FSB FINANCIAL STABILITY BOARD

Evaluation of the effects of too-big-to-fail reforms

Consultation Report

28 June 2020

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Table of Contents

Preface 1

Questions for Consultation 2

Executive Summary 4

1. Introduction 10

2. Reforms and their implementation 11

   2.1. The problem of too big to fail 11

   2.2. The post-crisis TBTF reforms 15

   2.3. Implementation status 19

3. Feasibility of resolution 21

   3.1. Progress in implementing the TBTF resolution reforms 21

   3.2. TLAC resources and market functioning 23

   3.3. Obstacles to resolvability 28

   3.4. Lessons from case studies 30

   3.5. Conclusion 31

4. The market's perceptions of the credibility of reforms 31

   4.1. Issues to analyse 31

   4.2. The funding cost advantages of SIBs in the post-crisis period 32

   4.3. The effects of reforms on implicit subsidies 35

   4.4. Market discipline: the relationship between bank risk and the price of debt 37

   4.5. Credibility of resolution reforms: views of stakeholders 38

   4.6. Conclusion 40

5. Banks' responses to reforms 40

   5.1. Results 44

   5.2. Conclusion 48

6. Broader effects of reforms 49

   6.1. Changes in the structure of the financial system 49

   6.2. Changes in the resilience of the financial system 54

   6.3. Global financial integration 61

   6.4. An estimate of the social costs and benefits of TBTF reforms 67

   6.5. Conclusion 68

Abbreviations 70

Bibliography 71
Annex A: TBTF reforms and their implementation 84
Annex B: The elements of resolution reforms 90
Annex C: Summary of public feedback and workshop 95
Annex D: The resolution reform index 100
Annex E: Literature review 110
Annex F: Views of credit rating agencies on resolution reforms 121
Annex G: Selected cases of public assistance or resolution of banks in FSB jurisdictions 124
Annex H: Testing bank behaviour 127
Annex I: Composition of the evaluation working group 128

Preface

This consultation report presents the preliminary results of, and seeks comments on, the evaluation on the effects of too-big-to-fail (TBTF) reforms for systemically important banks. The TBTF reforms being evaluated have three components: (i) standards for additional loss absorbency through capital surcharges and total loss-absorbing capacity requirements; (ii) recommendations for enhanced supervision and heightened supervisory expectations; and (iii) policies to put in place effective resolution regimes and resolution planning to improve the resolvability of banks. These reforms were endorsed by the G20 in the aftermath of the 2007-08 global financial crisis and have been implemented in FSB jurisdictions over the course of the past decade. The objective of this evaluation is to examine the extent to which the reforms are reducing the systemic and moral hazard risks associated with systemically important banks, as well as their broader effects on the financial system.

This report is being released in the midst of the unprecedented and still-evolving COVID-19 pandemic. The pandemic represents the biggest test of the post-reform financial system to date, as it has pushed the global economy into a recession of uncertain magnitude and duration. The rapid and coordinated response by fiscal, financial and monetary authorities has mitigated the impact of the shock on the real economy and the financial system. Authorities are making use of the flexibility built into existing international standards – including bank-specific and macroprudential buffers – to sustain the supply of financing to the real economy. However, the effects of the pandemic continue to put the financial system under strain.

This evaluation has not examined the implications of recent economic and financial developments because the analysis in the consultation report was largely completed before the outbreak of the pandemic. The report does not look at specific banks, nor does it make policy proposals. Nevertheless, it draws a number of conclusions that are relevant to policymakers, market participants and other stakeholders in the current situation.

The findings of the report suggest that TBTF reforms have contributed to the resilience of the banking sector and its ability to absorb, rather than amplify, shocks. Major banks are much better capitalised, less leveraged and more liquid than they were before the global financial crisis. Systemically important banks in advanced economies have built up significant loss-absorbing and recapitalisation capacity by issuing instruments that can bear losses in the event of resolution.

A key finding of the report is that significant progress has been made since the global financial crisis in establishing resolution regimes and enhancing the resolvability of banks. These reforms give authorities more options for dealing with banks in distress, though which options are used is for individual authorities to consider in light of the particular circumstances. Resolution planning, together with enhanced supervision, have significantly improved the operational capabilities of banks and authorities, as well as the accuracy and detail of the information available to them.

Feedback on the analysis and findings of the consultation report would be welcome, including on any additional evidence to consider and on updates to the analytical work that it may be useful to undertake in response to the pandemic. The consultation period has been extended to the end of September in order to give respondents more time to provide feedback, and the final report is expected to be published in early 2021.

Questions for Consultation

The Financial Stability Board (FSB) is seeking comments on its consultative document on the evaluation of the effects of too-big-to-fail (TBTF) reforms.

Background

This evaluation is examining the effects of the too-big-to-fail reforms for banks agreed by the G20 in the aftermath of the global financial crisis. This consultation report sets out the preliminary results for comment.

Questions

The FSB invites comments on the consultation report and the following questions. Please provide details and supporting evidence.

Overall

1. Does the report draw the appropriate inferences about the extent to which TBTF reforms have achieved their objectives?
2. Does the report identify suitable findings for consideration by the relevant policy-making bodies?
3. Are the analytical approaches used to evaluate the effects of the TBTF reforms appropriate? Are there other approaches to consider?
4. Is there relevant causal evidence of the TBTF reforms that can complement the findings of the report?
5. The analysis was carried out before the COVID-19 pandemic, which may have produced new evidence relevant to the evaluation. Within the terms of reference,[1] what updated analytical work would be most useful?

TBTF reforms

6. Does the report accurately describe the ways in which TBTF reforms may affect banks' behaviour and markets' responses? Are there other channels that the evaluation has not considered?

Feasibility of resolution

7. Does the report accurately describe the remaining obstacles to the resolvability of systemically important banks (SIBs)? Are there other major obstacles that should be highlighted?

The market's perceptions of the credibility of reforms

8. Does the report draw appropriate inferences about the extent to which market participants perceive resolution reforms to be credible?

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1 https://www.fsb.org/2019/05/evaluation-of-too-big-to-fail-reforms-summary-terms-of-reference/

Banks' responses to reforms

9. Does the report accurately describe changes in the structure and behaviour of SIBs? Are the findings about the extent to which these changes can be attributed to TBTF reforms appropriate?

Broader effects of reforms

10. Does the report accurately describe changes in the structure and resilience of the global financial system and in financial integration? Does it draw the appropriate inferences about the extent to which these changes have been driven by TBTF reforms? Does the report accurately describe and estimate the social costs and benefits of TBTF reforms?

Additional considerations

11. Are there any other issues that should be considered, within the terms of reference?[2]

Responses should be sent to fsb@fsb.org by 30 September 2020 with the title "TBTF Evaluation". Responses will be published on the FSB's website unless respondents expressly request otherwise.

[2] https://www.fsb.org/2019/05/evaluation-of-too-big-to-fail-reforms-summary-terms-of-reference/

Executive Summary

This consultative report presents the results of, and seeks comments on, the evaluation of the effects of too-big-to-fail (TBTF) reforms for systemically important banks (SIBs). The reforms were endorsed by G20 Leaders following the 2008 financial crisis as part of a wider package of reforms intended to enhance global financial stability and support the economy. The analysis largely took place prior to the outbreak of the COVID-19 pandemic, and the evaluation does not examine the implications of recent market developments.

The reforms within the scope of the evaluation are: (i) standards for additional loss absorbency through capital surcharges and total loss-absorbing capacity (TLAC) requirements; (ii) recommendations for enhanced supervision and heightened supervisory expectations; and (iii) policies to put in place effective resolution regimes and resolution planning to improve the resolvability of banks. These reforms apply to systemically important banks, which are an important part of the domestic banking sector in all FSB jurisdictions.

The evaluation examines how far the reforms have reduced the systemic and moral hazard risks associated with SIBs, and looks into their broader effects on the financial system. Because systemic risk and moral hazard are not directly observable, the evaluation focuses on the mechanisms through which the reforms are expected to operate. These include changes in the behaviour of banks due to the prospect of effective resolution rather than bailout, together with capital surcharges, enhanced supervision and changes in how market participants price bank risks and exert market discipline. For the reforms to achieve their objectives, these mechanisms must be sufficiently strong to affect aggregate outcomes, for example by reducing systemic risk.

The evaluation draws on a broad range of information sources. These include responses to a questionnaire by FSB jurisdictions; input from stakeholders through a workshop, a call for public feedback and interviews with market participants; a review of the literature; and new evidence on the effects of reforms using analytical work and data from commercial providers and FSB members. These sources taken together form the basis for the conclusions in the report.

It is not always possible to attribute observed outcomes to the TBTF reforms. The evaluation has sought to establish a causal link between the reforms and observed outcomes using statistical techniques to the extent possible. However, some TBTF reforms were only recently implemented; other reforms have been implemented in parallel; and low interest rates and unconventional monetary policies may have affected the evolution of key indicators. Comparisons between the period before and after the TBTF reforms are not easy to interpret: observations in the pre-reform period are potentially biased because they include the global financial crisis. Moreover, the pre-crisis period, when asset valuations did not fully reflect risks, is not necessarily a reliable benchmark. These factors, as well as data gaps, affect the interpretation of the results of the evaluation.

The overall findings of the evaluation can be summarised under three headlines:

- Indicators of systemic risk and moral hazard have moved in the right direction;
- Effective TBTF reforms bring net benefits to society; and
- There are still gaps that need to be addressed.

Indicators of systemic risk and moral hazard have moved in the right direction.

Feasibility of resolution

Significant progress has been made in implementing resolution reforms, particularly by jurisdictions that are home to G-SIBs. This is a significant improvement on the position before the global financial crisis, when resolution regimes for systemically important banks were lacking. Almost all G-SIB home jurisdictions, and key host jurisdictions, now have in place comprehensive regimes that give them the option of resolving a failing bank, and a significant number of authorities have produced resolution plans for G-SIBs. Good progress has been made on removing barriers to resolvability. Cross-border crisis management groups have been established for all G-SIBs, and home and host authorities have signed institution-specific cross-border cooperation agreements for most G-SIBs.

Most G-SIBs already meet their final requirements for TLAC and the market has so far absorbed issuance without difficulty. TLAC requirements are intended to ensure that a failing bank has sufficient equity and debt resources to absorb losses and to recapitalise the bank without taxpayer support in a resolution. G-SIBs in advanced economies already meet the 2019 transitional TLAC requirements and are well on the way to meeting final requirements in force from 2022. Most G-SIB TLAC debt has been issued to replace maturing ineligible debt. The markets absorbed this issuance without difficulty in the relatively benign market conditions that were observed during the implementation phase. While global minimum TLAC requirements apply only to G-SIBs, some jurisdictions also require D-SIBs and other banks to meet similar loss absorbency requirements.

Credibility of reforms: evidence from market prices and credit ratings

The funding cost advantages of systemically important banks have fallen since the implementation of reforms, but remain at least as high as they were before the 2007-08 crisis. The estimated funding cost advantages of SIBs have declined since reforms were implemented, from 2012 onwards, although this should not be interpreted as a causal relationship. However, average funding advantages have not fallen significantly below their – potentially distorted – pre-crisis levels. Funding cost advantages tend to be lower in jurisdictions that have implemented resolution reforms more fully.

The evolution of the price of structurally subordinated debt and of credit ratings suggests that market participants consider that resolution has become more credible. Bank debt and credit default swap (CDS) spreads suggest that debt issued by a holding company is seen by market participants as riskier than debt issued by its operating subsidiaries. This is consistent with expectations that the holding company would be bailed in without the operating subsidiary's external creditors incurring losses. In addition, following the implementation of reforms, holding companies received lower credit ratings than their main operating subsidiaries.

Market discipline appears to have improved. The sensitivity of SIBs' CDS prices to their risk (as measured by expected default frequency) has increased since the crisis of 2007-08. Also, TLAC-eligible debt yields more than otherwise similar debt instruments to which it is

subordinated, and this difference in yields is larger for riskier banks. This suggests that investors are at least partially pricing in the risk of G-SIB failure and a potential bail-in.

Credit rating agencies have removed the assumption of sovereign support in a number of jurisdictions. Their base case in such jurisdictions is that unsecured creditors of a failing SIB will be bailed in, although they do not exclude the possibility of bailout. Credit rating agencies judge that bailout is still more likely in the Middle East, Latin America, and most parts of Asia than elsewhere, although there are differences across countries.

Behaviour of systemically important banks

Banks are significantly more financially resilient than they were in 2007-08. Capital and liquidity have improved as a consequence of reforms to bank regulation (Basel III), which include capital surcharges for G-SIBs and D-SIBs. Banks' risk-based capital ratios and leverage ratios have increased, and those of SIBs have increased by more, albeit from low levels. In addition, Basel III reforms significantly tightened the definition of regulatory capital, improving its ability to absorb losses. Banks' estimated default risk has fallen in the period following the reforms.

Banks' profitability has fallen, reflecting changes in their capital and risk-taking. While resilience has increased, the profitability of SIBs, and in particular of G-SIBs, has fallen relative to that of other banks. Other things equal, this is to be expected if reforms are successful, and funding subsidies and risk-taking decrease for SIBs, while capital increases. Low profitability in some markets may also reflect insufficient exit from the market, a problem that resolution reforms are designed to address.

Higher capital ratios have not been associated with significant changes in the balance sheet structure of G-SIBs as compared to other banks. In particular, as a share of their assets, G-SIBs' lending has not evolved differently from that of the banking system as a whole. For other balance sheet items, such as liquid assets, subordinated debt and wholesale funding, there also do not appear to be material differences between G-SIBs and other banks. The asset composition of G-SIBs appears to have become gradually more similar since the early 2000s. But this trend cannot be credibly traced to the TBTF reforms – indeed, G-SIBs are less similar to each other in jurisdictions that have implemented more resolution reforms.

Global systemically important banks remain complex. The average G-SIB still has over a thousand subsidiaries in over 40 jurisdictions. A complex group may be hard to manage, supervise, and resolve. Factors such as the structure of the group, the number of business lines and their mapping into legal entities, and intragroup interdependencies also influence corporate complexity.

Domestic systemically important banks are highly diverse. The number of banks designated as D-SIBs (excluding G-SIBs) has grown from 11 in 2013 to 132 in 2018. D-SIBs account for a substantial proportion of domestic banking sector assets in each FSB jurisdiction in which they are present, with domestic market shares ranging from 9% to 79%. Across FSB jurisdictions the largest D-SIB is about a hundred times bigger than the smallest.

The capital ratios of D-SIBs have increased by more than those of non-SIBs. But for other balance sheet items there do not appear to be material differences between D-SIBs and non-SIBs.

Effective TBTF reforms bring net benefits to society

When interpreting the effects of reforms, it is important to distinguish private and social costs and benefits. For example, lowering implicit funding subsidies and requiring more disclosure will be perceived as a (private) cost by the banks affected, but may represent a net benefit for society. At the same time, there are also potential social costs. Higher capital and TLAC requirements may increase the overall cost of funding for banks. SIBs may pass some or all of this increase in costs onto borrowers by charging higher interest rates on loans. If other firms do not take up the slack, that in turn may reduce investment and output.

The evaluation has assessed the reforms from the perspective of social costs and benefits. The evaluation has estimated social costs and benefits using a simple framework, in which the social benefits of TBTF reforms are reduced probability and severity of financial crisis, and the social costs of the reforms arise via increases in the cost of bank credit. Under conservative assumptions, estimated net benefits are positive. This framework does not capture all types of social costs and benefits. The evaluation has therefore considered other factors, such as changes in bank competition, market structure, interconnectedness and the pricing of debt.

Overall, the analysis suggests significant net benefits for society resulting from TBTF reforms. Observed changes suggest increases in resilience, no material increases in the costs of funding, and more market discipline. Potentially negative side effects, such as a fall in aggregate lending or greater unintended fragmentation of financial markets, have not been observed. Where SIBs have reduced their activities, other suppliers of financial services have stepped in.

SIBs have lost domestic market share and market concentration has fallen. A reallocation of business away from SIBs to other firms is an expected outcome of TBTF reforms. On average, SIBs have lost domestic market share, but these trends differ across countries and regions. In general, the size distribution of banks remains highly skewed: in most countries, a few very large banks coexist with a large number of smaller or mid-sized banks. Hence, shocks affecting large financial institutions can have effects on aggregate outcomes.

The supply of credit has not been materially affected by these changes in market structure. Financing for the economy has not fallen: following the introduction of TBTF reforms, aggregate credit and gross domestic product (GDP) have grown at similar rates. Even if G-SIBs may have reduced their domestic credit relative to GDP, other banks and financial institutions have picked up the slack.

The resilience of central counterparties (CCPs) has become increasingly important. The requirement to use central clearing for standardised over-the-counter derivatives has turned bilateral direct exposures between SIBs into exposures to CCPs. Exposures to CCPs are concentrated among a small number of entities, which are typically SIBs. CCPs are increasingly important for financial stability. A substantial amount of work has therefore

been - and continues to be - devoted to maintaining their resilience, identifying options for their recovery and ensuring that they are resolvable. It is important that this continues and the work on CCP resolution is completed.

Market-based measures of systemic risk have fallen. A bank poses more risk to the system if it is likely to be undercapitalised when the whole system is undercapitalised or if its distress or failure would result in large losses in the financial system. Measures based on market data suggest that systemic risk was broadly stable between 2000 and 2019, except during the global financial crisis.

The 2007-08 financial crisis slowed down, but did not reverse, the long-term trend towards global financial integration. Cross-border lending by banks other than European banks continued to expand. Measures of cross-border connectedness peaked at the onset of the financial crisis and, after a sharp drop in 2008, have since returned to or surpassed their pre-crisis levels.

The evaluation could not support the hypothesis that internal TLAC has fragmentary effects, but it supports orderly resolution and incentivises coordination between home and host authorities. FSB standards provide that host authorities should impose internal TLAC requirements for material sub-groups in their jurisdiction, scaling the requirement within a 75%-90% range. Some respondents to the call for public feedback argued that such internal TLAC requirements could drive market fragmentation. The evaluation does not support this claim. Rather, internal TLAC supports orderly resolution and incentivises coordination between home and host authorities.

There are still gaps that need to be addressed

The report does not make specific policy recommendations; policy design remains the task of the relevant global bodies. However, a number of gaps need to be addressed.

Obstacles to resolvability remain. The evaluation identified a number of areas where improvements to the resolvability of SIBs could still be made. These involve TLAC implementation; resolution funding mechanisms; the valuation of bank assets in resolution; operational continuity and continuity of access to financial market infrastructure (especially CCPs); and cross-border coordination.

State support for failing banks has continued. Only three SIBs have been resolved in recent years. But public funds continue to be used to support small or medium-sized banks, even in jurisdictions with well-developed resolution frameworks. The few recent bank failures are characterised by very different circumstances, making it hard to draw broad conclusions. But there have been a number of cases of state support. This may reflect the fact that resolution reforms have been implemented recently and that the systems are still in transition, and that in particular circumstances other measures were deemed appropriate by the authorities. State support may also be provided where resolution regimes in some jurisdictions are less developed, underscoring the need to implement resolution reforms in full. In other cases, state support has mostly facilitated the banks' orderly restructuring or winding-up, after shareholders and (in some cases) junior creditors have absorbed losses.

There are opportunities to improve provision and availability of data and to consider the adequacy of current levels of transparency. For the reforms to work as intended, market participants and public authorities need sufficient information. Market participants suggest that certain information gaps may reduce their ability to understand how resolution will work and to assess or price the risks. Increased transparency is not, however, costless and the disclosure of otherwise confidential information may create the potential for adverse consequences in resolution. Nevertheless, the report suggests opportunities to enhance the credibility of reforms by enhancing disclosures of information relating to the operation of resolution frameworks; the resolvability of SIBs, including TLAC; and the details of resolution actions after the event.

There may also be gaps in the information available to public authorities and to the FSB and standard setters, which reduces their ability to monitor and evaluate. This includes, for example, information on who owns TLAC issued by G-SIBs, which is needed to assess the potential impact of a bail-in on the financial system and the economy. Careful consideration should be given by authorities and international bodies on the information needed to ensure an effective resolution.

The application of the reforms to domestic systemically important banks warrants further monitoring. D-SIBs are, by definition, economically important, and many of them operate across borders and are highly interconnected. Threats to their resilience may therefore affect financial stability in more than one jurisdiction. Yet, compared to G-SIBs, relatively little is published by national authorities and at the international level about D-SIBs' characteristics or the regulations to which they are subject. More information and analysis, potentially drawing on the analytical tools developed in this evaluation, could be used to compare prudential measures for these institutions and explore how the reforms have been applied to them.

Risks arising from the shift of credit intermediation to non-bank financial intermediaries should continue to be closely monitored. As non-bank financial institutions have picked up market share, some risks have moved outside the banking system. This shift may enhance the stability of the financial system, partly because it may lead to a diversification of funding sources. However, it could also be a source of financial instability. The evaluation has not examined the implications for non-bank financial intermediaries, but the findings on the banking sector reinforce the importance of continuing work by the FSB and standard-setting bodies to assess vulnerabilities and develop policy recommendations designed to address related financial stability risks.

1. Introduction

In the aftermath of the 2007-08 financial crisis, the G20 launched a comprehensive programme of financial sector reforms intended to increase the resilience of the global financial system while preserving its open and integrated structure. With implementation under way it is becoming possible to analyse the effects of these reforms. In 2017, the FSB, in collaboration with the standard-setting bodies (SSBs), developed a framework for the evaluation of the effects of the reforms. It has subsequently carried out a series of evaluations using this framework. It has examined whether post-crisis reforms have created incentives for central clearing, and whether they affect the financing of infrastructure projects or small and medium-size enterprises.

In May 2019 the FSB launched an evaluation of too-big-to-fail (TBTF) reforms as they apply to banks.[3] The reforms to be evaluated are:

- standards for additional loss absorbency through capital surcharges and total loss-absorbing capacity (TLAC) requirements;
- recommendations for enhanced supervision and heightened supervisory expectations; and
- policies to put in place effective resolution regimes and resolution planning and to improve the resolvability of banks.

Chapter 2 and Annex A describe the reforms in more detail.

The evaluation is examining the extent to which these reforms are working as intended and aims to identify any material unintended consequences, without compromising on the objectives of the reforms. Specifically, the evaluation:

1. assesses whether the reforms are reducing the systemic and moral hazard risks associated with systemically important banks (SIBs); and
2. examines broader effects (positive or negative) of the reforms on the financial system.

A working group drawn from FSB member institutions, including SSBs and international organisations, has conducted the evaluation. It has been chaired by Claudia M. Buch, Vice-President of the Deutsche Bundesbank, supported by FSB Secretariat staff and research assistants from the Bank for International Settlements (BIS) (see Annex H). The FSB engaged six academic experts to provide feedback on the methodological approaches, empirical analysis and interpretation of results.[4] The working group analysed information from a variety of sources, including:

- Responses to a call for public feedback issued in May 2019;
- Responses to a questionnaire of FSB member jurisdictions;
- Feedback from a stakeholder workshop in September 2019;

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3 *FSB launches evaluation of too-big-to-fail reforms and invites feedback from stakeholders*

4 The academic experts were selected following a call for nominations in February 2019 (https://www.fsb.org/2019/02/call-for-nominations-appointment-of-academic-advisors-for-the-fsb-evaluation-of-too-big-to-fail-reforms/). Each academic expert signed the BIS Code of Conduct for Contractors; a disclosure and affirmation form about any possible conflicts of interest; and a confidentiality agreement.

- Interviews with market participants;
- A review of the relevant literature; and
- New evidence on the effects of reforms using analytical work and data procured from commercial data providers, FSB member authorities and other sources.

Whenever possible the evaluation has tried to establish a causal link between the reforms and a number of indicators using statistical techniques. However, in a number of cases the relevant data either was not available or could not be shared with the working group. Findings relating to data gaps and information sharing are presented later in the report.

This report is structured as follows:

- Section 2 explains the rationale for the TBTF reforms and provides an overview of their content and their implementation;
- Section 3 presents results on the extent to which resolution is feasible in FSB member jurisdictions;
- Section 4 discusses what market participants think about the credibility of the TBTF reforms;
- Section 5 discusses the changes in the behaviour of banks in response to the reforms;
- Section 6 presents results on the broader effects of the reforms, and in particular changes to the structure and resilience of the financial system and their effects on global financial integration. It also includes an assessment of the social costs and benefits of the reforms.

The report also includes annexes with additional information on the TBTF reforms and their implementation status (Annex A); the elements of resolution reforms (Annex B); feedback from stakeholders (Annex C); the resolution reform index (Annex D); a review of the relevant literature (Annex E); the view of credit rating agencies on resolution reforms (Annex F); cases of resolution or public assistance for banks in FSB jurisdictions (Annex G); the empirical approach to bank behaviour (Annex H); and the composition of the working group (Annex I). A Technical Appendix, published alongside this report, provides a detailed description of the analytical approaches, data sources and results.

2. Reforms and their implementation

This chapter describes the reforms that are being evaluated. First it sets out the economic issues that arise when a bank is believed to be too large, complex or interconnected to be allowed to fail. It sets out the objectives of those reforms and describes the outcomes that might be expected if the reforms succeed. Then it introduces the TBTF reforms. The last section summarises the extent to which reforms have been implemented in FSB jurisdictions.

2.1. The problem of too big to fail

While all banks benefit from a safe and sound financial system, banks differ in their systemic importance. Financial institutions that are deemed to be too big to be allowed to fail are a recurrent theme in the history of financial crises. Financial crises can be very costly indeed. In the global financial crisis of 2007-08, governments spent considerable amounts of

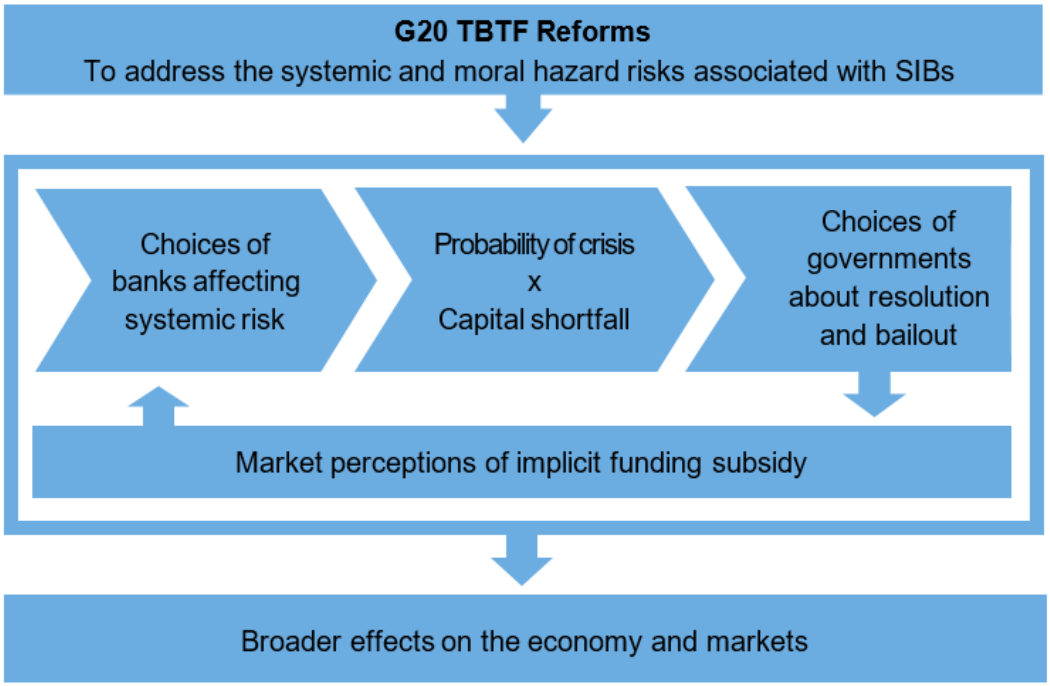
public money in order to prevent a meltdown of markets and mitigate negative consequences for the real economy. Implicit subsidies turned into explicit subsidies. Such subsidies affect the funding costs of banks and their incentives to take on risks.

Financial institutions may become so large, complex or interconnected that their distress or failure would cause serious harm to the financial system and the economy. A disorderly insolvency of such a financial institution is likely to lead to great destruction of value as a result of the loss of franchise value and the fire-sale liquidation of assets. It will without doubt result in protracted and costly litigation. It may well lead to contagion and threaten financial stability. Absent appropriate safeguards, governments may thus intervene in case of the distress of such a bank. Such bailouts can take the form of the injection of capital into a distressed bank in exchange for an equity stake or an explicit guarantee of some or all of its liabilities. The knowledge that a bank may be bailed out represents an implicit government subsidy, which has implications for the behaviour of banks and markets: creditors may be more willing to fund SIBs at lower rates than other banks and may be insensitive to the credit risk of the borrower.

As a result of implicit TBTF subsidies, banks do not bear all the downside risk of their actions, and so tend to take on too much risk. This tendency - moral hazard - may cause substantial economic distortions. Bank shareholders may take decisions which are rational from their individual point of view but which have negative consequences from the social point of view. The design of remuneration schemes affects the incentives of the managers of a bank. Banks may have an incentive to grow balance sheets, increase risk appetite and favour debt funding, because creditors do not bear all the losses when risks crystallise. This constitutes a systemic risk externality leading to social costs: banks, and especially SIBs, will seek risk beyond socially optimal levels if they do not the bear the full costs associated with their decisions, which in turn has implications for the probability and cost of crisis.

Figure 1 (overleaf) illustrates the transmission channels between TBTF reforms, perceived implicit funding subsidies, the behaviour of individual banks and aggregate outcomes. The systemic importance of banks depends, for example, on their choices over size, assets, structure, funding, and risk. Higher capital requirements and more intensive supervision can encourage banks to internalise their systemic risk externalities and change behaviour. Bank behaviour, in turn, determines the system-wide probability of distress (crisis), the capital shortfall and the amount of recapitalisation needed in case of distress, and the expected loss to the economy. In the absence of effective frameworks for resolution, public authorities are not able to credibly commit to allowing systemically important banks (SIBs) to fail. SIBs may thus enjoy funding cost advantages, market discipline may fail to constrain banks' risk-taking and market structures and competition may be distorted. These feedback mechanisms affect aggregate outcomes such as the overall resilience of the financial system and the provision of finance.

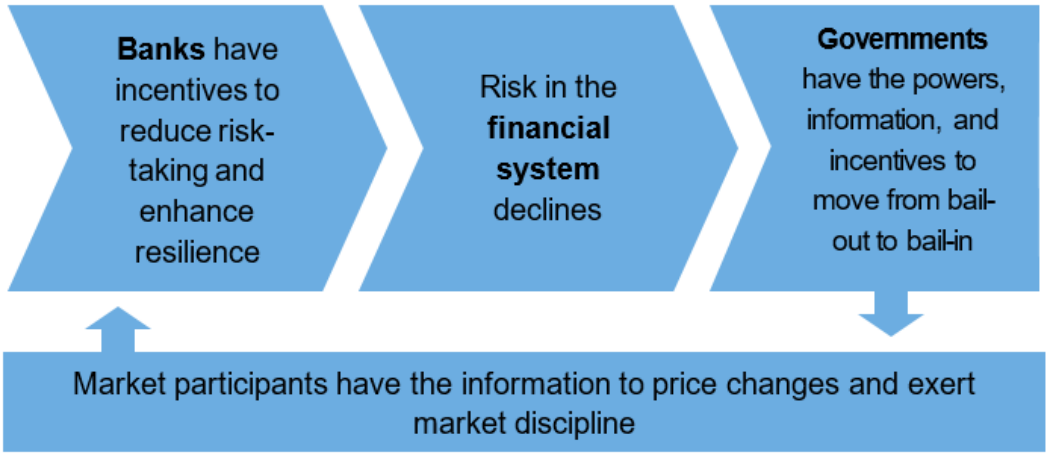
Overview of the building blocks of the evaluation of too-big-to-fail reforms Figure 1



Source: FSB

The too-big-to-fail reforms as a whole are intended to reduce the probability and cost of financial crisis. Tackling the TBTF problem could therefore generate large social benefits, such as improved resource allocation and potentially higher productivity growth, a more resilient financial system and less risk to the taxpayer. The objectives of the reforms are thus to shield taxpayers from losses, by increasing loss-absorbing capacity, mitigating risk-taking incentives and facilitating orderly resolution (Figure 2).

Reforms and objectives Figure 2



In order to assess whether the objectives of the reforms have been achieved, the evaluation has looked at the relevant transmission channels. Moral hazard and systemic risk are not directly observable, SIBs fail infrequently, and implementation of the reforms is not complete.

The evaluation has therefore focused on the mechanisms through which the reforms are expected to operate and on the observed reactions of banks and investors to reforms. For reforms to succeed:

- Governments must have the powers, the information and the incentives to move from bailout to bail-in. Banks must have financial resources and legal and operational structures that facilitate the effective use of resolution tools by the resolution authorities.
- The behaviour of banks must be affected by the prospect of resolution rather than bailout, together with capital surcharges and enhanced supervision.
- Market participants must have sufficient information to price these changes and to exert market discipline.
- These mechanisms must be sufficiently strong to affect aggregate outcomes, for example by reducing risk in the financial system.

