

**STUDY OF THE EFFECTS OF SIZE AND COMPLEXITY OF FINANCIAL
INSTITUTIONS ON CAPITAL MARKET EFFICIENCY AND ECONOMIC GROWTH
CARRIED OUT AT THE DIRECTION OF THE CHAIRPERSON OF THE FINANCIAL
STABILITY OVERSIGHT COUNCIL**

**ISSUED PURSUANT TO SECTION 123 OF THE
DODD-FRANK WALL STREET REFORM AND CONSUMER PROTECTION ACT**

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Table of Contents

Table of Contents2

I. OVERVIEW4

 Introduction.....4

 A Brief Historical Background6

II. REVIEW OF POSSIBLE LIMITATIONS ENUMERATED IN SECTION 1238

Section A. Explicit or Implicit Limits on the Maximum Size of Banks, Bank Holding Companies, and Other Large Financial Institutions8

 Section A Review of the Literature.....8

 Section A Regulatory Developments12

 Section A Summary14

Section B. Limits on the Organizational Complexity and Diversification of Large Financial Institutions15

 Section B Review of the Literature.....15

 Section B Regulatory Developments17

 Section B Summary18

Section C. Requirements for Operational Separation Between Business Units of Large Financial Institutions in Order to Expedite Resolution in Case of Failure.....19

 Section C Review of the Literature.....19

 Section C Regulatory Developments19

 Section C Summary19

Section D. Limits on Risk Transfer Between Business Units of Large Financial Institutions21

 Section D Review of the Literature.....21

 Section D Regulatory Developments22

 Section D Summary23

Section E. Requirements to Carry Contingent Capital or Similar Mechanisms25

 Section E Review of the Literature25

 Section E Regulatory Developments27

 Section E Summary27

Section F. Limits on Commingling of Commercial and Financial Activities by Large Financial Institutions28

 Section F Review of the Literature28

Section F Regulatory Developments.....	28
Section F Summary.....	28
Section G. Segregation Requirements between Traditional Financial Activities and Trading or Other High-Risk Operations in Large Financial Institutions	29
Section G Review of the Literature.....	29
Section G Regulatory Developments	31
Section G Summary	32
Section H. Other Limitations on the Activities or Structure of Large Financial Institutions That May be Useful to Limit Systemic Risk.....	33
Section H Review of the Literature.....	33
Section H Regulatory Developments	39
Section H Summary	43
III. REFERENCES	44

I. OVERVIEW

Section 123 of the Dodd-Frank Wall Street Reform and Consumer Protection Act (Pub. L. 111-203) (Dodd-Frank Act) requires the Chairperson of the Financial Stability Oversight Council (Council) to conduct a study of the economic impact of possible financial services regulatory limitations intended to reduce risks to financial stability and to make recommendations regarding the optimal structure of any limits considered. This report has been prepared in response to this mandate.

Section II of this report addresses each of the topics identified in section 123. Section II.A discusses explicit or implicit limits on the maximum size of banks, bank holding companies, and other large financial institutions. Section II.B discusses limits on the organizational complexity and diversification of large financial institutions. Section II.C discusses requirements for operational separation between business units of large financial institutions to expedite resolution in case of failure. Section II.D discusses limits on risk transfer between business units of large financial institutions. Section II.E discusses requirements to carry contingent capital or similar mechanisms. Section II.F discusses limits on commingling of commercial and financial activities by large financial institutions. Section II.G discusses segregation requirements between traditional financial activities and trading or other high-risk operations in large financial institutions. Finally, Section II.H discusses stress tests and capital and liquidity requirements as other limitations on the activities or structure of large financial institutions that may limit risks to financial stability.

Section 123 of the Dodd-Frank Act calls for a report to be issued every five years. This report updates the most recent report issued under section 123, published in 2016 (the 2016 Report), and addresses the literature published during the intervening years as well as the regulatory developments and implementation of the Dodd-Frank Act. The remainder of this overview section reproduces portions of the introduction and historical background sections of the 2016 Report with relevant updates that provide context for the developments and the types of costs and benefits of financial regulation discussed in this report.

This report addresses certain topics that are explored more fully in the Council's annual reports, which are required pursuant to the Dodd-Frank Act. Among other matters, the Council's annual report addresses the activities of the Council; significant financial market and regulatory developments, including insurance and accounting regulations and standards, along with an assessment of those developments on the stability of the financial system; potential emerging threats to the financial stability of the United States; and recommendations to enhance the integrity, efficiency, competitiveness, and stability of U.S. financial markets, promote market discipline, and maintain investor confidence.

Introduction

A healthy financial system is essential to economic growth and stability. By mobilizing savings and channeling funds to borrowers, the financial system promotes investment in industrial facilities and equipment, new technologies, human capital, and housing. Banking institutions (including

commercial banks, credit unions, savings associations, bank holding companies, and savings and loan holding companies, together referred to as “banks”) perform two special roles in the financial system. First, they engage in maturity and liquidity transformation by investing in long-term, illiquid assets created by borrowers and issuing short-term, liquid liabilities to investors. Second, they extend credit, using their expertise in screening credit risk *ex ante* and monitoring borrower behavior *ex post* to direct funds to the highest-valued uses.

Because banks and other financial institutions (including securities firms, investment banks, and other financial intermediaries) facilitate credit flows, adverse shocks to these firms can have an outsized impact on the overall economy. Insolvencies of banks and other financial institutions amplified the 2007-09 financial crisis; a similar dynamic also contributed to the Great Depression. Maturity transformation, by its nature, exposes banks to credit and liquidity risks, and thus, investors have incentives to monitor bank behavior and withdraw funds from institutions that are considered too risky. This market discipline can sometimes encourage banks to limit risk and to hold adequate reserves of capital and liquid assets. From a public policy perspective, unregulated banks tend to carry too much risk because they may not internalize the costs that their distress imposes on the financial system. For example, if one bank is forced to sell a significant amount of illiquid assets, other banks holding similar assets will experience mark-to-market balance sheet losses. The failure of one bank can trigger investor concerns about the solvency of other banks holding similar assets or serving as counterparties to the failed institution. These concerns can trigger runs and pose a threat to financial stability. Banks do not have a market incentive to include these external costs on the financial system overall when weighing the marginal benefits and costs *ex ante* of holding additional capital or liquidity.

The need to mitigate risks to financial stability is thus a compelling rationale for financial regulation. Further, public credit guarantees and liquidity provisioning, such as deposit insurance and access to the discount window, are essential backstops for preventing bank runs, which are harmful to financial stability. However, by reducing banks’ downside risk, such backstops can reduce the incentive of investors to monitor bank behavior. Public backstops must thus be accompanied by regulations, including limits on activities and minimum capital requirements, that are designed to reduce excessive risk-taking and minimize moral hazard. This is an additional rationale for financial regulation.

Financial regulation must strive to limit excessive risk while not hindering efficient financial intermediation. There are two main channels through which financial regulation can influence the economy. First, regulations can affect the supply and cost of credit in part through its implications on allocative efficiency. Ideally, the financial system should equalize both the marginal social benefit and the cost of credit across different borrowers. Financial regulation can promote allocative efficiency by narrowing differences between marginal costs and benefits, but it can also exacerbate such differences. Promoting allocative efficiency does not always reduce the cost of credit. If credit is priced below its social cost, regulation should aim to raise the price of credit. Regulation can also affect credit supply through its impact on technological efficiency.

Regulations that prevent innovation or preclude banks and other financial institutions from achieving economies of scale or scope can increase the cost of credit.

Second, financial regulation can influence the riskiness of individual banks and other financial institutions and the resilience of the overall financial system. Banks and other financial institutions may take on too much risk if they are not required to account for costs imposed on other institutions during times of distress, and this tendency is magnified when public backstops reduce market discipline. Lowering the default risk reduces the expected cost of resolutions and benefits the economy by decreasing the likelihood of financial crises. Therefore, regulations that limit risk can benefit the economy and enhance financial stability. However, poorly designed regulations may unintentionally increase risks to financial institutions or reduce the resilience of the financial system.

A Brief Historical Background

The U.S. financial system has been subject to varying levels of regulation over time. The National Bank Act of 1863 generally limited the activities conducted by national banks to those that are part of or incidental to the business of banking. The Banking Act of 1933 (known as “Glass-Steagall”) separated commercial banks from investment banks. Commercial banks could not underwrite securities, while securities firms could not engage in commercial banking. The Bank Holding Company Act of 1956 generally prohibited some banking organizations from affiliating with companies engaged in commercial activities.

However, beginning in the late 1960s, economic and technological innovation and deregulation gradually eroded these restrictions. Commercial banks lost market share to new financial instruments and institutions, such as commercial paper and money market mutual funds. In response, banks were allowed to expand and diversify their activities. The Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 (Riegle-Neal Act) significantly eased interstate banking restrictions. The Gramm-Leach-Bliley Act of 1999 expanded the range of financial activities that may be conducted by qualifying banks and their affiliates.

The early 2000s saw the rise of large, complex banks and other financial institutions engaged in a broad spectrum of financial activities, as well as an increase in the level of maturity transformation taking place outside of the formal banking sector (often called shadow banking). This new model allowed for illiquid and (sometimes) risky assets that were funded by asset-backed commercial paper or loans financed by repurchase agreements collateralized with asset-backed securities. In addition, the model featured credit and liquidity backstops of liabilities that were implicit rather than explicit, and less stringent capital requirements and other restrictions.

Regulation that did not sufficiently evolve in response to changes in the financial system potentially contributed to the 2007-09 financial crisis. The Dodd-Frank Act strengthened the regulatory system to address these developments. It established the Council, which is responsible for identifying risks to financial stability, promoting market discipline, and responding to emerging threats to the stability of the U.S. financial system. As one of its authorities, the Council may determine that a

nonbank financial company shall be supervised by the Board of Governors of the Federal Reserve System (Federal Reserve) and subject to prudential standards if the Council determines that material financial distress at the nonbank financial company, or the nature, scope, size, scale, concentration, interconnectedness, or mix of the activities of the nonbank financial company, could pose a threat to the financial stability of the United States. The revised Dodd-Frank Act also provides for enhanced prudential standards for bank holding companies with assets of \$250 billion or more. The Dodd-Frank Act creates enhanced oversight of the derivatives market and imposes safeguards and transparency on the process of securitizing pools of loans for investors. The Dodd-Frank Act also generally restricts banking entities subject to the rule from engaging in proprietary trading or investing in, sponsoring, or having certain relationships with private equity or hedge funds (Volcker Rule). Reporting requirements have subsequently been modified to address the scope of such activities. To mitigate a grave threat posed to U.S. financial stability, and subject to the concurrence of at least two-thirds of the voting members of the Council, the Federal Reserve may require designated nonbank financial companies and bank holding companies with assets of \$250 billion or more to sell or otherwise transfer assets or off-balance-sheet items to third parties, among other steps. In the event a major financial company fails, the Dodd-Frank Act provides the federal government with authority to wind down the company in an orderly fashion that protects the economy and does not impose the cost on taxpayers.

Macroprudential regulations should be dynamic, accounting for market innovation and evolution. The banking turmoil in March 2023 related to the failures of Silicon Valley Bank, First Republic Bank, Signature Bank, and others revealed that the Dodd-Frank Act remains effective in limiting the propagation of shocks and systemic risks. Despite this, some regulations may warrant recalibration in light of the March 2023 banking stress.

