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The Interplay among Financial Regulations, Resilience, and Growth

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Abstract Interconnectedness has been an important source of market failures, leading to the recent financial crisis. Large financial institutions tend to have similar exposures and thus exert externalities on each other through various mechanisms. Regulators have responded by putting in place more regulations with many layers of regulatory complexity, leading to ambiguity and market manipulation. Mispricing risk in complex models and the arbitrage opportunities through the regulatory loopholes have provided incentives for certain activities to be more concentrated in the regulated entities and for other activities to leave the banking into new shadow banking areas. How can we design an effective regulatory framework that would perfectly rule out bank runs and TBTF and to do so without introducing incentives for financial firms to take excessive risk? It is important for financial regulations to be coordinated across regulatory entities and jurisdictions and for financial regulations to be forward looking, rather than aiming to address problems of the past.

Keywords Financial reform · Capital regulations · Liquidity regulations · Too-big-to-fail · Living wills · Dodd–Frank Wall Street Reform and Consumer Protection Act · Financial stability · Interconnectedness

JEL classifications G12 · G21 · G28 · G18

1 Introduction

A special issue of the *Journal of Financial Services Research* presented selected papers from The Interplay Among Financial Regulations, Resilience, and Growth conference in

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June 2016. The conference was jointly sponsored by the Federal Reserve Bank of Philadelphia, the Wharton Financial Institutions Center, the Brevan Howard Centre at Imperial College London, and the *Journal of Financial Services Research*. The objective of the conference was to engender a robust exchange and discussion of leading scholars, regulators, and market participants on the vital subject of safety and soundness of the financial systems and financial stability and resiliency.

The papers appearing in this volume addressed critical questions related to understanding the changes in the financial system as a result of the rigorous and more complex financial regulations that were imposed on banks and other financial firms since the financial crisis that started in 2007. The new financial landscape was developed when a series of deeply indebted nonbank institutions that were not protected by the Federal Deposit Insurance Corporation (FDIC) faced the equivalent of bank runs as creditors or shareholders started to doubt their solvency. Lehman Brothers' failure demonstrated that the largest financial firms were deeply interconnected, causing regulators to extend the safety net beyond the banking sector, covering essentially more than half of the financial sector.

Questions and concerns arose about the pros and cons of the complex financial regulations such as the newly required capital and liquidity standards, living wills that large banks are required to develop, and the evolving stress testing at large banks. As regulations have become more complex and more regulations have been imposed over the past decade, some have argued that it is nearly impossible to monitor compliance and that the impact of many of these complex rules and regulations have at least partially offset one another.

Other concerns arose about the impact of stringent lending standards that may have provided incentives for banks to deny loans to consumers and to small businesses, resulting in slower economic recovery and growth in the real sector. In response to the limit to credit access and uncertainty about the economic recovery, consumers have been cautious in their spending and postponing large purchases; thus, the regulatory (indirect) impacts may have played a role in providing further drag on economic recovery.

We consider several important questions that emerged during the conference in designing effective financial regulations to achieve systemic financial stability and to mitigate systemic risk.

- Have we achieved more economic stability and a more resilient financial system after the Dodd–Frank Wall Street Reform and Consumer Protection Act (Dodd–Frank Act)?
- Has the Dodd–Frank Act been effective in enhancing financial resiliency?
- Should financial regulators consider simpler and/or smaller sets of regulations to increase transparency and place greater reliance on market discipline?
- Is increasing the scope, intensity, and complexity of financial regulation the right approach for better outcomes?
- Should there be more coordination among financial regulators (banking and nonbank financial regulations) and policymakers (fiscal and monetary policies) to avoid redundancy, duplication, or interference across the various rules?

The remainder of this paper reviews how the papers in the special issue along with other presentations at the conference addressed these questions. We will discuss the key components and fundamental motivations behind the financial regulatory reform. Section II reviews the recent financial reforms. Section III describes the microfoundations for financial reforms, focusing on capital regulations to enhance loss absorption in the banking system, liquidity

regulations, and the recovery and resolution requirements. In Section IV, we provide a mapping between the basic failures and inefficiencies in the banking system and the recent financial reforms. Section V explores the effectiveness, challenges, and deficiencies of the recent financial reforms and discusses areas that require more research and analysis. Finally, Section VI concludes.

2 Review of recent financial reforms

The Dodd–Frank Act, which was implemented in July 2010, was the largest financial reform since the Great Depression. In response to the damage caused by the recent financial crisis, the regulatory pendulum, as some believe, may have swung toward being overly cautious. The key components of the recent banking reforms under the Dodd–Frank Act revolve around several factors: (1) a requirement that banks be better capitalized for an increased absorption ability of their unexpected losses, (2) a requirement that banks be more liquid and better able to liquidate their assets at short notice to meet cash demand, and (3) the prevention of any market disruption from bank failures by requiring that large and complex banks have an effective resolution plan or living will.

In supporting these goals, several measures and requirements attempt to discourage banks from becoming too big and too complex. In this section, we review these fundamental changes under the Dodd–Frank Act, which have changed the financial landscapes for all large banking institutions — the new capital requirements, the new liquidity requirements, and the new recovery and resolution planning requirements.

2.1 The new capital requirements

The new financial regulations aim to strengthen the capital position of financial institutions. It is important to note that the Basel III capital framework does not replace the previous Basel II framework. Rather, Basel III can be viewed as a layer of capital rules built on top of the Basel II A-IRB framework with more conservative adjustments, additional liquidity requirements, and the counter cyclical buffers. The new Basel III framework introduces tighter capital requirements, relative to the previous Basel II framework, aiming for a stricter definition of bank capital in terms of both higher quality and higher quantity of bank capital.

In terms of *quantity* of bank capital, Basel III requires higher minimum capital ratios, in which the common equity ratio increased from 2% to 4%, and the Tier 1 capital ratio increased from 4% to 6%. The new framework also imposes two additional dynamic capital buffers and a new minimum leverage ratio.

In terms of the *quality* of bank capital, Basel III has redefined Tier 1 capital as being more restrictive, imposing limited amounts of certain Tier 1 capital (by the old definition) to be counted toward Tier 1 capital under the Basel III requirement. For example, Basel III imposes restrictive limits on the amount of mortgage servicing rights (MSR) that could be counted toward capital held by banking institutions. Under the new rules, no more than 10% of an institution's common equity component of Tier 1 capital could be held in the form of MSR. This has been reduced from 50% of common equity component of Tier 1 capital, an 80% reduction relative to the pre-Basel III period. In addition, the aggregate limit for MSR, deferred tax assets, trust preferred securities, and

minority equity interest altogether cannot exceed 15% of the common equity component of Tier 1 capital.

The capital regulation enhancement has also been considered in both the cross-sectional dimension and the time-series dimension. While U.S. banks have been much better capitalized since the financial crisis, the concept of capital regulation was not closely tied to the macroprudential regulation approach. To tie capital regulation somewhat to macroprudential and the overall financial stability, the Globally Systemically Important Banks (the G-SIBs) are required under the new capital regimes to hold an additional systemically important financial institution (SIFI) surcharge for additional loss-absorbing capacity, since their failures would likely have systemic impacts on the overall economy.