Several indicators have been used to assess whether these mechanisms are operating as intended. Should implicit funding subsidies fall, and should resolution frameworks and more effective supervision affect the behaviour of markets and banks, we would expect to see a number of effects on the behaviour of banks.

First, the competitive advantage of banks that were previously considered too big to fail would decline. As subsidies decline, SIBs would become more selective in their lending behaviour. And their profitability would fall as a result of higher capital, lower risk and higher funding costs.

Second, reduced expectations of bailouts would facilitate market discipline and reduce moral hazard. Banks' creditors would become more sensitive to the risk of the borrowing bank. Furthermore, banks would have to factor in the possibility of failing, which would reduce incentives to take on excessive risk and thus reduce moral hazard. Thus, reforms should affect their behaviour as a going concern.

Third, both effects above combined would cause SIBs' balance sheets to become less risky. Effective resolution planning should encourage their corporate structure to change to facilitate resolution. Faced with the prospect of resolution, bank managers would be more willing to take recovery action in order to avoid failure, and bank owners and managers may be more willing to support prudent action.

Finally, all these effects would in turn affect financial stability and economic activity. As SIBs face more stringent requirements, other banks and non-bank financial institutions would pick up market share and improve profitability relative to SIBs. Credit would be more efficiently allocated, increasing productivity growth. And finally, greater bank resilience and feasible and credible resolution regimes would reduce systemic risk.

When interpreting the effects of reforms, it is important to distinguish private and social costs and benefits. For example, lowering implicit funding subsidies and requiring more disclosure will be perceived as a (private) cost by the banks affected and some of its stakeholders but may represent a benefit for society. At the same time, there are also potential social costs. Higher capital and TLAC requirements may increase the overall cost of funding for banks. G-SIBs may pass some or all of this increase in costs onto borrowers by charging

higher interest rates on loans. If other firms do not take up the slack, that in turn may reduce investment and output.

Some of these changes, if they occur at all, will take time to materialise. Resolution of complex global financial institutions requires close cooperation and trust between home and host authorities. Time is needed for confidence to build up and to understand how new resolution frameworks are working. Time is also needed for loss-absorbing capacity to be built up and for fully developing the operational capabilities needed to execute resolution. Moreover, market shares adjust only slowly, and changes in the business models of institutions will take time. Other changes, such as market discipline, may take effect more quickly. Therefore, it may take some time until the full effects of reforms are observed.

Ideally, an evaluation of reforms should isolate the effects of each individual reform as well as of the reforms as a whole. In practice this is immensely challenging, especially when some effects are delayed. While the evaluation has attempted to isolate the effects of resolution reforms – as described below – it has not attempted to isolate the effects of capital surcharges or of more intensive supervision. An important reason for this is that higher capital surcharges and improved supervision also affects non-SIBs, which makes it much harder to identify effects specific to SIBs.

2.2. The post-crisis TBTF reforms

In 2009, as a response to the issues highlighted above, G20 Leaders called on the FSB to propose measures to address the systemic and moral hazard risks associated with systemically important financial institutions (SIFIs). In 2010, G20 Leaders endorsed the FSB's proposed framework for reducing the moral hazard posed by SIFIs.[5] The FSB report recommended that all FSB jurisdictions should put in place a policy framework to reduce the risks and externalities associated with domestic and global SIFIs. The FSB further specified the policy framework in 2011[6] and took stock of progress made and set out further actions in 2013.[7]

The FSB policy framework for tackling the TBTF problem for SIBs comprises:

- standards for higher loss absorbency through capital surcharges and TLAC;
- recommendations for enhanced supervision and heightened supervisory expectations; and
- policies to put in place effective resolution regimes and resolution planning and to assess and improve the resolvability of firms' structures and operations.

This section describes the post-crisis TBTF reforms and other reforms that may be relevant but are not in the scope of the evaluation; further detail is set out in Annex A.

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5 See *Reducing the Moral Hazard Posed by Systemically Important Financial Institutions* (November 2010).

6 See *Policy Measures to Address Systemically Important* Financial *Institutions* (November 2011).

7 See *Progress and Next Steps Towards Ending "Too-Big-To-Fail" (TBTF)* (September 2013).

2.2.1. Global and domestic systemically important banks

The 2010 FSB policy framework stated that banks that are systemically important in a global context should have higher loss absorbency capacity than the minimum levels in the Basel III framework. These banks should thus have a greater ability to absorb losses without restricting the provision of financial services including credit supply and support for market functioning. Standards for such banks should be commensurate with the system-wide expected losses that their distress or failure would produce. In response, the Basel Committee on Banking Supervision (BCBS) published a methodology in 2011 for assessing the systemic importance of banks. The assessment methodology attempts to measure five aspects of a bank's systemic impact: size, interconnectedness, lack of substitutes, international activity and complexity. The FSB uses this methodology to identify global systemically important banks (G-SIBs).

The FSB has published a list of G-SIBs every year since 2011.[8] Banks with a score that exceeds a threshold set by the BCBS (the "cut-off score") are automatically classified as G-SIBs. In addition, supervisory judgment may be used to adjust the classification of individual banks.

The second class of SIBs is domestic systemically important banks (D-SIBs). There are many banks that are not significant from a global perspective, but whose distress or failure could nevertheless have an important impact on their domestic financial system and economy. Such effects could also be felt across borders, even if the banks are not global.

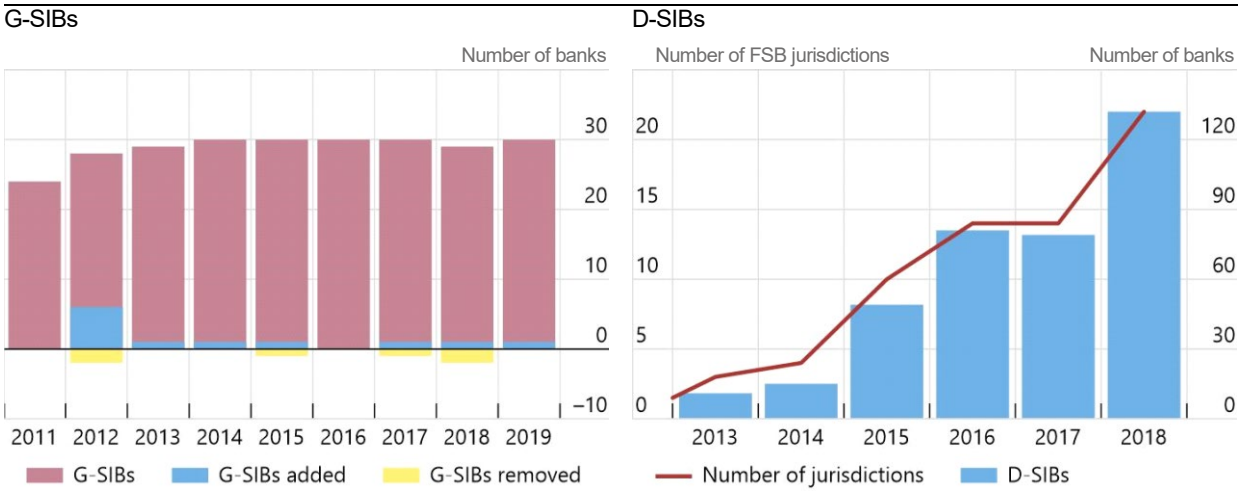
In 2012 the BCBS published a framework for D-SIBs. Banks are identified as D-SIBs by their national authorities, who are best placed to evaluate the impact of distress or failure on the local financial system and economy. In order to allow the different circumstances of individual jurisdictions to be taken into account, the framework is framed as a set of principles. This includes principles relating to the assessment methodology for D-SIBs and to higher loss absorbency requirements.

The number of G-SIBs has hovered around 30, with limited entry and exit since 2011 (Figure 3, left panel). At the same time, the number of banks designated as D-SIBs (excluding G-SIBs) in FSB jurisdictions has grown rapidly, from 11 in 2013 to 132 in 2018 (Figure 3, right panel). The total number of SIBs in each jurisdiction ranged from three to 15 at end-2018 (Figure 4).

8 See *2019 list of global systemically important banks (G-SIBs)* (November 2019).

Total number of G-SIBs and D-SIBs

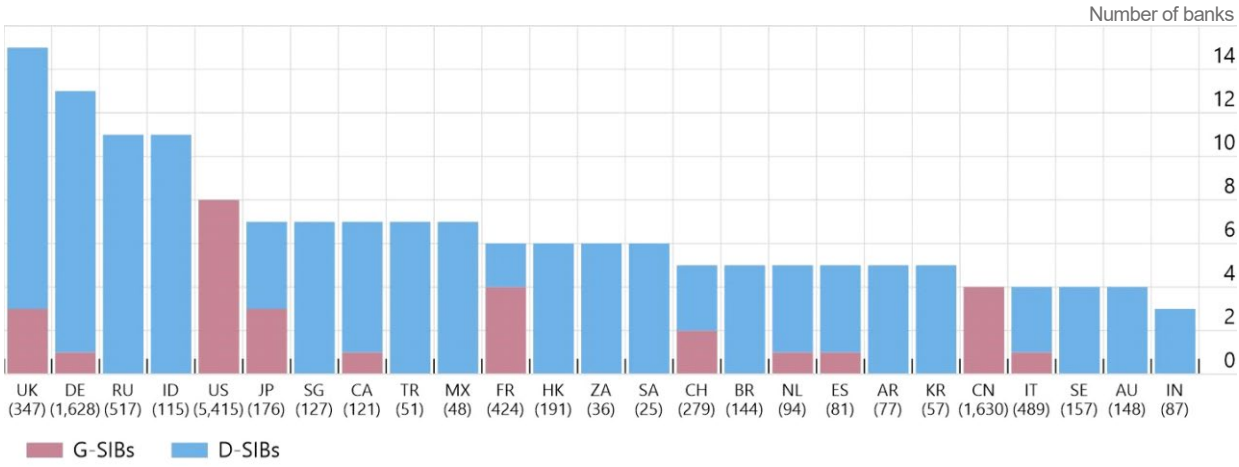
Figure 3



Source: FSB and TBTF evaluation survey

Number of SIBs by jurisdiction as at end-2018

Figure 4



Notes: The total number of banks in each jurisdiction is shown in parenthesis below the country label. Jurisdictions are ordered by the number of SIBs in the jurisdiction. China and the US have not designated D-SIBs. A bank that is a D-SIB in one jurisdiction may be a subsidiary of a G-SIB in another jurisdiction.

Source: FSB and TBTF evaluation survey

G-SIBs and D-SIBs represent an important part of the domestic banking sector in all FSB jurisdictions, with their collective share of domestic bank assets ranging from 35% to 82%.

2.2.2. Requirements for higher loss absorbency

Higher loss-absorbency requirements aim to enable SIBs to have a greater ability to absorb losses, both as a going concern and in resolution. In 2011 the BCBS published the methodology for a capital surcharge for G-SIBs. The surcharges have so far ranged from 1% to 2.5% of risk-weighted assets (RWAs), but could in principle become higher if a bank's score increases. These buffer requirements were phased in between 2016 and 2019. The buffer requirement must be met with the highest-quality type of capital, Common Equity Tier 1 (CET1).

In the context of the Basel III framework, these capital surcharges are material. The surcharge amounts to 1.4% of RWAs on average. By way of comparison, the Basel III minimum ratio of CET1 capital to RWAs is 4.5%. The BCBS D-SIB framework includes principles for calculating the capital surcharge for D-SIBs, but it does not impose a specific percentage.

In December 2017, the BCBS issued its finalised package of Basel III reforms. Among other things, this introduces a leverage ratio buffer requirement for G-SIBs, which is equivalent to 50% of the risk-weighted capital buffer. This new buffer requirement will come into effect in 2023.

2.2.3. Enhanced supervision

A second element of the post-crisis TBTF reforms was an agreement to enhance the intensity and effectiveness of the supervision of SIFIs. Under more intense supervision, moral hazard should be reduced, as supervisors can intervene to change the behaviour of managers. In 2010, the FSB, in consultation with the International Monetary Fund (IMF), released a report on this topic. The report set out recommendations in areas such as supervisory mandates, independence, resources, supervisory powers, improved techniques, group-wide and consolidated supervision, and supervisory colleges. Some of these recommendations were also incorporated in the 2012 update of the BCBS Basel Core Principles.

Subsequent FSB recommendations in 2011 and 2012 strengthened the supervisory expectations relating to financial institutions' risk governance, internal controls and risk management, as well as their risk data aggregation and risk reporting capabilities. This was followed by FSB guidance on enhanced supervision and heightened supervisory expectations on risk appetite frameworks and risk culture. The BCBS published principles for effective risk data aggregation and risk reporting (2013), and for supervisory colleges (2014).

2.2.4. Resolution and resolvability

Robust resolution mechanisms should reduce the probability of a bank failure in the first place by mitigating the moral hazard problem. As the management and shareholders of SIBs know that the bank would be resolved rather bailed out, their risk appetite should diminish.

The third element of the post-crisis reforms thus comprised measures to allow authorities to resolve financial institutions in an orderly manner without taxpayer exposure to loss from solvency support, while maintaining continuity of their vital economic functions. Such economic functions include deposit-taking and payments services. In 2011, the FSB issued the *Key Attributes of Effective Resolution Regimes for Financial Institutions* (Key Attributes) as the international standard on the resolution of SIFIs. These were updated in 2014. The Key Attributes set out the responsibilities, instruments and powers that resolution authorities should have at their disposal for firms that could have a systemic impact if they fail. From the perspective of SIBs, an important element is the bail-in power, which enables resolution authorities to write down liabilities and to convert creditors' claims into equity or other instruments of ownership of the bank or its successor. The Key Attributes also set out standards on recovery and resolution planning, as well as on resolvability assessments. The

FSB subsequently issued further guidance to promote the effective and consistent implementation of the Key Attributes. Further details on resolution are set out in Annex B.

The Key Attributes provide that resolution should be initiated when a firm is no longer viable or likely to be no longer viable, and has no reasonable prospect of becoming so. The resolution regime should provide for timely and early entry into resolution before a firm is balance-sheet insolvent and before all equity has been fully wiped out. There should be clear standards or suitable indicators of non-viability to help guide decisions on whether firms meet the conditions for entry into resolution. Each jurisdiction should have a designated administrative authority or authorities responsible for exercising the resolution powers over firms within the scope of the resolution regime. This resolution authority should have a range of powers to resolve a firm that has entered resolution, in pursuit of objectives including domestic and international financial stability, protection of depositors, and minimising the overall costs of resolution.

A key element of resolvability is the ability of a failing bank to absorb losses in resolution. In 2015, the FSB published the TLAC standard, which aims to ensure that if a G-SIB fails, it has sufficient loss-absorbing and recapitalisation capacity to implement an orderly resolution that minimises impacts on financial stability, ensures the continuity of critical functions and avoids exposing public funds to loss. The minimum TLAC requirement, expressed as a ratio of both RWAs and the Basel III leverage exposure measure, is being phased in between 2019 and 2022. G-SIBs headquartered in emerging market economies have more time to comply.

2.2.5. Other relevant reforms that are not in the scope of this evaluation

Other post-crisis G20 reforms that may have significant relevance for the TBTF problem are not within the scope of this evaluation. The FSB policy framework for SIFIs also noted that jurisdictions should have robust core financial market infrastructures (FMIs) to reduce contagion risk from the failure of individual institutions; and that national authorities could introduce supplementary requirements for such institutions. Other reforms that are not included in this evaluation include the Basel III capital and liquidity requirements (other than capital surcharges for G-SIBs, which are included); the requirement to clear standardised over-the-counter (OTC) derivatives at central counterparties (CCPs); and the requirement to exchange initial and variation margin on OTC derivatives that are not centrally cleared.

The objective of these reforms is ultimately to enhance resilience in the financial system, and they may well have affected the resilience and behaviour of banks and the extent to which they are connected to one another. From an empirical perspective these parallel reforms make it harder to attribute observed outcomes solely to the reforms within the scope of the evaluation.

2.3. Implementation status

In its 2019 implementation monitoring report, the FSB concluded that implementation of TBTF reforms for SIBs continues to advance but remains uneven. The FSB, in

cooperation with SSBs, monitors implementation of TBTF reforms and reports regularly to the G20 on progress:[9]

- The annual process for identifying G-SIBs, based on the BCBS assessment framework, is in place. All but two FSB jurisdictions have also designated D-SIBs.
- Implementation of capital surcharges and of reporting and disclosure requirements for G-SIBs proceeds on a timely basis. Higher capital requirements for D-SIBs have been adopted in almost all FSB jurisdictions.
- All advanced-economy jurisdictions that are home to G-SIBs have imposed external TLAC requirements and all G-SIBs subject to the January 2019 implementation deadline meet them. However, implementation of internal TLAC is less advanced and approaches to its distribution and calibration differ across jurisdictions. Furthermore, few jurisdictions have so far implemented the BCBS standards on the capital treatment of TLAC holdings or disclosure requirements for TLAC issuance.
- Supervisory frameworks have improved and supervisory colleges have been established for almost all G-SIBs. The effectiveness of colleges has improved in terms of information sharing, coordinated risk assessments and crisis preparedness. Yet challenges remain, including legal constraints on information-sharing, supervisory resource constraints and expectation gaps between home and host supervisors. And many G-SIBs are behind schedule in complying with the BCBS principles on risk data aggregation and risk reporting.
- Almost all G-SIB home and key host jurisdictions have in place comprehensive bank resolution regimes that align with the FSB Key Attributes. However, implementation of the Key Attributes is still incomplete in some other FSB jurisdictions. The resolution powers most often lacking in these jurisdictions are the power to resolve by bail-in and the power to impose a temporary stay on the exercise of early termination rights.
- Operationalising resolution plans for SIBs remains work in progress in many jurisdictions. Most jurisdictions have adopted bank resolution planning frameworks, and planning is most advanced for G-SIBs and in jurisdictions that are home to them. The scope of banks subject to resolution planning and to resolvability policies and the extent of their implementation varies across jurisdictions, particularly for banks other than SIBs. Crisis Management Groups are established for all G-SIBs, but institution-specific cross-border cooperation agreements are still not in place for a quarter of G-SIBs.

Additional information on implementation progress can be found in Annex A and, in the case of resolution reforms, in Chapter 3 and Annex B.

The evaluation has developed a resolution reform index. This is intended to illustrate the progress made by FSB jurisdictions in adopting comprehensive bank resolution reforms and investigate the relationship between those reforms and changes in bank and investor behaviour. The index captures a mixture of legislative and regulatory reforms and policy

[9] See the FSB's *Implementation and Effects of the G20 Financial Regulatory Reforms: Fifth Annual Report* (October 2019) and the BCBS Regulatory Consistency Assessment Programme (RCAP) reports on implementation of the Basel standards.

guidance. It has values between 0 and 1, where 0 represents no implementation and 1 represents full implementation of a reform.

The index draws mainly on information contained in FSB reports and is split into three sub-indices: (a) resolution powers and planning; (b) policies and guidance to operationalise resolution regimes; and (c) loss allocation. The index is not intended to assess jurisdictions' compliance with international standards, nor is it a benchmark of the resolvability of individual SIBs in each jurisdiction. However, it does provide a way of measuring the status and timing of implementation of reforms across jurisdictions. It has been used in a number of analyses described later in this report. Further details are set out in Annex D.

3. Feasibility of resolution

A critical component of the TBTF reforms is the introduction of a global resolution framework. Effective resolution enables public authorities to allocate losses to the shareholders and unsecured creditors of the bank without disrupting critical economic functions such as lending, taking deposits and making payments. The resolution reforms were developed with a view to making the resolution of a SIB feasible. They comprise a mix of legal powers, policy standards and coordination arrangements (see Annex A).

The evaluation seeks to answer four broad questions on the progress made by FSB jurisdictions in adopting resolution reforms. These questions (Table 1) are examined using descriptive and qualitative analyses, including case studies. In order to evaluate the extent to which the TBTF reforms have enhanced the ability of authorities to resolve failing SIBs in an orderly manner, this chapter first considers the extent to which jurisdictions have implemented resolution reforms. It compares the current levels of loss-absorbing resources in SIBs against the benchmarks used when calibrating the TLAC standard, and it also describes how the market for TLAC-eligible debt has been functioning. It draws some conclusions from available evidence on progress on the resolvability of G-SIBs. Finally, it examines the evidence from cases of bank failures in recent years.

Table 1: Central questions about feasibility of resolution

How much progress has been made in implementing the TBTF resolution reforms?
To what extent have G-SIBs complied with the FSB's requirements for total loss absorbing capacity (TLAC)?
What remains to be done to be assured that all G-SIBs are fully resolvable in line with FSB standards?
What can we learn from cases of bank failure since the reforms were put in place?

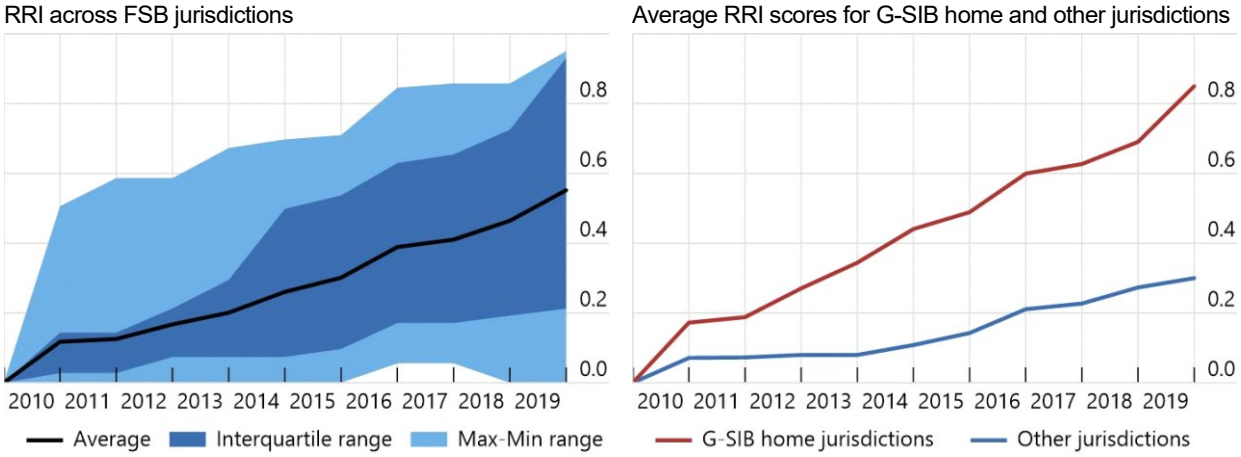
3.1. Progress in implementing the TBTF resolution reforms

Progress in establishing resolution regimes has been substantial (Figure 5). Chapter 2 introduced the resolution reform index, which was used as the basis for Figures 5 and 6. As Figure 5 shows, almost all G-SIB home and key host jurisdictions have had comprehensive

regimes for a number of years. However, implementation of resolution reforms remains incomplete in a number of FSB jurisdictions, so their benefits have yet to be fully realised.[10]

Progress of FSB members in the implementation of resolution reforms

Resolution reform index (RRI) **Figure 5**



Source: TBTF evaluation. See Annex D for details

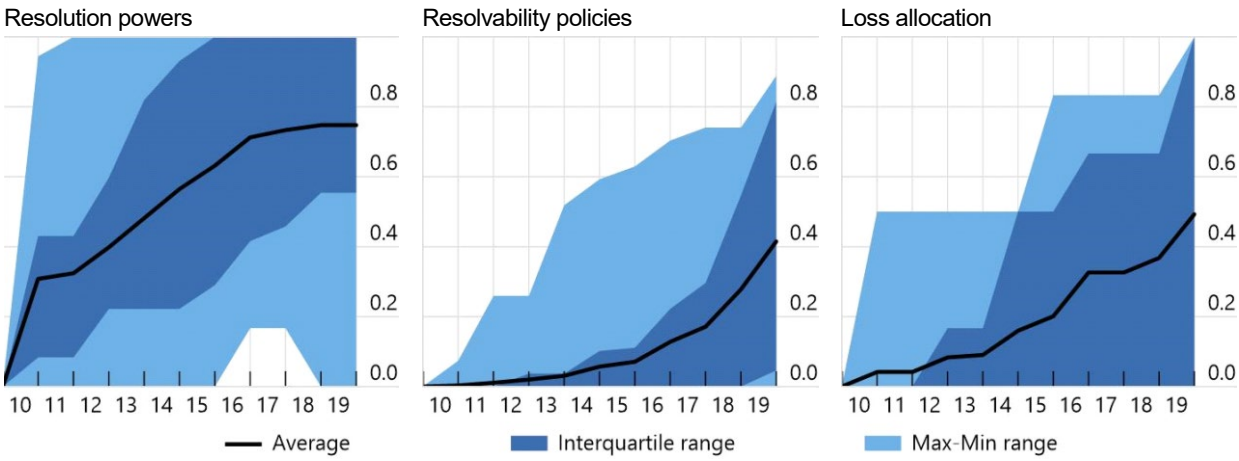
Implementation of policies designed to make SIBs more resolvable has been slower and more uneven than the adoption of legal frameworks. As Figure 6 shows, the adoption of resolution powers was the first type of measure introduced by many jurisdictions. However, having legal powers is not enough. The way in which banks operate and fund themselves can facilitate or hinder the effective use of these powers. For example, banks' corporate interdependencies, corporate structures and cross-border activities could all affect how easily they may be resolved. The slower progress on resolvability policies is partly attributable to longer lead times in developing and implementing such policies in response to potential obstacles identified by resolution planning. Jurisdictions that are home to G-SIBs or that host material subsidiaries of a G-SIB have made most progress in publishing regulations or guidance on resolvability for banks,[11] and also in their ability to allocate losses onto bank creditors through bail-in powers and TLAC requirements.

[10] See Annex 1 of the FSB's *2019 Resolution Report: "Mind the Gap"* for the status of implementation of bank resolution regimes by FSB jurisdictions as of September 2019.

[11] Private-sector initiatives have accompanied regulation, most noticeably in addressing the risk of close-out of financial contracts in resolution. The ISDA Resolution Stay Protocol supports the contractual recognition of powers to stay early termination rights. This power helps to avoid a disorderly close-out of positions against a bank in resolution, helping to ensure the continuity of its critical functions and minimising wider disruption and market dislocation.

Progress in the implementation of selected resolution reforms

Resolution reform index **Figure 6**



Source: TBTF evaluation. See Annex D for details

3.2. TLAC resources and market functioning

One of the most significant reforms intended to facilitate resolution is the FSB's TLAC standard. The evaluation has examined both the sufficiency of existing TLAC resources based on the global minimum TLAC standard and the way in which the new market for TLAC has functioned so far.

3.2.1. TLAC measured against requirements

G-SIBs are currently subject to transitional TLAC requirements. TLAC is intended to be capable of absorbing losses and recapitalising a firm in resolution. The amount of TLAC issued by G-SIBs can therefore offer an insight into the extent to which G-SIBs are capable of absorbing losses in a resolution. The TLAC standard sets a transitional minimum requirement for G-SIBs of 16% of RWAs and 6% of the leverage ratio exposure measure from January 2019. The final minimum requirements, which apply from January 2022, are 18% of RWAs and 6.75% of the leverage ratio exposure measure.

G-SIBs have made good progress in building up their TLAC-eligible resources. The analysis, as at end-2018, of the external TLAC resources of 26 G-SIBs showed that:

- In advanced economies,[12] all G-SIBs designated before the end of 2015[13] had ratios of TLAC to RWAs above the 2019 transitional minimum, and 21 out of 26 G SIBs analysed already had ratios of TLAC to RWAs above the 2022 steady-state minimum.

[12] The FSB TLAC standard provides an extended conformance period for G-SIBs headquartered in emerging market economies, but the conformance date will be accelerated if certain conditions are satisfied.

[13] Two Canadian banks included in the analysis were designated as G-SIBs only in 2018 and 2019 and are not yet subject to the 2019 transitional requirement. Hence, the TLAC resources of these two SIBs are not compared against the FSB's 2019 transitional TLAC minimum.

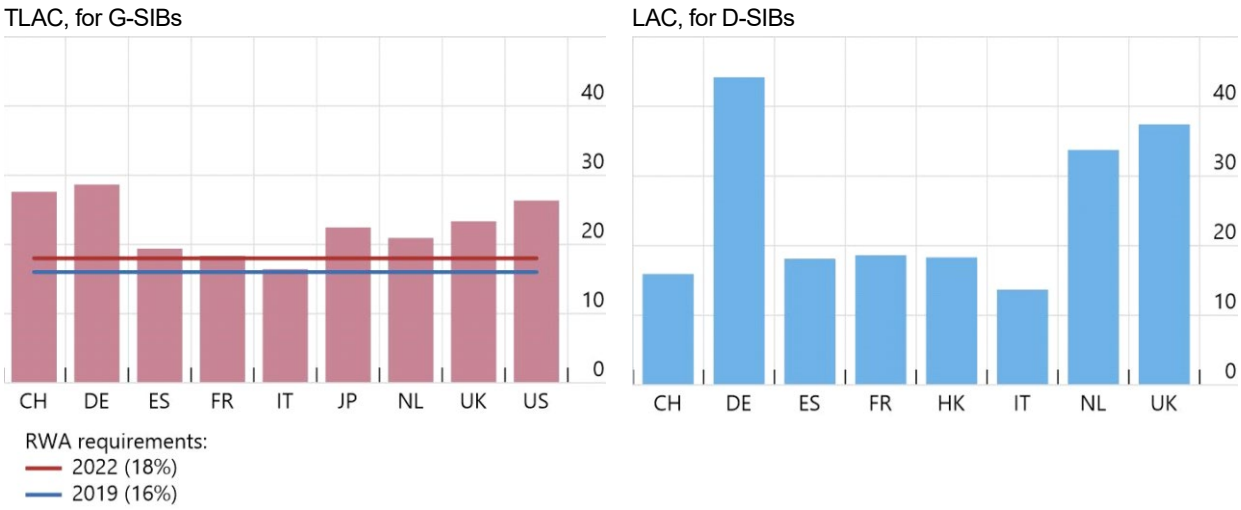
- All G-SIBs designated before the end of 2015 had TLAC resources that exceed the 2019 transitional minimum of 6% of the leverage ratio exposure measure. All but one G-SIB had resources that exceed the 2022 steady-state minimum of 6.75% of the leverage ratio exposure measure.

While the FSB TLAC standard is applicable only to G-SIBs, half of the 24 FSB member jurisdictions choose to apply a similar minimum requirement for loss-absorbing capacity (LAC) to a broader range of banks.[14] Twenty-one out of the 32 D-SIBs analysed have ratios of LAC to RWAs above the 2019 transitional TLAC minimum of 16% for G-SIBs, and 20 D-SIBs have LAC leverage ratio exposure above the 2019 transitional minimum for G-SIBs (Figure 7).[15]

Average ratio of loss-absorbing capacity to RWAs, by jurisdiction

In percent **Figure 7a**

Average ratio of LAC to RWAs, by jurisdiction



Notes: TLAC: total loss-absorbing capacity. LAC: loss-absorbing capacity. RWAs: risk-weighted assets.

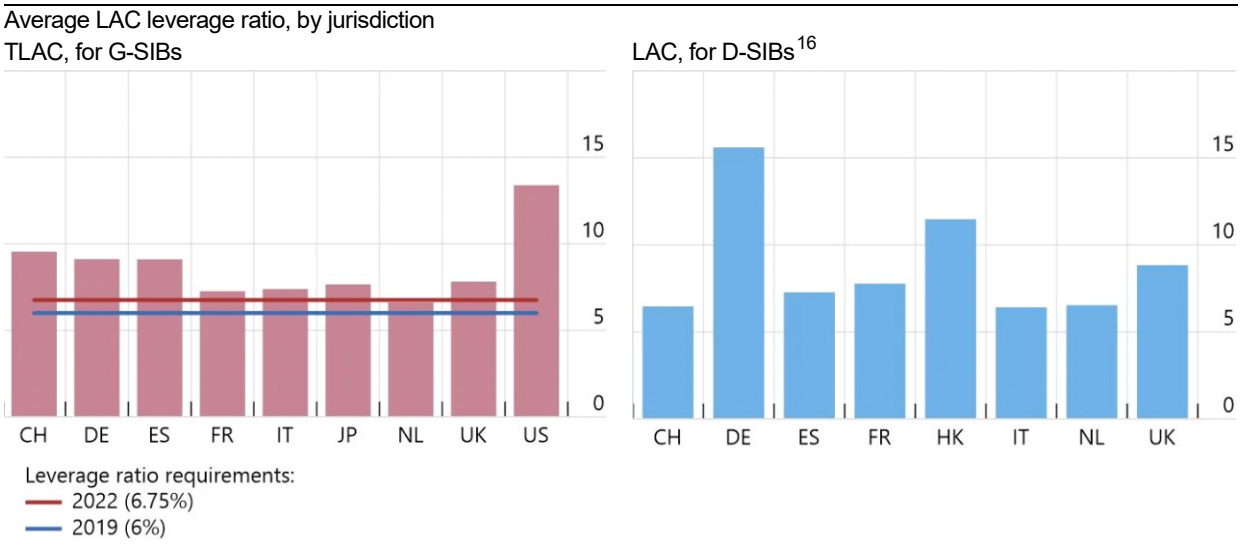
Source: TBTF evaluation

[14] LAC requirements have been imposed on a broader set of banks in Canada, the EU, Hong Kong, Japan, Switzerland and the UK. For example, the EU's Minimum Requirement for own funds and Eligible Liabilities applies to all banks. See the FSB's *Thematic Review on Bank Resolution Planning* (2019).