II. REVIEW OF POSSIBLE LIMITATIONS ENUMERATED IN SECTION 123

Section A. Explicit or Implicit Limits on the Maximum Size of Banks, Bank Holding Companies, and Other Large Financial Institutions

This section discusses limits on the size of banks, bank holding companies, and other large financial institutions. As discussed in the first report under section 123 of the Dodd-Frank Act, issued in 2011, the costs and benefits of such limits depend on the importance of economies of scale, large financial institutions' ability to take advantage of market power, and market perceptions that large financial institutions have access to a government safety net. The 2016 Report expanded on these ideas by noting that the ability to issue highly tradable liquid debt grants further advantages in terms of funding and operating costs. It highlighted that these factors decrease investors' perceptions of bank risk and lead to lower funding or per-unit operating costs.

The potential cost of limits on the size of financial institutions is that such limits may prevent financial institutions from achieving economies of scale and benefiting from business and geographic diversification. One potential benefit of limits on the size of financial institutions is that such limits may prevent financial institutions from acquiring and taking advantage of market power by setting prices anti-competitively. Another possible benefit of such limits is that they may prevent financial institutions from growing so large that they are perceived by the market to benefit from an implicit government subsidy. Limiting this perception may constrain excessive risk-taking by preventing the moral hazard associated with the perceived access to a government safety net. In addition, size limitations may allow large firms to be resolved, if necessary, in a more orderly way and with less disruption to the financial system and the economy.

Lastly, growth in bank holding company size and complexity may lead to more challenges in designing appropriate banking regulation and supervision. Literature released since 2016 continues to provide evidence that size and complexity have advantages and disadvantages and, as such, regulation must continue to be nuanced and targeted. Market concentration has continued to accelerate while volatility remained subdued. Large banks have continued to grow in size and complexity despite evidence suggesting that continued gains from economies of scale may be limited after a certain size. While certain regulations were aimed at limiting the increase in complexity, evidence suggests that such regulations may have failed in achieving that goal.

Section A Review of the Literature

An assessment of the costs and benefits of size or concentration limitations on large financial institutions depends in part on the role these large financial institutions play during financial crises and the effect of size and concentration in their market segments. The literature review conducted for the 2016 Report found evidence that banking institutions exhibited economies of scale while their funding cost advantages have appeared to have declined. Recent research has identified further evidence on the effects of firm size on different economic outcomes. Large banks may be more resilient during crises due to diversified portfolios and better access to capital, but their potential failures pose greater threats to and have more severe repercussions on the real economy.

Higher market concentrations, measured using the Herfindahl index based on bank market shares, can also lead to higher markups in nonfinancial sectors, meaning that firms with common lenders appear to charge higher prices marked up over their costs. The literature review in the 2016 Report also revealed that the design of banking regulation may become more challenging going forward due to growth in bank size, concentration, and complexity. More recent work highlights innovative bank resolution mechanisms that take firm size and activity concentration into account when designing bailout policy.

Economies of Scale

Evidence from empirical studies is consistent with the notion that financial institutions are characterized by benefiting from economies of scale. The basic definition of economies of scale is that a firm's output increases more than one-for-one as costs increase. This often arises when a high proportion of total costs are invariant to the firm's output. Economies of scale can influence funding costs for financial institutions if investors believe that such economies render a larger institution more profitable or less likely to default. Larger firm size also enables financial institutions to diversify (see Section B), which can further lower an institution's default risk, and therefore funding costs. These are central to the discussion centered around limiting the maximum size of financial institutions because of the potential trade-off between limiting size and regulatory or financial stability concerns. Recent papers show evidence of increasing growth and concentration for financial institutions. Fernholz and Koch (2021) shows that bank asset concentration has risen in the United States since the 1980s but declined in Europe since 2008. The study finds that the 10 largest U.S. bank holding companies controlled about 70 percent of total bank assets by 2010. In contrast, the 10 largest European commercial banks saw their share of total assets fall by one third from 2008 to 2016. The papers attribute this to higher relative growth rates for the largest U.S. banks.

Several recent studies provide further evidence for the effects of economies of scale on different outcomes. Sapci and Miles (2019) studies the interactions between size, cost efficiency, and returns to scale using a newly constructed bank-level dataset. The paper finds that all banks, except the seven largest banks, exhibit increasing returns to scale. The study uses statistical methods to prove a bidirectional relationship between size and cost efficiency. Taking this into account, further analyses demonstrate that these banks enjoy cost efficiency as they grow but lose gains from economies of scale even after controlling for bank-level characteristics, macroeconomic factors, and the regulatory environment.

Baron, Schularick, and Zimmermann (2023) shows that large banks are more resilient during crises due to their diversified portfolios and better access to capital, although their potential failures pose greater threats. The analysis stretches across 17 advanced economies since the 1870s before and after several financial crises. The study shows that a country's largest banks (i.e., the top five by assets) typically gain market share in crises while small banks fail more often or are absorbed. Thus, following a crisis, the largest banks become larger and more dominant despite taking more risks before crises. These large banks also suffer greater equity losses during the crises and contract

their lending the most. The survival and expansion of the largest banks appear linked to substantially higher rates of government rescues and, compared to smaller banks, to the fact that their deposit flows are less sensitive to bank losses. Additionally, the paper finds no evidence that large-bank-dominated systems have fewer crises.

Other studies have found further evidence that growth in bank size can have unanticipated effects. Huber (2021) uses postwar German data and shows that larger banks did not reap significant benefits from economies of scale and operational efficiencies but instead worked with riskier borrowers. Furthermore, the research reveals that bigger banks did not always raise real economic growth and could harm some borrowers and the real economy. The findings show that the advantage of bank size also comes with increased systemic risks, as large banks' interconnectedness within the financial network means their failure can trigger widespread economic disruption.

Saidi and Streitz (2021) documents a link between bank concentration and markups in nonfinancial sectors. The analysis is based on variation in banks' market shares across industries and bank mergers that increase concentrations. The results show that higher credit concentration is associated with higher markups—meaning that firms charge higher prices relative to their cost of production and sales—and that lenders with high market shares charge lower loan rates. The paper shows that there is a greater incidence of competing firms sharing common lenders that induce less aggressive product market competition among their borrowers, thereby internalizing the potential adverse effects of higher rates. The paper finds that the effect is stronger in industries with competition in strategic substitutes.

Funding Costs

Studies have also addressed how firm size can affect funding costs and related decisions for financial institutions. Davila and Walther (2020) explores how large and small banks make funding decisions when system-wide bailouts are possible and finds that bank size is a key determinant of banks' leverage choices, even when bailout policies treat large and small banks symmetrically. Utilizing a hypothetical model in which policymakers have adopted a “too big to fail” (TBTF) policy, the analysis finds that larger banks are more likely to receive government support due to their systemic importance, reinforcing the TBTF policy. As a result, large banks leverage more than small banks because they internalize that their decisions directly affect bailout policies, and, in equilibrium, this effect is amplified by strategic spillovers to small banks. As a result, the implicit backstop creates moral hazard, encouraging large banks to take on greater risks with the expectation of government rescue in crises. Levine, Lin, and Xie (2021) assesses the impact of the expansion of bank assets on the cost of banks' interest-bearing liabilities. The research shows that the geographic expansion of banks across U.S. states lowered their funding costs, especially when banks were headquartered in states with lower macroeconomic covariance with the overall U.S. economy. The results are consistent with the literature that shows geographic expansion can offer large risk diversification opportunities that reduce funding costs.

Size and Risk

Firm size and concentration in certain banking activities and products play a significant role during financial crises, as large financial firms may amplify shocks due to their central role across different market activities. Recent work shows that this risk has increased along one dimension – concentration – while it has diminished along another – volatility. Fernholz and Koch (2017) shows that bank asset concentration has increased, but asset volatility for bank holding companies has declined since the 1990s.

Nevertheless, large banks remain key to understanding how financial crises begin and propagate. Several papers studied the importance of bank size during a financial crisis. Lorenc and Zhang (2020) finds that stress in larger banks has more severe repercussions on the real economy, as these institutions play a crucial role in credit allocation and this distress can lead to significant credit shortages. The impact increases with size such that the top 0.15 percent of banks from an aggregate sample population going back 60 years, based on size, have more than twice the impact of the top 0.75 percent of banks from the same sample, and three times as large as that of banks in the top 1 percent. Levine (2021) assesses the impact of the expansion of bank assets on the cost of banks' interest-bearing liabilities. The paper supports the idea that, all else being equal, the largest banks should be subject to the most stringent capital and liquidity requirements given their outsized impact on financial stability and the scope of moral hazard. By contrast, smaller banks should be subject to successively less stringent requirements.

Gao and Reed (2024) studies how fire sales and financial fragility depend on the size distribution of the banking sector. The findings show that should panic behavior emerge in a large part of the financial system, the fire sale discount will be high due to the significant size of banks' asset sales. However, if only a small segment of the banking system is experiencing fire sale conditions, then the limitations imposed from outside liquidity may not be as severe. Thus, differences in financial fragility across segments arise endogenously due to the different sizes of the deposit base and the amount of assets held. Notably, when outside liquidity is high (where banks do not hold extra liquid assets), the large banking sector is more vulnerable to panic than the small market due to larger fire sale discounts. However, should outside liquidity be low (which induces banks to hold excess liquid assets), a more liquid portfolio is held by banks in the large segment, leaving them less prone to runs. Finally, when banks in the large market hold precautionary liquidity but those in the small sector do not, the relative degree of fragility depends on the amount of outside liquidity and the extent of size asymmetry in the banking system.

Firm size and concentration also have important implications for policy design. Philippon and Wang (2023) studies bank resolution mechanisms. In this model, the key constraint is that governments cannot avoid bailouts that are *ex post* efficient. Contrary to common wisdom, the paper shows that the government may still avoid moral hazard and implement the first best allocation by using the distribution of bailouts across banks to provide incentives. The paper analyzes the properties of credible tournament mechanisms that provide support to the best performing banks and resolve the worst performing ones. The research extends the mechanism and shows that it

continues to perform well when banks are imperfect substitutes, when banks are differentially interconnected if bailout funds can be earmarked, and when taking risk is driven by overoptimism instead of moral hazard.

Section A Regulatory Developments

In the years since the 2016 Report, the bank regulatory agencies have adopted rules and guidance pursuant to their authorities under the Dodd-Frank Act that reflect that larger banks may need more tailored regulation relative to smaller institutions. In addition, Congress passed the Economic Growth, Regulatory Relief, and Consumer Protection Act (EGRRCPA) in 2018, and the banking agencies adopted regulatory frameworks consistent with EGRRCPA that tailor capital, liquidity, stress testing, and other requirements to the risks that an institution poses to the financial system.

Tailoring Framework

On November 1, 2019, the Office of the Comptroller of the Currency (OCC), the Federal Reserve, and the Federal Deposit Insurance Corporation (FDIC) (together, the agencies) adopted a final rule to revise the criteria for determining the applicability of regulatory capital and liquidity requirements for large U.S. banking organizations and the U.S. intermediate holding companies of certain foreign banking organizations. The final rule establishes four risk-based categories for determining the applicability of requirements under the agencies' regulatory capital rule and liquidity coverage ratio rule. Under the final rule, such requirements increase in stringency based on measures of size, cross-jurisdictional activity, weighted short-term wholesale funding, nonbank assets, and off-balance sheet exposure. The final rule applies tailored regulatory capital and liquidity requirements to depository institution holding companies and U.S. intermediate holding companies with \$100 billion or more in total consolidated assets as well as to certain depository institutions. Separately, the Federal Reserve adopted a final rule that revises the criteria for determining the applicability of enhanced prudential standards for large domestic and foreign banking organizations using a risk-based category framework that is consistent with the above framework, and makes additional modifications to the Federal Reserve's company-run stress test and supervisory stress test rules. In addition, the Federal Reserve and the FDIC separately adopted a final rule that amends the resolution planning requirements under section 165(d) of the Dodd-Frank Act using a risk-based category framework that is consistent with the framework described above.