First, on the *cross-sectional* dimension, banks are grouped into categories based on their asset size and complexity; large systemically important banks are subject to more layers of capital regulations. The SIFI surcharge imposed on the G-SIBs was also designed to discourage banks from growing too excessively in asset size and to allow more time before all capital is wiped out during the crisis.[1] This surcharge ranges from 1.0% (for Bank of New York Mellon, Morgan Stanley, State Street, U.S. Bancorp), 1.5% (Wells Fargo, Goldman Sachs), 2.0% (Bank of America), 2.5% (Citibank, JPMorgan Chase), to 3.5% (empty bucket for November 2016–November 2017), depending on the risk characteristics of the firms. To allow the G-SIBs and G-SIFIs enough transition time to build their capital for the new requirements, the new rules will not be fully implemented until 2019. Some previously large nonbank institutions have also been classified as SIFIs and have been brought under the banking and capital regulation umbrella.

Second, on the *time-series* dimension, the required capital would change with the economic cycle; for example, a higher capital buffer is required in times when systemic risk is building; the additional common equity of 2.5% of countercyclical capital buffers to risk-weighted assets (RWA) would be imposed during periods of excessive credit growth. Failure to maintain these buffers over the minimum required capital would result in limits on capital distributions and discretionary bonus payments.

In addition to the international Basel III framework described previously, U.S. banking regulators introduced, in response to the financial crisis, a rigorous annual capital stress testing at all large banks that operate in the U.S. The most rigorous annual stress tests, or the annual Comprehensive Capital Analysis and Review (CCAR),[2] are conducted on large systemic banks with assets of more than $50 billion. Another set of annual stress tests somewhat less rigorous than the CCAR is conducted on midsize banks with assets between $10 billion and $50 billion is the Dodd–Frank Annual Stress Testing (DFAST).[3] The annual bank capital stress testing has become part of the mainstream approach to bank capital supervision since the implementation of the Dodd–Frank Act in 2010. The required capital under stress testing would depend on the forward-looking projection around the economic conditions and stress scenarios over the next two years.

[1] However, large and complex banking institutions grew during the recent financial crisis because of the government bailouts.

[2] The threshold based solely on asset size of $50 billion has recently been a popular topic of debate, but it is not the focus of this paper. Of the approximately 6500 banks in the United States, 38 banking firms have assets exceeding the $50 billion threshold.

[3] Of the 6500 U.S. banking firms, 66 have assets between $10 billion and $50 billion.

2.2 The new liquidity requirements

The new regulatory framework intends to create a more resilient financial system and to enhance public confidence during the crisis by requiring large and complex financial institutions to meet the additional liquidity requirements. These requirements are intended to prevent liquidity crisis in which cash outflows accelerate and cash inflows dry out during a period of financial distress. Banks are now subject to the new liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR).

The LCR is designed to reduce liquidity mismatch between assets and liabilities. The LCR is a measure of an institution's ability to withstand a severe liquidity freeze that lasts at least 30 days. Specifically, the LCR requirement would ensure that banking firms have sufficient high-quality liquid assets (HQLAs) to offset their expected net cash outflow during the stress scenario, which lasts at least 30 days. These are the stock of unencumbered assets that are expected to be readily available and capable of conversion into cash during the stress period. The HQLAs are tiered by their value retention and market liquidity. Level 1 HQLAs have the most liquid assets (with zero risk weight) such as cash, central bank deposits, and sovereign securities. Level 2 HQLAs are other liquid assets such as marketable securities and some small portion of mortgage-backed securities with government guarantees that are usually counted toward the required HQLAs subject to some haircuts and cannot exceed 40% of the overall required HQLAs. Baker et al. (2017) show that the new liquidity requirement has imposed new binding constraints for banking firms, in which Level 1 assets (the most liquid assets) are far more constrained than Level 2 assets (not as liquid as Level 1 assets), and they are the most expensive (not generating returns) class of assets to hold on the balance sheet.

The NSFR is a liquidity requirement that follows a concept of a longer-term approach designed to reveal risks that arise from significant maturity mismatches between assets and liabilities. The NSFR is designed to ensure that banking firms have more stable (long-term) sources of funds on an ongoing basis to fund long-term assets. This intends to limit banks' reliance on short-term wholesale funding, which was a major problem during the recent financial crisis. Specifically, the NSFR is measured as a ratio of the available amount of stable funding with maturity longer than one year to the required amount of stable funding in one year. The NSFR ratio (with prudent assumptions regarding the rollovers of assets) would reveal risks that arise from significant maturity mismatches. The NSFR ensures that long-term assets are funded with a minimum amount of stable liabilities.

2.3 The new resolution frameworks and bail-in instruments

The lack of effective resolution framework under the old regime has effectively forced governments around the globe to bail out failed banking institutions, especially those large banking firms whose failures are likely to cause disruption in the financial markets. The recent financial reform, under the Dodd–Frank Act, intends to provide early intervention powers and resolution authorities to banking supervisors. One important dimension of the reform is the move away from a bailout approach toward a bail-in approach to avoid putting the burden of bank failures on taxpayers, who have no share in the upside gains that bank shareholders receive through the bank's risk-taking activities.

To facilitate the bail-in approach, another buffer has been introduced to ensure that banks have sufficient access to additional capital in a stress scenario. Banking firms are required to hold additional equity capital or liabilities that would be converted to equity capital during a

stress period in which equity funding is exhausted. Specifically, large and complex financial institutions would be subject to the total loss absorbing capacity (TLAC) requirements to be phased in starting on January 1, 2019. Banks are required to hold sufficient convertible liabilities that would be converted into common equity capital when additional capital is needed (e.g., during a serious economic downturn) to ensure sufficient time for insolvent banks to be smoothly restructured and recapitalized.

The TLAC is part of the Pillar 1 requirements of the Basel III framework. The proposed minimum TLAC requirement for G-SIBs is an additional 8% of available capital to RWA, adding 16% to 20% of their RWA depending on their SIFI surcharge. The TLAC could be held in the form of common equity Tier 1 capital, additional Tier 1 capital, Tier 2 capital, or in the form of (convertible) long-term unsecured debt. The additional long-term securities could potentially play an important role in promoting safety and soundness in the banking system and in enhancing financial stability. It is important to ensure that the securities are sufficiently liquid and should be actively traded to ensure no mispricing. Not all TLAC securities would be the same in terms of their ability to absorb losses.

This move is important to ensure that banks (and their investors), rather than taxpayers, bear the cost of bank failures. The ability of bank regulators to determine assets quality and to separate good assets from bad assets within the large complex banking institutions would be an important factor in facilitating a smooth resolution. The overall loss absorbing capacity in the U.S. banking industry could be enhanced by the new capital framework. It remains to be seen whether the new TLAC requirements will provide sufficient time for regulators to bridge the gap in selling or merging troubled large banks and in preventing another financial crisis.

3 Microfoundations for the financial reforms

The recent financial reforms aim to address market failures during the financial crisis that started in 2007. In this section, we discuss three types of market failures that have been well documented in the banking literature and their implications for the recent financial reforms. These market failures are: (1) coordination problems and panics, (2) moral hazard and incentive problems, and (3) interbank connection and contagion.

