome variable. Column (3) uses commercial bank balances due to affiliated nonbanks other than broker-dealers as a share of commercial bank assets as the outcome variable. The outcome variable in Column (3) is calculated as balances due to affiliated nonbanks minus balances due to affiliated broker-dealers.

B.3 Section 6: Living Wills

Difference-in-Differences Event Study Coefficients. In Figure B.7, we plot event study estimates from the dynamic difference-in-differences specification in Section 7.

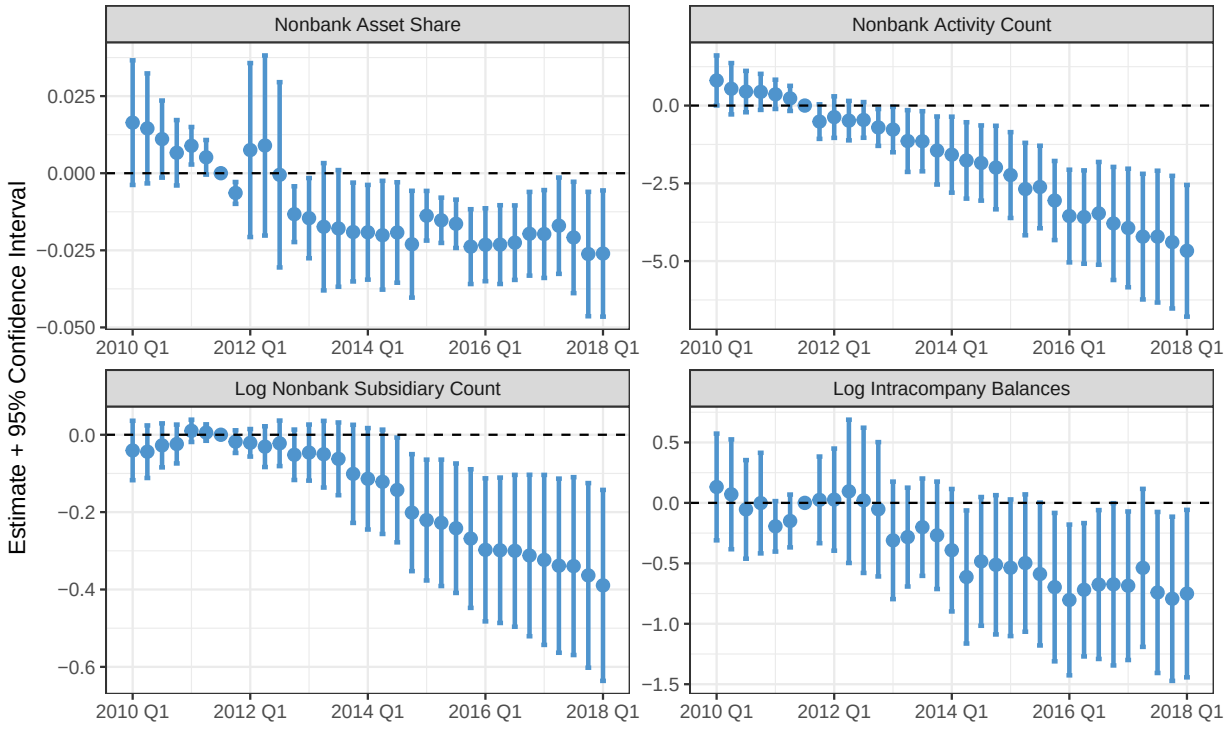

Figure B.7: Event Study Coefficients for Living Will Treatment Effects. This figure presents event study estimates from difference-in-differences regressions evaluating the impact of living wills regulation on four outcomes: nonbank asset share, nonbank activity count, number of nonbank subsidiaries, and log intracompany balances. Each panel shows interaction terms between the treatment group indicator and quarter fixed effects, with 2011:Q3 as the omitted base period. Standard errors are clustered at the BHC level.

Controls for Stock Returns During GFC. In Table B.3, we augment the baseline DID specification by adding a control for bank-level cumulative equity returns during 2008, interacted with the post dummy. This allows us to mitigate the concern that post-treatment dynamics are confounded by differential financial stress or risk tolerance driven by crisis-era performance. Since some banks in our sample are not publicly traded, our augmented specification is estimated on fewer observations. Columns (1)-(3) use nonbank asset share as the outcome, while columns (4)-(6) use unique nonbank activity count as the outcome. Columns (1) and (4) present the baseline specification from the main text, columns (2) and (5) control for 2008 stock returns, and columns (3) and (6) add the additional control variables described in Section 6. Comparing across specifications, we find that the negative treatment effects are robust, although the effect on nonbank asset share is somewhat attenuated.