G-SIB Surcharge

On September 1, 2023, the Federal Reserve published a proposed rule to amend the Board's rule that identifies and establishes risk-based capital surcharges for global systemically important bank holding companies (G-SIBs). The proposal would also amend the Systemic Risk Report (FR Y-15), which is the source of inputs to the implementation of the G-SIB framework under the capital rule. The changes set forth in the proposal would improve the precision of the G-SIB surcharge and better measure systemic risk under the framework. For certain systemic indicators currently measured only as of a single date, the proposal would change to reporting of the average of daily or

monthly values to reduce the effects of temporary changes to indicator values around measurement dates. To improve risk capture, the proposal would also make improvements to the measurement of some systemic indicators used in the G-SIB surcharge framework and the framework for determining prudential standards for large banking organizations. In addition, the proposal would reduce cliff effects and enhance the sensitivity of the surcharge to changes in the method 2 score by calculating surcharges based on narrower score band ranges. Finally, the proposal would make several amendments to the FR Y-15 to improve the consistency of data reporting and systemic indicator measurement.

Loss-Absorbing Capacity and Long-Term Debt

On January 24, 2017, the Federal Reserve issued a final rule to require a U.S. top-tier bank holding company identified under the Board’s rules as a global systemically important bank holding company (covered BHC) to maintain outstanding a minimum amount of loss-absorbing instruments, including a minimum amount of unsecured long-term debt. In addition, the final rule prescribes certain additional buffers, the breach of which would result in limitations on the capital distributions and discretionary bonus payments of a covered BHC. The final rule applies similar requirements to the top-tier U.S. intermediate holding company (IHC) of a global systemically important foreign banking organization with \$50 billion or more in U.S. non-branch assets (covered IHC). The final rule also imposes restrictions on other liabilities that a covered BHC or covered IHC may have outstanding in order to improve their resolvability and resiliency; these restrictions are referred to in the final rule as “clean holding company requirements.”

On January 6, 2021, the OCC, Federal Reserve, and FDIC issued a final rule that applies to advanced approaches banking organizations with the aim of reducing both interconnectedness within the financial system and systemic risks. As a general matter, the final rule requires deduction from a banking organization’s regulatory capital for certain investments in unsecured debt instruments issued by foreign or U.S. G-SIBs for the purposes of meeting minimum total loss-absorbing capacity requirements and, where applicable, long-term debt requirements, or for investments in unsecured debt instruments issued by G-SIBs that are pari passu or subordinated to such debt instruments.

On September 19, 2023, the Federal Reserve, OCC and FDIC issued a proposed rule that would require certain large depository institution holding companies, U.S. intermediate holding companies of foreign banking organizations, and certain insured depository institutions, to issue and maintain outstanding a minimum amount of long-term debt. The proposed rule is intended to improve the resolvability of these banking organizations in case of failure, reduce costs to the Deposit Insurance Fund, and mitigate financial stability and contagion risks by reducing the risk of loss to uninsured depositors.

Bank Mergers

On September 25, 2024, the OCC issued a final rule and policy statement of business combinations under the Bank Merger Act. The OCC’s final rule eliminated expedited processing of merger

applications to reflect its view that mergers are significant corporate transactions. The policy statement enhances transparency around its review process and provides additional guidance to stakeholders around the OCC's review of applications. The policy statement discusses general principles for the OCC's review; its consideration of the financial stability, managerial and financial resources and future prospects, and convenience and needs statutory factors under the Bank Merger Act; and the OCC's decision process for extending the public comment period or holding a public meeting.

On September 27, 2024, the FDIC issued a final Statement of Policy on Bank Merger Transactions to provide transparency on how the FDIC administers its responsibilities under the Bank Merger Act. The final statement took into consideration comments received in response to the FDIC's request for comment on a Proposed Statement of Policy on Bank Merger Transactions. The final statement focuses on the scope of transactions subject to FDIC approval, the FDIC's process for evaluating merger applications, and the principles that guide the FDIC's consideration of the applicable statutory factors as set forth in the Bank Merger Act.

Section A Summary

Recent literature generally appears to continue to provide empirical support for some benefits associated with the size of large financial institutions, namely the existence of economies of scale in banking institutions, which confers certain benefits to both consumers and businesses of all sizes. However, recent studies have also shown that while size and concentration can shield banks during financial crises, their potential failures can have severe repercussions in the financial system and the real economy.

Section B. Limits on the Organizational Complexity and Diversification of Large Financial Institutions

This section discusses limits on the organizational complexity and diversification of large financial institutions. While internationalization, consolidation, and conglomeration offer potential benefits to financial institutions, these developments could also lead to shifts in behavior that increase risks to financial stability.

As noted in the 2016 Report, whether the benefits of diversification are larger than the costs cannot be determined from theory alone and is therefore an empirical question. Limits on the organizational complexity and diversification of large financial institutions may have important implications for the risks posed by such firms through the supply of financial services, the sources of credit available to borrowers, the efficiency of markets in allocating capital, and the increased difficulties involved with the resolution of complex institutions.

Section B Review of the Literature

Recent academic studies reveal that complex banking organizations tend to exhibit higher risk profiles due to their involvement in diverse financial activities and markets. Over the past decade, banks have reduced complexity in response to regulatory changes by limiting the number of affiliates. Effective regulation has been shown to mitigate the risks associated with banking complexity. Additionally, organizational and geographic diversification can enhance financial stability by spreading risk and reducing funding costs. These findings underscore the need for a balanced approach combining robust regulation with strategic diversification to maintain financial stability in complex banking institutions.

Research by Buch and Goldberg (2022) uses data and analytical advances to generate rich cross-country insights on the complexity and riskiness of banking organizations. The study has four key findings. First, the largest banks in various countries tend to be the more complex ones. However, even controlling for size, there is substantial diversity across banking organizations in terms of complexity choices. Second, over the past decade, banking organizations tended to reduce complexity by limiting the number of affiliates in both domestic and foreign locations. Generally, however, complexity patterns are persistent. Third, regulatory changes can alter both banking organizational complexity and the associated risk profiles. Fourth, the link between complexity and risks involves trade-offs: diversification benefits and reductions in liquidity risk may weigh against agency problems, monitoring costs, and systemic risk contributions arising from higher complexity.

Goldberg and Meehl (2020) further examines the structure of large U.S. bank holding companies, using a range of measures of organizational, business, and geographic complexity, and finds that they remain very complex. Organizational complexity has declined the most since the 2007-09 financial crisis, as the average number of legal entities within large U.S. bank holding companies has fallen. By contrast, the multiple industries spanned by legal entities within the holding companies have shifted more than they have declined, especially within the financial sector. Nonfinancial entities within U.S. bank holding companies still tilt heavily toward real estate-related

businesses and span numerous other industries. Fewer large bank holding companies have global affiliates and the geographic span of the most complex has declined. Locations with favorable tax treatment still attract a significant share of the foreign bank and nonbank entities while informationally opaque locations are losing their share of such entities.

Correa and Goldberg (2022) studies bank complexity and its effect on risk profiles. Complexity raises the costs of bank resolution when organizations fail, but the effect of complexity on their broader risk profiles is less understood. Business, organizational, and geographic complexity can engender explicit trade-offs between the agency problems that increase risk and the diversification, liquidity management, and synergy improvements that reduce risk. The outcomes of such trade-offs may depend on bank governance arrangements. The paper tests these conjectures using data on large U.S. bank holding companies during the 1996-2018 period. Organizational complexity and geographic scope tend to provide diversification gains and reduce risks while also increasing a bank's exposure to systemic risks. Regulatory changes have significantly reduced organizational complexity, leading to a decrease in systemic risk and an increase in liquidity risk among bank holding companies. While bank governance structures have, in some cases, significantly affected the buildup of bank holding company complexity, better governance arrangements have not moderated the effects of complexity on risk outcomes.

Regulation can also lead to changes in lending behavior for complex banks. Degl'Innocenti, Zhou, and Zhou (2023) investigates the impact of the Dodd-Frank Act on the credit risk behavior of complex bank holding companies. Consistent with the moral hazard hypothesis, the research finds that complex bank holding companies affected by the Dodd-Frank Act increased their credit exposure and thus associated risk. The paper discusses possible explanations, including that banks decreased their lending portfolio quality, loan monitoring, and strength and independence of the risk management function after the Dodd-Frank Act was implemented.

There has also been substantial work examining the benefits of diversification. Goetz, Laeven, and Levine (2016) evaluates the impact of the geographic expansion of a bank holding company across U.S. metropolitan statistical areas on bank risk. For the average holding company, the results suggest that geographic expansion materially reduces risk without affecting loan quality. The results are consistent with arguments that geographic expansion lowers bank risk by reducing exposure to local shocks and inconsistent with arguments that expansion, on the net, increases risk by reducing the ability of bank holding companies to monitor loans and manage risks.

Banking turmoil in 2023 brought renewed attention to banks' branch network and deposit taking activity. Doerr (2024) provides novel evidence that the geographic diversification of banks' deposit base improves their funding stability and thereby fosters liquidity creation. The paper establishes that banks with greater diversification have a higher dispersion in deposit growth rates across their branches and lower volatility in deposit growth rates over time, and is associated with lower bank deposit rates. These patterns are consistent with diversification improving funding stability and lowering bank risk. The findings show that diversification allows banks to engage in increased liquidity creation and small business lending, with positive effects on the real economy. The

funding stability channel of geographic diversification is distinct from previous findings on the benefits of diversification on banks' asset side. It also highlights the benefits of bank branch networks beyond information acquisition.

In the same vein, Gelman, Goldstein, and MacKinlay (2023) shows how bank asset diversification benefits the economy. The research finds that diversification reduces a bank's risk and stabilizes its stream of earnings. Diversified banks lend more in normal times and maintain credit supply during negative shocks when credit availability is paramount. The study uses changes in bank regulation to identify the causal effect of asset diversification. Diversification induced lending, as well as its resiliency, leads to positive spillovers to the economy.

Doerr and Schaz (2021) finds similar results and shows that diversified banks maintain higher loan supply during banking crises in borrower countries. Diversified banks are stabilizing due to their ability to raise additional funding during times of distress. The paper shows that diversified domestic banks are a stable source of funding, while foreign banks with little diversification are fickle. The findings suggest that declining financial integration makes countries more vulnerable to local financial shocks.

Section B Regulatory Developments

Resolution Plans

As the organizational complexity at a financial institution increases, any potential resolution of that financial institution becomes more difficult. As such, regulators have used the resolution plans mandated by the Dodd-Frank Act to better understand the workings of large financial companies and to ensure that each bank's resolution planning processes and capabilities are appropriate for the bank's complexity. Many banks have taken steps to reduce their organizational complexity in order to enhance their resolvability.

On February 4, 2019, the Federal Reserve and FDIC issued resolution plan guidance applicable to the eight largest and most complex domestic banking organizations. The guidance is meant to assist these firms in developing their resolution plans that are required to be submitted pursuant to the Dodd-Frank Act. The guidance provides additional information for the firms regarding their resolution planning capabilities in areas such as capital, liquidity, and payment, clearing, and settlement activities.