3.1 Coordination problems and banking panics

The banking literature has documented that bank runs are among the key factors for the previous banking crises around the world. For early theories, see Bryant (1980) and Diamond and Dybvig (1983). For some empirical evidence, see Bordo et al. (2001); Reinhart and Rogoff (2009); and Crowe et al. (2011). Safety and soundness in the banking system and financial stability depend to a large extent on the solid foundation of public confidence in the banking system. Banks perform an important intermediary function of liquidity and maturity transformation. Banks take short-term deposits (and other liabilities) from consumers and provide them with liquid access to their savings. At the same time, banks use this relatively short-term funding to make longer-term loans (such as mortgages, car loans, or investment loans) to consumers and businesses that need funding. Banks maintain sufficient liquidity to meet normal withdrawal demand from depositors and/or investors during normal times. This intermediary role that banking institutions provide exposes them to strategic complementarities among depositors and investors in their withdrawal decisions, which could potentially lead to

bad equilibria and runs that force banking firms to liquidate their assets at fire sale prices to meet unusual withdrawal demands, leading to insolvency and failures.

This role provides the basic rationale behind the existing federal deposit insurance, bank bailout, and other government guarantees that we observe today, with the goals of providing public confidence and avoiding panics and runs. A theoretical analysis of the role of guarantees is provided in Allen et al. (2017). They build on the Goldstein and Pauzner (2005) model, in which bank runs occur based on both panic and information, and the probability of a run is uniquely determined in equilibrium.

The problem of runs is broader than the context of traditional banking intermediaries. In today's modern financial markets in which banks engage in nontraditional activities, we argue that banks remain exposed to panics and runs. Gorton (2008) finds that the failures in subprime-related securities caused investors to refuse to fund banks in the wholesale capital market (e.g., using commercial paper), causing a liquidity crisis that led to the global financial crisis. The financial reforms that followed the financial crisis imposed explicit liquidity requirements on banking institutions for the first time.

3.2 Moral hazard and incentives problems

The various explicit and implicit federal guarantees could be viewed as a put option that the government provides to banking firms, giving banks the right to sell their assets at an exercise price equal to the value of their paid-in capital; see Merton (1977). This has provided incentives for banks to take excessive risk, since bank shareholders participate only in the upside of their risk-taking decisions. These moral hazard problems are exacerbated by the government's concerns about panics and/or contagion, which has led the governments around the world to bail out failed banks, leading to unintended consequences of a fragile banking system. Banks do not internalize the consequence of their risk taking because someone else would bear the burden of failure if the risk does not work out. Too big to fail (TBTF) has been a serious problem in the banking systems in many countries.[4]

The moral hazard, incentive problems, and excessive risk taking are not solely contained in the banking system; they are also observed in other markets that have no government guarantees. Allen and Gale (2000a) observe the interaction between incentives in the financial system and asset prices, where investors bid up prices of risky assets above their fundamental values, leading to a financial crisis as the asset bubble bursts. There are potentially important repercussions from the asset price cycles for effective financial regulations. Similarly, Allen and Gu (2018) discuss different sources of systematic risks in the financial systems, which have been the primary causes of the 2007–2009 financial crisis. Their analysis suggests that microprudential regulation that focuses on the risks taken by individual banks is not sufficient to prevent crises, again, providing support for the macroprudential supervision. The new rules and regulations attempt to provide a macroprudential framework that uses capital requirements, liquidity requirements, and other systemwide regulatory tools to limit harm caused by moral hazards and other incentives in the financial systems.

[4] See Brewer III and Jagtiani (2013) for discussion on how much banking firms were willing to pay to become TBTF.

3.3 Interbank connections and contagion: systemic effects

There have been inefficiencies in the banking system due to externalities that banks exert on one another and on the banking systems overall. Through various mechanisms, banks do not internalize these externalities, which lead to inefficient outcomes. For example, Bhattacharya and Gale (1987) have documented the free rider problems in liquidity provision, in which banks would have incentives to underinvest in liquid assets (given that liquid assets earn a smaller rate of return than illiquid assets) and free ride on the common pool of liquidity in the interbank market. Similarly, Bebchuk and Goldstein (2011) look at a freeze in the credit market (rather than the interbank market) and demonstrate that network externalities could lead to market freezes. For example, if a project's success is dependent on a sufficient number of banks investing in the project, and if a bank has an expectation that other banks would not invest in the project, this would lead to fewer banks investing and the project actually failing (self-fulfilling expectation).

Some of the externalities in the banking system would impose direct contagion effects on the entire banking system. A bank's idiosyncratic shock could have a dramatic impact on other banks, and the domino impact could potentially transmit failures from the initially affected bank to a broad group of banks and potentially to the overall banking system. Allen and Gale (2000b) and Freixas et al. (2000) provide early studies of how idiosyncratic liquidity shocks affect the stability of the overall banking system with the various network structures and varying impacts. Benoit et al. (2017) provide a survey of this literature. In addition to liquidity shocks in response to deposit withdrawal, the portfolio adjustment could also generate potential contagion effects, as considered in Goldstein and Pauzner (2004). This is the case in which depositors hold deposits at multiple banks, and one of the banks comes under stress, causing the depositors to run on other banks in an attempt to preserve their total wealth. These are just some examples to demonstrate how multiple sources of shocks can ignite systemic risk and resulting instability in the financial system.

The interbank connections and their interconnectedness through guarantees, coinsurances, similar portfolio compositions, and other factors confirm that policies and procedures that focus on safety and soundness and risk monitoring at an individual institution would not be sufficient to protect the financial system. Banking regulations also need to focus on the aggregate risk level, the distribution of risk, and the interconnectedness among all market participants to be effective in maintaining financial stability; this is the macroprudential approach. It is also important for regulators to keep in mind that the linkages, structures, and relationships that we observe today may not be stable over time, reflecting the dynamic nature of the financial landscapes. Regulations would need to be continuously adapted to reflect the increasing complexity and newly created financial innovations and technologies in this space.

4 Mapping between basic failures and the recent financial reforms

The financial reforms since the crisis are motivated by the lessons learned and aim to reduce the moral hazard problems and the contagion and systemic effects in the financial system. In this section, we discuss the specific reforms related to bank capital and liquidity requirements and the resolution planning (the living wills) requirements. We also attempt to discuss the remaining challenges in maintaining financial stability.

The Dodd–Frank Act has also shifted the emphasis of financial regulation away from microprudential supervision (monitoring risk at an individual institution) to a macroprudential approach (monitoring risk of the banking system as a whole) with the goal of enhancing financial stability and resiliency for the entire system. The new approach focuses on the risks of market disruption more broadly and the potential impact that financial distress at one or more SIFIs would spread through a high degree of interconnectedness across these large banking and nonbanking financial institutions.