[15] TLAC-RWA resources are as at the year-end accounting date closest to end-2018. They are calculated net of resources used to meet capital conservation buffers and of G-SIB buffers, but not net of other applicable buffers. TLAC-leverage resources are calculated without deduction of any regulatory capital buffers that are currently applicable. Resources shown include available unsecured senior preferred liabilities up to a maximum of the equivalent of 2.5% RWAs for all banks if the allowance is granted in the relevant jurisdiction. The FSB's *Review of the Technical Implementation of the Total Loss-Absorbing Capacity (TLAC) Standard* (2019) has a different representation, showing capital buffers and allowances for senior preferred separately, and is therefore not directly comparable.

Average ratio of loss-absorbing capacity to leverage exposure measure, by jurisdiction

In percent **Figure 7b**



Notes: TLAC: total loss-absorbing capacity. LAC: loss-absorbing capacity.

Source: TBTF evaluation

3.2.2. TLAC measured against historical losses and recapitalisation amounts

As another perspective, SIBs' loss-absorbing capacity can be compared with major bank losses and recapitalisation needs in the past. The evaluation used the data from the 2015 TLAC report to compare current levels of TLAC with historical losses and recapitalisation needs. The latter were based on the estimates used to calibrate the TLAC standard for G-SIBs.[17] TLAC data are for the end of 2018. The losses examined for that purpose were from 13 major bank failures during the global financial crisis and the Japanese banking crisis of the 1990s. They are measured as the losses plus recapitalisation needs, based on Total Comprehensive Income. It should be borne in mind, though, that those losses occurred before the introduction of post-crisis reforms and thus provide no direct guidance for the future.

As at end-2018, most SIBs had loss-absorbing capacity that exceeded historical losses and recapitalisation needs. For the purpose of the exercise, the 75th percentile of these historical losses was used. This percentile equates to losses equal to 15.3% of RWAs and 6.1% of total assets. This comparison is therefore a broad approximation, especially given changes to a number of variables (including differences in risk weights and accounting standards). Using the 75th percentile as a benchmark, out of the 58 SIBs included in the analysis (see Figure 8): 46 had loss-absorbing capacity that exceeded 15.3% of the resolution group's RWAs, and 40 had loss-absorbing capacity that exceeded 6.1% of the resolution group's total assets.

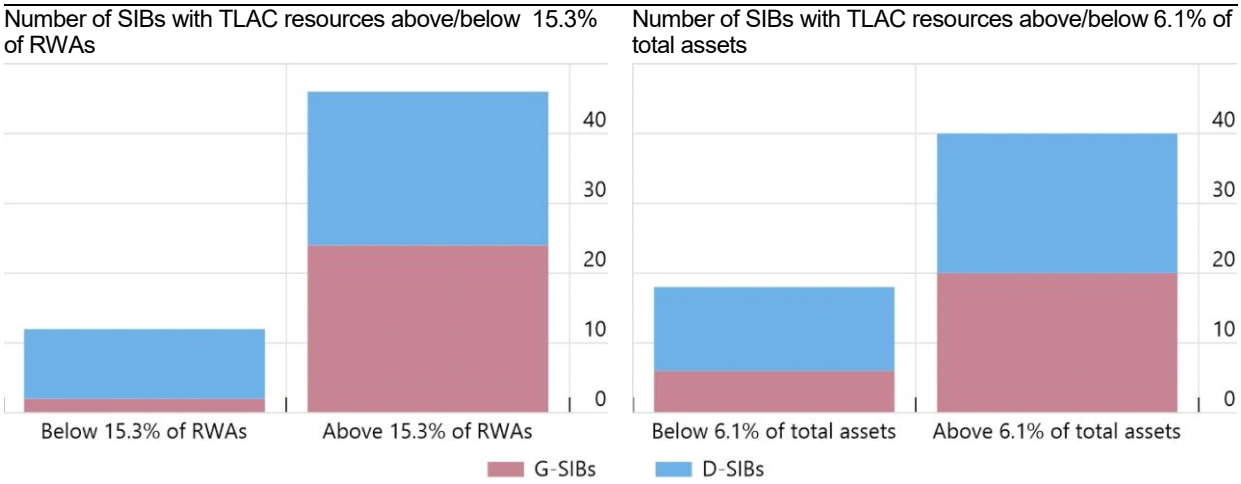
[16] LAC held by other institutions within the financial sector may be eligible for meeting D-SIBs' LAC requirements. The FSB TLAC holdings standard does not apply to D-SIBs' LAC isuances.

[17] FSB, *Historical Losses and Recapitalisation needs Findings Report*, November 2015.

TLAC resources against estimated historical losses and recapitalisation needs

Number of SIBs

Figure 8



Notes: 15.3% of RWAs and 6.1% of total assets are the 75th percentile of the distribution of historical losses and recapitalisation needs. TLAC: total loss-absorbing capacity. RWAs: risk-weighted assets.

Source: TBTF evaluation

3.2.3. Holdings of TLAC-eligible debt

Exposing creditors to losses in resolution could have financial stability and broader economic consequences. For this reason, the TLAC standard provides that TLAC instruments held by other G-SIBs do not count towards meeting their TLAC requirements. The BCBS has developed a standard prescribing the prudential treatment of TLAC held by other banks. The TLAC standard requires that holders of TLAC-eligible instruments are able to absorb losses in a time of stress in the financial markets without spreading contagion and without necessitating the allocation of loss to liabilities where that would cause disruption to critical functions or financial instability. To address these risks, the TLAC investor base should be broad and include enough long-term, stable and diversified investors with the capacity to absorb losses; and investors should be capable of becoming shareholders if TLAC debt is converted to equity (e.g. in terms of fitness and propriety, and investment mandates).

Since information on the TLAC investor base is not available at the global level, the evaluation examined holdings of TLAC issued by G-SIBs in the euro area. The analysis is based on the Securities Holding Statistics by Sector (SHSS) of the European Central Bank (ECB). The analysis focuses on the holdings of publicly-traded TLAC-eligible senior debt and senior non-preferred debt issued by the eight G-SIBs headquartered in the euro area.[18] While this is the most complete database available, its coverage is still incomplete.[19] It covers investors

[18] TLAC eligibility as identified on Bloomberg.

[19] See https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/securities_holdings/html/index.en.html. SHSS includes holdings by investors resident in the euro area and holdings by investors resident outside the euro area to the extent their holdings are deposited with a custodian in the euro area. The coverage is on average 33% of the total, which means that about two-thirds of the TLAC debt issued by euro area G-SIBs is held outside the euro area and is not deposited in a euro area custodian. For TLAC debt held outside the euro area, there is no public information comparable to that available on euro area investors.

resident in the euro area, and investors from outside the euro area are included only where they use a custodian in the euro area.

Among investors from the euro area, financial institutions held the largest share of reported TLAC debt (53%). Within the financial sector, investment funds other than money-market funds hold the highest share (24% of reported TLAC), followed by insurance companies and pension funds (16%) and banks (12%). Other financial institutions hold a small share. Outside the financial sector, households have the largest proportion (6%), while non-financial corporations and governments also hold small shares of TLAC.

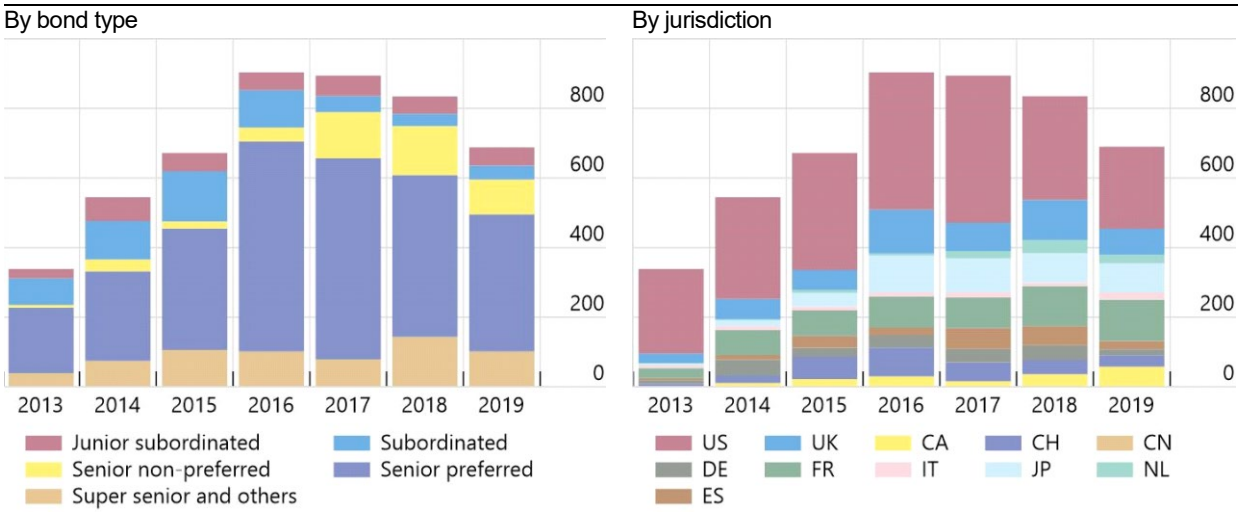
The share of TLAC debt held by households in the euro area has fallen markedly since 2014. The share of direct holdings dropped by two thirds (from 18% to 6%), potentially in response to regulatory restrictions and increased retail awareness of the riskiness of these securities. Households would also indirectly hold TLAC instruments through their holdings in investment funds, insurance companies and pension funds.

3.2.4. TLAC market functioning

In the period to end 2019, financial markets were able to absorb TLAC-eligible debt issuance without difficulty. Available data show that the primary market for non-TLAC debt is larger than that for TLAC debt. However, between 2013 and 2016, a shift towards TLAC debt was temporarily observed as G-SIBs issued large amounts of TLAC in order to comply with the TLAC standard. By 2017, when the regulatory minimum was largely met, the primary market for non-TLAC debt increased in relative size, particularly in Asia (Figure 9).

G-SIBs' TLAC-eligible debt issuance by bond type and jurisdiction

Billions of US dollars **Figure 9**



Sources: Bloomberg; Refinitiv

Issuers also benefited from the low interest rate environment as investors searched for yield. Spreads were very low by historical standards, supported by accommodative monetary policy and improvements in banks' resilience (see Chapter 5).

3.3. Obstacles to resolvability

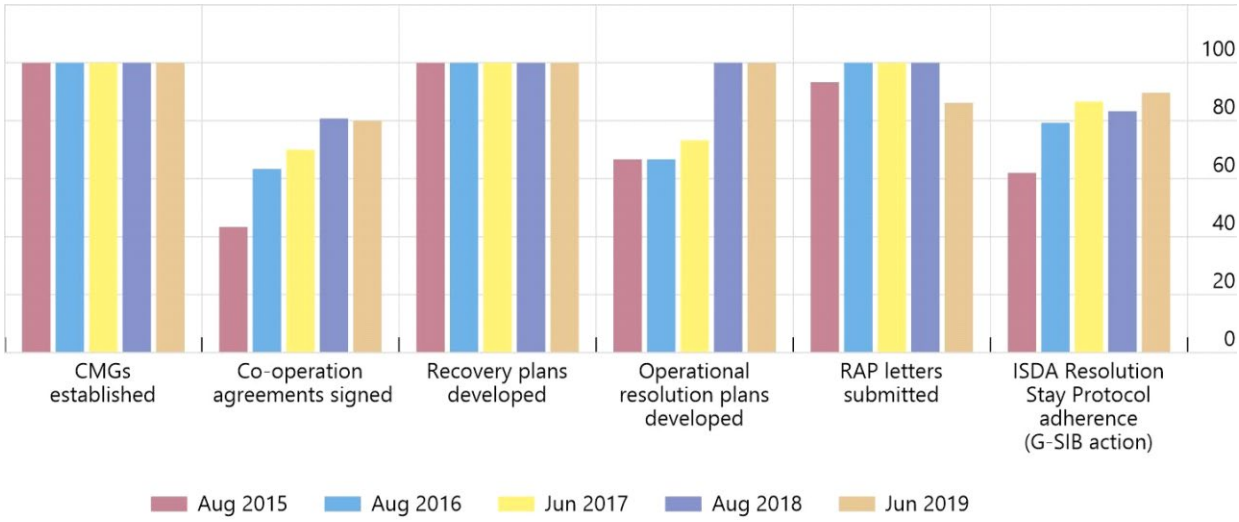
Most, but not all, FSB jurisdictions have adopted resolution planning frameworks. Resolution planning and resolvability assessments form part of an iterative process, by which resolvability assessments both inform resolution plans and test their feasibility. The FSB's 2019 thematic peer review of resolution planning concluded that resolution planning is most advanced in jurisdictions that are home to G-SIBs, where authorities have developed resolution strategies largely based on bail-in.[20] It notes that, while planning requirements vary across jurisdictions, resolution planning for D-SIBs – at least in G-SIB home jurisdictions – largely mirrors what is being done for G-SIBs.

The FSB has published standards and guidance covering aspects of bank resolvability, and has collected information annually on the resolvability of G-SIBs through the Resolvability Assessment Process (RAP). The objective of the RAP template is to share and discuss obstacles to the resolvability of G-SIBs in a consistent manner, determine actions to improve resolvability and, by so doing, increase trust and cooperation between home and host resolution authorities of a G-SIB. G-SIB home jurisdictions have reported to the FSB Chair on the resolvability of their G-SIBs annually since 2015. The information in these RAP letters is based on discussions within CMGs and is not made public. It is used by the FSB on an anonymised and aggregated basis as input in the preparation of the annual FSB progress reports.

The RAP submissions show progress in improving resolvability of G-SIBs over time (Figure 10). They show that resolvability assessments have evolved from recording the implementation of general frameworks and wide-ranging initiatives to focus on narrower, bank-specific tasks. While potential obstacles to orderly resolution remain (see below), they are now fewer and are more clearly understood.

Progress in resolvability of G-SIBs (August 2015 - June 2019)

In percent of home jurisdictions of G-SIBs **Figure 10**



Notes: CMG: Crisis Management Group; RAP: Resolvability Assessment Process

Sources: FSB 2019 Resolution Report: Eighth Report on the Implementation of Resolution Reforms "Mind the Gap"

[20] See the FSB's April 2019 *Thematic Peer Review on Bank Resolution Planning*.

Despite the progress made, obstacles to resolvability remain. This is shown by a study of the resolution reform index, FSB resolution progress and peer review reports, and of RAP submissions. Overcoming these obstacles would help to ensure that resolution authorities can exercise their resolution powers in a timely and effective way. In particular:

- *Internal TLAC:* The FSB's 2019 review of the technical implementation of the TLAC standard concluded that important challenges remained for home and host jurisdictions to ensure the appropriate distribution of internal TLAC, and to ensure balance between TLAC resources that are prepositioned at material subsidiaries or subgroups as internal TLAC, and non-prepositioned resources that would be readily available to be deployed flexibly where needed in times of stress.[21]
- *Funding in resolution:* A failing bank is likely to be suffering from an acute liquidity stress in the run up to resolution and in the immediate aftermath until the market is satisfied that its condition has stabilised. Resolution authorities need to understand the extent and location of funding needs within the group and the amount of liquidity that can be made available through both private funding and public backstops. RAP submissions indicate that work to evaluate funding needs and identify sources of funding in resolution is still at an early stage in many cases.[22] While some jurisdictions have public-sector backstop funding mechanisms that could provide temporary liquidity to a bank in resolution, the RAP submissions suggest that further work may be necessary to develop resolution funding strategies and to ensure cross-border coordination.[23]
- *Valuation:* In resolution, resolution authorities need accurate and complete valuations of banks' assets and liabilities. Resolution authorities are required to carry out timely and robust valuations as part of triggering and executing a resolution. This requires that banks can produce data on their assets and liabilities quickly and in a format in which it can be readily examined. Work on ensuring that such valuation capabilities are in place is generally less advanced. Only a few jurisdictions have developed the conceptual framework and identified the information and capabilities required for valuation.
- *Continuity of access to financial market infrastructure (FMIs):* A bank in resolution needs to continue to have access to FMIs (for example payments systems and CCPs) in order to continue to carry out its critical functions and meet obligations. Many jurisdictions are still working on continuity of access to FMIs in resolution, but in most cases this is at an early stage and is focused on G-SIBs only.
- *TLAC holdings and disclosures:* When considering resolution actions, resolution authorities need to weigh up whether the benefits of avoiding bailout by exposing holders of resources eligible for TLAC to loss might be outweighed by any negative contagion effects to the financial system. The TLAC Review noted that further work is needed to implement the BCBS standard on TLAC holdings. Furthermore, while many G-SIBs voluntarily publish their TLAC resources, implementation of the BCBS

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21 *Review of the Technical Implementation of the TLAC Standard*, FSB, July 2019

22 See FSB *2019 Resolution Report: "Mind the Gap"* (2019)

23 2018 FSB Report on Progress; Technical Appendix

standard on TLAC disclosures is uneven,[24] making it difficult for investors to accurately assess bank-specific TLAC resources.

3.4. Lessons from case studies

Only three D-SIBs in FSB jurisdictions have been resolved since 2016. Annex G identifies instances since 2016 in which resolution tools or public funds have been used to support banks in stress. Since 2016, public funds have been used in the cases of five D-SIBs in FSB jurisdictions.[25] Private-sector recovery actions (e.g. voluntary recapitalisations and commercial acquisitions of failing banks outside of resolution) may offer evidence that resolution is considered credible by a bank's investors, but these too are few in number.

Bank failures are characterised by very different circumstances, making it hard to draw broad conclusions. The evaluation carried out a number of in-depth case studies - covering an insolvency, a resolution and a voluntary restructuring - in order to draw lessons about the feasibility of resolution. The cases were Banco Popular Español SA, The Co-operative Bank Plc and Lehman Brothers Holding Inc. However, the circumstances of each case differed significantly and it has not been possible to draw general conclusions. The 2019 FSB thematic peer review on bank resolution planning also surveyed FSB members on their experiences of resolution cases. All six reported cases involved the use of transfer powers. Some of the lessons drawn by resolution authorities from these cases relate to the timely availability of bank data; the desirability of an alternative strategy or back-up plan in case the preferred strategy cannot be implemented; and the need for adequate liquidity in resolution. A lesson in all cases was the limited time available for executing the resolution and hence the need to prepare in advance, and the need for coordination among authorities.

Despite resolution-related reforms, public funds have continued to be used on occasion to support banks in stress, even in jurisdictions with well-developed resolution frameworks. Such cases of support have mostly facilitated the banks' orderly restructuring or winding-up, after bank shareholders and (in some cases) junior creditors have absorbed losses. Annex G shows that there have been at least eight cases since 2016 in which public funds have been used. Some of these cases have illustrated that jurisdictions lack adequate resolution planning and tools, suggesting a need to implement resolution reforms and complete the crisis management framework.[26] Others may partly reflect that resolution reforms have been implemented recently and that the systems are still in transition. But other cases – where jurisdictions have already introduced comprehensive resolution regimes – can, rightly or wrongly, cast doubt on the effectiveness and credibility of those regimes.[27]

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[24] The TLAC disclosures are specified through the BCBS Pillar 3 disclosure standards, which include disclosure templates for both external TLAC and internal TLAC. These standards entered into force on 1 January 2019 and their implementation is being monitoring by the BCBS. As of May 2019, only six BCBS member jurisdictions had rules in force: See the BCBS October 2019 *Seventeenth progress report on adoption of the Basel regulatory framework*.

[25] Banca Monte dei Paschi di Siena, NordLB, Bank Otkritie, Promsvyazbank and B&N Bank.

[26] In some of these cases, the relevant national authorities have also pointed to the lack of liquidation options that provide for the orderly closure and wind-down. De Aldisio et al. (2019) highlight the constraints on orderly liquidation for small and medium sized banks in the EU.

[27] See also IMF (2020) at p. 55 et seq.

3.5. Conclusion

The TBTF reforms have led to the introduction of statutory resolution regimes in most FSB jurisdictions. Resolution plans and cross-border crisis management groups are in place for G-SIBs, which represents a significant improvement compared to the last global financial crisis.

However, the extent of implementation varies widely across FSB jurisdictions. This makes it difficult to draw general conclusions. Most progress has been made by G-SIB home jurisdictions and certain material host jurisdictions. Many jurisdictions have fully, or nearly, implemented the key resolution reforms. But the extent to which the resolvability of SIBs has improved is much harder to judge.

Obstacles to resolvability remain. Evidence from the RAP, FSB reports and TLAC analyses suggests that SIBs now have more financial resources to absorb losses in resolution and have improved their resolvability and the technical and operational capabilities needed to execute resolution, but more needs to be done.

4. The market's perceptions of the credibility of reforms

4.1. Issues to analyse

Assessing the credibility of the TBTF reforms is central to the question of whether the reforms have met their objectives. For the TBTF reforms to succeed, they must make it feasible for authorities to carry out an effective resolution of a failing bank. But bank creditors and other market participants must also believe that the authorities will use the resolution powers, rather than resort to a bailout. If resolution reforms are credible in the eyes of investors, markets should mitigate excessive risk-taking by banks and incentivise banks to take timely recovery action, thereby protecting taxpayers and reducing the need for resolution to take place. The central questions discussed in this chapter are set out in Table 2.

Table 2: Central questions about the credibility of reforms

Have implicit funding subsidies for SIBs changed during the post-crisis period?
To what extent are changes in funding subsidies attributable to TBTF reforms?
Has market discipline improved?
How do stakeholders perceive the credibility of reforms?

Credible TBTF reforms imply that investors require additional compensation for the risk of loss in the event of distress or failure. If market participants expect banks to be bailed out, SIBs benefit from implicit funding subsidies; credible reforms should be associated with a reduction in these subsidies. In addition, if creditors believe they will benefit less from implicit guarantees, then they are likely to become more sensitive to the risk of the borrowing bank, which in turn should discipline bank behaviour by mitigating moral hazard.

The evaluation has used a range of methods to assess the credibility of reforms. Implicit subsidies of SIBs are, by definition, not observable. However, market prices that reflect the

expectations of investors and the views of credit rating agencies can be used as proxies. The evaluation has reviewed the existing literature and carried out additional analysis to estimate funding cost advantages. The empirical analysis attempts to take into account a range of factors that may explain why funding advantages exist. In part, funding cost advantages are due to the presumption of government guarantee, but SIBs may also enjoy them for other reasons such as economies of scale and scope, diversification and more liquid markets for their liabilities. The structure of the banking sector, the degree of risk aversion among investors, the strength of the sovereign and the stance of monetary policy are all likely to affect the size of implicit funding subsidy (e.g. by affecting the price of credit risk).

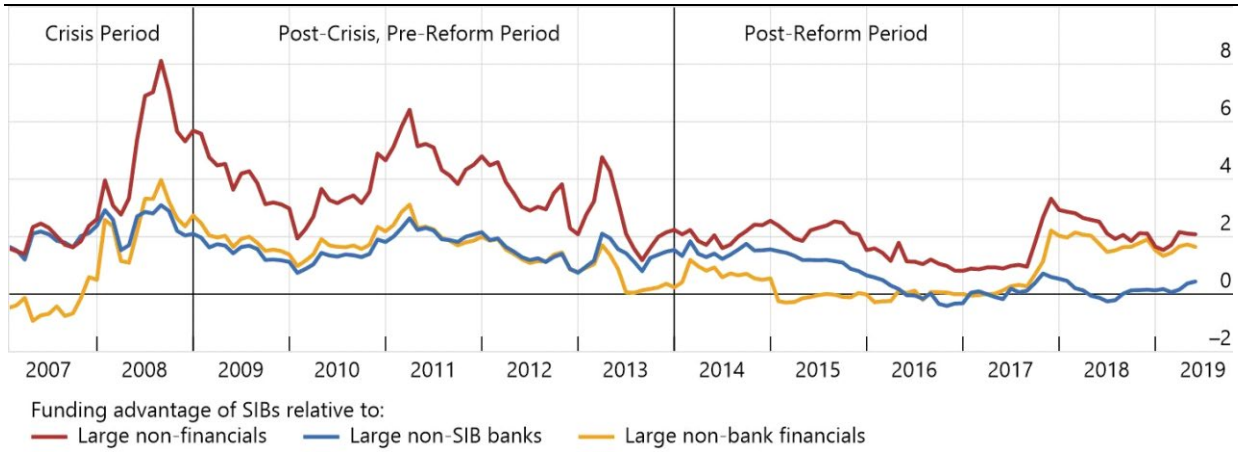
4.2. The funding cost advantages of SIBs in the post-crisis period

The funding cost advantages of SIBs are estimated using a range of approaches that involve the use of market prices. These approaches include: (a) comparing the funding costs of SIBs with those other entities, using bond and CDS prices; (b) comparing observed CDS prices and CDS prices implied by models: and (c) constructing a TBTF risk factor using changes in equity prices. None of the methods is a priori more or less likely to deliver more reliable results. The evaluation has therefore used all three. In addition, the evaluation has also examined the evolution of the uplift of credit ratings from government support (see the Technical Appendix for more detail).

Figure 11 illustrates the typical evolution of the funding cost advantage of SIBs based on these approaches. The results of the analysis vary by method and data source. The figure is based on one of the approaches described below but illustrates the pattern observed across the methods used in the evaluation (Box 1). The general pattern is that funding cost advantages spiked during the crisis period. They decayed in the period after the crisis but before the implementation of reforms. The effect of reforms is estimated as a change between the period in which reforms are implemented and the period between the crisis and the reforms.

Funding cost advantage of SIBs in the global portfolio, factor pricing approach

Portfolio returns (%) **Figure 11**



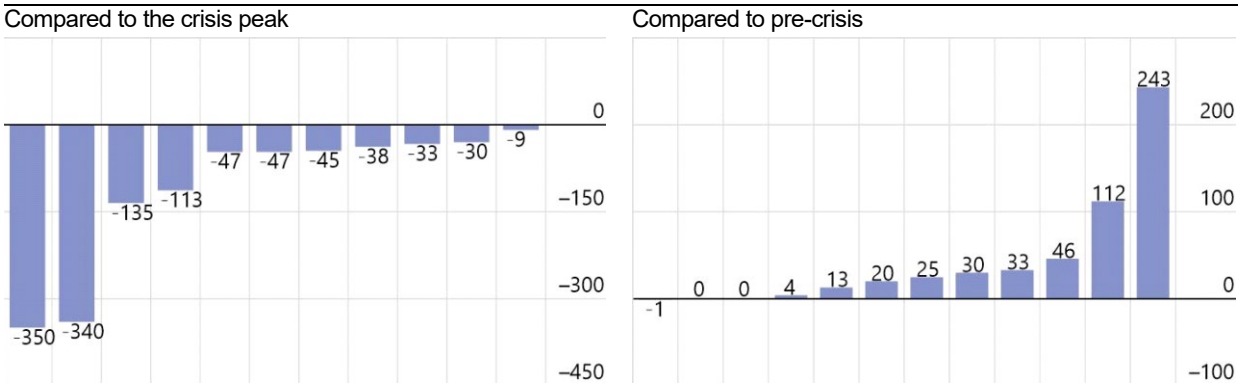
Sources: Federal Reserve Bank of St Louis (FRED); Eikon; Kenneth R. French website (data for Developed Market Factors); TBTF evaluation

4.2.1. *Existing literature*

A review of the literature suggests that SIBs' funding cost advantages peaked during the global financial crisis, remained high for a number of years, and then fell. The literature suggests that funding cost advantages have fallen substantially since the crisis peak (left-hand panel, Figure 12). At the same time, these studies also find that funding cost advantages after the crisis remained at least as high as those seen before the crisis (right-hand panel, Figure 12).

Estimated changes in SIBs' funding cost advantages relative to the crisis peak (left) and the pre-crisis period (right)

In basis points **Figure 12**



Notes: Each bar represents the outcome of one study. A positive sign indicates that the funding cost advantage has been higher after the crisis compared to the crisis peak (left chart) and pre-crisis period (right chart). The dispersions across studies occur in part owing to differences in the methodologies used and the jurisdictions examined.

Sources for post-crisis minus pre-crisis estimates: Acharya et al (2016); Gudmundsson (2016); IMF (2014); Lester and Kumar (2014); Li et al (2011); Mora (2018); Schich and Aydın (2014); Schich and Lindh (2012); Schich, Bijlsma and Mocking (2014); Tsesmelidakis and Merton (2013); Ueda and Weder di Mauro (2013); Zhao (2018)

Sources for post-crisis minus crisis peak estimates: Bijlsma et al (2014); Blix Grimaldi et al (2019); Gudmundsson (2016); IMF (2014); Lester and Kumar (2014); Schich and Aydın (2014); Schich and Lindh (2012); Schich, Bijlsma and Mocking (2014); Schich et al. (2014); Tsesmelidakis and Merton (2013)

There are still significant gaps in the research on how funding cost advantages have evolved over time and across jurisdictions. In particular, few studies include the period after 2015, when reforms were still being implemented, and most studies focus only on EU and US banks. There is also little research on how TBTF reforms, and resolution reforms in particular, affect funding cost advantages. The evaluation has therefore used more recent data, expanded the coverage of countries and focused on the effects of reforms.

Box 1: Approaches to measuring funding cost advantages of SIBs

Funding cost comparison: bond and credit default swap (CDS) pricing

This approach studies how bond yields and CDS spreads have evolved for SIBs as compared to other banks or large firms during the period in which reforms have been implemented. In the absence of TBTF perceptions, the funding costs of SIBs and other large firms should be similar, after accounting for firm-specific risk and other firm-specific characteristics. Evidence of lower funding costs of SIBs relative to other banks or large firms is consistent with the existence of implicit guarantees arising from TBTF perceptions.

Contingent claims model

This approach compares actual CDS prices with those derived from models based on equity prices. Observed CDS spreads reflect both the probability of bank distress and the expected government

support in case of distress. If shareholders do not benefit from a bailout, equity prices reflect only the probability of distress. The difference between observed and model-implied CDS prices may then be attributed to expected government support.

Factor pricing

This approach involves comparing the return on a portfolio of SIB equities with the return on a portfolio of equities of banks that are not SIBs, while accounting for other risk factors. The difference provides an estimate of the equity market's perception of TBTF risk.

Credit ratings

This approach involves examining the difference between an issuer's "all-in" credit rating, which includes the credit rating agency's assumptions about external support provided for bank debt, and a "stand-alone" credit rating that represents a bank's strength assuming no support. The evaluation has produced no new estimates of funding cost advantages using this method.

4.2.2. Funding cost advantages estimated with market prices

Analysis of funding cost advantages as measured by bond yields does not produce consistent conclusions across jurisdictions. If, other things equal, the primary market yields on bonds issued by banks other than SIBs are higher than similar bonds issued by SIBs, one may conclude that SIBs have a funding advantage. Results are based on studies from three regions, chosen on the basis of access to data:

- For Canadian banks, the funding cost advantages of banks that were designated as G-SIBs in 2017 (but not those of D-SIBs) have been lower since 2012 than they were before the crisis.
- For EU banks, there is no evidence of a funding cost advantage for SIBs in the sample period,[28] even before the crisis, and there is no evidence of a change in relative funding costs in the reform implementation period.
- For German SIBs, funding cost advantages have been estimated using the prices of bonds traded in secondary markets. The evaluation finds evidence of a funding cost advantage for D-SIBs relative to other large banks. However, bond prices generate no robust evidence of a decrease in the funding cost advantage during the reform implementation period.

Funding cost advantages as measured by CDS prices declined significantly in 2012-2019 when compared to 2009-2011. A CDS contract in effect provides insurance against the risk that a borrowing firm may default on its debt. Changes in the CDS price indicate changes in the market's view of the probability that the firm will default. A bank's CDS spread typically moves closely with its bond yield and is therefore related to the bank's funding costs. The evaluation compared the CDS spreads of SIBs with those of other banks in order to estimate how the funding advantage has changed since the reforms. There is a significant decline in SIBs' funding advantages after the crisis. However, there is no significant decline when comparing the post-crisis period (2009-2019) with the pre-crisis period (2004-July 2007).

[28] The UK was a member of the EU during the sample period.

The contingent claims approach suggests that the cost advantages have declined substantially since 2012, after peaking during the global financial crisis. In this approach, the funding advantage is estimated as the difference between actual and theoretical CDS prices estimated using equity prices for a sample of 33 European and US G-SIBs and European D-SIBs. After the adoption of the EU Bank Recovery and Resolution Directive in 2014, the advantage continued to decline, but it has remained at elevated levels compared to before the crisis. There is also a fair amount of variability across countries. The funding cost advantage of SIBs has actually increased in some countries, even after 2014.

Measured by equity prices, the funding advantage of SIBs was lower, on average, after the implementation of reforms than before, but not significantly different from the pre-crisis period. An alternative approach is to estimate funding cost advantages using equity prices using the factor pricing approach described in Box 1. The evolution of funding advantage varies across jurisdictions. G-SIBs' funding advantages declined on average in the post-reform period in Europe and the US, but not in other regions. Moreover, the funding advantage of SIBs declined more in those jurisdictions judged by credit rating agencies to have "effective" or "operational" resolution regimes.