On November 1, 2019, the Federal Reserve and FDIC issued a final rule that modifies their resolution plan requirements for large firms. The rule retains resolution plan elements in place for the largest firms while reducing requirements for smaller firms that pose less risk to the financial system. The final rule uses the separate framework developed by the federal banking agencies for application of prudential requirements, and establishes resolution planning requirements tailored to the level of risk a firm poses to the financial system. Consistent with EGRRCPA, the final rule affects domestic and foreign firms with more than \$100 billion in total consolidated assets.

On August 31, 2020, the FDIC and Securities and Exchange Commission (SEC) issued a final rule

required by the Dodd-Frank Act, which clarifies and implements provisions relating to the orderly liquidation of certain brokers or dealers in the event the FDIC is appointed receiver under Title II of the Dodd-Frank Act. The FDIC and SEC developed the final rule in consultation with the Securities Investor Protection Corporation.

On December 22, 2020, the Federal Reserve and FDIC issued final guidance for the resolution plans of certain large foreign banks. On August 15, 2024, the Federal Reserve and FDIC issued final joint guidance to help certain large banks further develop their resolution plans. The guidance generally applies to domestic and foreign banking organizations with more than \$250 billion in total assets but that are not the largest and most complex banking organizations, for which guidance is already in place. The guidance also supersedes the December 2020 guidance for certain large foreign banks. The guidance is organized around key areas of potential vulnerability, such as capital, liquidity, and operational capabilities that could be needed in resolution. Distinct from the guidance to the eight largest and most complex domestic banking organizations, the guidance provides agency expectations for both single point of entry and multiple point of entry resolution strategies, which are different strategies banking organizations have adopted for their rapid and orderly resolution. It also recognizes that the preferred resolution outcome for foreign banking organizations is often a successful home country-led resolution and guides foreign banking organizations on how to address the global resolution plan in their U.S. plan. The agencies also announced that they are extending the resolution plan submission deadline for the banking organizations to which the guidance applies. Banking organizations are required to submit their resolution plans by October 1, 2025, instead of March 31, 2025. The purpose of the extension was to provide reasonable time for banking organizations to consider the final guidance as they develop their plan submissions.

Other Considerations of Organizational Complexity

On October 27, 2021, the National Credit Union Administration (NCUA) issued a final rule amending the NCUA's credit union service organization regulation. The rule accomplishes two objectives: expanding the list of permissible activities and services for credit union service organizations to include the origination of any type of loan that a federal credit union may originate; and granting the NCUA Board additional flexibility to approve permissible activities and services.

Section B Summary

Recent academic literature discusses how diversification may both provide benefits to financial institutions and present additional risks to financial stability. To the extent diversification leads to greater organizational complexity, that in and of itself can present additional risks given the increased difficulties with resolving complex institutions and the risks they pose to critical market functions. As such, complexity can lead to greater systemic risk and operational inefficiencies, but effective governance and regulation can mitigate these risks. Conversely, geographic and operational diversification can enhance financial stability by reducing risks and funding costs.

Section C. Requirements for Operational Separation Between Business Units of Large Financial Institutions in Order to Expedite Resolution in Case of Failure

This section reviews operational separation between business units in large financial institutions. Operational separation aims to reduce interdependencies among a financial organization's various business units. Separate legal entities can be integrated through intercompany agreements and shared services; operational separation contemplates business units that can operate independently from each other. With a separation of business units, each business unit may comprise numerous legal entities, but these entities are interdependent only within the business unit, not across business units. As banking complexity increases, so does the difficulty and duration of resolution processes. In this context, the primary challenge in a resolution arises when separate entities cannot operate independently. As such, both bank holding companies, as well as resolution authorities, have opted to pursue a single-entry strategy where the holding company is resolved while it reallocates capital to maintain continuity for its subordinate entities.

As noted in the 2016 Report, arguments for or against operational separation depend on the type of organizational structure that makes an institution more likely to survive a financial crisis and therefore less likely to require resolution.

Section C Review of the Literature

Recent literature does not directly address how operational separation affects resolution in the event of the failure of a financial institution. The costs of operational separation, however, must be balanced against the expected benefits of a more streamlined resolution process. First, operational separation adds administrative overhead to separated business units. Overhead includes costs arising from corporate governance, management oversight, and risk management. In addition, there may be costs of organizational separation arising from diseconomies of scale.

Research shows that higher levels of efficient communication within financial institutions can improve bank outcomes. Levine et al. (2020) and Lim et al. (2024) show that increases in communication within bank branches boost small business lending, increase mortgage origination volume, and lead to better performing loans and higher efficiency.

Section C Regulatory Developments

There have not been significant regulatory developments related to requirements for operational separation between business units of larger financial institutions since the 2016 Report.

Section C Summary

The focuses of academic research and regulatory policy have differed in relation to operational separation. The literature addresses only limited aspects of the costs and benefits related to operational separation and centralization. Banking regulators have worked specifically to address the challenges that operational interconnectedness can pose for resolution and have focused their resolution strategies on the bank holding company itself as a source of strength for all entities under

it. The banking regulators and institutions they regulate continue to refine their approach to addressing these challenges as they implement rules and guidance.

Section D. Limits on Risk Transfer Between Business Units of Large Financial Institutions

Risk transfer among business units is a key element of the risk management and operations of large financial institutions. An allocation mechanism that transfers operating capital, margin, or funding from one business unit to another may decrease the risk of the transferor and increase the risk of the transferee, or it could have the opposite effect. This section addresses the transfer of funding and capital among consolidated business units, including recent regulatory developments regarding derivatives and securities financing activities between business units.

As noted in the 2016 Report, risk transfers across business units can help the consolidated organization adjust to shocks by reallocating capital or liquidity within the firm as needed. Changes required by the Dodd-Frank Act have generally built upon the long-standing framework of protecting depository institutions that are part of a larger consolidated bank holding company. These changes focused on limiting how risk might be transferred between business units through derivatives transactions.

Section D Review of the Literature

Risk transfer across business units helps to efficiently allocate risk for large financial institutions, as firms can use internal capital to reallocate liquidity within the business. It can also transmit shocks and reduce the benefits of diversification, particularly if one business unit's funding is entirely dependent on other units. Similarly, a lending unit may be adversely affected if a borrowing unit becomes distressed and unable to satisfy its obligations. Modern financial intermediation practices, such as loan originations, market making, prime brokerage, and shadow banking, play a crucial role in stabilizing banks during capital shocks by enabling quicker capital rebuilding and mitigating immediate contractions. While recent literature does not broadly address limits on risk transfers within financial institutions, several papers have studied the allocation of activities and risk between bank- and non-bank financial institutions that provide similar services.

Acharya, Cetorelli, and Tuckman (2024) sheds light on the connections between nonbank financial intermediaries and banks. These two sectors are commonly viewed either as operating in parallel, performing different activities, or as substitutes, performing substantially similar activities, with banks inside and nonbank financial intermediaries outside the perimeter of banking regulation. The paper argues that nonbank financial intermediaries and bank businesses and risks are so interwoven that they are better described as having transformed over time rather than as having migrated from banks to nonbank financial intermediaries. These transformations are at least in part a response to regulation and are such that banks remain important as both routine and emergency liquidity providers to intermediaries. The findings support this perspective as follows: (i) enhanced financial accounts data for the United States ("From Whom to Whom") show that banks and nonbank financial intermediaries finance each other, with intermediaries especially dependent on banks; (ii) case studies and regulatory data show that banks remain exposed to credit and funding risks, which at first glance seem to have moved to nonbank financial intermediaries, and also to contingent

liquidity risk from the provision of credit lines to intermediaries; and (iii) empirical work confirms linkages between banks and intermediaries. The findings suggest that regulation should adapt to this landscape by treating the two sectors holistically, by recognizing the implications for risk propagation and amplification, and by exploring new ways to internalize the costs of systemic risk.

Jiang et al. (2020) examines the leverage of shadow banks, revealing that these entities use more equity capital than traditional banks but are more leveraged than nonfinancial firms. The research finds significant differences in leverage and capitalization between shadow banks and traditional banks, partly due to the lack of insured deposits for shadow banks. This model suggests that safety nets significantly lower bank capitalization, especially for smaller banks, highlighting the impact of deposit insurance on capital structure.

The way in which credit markets are modeled can have important implications for policy and macroeconomic analysis. Buchak et al. (2024) critiques existing macroeconomic models for not incorporating modern financial intermediation dynamics that facilitate risk transfers, such as loan sales and shadow banking. The study uses micro-level data to demonstrate that these adjustment margins are crucial for understanding credit markets. This dynamic model shows that loan sales and shadow bank activities help banks recover faster from capital shocks by mitigating immediate contractions and enabling quicker capital rebuilding. Ignoring these margins leads to significant errors in policy assessments related to aggregate lending. This model emphasizes the importance of incorporating modern intermediation mechanisms to accurately capture the relationship between bank capital and aggregate lending.

Regulatory burdens (i.e., limits on risk transfers) can influence how banks structure their organizations. Buchak et al. (2018) explores the rise of shadow banks in mortgage origination, driven by regulatory differences and technological advantages. This study shows that regulation led traditional banks to contract originations. This allowed shadow banks, particularly fintech lenders, to partially fill these gaps. Fintech lenders, serving more creditworthy borrowers, charge a premium for convenience. This model attributes shadow bank growth to both regulatory and technological factors, with regulation playing a more significant role.

Section D Regulatory Developments

On February 4, 2020, the SEC issued a final rule that requires the application of specific risk mitigation techniques to portfolios of uncleared security-based swaps. In particular, the final rule establishes requirements for each registered security-based swap dealer and each registered major security-based swap participant regarding, among other things, reconciling outstanding security-based swaps with applicable counterparties on a periodic basis, engaging in certain forms of portfolio compression exercises, as appropriate, and executing written security-based swap trading relationship documentation with each of its counterparties prior to, or contemporaneously with, executing a security-based swap transaction. The SEC also issued an interpretation addressing the application of the portfolio reconciliation, portfolio compression, and trading relationship documentation requirements to cross-border security-based swap activities, and amended its

regulations to address the potential availability of substituted compliance in connection with those requirements. Lastly, the final rule includes corresponding amendments to the recordkeeping, reporting, and notification requirements applicable to security-based swap dealer and major security-based swap participants.

On September 15, 2020, the Commodity Futures Trading Commission (CFTC) issued a final rule imposing capital and financial reporting requirements on swap dealers and major swap participants that are not subject to a banking regulator. The adoption of the capital requirements completes the CFTC's obligations under Title VII of the Dodd-Frank Act to adopt rules imposing both capital and margin requirements on swap dealers and major swap participants. The capital rules recognize the diversity of organizations registered with the CFTC as swap dealers, which includes global financial institutions, small swap dealers that engage primarily in swaps with commercial end-users, and agricultural or energy firms, by permitting the swap dealers to elect one of three capital approaches: (1) a bank-based capital approach that is consistent with the capital rules of the prudential regulators; (2) a capital approach that is consistent with the CFTC's existing futures commission merchants and the SEC's existing securities broker-dealer capital requirements; and, (3) for swap dealers predominantly engaged in nonfinancial activities, a capital requirement based on the swap dealer's tangible net worth. The CFTC's final capital rules also require major swap participants to maintain positive tangible net worth. The financial reporting requirements require swap dealers and major swap participants to file with the CFTC, among other reports, periodic unaudited financial statements and annual audited financial statements.