4.1 Capital requirement regulation

The traditional approach to capital regulation was motivated around the moral hazard concerns that banks have access to lower funding costs through insured deposits, and that they are provided with incentives to take excessive risk such that bank shareholders would capture the gains if the risk works out and the federal government (or tax payers) would be responsible for it if the risk does not pay off. The most that bank shareholders could lose is the amount of common equity capital. Requiring banks to hold more capital would increase the cost of their risk-taking decisions. Following this reasoning, the Basel capital framework, which is a risk-based capital requirement, is a set of rules that move us in the right direction.

Under the Basel risk-based capital rules, large U.S. banks are required to follow the most complex capital modeling called the advanced internal rating–based (A-IRB) approach. In this case, they build their own internal models to estimate their portfolio's RWA based on the risk parameters — the probability of default, the loss given default, and the exposure at default — and then hold sufficient capital relative to the calculated RWA. The RWA is expected to be different from the bank's total assets, depending on the portfolio risk. The goal is to penalize risky banks and to reward safe banks. Herring (2018) discusses how more complicated capital rules are inevitably more difficult for both supervisors and regulated entities to understand, making capital adequacy compliance much more costly under the complex Basel III rules.

Up until the recent financial crisis, bank capital regulations primarily focused on microprudential considerations. The recent crisis demonstrated that this approach to financial regulation did not protect financial stability, as bank capital could evaporate overnight at some banks, and the shock at one bank could create a domino effect across the banking system. After the recent financial crisis, the focus on the macro impact of capital regulations became more prevalent, not only in the U.S. but also around the globe, as a means to protect the stability of the financial system. History has shown that financial regulations tended to keep expanding in response to the previous crisis. A combination of the Dodd–Frank Act and the new Basel III international capital framework have added several layers of capital buffers over those previously required under the Basel II rules.

Brunnermeier et al. (2009) pointed out this "fallacy of composition," which is a belief that it is not possible to make a system as a whole safe and sound by ensuring that each individual bank in the system is safe. They explain that as individual banks try to make themselves safer, they can potentially behave in ways that their behaviors collectively would undermine the entire banking system. Examples include fire-selling assets at one bank, driving down prices in the asset markets. Banks also tend to follow their own portfolio diversification strategies. They focus on their own risk-sharing and hedging motives, disregarding the potential systemwide impacts (driven by increasing interconnectedness and more correlated portfolios across banking institutions). This in turn creates externalities in the banking system. The recent financial reforms attempt to consider these potential externalities caused by actions or failures of a

banking firm, especially large financial institutions. Therefore, setting risk-based bank capital requirements on the basis of bank size is certainly another important step.

Failures of larger and more complex institutions played a critical role in the recent crisis, causing disruption to the economy. These large banking firms should be subject to a different set of rules and requirements. Since failure of a large and complex banking firm causes significant negative externalities, the SIFIs are now required to hold much more capital to absorb potential losses than non-SIFIs. Under the international guidelines issued by the Financial Stability Board, the list of G-SIBs has been issued, and the list has been revised annually and released in November each year. The criteria for whether an institution would be designated as one of the G-SIBs is based on the various characteristics of the banking firms, including large asset size, more cross-jurisdictional activities, greater degree of interconnectedness with other institutions, no substitutability (products and services cannot be easily offered by another firm as a substitute), and greater degree of complexity (complex organizational structure; risky activities cannot be easily measured and managed). The latest list of G-SIBs (released in November 2016) include the following U.S. banking firms: Citigroup, JPMorgan Chase, Bank of America, Goldman Sachs, Wells Fargo, Bank of New York Mellon, Morgan Stanley, State Street, and U.S. Bancorp.

Through the Dodd–Frank Act reform, some large and complex nonbank financial institutions have been brought under the Federal Reserve's banking regulation umbrella because they have been identified as one of the SIFIs, including AIG, Prudential Financial, MetLife, and GE Capital. The process that determines whether a nonbank financial institution or a group of financial institutions are systemically important plays a critical role under the Dodd–Frank Act framework. There have been questions and arguments about whether the process has been a fair one. For example, MetLife won its legal challenge to the SIFI designation process by the Financial Stability Oversight Council (FSOC) (although it was an uphill battle). GE Capital has also been released from its SIFI status designation through its dramatic reduction in asset size and financial activities.

It remains to be seen whether these new sets of capital requirements will be effective in preventing another financial crisis. Laeven and Levine (2009) argue that the impact of bank capital on a bank's risk-taking decision may depend on its ownership structure. Haldane and Madouros (2012) argue that less complex capital rules, such as leverage ratios, may be more effective than complex rules. Haldane (2013) and Herring (2018) have shown that RWA for a sample of 16 U.S. and European G-SIBs has been declining since the RWA calculation was imposed in the mid-1990s. Figure 1 shows similar decline in RWA to total assets at large U.S. banks as well. Banks have been maintaining a smaller capital ratio relative to RWA as their RWA to total assets have declined. Whether this reflects a true decline in risk taking is questionable. Evidence from Figs. 2 and 3 indicates that the various risk measures (return on assets volatility and subordinated bond spreads) have not declined. However, non–risk-based leverage ratio rules would provide incentives for risk taking. Consistent with this argument, Baker et al. (2017) also point out that the increased complexity and increased number of additional capital rules that have been put in place since the financial crisis have made it difficult to determine which of the capital constraints are binding. However, the new Basel III and the Dodd–Frank Act requirements that use leverage ratios as a backstop, rather than using them as simplistic capital tools, seem to be another move in the right direction overall.

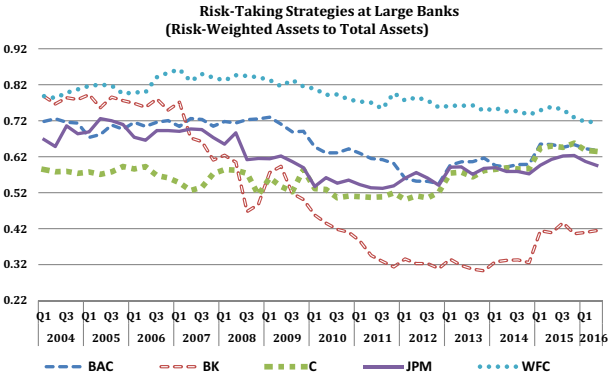

Fig. 1 Risk-Taking Strategies at Large Banks (Risk-Weighted Assets to Total Assets). Source: FDIC data from SNL database. BAC=Bank of America; BK=Bank of New York Mellon; C=Citigroup; JPM = JPMorgan Chase; WFC=Wells Fargo

4.2 Liquidity requirement regulations

The new Basel III framework has introduced new liquidity requirement regulation for the first time, in the form of the LCR and the NSFR (discussed in detail earlier in Section II). Liquidity has often been identified as the cause of bank failures. Liquidity shortage was also identified as one of the key shortcomings during the recent financial crisis (Basel Committee 2011). The capital rules in place during the financial crisis did not account for liquidity, which led to liquidity shortfalls that triggered widespread fire sales of assets by several large banks and further intensified the crisis.[5]

It seems reasonable to believe that more liquidity under the new liquidity regulations would reduce the likelihood that banks would need to sell assets at fire sale prices because they would have enough liquid assets in their portfolio and would be in a better position to withstand liquidity shocks without having to prematurely liquidate their longer-term assets. On the one hand, it is reasonable to expect that the liquidity rules would be able to prevent contagion effects and negative externalities across banks. On the other hand, requiring banks to hold excessive amount of liquid assets could mean that their long-term profitability would also decline. An unintended consequence would be that bank managers would try to boost the firm's profitability by taking more risk, such as additional risks that are not correctly priced under the Basel capital rules. In addition, from the market perspective, shareholders may not be necessarily looking for banks to hold more liquidity, but rather they have reasons to expect their banks to be more profitable.