Macroeconomic conditions, the stance of monetary policy and investor uncertainty also influence funding cost advantages for SIBs. The funding cost advantage of SIBs is lower when the banking sector is a smaller share of the economy. It also tends to be higher in countries with a low ratio of sovereign debt to GDP, consistent with implicit guarantees being larger where the sovereign has more fiscal capacity. Investor uncertainty (as measured by the VIX) is positively related to the funding cost advantage.

Low interest rates tend to be associated with lower funding cost advantages of SIBs.[29] This may occur because SIBs' funding cost advantages are reduced by more than those of other large firms because interest rates cannot go significantly below zero.[30] Alternatively, it may occur because investors searching for yield may reduce the funding costs of non-SIB banks perceived as riskier.

4.3. The effects of reforms on implicit subsidies

Changes in the funding cost advantages of SIBs can signal that resolution reforms have been credible. If these reforms are credible, they will affect stakeholders' beliefs about who bears losses in the event of distress or failure – in particular, whether it will be shareholders and creditors rather than taxpayers.

A limited number of studies explore market expectations of government support and the effects of bank bail-in. The more established approach investigates whether events that may affect the perception of the probability of bail-in (such as major regulatory changes, G-SIB designation, bail-ins or recapitalisations) affect banks' CDS or stock prices in the short term. In general, the results suggest that investors respond as if such events reduced their perceived

[29] While the analyses control for a number of confounding factors, it is likely that the sensitivity of risk pricing to macro factors changes in stress periods or in periods of low interest rates.

[30] Lower interest rates are generally expected to reduce the funding costs of all banks. However, if SIBs are initially paying lower rates than non-SIBs, the zero lower bound limits how much their funding costs can fall.

probability of bailout (Bongini et al., 2015; Moenninghoff et al. 2015; Schäfer et al., 2016b and 2017). A more recent approach uses structural models to derive implied bailout probabilities, using banks' stock market values and CDS spreads, and finds that perceived bailout probabilities were lower for US G-SIBs following the reforms than before the crisis (Berndt et al., 2018; Guennewig and Pennacchi, forthcoming).

The evaluation expanded the set of available methods and performed three types of analysis. First, it extended the results in Schäfer et al (2017) to include more recent events. Second, it looked at differences between holding and operating companies' ratings and bond spreads. Finally, it assessed the correlation between outcomes and the implementation of resolution reforms.

4.3.1. Probability of bail-in: an event study approach

Recent events in the EU do not seem to trigger abnormal reactions in bank funding markets. The evaluation expanded Schäfer et al. (2017) to include more recent EU events, such as the resolution of Banco Popular and the further tightening of EU prudential and resolution rules in 2019 (Bellia and Maccaferri, 2020). Overall, events did not seem to trigger abnormal reactions in bank funding markets after bank prudential and resolution reforms were implemented in the EU in 2016. An exception is the 2018 Council agreement on its general approach to the proposed banking package.[31] While the 2016 and 2019 reforms of EU prudential and resolution rules seem to have increased perceived probabilities of bail-in, the latter seem not to be affected significantly by more recent individual cases.

4.3.2. Changes in holdco/opco spreads and ratings

To identify the effect of resolution policies, the evaluation compared the spreads and credit ratings of SIB holding companies ("holdcos") and their operating subsidiaries ("opcos"). Such a comparison within a group has the advantage that all group-specific factors that affect default probabilities are automatically accounted for. It therefore represents a good proxy for the credibility of reforms.

In most resolution strategies, creditors of the holdco would be bailed in while the opcos would continue to operate without interruption to their critical economic functions. In such a case, holdcos effectively recapitalise their opcos during a resolution. Thus, the holdco is more likely to fail than the opco, and debt issued by the holdco would incur losses before the debt issued by the opco. This implies that, if resolution policies are credible, the market should view holdcos as having a higher probability of default than opcos. By comparing holdcos to opcos we can produce a direct estimate of the subsidy.

Credit spreads of SIB holding companies (holdcos) have increased relative to their operating subsidiaries (opcos), suggesting that resolution reforms have become increasingly credible. The CDS spread of SIB holdcos has increased relative to their opcos since 2014 (Figure 13). The impact is higher when the 2014 definition of the CDS contracts is used, since those

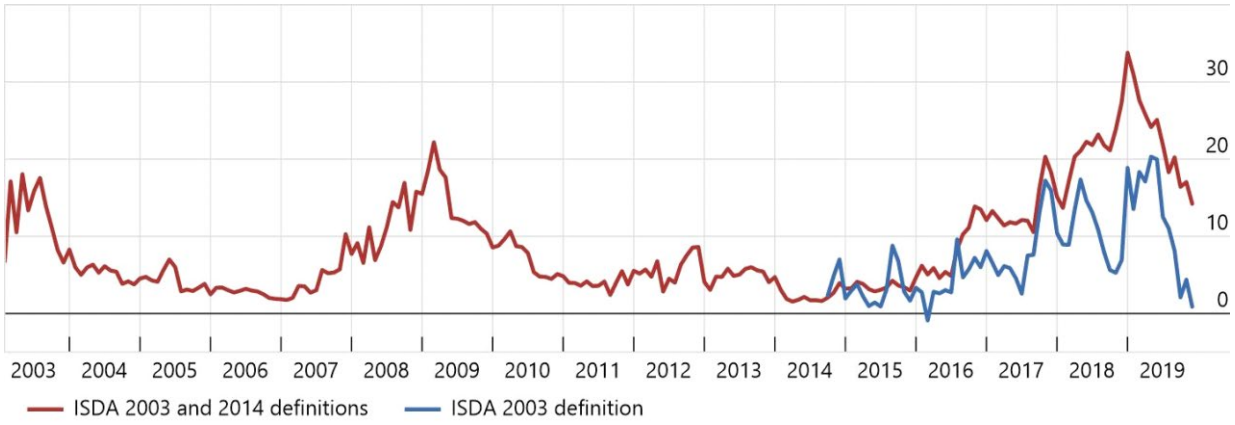
[31] The EU banking reform package, adopted in May 2019, contained amendments to prudential requirements and strengthened the framework for the recovery and resolution of banks.

definitions include government intervention as a credit event, and their prices are more sensitive to changes in the expected probability of bail-out.

This result is supported by differences in credit ratings. Following the implementation of reforms, holdcos were also rated less highly than their main operating subsidiaries.

CDS spread between holding and operating companies

In basis points **Figure 13**



Notes: Data is for single-named five-year (5Y) senior composite CDS for all banks domiciled in FSB member jurisdictions, G20-countries and G-SIB home jurisdictions. See the Technical Appendix for more detail. An increase in the spread between holdco and opco CDS prices implies that holdco debt is considered to be riskier, consistent with some positive probability of bail-in.

Source: Markit

The evidence of higher spreads on bail-inable debt appears to be independent of organisational structure. Under an alternative corporate structure that is more common in Europe, the parent bank is at the same time a resolution entity, and it issues subordinated or senior non-preferred bonds that rank below its senior bonds. The evaluation found evidence of a bail-in premium for these bonds as well.

4.3.3. Relating funding advantages of SIBs to progress in implementation of reforms

Funding cost advantages of SIBs are negatively correlated with the degree to which resolution reforms have been implemented. This analysis is based on the resolution reform index described in Chapter 2. This suggests that more comprehensive implementation of resolution reforms is associated with a reduced funding advantage for SIBs, and hence with less economic distortion.

4.4. Market discipline: the relationship between bank risk and the price of debt

A credible resolution regime implies that investors price the risk of loss during resolution. Markets discipline banks, affecting their risk-taking incentives, if they demand a higher yield on debt instruments issued by riskier banks. Price differences between banks' TLAC-eligible debt and debt that is not TLAC-eligible provide a proxy for the extent to which investors consider a resolution regime to be credible.

Consistent with the notion of market discipline, estimated bail-in risk premia are higher for TLAC-eligible debt and for more risky SIBs.[32] A comparison of the option-adjusted spread of TLAC-eligible and ineligible senior unsecured bonds suggests that investors are indeed pricing a risk premium on the TLAC-eligible debt of G-SIBs and other major banks. The premium varies considerably across banks and jurisdictions. It tallies with the structure of resolution regimes, approaches to subordination and differences in banks' risk-taking, such that banks that have taken on more risk pay a higher premium. The premium also accords with differences in credit rating agencies' judgements of the likelihood of government support for failing banks: a higher bail-in premium is paid by banks subject to a resolution regime that is judged by rating agencies to be "effective" or "operational".

That said, the strength of market discipline varies with risk appetite. During episodes of abundant investor risk appetite, when credit spreads are compressed, bail-in risk premia of lower-rated SIBs become indistinguishable from higher-rated ones.[33]

The sensitivity of SIBs' CDS prices to bank risk has increased relative to non-SIBs since the pre-crisis period. This higher sensitivity to bank risk, as measured by Moody's Expected Default Frequency, is in turn likely to mitigate SIBs' incentives to take on excessive risk. This change is not significantly different between pre- and post-reform periods, but appears to be a more general change in investors' attitudes since the crisis. Moreover, the sensitivity of CDS prices and equity returns of SIBs to the probability of a systemic crisis has increased, compared both to the pre-crisis period and to the pre-reform period. This is an intended effect of the TBTF reforms, as markets seem to demand higher compensation for systemic risk.

4.5. Credibility of resolution reforms: views of stakeholders

4.5.1. Credit rating agencies

The evaluation has analysed how three credit rating agencies – Fitch, Moody's and Standard & Poor's – assess resolution reforms. Each rating agency considers both the capacity and willingness of public authorities to resolve failing banks without extraordinary public support. As part of their assessment they examine the legal powers of the resolution authority, the resolution frameworks and the quantity of TLAC issued by each bank. In order to judge willingness to support, they analyse the legal and regulatory frameworks and statements by senior officials, and they also meet officials to discuss the frameworks. Additional information is in Annex F.

Bank credit ratings comprise two elements: a bank's stand-alone strength; and its likelihood of receiving external support in the event of failure. Moody's and S&P produce a stand-alone rating capturing only the first component and an "all-in" rating capturing both. The possibility of support means that the all-in rating is typically higher than the stand-alone rating. Instead of a stand-alone rating, Fitch produce a Support Rating Floor, which isolates the impact of the

[32] See Lewrick, Serena and Turner (2019) for an analysis of the bail-in risk premium and the associated market discipline.

[33] See Lewrick, Serena and Turner (2019).

possibility of sovereign support. In general, rating agencies do not assess how the likelihood of resolution might differ between a systemic risk event and idiosyncratic failure.

Traditionally, the difference between the all-in and the stand-alone credit rating has been used as an indication of credit rating agencies' assessment of the likelihood of the government support ("support uplift").[34] This difference can be expressed in notches of credit ratings, with one notch representing a difference of one rating category (e.g. Aa2 to Aa3). The support uplift depends in principle on three factors: the likelihood of the bank failing; the willingness of the authorities to provide solvency support; and the state's fiscal capacity.

The three credit rating agencies have removed or significantly reduced sovereign support uplifts for bank ratings in a number of jurisdictions since the introduction of resolution reforms. The agencies reduced their support uplift by more than one notch during the reform implementation period relative to the pre-reform period. Sovereign support uplifts are now:

- low in jurisdictions where resolution frameworks are judged to be "effective" or "operational";
- low where banks are judged to be resilient, regardless of whether the resolution framework is judged to be "effective" or "operational"; and
- higher where reforms are not regarded as "effective" or "operational", the banks are regarded as less resilient and the sovereign is highly rated.

4.5.2. Other stakeholders

The evaluation's call for feedback elicited views that were split broadly by type of respondent. Industry respondents tended to maintain that resolution was credible, while there was more scepticism among academics – especially about the use of resolution tools in a systemic crisis.

Investors and analysts also report disclosure gaps that make it difficult for them to assess whether a bank is resolvable. The credit rating agencies identified a number of areas where the current information is not, in their view, adequate. These included insufficient disclosure of resolution strategies and of loss waterfalls within resolution groups and, in some jurisdictions, lack of clarity about resolution funding arrangements. Some market participants also report that there are gaps in the disclosure of information about the operation of resolution frameworks and the resolvability of SIBs that may reduce their ability to understand how resolution will work and to assess or price the risks and impact. In addition, bank-specific disclosures relating to resolution plans remain very limited. Furthermore, the extent of compliance with TLAC requirements is not generally disclosed by resolution authorities or by banks. As mentioned in Chapter 3, implementation of the TLAC disclosures standard is less advanced, making it difficult for investors to accurately assess the levels of bank-specific TLAC resources.

[34] In the run-up to the financial crisis of 2007-08, the likelihood of state support was underestimated. See e.g. the *Financial Stability Report* of the Swiss National Bank (2016).

4.6. Conclusion

The evidence suggests that the funding cost advantages of SIBs have declined since TBTF reforms were implemented in 2012 but remain higher than before the global financial crisis. These results broadly suggest that reforms may have been effective in reducing subsidies. However, in spite of the reduced funding cost advantage in the reform implementation period, the average post-crisis funding cost advantages have not fallen below their pre-crisis levels. Moreover, the average funding cost advantages in the reform implementation period are not consistently below their pre-crisis average in all studies.

The evidence also suggests that the credibility of resolution reforms has risen. Thus, the funding cost advantage of SIBs is lower in jurisdictions that have implemented resolution reforms more fully. Credit rating agencies have removed or significantly reduced sovereign support uplifts for G-SIB ratings in a number of jurisdictions since the introduction of resolution reforms. Funding cost advantages and sovereign support ratings of SIB holdcos have decreased relative to their opco subsidiaries, suggesting that bail-in has become more credible. Finally, there is some evidence that resolution reforms have improved market discipline.

Other factors influence funding cost advantages, without affecting their general pattern of evolution. These factors include macroeconomic conditions, the size of the banking sector, the stance of monetary policy and investor uncertainty. The funding cost advantages of SIBs tend to be lower in countries where sovereign risk is higher and the share of the banking sector is lower. They are also lower when interest rates and investor uncertainty are lower.

Increased credibility and the associated benefits have not been uniform. In spite of the positive association of reforms and reductions in the funding cost advantage, the results vary across countries. Jurisdictions that have progressed further in enacting the reforms see bigger reductions in SIB funding cost advantages.

Inadequate disclosures may be limiting market participants' understanding of how they may be exposed to loss in resolution, which in turn, may impair market discipline. Increased transparency is not, however, costless and the disclosure of otherwise confidential information may create the potential for adverse market reactions and consequences in resolution. Disclosures should not constrain the ability of the resolution authorities to choose the approach that best supports orderly resolution in the circumstances. Nevertheless, there may be opportunities to enhance credibility of reforms by enhancing disclosures of information relating to the operation of resolution frameworks (e.g. resolution plans, strategies and funding arrangements) as well as the resolvability of SIBs (including TLAC).

5. Banks' responses to reforms

The post-crisis TBTF reforms are intended to incentivise SIBs to take into account the negative implications of their behaviour on the overall financial system. The failure or distress of large financial institutions would have implications for the system as a whole, and systemic risk can build up if financial institutions engage in excessive risk-taking or lending. Incentives to change behaviour are, in turn, shaped by the response of markets to the reforms, by the actions of supervisors and by the expected actions of resolution authorities. As set out

in Chapter 2, if the reforms are to succeed, SIBs should change their behaviour, both directly in response to reforms and as other market participants adjust. For example, as shown in the previous chapter, the price of debt will likely take into account banks' risk profiles more than before and should incentivise banks to change their behaviour.

The evaluation has assessed whether there have been any changes in SIBs' behaviour and risk profiles and whether any such changes can be attributed to the TBTF reforms. The evaluation has built on previous literature and extended the analyses, by broadening the scope of reforms, banks and balance sheet variables considered and by conducting additional tests and robustness checks. The evaluation seeks to answer five broad questions on how SIBs' behaviour and structure have changed in the years following the reforms (Table 3).

Table 3: Central questions on banks' responses to the TBTF reforms

How have SIBs' regulatory ratios and balance sheets evolved?
How have SIBs' lending and credit allocation evolved?
How have SIBs' risks and profitability evolved?
How has the complexity of SIBs evolved?
How has the domestic market structure in SIBs' jurisdictions evolved?

A large body of literature studies changes in the activities and risk of banks following the global financial crisis. Some of these studies are particularly relevant for the evaluation. Violon et al. (2017) use a panel of 97 large international banks from 22 countries to investigate the impact of G-SIB designation on G-SIBs' activity and balance sheet structure. They find that asset growth decreased and the leverage ratio increased for the largest, most systemically important banks, relative to a control group, while there are no indications of a general change in asset and liability structure or of a relative reduction in lending. BCBS (2019) looks at the evolution of the G-SIB scores over the period 2013-17. Although the results vary across regions, G-SIBs have generally reduced their scores over the period assessed, changing their balance sheets in ways that are consistent with the aims of the G-SIB framework. Similarly, Goel et al. (2019) benchmark G-SIBs' balance sheet adjustments against those of other major banks and conclude that G-SIBs' adjustments are consistent with the incentives set by the post-crisis regulatory framework. They also find that G-SIBs' resilience has improved in recent years, on the back of higher capital ratios.

The main empirical approach relies on difference-in-differences (DiD) estimation. The DiD approach analyses two related questions: whether variables of interest (such as capital ratios) evolved differently for banks that have been subject to the TBTF reforms relative to banks that have not; and whether there have been any differences between banks that were designated as G-SIBs and those designated as D-SIBs. For the purposes of the analysis, banks were allocated to four categories: G-SIBs, D-SIBs, "partially-treated" banks and other banks. Partially treated banks are not designated as SIBs but are nevertheless – on account of their size or complexity – subject to one or more of higher capital requirements, recovery and resolution planning requirements and TLAC requirements. The methodology is described in more detail in Annex H and the Technical Appendix.

This technique requires the identification of the period before reforms and the period after reforms. In the analysis the period after reforms is assumed to start at the beginning of 2012, following the announcement of the G-SIB framework. But in fact, some of the TBTF reforms, such as resolution reforms, were implemented only recently. This makes it more difficult to identify material behavioural changes, as banks may still be responding to reforms.

Another way of analysing the effects of reforms would be to test whether effects vary according to the intensity with which regulatory constraints bind. However, the evaluation found that there is no consistent disclosure of bank-specific buffer or minimum requirements, or of the extent to which banks exceed them. This affects the ability to determine the extent to which banks are constrained by risk-based capital requirements, leverage ratio requirements or other domestic requirements such as stress tests. Such information, if disclosed, also would help markets to assess and price the risk of a drawdown of capital buffers or a breach of minimum requirements.

Box 2 describes how G-SIBs' regulatory measures have evolved. The remainder of the chapter first describes how banks' balance sheets have evolved. It then provides an overview of new empirical work on bank behaviour and structures. A more detailed description of the analyses is provided in the Technical Appendix.

Box 2: Evolution of regulatory ratios for G-SIBs since 2012

The analysis in this chapter largely relies on vendor data. The main reason for this is the need to obtain sufficiently long time series in order to capture behaviour for SIBs and non-SIBs before and after the reforms. The use of vendor data comes at the cost of having to use proxy variables for some of the variables of interest. For example, risk-weighted capital ratios reported in the vendor data fail to account for changes in the definition of capital introduced under Basel III; the Basel III leverage ratio has to be proxied by the ratio of Tier 1 capital to total assets; and sufficiently long time series on the Basel III liquidity ratios are not available.

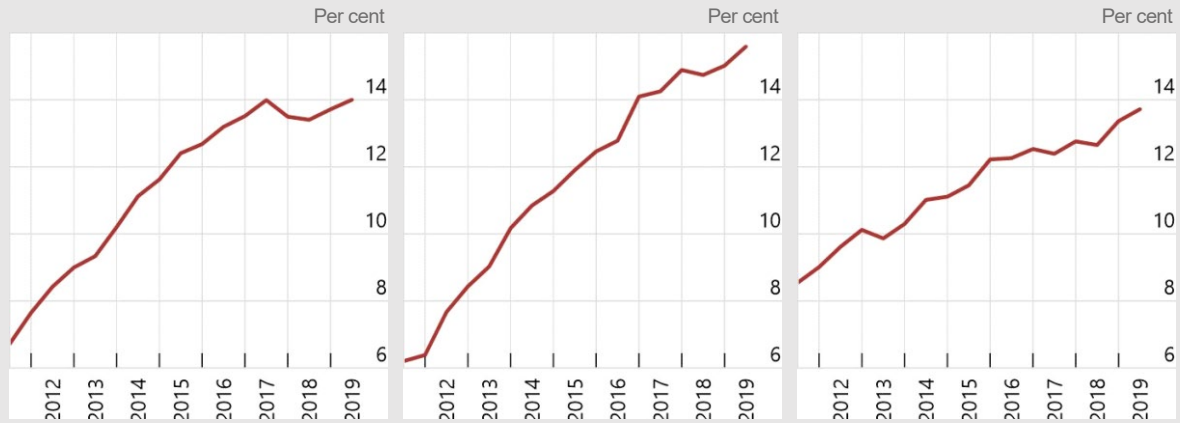
While the BCBS regularly publishes aggregate and regional results for Group 1 and Group 2 banks in its Basel III capital monitoring reports, it does not typically publish results for G-SIBs. This box describes how the main regulatory metrics have evolved for G-SIBs since 2012, with an additional breakdown by region. The charts have been produced by the BCBS based on data collected for its Quantitative Impact Studies.

Overall, the resilience of G-SIBs has materially increased from the perspective of all four of the regulatory measures: risk-based capital ratio; leverage ratio; liquidity coverage ratio; and net stable funding ratio. This suggests that G-SIBs' ability to absorb solvency and liquidity shocks as a going concern has markedly increased.

Figure A illustrates the evolution of the Basel III Tier 1 risk-based capital ratio for consistent samples of G-SIBs from 2012 to 2019. Risk-weighted capital ratios increased materially in all three regions under consideration, from between 6% and 9% in 2012 to around or above 14% in 2019.

Initial Basel III Tier 1 risk-based capital ratio, by region

Consistent sample of G-SIBs, weighted average **Figure A**



Note: The graph shows the fully phased-in initial Basel III framework up to and including end-2018 and the actual framework in place for end-June 2019.

Source: Basel Committee on Banking Supervision

The evolution of Basel III leverage ratios is shown in Figure B. (The leverage ratio is a supplementary capital requirement that is not based on risk weights.) Starting from relatively low levels, G-SIBs in all three regions have considerably increased their leverage ratios in recent years, from values between 2.5% and 4% to values between 5% and 6.5%.[35] While the increase in the ratio is similar across regions, European G-SIBs have lower leverage ratios than G-SIBs elsewhere, with a weighted average leverage ratio of around 5% in 2019 (compared with 6.5% for G-SIBs elsewhere).

Fully phased-in final Basel III leverage ratio, by region

Consistent sample of G-SIBs, weighted average **Figure B**

Note: Data points from H1 2011 to H2 2012 use the original (2010) definition of the leverage ratio. Data points from H1 2013 to H1 2017 use the 2014 definition of the leverage ratio. The data points for H1 2013 use an approximation for the initial definition of the Basel III leverage ratio exposure where gross instead of adjusted gross securities financing transaction values are used. Data points from H2 2017 onwards use the final definition of the leverage ratio to the extent data are available.

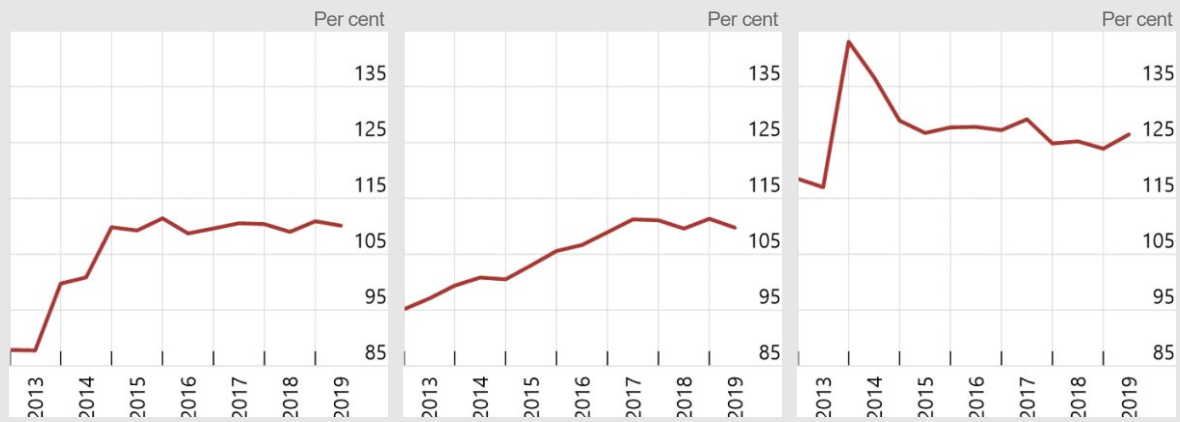
Source: Basel Committee on Banking Supervision

Finally, Figure C shows that the net stable funding ratio has increased for G-SIBs in all regions. For North American G-SIBs, the increase mostly occurred by 2015, with relatively stable ratios since then, while for European G-SIBs the ratio continuously increased during the sample period, with European G-SIBs arriving at similar levels as their North American peers in 2017. Net stable funding ratios of

G-SIBs in other jurisdictions are consistently higher than those of North American and European G-SIBs.[36]

Net stable funding ratio, by region

Consistent sample of G-SIBs, weighted average **Figure C**



Source: Basel Committee on Banking Supervision

5.1. Results

This section provides an overview of the results from the BCBS and from the evaluation's analysis, ordered around the five questions included in Table 3.

5.1.1. How have SIBs' capital ratios and balance sheet structure evolved?

Banks overall have substantially increased both the quality and quantity of their capital since the financial crisis of 2007-08. Their unweighted capital ratios, i.e. the ratios of Tier 1 capital to assets, now stand between 6% and 9%. Risk-weighted capital ratios stand between 12% and 16%. The increase would look even larger across all groups if the narrower definition of capital introduced under Basel III were to be taken into account.

Banks' capital has increased across the board, and both D-SIBs and G-SIBs have increased their capital ratios by more than other banks (Figure 14). This no doubt at least partly reflects higher regulatory capital requirements. The left panel shows the increase in average capital ratios for G-SIBs, D-SIBs, partially treated banks, and other banks in the control group. In the post-reform period, the risk-weighted capital ratio for G-SIBs, D-SIBs and

[35] Reforms that strengthened capital standards should, in principle, also have a positive impact on market-based capital ratios, such as the market value of equity to total assets. However, studies have pointed out that this ratio does not match the increase observed in regulatory capital ratios (Sarin and Summers, 2016). In advanced economies the market value of equity over total assets has in fact been broadly stable for G-SIBs and D-SIBs since the reforms. Sarin and Summers argue that, while regulatory ratios are based on backward-looking accounting measures, market metrics are forward-looking and take into account expectations of future profits. The TBTF reforms suggest an additional reason not to expect market-based leverage ratios to increase as much as Basel III leverage ratios: reforms that reduce implicit subsidies might also be expected to reduce market capital ratios by reducing expectations of future profits.

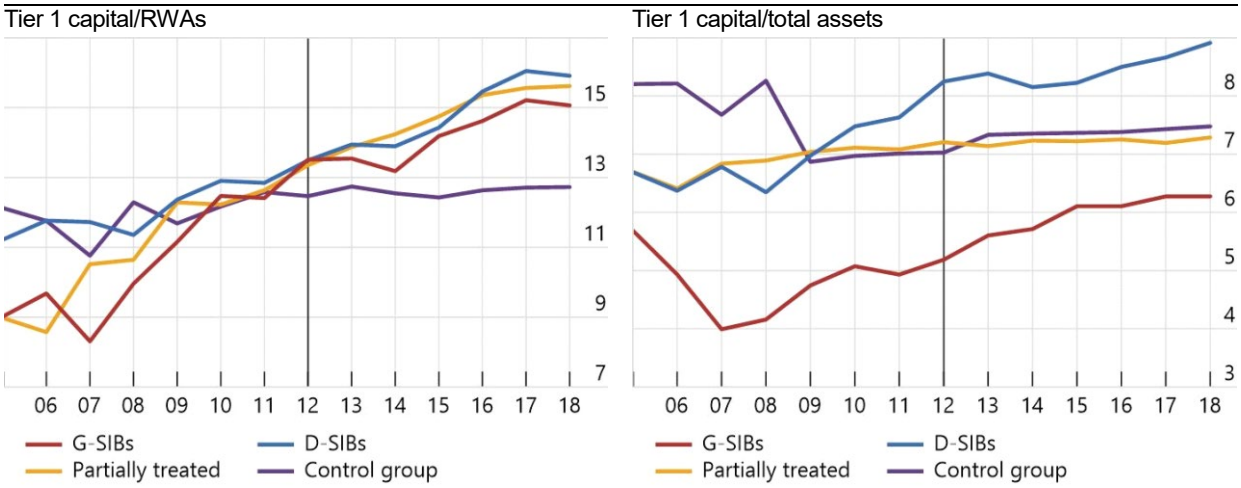
[36] The results for the liquidity coverage ratio – not shown – are qualitatively similar. European G-SIBs display a continuous increase in the ratio to around 140% in 2019. North American G-SIBs started off at similar levels in 2013 and also saw increases at the beginning of the sample period; since then, the ratio has stabilised at around 120%. The evolution of the ratio in the rest of the world is U-shaped, with the weighted average always exceeding 120%.

partially-treated banks is much higher than for other banks. While all four types of bank had similar levels of risk-weighted capital ratios in 2011 (around 12%), average capital ratios of G-SIBs, D-SIBs and partially treated banks in 2018 are roughly 4 percentage points higher, at around 16%.

G-SIBs still have much lower ratios of capital to assets than other banks. The right-hand panel of Figure 14 shows that average unweighted capital ratios for all other groups of banks exceed 7% of assets. In the case of D-SIBs, this number approaches 9%, but the average ratio for G-SIBs stands at 6%.

Evolution of risk-weighted and unweighted capital ratios for banks

In per cent **Figure 14**



Notes: The chart illustrates how risk-weighted and unweighted capital ratios have evolved for D-SIBs, G-SIBs, partially-treated banks (banks that are neither G-SIBs nor D-SIBs but have one of the following three TBTF characteristics as documented by member authorities: some HLA requirements, some recovery and resolution requirements and some TLAC requirements), and banks in the control group. All banks above a size threshold of USD10bn applied. RWAs: risk-weighted assets.

Source: SNL

The differences in the evolution of capital ratios between the different groups of banks tend not to be statistically significant. Other differences between banks and countries may be driving the trends. One possible reason for this is that many other reforms have been implemented in parallel to the TBTF reforms. For example, the Basel III reforms, stress testing and changes in Pillar 2 capital requirements have induced both SIBs and banks that are not SIBs to increase capital ratios.

For the other balance sheet variables, the findings mostly do not suggest major differences in adjustments between SIBs and non-SIBs or between G-SIBs and D-SIBs. However:

a) the ratio of deposits to total liabilities increased more for G-SIBs than for D-SIBs, starting from lower average levels,

b) the ratio of cash and central bank reserves to total assets increased more for G-SIBs and D-SIBs than for other banks, and

c) the ratio of net loans to banks to total assets decreased less for G-SIBs than for D-SIBs.

However there is no obvious explanation linking these results to the TBTF reforms, and they could also be driven by other factors (including Basel III).

5.1.2. How have SIBs' lending and credit allocation evolved?

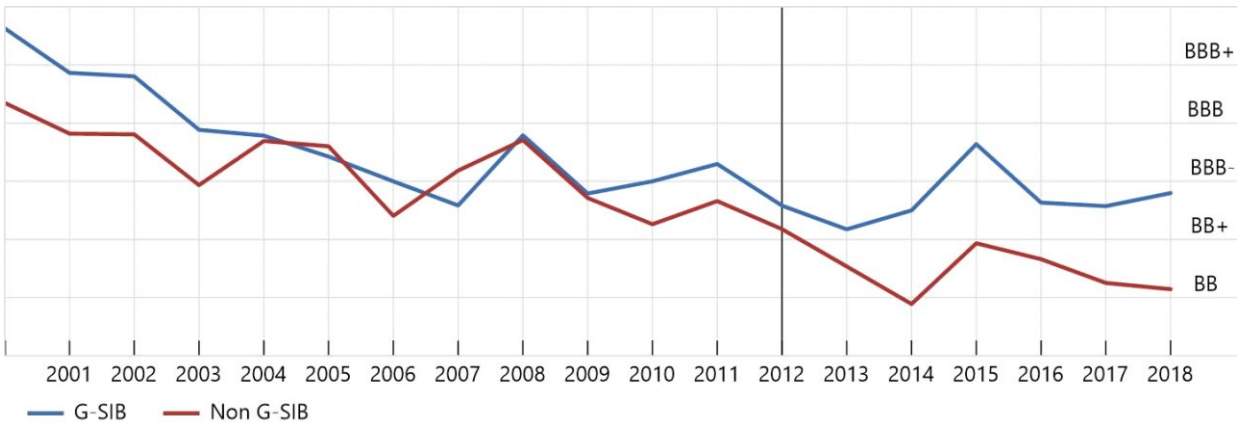
The share of customer loans in total assets has not evolved differently for SIBs when compared with other banks. There is also no significant difference between D-SIBs and G-SIBs in this respect. Customer loans represent a smaller share of the balance sheet for G-SIBs than for other banks. This share remained relatively stable over time for G-SIBs, D-SIBs and partially-treated banks, while it fell slightly for banks in the control group. Differences between the groups tend to be not statistically significant. This pattern holds across all regions, except for emerging market and developing economies (EMDEs), where the share of customer loans in total assets increased for SIBs relative to other banks.