On November 27, 2023, the Federal Reserve issued a final rule adopting risk-based capital requirements for depository institution holding companies that are significantly engaged in insurance activities. This risk-based capital framework, termed the Building Block Approach, adjusts and aggregates existing legal entity capital requirements to determine enterprise-wide capital requirements. The final rule also contains a risk-based capital requirement excluding insurance activities, in compliance with section 171 of the Dodd-Frank Act. The Federal Reserve also adopted a reporting form FR Q-1 related to the Building Block Approach. The capital requirements and associated reporting form meet statutory mandates and are intended to help prevent the economic and consumer impacts resulting from the failure of organizations engaged in banking and insurance.

Section D Summary

While the literature on this topic is not extensive, related literature indicates that risk transfers across business units can help the consolidated organization adjust to shocks by reallocating capital or liquidity within the firm as needed but can also transmit shocks between business units. It highlights changes over time in how large financial institutions utilize business units to reallocate capital or liquidity. Large financial institutions are utilizing nonbank financial intermediaries as a key component of their organizations. The literature also finds that trend is partly attributable to regulatory developments. The research shows that properly modeling these dynamics, as well as the role of regulation, has important implications for policy and supervision, and policymakers should

recognize the implications for risk propagation and amplification of modern financial intermediation practices.

Section E. Requirements to Carry Contingent Capital or Similar Mechanisms

Contingent capital, subordinated loss absorbing debt, or similar mechanisms are arrangements that are intended to bolster the solvency of a financial institution following a trigger event (typically a measure of distress). Such arrangements include debt-to-equity swaps or a permanent write-down of debt. These instruments have been discussed as a potentially lower-cost form of loss-absorbing capacity that could help address some of the challenges that arose in the 2007-09 financial crisis.

As noted in the 2016 Report, the academic literature largely focused on issues of design, particularly how to structure contingent capital instrument trigger mechanisms. The 2016 Report noted that the Council’s 2012 report on contingent capital stopped short of recommending that such instruments be required for use, suggesting instead that it is an area for continued private sector innovation. As was the case in 2016, U.S. banking regulators have not implemented a contingent capital requirement, opting to focus their efforts on requiring greater amounts of capital and long-term debt.

Section E Review of the Literature

There has been significant academic work on the theory, design, and empirical use of contingent capital since the 2016 Report. The design of contingent capital securities involves several tradeoffs and frictions. For example, Allen and Barbalau (2022) reviews the recent literature on security design, while Oster (2020) reviews the literature on contingent convertible bonds (CoCo). Among the research on contingent capital securities, there is some conflict over whether an optimal contingent capital bond or security is possible or practical. Himmelberg and Tsyplakov (2020), for example, argues that CoCos either have built-in incentives to preemptively raise capital to avoid triggering a conversion or may create an incentive to destroy capital to force a conversion if a conversion does not dilute shareholder equity. In contrast, Javadi, Li, and Nejadmalayeri (2023) argues that there is no conversion ratio that prevents bailouts, making CoCos ineffective from a policy perspective. Melin and Panjwani (2024) presents a model intended to offer an optimal CoCo design for banks. The research shows that including such a CoCo in the firm’s capital structure increases its optimal levered value while making it more resilient to bankruptcy. CoCos in their framework are time consistent, which alleviates the risk of renegotiation by stakeholders and removes the uncertainty of a discretionary trigger, factors that spooked markets during the run on Credit Suisse in March 2023.¹ Berger et al. (2022) argues that based on a dynamic model of bailouts, bail-ins, and bank failures, the model of bail-in is most effective at forcing distressed banks to recapitalize on their own.

Among the empirical literature on contingent capital are studies of pricing in CoCos and credit default swap (CDS) markets (Allen and Golfari (2023), Kind, Oster, and Peter (2021)), studies of the strategy of issuing or refinancing behavior of banks issuing contingent capital (Kund,

¹ The triggering and write-down of \$17.5 billion of Credit Suisse’s AT-1 contingent capital debt as part of its acquisition by UBS is potentially the most important event experienced so far in the contingent capital sector. Nonetheless, there has been little academic research into this Credit Suisse event and its overall market impact.

Hertrampf, and Neitzert (2023), Koziol and Roßmann (2022)), and other research that includes case studies (Bologna, Miglietta, and Segura, 2020) and lab experiments (Davis and Korenok, 2023). In a cross-country study of systemic risk, dos Santos Mendes et al. (2022) argues that the initial issuance of CoCo bonds led to a decrease in market-based measures of systemic risk, but banks that issued further CoCo bonds resulted in an increase in systemic risks. Focusing on European banks, Bah et al. (2021) argues that CoCo spreads are positively associated with bank systemic risk and bank default risk, suggesting that markets view CoCo bonds as gone-concern capital, which is generally any capital that can absorb losses before depositors and general creditors. Basel III established relevant technical definitions of going- and gone-concern capital for Tier 1 and Tier 2 equity. By implication, the paper argues that CoCo bonds may not be considered a credible recovery or resolution tool by market participants. These results on existing contingent capital instruments may provide important context for any future policy design. Allen and Golfari (2023) argues that the structure of CoCos changed after the 2007-09 financial crisis. The bonds identified in a dataset increasingly remove punitive measures diluting shareholder value by including conversion ratios of zero. The argument is that this removes the incentives for bank managers and executives to take preemptive measures aimed toward reducing risk. Allen, Golfari, and Won (2023) reframes CoCo bonds from their earlier use as increasing banks' Total Loss-Absorbing Capacity (TLAC) towards their recent use as increasing banks Equity-protecting Loss Absorbing Capacity. Work by researchers at the Office of Financial Research shows that there can be spillover price effects following press releases by banks that issue CoCos using data on European G-SIBs (Gleason et al., 2017).

There is also an academic literature that considers other implications of contingent capital. Li, Guo, and Meng (2022) studies the effect of CoCo bonds on clearing payment systems, networks, and liquidity risk. The results show that CoCo bonds improve bank and liquidity resilience, but also increase systemic exposure to contagion from a sufficiently large economic shock. Shan et al. (2023) shows that banks with higher dividend payouts use CoCo bonds more frequently, and this relationship is stronger in countries where regulators are more active in intervening with bank operations. The paper interprets this relationship as consistent with banks using CoCo bonds to appear safer, assuaging regulators' concerns, and allowing the banks to maintain their existing dividend payout strategy.

Despite the challenges presented with contingent capital design, Walther and White (2020) argues that contingent capital may be a superior tool for regulators. To avoid triggering runs or negative price signals based on supervisory information or actions, regulators may prefer to require contingent capital rather than design other types of discretionary bailout or bail-in policies. Other papers consider the contradictory results and provide theoretically consistent solutions to bank run risk and the moral hazard problem of public bailout policies. For example, Lambrecht and Tse (2023) models bailout and bail-in policies, and the paper proposes an alternative based on a bailout fund financed by a tax on bank dividends (i.e., a bailout mechanism without public money) that could resolve bailouts without public money and without distorting insiders' incentives.

Section E Regulatory Developments

The Federal Reserve, OCC, and FDIC have not required banks or bank holding companies to issue contingent capital. The agencies have instead required banks and bank holding companies significantly to increase the amount of common equity tier 1 capital, tier 1 capital, and tier 2 capital to levels that have obviated the need for a requirement to issue contingent capital instruments. As described in Section A, the agencies have proposed or finalized revisions to their rules on requirements for certain banking organization to maintain levels of long-term debt that would provide additional loss absorbency in the event of a resolution of the organization.

These agencies, in the course of revising the eligibility requirements for regulatory capital as part of their broad overhaul of the regulatory capital rules, considered whether to permit contingent capital to qualify as tier 1 capital and determined that restricting tier 1 capital instruments to those classified as equity under GAAP, which would essentially exclude contingent capital instruments, would better ensure the ability of banks and bank holding companies to absorb losses. Contingent capital instruments, if properly structured, could qualify as tier 2 capital. Nonetheless, banks and bank holding companies in the United States have not shown an appetite for issuing contingent capital that does not qualify as tier 1 capital, given the obstacles to doing so discussed in the Council's 2012 report on contingent capital.

European authorities allow contingent capital, in the form of contingent convertible bonds, to count toward satisfying requirements implemented under international standards, such as the Basel capital standards and the Financial Stability Board's final TLAC standard.

Section E Summary

The academic literature has continued to focus on issues of design of contingent capital in the past eight years. It has also studied topics related to theory and empirical use of contingent capital. On theoretical topics, the literature has studied issues centered around optimal design of these securities. Empirical work has focused on pricing, issuing, and refinancing behaviors by banks that issue contingent capital. These papers have also focused on the effects of contingent capital securities on systemic and default risk.

Section F. Limits on Commingling of Commercial and Financial Activities by Large Financial Institutions

This section discusses the commingling of commercial and financial activities by large financial institutions in the United States. The mixing of banking and commerce may involve commercial firms entering the market for banking products or services or, conversely, banking firms entering the market for commercial products or services.

As noted in the 2016 Report, the academic literature on this topic is relatively limited and focused mostly on Glass-Steagall policies that separated most commercial banking functions from securities transactions. The report noted that financial innovation alongside market and regulatory changes can lead to the erosion of the clear-cut separation of commercial and investment banking.

Section F Review of the Literature

Since 2016, the benefits and disadvantages of commingling commercial and financial activities of large financial institutions have not been an active area of economic research. Some recent papers examine this question in the case of industrial banks. Barth and Sun (2019) examines the role of regulation designed to prevent nonfinancial firms from owning banks and argues that the performance and regulation of industrial banks over time challenge the justification and necessity of such a separation. On the other hand, Wilmarth (2020) argues that acquisitions of industrial banks by commercial firms can have pernicious effects, including posing dangers to the stability of the financial system.

Section F Regulatory Developments

There have not been significant regulatory developments related to limits on the commingling of commercial and financial activities since the 2016 Report.

Section F Summary

Recent literature provides relatively limited insight into the effects of the separation of banking and commerce. Some recent work has been published particularly on the topic of industrial banks, with mixed results.

Section G. Segregation Requirements between Traditional Financial Activities and Trading or Other High-Risk Operations in Large Financial Institutions

In 2013, the final rules implementing section 619 of the Dodd-Frank Act, known as the Volcker Rule, were adopted. The Volcker Rule generally prohibits banking entities (i.e., insured depository institutions and their affiliates, as well as any foreign banking entity that operates a branch, agency, or commercial lending company in the United States) from engaging in proprietary trading or from acquiring or retaining an ownership interest in, sponsoring, or having certain other relationships with hedge funds or private equity funds, subject to certain exceptions and exemptions. EGRRCPA excluded certain smaller banks from the Volcker Rule's coverage. The Federal Reserve, OCC, FDIC, SEC, and CFTC (the Volcker rule-writing agencies) adopted regulations implementing that exclusion in 2019.

Banking entities have generally been required to comply with the Volcker Rule's requirements since July 2015 (except for a limited extension related to investments in certain legacy covered funds in place as of December 31, 2013). Since 2016, the academic literature has addressed several aspects of the Volcker Rule, including the rule's potential effectiveness relative to alternative approaches. In addition, several papers have examined proprietary trading and other high-risk operations more broadly.

Section G Review of the Literature

Recent research related to the effects of the Volcker Rule has addressed its negative effects on liquidity in bonds and funding for hedge funds, as well as bank risk and risk management. Other literature has focused on the rule's impact on proprietary trading by different types of large financial institutions and the effects of the rule on smaller banks. For a broader view on the effects of the rule, Bui (2018) examines the effect of the Volcker Rule on financial stability, focusing on three channels: revenue diversification, bank similarity, and proprietary trading activity. In addition, Baily, Klein, and Schardin (2017) gives a broad overview of the benefits and costs of key provisions of the Dodd-Frank Act, including the Volcker Rule.