	Nonbank Asset Share			Unique Nonbank Activity Count		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat x Post	-0.0252**	-0.0185***	-0.0193***	-2.736***	-3.030***	-2.808***
	(0.0100)	(0.0062)	(0.0072)	(0.6649)	(0.7285)	(0.6353)
Stock Return in 2008 × Post		-0.0072	-0.0040		-0.0204	-0.4210
		(0.0101)	(0.0069)		(0.4905)	(0.5249)
Controls			✓			✓
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,600	4,125	4,125	6,600	4,125	4,125
R^2	0.979	0.987	0.987	0.977	0.976	0.977

Table B.3: Living Wills - Controlling for GFC stock returns. This table presents variants of the main difference-in-difference specification from Table 4. Columns (1) and (4) correspond to the baseline specifications for nonbank asset share and unique nonbank activities as outcomes. In columns (2) and (5), we introduce bank-level cumulative equity returns during 2008 interacted with the post dummy as a control. Equity return data is sourced from CRSP. In columns (3) and (6), we add the additional bank-level controls described in Section 6, including pre-treatment capital ratios, liquid asset ratios, total deposits as a share of assets, transaction deposits as a share of total deposits, and unused commitments as a share of assets. Standard errors, in parentheses, are clustered at the BHC level. *** p<0.01, ** p<0.05, * p<0.1.

Leave-One-Out Analysis. This figure displays a leave-one-out robustness check for the estimated treatment effect of living wills on the nonbank asset share of BHCs, based on the difference-in-differences specification with controls. Each point shows the estimated coefficient on the treatment indicator when one large treated BHC is excluded from the sample. The dashed vertical line represents the full-sample baseline estimate. Across all iterations, the estimated effects remain negative and tightly clustered around the baseline, indicating that no single institution is driving the overall result.

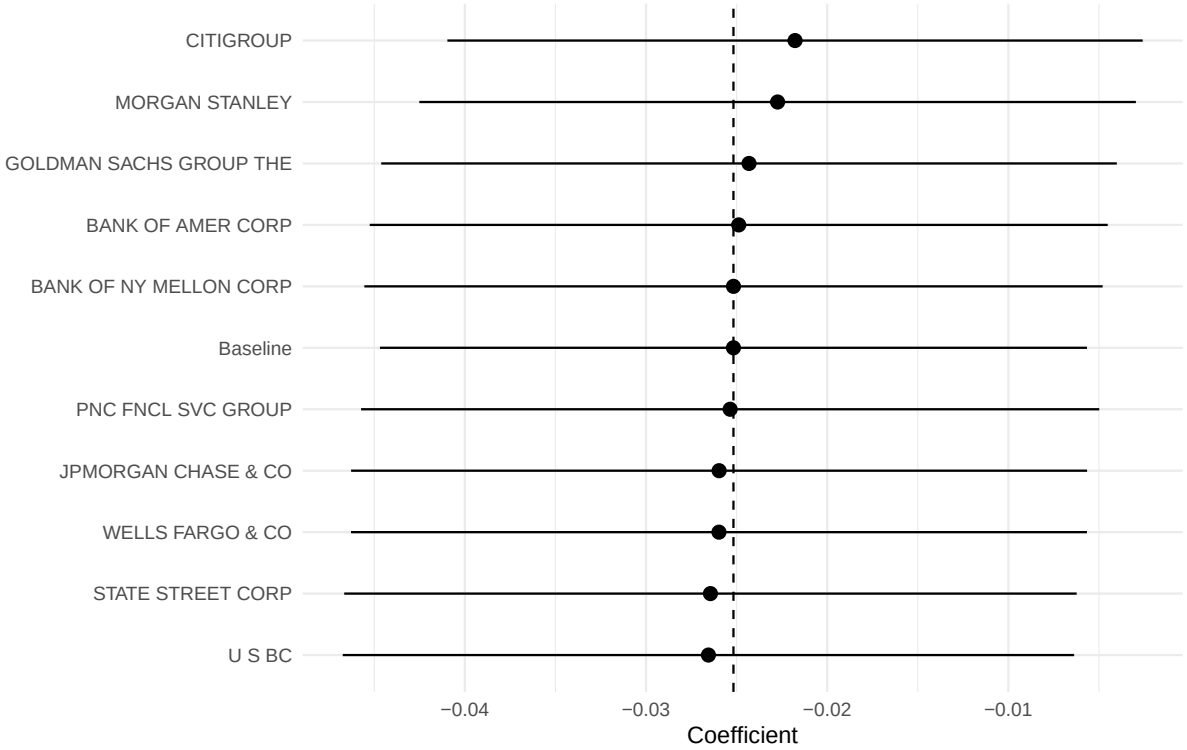

Figure B.8: Leave-One-Out Robustness for Living Wills. This figure shows how the estimated effect of living wills on nonbank asset share changes when the largest treated BHCs are excluded one at a time. Each point represents the coefficient estimate from a difference-in-differences regression with controls, omitting one major BHC. The dashed vertical line indicates the baseline estimate using the full treated sample. The stability of the estimates confirms that the observed treatment effect is not driven by any single institution.