Analysis based on more detailed syndicated loan data confirms these aggregate patterns. It does not reveal differences in the evolution of syndicated loans volumes between G-SIBs and other banks.[37] Loan volumes for G-SIBs did not evolve differently from those of other banks, even when controlling for possible differences in the demand for credit across different countries and sectors.

There is, however, some evidence that G-SIBs shifted lending towards less risky borrowers after the reforms when compared with other banks. This is illustrated in Figure 15, which shows that the average credit rating on syndicated loans fell for both G-SIBs and other banks until 2012. After that, borrower ratings stabilised for G-SIBs but continued to fall for other banks. This divergence is statistically significant. The analysis also suggests that, since the crisis, the share of syndicated loans that is collateralised has risen for both G-SIBs and other banks. Banks other than G-SIBs started to take more collateral during the crisis and G-SIBs did so afterwards.

Average rating over time, based on syndicated loan data

Value-weighted borrower rating **Figure 15**



Notes: The figure shows the weighted average rating for syndicated loans extended by G-SIBs and other banks. Prior to 2011, the 2011 G-SIB group is used.

Source: Dealogic Loanware

[37] The analysis focuses on syndicated loans since data on these loans is available in a global loan-level data set provided by Dealogic Loanware that permits a consistent cross-country study. For the average G-SIB, syndicated loans comprise about 10 per cent of total net loans.

G-SIBs became more conservative in their pricing behaviour after the reforms. While on average they charged lower interest rates for syndicated loans than other banks in the period before 2012, the pricing gap has narrowed since then. This is consistent with a reduction in implicit funding subsidies for G-SIBs.[38] The gap has narrowed most for the least risky borrowers.

5.1.3. How have SIBs' risks and profitability evolved?

Findings on bank profitability are, by and large, consistent with expectations. Lower risk, higher capital, a potential reduction in risk-taking, and a reduction in funding cost subsidies can be expected to lower profitability. A relative reduction in profitability for SIBs is to be expected if reforms are successful and funding subsidies and risk-taking decrease for SIBs while capital increases. The analysis suggests that the profitability of SIBs, and in particular of G-SIBs, has fallen relative to that of other banks. Relative falls in profitability tend to be larger for North American G-SIBs. The profitability of US G-SIBs has in fact increased by more than that of G-SIBs in other regions. But the profitability of US banks that are not SIBs has increased by still more, hence the relative decline.

Banks' default risks have declined since the reforms according to many measures; this effect is in some cases more pronounced for G-SIBs. This effect is consistent with the relative increase in capital ratios documented above. In line with the objectives of the reforms, measures of bank risk[39] decreased more for SIBs, and in particular for G-SIBs, in the period following the reforms. For example, average Expected Default Frequencies (EDFs) for G-SIBs declined from 0.9% to 0.6% for G-SIBs, while they remained relatively constant at 0.9% for D-SIBs and banks in the control group. However, the differences are typically not statistically significant, with the exception of non-performing loan ratios, which fell more for G-SIBs than for D-SIBs. Again, a possible explanation for the lack of statistical significance could be the many confounding factors affecting the risk of both SIBs and other banks (including Basel III), which could affect groups of banks differently.

5.1.4. How has the complexity of SIBs evolved?

As measured by numbers of subsidiaries, G-SIBs remain fairly complex. A complex group may be harder to manage, supervise, and resolve. Measured crudely by their number of subsidiaries, G-SIBs are still complex.[40] The average G-SIB has 1,203 subsidiaries. Only 5% of these are banks, which nevertheless tend to account for most of the assets of each G-SIB. The majority are non-financial subsidiaries (57%), mutual and pension funds/nominees/trusts/trustees (22%) and other financial subsidiaries (16%). The number of subsidiaries significantly increased in the run-up to the 2007-08 global financial crisis and in

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38 A reduction in implicit funding subsidies (see Chapter 4) would imply a relative increase in funding costs for G-SIBs. It could be that G-SIBs passed on some of this increase to their borrowers and therefore reduced interest rates less than other banks.

39 Bank risk can be measured in several different ways; modelled probabilities of distress, obtained from the model described in Goel et al. (2019) and market-based measures like Moody's EDFs, z-scores, changes in RWAs and average risk weights, and balance-sheet measures like the ratio of non-performing loans to loans. See Technical Appendix.

40 The number of subsidiaries is only one and isolated factor that may influence corporate complexity. Organisational and corporate complexity comprise a wide range of dimensions, but because of the lack of data, the focus is on the number of subsidiaries.

the following years until 2011. There are indications of a reduction in the number of subsidiaries for the period between 2011 and 2014, but data challenges make it difficult to draw conclusions for the most recent past.[41]

There has been relatively little change in geographic complexity either. A cross-border resolution requires authorities in multiple jurisdictions to coordinate their actions. The coordination challenges arising in a cross-border resolution are likely to increase with the number of jurisdictions and authorities involved, and so the evaluation also analysed the geographic diversification of G-SIBs. The average G-SIB has subsidiaries in 44 jurisdictions. About 60% of their subsidiaries are incorporated outside the jurisdiction of the home country. Both of these numbers are quite stable over time but vary markedly across institutions. For some groups, more than 90% of their subsidiaries are incorporated abroad. G-SIBs may have subsidiaries in up to 83 jurisdictions.

Of course, the analysis is limited, as the number of subsidiaries and the share of foreign subsidiaries are only two factors that may influence corporate complexity. Others include the structure of the group, the number of business lines and their mapping into legal entities, intragroup funding interdependencies and the existence of cooperation agreements between relevant authorities. While there is anecdotal evidence that G-SIBs in some jurisdictions have made substantial progress in reducing business complexity more generally, measuring such progress in a consistent or systematic way is very difficult. Unfortunately, the lack of consistent disclosure on banks' corporate structures makes it difficult to broaden the analysis, for example to include branches. Enhanced transparency as well as consistent methodologies would help to improve the understanding and the assessment of the corporate structures of G-SIBs.

5.2. Conclusion

Overall, in line with the objectives of the reforms SIBs have increased their capital ratios by more than other banks, although this difference is often not statistically significant. Nevertheless, G-SIBs continue to be have lower ratios of capital to assets than other banks. Other than this, the analysis does not reveal any differential balance-sheet adjustments or unintended effects for G-SIBs relative to D-SIBs, or for SIBs relative to other banks. In those cases where differences are observed, they could also be due to other confounding factors rather than the TBTF reforms. It is difficult to state whether the lack of significant differences in behaviour across different types of banks is because reforms have not affected behaviour, or because differences exist but cannot be detected.

Findings on bank profitability are consistent with expectations. The analysis suggests that the profitability of SIBs, and in particular of G-SIBs, has fallen relative to that of other banks, reflecting higher capital, lower implicit funding subsidies, and lower risk.

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[41] The abrupt increase for 2017 is due to a data discontinuity: Bureau van Dijk expanded its coverage of subsidiaries for US banks only, which resulted in a significant increase in the reported number of subsidiaries of US G-SIBs. In contrast, Federal Reserve data show a fall in the number of subsidiaries. See Carmassi and Herring (2019) and Annex D for data on the corporate structures of US G-SIBs based on publicly available data from the Federal Reserve/National Information Center.

There is no evidence that TBTF reforms have negatively affected loan volumes. At the same time, there are some effects on risk-taking and pricing in syndicated loan markets. The syndicated loan data suggests that G-SIBs shifted lending towards less risky borrowers following the reforms, and also reduced the pricing gap relative to other banks and thus became (in relative terms) more conservative in their pricing behaviour. Consistent with the reduction in risk-taking and the increase in capital levels, banks, and especially G-SIBs, have become more resilient in recent years.

Organisational complexity, measured by number of subsidiaries, was high before the crisis and has remained so. However, the number of subsidiaries is only one factor that may influence organisational complexity. Other important dimensions could not be analysed, owing to the lack of data.

6. Broader effects of reforms

This chapter looks at changes to the financial system and the economy at the aggregate level. The previous three chapters focused on the effects of the TBTF reforms on individual institutions or markets, while this chapter analyses these effects more broadly. The analysis was designed to answer four main questions, which are listed in Table 4. The rest of this chapter attempts to answer each of these questions. More details of the analytical work are provided in the Technical Appendix.

Table 4: Central questions about broader effects of the reforms

How has the structure of the financial system changed since the introduction of the TBTF reforms?
How has the resilience of the financial system changed since the introduction of the TBTF reforms?
To what extent have the TBTF reforms affected global financial integration?
What are the social costs and benefits of TBTF reforms?

This is a broad set of topics, and the evaluation has used a range of analytical approaches to investigate them. Most of the results presented in this chapter are descriptive. Identifying a causal link between the TBTF reforms and observed aggregate developments is not easy. Confounding factors make causal inference very challenging. For instance, macroeconomic, financial and policy developments have also driven changes across G-SIBs and regions. Furthermore, in some cases data is limited.

6.1. Changes in the structure of the financial system

Beyond effects on individual banks, TBTF reforms have the potential to change the structure of the financial system. A reduction in implicit subsidies (see Chapter 4) and changes in SIBs' behaviour and structure (see Chapter 5) may result in a shift of activities to other banks, non-banks or markets. The question to be investigated in this section is whether market concentration has changed and aggregate supply of financial services has been affected. If supply by G-SIBs falls, and if other banks or financial institutions are unable to provide more of these services in response, the aggregate supply of these services could fall and concentration could rise, potentially generating adverse effects for economic growth or financial stability.

6.1.1. SIBs' domestic market share and concentration

If implicit subsidies fall, SIBs' competitiveness is expected to decline, and their market share may fall. This subsection describes how SIBs' shares of total assets, customer loans and customer deposits in their domestic markets have changed over the last decade and how market concentration has changed.

Market shares of SIBs in domestic banking markets have been declining. Both G-SIBs' and D-SIBs' shares of total assets, customer loans and customer deposits in their domestic banking market have been declining since 2010, while the market shares of other banks have been increasing.[42] Most of the decline in G-SIBs' and D-SIBs' market shares occurred between 2012 and 2015, which coincides with the implementation of several TBTF reforms. Higher capital buffer requirements provided by the G-SIB surcharge may have led to relative reductions in some key elements of G-SIBs' balance sheets and in their risk-taking (Figure 16). The market share of D-SIBs has fallen by more than that of G-SIBs. One explanation for this result is if TBTF policies bind more on D-SIBs than on G-SIBs. Alternatively, or in addition, it could be a consequence of retrenchment by G-SIBs, given that G-SIBs' foreign subsidiaries are often designated as D-SIBs in host jurisdictions.

This reduction in market share is not inconsistent with the result in Chapter 5 that the ratios of loans to assets for SIBs and non-SIBs have not evolved differently. That result relates to the ratio of loans to assets; this result relates to the composition of the overall market for loans. Hence, while the market share of banks other than SIBs has grown, both SIBs and non-SIBs have experienced a similar evolution of the ratio of loans to assets. In addition there are differences in the datasets used to produce the results. The DiD results are on a consolidated basis at bank level, while the market share results are based on aggregate domestic activities by type of bank (G-SIBs, D-SIBs and other banks).

The patterns vary markedly across regions (Figure 17)**.**[43] While European G-SIBs have increased their share of assets, loans and deposits, the market share of G-SIBs in emerging markets has declined. In North America, where G-SIBs' market shares are higher to begin with, their shares of total assets and of deposits have fallen. In the Asia-Pacific region, G-SIBs' share of loans has fallen, but not their share of assets or deposits.

As for D-SIBs, in the Asia-Pacific region they have increased their market share. The share of D-SIBs in emerging markets has instead fallen, while the market share of D-SIBs in North America and Europe has been stable.

The declining domestic market share of SIBs results from a fall in volumes, which has led to lower market concentration within SIBs. The number of SIBs has changed only slightly since the introduction of the reforms and no major mergers or demergers have occurred since 2011. The share held by the three largest banks - relative to the total held by SIBs - has

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42 The analysis includes FSB jurisdictions for the period 2010 to 2018.

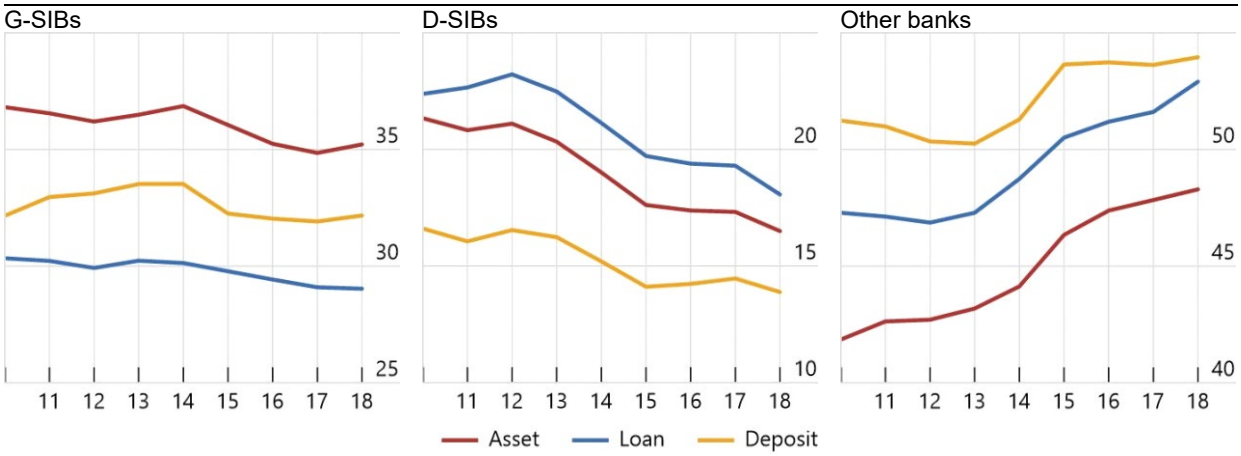
43 The four regions are North America (Canada and US), Europe (France. Germany, Italy, the Netherlands, Spain, Sweden, Switzerland, the UK), Asia-Pacific (Australia, Hong Kong, Japan, and Singapore) and emerging markets (Argentina, Brazil, China, India, Mexico, Russia, Saudi Arabia and Turkey).

been shrinking.[44] The decrease has been more pronounced in EMDEs than in advanced economies. In the latter, the decline has been larger after 2012, whereas in EMDEs it started a few years before (Figure 18).

G-SIBs', D-SIBs' and other banks' domestic market shares in FSB jurisdictions

In per cent

Figure 16

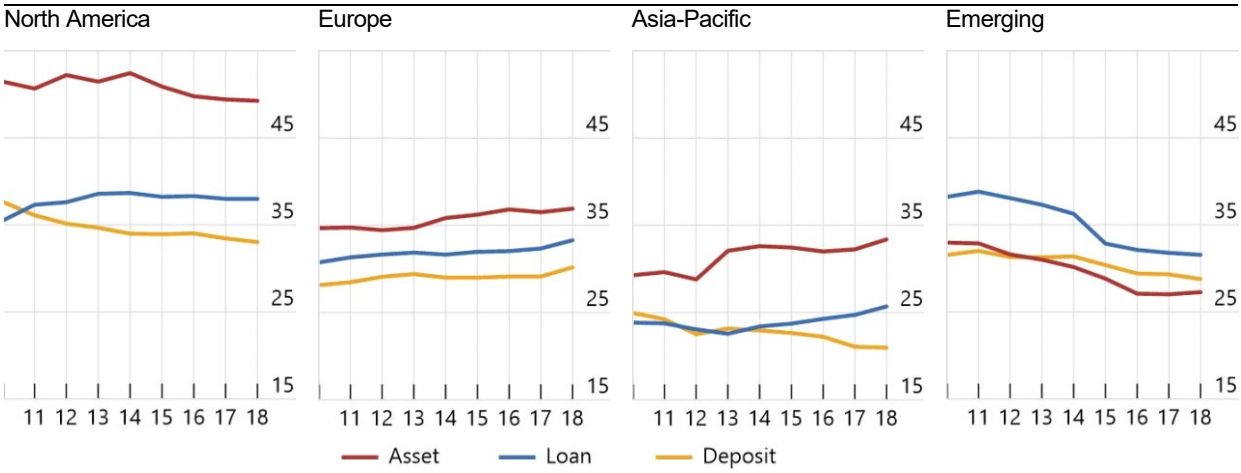


Notes: Data is from a TBTF evaluation survey, which includes information by country on domestic loans to customers, granted by domestic G-SIBs, domestic D-SIBs, and other banks. 21 jurisdictions provided data, but due to data inconsistency, 19 jurisdictions are considered in these charts. Regional classifications follow footnote 43. Weighted averages. Composition changes are not adjusted.
Source: TBTF evaluation

G-SIBs' domestic market shares by region

In per cent

Figure 17



Notes: Data is from FSB survey, which includes information by country on domestic loans to customers, granted respectively by domestic G-SIBs, domestic D-SIBs, and domestic non-systemic banks. 21 jurisdictions provided data, but due to data inconsistency, 19 jurisdictions are considered in these charts. Regional classifications follow footnote 36. Weighted averages. Composition changes are not adjusted.

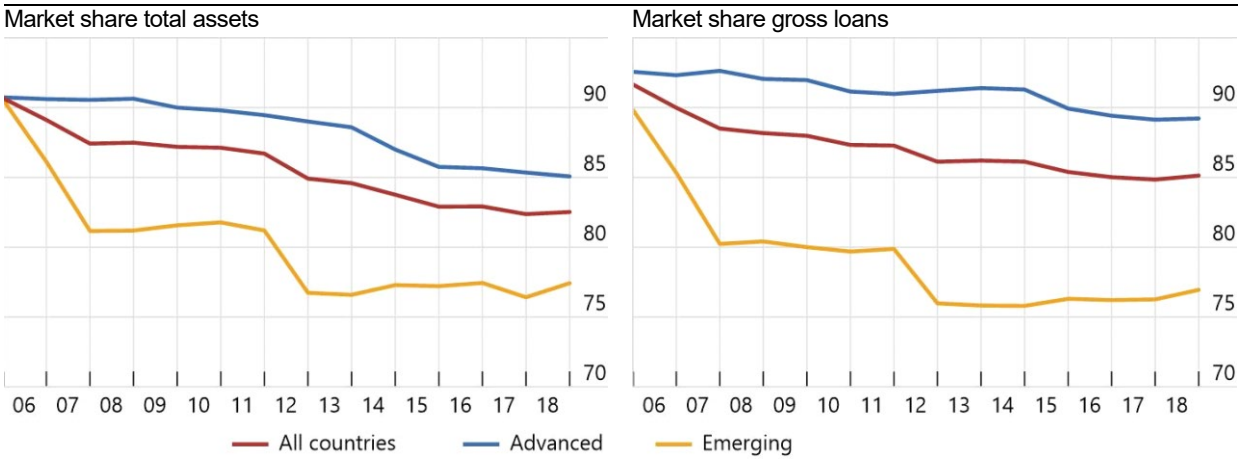
Source: TBTF evaluation

[44] The result is the same when the Herfindahl-Hirschman concentration index is used.

Market shares of the top three banks within SIBs in terms of total assets and gross loans by jurisdiction

In per cent

Figure 18



Notes: Unconsolidated bank data. Weighted market share averages are concentration ratios (three largest banks) in FSB jurisdictions. Weights are based on SIBs' assets/loans in a given jurisdiction relative to all SIBs in the sample.

Sources: FitchConnect; TBTF evaluation

Although the TBTF reforms incentivise banks to reduce the scale of their activities at the margin, the effects have not been large enough to affect the size distribution of banks. Shocks to large banks can therefore still have aggregate economic effects. The banking sector is still characterised by a few very large banks and many small and medium size banks and its size distribution still follows a power law. This skewed distribution means that shocks hitting individual institutions can have aggregate implications. This effect is present even if other channels such as interconnectedness are ignored. Econometric evidence supports this effect, which is particularly important when markets are under stress.[45]

6.1.2. G-SIBs' domestic lending as a share of the economy

This section looks at the growth of credit to the domestic non-financial sector. It evaluates the relative contributions to credit growth of different lenders: G-SIBs, D-SIBs, other banks, and non-bank financial intermediaries (NBFIs). It covers 19 FSB member jurisdictions over the period 2010-2018. We saw in the previous section that SIBs' domestic market share has fallen on average, although the results vary by regions. An important question is whether this has been associated with a fall in the aggregate supply of credit relative to the size of the economy. A related question is whether this would be a bad outcome for the economy. The level of credit seen prior to the global financial crisis is not necessarily a good benchmark. It may have been the result of excessive risk-taking promoted by implicit subsidies, which ultimately motivated the TBTF reforms. Hence, a lower contribution by G-SIBs to aggregate credit growth is not necessarily bad from an economic and financial stability perspective.[46]

Financing for the economy remained stable after the introduction of TBTF reforms. Total credit and GDP have been growing at similar rates, and thus the ratio of credit to GDP remained broadly constant. G-SIBs have made a small contribution to domestic credit growth.

[45] See the Technical Appendix.

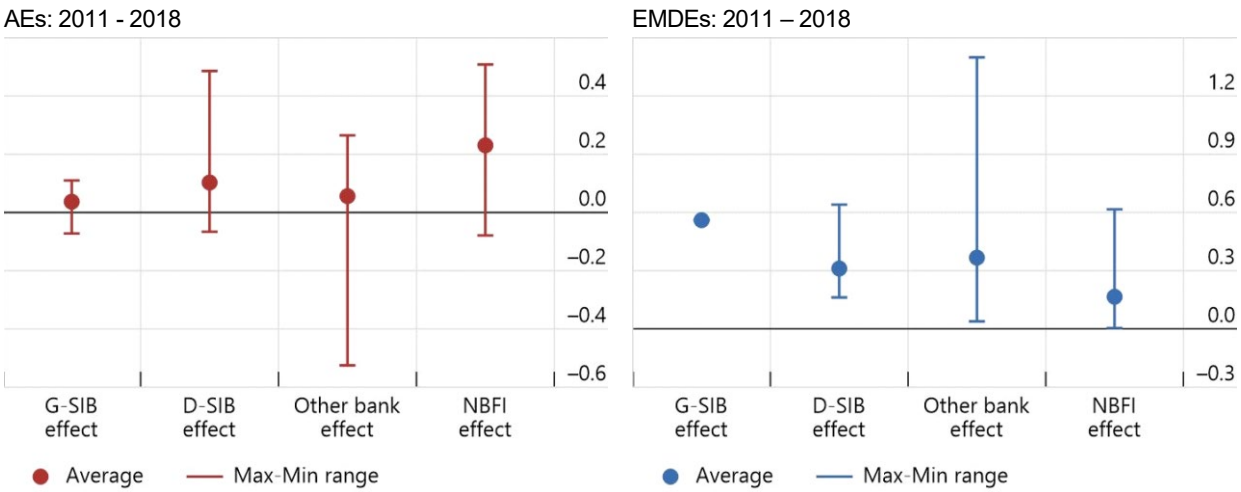
[46] Cecchetti et al. (2011).

Over the period 2011 to 2018, the contribution of G-SIBs to domestic credit growth relative to GDP was marginally positive, although lower than that of other domestic banks and NBFIs (Figure 19). This result is consistent with the decline in G-SIBs' domestic market share described above.

The contribution by G-SIBs to domestic credit relative to GDP is also inversely related to progress in the implementation of resolution reforms. Regression analysis shows that in jurisdictions with more advanced resolution reforms, the ratio of G-SIB credit to GDP tends to be lower.[47] This result is consistent with the hypothesis that the threat of credible resolution gives an incentive to G-SIBs to reduce lending, but it does not conclusively demonstrate it.

Decomposition of changes in the ratio of customer loans to GDP

In percentage points **Figure 19**



Notes: Maximum, minimum and average values shown. Elaborations on BIS and FSB survey data. GDP contributions and residual effects are not shown. NBFI: non-bank financial intermediary.

Sources: BIS; TBTF evaluation survey

The evidence on G-SIBs' aggregate domestic lending is consistent with findings shown in Chapter 5. The literature is mixed (see Annex E). Some studies find a decline in lending by G-SIBs in the aftermath of the global financial crisis. Others show that the ability of G-SIBs to provide loans to the real economy remained unchanged after they were designated as G-SIBs.[48]

Other intermediaries (both banks and non-banks) have contributed more than G-SIBs to growth in the ratio of credit to GDP. The additional impact of the TBTF reforms on G-SIBs could have left space for growth by other intermediaries. This interpretation is supported by regression analysis, which shows that the ratio of domestic non-financial credit to GDP is unrelated to the resolution reform index for D-SIBs, non-SIBs, and non-banks, in contrast to the effect found for G-SIBs. Furthermore, credit from banks that are not systemically important is negatively related to credit from G-SIBs.

[47] See Technical Appendix for details.

[48] Cohen and Scatigna (2016) and Violon et al. (2018).

The small aggregate contribution by G-SIBs to domestic credit-to-GDP may be linked to TBTF reforms, but a causal attribution is not possible given many confounding factors. The statistical relationship between G-SIBs' domestic credit and the implementation of TBTF resolution reforms is economically significant. A one standard deviation increase in the resolution reform index is associated with a one percentage point reduction in the ratio of G-SIB domestic credit to GDP. However, there is no counterfactual to which the observed changes can be compared, nor is the pre-reform period long enough to use as benchmark: long time series on bank and total credit are publicly available from the BIS but no breakdown between SIBs and non-SIBs is provided.

The evidence available from FSB monitoring of non-bank financial intermediaries complements the results discussed above. The analysis finds substantial growth in total assets of NBFIs after the TBTF reforms. Between 2011 and 2018, banks' share in the assets of the financial system has been decreasing while the share of NBFIs has been increasing worldwide, in advanced economies and in emerging markets alike. In isolation, this could be interpreted as supporting the hypothesis of a structural change in the financial system; however, the growth of NBFIs is significantly inflated by valuation gains in the investment fund sector.

Continued monitoring of NBFI risks is necessary.[49] A more diversified financial system could contribute to financial stability, but the implications of increased NBFI lending have not been fully assessed. Substitution between G-SIBs and non-bank sources of credit reduces the concentration in the provision of credit to the real economy, which could improve financial stability. However, a shift of credit provision activities to intermediaries could raise financial stability concerns. The evaluation has not examined the implications for non-bank financial intermediaries, but the findings on the banking sector reinforce the importance of continuing work by the FSB and standard-setting bodies to assess vulnerabilities and develop policy recommendations designed to address related financial stability risks.

6.2. Changes in the resilience of the financial system

The resilience of the financial system is its capacity to absorb shocks without propagating or amplifying them. If the global financial system can withstand shocks, adverse effects on the real economy can be avoided. The core financial stability question is whether SIBs have become less systemically important and whether the system as a whole has become more resilient following the TBTF reforms. Generally, shocks to individual banks can give rise to systemic risk if banks are large, highly interconnected, exposed to similar shocks, or provide services for which close substitutes are not available. This section focuses on how indicators of systemic risk have changed and assesses implications for resilience.

Measures of aggregate risk, network characteristics and banks' assets holdings are used to explore changes in resilience of the system. SIBs have become more resilient (see Chapter 5) and, other things equal, this should improve the overall resilience of the banking

[49] In the insurance sector, the International Association of Insurance Supervisors (IAIS) adopted in November 2019 the 'holistic framework for the assessment and mitigation of systemic risk in the insurance sector'. This includes an annual assessment of systemic risk arising from sector-wide trends and also of systemic risks at the level of individual insurers in order to allow for a global collective assessment and coordinated supervisory response when needed.

system. But the shape of the network also matters. SIBs could have become more interconnected with NBFIs and shifted risk to the non-bank financial sector. And the incentives embedded in the G-SIB designation framework could have caused portfolios to converge, exposing G-SIBs to higher systemic risk in tail events.

6.2.1. Interconnectedness

The structure of the financial system affects the way in which shocks propagate. International contagion takes place through different channels, including for instance trade, bank loans and investment flows.[50] One way in which shocks can be transmitted is by direct exposures, including interbank lending. The likelihood and impact of contagion through this channel depends on the degree of completeness of the interbank market.[51] Structures that are more densely connected may be more robust to the transmission of small shocks than those that are less densely connected.[52] However, for larger shocks, a densely connected network may amplify the transmission of shocks, leading to a more fragile financial system.[53] This section first examines connections between banks and then turns to connections between banks and CCPs.

Experience from financial crises indicates that interconnectedness across financial markets may increase abruptly after large shocks. The propagation mechanisms can be highly non-linear. Such an effect may lead to sharp changes in the response of a market to shocks arising elsewhere in the system. Interconnections can occur through many different channels and hence are difficult to capture in full. Interconnections between financial institutions can be both direct and indirect. Bilateral exposures via contractual obligations can directly transmit shocks within a financial network. Indirect contagion can occur when banks' actions affect other banks through non-contractual channels.

Post-crisis reforms aimed to limit direct interconnectedness. The interconnected nature of G-SIBs contributed to a financial system where distress in a single point in the network could be directly transferred to the rest of the system. Hence the G-SIB assessment framework includes interconnectedness as one of its five measures of systemic importance. Three indicators are used within this measure: intra-financial system assets; intra-financial system liabilities; and securities outstanding.[54] In addition, banks' investments in other banks' capital and TLAC instruments are, broadly speaking, deducted from regulatory capital. This approach also aims to limit interconnectedness.[55] More recently, tighter large exposure limits have been imposed on G-SIBs' exposures to other G-SIBs.[56]

Volatility interconnectedness between SIBs has slightly declined since the financial crisis of 2007-08 but remains higher than before the crisis.[57] This implies that the

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50 Favero and Giavazzi (2002), Forbes and Rigobon, (1999), and Rigobon (2003).

51 In a complete network, there is a direct link between all pairs of nodes.

52 Allen and Gale (2000).

53 Acemoglu, Ozdaglar, and Tahbaz-Salehi (2015).

54 BCBS (2013).

55 BCBS (2016).

56 BCBS (2014).

57 The analysis follows the approach of Diebold and Yılmaz (2009, 2014, 2015).

propagation of volatility shocks between SIBs has become less influential than during the peak of the financial crisis in 2008, though the interconnectedness measures are higher now than they were in the years leading up to the crisis (2005-07) (Figure 20). The reduction in connectedness between SIBs may also reflect the reduced role of interbank markets. The pattern of volatility connectedness between SIBs is, however, broadly similar to that of global stock markets as a whole.

These findings are in line with the existing literature. Research shows that global banks' volatility connectedness increased until September 2008 and decreased gradually thereafter, albeit with some bumps during the European sovereign debt crisis.[58] Comparable findings are obtained for a sample of large US banks, including G-SIBs; for a sample of G-SIBs and global systemically important insurers; and for a sample of European banks.[59] Estimates based on balance sheet data are also consistent with this evidence, and show that the level of connectedness has decreased following the global financial crisis.[60]

Total connectedness between G-SIBs **Figure 20**

Notes: The sample include all G-SIBs excluding those headquartered in China. Red vertical line indicates Lehman collapse (15 September 2008). Black vertical lines indicate G20 meetings (April 2009 and September 2009), the establishment of D-SIBs framework (October 2012), and the beginning of implementation phase for the G-SIBs surcharge (January 2016).

Sources: Refinitiv; national data; TBTF evaluation

The reduction in volatility connectedness between SIBs does not appear to be correlated with the key policy dates of the TBTF reforms. There is also no agreement in the literature as to whether this trend is the result of the implementation of regulatory reforms, especially for G-SIBs, or instead of the much broader set of post-crisis policy measures, including monetary and fiscal. It is not possible, therefore, to state that the TBTF reforms caused the observed changes in interconnectedness.

Regulatory reforms to derivatives markets may profoundly affect the shape of the financial system. As mentioned in Chapter 2, some standardised derivatives must now be centrally cleared and other derivatives have minimum margin requirements. As a result, CCPs have become an increasingly important part of the financial system.

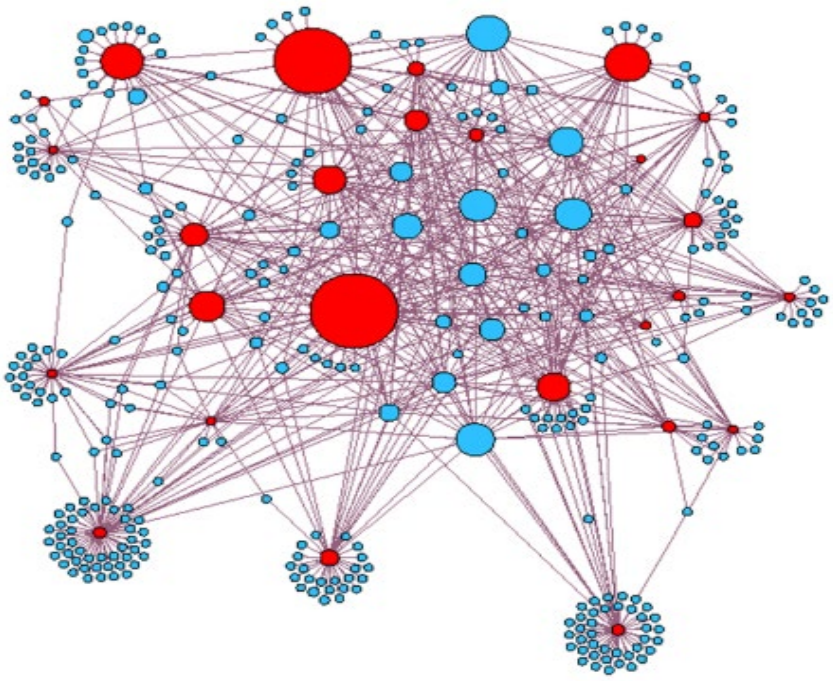
58 Demirer et al. (2018).