Work by Allahrakha et al. (2019) employs confidential supervisory data and finds that the rule had significant adverse liquidity effects on covered firms' corporate bond trading, borne by customers and dealers trading with the covered firm. Bao, O'Hara, and Zhou (2018) shows that the liquidity of bonds following a rating downgrade decreased after the Volcker Rule. The paper argues that dealers regulated by the rule have decreased their market-making activities, while non-Volcker affected dealers have not offset the decreased activities. In the hedge fund space, Bowe, Kolokolova, and Yu (2019) finds that the implementation of the Volcker Rule also had effects on the funding liquidity of hedge funds, as well as their liquidity risk exposure and liquidity provision to the market. The impact seems more pronounced for those funds with business connections to systemically important U.S. banks. For banks, Chung, Keppo, and Yuan (2020) finds that the Volcker Rule does not decrease a bank's default probability, since the rule decreases the trading book size and thus raises the illiquid banking book portfolio, which is difficult to scale down in the

case of negative earnings. Other studies also find that the Volcker Rule may have increased bank risk, such as Li, Liu, and Pei (2020), which finds that discretionary loan loss provision significantly increased for affected banks. Elayan et al. (2018) finds that the overall positive market response to the Volcker Rule appears to be driven by the larger number of nontargeted, smaller banks. This suggests that the Volcker Rule had a positive effect on smaller banks, since it helps level the playing field between large and small banks.

Several papers discuss evidence of proprietary trading across several entities and markets. Avci, Schipani, and Seyhan (2018) finds that after the prohibitions in Glass-Steagall were relaxed, banks that traded using nonpublic information earned higher-than-expected returns from proprietary trades on this information. Kumar et al. (2020) finds a similar result for hedge funds, as the paper shows that hedge funds gain an information advantage from their prime broker banks regarding the banks' corporate borrowers. Hedge funds can make abnormally large returns, outperforming trades in borrowing firms' stocks before loan announcements, particularly those with high revenue potential for prime broker banks. Lowry, Rossi, and Zhu (2019) finds significant evidence of advisor banks trading client firm options ahead of merger announcements, but no similar trading in client firm stocks. This suggests strong conflicts of interest within investment banks, where the investment banking division holds substantial private information, and the asset management division seeks such information. Haselmann, Leuz, and Schreiber (2021) analyzes banks' trading behavior using supervisory and credit-registry data. The paper finds that relationship banks trade on private information about their borrowers, building positions before corporate events with positive or negative news and unwinding them shortly after. This pattern highlights potential conflicts of interest in universal banking and suggests that combining large datasets can enhance market and financial institution supervision. This information channel is not entirely confined to trading activities, as Frattarli and Herpfer (2023) shows that bankers use information from lending relationships to help borrowers find partners for strategic alliances. The paper finds that firms that share a lending relationship with the same banker or are connected through a network of bankers are more likely to enter alliances. Bankers' ability to facilitate alliances is stronger for opaque borrowers and decreases with distance among a banker network. Firms connected to more potential partners through banker networks enter more alliances, which are associated with positive announcement returns, and brokering banks are more likely to receive future underwriting business.

There has also been a developing body of theoretical research focusing on other high-risk operations at large financial institutions. Farhi and Tirole (2021) explains that traditional banking relies on four pillars: small and medium enterprise lending, insured deposit taking, access to the lender of last resort, and prudential supervision. The paper shows that these pillars naturally emerge as an equilibrium outcome in a game between banks and the government. The paper finds that regulation and deposit insurance complement each other, and that prudential regulation must adapt to the rise of shadow banking. The paper proposes structural remedies such as ring-fencing between regulated and shadow banking and sharing liquidity in centralized platforms to counter bogus liquidity hoarding and financial contagion. In a similar vein, Begenau and Landvoight (2022) examines the shadow banking system's response to changes in capital regulation of

commercial banks. The paper’s quantitative general equilibrium model, which includes both regulated and unregulated banks, reveals that tighter capital requirements for regulated banks increase the convenience yield on all banks’ debt, leading to higher leverage in the shadow banking sector. At the same time, tighter regulation reduces the deposit insurance subsidies for commercial banks, decreasing competitive pressures on shadow banks to take risks. The net result is a safer financial system with an expanded shadow banking sector. Calibrating this model to U.S. financial institutions’ data, the research indicates that the optimal capital requirement is around 16 percent. Lastly, Buchak et al. (2024) improves upon the current balance sheet model of banking by accounting for two critical adjustment margins often missing from the predominant view of financial intermediation. The shadow bank substitution margin highlights how shadow banks substitute for traditional banks for loans that can be easily sold. The balance sheet retention margin shows banks switching between balance sheet lending and selling loans based on their balance sheet strength. The structural model estimates reveal that these margins significantly shape policy responses, reducing the impact of capital requirements on lending, with wealthier borrowers bearing the costs. Furthermore, disruptions in the secondary market like quantitative easing have a more substantial impact on lending than capital requirements.

Section G Regulatory Developments

Volcker Rule

On July 22, 2019, the OCC, Federal Reserve, FDIC, SEC, and CFTC issued final rules to amend the regulations implementing the Bank Holding Company Act’s prohibitions and restrictions on proprietary trading and certain interests in, and relationships with, hedge funds and private equity funds, commonly known as the Volcker Rule, in a manner consistent with EGRRCPA. EGRRCPA amendments and the final rules exclude from these prohibitions and restrictions certain firms that have total consolidated assets equal to \$10 billion or less and total trading assets and liabilities equal to 5 percent or less of total consolidated assets. EGRRCPA and the final rules also revise the restrictions applicable to the naming of a hedge fund or private equity fund to permit an investment adviser that is a banking entity to share a name with the fund under certain circumstances.

On November 14, 2019, the Volcker rule-writing agencies issued a final rule that tailors and simplifies the regulations implementing the Volcker Rule. The final rule incorporates a risk-based approach that relies on a set of clearly articulated standards for both prohibited and permitted activities and investments. Among other changes, the final rule revises the definition of “trading account,” streamlines the requirements of certain permitted activities, and revises the compliance program requirements associated with the Volcker Rule.

On July 31, 2020, the Volcker rule-writing agencies issued a final rule that amends the regulations implementing section 13 of the BHC Act. The final rule modifies three areas of the Volcker Rule by streamlining the covered funds portion of the rule; addressing the extraterritorial treatment of certain foreign funds; and permitting banking entities to offer financial services and engage in other activities that do not raise concerns that the Volcker Rule was intended to address.

Section G Summary

Banking entities have exited the trading and funds activities identified by Congress as posing undue risk to the financial system by divesting investments and businesses in order to come into compliance with the Volcker Rule. Research has shown that the Volcker Rule has had effects across a variety of markets. In particular, it has had negative effects on liquidity in bonds and funding for hedge funds. On the other hand, research also shows evidence of proprietary trading that raises the concerns discussed above across several entities and markets, which suggests that segregation requirements may still serve a role in modern financial regulation.

Section H. Other Limitations on the Activities or Structure of Large Financial Institutions That May be Useful to Limit Systemic Risk

This section discusses recent research on regulatory stress tests, capital requirements, and liquidity requirements, which have been the subject of significant attention by academics and regulators during the past few years as additional means to mitigate threats to financial stability.

Section H Review of the Literature

Stress Tests and Capital Planning

Stress testing in both the United States and Europe has been the subject of extensive research. Much of that research compares the behavior and consequences of banks just above, versus those just below, bank size thresholds for stress testing. There is little evidence of banks manipulating their size or aggregate lending to avoid or changing their behavior in response to stress testing (Garcia and Steele, 2022; Bassett and Berrospide, 2017), but there is significant evidence of banks changing their behavior with respect to types of lending. There is evidence that banks reduce lending in risky assets, likely because of how assets are risk-weighted for supervisory or stress testing purposes (Garcia and Steele, 2022), with concentrated effects on lending and interest rates in borrowing for jumbo mortgage lending (Calem et al., 2020), home equity lending (Sedai and Medda, 2023), corporate lending to large firms (Acharya et al., 2018), and small business lending (Chen, Hanson, and Stein, 2017, Cortes et al., 2020).

There is evidence of banks adjusting behavior around the timing of stress tests by, for example, increasing capital and lowering dividends at the starting point of stress tests, but reversing course in the quarters after the tests (Cornett et al., 2020). Leitner and Williams (2023) suggests that there are trade-offs in how transparent regulators are with stress testing, as maintaining the secrecy of models and scenarios *ex ante* may prevent banks from gaming the stress tests. The effect of testing may partly be translated through changes in banks' organizational structure or corporate culture (Garcia, Harithsa, and Owusu, 2024), though for European banks the effects of stress tests seem to be related to the intrusiveness of supervisory scrutiny and the existing risk management culture of the bank (Kok et al., 2023). Markets appear to value the information content of stress testing (Guerrieri and Modugno, 2024), suggesting that testing bank resilience may lower banks' cost of capital. Positive stress test results caused U.S. and European banks to experience positive abnormal equity returns and tighter CDS spreads (Ahnert et al., 2020; Sahin, de Haan, and Neretina, 2020), an effect that appears even more important during crises (Fernandes, Igan, and Pinheiro, 2020).

There is reason for caution in considering the success of stress testing frameworks, as several research papers point out that the narrow set of scenarios considered in stress testing could concentrate risks in unmodeled areas (Schuermann, 2020), which may also raise some fairness concerns (Glasserman and Li, 2024). There may be spillover effects into other parts of bank behavior and markets. For example, it appears that stress testing leads banks to work more intensively to avoid taxes or engage in strategic tax planning (Francis, Garcia, and Harithsa, 2022).

Research literature focused more on theory has developed ideas for improving stress testing design. Parlatore and Philippon (2022), Orlov, Zryumov, and Skrzypacz (2023), Huang (2021), and Cont, Kotlicki, and Valderrama (2020) specify options for the design of stress testing scenarios. Each model of stress testing depends on the objectives of the regulator, the approach to modeling banking networks and interbank risk exposures, and the information environment. Arora, Gao, and Tompaidis (2022) presents some options for operationalizing stress testing approaches to bank balance sheets. Hopper et al. (2023) suggests several approaches to designing scenarios with multiple financial and nonfinancial shocks based on consulting with teams with interdisciplinary expertise to better reflect the recent bank failures and crises in 2020 and 2023.

Loss-Absorbing Capacity

Research has investigated the status and role of TLAC rules and debt in the resolution of failed banks. TLAC is meant to provide an alternative to publicly funded bailouts for failed banks. In the aftermath of the 2007-09 financial crisis, regulators have put additional emphasis on banks issuing debt that can absorb losses in the face of bank failure or distress.

Several papers have presented theoretical treatments of additional capital and new TLAC requirements that attempt to make bail-in resolution feasible. Indergand and Hrasko (2021) suggests that in a structural model of bank failure, expected losses may still exceed TLAC most of the time. The paper emphasizes that the pricing and market perception of bail-in debt will depend strongly on whether there is a well-defined ranking in the seniority of each type of debt or equity. Several other research papers present theoretical (Ebner and Westhoff, 2024; Lendermann, 2023) and operational (Hasenclever, 2020; Troger, 2019) treatments of TLAC and Minimum Requirement for own funds and Eligible Liabilities (MREL). Cottrell et al. (2023) studies the empirical effects of TLAC on default risk by analyzing CDS spreads. There is some evidence that the second stage of TLAC requirements through 2022 reduced default risk in G-SIBs globally based on the effect of implementation on CDS spreads. The theoretical discussion in Lendermann (2023) presents lessons from the Credit Suisse default and proposes a market-based trigger design for certain types of emergency measures or loss-absorbing instruments.