It is also important to understand the relationship between bank capital regulations and liquidity regulations. From a long-term perspective, capital regulations are intended to preserve financial stability in the longer term. However, from a short-term perspective, bank capital also presents a banking firm's ability to absorb losses in the short run, and thus, capital and liquidity regulations interact in an important way in the short run. Eisenbeis et al. (2018) discuss issues concerning the governance of these macroprudential regulations under the DFA. The

[5] For example, Bear Stearns became financially insolvent because it could not meet liquidity demand, and it was bailed out in March 2008. Its shares were traded as high as $93 per share as of February 2008, and it was purchased by JPMorgan Chase through a government-assisted merger at a much lower price of initially $2 per share in March 2008 (this was subsequently revised to $10 per share in the official final deal).

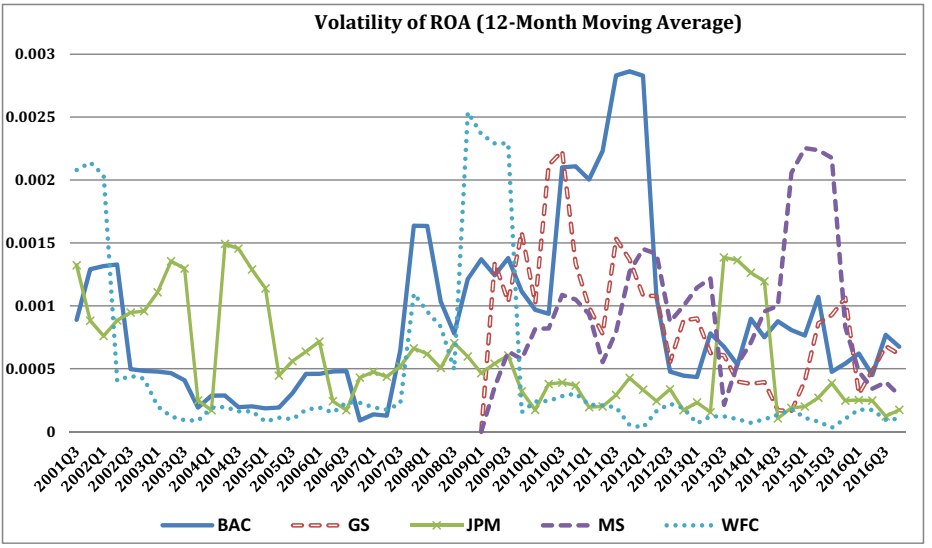

Fig. 2 Volatility of ROA (12-Month Moving Average). Sources: FDIC data from SNL database. BAC=Bank of America; GS = Goldman Sachs; JPM = JPMorgan Chase; MS = Morgan Stanley; WFC=Wells Fargo

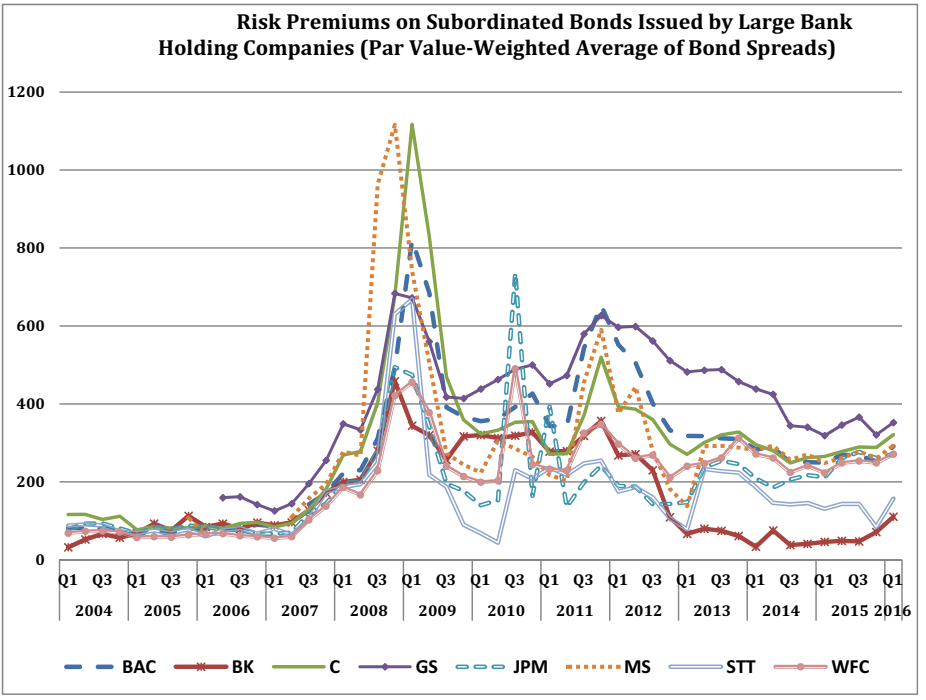

Fig. 3 Risk Premiums on Subordinated Bonds Issued by Large Bank Holding Companies (Par Value-Weighted Average of Bond Spreads). Sources: Bond yields from OTC Corporate Bond Transaction Data (TRACE) through the Wharton Research Data Services (WRDS) and daily Treasury yields from Bloomberg. BAC=Bank of America; BK=Bank of New York Mellon; C=Citigroup; GS = Goldman Sachs; JPM = JPMorgan Chase; MS = Morgan Stanley; STT = State Street; WFC=Wells Fargo

governance structure is split among a number of federal financial regulators, with some conflicting goals and authorities. Overall, the various financial rules and regulations may often be pulling in different directions and partially offset one another, thus potentially increasing the overall cost to the economy without achieving the full benefits intended by each of the rules.

4.3 Recovery and resolution planning requirement

Concern about financial instability resulting from the failure of an SIFI has led to the bailout policies known as TBTF, which created moral hazard problems (e.g., incentives for excessive risk taking) that were one of the causal factors for the financial crisis. The financial reform related to large bank resolution intends to eliminate the moral hazard of TBTF bailouts. The new regulations aim to end the policy of TBTF by giving regulators new authority to resolve failing SIFIs. If large banks could be allowed to fail without contagion and widespread disruption, the federal government would not feel obligated to bail them out. The Dodd–Frank Act intends to end the TBTF policy by creating an effective resolution process to allow an SIFI to fail without any significant disruption to the financial market or to the payment system. Resolvability is one of the Dodd–Frank Act requirements for all SIFIs and G-SIBs. Banks have been working on their resolution plans and have been making very slow progress toward the ultimate goal of being able to complete the resolution through a bankruptcy process.[6]

Under the Dodd–Frank Act financial reform, the SIFIs are subject to periodic regular resolvability assessments. Their resolvability is also reviewed in a high-level Financial Stability Board Resolvability Assessment Process. Title 1 of the Dodd–Frank Act requires that the G-SIBs and the SIFIs submit the "living wills," which is essentially their resolution plans explaining in detail how they would be resolved under the U.S. bankruptcy code in the case of insolvency. There have been concerns that this would not actually work in practice owing to a lengthy bankruptcy process based on the U.S. bankruptcy laws, especially since the SIFIs typically have a very complex structure with hundreds or thousands of interconnected entities around the globe.