59 Diebold and Yılmaz (2014), Malik and Xu (2017), and Clemente et al. (2020).

60 Bongini et al. (2018).

SIBs and CCPs are highly interconnected. Many of the entities that are connected to CCPs are SIBs.[61] In many cases, CCP membership is drawn from a common group of large banks, many of which are also important providers of financial services to CCPs (offering liquidity provision, lines of credit, custodianship, and settlement and cash management). Members and CCPs are often based in different jurisdictions.

The CCP-clearing member network **Figure 21**



Notes: This figure is taken from the BCBS-CPMI-FSB-IOSCO report *Analysis of Central Clearing Interdependencies* (2018a). It depicts the CCP network for the top 25 clearing members of each CCP. Each CCP is shown in red and each clearing member in blue. The size of a CCP node is a proxy for the CCP's credit risk exposure to its clearing members, while the size of a clearing member node is a measure of the prefunded financial resources that the clearing member has posted or contributed to all CCPs of which it is a member.

Exposures to CCPs are concentrated among a small number of entities. The largest 11 contributors to the CCPs' financial resources (out of 306 clearing members) are connected to between 16 and 25 CCPs. The default of a clearing member could therefore result in defaults of the same entity or affiliates in up to 24 other CCPs (Figure 21).

Clearing through CCPs has significant benefits, but may also create new risks. Clearing makes the OTC derivatives market less complex and potentially less prone to contagion. A key risk mitigant is that multilateral netting of each clearing member's exposure to the others is facilitated by the CCP itself.[62] Ensuring that SIBs are resolvable should also reduce the risk that a CCP has to deal with a disorderly default of a clearing member. But the clearing mandate also means that the resilience of CCPs is increasingly important for financial stability. A substantial amount of work has therefore been - and continues to be - devoted to maintaining their resilience, identifying options for their recovery and ensuring that they are resolvable. It is important that this continues and the work on CCP resolution is completed.

[61] 22 out of the 26 CCPs surveyed were exposed to at least ten G-SIBs (BCBS et al, 2018a).

[62] As noted in the report of the Derivatives Assessment Team (BCBS et al, 2018b).

6.2.2. Portfolio similarity

Indirect linkages between banks can be as important as direct ones. They may, for example, arise when financial intermediaries hold common or correlated assets that expose holders to the same risk factors. Rapid liquidation of assets may cause prices to fall, which in turn may affect other financial institutions that hold similar assets.[63] Similarity in asset allocation can thus increase systemic risk through fire-sale mechanisms.

A key question in the evaluation is whether the reforms have caused G-SIBs to become more similar to each other and hence more exposed to the same risks. If G-SIBs have become more similar, they may be exposed to common shocks in a way that leaves the aggregate provision of financial services more volatile. Some respondents to the call for public feedback asserted the TBTF reforms had caused banks to become more similar. A priori, if regulatory reform has caused banks to become more similar, the additional constraints introduced by the Basel III reforms would be the more likely cause. However, it is also possible that the G-SIB assessment framework could encourage some convergence.

Average portfolio similarity among G-SIBs steadily increased from the early 2000s (Figure 22), although this masks variation across regions. The analysis relies on a widely used metric of similarity[64] and is based on annual balance sheet data from Fitch ratings covering the period 2000-2018 for 34 current or former G-SIBs from 12 jurisdictions. The aggregate increase, though statistically significant, is small and cannot be confidently attributed to the TBTF reforms.

G-SIBs' portfolio similarity is significantly and negatively correlated with the extent of implementation of TBTF reforms. G-SIBs' assets are more similar in jurisdictions with less advanced implementation of the resolution framework, as proxied by a lower resolution reform index. This result is not consistent with the hypothesis that the resolution reforms increase G-SIBs' portfolio similarity.

It is not easy, however, to identify a causal link between the TBTF reforms and portfolio similarity. Macroeconomic, financial and policy developments, and other prudential reforms, may also have driven changes in business models across G-SIBs and regions. In addition, the available data has limited granularity.

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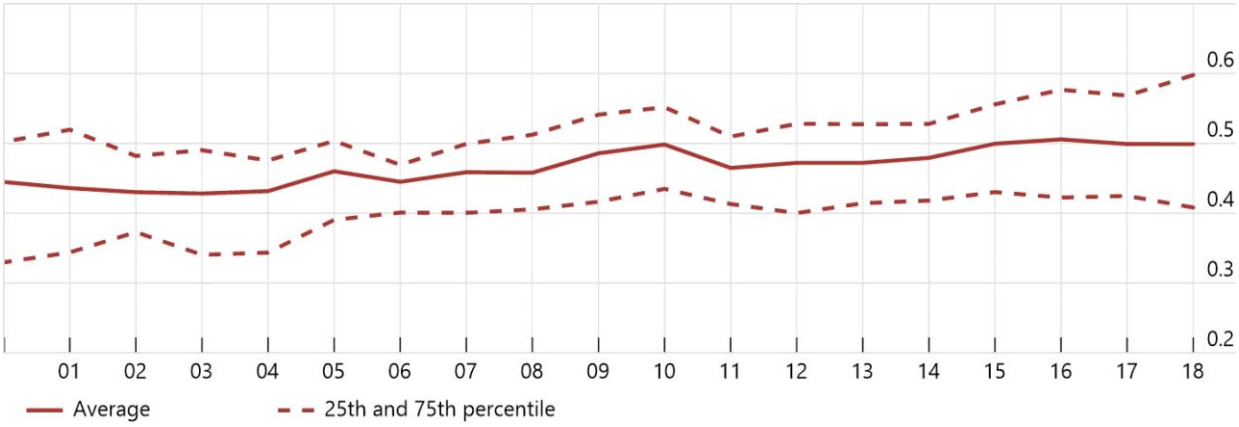
63 Adrian and Shin (2010), Eisenbach et al. (2015), Greenwood, Landier and Thesmar (2015), and Shleifer and Vishny (2011).

64 The analysis uses a measure of cosine similarity, as in Giradi et al. (2018) and Abad et al. (2017). See the Technical Appendix for details.

Measures of G-SIBs' portfolio similarity **Figure 22**



Notes: Measured by cosine similarity. For details, please refer to the Technical Appendix. All G-SIBs are covered as long as data is available for each year.

Sources: FitchConnect; FSB calculations

6.2.3. Measures of systemic risk

Some measures suggest that the systemic importance of banks has declined. There are different ways to measure systemic importance. As explained in Chapter 2, the G-SIB assessment methodology combines a number of indicators of banks' systemic importance. Some, but not all, of these indicate that the differences in systemic importance between G-SIBs and D-SIBs, and between SIBs and non-SIBs, are now smaller. Since data on these G-SIB indicators is available only after 2013, the evaluation has relied on proxy measures for those indicators. Market-based proxy measures of systemic risk such as SRISK and ΔCoVaR can also illustrate developments; these are presented later in this section.

For the proxy variables for G-SIB indicators, the following patterns emerged:

1. **Size:** While asset growth was roughly similar for the different groups of banks in the years before the reforms, asset growth for D-SIBs and in particular for G-SIBs fell significantly after the reforms. This reduction is less pronounced for other banks. This pattern holds across all regions, except for Asia-Pacific, where asset growth also fell for other banks, so that differences are insignificant.
2. **Balance sheet complexity:** The share of derivatives in total assets fell significantly for G-SIBs, although starting from and remaining at significantly higher levels than for other banks. The same applies to the share of Level 2 and Level 3 assets or the share of Level 3 assets in total assets, which was reduced but is still much higher for G-SIBs than for other banks.[65] In contrast, there are no divergent patterns between SIBs and non-SIBs or between D-SIBs and G-SIBs for the share of trading and available for sale securities in total assets.

[65] Accounting standards commonly use a three-level hierarchy to categorise fair value assets. Level 1 assets are financial assets that have readily observable, transparent prices and therefore a reliable market value. Level 2 assets are financial assets that do not have regular market pricing, but for which a fair market value can be determined based on other data values or market prices. Level 3 assets are financial assets that are not traded frequently, so that it is most difficult to assign a reliable fair market value.

3. **Interconnectedness:** For the share of securities issued in total liabilities the analysis does not reveal any significant differences in adjustment between D-SIBs and non-SIBs (or between G-SIBs and D-SIBs).

Data constraints prevented the evaluation from creating proxies for the other risk categories in the G-SIB methodology, which are cross-jurisdictional activity and substitutability.

The calculation of G-SIB surcharges could also incentivise period-end window-dressing, but such effects are likely to be small compared to the benefits of a reduction in the likelihood and cost of future financial crisis. A bank's G-SIB score – which is used to determine its G-SIB capital surcharge – is an average of five factors (see Chapter 2). Most jurisdictions measure these factors at the end of the calendar year. Banks may try to obtain a lower capital surcharge by temporarily reducing their score. G-SIBs are key players in foreign exchange and short-term funding markets and could lower their score by briefly reducing participation in these markets.[66] Hence, window dressing may have effects on bank behaviour and thus the functioning of financial markets as end-period adjustments increase volatility and cause temporary market-level distortions.[67] Similar effects could arise alongside the Basel III leverage ratio, taxes and deposit insurance assessment fees. To address concerns that period-end adjustments risk disrupting the operations of financial markets, the Basel Committee in 2019 introduced revisions to the leverage ratio disclosure requirements.[68]

Market-based systemic risk measures can also be used as a complement to BCBS G-SIB scores. Two market-based measures that are often used are ΔCoVaR and SRISK. These measures do not try to capture a particular source of systemic risk or a channel of transmission. ΔCoVaR aims to measure the financial system's stress conditional on an individual financial institution's stress, while the SRISK of a financial institution is defined as the expected capital shortfall of that institution conditional on a systemic event. One difference between these measures is that while ΔCoVaR is computed only from market data, SRISK uses information on leverage (debt to market capitalisation) as well. Thus, SRISK reflects the resilience of financial institutions to a larger extent. More details are set out in the Technical Appendix.

These market-based measures show broadly stable patterns of systemic risk. The weighted average ΔCoVaR was broadly stable from 2000 to 2019, except during the global financial crisis (Figure 23). ΔCoVaR in the post-reform period declined more relative to the pre-crisis period for G-SIBs than for other banks (Figure 24). In addition the ΔCoVaR of G-SIBs that had higher ΔCoVaR before the crisis decreased more than for other G-SIBs.

The analysis of SRISK produces similar results. On the basis of the balanced sample in Figure 25 below, the ratio of SRISK to GDP increased in the run-up to the financial crisis and then declined. In the period of the analysis, while for G-SIBs the ratio of SRISK to GDP trended down following the reforms, it was broadly flat for other banks (Figure 26).

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66 Behn et al. (2019).

67 Correa et al (2019).

68 https://www.bis.org/publ/bcbs_nl20.htm

Figure 23. ΔCoVaR

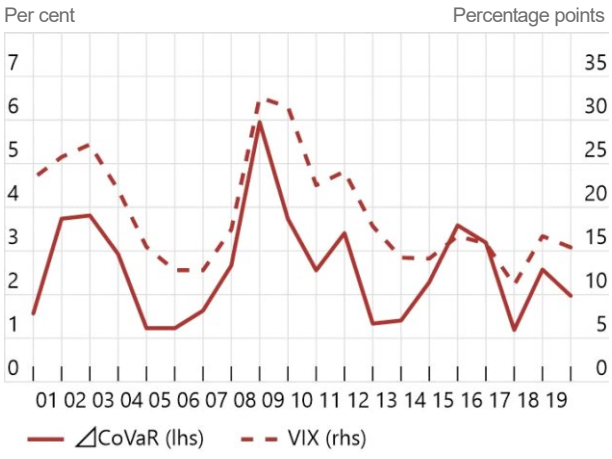


Figure 24. ΔCoVaR in post-reform vs pre-crisis period

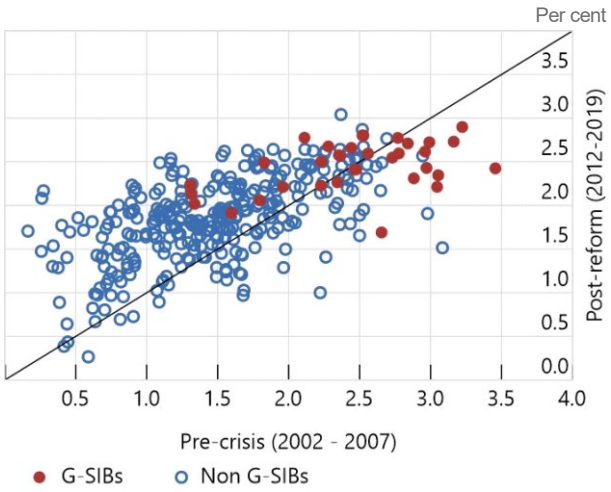


Figure 25. Ratio of SRISK to GDP

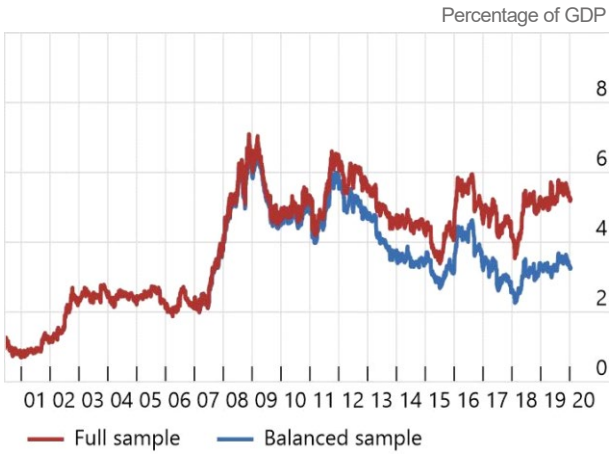
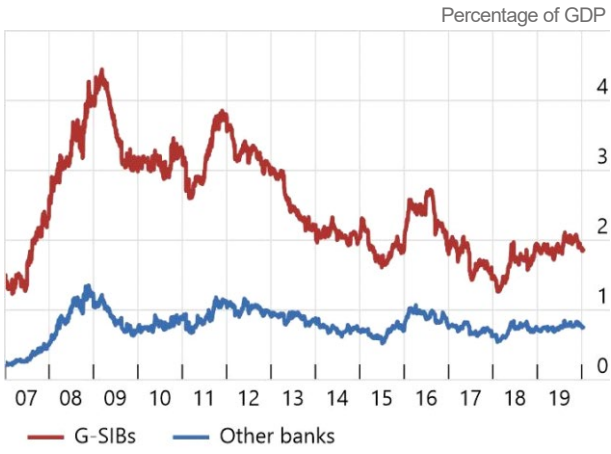


Figure 26. Ratio of SRISK to GDP for G-SIBs



Sources: Bloomberg; V-Lab

The findings are broadly consistent with the existing literature. Research shows that ΔCoVaR was high during the crisis and low in both pre- and post-crisis periods.[69] Other studies find that, for US banks, measures of systemic risk contribution peaked during the crisis and have then been higher since the crisis than before the crisis, as is observed for SRISK in this report.[70]

6.3. Global financial integration

Global financial integration has major benefits but also entails risks that need to be managed. An open and integrated financial system has major benefits, provided the system as a whole is resilient against shocks. On the one hand, it contributes to the efficient allocation of global savings across countries and supports international trade and investment through financial deepening, risk sharing and diversification across institutions and markets, with

69 Adrian and Brunnermeier (2016) and Benoit et al. (2017).

70 For example, Sarin and Summers (2016) and Brownlees and Engle (2017).

positive effects on growth. On the other hand it also entails risks. Sudden stops and abrupt reversals of capital flows can impose significant costs.[71] Increased openness also exposes economies to shocks originating abroad.[72]

This section reports on changes in global financial integration. It first describes changes in cross-border bank lending, in aggregate and across regions. It then examines whether the shape of the cross-border banking network has changed. It then discusses whether TBTF reforms have affected cross-border bank lending. Finally, it discusses internal TLAC and market fragmentation.

6.3.1. Cross-border lending

The financial crisis has slowed down, but not reversed, the long-term trend towards global financial integration.[73] The aggregate retrenchment in international banking since the crisis stems from a decline in cross-border lending by European banks. Cross-border lending between other regions has continued to expand. Lending by international banks has shifted to more stable locally-funded sources in local currencies. Cross-border lending by advanced economy banks to borrowers in EMDEs has grown since the crisis, and intraregional lending has also increased within EMDEs, in particular in Latin America and Asia (Figure 27).

71 Agenor (2003).

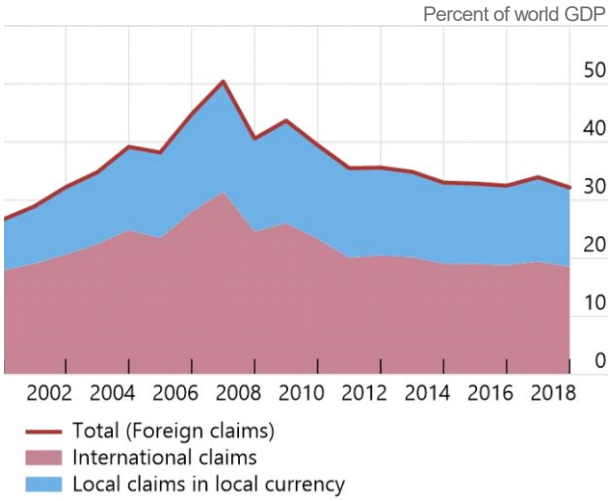
72 For example, Forbes and Rigobon (2002).

73 FSB (2019), *Implementation and Effects of the G20 Financial Regulatory Reforms: Fifth Annual Report*.

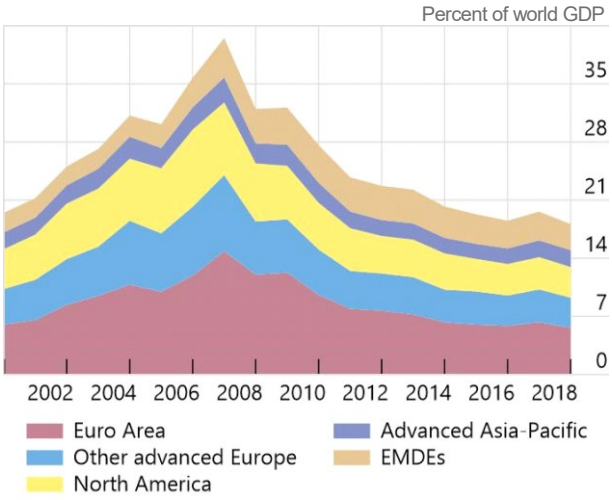
International bank claims

Figure 27

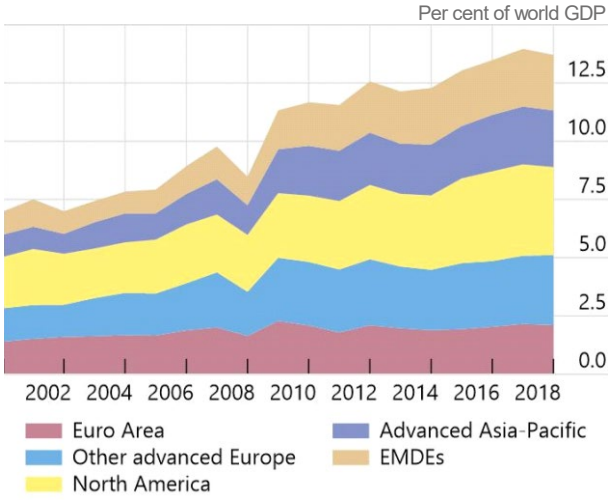
International bank claims have contracted more than foreign banks' local claims



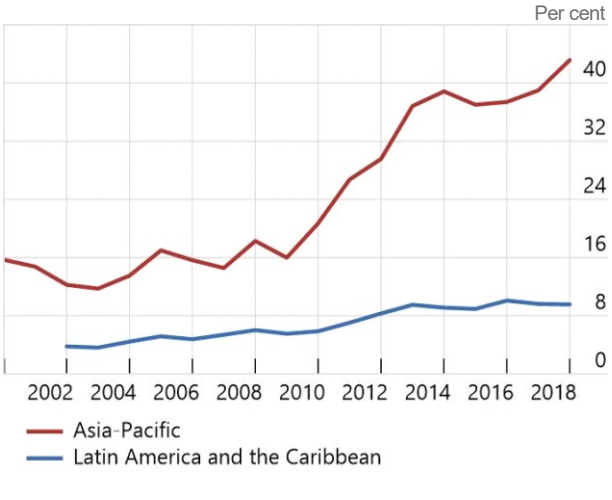
European banks' foreign claims on entities in advanced economies have dropped substantially



Other banks' foreign claims on entities in all regions have continued to increase



The share of intra-regional claims has increased in EMDEs in Asia and Latin America



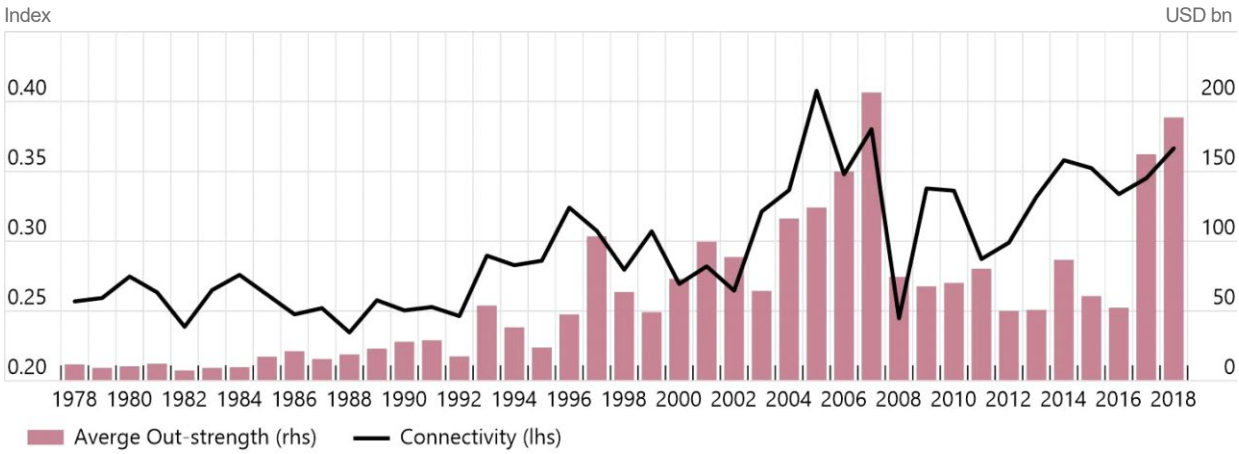
Note: Balanced samples.

Source: FSB, *Implementation and Effects of the G20 Financial Regulatory Reforms: Fifth Annual Report* (2019)

The G-SIB and resolution frameworks may have affected the way in which bank credit, and capital more generally, flow across borders. Changes in the overall network of cross-border banking flows differ between advanced economies and EMDEs. Figure 28 shows how measures of connectedness have changed through time.[74] Indicators are pro-cyclical and reached peak values at the onset of the financial crisis. After a sharp drop in 2008, they have returned to their pre-crisis levels. Cross-border connectivity between advanced economies fell and remained lower in the aftermath of the crisis. By contrast, connectivity between these countries and others has increased and surpassed pre-crisis levels, leaving overall connectivity unchanged.

[74] Following Minoiu and Reyes (2013). See Technical Appendix for details.

Cross-border network indicators: 1978 – 2018 **Figure 28**



Notes: connectivity characterises the density of links observed over the total possible number of links. Average out-strength shows the average value of outflows originated in a given link. BE, LU, DK, NL, FR, SE, DE, CH, IE, UK, JP, and US are covered.

Sources: BIS; TBTF evaluation

There is no evidence that the implementation of TBTF reforms has reduced cross-border lending. Chapter 5 reported that the evaluation looked at detailed loan-level data on syndicated loans. Total syndicated lending has been increasing after a sharp drop in 2009. While G-SIBs lend to foreign borrowers more than other banks do, the proportion of foreign lending is relatively stable for both groups (fluctuating between 55% and 65% for G-SIBs and between 30% and 40% for other banks). An additional exercise using BIS Locational Banking Statistics also suggests that cross-border lending was not affected by TBTF reforms.

Evidence about the impact of TBTF reforms on the growth of banks' lending outside their home market is mixed. The analysis looked at whether the rate of growth of credit granted by bank subsidiaries of G-SIBs operating in five Latin American countries was different from those of other banks in the region following the announcement of the G-SIB capital surcharge. In three countries it was not. In two countries credit growth was lower, although still positive, for subsidiaries of foreign G-SIBs.[75] A similar analysis of German banks found that SIBs reduced lending to foreign borrowers more than non-SIBs after 2011, when the G-SIB framework was announced. In particular, they reduced lending to borrowers outside the EU and the euro area.[76]

6.3.2. Market fragmentation and internal TLAC requirements

The FSB report on market fragmentation noted concerns that some markets may be fragmented along jurisdictional lines. Such fragmentation could result from inconsistent implementation of international standards, differences in supervisory practices, or as a by-product of domestic measures to improve resilience. One of the drivers of such market fragmentation could be the ring-fencing of liquidity and capital resources within local markets. In some cases, such fragmentation along geographical lines could enhance financial stability

[75] For this exercise, a common framework for the analysis of loan-level data from credit registries was used. See Cantú et al. (2019) and the Technical Appendix.

[76] Abbassi and Völpel (2020).

by, for example, reducing complexity of a resolution or by reducing the transmission of shocks between jurisdictions. In other cases, however, fragmentation could lead to inefficient resource allocation or reduced diversification and have negative consequences on financial stability.[77]

Resolution reforms include standards for the pre-positioning of financial resources within G-SIBs, which may affect the mobility of those resources. The availability of adequate loss-absorbing resources is a necessary condition for resolvability. The FSB's TLAC standard and guidelines on internal TLAC aim to achieve an adequate amount and appropriate distribution of loss absorbing and recapitalisation capacity within banking groups.[78] Committing these resources can, however, reduce the amount of resources that can be freely distributed within a group to respond to business or regulatory needs. As a result, some market participants have expressed concerns that internal TLAC requirements can lead to market fragmentation. Evidence on the effects of internal TLAC is not yet available. G-SIBs have not published TLAC information in a consistent manner and information about internal TLAC is still missing. Nevertheless the evaluation has considered the potential benefits and costs. These are described below.

Costs may arise for banks when they have to pre-position a greater amount of financial resources than they would have otherwise done. Some G-SIBs manage capital and liquidity centrally, and requiring them to pre-position resources at their material subsidiaries may decrease the efficiency of such a model and increase their funding costs. What matters from the point of view of the evaluation, however, is the social perspective. The extent to which these private costs lead to social welfare losses depends on several factors, such as the extent to which higher costs are passed on to customers, which may depend on whether there are substitutes for their services. Evidence that, while market shares have changed, there has been no impact on aggregate credit, is presented earlier in this chapter.

Excessive pre-positioning of internal TLAC could also reduce financial stability by making the banking group less resilient. Cross-border banking groups are susceptible to shocks in multiple jurisdictions, and the amount of financial resources necessary to offset losses and recapitalise a subsidiary in response to a shock is impossible to predict in advance. High pre-positioning or ring-fencing requirements may be the outcome of a collective action problem, whereby host authorities are not confident that sufficient financial resources will be available for the subsidiaries in crisis and hence require resources to be available up front. If all host authorities act in a similar way, they may all be worse off. With high levels of pre-positioned internal TLAC, a G-SIB could have enough resources to prevent the failure of one of its subsidiaries but be unable to move them across the group to where they are needed. In this case, increasing pre-positioned resources could make a banking group less resilient.[79]

The objective of internal TLAC requirements is to support the orderly resolution of a cross-border group. It enables a cross-border group to be resolved by applying resolution powers only at the level of the resolution entity (see Annex B). For a banking group with a single-point-of-entry strategy,[80] the pre-positioning of internal TLAC at material subsidiaries

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77 Claessens (2019).

78 See Annex B for an explanation of internal TLAC.

79 Ervin (2017) and (2018).

80 See Annex B for an explanation of resolution strategies.

provides a mechanism for the allocation of losses. For a group with a multiple-point-of-entry strategy, internal TLAC should serve a similar purpose for each of the resolution entities within the group. This should in turn contribute to financial stability and to the public good by reducing the probability and severity of future financial crises.

Internal TLAC also serves as a coordination device to help diminish host authorities' incentive to ring-fence assets in resolution. Both pre-positioning and ring-fencing constrain transfers of resources within a banking group. However, pre-positioning involves establishing a contractual requirement in advance between the subsidiary and its parent, following agreement between the relevant host and home authorities. In contrast, ring-fencing often takes place without adequate consultation between home and host authorities and it can be symptomatic of the collective action problem described above. Various analyses[81] have shown that a better outcome may be achieved – and the collective action problem addressed – when home and host authorities cooperate and when credible and enforceable mechanisms are present to ensure the timely allocation of resources within a group in crisis. Pre-positioning of internal TLAC can serve as a commitment device that aligns incentives and hard-wires cooperation in stress.[82]

Assessing the benefits and the costs of internal TLAC requires a counterfactual, and it is unrealistic to assume that the alternative would be fully mobile capital. Industry estimates[83] of the potential fragmentary effects of internal TLAC assume that the alternative would be an integrated banking group with fully mobile capital. This is quite unrealistic given the experience of the 2007-08 financial crisis. Without internal TLAC, host authorities cannot be sure whether financial resources might be made available to subsidiaries in a crisis. To reduce uncertainty, authorities might end up imposing requirements on subsidiaries operating in their jurisdictions in an uncoordinated manner, leading to differences in the timing, nature and level of these requirements. Under such a scenario, unallocated resources in the resolution group would be lower than they would be in a cooperative arrangement, leaving little incentive for home and hosts to cooperate and thereby reducing the probability of cross-border implementation of the preferred resolution strategy. Hence, estimates of the costs may be excessive.

There are trade-offs involved in determining the optimal amount of pre-positioned resources. Host authorities want certainty and home authorities want flexibility.[84] The distribution of loss-absorption and recapitalisation capacity within G-SIBs is being discussed by home and host authorities and at the FSB. Positioning and monitoring TLAC to support resolution strategies requires coordination between home and host authorities as well as credible and enforceable mechanisms to transfer resources within groups in times of crisis. This process requires them to cooperate up front. This should improve understanding of the other authorities' interests and help minimise last-minute coordination issues in a crisis.[85]

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81 For example. Bolton and Oehmke (2019).

82 Tucker (2019).

83 Ervin (2017 and 2018).

84 Quarles (2019).

85 Quarles (2018).

6.4. An estimate of the social costs and benefits of TBTF reforms

The key objective of the reforms is to reduce the probability and impact of the distress or failure of SIBs. A broader aim of the reforms is to reduce the probability and severity of financial crises. Reforms that speed up the resolution and recapitalisation of failed banks should curtail crises and make them less severe. But concerns have also been voiced about possible side-effects in terms of a reduction in lending, an increase in the price of credit, or a withdrawal from foreign markets. Some such outcomes would be foreseen rather than unintended consequences of the reforms (see Chapter 2). But in any case they have been investigated earlier in this report and little or no evidence of such effects has been found.

When interpreting the effects of reforms, it is important to distinguish private and social costs and benefits. The proper way to evaluate the effects of reform is to focus on the latter, and this is what this evaluation has done. For example, lowering implicit funding subsidies and requiring more disclosure will be perceived as a (private) cost by the banks affected but may represent a net benefit for society. At the same time, there are also potential social costs associated with the reforms. Higher capital and TLAC requirements may increase the overall cost of funding for banks. G-SIBs may pass some or all of this increase in costs onto borrowers by charging higher interest rates on loans. If other firms do not take up the slack, that in turn may reduce investment and output.

This report takes a holistic approach to assess social costs and benefits of reforms. Throughout this report, qualitative and quantitative evidence on the effects of the TBTF reforms has been compiled. This includes changes in the availability and pricing of credit, changes in market structure and interconnectedness, including cross-border financial integration, changes in market discipline, and changes in measures of systemic risk. These quantitative findings are complemented by more qualitative evidence on the feasibility and credibility of resolution, which have a significant impact on shifting risks away from taxpayers towards creditors and owners of systemically important banks.

To complement this analysis, the costs and benefits have been estimated using the framework developed by the BCBS (2010). In this framework, social benefits are the result of a decrease in the likelihood and severity of a financial crisis, while social costs are those associated with providing financial services at higher cost because of increases in prudential requirements and compliance costs for banks.