There is some evidence that TLAC may have unintended effects that could increase certain types of systemic risks. Altavilla et al. (2022) uses confidential data on securities holdings for European banks. The paper finds that banks increased their holdings of eligible subordinated debt issued by other G-SIBs. This trend of banks investing in subordinated debt of other banks appears to have increased bank interconnectedness within countries, potentially presenting a concentration risk to the banking sector. Homma and Suzuki (2023) shows that increased TLAC bond issues by certain banks are correlated with an increase in some indicators of bank risk-taking behavior.

Capital and Liquidity

This section reviews the literature on capital and liquidity that directly addresses financial institution soundness and systemic stability. The literature focuses on the costs and benefits of capital requirements and how market structure and regulation can influence these effects.

Begenau (2020) develops a dynamic general equilibrium model to assess the effects of bank capital requirements. Households' preferences for liquid assets create a liquidity premium on deposits, leading to excessive risk-taking in the banking sector. The study shows that higher capital requirements, by creating a scarcity of deposits, can lower the cost of capital for banks and boost lending. Additionally, increased capital requirements enhance banks' monitoring incentives, improving overall efficiency. The research suggests that the marginal benefits of higher capital requirements outweigh the marginal costs, indicating that U.S. capital requirements may have been too low.

How banks can pass through capital discounts to their borrowers depends on the market structure. Di Patti et al. (2023) studies the effect of a change in minimum capital requirements on the cost of credit. The research exploits a reduction of the risk weight applied to loans to small and medium enterprises, whose exposure is below a threshold (the Small and Medium Enterprises Supporting Factor). Employing a regression discontinuity design and matched bank firm data from the Italian Credit Register, the results infer an average reduction in interest rates of 9.5 basis points per percentage point drop in minimum capital requirements. The paper also finds that the estimate of the effect is larger, between 12.5 and 15.5 basis points per percentage point change, for borrowers that have low costs of switching between banking relationships. This result can be interpreted as evidence that the pass-through of capital discounts to borrowers depends on the extent to which banks exercise monopoly power. This suggests that competition between lenders is important for the effectiveness of changes in banks' capital buffers as a macro-prudential policy tool.

To analyze the cross-border effect of bank capital regulation, Bahajs and Malherbe (2021) proposes a model for studying the international coordination of bank capital regulation under the principle of reciprocity. The paper shows that such a regime makes countries compete for scarce bank equity capital. Raising capital requirements in a country may generate bank capital outflows as well as inflows. The research identifies the condition for the sign of the capital flow and the associated externality and highlight the implications for macroprudential regulation. Compared to collaboration, overshooting is likely: countries have an incentive to increase Basel III's countercyclical capital buffer too much in good times and cut it too much in bad times.

Effects of Capital on Banking Stability

Recent research has continued to examine whether capital requirements make banks safer. Bostandzic et al. (2022) employs the European Banking Authority capital exercise of 2011 as a quasi-natural experiment to investigate how capital requirements affect various measures of bank solvency risk. Their results show that, while regulatory measures of solvency improve, nonregulatory measures indicate a deterioration in bank solvency in response to higher capital requirements. The

decline in bank solvency is driven by a permanent reduction in banks' market value of equity. This finding is consistent with a reduction in bank profitability, rather than a repricing of bank equity due to a reduction of implicit and explicit TBTF guarantees. The paper then discusses alternative policies to improve bank solvency.

Regulatory policy itself can influence market structure. Corbae and D'Erasmus (2021) develops a model to study the impact of regulatory policies on bank risk-taking and market structure. This model, calibrated to U.S. data, features a market structure where large banks with market power interact with smaller competitive banks and nonbank lenders. Banks face both idiosyncratic and aggregate funding shocks, affecting their loan portfolios. The model predicts realistic business cycle properties and the role of concentration in financial stability. The study concludes that regulatory policies significantly influence market structure, affecting allocative efficiency and stability. Based on this model, a scenario involving an increase in capital requirements from 4 percent to 8.5 percent would lead to a decline in bank entry, an increase in concentration, a decline in aggregate bank lending, and an increase in interest rates (and markups) on bank loans. In this scenario, the probability of a crisis would increase in the model of banks under perfect competition, but would decrease under imperfect competition, where banks have market power. A scenario involving a size-dependent capital and liquidity requirement (simulating the 8 percent Liquidity Coverage Ratio, 11 percent capital requirement, and 2.5 percent G-SIB surcharge based on the Dodd-Frank Act) would have very similar effects to the overall capital requirement increase. Notably, the size-dependent scenario would slightly increase crisis risk because large banks would have more volatile default frequency (i.e., more sensitivity to external financing shocks), even though they would hold more safe assets to meet the liquidity requirement. The paper decomposes the change in aggregate welfare from an increase in capital requirements, concluding that it would cause short- and long-run welfare losses for firms and entrepreneurs (due to less lending and higher interest rates on loans), and long-run welfare gains to households due to lower risk of crisis and smaller bailout costs.

Because estimating the cost of capital requirements can be difficult, novel approaches need to be developed. In one such approach, Kisin and Manela (2016) estimates the shadow cost of capital requirements using data on a costly loophole that allowed banks to relax these constraints. This loophole—liquidity guarantees to asset-backed commercial paper conduits—was exploited by the largest banks before the 2007-09 financial crisis. The findings show theoretically that a bank's use of the loophole reveals its private compliance cost, which considers both the costs of issuing equity and the effectiveness of capital regulation. The paper finds that increasing capital requirements would impose a modest cost—\$220 million a year for all participating banks combined per percentage-point increase, which is approximately \$14 million on average.

Effects of Capital on Financial Institution Default Risk

In a theoretical model, Pancost and Robatto (2023) studies the effects of capital requirements on risk-taking. The paper identifies a new channel by which deposit insurance and capital requirements affect welfare in general equilibrium. In this model, entrepreneurs have access to socially valuable projects whose return is subject to idiosyncratic, uninsurable risk. This risk

reduces the entrepreneurs' investment and gives rise to a demand for safe assets, which are supplied by banks. If the government provides subsidized deposit insurance, banks pay a higher risk-adjusted return on deposits, and entrepreneurs increase their investment in projects that are socially valuable. The findings suggest that the optimal capital requirement trades off this effect with the moral hazard induced by deposit insurance.

Potential Responses to Capital Standards

Capital requirements and liquidity regulation can impact credit markets and corporate behavior. Fraisse, Lé, and Thesmar (2020) measures the impact of bank capital requirements on corporate borrowing and investment using loan-level data. The Basel II regulatory framework makes capital requirements vary across both banks and across firms, which allows the model to control for firm-level credit demand shocks and bank-level credit supply shocks. The findings show that a percentage point increase in capital requirements reduces lending by 10 percent. Firms can attenuate this reduction by substituting borrowing across banks. The resulting reduction in borrowing capacity impacts investment, but not working capital: fixed assets are reduced by 2.6 percent, but lending to customers is unaffected.

Hachem and Song (2021) explores how liquidity regulation can inadvertently trigger credit booms due to interbank market power. The study considers a scenario where a price-setter and multiple price-takers trade reserves following liquidity shocks. The less liquid price-takers engage in shadow banking to bypass regulation, leading to a reallocation of funding and a credit boom. The paper also examines how endogenous changes in bank liquidity ratios influence the magnitude of these booms, using China as a case study to illustrate the model's quantitative performance.

Effects of Liquidity on Banking Stability

Recent research has studied changes to bank funding and liquidity over the last decade. Li et al. (2023) studies the pass-through of Treasury supply to bank deposit funding and find that its effect depends on bank market power. The results show that an increase in Treasury supply crowds out bank deposits with disproportionate effects in more competitive deposit markets. The explanatory power of Treasury supply is not driven by monetary policy or banks' investment opportunities. Furthermore, the findings show that a larger Treasury supply curtails bank lending and affects the bank funding structure. These empirical findings are rationalized with a model of imperfect deposit competition. The model and empirics predict the opposite effect for monetary policy rate hikes, consistent with the deposit channel of monetary policy.

Li and Li (2021) studies the role of bundling payment services and credit provision in banks. Bundling creates liquidity mismatches for banks as banks support payment activities by allowing depositors to freely transfer funds into and out of their accounts while investing in illiquid loans. Using payment data from Fedwire, this paper shows that banks face sizeable liquidity risk due to depositors' payments. Payment liquidity risk is a form of funding risk inherent in the monetary role of deposits, yet it compromises the role of banks as lenders. An increase in payment risk is associated with a significant decline in lending. The effect is stronger for undercapitalized banks

and when reserves are scarce.

Bank's funding sources have changed significantly during the last two decades, with effects on leverage and investment decisions, as studied in Barattieri, Moretti, and Quadrini (2021). This paper notes that the share of noncore funding (NCF) was high before the 2007-09 financial crisis but declined substantially after the crisis. To better understand this, the paper proposes a general equilibrium model where NCF provides insurance against idiosyncratic risks faced by banks. Insurance makes leverage and investment more attractive, but it also increases the vulnerability of the banking sector to crises. These results show that learning about the likelihood of a crisis could have been important for generating the observed dynamics of NCF and leverage, which, in turn, affected the dynamics of the macroeconomy.

Macprudential Policy

The various effects of international reforms have been another area of study for researchers. Behn and Schramm (2021) uses granular data on syndicated loans to analyze the impact of international reforms for G-SIBs on bank lending behavior. Using a difference-in-differences estimation strategy, the paper finds no effect of the reforms on overall credit supply while documenting a substantial decline in borrower- and loan-specific risk factors for the affected banks. Moreover, the study detects a significant decline in the pricing gap between interest rates charged by G-SIBs and other banks, which can be interpreted as indirect evidence for a reduction in funding cost subsidies. Overall, these results suggest that reforms have helped to mitigate moral hazard problems associated with G-SIBs, while the consequences for the real economy have been limited.

Agarwal and Goel (2024) studies bank regulation and supervision in depth. This work indicates that supervisory assessments, such as stress tests, gauge banks' riskiness and allow regulators to impose bank-specific capital regulation that can improve welfare. However, the paper asserts that regulation based on noisy supervision—meaning that regulators do not have complete information about each bank's operations—can decrease welfare by misclassifying banks, distorting incentives, and leading to greater risk-taking. Regulation should not be bank-specific in such cases. When bank defaults are costlier, supervision should strive for a lower probability that riskier banks go undetected. The study concludes that when the supervisor can incur a cost to optimally reduce both false positive and false negative rates, the regulator should make capital requirements more bank specific.

Schroth (2021) analyzes macroprudential policy with capital buffers by studying dividend policy when banks fund loans with equity and debt. In the model, bank shareholders consider equity costly and a bank's access to debt depends on its shareholder value. In response to loan losses, banks cut dividends, but eventually defer dividends too much. Banks do not internalize that a commitment to higher dividends (and fewer loans) during recoveries from financial crises would increase shareholder value and access to debt during crises. Constrained-efficient dividends, while restricted during normal times and zero during crises, are higher during recoveries.

Section H Regulatory Developments

Stress Tests and Capital Planning

On April 25, 2018, the NCUA issued a final rule to amend its regulations regarding capital planning and stress testing for federally insured credit unions with \$10 billion or more in assets (covered credit unions). The final rule reduces regulatory burden by removing some of the capital planning and stress testing requirements previously applicable to certain covered credit unions. The final rule also makes the NCUA's requirements more efficient by, among other things, authorizing covered credit unions to conduct their own stress tests in accordance with the NCUA's requirements and permitting covered credit unions to incorporate the stress test results into their capital plans.