Under the new rules, a failed SIFI would go through a bankruptcy process, assuming effective resolution planning. In the case that it fails to resolve effectively (without creating any significant adverse impact on U.S. financial stability) under Title 1 through the normal U.S. bankruptcy process, the Dodd–Frank Act also created the Orderly Liquidation Authority under Title II, which provides the FDIC with backup authorities to place the SIFIs into receivership by identifying good assets from bad assets and to facilitate a merger or selloff the SIFIs and their subsidiaries. The FDIC would place the failed/failing top-tier parent company into receivership and keep subsidiaries in operation to avoid any market interruption.

For the Dodd–Frank Act Title II to be effective, the top-tier holding company must maintain a sufficient amount of equity and unsecured debt for the recapitalization without either threatening short-term funding liabilities or necessitating injections of capital from the government. This is why the TLAC requirement (discussed earlier) would come in handy. Long-term debts would be converted into common equity as needed.

[6] In 2014, regulators rejected living wills submitted by 11 large banks, leading the industry to revise trillions of dollars in contracts so they would remain in place for up to 48 h after a bank fails, giving governments more time to restructure banks without having to take them over; see Onaran (2017) and the International Monetary Fund (2014).

The appropriate amount of funds available is necessary to maintain public confidence in the financial system. The ultimate goal is not to protect banks from being bailed out or to protect them from being resolved, but to provide an orderly restructuring in times of crisis to avoid contagion effects as the public loses confidence in the banking system. While the bail-in approach would impose the responsibility of failures on bank shareholders and creditors, rather than taxpayers, the implementation may be difficult in practice. More research in this area is required to provide sufficient support that the approach would be effective during the financial crisis for policymakers and the federal government to feel confident enough to choose this method (over the typical bailout approach) in the time of crisis.

5 Effectiveness, challenges, and deficiencies of the recent financial reforms

The recent financial reforms, the Basel III, and the Dodd–Frank Act reform intend to enhance the banking firms' ability to absorb unanticipated losses and to reduce insolvency risk and the risk of systemic failures. A new set of capital standards have been imposed on all banks, although the focus has been on large and more complex financial institutions. This is partly in response to the perceived causes of the recent crisis. The required capital is also intended to provide "skin-in-the-game" and to reduce incentives for bank managers and shareholders to take excessive risk. The new capital rules intend to enhance both the quantity and the quality of bank capital. The liquidity requirement and the resolution planning requirement have been introduced for the first time. The reforms intended to close the gaps in the regulatory perimeters that were revealed during the recent financial crisis. Banking institutions are now faced with higher costs of running businesses and greater regulatory burdens, which would in turn require them to take more risk and/or pass higher operating cost onto consumers. In addition, the increased regulatory burden has been driving much of the banking businesses outside the banking regulatory umbrella into the shadow banking sector.

5.1 Integrated approach in regulating the financial system as a whole — risk migration

Nonbank financial firms, such as mutual funds, hedge funds, and money market funds, have been less affected by the recent financial reforms primarily because, unlike banks, these nonbank institutions are not funded by insured deposits. There are no particular moral hazard incentives for them to take excessive risk, and even if they do, they are not expected to be bailed out by the federal government. Many of the nonbank financial institutions, however, were in severe stress during the crisis. The interconnectedness across banks and nonbank institutions was so severe that failures of these nonbank institutions would have threatened U.S. financial stability; thus, they were effectively bailed out. To date, smaller nonbank financial institutions have remained free of the added regulatory burden while they provide similar banking products from the shadow banking sector. Fintech lending platforms, which make loans to consumers and small businesses (much the same as in bank lending) have also been growing exponentially since the financial reforms without being subject to banking regulations; see Jagtiani and Lemieux (2016, 2018).

Overall, financial regulations should view the financial system with a more integrated approach and account for interactions across the regulated and nonregulated parts of the system. A more holistic regulatory approach has been attempted under the Dodd–Frank Act

by the FSOC to bring large systemic nonbank entities under the same regulatory umbrella. This again is another move in the right direction: large (systemic) institutions that perform similar functions and/or provide similar financial services should be subject to the same regulations. In addition, financial regulations need to be revised and updated regularly to keep up with new innovations and the changing financial landscapes.

Money market mutual funds (MMMFs) are a good example of nonbank institutions that emerge to perform a bank-like function without being a bank and without being subject to banking regulations. While regulations focus on banking institutions, the other parts of the financial system start to perform the liquidity creation role of banks and inherit some of the risks. The risk of banking activities has escaped from the banking sector and moved into the shadow banking sector. We observed runs on the MMMFs during the recent financial crisis. The same is even true for other mutual funds, some of which invest more in illiquid assets than others. Chen et al. (2010) and Goldstein et al. (2017) explore the risk characteristics of these nonbank institutions and the relation to their holdings. Indeed, corporate bond funds could also trigger panic, but they are not as tightly regulated.

Regulatory restrictions imposed on banks have also encouraged the growth of the corporate bond fund sector. Corporations have increasingly depended on the capital market funding (rather than bank borrowing), and they have issued more corporate bonds. Banks are more restricted in their ability to hold corporate bonds. Figure 4 shows the growth of corporate bonds and their funding sources. The largest groups of investors for corporate bonds have increasingly been mutual funds, insurance companies, pension funds, and MMMFs. The growth in the corporate bond market and the increase in holdings by open-end institutions such as mutual funds in the last decade deserve more attention from financial regulators and policymakers.

These mutual funds hold some very illiquid assets, but at the same time, they are able to offer investors liquidity on a daily basis. However, owing to strategic complementarities in