- The cost of a crisis includes a short-term contraction in GDP as a result of disruption to the supply of credit, and a possibly permanent reduction in GDP due to forgone investment during the crisis;
- Higher bank capital ratios are assumed to reduce the probability of a financial crisis, and the social benefits of raising bank capital ratios is the reduction in the crisis probability and the reduction in the cost of crisis, i.e. the expected GDP loss prevented by regulation;
- The social costs associated with raising bank capital ratios follow from the framework's assumption that an increase in bank capital ratios increases banks' cost of funding, which banks pass through to borrowers. The resulting increase in the credit spreads on bank loans reduces investment and thus GDP.

The analysis suggests that TBTF reforms produce significant net benefits for society. The reforms are estimated to yield a present value benefit of 0.30% of GDP, while the cost of the TBTF reforms is estimated to amount to 0.09% of GDP. To place this in context, the aggregate GDP of FSB member jurisdictions amounted in 2019 to USD72.05 trillion. Estimated gross benefits would amount to USD216bn and estimated gross costs would amount to USD65bn.

Moreover, this is a conservative estimate which is likely to understate the net social benefits of reforms significantly. The framework does not include the effects of any improvement in the allocation of credit that may be induced by reforms. Network effects, which (as discussed earlier in this chapter) may affect systemic risk, are not captured. The impact of the reduction in implicit subsidies – an objective of reforms – is treated as a cost rather than a social benefit. The estimates assume that higher capital cushions have no impact on the interest that a bank must pay on its borrowing, whereas in practice higher capital is associated with lower borrowing costs.[86] All costs of increased capital requirements are assumed to be passed on to a bank's borrowers, who do not move to competitors; however, evidence presented earlier in this chapter suggests that as G-SIBs have lost market share others have stepped in. Benefits and costs are discounted at 5%, significantly higher than current long-term interest rates in most FSB jurisdictions. And any beneficial effects of the reforms on the cost of crises cost are assumed to occur only in the short term, disregarding important long-term effects since studies suggest that costs may be long-lasting or permanent.[87] Finally, the benefits of avoiding a banking crisis are not visible in the average year, but at a time when a shock has hit the system. In such periods, the benefits of resilience become more visible.

6.5. Conclusion

The evaluation has assessed the reforms from the perspective of social costs and benefits. The evaluation has estimated social costs and benefits using a simple framework, in which the social benefits of TBTF reforms are reduced probability and severity of financial crisis, and the social costs of the reforms arise via increases in the cost of bank credit. Under conservative assumptions, estimated net benefits are positive. This framework does not capture all types of social costs and benefits. The evaluation has therefore considered other factors, such as changes in bank competition, market structure, interconnectedness or debt pricing.

Overall, the analysis suggests significant net benefits for society resulting from TBTF reforms. Observed changes suggest increases in resilience, no material increases in the costs of funding, and more market discipline. Potentially negative side effects, such as a fall in aggregate lending or greater unintended fragmentation of financial markets, have not been observed. Where SIBs have reduced their activities, other suppliers of financial services have stepped in.

Systemically important bank have lost domestic market share and market concentration has fallen. A reallocation of business away from SIBs to other firms is an expected outcome

86 See BCBS (2019).

87 Furceri and Mourougane (2009). Romer and Romer (2019).

of TBTF reforms. On average, SIBs have lost domestic market share, but these trends differ across countries and regions. In general, the size distribution of banks remains highly skewed: in most countries, a few very large banks tend to coexist with a large number of smaller or mid-sized banks. Hence, shocks affecting large financial institutions can have effects on aggregate outcomes.

SIBs' share of total assets, customer loans and customer deposits in their domestic banking market have been declining since 2010, while that of other banks has increased. Most of the decline in G-SIBs' and D-SIBs' market shares occurred between 2012 and 2015, which coincides with the implementation of several TBTF reforms.

The supply of credit has not been materially affected by these changes in market structure. Financing for the economy has not fallen: following the introduction of TBTF reforms, aggregate credit and GDP have grown at similar rates. Even if G-SIBs have reduced their domestic credit relative to GDP, other banks and financial institutions have picked up the slack.

Market-based measures of systemic risk have tended to fall. Market-based measures of system risk are based on the notion that a bank poses more risk to the system if it is likely to be undercapitalised when the whole system is undercapitalised or if its failure would result in large losses in the financial system. Measures based on market data (SRISK and ΔCoVaR) suggest that systemic risk was broadly stable from 2000 to 2019, except during the global financial crisis of 2007-08. There are also some indications that SIBs reduced their systemic importance along some of the dimensions captured by the G-SIB framework, although the pattern varies across indicators, banks, and regions. Where there is a reduction, it tends to be driven by G-SIBs.

Risks arising from the shift of credit intermediation to non-bank financial intermediaries should continue to be closely monitored. As non-bank financial institutions have picked up market share, some risks have moved outside the banking system. This shift may enhance the stability of the financial system, not only because it may lead to a diversification of funding sources. However, it could also be a source of financial instability. The evaluation has not examined the implications for non-bank financial intermediaries, but the findings on the banking sector reinforce the importance of ongoing work by the FSB and standard-setting bodies to assess vulnerabilities and develop policy recommendations designed to address related financial stability risks.

The 2007-08 financial crisis slowed down, but did not reverse, the long-term trend towards global financial integration. Cross-border lending by banks other than European banks continued to expand. Measures of cross-border connectedness reached peak values at the onset of the financial crisis and, after a sharp drop in 2008, have returned to or surpassed their pre-crisis levels.

Internal TLAC supports orderly resolution and incentivises coordination between home and host authorities, while the evaluation could not support the hypothesis that it has fragmentary effects. FSB standards provide that host authorities should impose internal TLAC requirements for material sub-groups in their jurisdiction, scaling the requirement within a 75%-90% range. Some respondents to the call for public feedback argued that requirements for internal TLAC drive market fragmentation. The evaluation did not find supporting evidence.

Abbreviations

AEs	Advanced economies
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
CCP	Central counterparty
CDS	Credit default swap
CMG	Crisis management group
CPMI	Committee on Payments and Market Infrastructures
DiD	Difference-in-differences (statistical technique)
D-SIB	Domestic systemically important bank
EDF	Expected default frequency
EMDEs	Emerging market and developing economies
FSB	Financial Stability Board
GDP	Gross domestic product
G-SIB	Global systemically important bank
HLA	Higher loss absorbency
IAIS	International Association of Insurance Supervisors
IOSCO	International Organization of Securities Commissions
ISDA	International Swaps and Derivatives Association
iTLAC	Internal TLAC
LAC	Loss-absorbing capacity
LGD	Loss given default
NBFI	Non-bank financial intermediary
RAP	Resolvability assessment process
RRI	Resolution reform index
RWAs	Risk-weighted assets
SHSS	Securities Holding Statistics by Sector (ECB database)
SIB	Systemically important bank
SIFI	Systemically important financial institution
SNP	Senior non-preferred
TBTF	Too big to fail
TLAC	Total loss-absorbing capacity

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Annex A: TBTF reforms and their implementation

The policy framework

At the Pittsburgh Summit in 2009, G20 Leaders called on the FSB to propose measures to address the systemic and moral hazard risks associated with systemically important financial institutions (SIFIs). At the Seoul Summit in 2010, the G20 Leaders endorsed the FSB framework for reducing the moral hazard posed by SIFIs. The report recommended that all FSB jurisdictions should put in place a policy framework to reduce the risks and externalities associated with domestic and global systemically important financial institutions in their jurisdictions, and that the policy framework for SIFIs should combine:

a) **a resolution framework** and other measures to ensure that all financial institutions can be resolved safely, quickly and without destabilising the financial system and exposing the taxpayer to the risk of loss;
b) a requirement that SIFIs, and initially in particular global SIFIs (G-SIFIs), have **higher loss absorbency** to reflect the greater risks that they pose to the global financial system;
c) **more intensive supervisory oversight** for financial institutions which may pose systemic risk;
d) **robust core financial market infrastructures (FMIs)** to reduce the risk of contagion arising from the failure of individual institutions; and
e) other supplementary prudential and other requirements as determined by the national authorities.

Additionally, according to the FSB framework, home jurisdictions for G-SIFIs should:

a) enable a rigorous co-ordinated assessment of the risks facing the G-SIFIs through international supervisory colleges; and
b) make international recovery and resolution planning mandatory for G-SIFIs and negotiate institution-specific crisis cooperation agreements within cross-border crisis management groups (CMGs).

The reforms within the scope of this evaluation are the first three above: a resolution framework, higher loss absorbency and more intensive supervision.

G20 reforms and their implementation status

Assessment, designation and higher loss absorbency

An important step in the post-crisis reforms was to define the set of systemically important banks that would be subject to extra regulatory measures. In 2011, the Basel Committee published a **methodology for assessing the systemic importance of banks**. The assessment methodology attempts to measure five aspects of a bank that may make it hard to resolve: size, interconnectedness, lack of substitutes, international activity and complexity. With the exception of the size category, each of the five categories uses multiple indicators. These indicators are then combined into a systemic risk score. The BCBS methodology gives an equal weight of 20% to each of the five categories.

Using the methodology devised by the BCBS, the FSB has designated **G-SIBs** annually since 2011. Banks with a score that exceeds a threshold set by the BCBS (the cutoff score) are automatically classified as G-SIBs. A bank may also be classified as a G-SIB following the exercise of supervisory judgment.

A second step was to determine the **amount of extra capital** that G-SIBs would have to have, in order to mitigate the extra risk that they pose to the financial system. (Technically, the extra capital increases the amount of the Basel III capital buffer requirement.) In 2011 the BCBS also published the methodology for capital surcharges for G-SIBs. This is a mapping from the systemic risk score to a capital surcharge. The capital surcharges for G-SIBs have so far ranged from 1% to 2.5% of risk-weighted assets, in four buckets, but could in principle become higher if a bank's score increases. The surcharges must be met with Common Equity Tier 1 (CET1). The requirements were phased in from 1 January 2016 to 1 January 2019.

In December 2017, the BCBS issued its finalised package of Basel III reforms. This introduces a **leverage ratio capital surcharge** for G-SIBs, which is equivalent to 50% of a G-SIB's risk-weighted capital surcharge explained above. This new leverage ratio buffer will come into effect on 1 January 2023, having been delayed by a year because of the COVID-19 pandemic.

In 2012, the BCBS published a set of principles on the assessment methodology for identifying D-SIBs and for calibrating D-SIBs' capital surcharges. Banks are identified as D-SIBs by their national authorities. The BCBS believes that it would be appropriate if banks identified as D-SIBs by their national authorities were required to comply with the principles in line with phase-in arrangements for the G-SIB framework, i.e. between January 2016 and January 2019.

As part of its Regulatory Consistency Assessment Programme (RCAP), the BCBS published in 2016 an assessment of the G-SIB framework and a review of the D-SIB framework in G-SIB home jurisdictions. Each G-SIB home jurisdiction was found to be compliant with the G-SIB framework. In those jurisdictions where detailed D-SIB frameworks have been implemented, those frameworks were also found to be broadly aligned with the Committee's D-SIB principles, although there was some variation across these jurisdictions in the additional requirements and policy measures applied to D-SIBs.

The latest BCBS RCAP report (May 2019) indicates that higher loss absorbency requirements for G-SIBs and D-SIBs have been adopted in all BCBS jurisdictions, with the exception of China.

More intensive supervision

In 2010 the FSB, in consultation with the IMF, released a report on the intensity and effectiveness of the supervision of SIFIs. The report set out recommendations intended to make the supervision of financial institutions more intense, effective and reliable by covering areas such as supervisory mandates, independence, resources, supervisory powers, improved techniques, group-wide and consolidated supervision, supervisory colleges etc. Some recommendations were incorporated in the update of the BCBS Basel Core Principles and its assessment methodology, and some "additional criteria" were upgraded to "essential criteria".

Subsequent FSB recommendations in 2011 and 2012 strengthened supervisory expectations for financial institutions' risk governance, internal controls and risk management, as well as their risk data aggregation and risk reporting capabilities. This was followed by FSB guidance on enhanced supervision and heightened supervisory expectations on risk appetite frameworks and risk culture, and by BCBS principles for supervisory colleges and for effective risk data aggregation and risk reporting.

The 2013 FSB Principles for effective risk appetite set out key elements for: (i) an effective risk appetite framework; (ii) an effective risk appetite statement; (iii) risk limits; and (iv) defining the roles and responsibilities of the board of directors and senior management. These principles aim to enhance the supervision of SIFIs, but are also relevant to financial institutions more generally.

The 2014 FSB framework for assessing risk culture identifies some foundational elements that contribute to the promotion of a sound risk culture within a financial institution, particularly SIFIs. The paper does not define a target culture but provides guidance for supervisors to assess the soundness and effectiveness of a financial institution's risk culture by identifying practices, behaviour and attitudes that may influence it.

Supervisory colleges for G-SIBs can enhance information-sharing among supervisors, help the development of a common understanding of risk in financial groups, promote a shared agenda for addressing risks and vulnerabilities, and provide a platform for communicating key supervisory messages among college members. The 2014 BCBS principles for supervisory colleges outline expectations for college objectives, governance, communication and information-sharing, as well as potential areas for collaborative work between supervisors.

The 2013 BCBS principles for data aggregation cover four topics: governance and infrastructure; risk data aggregation capabilities; risk reporting practices; and supervisory review, tools and cooperation. G-SIBs are expected to comply with them. The implementation of these principles is expected to improve both risk management abilities and resolvability, as resolution authorities need access to timely and accurate management information during a resolution.

Assessing implementation of these reforms is difficult, since the relevant principles are qualitative and supervision is hard to measure. The FSB has issued reports on overall progress in increasing the intensity and effectiveness of SIFI supervision, complemented by thematic peer reviews on risk governance and SIB supervision. The BCBS has issued progress reports on implementation of its principles for effective supervisory colleges and for effective risk data aggregation. The IMF and World Bank have assessed compliance with the Basel Core Principles for almost all FSB jurisdictions.

As noted in the latest (November 2018) FSB annual report on implementation and effects of reforms, supervisory frameworks have improved and supervisory colleges have been established for almost all G-SIBs. Within colleges, information-sharing, coordinated risk assessment and crisis preparedness have all improved since 2015. Yet challenges remain, including those related to legal constraints on information-sharing, supervisory resource constraints and expectation gaps between home and host supervisors.

Most G-SIBs have found it challenging to comply with the BCBS principles on risk data aggregation and compliance has been much slower than expected.

Resolution reforms

Resolution reforms are explained in more detail in Annex B.

Relevant reforms not in scope

BCBS standards

In response to shortcomings in the framework revealed by the crisis of 2007-08, the Basel Committee published a number of rapid amendments to the Basel II framework in July 2009. This package of reforms is known as Basel II.5. It increased capital requirements for the trading book and for resecuritisations. BCBS members agreed to implement these changes by 2011. It also contained measures intended to strengthen supervisory review (Pillar 2) and market discipline (Pillar 3).

Basel III is a broader set of measures developed by the Basel Committee in response to the financial crisis of 2007-08. The Basel Committee published the standards in December 2010 and revised them in June 2011. The framework applies to internationally-active banks, although some jurisdictions apply the standards more widely. Most of the package was intended to be implemented on 1 January 2013, although there were transitional periods for some elements.

The Basel III package improved the **quality of regulatory capital** by placing greater weight on going-concern capital in the form of Common Equity Tier 1 (CET1) capital. The predominant form of Tier 1 bank capital is now common shares and retained earnings. The definition of Tier 2 capital was harmonised. The category of Tier 3 capital was eliminated.

It also increased **capital requirements**:

- CET1 capital must be at least 4.5% of RWAs;
- Tier 1 capital must be at least 6.0% of RWAs; and
- Total capital (Tier 1 capital plus Tier 2 capital) must be at least 8.0% of RWAs.

The package also introduced a framework to promote the conservation of capital and the build-up of adequate buffers above the minimum that can be drawn down in periods of stress, so that banks are able to conduct business as normal when their capital levels fall into the conservation range as they experience losses. This element was phased in between 2016 and 2019. These "**Basel III buffers**", which must be met with CET1 capital, combine three elements:

- a capital conservation buffer of 2.5% of RWAs;
- a buffer for G-SIBs, of up to 3.5% of RWAs, which is described above and is within the scope of the evaluation; and
- a countercyclical capital buffer, which is increased by macroprudential authorities in periods of excessive credit growth, normally varying between zero and 2.5% of RWAs.

Basel III revised areas of the risk-based capital framework that had been shown to be undercalibrated, including the standards for market risk, counterparty credit risk and securitisation;

Basel III introduced a new minimum **leverage ratio** requirement in order to supplement the risk-weighted capital requirement. Acknowledging that risks can be only imperfectly measured, this created a leverage exposure measure (LEM), which, unlike the risk-based framework, does not attempt to measure risk. An internationally-active bank's leverage ratio - the ratio of its Tier 1 capital to its LEM - must exceed 3% at all times.

The framework introduced two new minimum standards to mitigate liquidity risk. The **liquidity coverage ratio** is intended to ensure that a bank has enough high-quality liquid resources to survive an acute stress scenario lasting for one month. This was implemented in 2015. The objective of **the net stable funding ratio** is to promote resilience over a longer time horizon by creating incentives for a bank to fund its activities with stable sources of funding. This standard came into force in 2018.

Importantly for this evaluation, the Basel III package introduced several elements intended to limit the size of bilateral interbank exposures and thus change the shape of the banking network. They included:

- capital incentives for banks to use CCPs to clear over-the-counter derivatives;
- higher capital requirements for trading and derivatives activities and securitisations; and
- higher capital requirements for exposures within the financial sector.

In 2014 the Basel Committee introduced a **large exposures** regime that mitigates systemic risks arising from interlinkages across financial institutions and concentrated exposures. A bank's exposure to another counterparty cannot exceed 25% of its Tier 1 capital. Bilateral exposures between G-SIBs are subject to a tighter requirement: they may not exceed 15% of Tier 1 capital. The standard came into force on 1 January 2019.

In December 2017 the Basel Committee published a **final Basel III package** of reforms. These included changes to the standardised approach and internal ratings-based approaches to credit risk, and to the frameworks for credit volatility adjustment risk and for operational risk. They also introduced an 'output floor' on risk weighted assets and a leverage ratio capital surcharge for G-SIBs. These reforms will be phased in between 2023 and 2028. At the same time, the Basel Committee published its new standard for market risk, the **Fundamental Review of the Trading Book**. This comes into force in 2023, having been delayed by a year because of the COVID-19 pandemic.

The clearing mandate

In 2009, at Pittsburgh,[88] G20 Leaders committed to ensure that **all standardised OTC derivatives contracts are cleared through CCPs**. In October 2010 the FSB recommended[89] that IOSCO, working with other authorities as appropriate, should coordinate the application of central clearing requirements. In February 2012 the Technical Committee of IOSCO

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88 G20, Pittsburgh Summit Leaders' statement, September 2009 (https://www.fsb.org/wp-content/uploads/g20_leaders_declaration_pittsburgh_2009.pdf
).

89 Implementing OTC Derivatives Market Reforms (2010)

published its Requirements for Mandatory Clearing,[90] which set out 17 recommendations that authorities should follow when establishing a mandatory clearing regime. The use of CCPs in the core of the OTC derivatives system ensures that counterparty credit risk is mitigated, provided that CCPs are robust.

These recommendations related to:

- determining whether a mandatory clearing obligation should apply to a product or set of products;
- considering potential exemptions to the mandatory clearing obligation;
- establishing appropriate communication between authorities and with the public;
- considering cross-border issues; and
- monitoring and reviewing the mandatory clearing obligation.

Responsibility for determining the exact range of OTC derivative products subject to a mandatory clearing requirement lies with each jurisdiction.

Margin requirements

The G20 Cannes declaration[91] of November 2011 called on the Basel Committee and IOSCO to develop standards on margining for non-centrally cleared OTC derivatives. In March 2015 the Basel Committee and IOSCO published minimum standards for margin requirements for non-centrally cleared derivatives. The objectives of the standards include reducing systemic risk and limiting both the build-up of uncollateralised exposures within the financial system contagion and spill-over effects, by ensuring that collateral is available to offset losses caused by the default of a derivatives counterparty.

All covered entities under this standard that engage in uncleared derivatives must exchange, on a bilateral basis, the full amount of variation margin regularly (e.g. daily) and initial margin with a threshold not to exceed EUR50 million. Covered entities include all financial firms and systemically important non-financial entities. Central banks, sovereigns, multilateral development banks, the BIS, and non-systemic, non-financial firms are not subject to these requirements.

For the largest firms, the initial implementation date for both variation and initial margin was 1 September 2016. The initial margin implementation schedule includes progressively lower thresholds, ending with a final implementation date that was originally 1 September 2020, but has since been postponed. The implementation date for exchange of variation margin for all other covered entities was 1 March 2017.

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[90] https://www.iosco.org/library/pubdocs/pdf/IOSCOPD374.pdf

[91] G20, Cannes Summit Final Declaration, November 2011 (https://www.fsb.org/wp-content/uploads/g20_leaders_declaration_cannes_2011.pdf).

Annex B: The elements of resolution reforms

The FSB issued in 2011 (and updated in 2014) the **Key Attributes of Effective Resolution Regimes for Financial Institutions** (the "Key Attributes") as the international standard on resolution. The Key Attributes set out the responsibilities, instruments and powers that national resolution authorities should have at their disposal for firms that could have a systemic impact if they fail. They also set out recovery and resolution planning requirements, as well as resolvability assessments, for such firms.

Resolution for SIBs

G-SIB resolution is intended to achieve an orderly resolution and facilitate the effective use of resolution powers with the aim of making the resolution of any bank feasible without severe systemic disruption and without taxpayer solvency support. A resolution must maintain vital economic functions through mechanisms which make it possible for shareholders and unsecured and uninsured creditors to absorb losses in a manner that respects the hierarchy of claims in liquidation.

Under the Key Attributes, an effective resolution regime should:

- ensure continuity of systemically important financial services, and payment, clearing and settlement functions;
- protect, where applicable and in coordination with the relevant insurance schemes and arrangements such depositors, insurance policyholders and investors as are covered by such schemes and arrangements, and ensure the rapid return of segregated client assets;
- allocate losses to firm owners (shareholders) and unsecured and uninsured creditors in a manner that respects the hierarchy of claims;
- not rely on public solvency support and not create an expectation that such support will be available;
- avoid unnecessary destruction of value, and therefore seek to minimise the overall costs of resolution in home and host jurisdictions and, where consistent with the other objectives, losses for creditors;
- provide for speed and transparency and as much predictability as possible through legal and procedural clarity and advanced planning for orderly resolution;
- provide a mandate in law for cooperation, information exchange and coordination domestically and with relevant foreign resolution authorities before and during a resolution;
- ensure that non-viable firms can exit the market in an orderly way; and
- be credible, and thereby enhance market discipline and provide incentives for market-based solutions.

Resolution regimes should include a broad range of powers and options to enable the resolution authority to resolve a firm that is no longer viable and has no reasonable prospect of becoming so.

For all G-SIFIs, including G-SIBs, the Key Attributes also require the establishment of **Crisis Management Groups** (CMGs) with the objective of enhancing preparedness for, and facilitating the management and resolution of, a cross-border financial crisis affecting the firm. The Key Attributes also require institution-specific **cooperation agreements** (CoAgs) that define the roles and responsibilities of participating authorities and establish processes for coordination and information-sharing in developing recovery and resolution plans and carrying out resolvability assessments, and for coordination both in the run up to and in a resolution.

In addition to the Key Attributes, the FSB has issued guidance on various aspects of **resolution planning**. These include guidance on bail-in execution; guiding principles on temporary funding needed to support the orderly resolution of a G-SIB; funding strategy elements of an implementable resolution plan; cross-border effectiveness of resolution actions; recovery plan triggers and stress scenarios; identification of critical functions and critical shared services; developing effective resolution strategies; continuity of access to FMIs; and arrangements to support operational continuity in resolution. In October 2016 the FSB also published a methodology for assessing the compliance of a jurisdiction's bank resolution frameworks with the Key Attributes, to be used by the IMF and World Bank in FSAPs.

Resolution toolkit

The Key Attributes set out the **powers** that national resolution authorities should have at their disposal for firms in all financial sectors that could have a systemic impact if they fail. These include powers: to control and operate a firm, or to conduct resolution through an administrator; to remove and replace management; to ensure continuity of services and functions in resolution; to transfer assets and liabilities, and establish and operate temporary bridge banks and asset management vehicles; to impose temporary stays on the exercise of early termination rights; and to write down and convert liabilities (bail-in). These powers should be available under the legal framework for the purposes of resolution and exercisable without the consent of shareholders, creditors, debtors or the firm in resolution.

Bail-in is an important new tool introduced by the Key Attributes, since it supports a creditor-financed resolution to support continuity of critical functions. The objectives of bail-in may be achieved by alternative means: either recapitalising the entity that provides those functions; or by capitalising a newly established entity or bridge institution to which the functions have been transferred. Whichever of these approaches is taken, the Key Attributes require that resolution authorities should have powers both to write down liabilities and to convert creditors' claims into equity or other instruments of ownership of the firm (or its successor).

The Key Attributes also contain a provision on the **conditions for entry into resolution**, specifying that the conditions should permit early resolution when a firm is no longer viable (or likely to become so) and before it is insolvent; and **safeguards** for the entry into resolution and the exercise of any resolution powers.

Resolution strategies

Resolution strategies are broadly based on two stylised approaches:

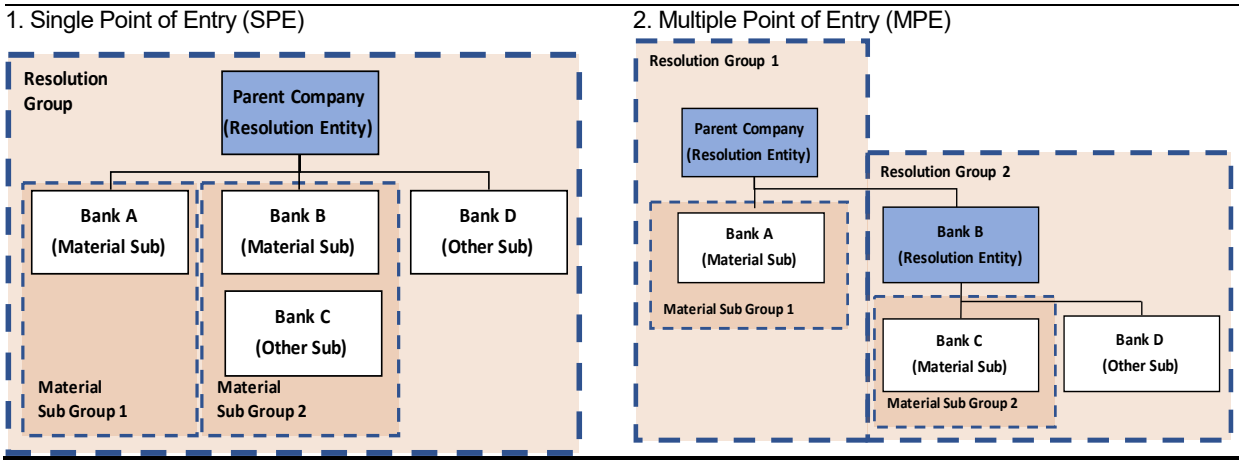
- **Single point of entry (SPE)** involves the application of resolution powers, for example, bail-in and/or transfer tools, at the top parent or holding company level or at a single institution by a single resolution authority – probably in the jurisdiction

responsible for the global consolidated supervision of a group. An SPE approach operates through the absorption of losses incurred within the group by the top parent or holding company through, for example, the write-down and/or mandatory conversion of unsecured debt issued by that top company into equity ("bail-in"). If sufficient TLAC is available at the top parent or holding level, operating subsidiaries should be able to continue as going concerns without entering resolution. However, host authorities may need to exercise powers to support the resolution led by the home authorities.

- **Multiple point of entry (MPE)** involves the application of resolution powers by two or more resolution authorities to different parts of the group, and is likely to result in a break-up of the group into two or more separate parts. The group could be split on a national or regional basis, along business lines, or some combination. There is no need for the resolution powers applied to the separate parts to be the same, and they could involve different resolution options. MPE approaches nevertheless require actions to be coordinated across jurisdictions in order to avoid conflicts or inconsistencies that undermine the effectiveness of the separate resolution actions, a disorderly run on assets and contagion across the group.

The SPE approach has been adopted for 28 out of 30 G-SIBs. SPE groups have a single resolution entity – the entity to which resolution powers would be applied in resolution, and which must meet external total loss absorbing capacity requirements. MPE groups have multiple resolution entities and multiple resolution groups. This is shown in Figure 29 below.

Stylised Resolution Approaches **Figure 29**



Loss absorbency in resolution

In 2015 the FSB issued Principles on Loss-absorbing and Recapitalisation Capacity of G-SIBs in Resolution and the accompanying **Total Loss-absorbing Capacity (TLAC) Term Sheet**. These established an international minimum standard for TLAC requirements for G-SIBs. This aims to ensure that sufficient amounts of loss-absorbing capacity are available at the right locations within G-SIBs so as to provide home and host authorities and the market with confidence that G-SIBs can be resolved in an orderly manner. It also aims to diminish any incentives that authorities may face to ring-fence in advance or during resolution.

The TLAC Term Sheet defined a common minimum requirement for TLAC issued by G-SIBs. It contemplates that G-SIBs should be required by national authorities to meet the applicable external TLAC requirement from 1 January 2019.

Minimum TLAC requirements are set as a ratio both of the resolution group's RWAs and of its leverage ratio exposure measure.

- Minimum TLAC requirements must be at least 16% of the resolution group's RWAs from 2019 and at least 18% as from 2022.[92] Basel III capital buffer requirements must be met in addition to the TLAC RWA minimum.
- Minimum TLAC must be at least 6% of the Basel III leverage ratio exposure measure as from 2019 and at least 6.75% as from 2022.

Regulatory capital, including that used to meet Basel III minimum capital requirements, is also eligible TLAC. But regulatory capital that is used to satisfy Basel III capital buffer requirements cannot also be used to satisfy TLAC requirements at the same time. This is to ensure that buffers are usable prior to any resolution, and that resources held to satisfy TLAC resources are available to absorb losses or to support recapitalisation in resolution. Other instruments may also be eligible TLAC under certain conditions; for example TLAC-eligible instruments must have a minimum remaining contractual maturity of at least one year or be perpetual. Certain liabilities are excluded from TLAC, and in order to be eligible TLAC, an instrument must be subordinated to them.[93]

The FSB also has issued guidance on the size and composition of the **internal TLAC requirement**, cooperation and coordination between home and host authorities and the trigger mechanism. The TLAC term sheet provides that host authorities should impose internal TLAC requirements for the material sub-groups in their jurisdiction, scaling the requirement within a 75% - 90% range.

The BCBS also adopted two standards relating to TLAC. The first set out the regulatory capital treatment of **banks' investments in TLAC** instruments issued by other banks. The standard applies to both G-SIBs and internationally-active banks other than G-SIBs. Broadly speaking, banks must deduct holdings of TLAC instruments that are not already included in regulatory capital from their own Tier 2 capital. Instruments ranking pari passu with subordinated forms of TLAC must also be deducted. The objective of the deduction approach is to reduce the risk of contagion within the financial system should a G-SIB enter resolution.

The BCBS has also adopted a standard on **Pillar 3 disclosure requirements for TLAC** instruments. The Pillar 3 disclosure standard, which entered into force on 1 January 2019, aims to provide more information about TLAC at the resolution group and legal entity levels.

The FSB monitors and publishes annual progress reports on the implementation of resolution reforms, including resolution-related requirements for G-SIBs. These banks are subject to a regular high-level review of their resolvability by CMG home and host authorities through the

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92 For G-SIBs headquartered in an emerging market economy, the conformance period has been extended to 2025 for the transitional requirement and to 2028 for the final requirements, This date may be accelerated if certain conditions are met.

93 An exception to this is set out in section 11 of the Term Sheet.

FSB Resolvability Assessment Process (RAP). The FSB has also examined progress in implementation of the Key Attributes through various country and thematic peer reviews. The latest thematic review, focusing on bank resolution planning, was published in April 2019.

The TLAC Principles mandated the FSB to undertake a review of their implementation by the end of 2019. The report, published in July 2019, concludes that: progress has been steady and significant in both the setting of external TLAC requirements by authorities and the issuance of external TLAC by G-SIBs. This has enhanced the resolvability of G-SIBs, strengthened cooperation between home and host authorities and boosted market confidence in authorities' capabilities to address TBTF risks. The FSB saw no need to modify the TLAC standard, as implementation was ongoing. Further efforts were needed to implement the standard fully and effectively and to determine the appropriate distribution of TLAC resources within a group.

Through FSAPs, the IMF and World Bank assess compliance with the Key Attributes for the banking sector. They also typically prepare a technical note on the financial safety net and crisis management, which may capture several elements of the Key Attributes but is not exhaustive and does not include grades.

Substantial work remains in achieving effective resolution regimes and operationalising plans for SIBs. Almost all G-SIB home and key host jurisdictions have in place comprehensive bank resolution regimes that align with the Key Attributes, but implementation is still incomplete in other FSB jurisdictions. The powers most often lacking are bail-in and the power to impose a temporary stay on the exercise of early termination rights. CMGs have been established, and resolution strategies and operational resolution plans developed, for all G-SIBs. Despite the very substantial progress, important technical and operational aspects need to be addressed in certain jurisdictions to make sure that resolution plans can be executed effectively. In addition, institution-specific CoAgs are still not in place for some G-SIBs. In most G-SIB home jurisdictions external TLAC requirements have been finalised or are close to being finalised. However, implementation of internal TLAC is less advanced. Furthermore, few jurisdictions have yet introduced requirements on cross-holdings of other G-SIBs' TLAC or disclosure requirements for TLAC.