On March 13, 2019, the Federal Reserve issued a final rule amending the capital plan rule to limit the scope of potential objections to a firm's capital plan on the basis of qualitative deficiencies in the firm's capital planning process (qualitative objection). The Federal Reserve announced that, as of the publication date, it would no longer issue a qualitative objection under the capital plan rule to a firm if the firm has been subject to a potential qualitative objection for four consecutive years, and the firm does not receive a qualitative objection in the fourth year of that period. In addition, except for certain firms that have received a qualitative objection in the immediately prior year, the Federal Reserve stated that it would no longer issue a qualitative objection to any firm effective January 1, 2021.

On October 10, 2019, October 24, 2019, and November 1, 2019, the OCC, FDIC and Federal Reserve, respectively, adopted parallel final rules that, consistent with EGRRCPPA, revise the minimum asset threshold for firms to conduct stress tests, revise the frequency by which firms would be required to conduct stress tests, and remove the adverse scenario from the list of required scenarios in the stress test rules. The Federal Reserve's final rule also makes conforming changes to the Federal Reserve's Policy Statement on the Scenario Design Framework for Stress Testing.

On February 3, 2021, the Federal Reserve issued a final rule tailoring the requirements in the Federal Reserve's 2011 capital plan rule based on risk. Specifically, as indicated in the Federal Reserve's October 2019 rulemaking that updated the prudential framework for large BHCs and U.S. IHCs of foreign banking organizations (FBOs) (tailoring rules), the final rule modifies the capital planning, regulatory reporting, and stress capital buffer requirements for firms subject to "Category IV" standards under that framework. To be consistent with preceding changes to the Federal Reserve's stress testing rules, the final rule makes other changes to the Federal Reserve's stress testing rules, Stress Testing Policy Statement issued in 2019, and regulatory reporting requirements, such as the assumptions relating to business plan changes and capital actions and the publication of company-run stress test results for savings and loan holding companies. The final rule also applies the capital planning and stress capital buffer requirements to covered saving and loan holding companies subject to Category II, Category III, and Category IV standards under the tailoring rules.

Capital and Liquidity

On August 6, 2018, the Federal Reserve published a final rule, issued pursuant to section 165(e) of the Dodd-Frank Act, establishing single-counterparty credit limits (the SCCL) for BHCs and FBOs with \$250 billion or more in total consolidated assets. The Federal Reserve issued proposed rules in 2011 for domestic BHCs and in 2012 for FBOs, and issued a re-proposal in 2016. Among other changes, the rule limits the “net credit exposures” of covered firms to a single counterparty to a specified percentage of the covered firm’s eligible capital base, and includes modifications from the 2016 re-proposal intended to streamline compliance with the SCCL.

On December 28, 2018, the OCC, Federal Reserve, and FDIC adopted interim final rules, previously issued on August 29, 2018, as final without change. The interim final rules were issued to implement section 210 of EGRRCPA, which amended Section 10(d) of the Federal Deposit Insurance Act (FDI Act) to permit the agencies to examine qualifying insured depository institutions (IDIs) with under \$3 billion in total assets not less than once during each 18-month period. The final rules increase, from \$1 billion to \$3 billion, the total asset threshold under which an agency may apply an 18-month on-site examination cycle for qualified IDIs that have an “outstanding” composite rating. The agencies also exercised their discretionary authority under section 10(d)(10) of the FDI Act to extend eligibility for an 18-month examination cycle, by regulation, to qualifying IDIs with an “outstanding” or “good” composite rating with total assets under \$3 billion. In addition, the final rules adopt as final the parallel changes to the agencies’ regulations governing the on-site examination cycle for U.S. branches and agencies of foreign banks, consistent with the International Banking Act of 1978.

On June 21, 2019, the OCC, Federal Reserve, and FDIC issued a final rule to implement section 205 of EGRRCPA by expanding the eligibility to file the agencies’ most streamlined report of condition, the Federal Financial Institutions Examination Council (FFIEC) 051 Call Report, to include certain IDIs with less than \$5 billion in total consolidated assets that meet other criteria, and establishing reduced reporting requirements for the FFIEC 051 Call Report filings for the first and third quarters of a year. The OCC and Federal Reserve also finalized similar reduced reporting for certain uninsured institutions that they supervise with less than \$5 billion in total consolidated assets that otherwise meet the same criteria.

On October 13, 2019, the OCC, Federal Reserve, and FDIC adopted a final rule that provides for a simple measure of capital adequacy for certain community banking organizations, consistent with section 201 of EGRRCPA. Under the final rule, depository institutions and depository institution holding companies that have less than \$10 billion in total consolidated assets and meet other qualifying criteria, including a leverage ratio (equal to tier 1 capital divided by average total consolidated assets) of greater than 9 percent, will be eligible to opt into the Community Bank Leverage Ratio (CBLR) framework (qualifying community banking organizations). Qualifying community banking organizations that elect to use the CBLR framework and that maintain a leverage ratio of greater than 9 percent will be considered to have satisfied the generally applicable risk-based and leverage capital requirements in the agencies’ capital rules and, if applicable, will be

considered to have met the well-capitalized ratio requirements for purposes of section 38 of the FDI Act.

On January 24, 2020, the OCC, Federal Reserve, and FDIC issued a final rule implementing a new approach—the standardized approach for counterparty credit risk (SA-CCR)—for calculating the exposure amount of derivative contracts under these agencies’ regulatory capital rule. Under the final rule, an advanced approaches banking organization may use SA-CCR or the internal models methodology to calculate its advanced approaches total risk-weighted assets, and must use SA-CCR, instead of the previous exposure methodology, to calculate its standardized total risk-weighted assets. A non-advanced approaches banking organization may use the current exposure methodology or SA-CCR to calculate its standardized total risk-weighted assets. The final rule also implements SA-CCR in other aspects of the capital rule. The final rule requires an advanced approaches banking organization to use SA-CCR to determine the exposure amount of derivative contracts included in the banking organization’s total leverage exposure, the denominator of the supplementary leverage ratio. In addition, the final rule incorporates SA-CCR into the cleared transactions framework and makes other amendments, generally with respect to cleared transactions.

On January 27, 2020, the OCC, Federal Reserve, and FDIC issued a final rule to implement section 402 of EGRRCPA. Section 402 directs these agencies to amend the regulatory capital rule to exclude from the supplementary leverage ratio certain funds of banking organizations deposited with central banks if the banking organization is predominantly engaged in custody, safekeeping, and asset servicing activities.

On March 18, 2020, the Federal Reserve issued a final rule intended to simplify its capital framework while preserving strong capital requirements for large firms. The final rule integrates the regulatory capital rule (capital rule) with the Comprehensive Capital Analysis and Review (CCAR) framework, as implemented through the capital plan rule. The final rule makes amendments to the capital rule, capital plan rule, stress test rules, and Stress Testing Policy Statement. Under the final rule, the Federal Reserve will use the results of its supervisory stress test to establish the size of a firm’s stress capital buffer requirement, which replaces the static 2.5 percent of risk-weighted assets component of a firm’s capital conservation buffer requirement. Through the integration of the capital rule and CCAR, the final rule removes redundant elements of the previous capital and stress testing frameworks that operate in parallel rather than together, including the CCAR quantitative objection and the assumption that a firm makes all capital actions under stress. The final rule applies to BHCs and U.S. IHCs of FBOs that have \$100 billion or more in total consolidated assets.

On December 8, 2020, the Federal Reserve issued a final rule to amend the Federal Reserve’s assessment rule, Regulation TT, pursuant to Section 318 of the Dodd-Frank Act to address amendments made by section 401 of EGRRCPA. The final rule raises the minimum threshold for being considered an assessed company from \$50 billion to \$100 billion in total consolidated assets for BHCs and savings and loan holding companies, and adjusts the amount charged to assessed

companies with total consolidated assets between \$100 billion and \$250 billion to reflect changes in supervisory and regulatory responsibilities resulting from EGRRCPA.

On February 11, 2021, the OCC, the Federal Reserve, and the FDIC issued a final rule that implements a stable funding requirement, known as the net stable funding ratio (NSFR), for certain large banking organizations. The NSFR uses a quantitative metric to measure the stability of the funding profile of certain large banking organizations. The final rule requires these banking organizations to maintain minimum amounts of stable funding to support their assets, commitments, and derivatives exposures over a one-year time horizon. The NSFR is designed to reduce the likelihood that disruptions to a banking organization's regular sources of funding will compromise its liquidity position, promote effective liquidity risk management, and support the ability of banking organizations to provide financial intermediation to businesses and households across a range of market conditions. The NSFR supports financial stability by requiring banking organizations to fund their activities with stable sources of funding on an ongoing basis, reducing the possibility that funding shocks would substantially increase distress at individual banking organizations. The final rule applies to certain large U.S. depository institution holding companies, depository institutions, and U.S. IHCs of FBOs, each with total consolidated assets of \$100 billion or more, together with certain depository institution subsidiaries (together, covered companies). Under the final rule, the NSFR requirement increases in stringency based on risk-based measures of the top-tier covered company. U.S. depository institution holding companies and U.S. IHCs subject to the final rule are required to publicly disclose their NSFR and certain components of their NSFR every second and fourth calendar quarter for each of the two immediately preceding calendar quarters. In addition, the final rule amended certain definitions in the agencies' liquidity coverage ratio rule that are also applicable to the NSFR.

On December 23, 2021, the NCUA adopted a final rule providing a simplified measure of capital adequacy for federally insured, natural-person credit unions (credit unions) classified as complex (those with total assets greater than \$500 million). Under the final rule, a complex credit union that maintains a minimum net worth ratio, and that meets other qualifying criteria, is eligible to opt into the complex credit union leverage ratio (CCULR) framework if they have a minimum net worth ratio of nine percent. A complex credit union that opts into the CCULR framework need not calculate a risk-based capital ratio under the NCUA's October 2015 risk-based capital final rule, as amended. A qualifying complex credit union that opts into the CCULR framework and maintains the minimum net worth ratio is considered well capitalized. The final rule also makes several amendments to update the NCUA's October 2015 final rule, including addressing asset securitizations issued by credit unions, clarifying the treatment of off-balance sheet exposures, deducting certain mortgage servicing assets from a complex credit union's risk-based capital numerator, revising the treatment of goodwill, and amending other asset risk weights.

On September 18, 2023, the Federal Reserve, OCC, and FDIC issued a proposed rule that would substantially revise the capital requirements applicable to large banking organizations and to banking organizations with significant trading activity. The revisions set forth in the proposal

would improve the calculation of risk-based capital requirements to better reflect the risks of these banking organizations' exposures, reduce the complexity of the framework, enhance the consistency of requirements across these banking organizations, and facilitate more effective supervisory and market assessments of capital adequacy. The revisions would include replacing current requirements that include the use of banking organizations' internal models for credit risk and operational risk with standardized approaches and replacing the current market risk and credit valuation adjustment risk requirements with revised approaches. The proposed revisions would be generally consistent with recent changes to international capital standards issued by the Basel Committee on Banking Supervision. The proposal would not amend the capital requirements applicable to smaller, less complex banking organizations.

Section H Summary

Collectively, the studies discussed in this section highlight the complex dynamics between regulatory measures, market behaviors, and systemic risk in financial institutions. From strategic interactions among investors to the impact of capital regulations and the importance of effective supervision, understanding these factors is crucial for designing robust regulatory frameworks. By addressing both the direct and indirect effects of financial regulations, policymakers can better manage systemic risks and promote a more stable and resilient financial system.

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