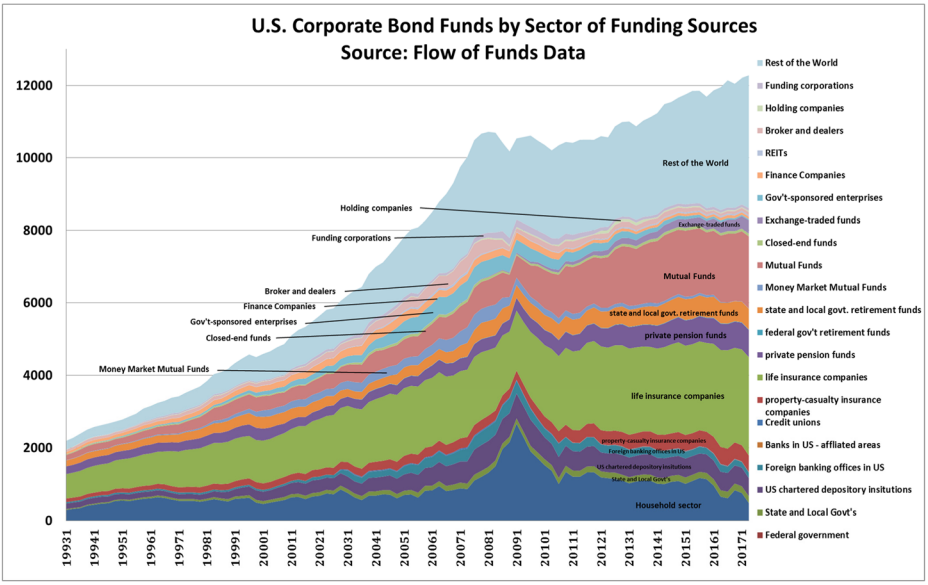

Fig. 4 U.S. Corporate Bond Funds by Sector of Funding Sources Source: Flow of Funds Data

redemption decisions, any unusual amount of redemption by investors would create costs to those who stay because the net asset value of their investment would decline as the fund prematurely liquidates some illiquid assets to meet redemption demand. There is a potential for runs to originate from this nonbank sector, with significant negative consequences for the overall bond market and for the real economy. It is thus important to coordinate regulations across different entities and across sectors.

5.2 Simple vs. complex regulatory approach — trade-off

The financial regulatory trends in the past decades have been toward more complex regulations, partly owing to the increasing complexity of the regulated banking entities. Hakenes and Schnabel (2014) show in their theoretical model that it is actually in the banks' interest to push for complex regulations that are hard to implement and hard to monitor, especially since regulatory agencies tend to pay less and thus the regulatory jobs are less attractive to those top talents. Over the years, the greater complexity of financial institutions (with thousands of subsidiaries around the globe and complex financial innovations) called for more complex financial regulations, followed by even more complex financial products and services. The regulatory arbitrage by complex financial institutions called for further complexity in financial regulations.

One of the recent concerns has been related to the unintended consequences of the complex capital regimes under the Basel III and the CCAR stress testing. Stress testing models have been subject to well-known model risks. Model complexity intends to capture all risks, but the complexity should not be the goal by itself, because some risks may not be possible to model, resulting in unintended consequences. The model complexity and model risk could result in underpricing of some products, driving a high-portfolio concentration of the products and driving other products whose risks are correctly priced (or overpriced) out of the banking system into shadow banking areas. Jagtiani and Lemieux (2016, 2018) have documented lending activities by fintech firms that are not subject to banking regulations.

The Basel RWA for mortgages provides a good example of how regulations could not keep up with the changing financial landscape, resulting in the underpricing of mortgage risks. The Basel RWA calculation is based on assumptions that no longer hold after the financial crisis. The Basel model treats mortgage loans as low-risk assets because traditionally it was perceived to be hardly any chance of a nationwide mortgage default event. This has completely changed since the recent financial crisis as people have changed their payment priority to default on their mortgages before other financial products.[7] Figure 5 shows the increased portfolio concentration in mortgage loans (subject to smaller capital requirements) at large U.S. banks that were subject to the Basel requirements. We do not find the same increase in mortgage concentration at regional or small banks that were not subject to the Basel rules. Again, this evidence demonstrates that regulatory complexity often results in unintended consequences; in this case, underpricing mortgage risk and thus increasing portfolio concentration of mortgages prior to the mortgage crisis, which resulted in the global financial crisis.

[7] A large number of mortgage defaults during the recent crisis resulted in a sizable backlog of foreclosures, thus expanding the foreclosure timeline to a few years or longer in some areas and allowing defaulted borrowers to live in their homes at no cost for years. This provided more incentive to strategically default on mortgage loans; see Jagtiani and Lang (2011).

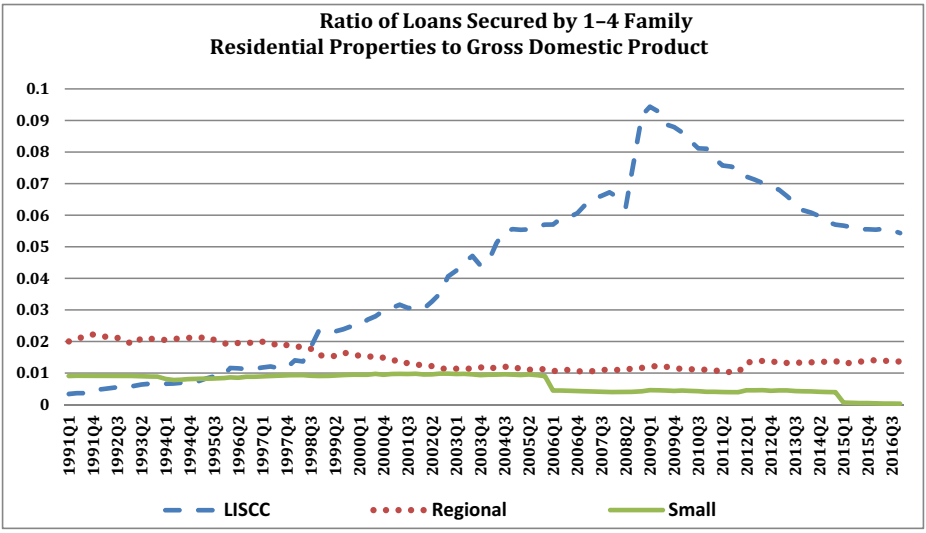

Fig. 5 Ratio of Loans Secured by 1–4 Family Residential Properties to Gross Domestic Product. Source: FR Y9-C Reports. The LISCC banking firms include Bank of America, Goldman Sachs, JPMorgan Chase, Morgan Stanley, Wells Fargo, Citigroup, Bank of New York Mellon, and State Street. "Regional" is defined as bank holding companies with total assets between $1 billion and $10 billion. "Small" is defined as small banking firms with assets less than $1 billion. LISCC = large institution supervision coordinating committee

Complex regulations also tend to be difficult to interpret, hard to monitor, and subject to manipulation. There have been tensions in light of the need for complex regulations to address ongoing and increasingly complex financial innovations and ever-increasing complexity of the financial system. Thus, the tendency to make regulation complex can backfire. The vicious circle among the complexity of financial regulations, financial innovations, and governance structure of financial institutions needs to be stopped. Simplicity and transparency in financial regulations would provide greater ability for banking firms to project their capital holding and optimization of their capital allocation to the various business units. Uncertainty and complexity should be avoided for the regulatory framework to be sustainable and to enhance financial stability.

5.3 Complications in implementing the new rules

Following the financial crisis and the Dodd–Frank Act reform, stress testing has become a central component of the Federal Reserve supervision of SIFIs. The Federal Reserve stress testing is considered to be more forward looking than the previous capital regulations.[8] In addition, layers of capital ratios have been added on top of the previous Basel II capital ratios. The SIFIs have been required to submit their resolution plan for a smooth resolution process.

CCAR stress testing There have been concerns about the current process in which banks have qualitatively failed a CCAR stress test even while maintaining (quantitatively) the required level of capital under the Basel III capital standards. In addition, in response to

[8] There has been significant support for the current stress testing as an effective method for enhancing public confidence and U.S. financial stability overall; see Allen et al. (2016).

uncertainty about the (forward-looking) stress scenarios to be applied to the two-year loss projection, and to avoid risking their reputation, banks may have had to maintain extra capital cushions to ensure sufficient capital to pass the annual stress testing, thus potentially holding too much excess capital. Some banks have admitted that they try to maintain the return on equity (ROE) that shareholders expect and that operating a bank with low ROE would make it difficult to recapitalize.[9]

The resolution plan and bail-in policies Banks have also been making slow progress on their resolution plans. A few years after the Dodd–Frank Act, based on the 2013 resolution plans submitted, 11 banks failed to provide regulators with the blueprint for resolving their operations without disrupting the U.S. economy and financial system. Regulators encouraged them to simplify the firm structure to enhance the prospects for an orderly resolution. The progress has been slow and would require enormous further efforts to be effective. As noted in the Board of Governors of the Federal Reserve System and the Federal Deposit Insurance Corporation (2016) and Hamilton (2016), as of April 2016, several SIFIs including JPMorgan Chase, Bank of America, Wells Fargo, Bank of New York Mellon, and State Street still failed to persuade regulators that they could go through the U.S. bankruptcy process without disrupting the U.S. financial stability. The banking firms failed the resolution plan review based on their 2015 submissions.[10]

Despite the Dodd–Frank Act Title I, Title II, and TLAC requirement, it remains unclear whether the Dodd–Frank Act resolution plan would actually work in practice for at least two reasons. First, the resolution plans submitted by banking firms assume that the economic condition would be normal at the time of failure; thus, the plan would not work if the failure took place during economic downturn or during a financial crisis. Second, the submitted resolution plans also assume that it is an idiosyncratic failure; that is, no other large banking firms would be experiencing similar financial difficulties. Overall, it seems to follow by design that the Dodd–Frank Act resolution plan would not be expected to work effectively in the case of multiple failures or under less-than-normal economic conditions.[11]

The difficulty in this implementation is not unique to U.S. banks. There have been concerns about whether the regulatory authorities would pull the trigger at exactly the right time and what would be the impact if it does not work. There are also potential issues with indeterminacies and the amplification effects as discussed in Bond et al. (2010) and Sundaresan and Wang (2015). In addition, Kane (2018) argues that, despite strict regulations on capital stress tests, resolution plan and living wills, compensation controls, and liquidity

[9] As stated in Carney (2016), bank capital is not costless to society. If capital requirements are increased, some of those costs will be passed on to households and businesses in the real economy.

[10] Citibank did not fail based on its 2015 submitted plan, where significant improvement had been made from the previous plan, but Citibank also failed the previous resolution plan review. Goldman Sachs Group Inc. and Morgan Stanley also made it through without getting labeled with the term *not credible*, because neither was found insufficient by both agencies, although Goldman Sachs was faulted by the FDIC and Morgan Stanley by the Fed.

[11] Similarly, the Federal Reserve Bank of Minneapolis, led by President Neel Kashkari, has proposed an alternative supplemental plan to end TBTF; see Federal Reserve Bank of Minneapolis (2016). If the resolution plan fails to effectively resolve insolvent SIFIs in a timely fashion without spillover effect on the economy, an alternative proposal is that the big banks should be broken up. The proposal was out for public comments until January 17, 2017, and the final plan was released almost 12 months later; see Federal Reserve Bank of Minneapolis (2018). The final proposal calls for, among other things, a significant increase in capital requirements at large banks.

requirements, if bank executives are not individually punished for their "safety-net theft," more "safety-net abuse" would continue into the future. It remains to be seen whether the new resolution authorities contained in the Dodd–Frank Act reform would be effective in ending TBTF and in containing the potential widespread systemic impacts of large bank failures.[12] In addition, cross-border resolution is an important concern because it would be impossible to resolve Citibank in a timely fashion, given its operations in nearly 100 countries.

5.4 Understanding the origins of risk taking

While the financial reforms have mainly emphasized government guarantees as a source of risk taking (i.e., moral hazard problems due to deposit insurance), the real issue is deeper and more complicated due to other sources of moral hazards. Evidence from previous studies suggests other sources as incentives for risk-taking decisions. For example, Falato and Scharfstein (2015) suggest that pressure from the stock market may be responsible for bank risk taking. Laeven and Levine (2009) suggest that risk taking is related to the governance and ownership structure of the firm. Fahlenbrach and Stulz (2011) find that risk taking is tied to incentive compensation. Effective financial regulations should consider the deeper reasons behind risk taking.

In addition, it is important to remember that not all risk taking by the financial sector is problematic. The financial sector should be expected to take some risk, which is inherent to the process of liquidity creation and to the transfer of funds across different players. Hence, we need a better understanding of how much risk is optimal for the financial system to take and use that to guide financial regulation. This point is further emphasized and analyzed in Allen et al. (2017).

6 Summary and concluding remarks

It is well known that federal subsidies and deposit guarantees have led to moral hazard problems in the U.S. banking industry, allowing banks to take advantage of the insurance without having to pay a fair insurance premium. The moral hazard problems have evidently been extended beyond the banking industry to cover nonbank financial firms during the recent financial crisis. Interconnectedness has been an important source of market failures, leading to the recent financial crisis. Large financial institutions tend to have similar exposures and thus exert externalities on each other through various mechanisms.

Regulators have responded by putting in place more regulations with many layers of regulatory complexity. Financial regulations and banking supervision have become more and more dependent on complex models that are subject to model risks and the lack of relevant data. More complex financial regulations tend to backfire as they are subject to more risk than simpler and more nimble regulations. Complex subjective regulation leads to ambiguity and market manipulation. Mispricing risk in complex models and the arbitrage opportunities through the regulatory loopholes have provided incentives for certain activities to

[12] Allen et al. (2016) discuss whether the new resolution authorities contained in the Dodd–Frank Act are sufficient to end TBTF and to contain the systemic impact of the failure of one or more SIFIs.

be more concentrated in the regulated entities and for other activities to leave the banking into new shadow banking areas.

An important policy question remains: How can we design an effective regulatory framework that would perfectly rule out bank runs and TBTF and to do so without introducing incentives for financial firms to take excessive risk (to be subsidized by taxpayers). Other considerations include:

- The optimal amount of risk taking
- How to address migration of risks across different parts of the financial system
- How to resolve the complications in implementing the new rules
- How to account for different origins of risk taking other than the traditional moral hazards from deposit insurance
- How to make financial regulations more forward looking

Policymakers need to be careful in interpreting financial reports or the empirical evidence. It is important to maintain a holistic view of the financial system and that additional risk in one sector is not necessarily evidence of moral hazard as risks migrate across financial sectors. While most of the financial regulations focus on banks, many banking activities have left the banking system to other parts of the financial system. A run, which used to be a banking concern, has become a key concern for mutual funds, as discussed in Goldstein et al. (2017). It is important for financial regulations to be coordinated across regulatory entities and jurisdictions and for financial regulations to be forward looking, rather than aiming to address problems of the past.

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Compliance with ethical standards

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