Annex C: Summary of public feedback and workshop

In May 2019 the FSB issued a call for public feedback on its evaluation of too-big-to-fail reforms. It also held a workshop with stakeholders in New York on 16 September 2019. This Annex summarises the diverse opinions expressed. It does not represent the views of the FSB.

1. Public feedback

Stakeholders were asked to answer six questions:

1. To what extent are TBTF reforms achieving their objectives as described in the terms of reference? Are they reducing the systemic and moral hazard risks associated with SIBs? Are they enhancing the ability of authorities to resolve systemic banks in an orderly manner and without exposing taxpayers to loss, while maintaining continuity of their economic functions? What evidence can be cited in support of your assessment?
2. Which types of TBTF policies (e.g. higher loss absorbency, more intensive supervision, resolution and resolvability, other) have had an impact on SIBs and how? What evidence can be cited in support of your assessment?
3. Is there any evidence that the effects of these reforms differ by type of bank (e.g. global vs domestic SIBs)? If so, what might explain these differences?
4. What have been the broader effects of these reforms on financial system resilience and structure, the functioning of financial markets, global financial integration, or the cost and availability of financing? What evidence can be cited in support of your assessment?
5. Have there been any material unintended consequences from the implementation of these reforms to date? What evidence is available to substantiate this?
6. Are there other issues relating to the effects of TBTF reforms that are not covered in the questions above and on which you would like to provide your views? Please substantiate your comments with evidence.

Seventeen responses were published on the FSB website. A majority came from banks and trade associations, while three academic researchers also responded. The feedback was as follows:

- Industry respondents reported that the TBTF problem is substantially solved, usually citing two papers on implicit subsidies (GAO, 2014 and PwC, 2014) along with Carmassi et al (2019). The Bank Policy Institute cited its own recent research on US bond spreads. Prof. Admati (Stanford) disagreed, arguing that resolution by bail-in is not credible. The European Financial Congress (Poland) suggested that it was too soon to tell, but expressed scepticism about the incentives of public authorities.
- Industry respondents reported a wide variety of unintended consequences – such as depressed profitability; deleveraging; reduced market liquidity; reduced cross-border lending; and substitution to NBFIs – not all of which were in fact unintended. This section of the responses was typically weakly evidenced, and there was little attempt to address causation.
- Responses to question 3 above were sparse and heterogeneous. A Spanish respondent asserted that MPE banks with multiple-point-of-entry strategies are

unfairly treated. BBVA and Credit Suisse had opposing views over whether D-SIBs are treated more stringently than G-SIBs.

- Industry respondents wanted the scope of the evaluation to be expanded in a number of directions. Most of these suggestions fell outside the terms of reference.

2. Workshop

The working group held a workshop on 16 September 2019 at the Federal Reserve Bank of New York. Around 45 participants from banks, other financial institutions, trade associations, credit rating agencies, think-tanks, consultancies, law firms, academia and civil society attended, in addition to working group members and representatives from the BCBS and the FSB. Each of the four sessions comprised four presentations followed by open discussion. The workshop followed the Chatham House Rule.

Implicit funding subsidies and market perceptions

Views on the effect of TBTF reforms on market perceptions differed. Most participants felt that post-crisis TBTF reforms have reduced systemic risk in most jurisdictions (although speakers were sceptical about the effectiveness of reforms in some jurisdictions):

- investors and analysts agreed that clarity on the seniority structure of bank liabilities, greater supervisory intensity and more efficient resolution have lowered the probability of failure of a G-SIB and made pricing more closely related to the risk of the bank;
- they were less able to determine loss given default, partly because resolution regimes differ and because public information about institutional details is incomplete.

The TBTF reforms were widely seen by the buy side as credibly exposing creditors to loss. The Key Attributes are expected, in most jurisdictions, to have shifted credit risk from taxpayers to creditors and from protected (senior preferred debtholders and depositors) to unprotected securities. There was concern about how TLAC debt instruments would work in practice (e.g. if owned by retail investors). One speaker expressed scepticism about whether cross-border SPE resolution can work and expected that foreign subsidiaries would still have to be resolved separately.

Speakers disagreed on the extent to which the analysis and pricing of bank instruments are affected by TBTF reforms. One speaker argued that the LGD component of ratings, in particular, is much affected by reforms. Another investor/analyst claimed that pricing is dominated by microstructural factors such as liquidity and short-term demand and supply, and investors do not focus on regulatory reforms at all. Implicit subsidies, he argued, cannot be inferred reliably from market prices as the latter are not informative, at least as absolute measures: (i) macroeconomic factors (e.g. low interest rates) swamp pricing; (ii) investors – including retail investors - are searching for yield; and (iii) banks remain highly opaque.

Bank behaviour and structure

Bank representatives emphasised that the reforms had substantially increased resilience but otherwise focused on the (private) costs of regulation. Many of the issues they raised were not specific to the TBTF reforms. Banks argued that:

- they could not disentangle effects of individual reforms but saw most impact from the interaction and accumulation of regulations;
- the framework double-counted risks and was biased against wholesale business – with FICC return on equity not covering the cost of capital - affecting liquidity in key markets (as evidenced by volatility shocks) and causing a movement of risks from banks into non-banks that may not have the same degree or nature of oversight and regulation of those risks as banks do;
- recovery planning was a useful exercise for banks' management;
- the G-SIB scoring system assumes that systemic risk is constant, when in fact it has fallen;
- the G-SIB framework encouraged window-dressing at year-end.

Banks also argued that "gold-plating" of reforms, divergent implementation (especially of D-SIB frameworks and internal TLAC) and regulatory complexity might have negative consequences.

Academics and civil society representatives argued that removing implicit subsidies was intended to increase private costs for banks. The erosion of franchise value and profitability in the EU did not reflect regulatory burdens but instead an overbanked market that needed to consolidate. The main question for the evaluation was whether regulations were increasing private costs sufficiently to discourage banks from engaging in activities increasing systemic risks. Other than interconnectedness, which had fallen as a result of market reforms, all other G-SIB scores had increased in aggregate and very few banks had dropped off the list of G-SIBs. Reforms were being prematurely watered down, especially in the US. Increased credit provision by non-banks did not suggest flaws in banking regulation, but was instead a prompt to monitor and regulate non-banks. One academic argued that improving resilience had had a positive effect on quantity and quality of bank lending.

Both types of respondent said that regulation was potentially leading banks to become more similar, which they saw as a concern. An academic argued that regulatory burdens represent a barrier to entry, limiting competition.

Practitioners said that they had streamlined their corporate structures. One representative said that the number of legal entities within his banking group had fallen by 27%, partly driven by recovery and resolution planning. Some academics argued that the thousands of remaining legal entities were still too numerous and interconnected. Others argued that group structures were becoming even more complex and opaque.

Of the TBTF reforms, participants perceived that higher capital requirements had the biggest impact, although they did not distinguish between G-SIB surcharges and other requirements such as Basel III and requirements arising from stress tests. They also saw resolution reforms as very important.

Resolution and resolvability

The main area of contention in this session lay in the credibility of resolution in systemic crisis; some participants believed that debt instruments would not be bailed in and that public backstops would always be necessary in crises.

An academic researcher interpreted bank equity returns as suggesting that more comprehensive resolution regimes could be destabilising in times of systemic stress, because such regimes make it more credible that investors will suffer losses. The speaker asserted that it was very difficult to avoid time-consistency problems; that there would always be public backstops in crisis; and that bail-inable debt might therefore be a poor substitute for capital.

A bank representative argued, to the contrary, that the reforms had made a crisis less likely and the system more resilient to the failure of a bank. Increased capital had made banks more resilient and resolution planning had also played an important role. Banks were less interconnected. They had issued very large amounts of TLAC and were not holding TLAC issued by other banks. Industry speakers believed that resolution authorities would indeed use their powers to bail in TLAC debt, given that it had been sold as a loss-absorbing instrument and was not generally in the hands of retail investors. From a resolution perspective, they argued, the number of group entities is not a measure of complexity, which is instead caused by intragroup interconnection.

Two speakers also emphasised how far we have come since 2008. Banks in the US now had sufficient liquidity to avoid fire-sales of assets and the resolution regime provided tools to avoid a forced liquidation by preventing close-outs in financial contracts and by maintaining continuity of critical functions. One of the speakers emphasised that timely implementation of resolution is critical, before all value in the bank has been destroyed.

Another speaker argued that, unlike in 2008, FSB member jurisdictions now had resolution authorities with resolution powers. Crisis management groups have been in place for a decade. Regardless of the number of resolution entities within a group, authorities have converged on planning for resolution by bail-in. Progress on TLAC, stays in resolution and operational continuity has been made. But it was argued that we are only half way through the process.

Participants identified a number of remaining gaps, the first of which was the need for more clarity about liquidity backstops in resolution.

Throughout the day, ring-fencing of resources in subsidiaries was mentioned as a potential obstacle to recovery or to resolution. Bank representatives argued that internal TLAC requirements in subsidiaries were excessive, reducing banks' ability to shift loss-absorbing capacity to where it was needed. One speaker, though, argued that the underlying problem was solo capital requirements: in SPE groups, authorities cannot stabilise one subsidiary in isolation from others, and solo capital requirements are ineffective. A group is either bailed out as a group or bailed in as a group, it was argued. Internal TLAC is a way to solve that problem and to align the incentives of regulators.

One participant argued that a gap in the EU framework is the incentives for authorities to avoid resolution and engage in precautionary recapitalisation without constraints on bailouts. This

loophole was available because the resolution framework is EU-wide but insolvency law is left to EU member states.

Cross-border cooperation was frequently cited as an area needing further progress and speakers expressed concern that ring-fencing of capital and TLAC would make it harder.

A number of speakers argued that authorities should be clearer about what they would do in the event of bank failure and how that would affect bondholders, derivatives counterparties and depositors of a bank in resolution.

Broader effects of TBTF reforms

One speaker argued that the EU banking system has excess capacity and a tendency towards national champions, which would lead to higher concentration and systemic risk. Lack of transparency by supervisors does not help market discipline, it was argued. While price-to-book ratios in the US had fallen from 2.3 to 1.4 since 2006 in the US, they had fallen from 2.0 to 0.75 in the EU. At least part of the difference is down to prospects of bail-in for EU banks, following the introduction of the Bank Recovery and Resolution Directive. The non-bank financial system is now much larger than it was, and highly connected with the banking system (14 of the 25 largest asset managers are owned by banks), which poses risks to financial stability in the view of the speaker, particularly in case of runs on the asset managers. Prudential requirements comparable to those for banks would be necessary.

A representative of civil society argued that the reforms introduced after the crisis are materially deficient. Despite all the initiatives, the TBTF problem was “alive, well, and getting worse”. The objective of the TBTF EWG should be to assess not just whether the reforms are reducing moral hazard but whether they are reducing it sufficiently.

A bank representative argued that the TBTF reforms are fuelling market fragmentation as home and host authorities often make incompatible choices. A holistic solution of the home/host conflicts was needed. He argued that i) the changes in market making are not related to the TBTF reforms, but instead to other requirements (e.g. leverage ratio); ii) the market for bail-inable debt should grow more, to provide more investment and diversification opportunities. Changes to the tax regime could foster such growth.

The fourth panellist argued that the financial system is somewhat safer than before the financial crisis - but not safe enough. He asserted that the current tendency of regulators is once again to ease requirements during good times. He said that the FSB is facing some process challenges, with too many banks pushing back against reforms when their implementation is not yet complete. He claimed also that banks have not yet internalised the cost of their failure, hence authorities should avoid going in the wrong direction. There is also an excessive opacity in the financial system, which should be reduced.

Other participants commented on: the need to assess whether resolution works for medium-sized banks; the need to better control interconnectedness and systemic risk; and the decline in interbank exposure coupled with the increase in bank-to-NBFI exposure.

Annex D: The resolution reform index

Purpose of index

The RRI illustrates the progress of FSB jurisdictions in adopting comprehensive bank resolution reforms since the global financial crisis. It captures a mixture of legislative and regulatory reforms and policy guidance. Given the dynamic nature of these reforms and the fact that international policy is still being developed, the index is not static and will be updated as new items are included and policies are issued.

The RRI is not intended to assess jurisdictions' compliance with international standards; indeed, some of its components go beyond the scope of those standards. The index is also not a benchmark of the resolvability of individual SIBs in each jurisdiction, nor does it reflect authorities' considerations in deciding whether and how to use different resolution tools.

Within the context of the evaluation, the index has been used in two ways:

1. As a descriptive statistic to show implementation progress of resolution reforms over time (2010-19) and across FSB jurisdictions.
2. As a variable in regression analyses carried out by the evaluation group, to help provide insights on the credibility and effects of the resolution reforms implemented.

Design principles

Four principles were used to determine the items to include in the index:

1. Items should capture **progress across the main areas of resolution reform** introduced since the global financial crisis. This includes, but is not limited to, steps by authorities to implement the FSB Key Attributes for Effective Resolution Regimes (Key Attributes), related implementation guidance, and additional requirements for G-SIBs (e.g. TLAC).
2. Items should provide unique information, in order to facilitate the analysis of relative progress between jurisdictions and identify the effects of resolution reform. This involves selecting items that tend to have **more variability** and **lower correlation** across jurisdictions and over time.
3. Items should be based on **consistent and accurate** data.
4. The relative weight of different items within the RRI should reflect **expert judgment**. All weighting systems involve implicit assumptions about relative importance, so this index reflects what resolution authorities consider to be important elements of an effective and credible resolution regime.

RRI design

The RRI comprises three sub-indices**:**

1. The first sub-index covers **resolution powers** and **recovery and resolution planning**.
2. The second sub-index covers the development of **policies and guidance to operationalise resolution regimes** (as opposed to the legal framework).

3. The third sub-index covers **loss allocation**, and includes bail-in powers and the existence of external loss absorbing capacity (LAC) requirements for SIBs.

To calculate the RRI, these three sub-indices are equally weighted. By splitting the RRI into three sub-indices, the evaluation working group has sought to give due weight to the reforms that are considered most important for the effectiveness and credibility of resolution. The weighting is consistent with attempts to capture the progress of resolution reforms found in the literature.[94]

The sub-indices are composed of the following items, with their weights in the overall RRI shown in parenthesis.

Sub-index 1: resolution powers and recovery and resolution planning

1. Powers to transfer or sell assets and liabilities, as described in the Key Attributes (5.6%).
2. Powers to establish a temporary bridge institution, as described in the Key Attributes (5.6%).
3. Power to impose temporary stay on early termination rights, as described in the Key Attributes (5.6%).
4. Recovery planning for systemically important banks, as described in the Key Attributes (5.6%).
5. Resolution planning for systemically important banks, as described in the Key Attributes (5.6%).
6. Powers to require changes to firms' structure and operations to improve resolvability, as described in the Key Attributes (5.6%).

Sub-index 2: policy and guidance to operationalise resolution regimes

1. Public disclosure of bank resolution planning and resolvability assessments (3.7%). This covers disclosure by authorities of the resolution framework and tools (one third of the total), of their policies on resolution planning and resolution strategies (one third of the total), and of their resolvability assessment findings (one third of the total).
2. Cross-border enforceability of bail-in, as described in the 2015 FSB Principles for Cross-border Effectiveness of Resolution Actions (3.7%). This covers regulation by authorities on contractual provisions to ensure cross-border enforceability of bail-in for instruments issued by domestic banks governed by the law of a foreign jurisdiction.
3. Early termination of financial contracts, as described in the 2015 FSB Principles for Cross-border Effectiveness of Resolution Actions (3.7%). This covers regulation by

[94] For example, the bank resolution index in the forthcoming working paper on *Bank Resolution Regimes and Systemic Risk* by Beck, Radev and Schnabel has four sub-indices that capture different dimensions of an effective bank resolution framework: general framework, powers, tools, and bail-in framework. The index constructed by Coleman, Georgosouli, and Rice in *Measuring the Implementation of the FSB Key Attributes of Effective Resolution Regimes for Financial Institutions in the European Union* (October 2018, Board of Governors of the Federal Reserve System, International Finance Discussion Paper No. 1238) is based on the twelve essential features found in the FSB Key Attributes standard.

authorities on contractual provisions to prevent exercise of early termination rights in resolution for contracts governed by the laws of a foreign jurisdiction.[95]

4. Operational continuity, as described in the 2016 FSB *Guidance on Arrangements to Support Operational Continuity in Resolution* (3.7%). This covers guidance by authorities on arrangements to support continuity of critical functions and/or critical shared services in resolution.
5. Funding in resolution, as described in the 2018 FSB *Funding Strategy Elements of an Implementable Resolution Plan* (3.7%). This covers guidance by authorities on assessing and preparing for banks' liquidity needs in resolution.
6. Continuity of access to FMIs, as described in the 2017 FSB *Guidance on Continuity of Access to Financial Market Infrastructures (FMIs) for a Firm in Resolution* (3.7%). This covers guidance by authorities on arrangements to support continuity of access to FMIs for a bank in resolution.
7. Valuation capabilities, as described in the 2018 FSB *Principles on Bail-in Execution* (3.7%). This covers guidance by authorities to ensure that banks can support the valuation process during resolution.
8. TLAC holdings, as described in the 2016 BCBS *TLAC holdings standard* (3.7%). This covers implementation by authorities of the BCBS standard on the regulatory capital treatment of banks' investments in TLAC instruments.
9. LAC disclosures (3.7%). This covers implementation by authorities of the TLAC disclosure requirements in the 2017 BCBS *Pillar 3 disclosure requirements – consolidated and enhanced framework* standard, as well as any other (additional) disclosure requirements relating to LAC for SIBs.

Sub-index 3: loss allocation

1. Minimum external LAC requirements for SIBs (16.7%). This covers implementation of TLAC requirements for home jurisdictions of G-SIBs as described in the 2015 FSB *TLAC Principles and Term Sheet*, and any other LAC requirements imposed by FSB jurisdictions on D-SIBs. If a jurisdiction is home to both G-SIBs and D-SIBs but has only adopted LAC requirements for the former, then it will receive two thirds of the score. If a jurisdiction is home to only G-SIBs or D-SIBs (but not both) and has adopted LAC requirements for those institutions, it will receive the full score.
2. Powers to write down and convert liabilities (bail-in), as described in the Key Attributes (16.7%).

The items above do not cover all elements of bank resolution regimes. Other elements were excluded from the index because they:

- involve powers that may also be available in supervisory frameworks (e.g. power to remove or replace management of a failed bank);

[95] To be consistent with the rest of the sub-index, this variable only captures regulations or guidance by authorities requiring parties to include language in financial agreements that ensures stays on or overrides of termination rights are enforceable on a cross-border basis. It does not therefore capture voluntary adherence to the ISDA Universal Resolution Stay Protocol.

- are highly correlated with items already included in the index (e.g. availability of several resolution powers presupposes the existence of a designated resolution authority); or
- cover areas where there is no consistent or accurate data to assess progress (e.g. availability and adequacy of public backstop funding arrangements).

Data sources

The index is based on information from the annual FSB resolution reports; FSB reports to the G20 on implementation and effects of reforms; the 2013, 2016 and 2019 FSB thematic peer reviews on resolution regimes; country peer reviews covering resolution regimes; and the BCBS progress reports on adoption of the Basel regulatory framework. This information has been supplemented by FSB jurisdictions' responses to a questionnaire carried out in mid-2019, and by cross-checking and follow-up with individual jurisdictions.

Index scoring scheme

Jurisdictions are scored on a four-point scale for each of these items.

Score	Meaning
0	Not implemented (i.e. draft regulation or policy not published)
0.33	Under development (i.e. draft regulation or policy published or submitted to legislative body, or rule-making initiated under existing supervisory powers)
0.67	Partial implementation (i.e. final legislation, regulation or policy published but not yet effective, or only partly adopted in terms of scope or coverage, or introduced only as a pilot)
1	Fully implemented (i.e. final rule published and effective for all relevant banks)

Each sub-index is constructed by calculating the jurisdiction's equally-weighted average of scores across each component item. The three sub-indices are then combined by calculating their simple average to produce the overall RRI. The RRI score for any particular jurisdiction will therefore vary between 0 and 1.

RRI results

A few conclusions can be drawn from the evolution of the RRI and its sub-indices over time and by jurisdiction (see figures below):[96]

1. There has been strong overall progress in implementing resolution frameworks since 2010. This is shown by the increase in the RRI and each of its sub-indices over this period.
2. Most jurisdictions have created additional resolution powers and introduced recovery and resolution planning for systemically important banks. But progress in operationalising the resolution process – including with respect to loss allocation – is

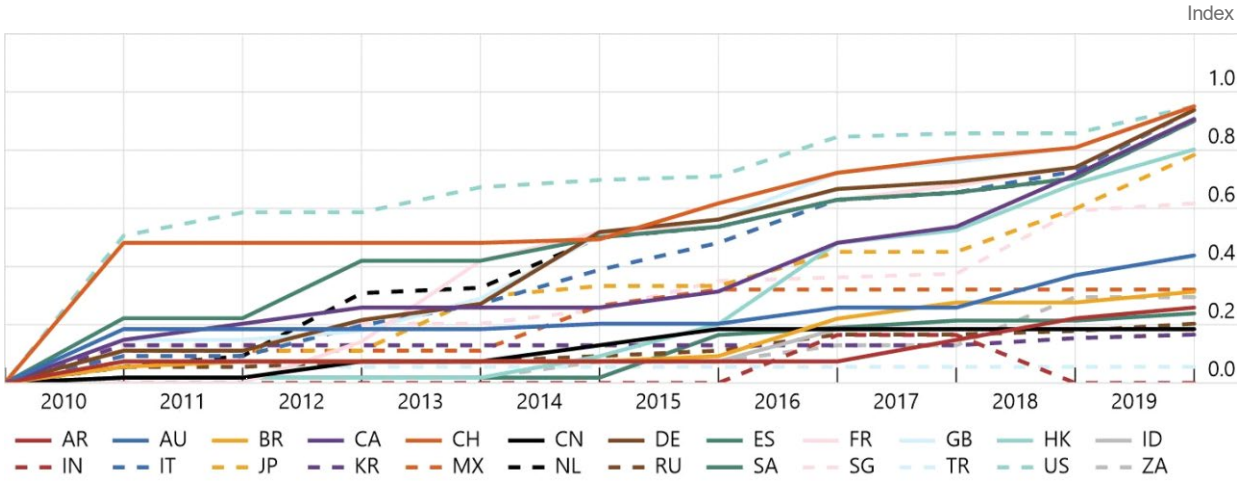
[96] The underlying data are also available on the FSB website, www.fsb.org.

less advanced. This is shown by comparing the scores for sub-indices 1 with those of 2 and 3.

3. There are significant differences across FSB jurisdictions on resolution reforms, with progress most evident for G-SIB home and material host jurisdictions. This is shown by comparing the RRI and its sub-indices (especially 2 and 3) by jurisdiction.

RRI scores by jurisdiction

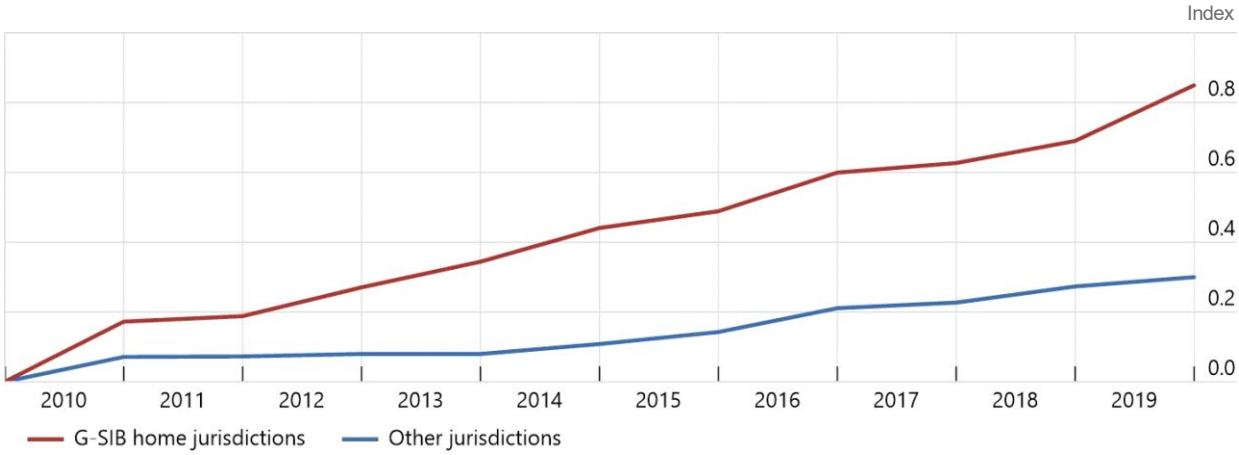
Figure 30



Source: FSB

Average RRI scores for G-SIB home jurisdictions and other jurisdictions

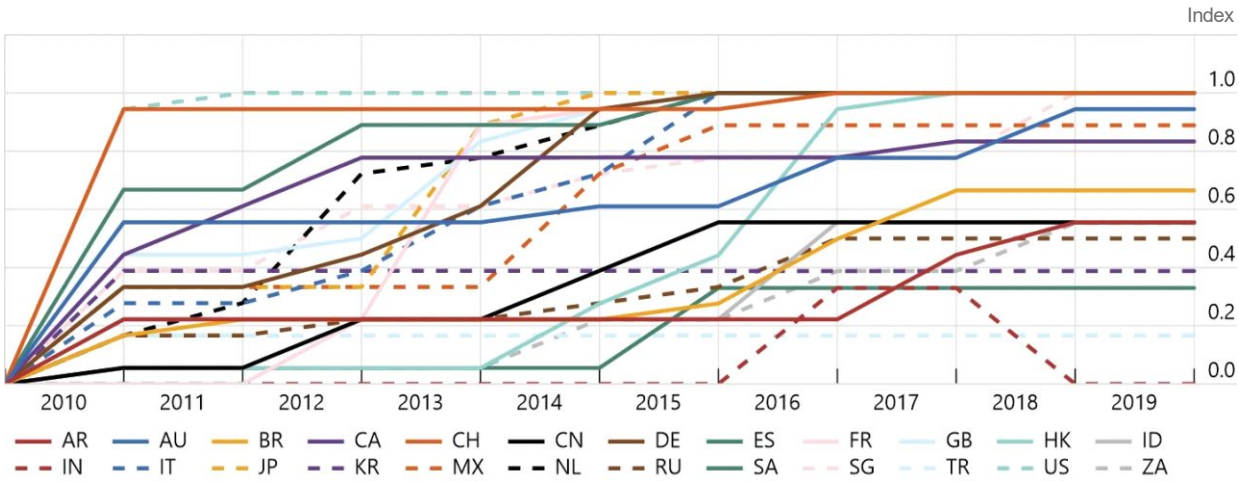
Figure 31



Source: FSB

RRI scores for Sub-Index 1

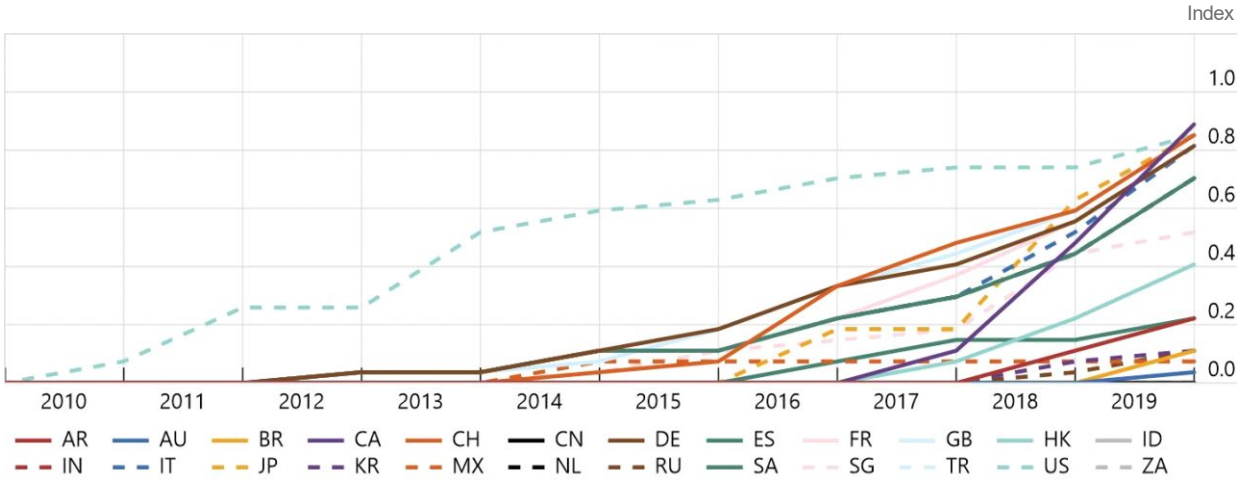
Figure 32



Source: FSB

RRI scores for Sub Index 2

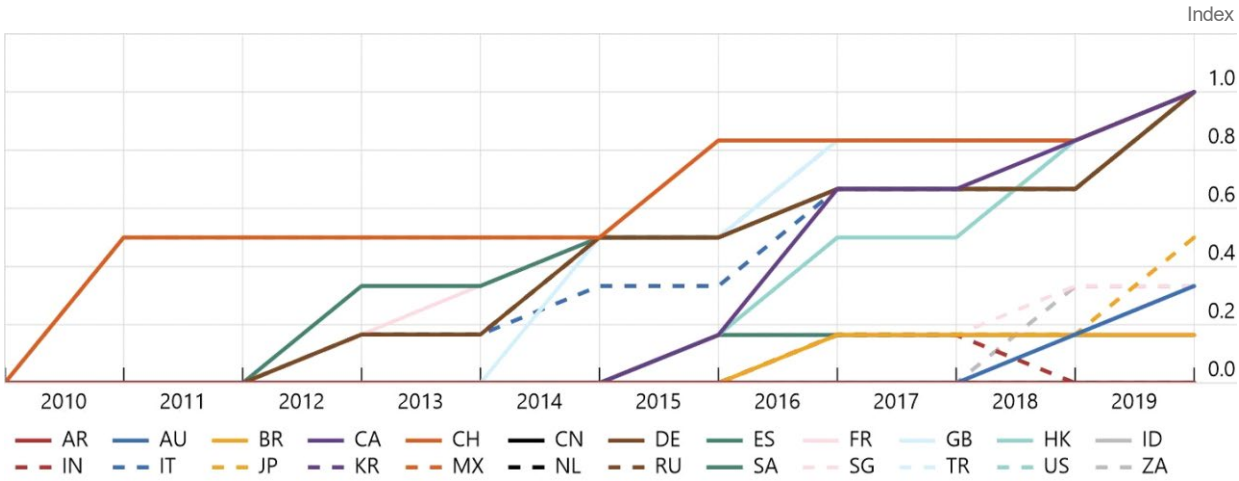
Figure 33



Source: FSB

RRI scores for Sub-Index 3

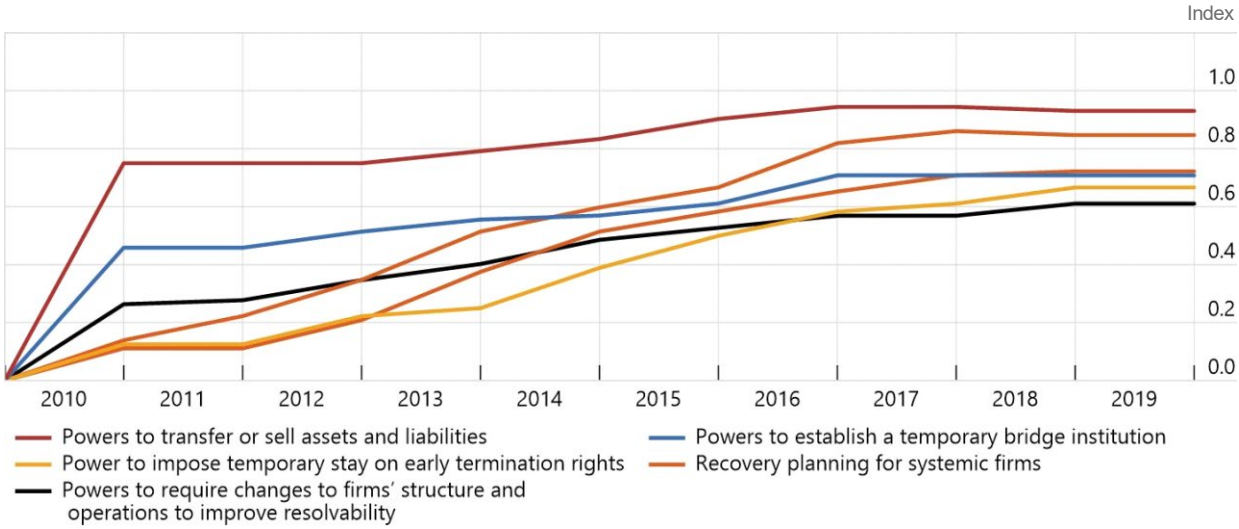
Figure 34



Source: FSB

RRI scores for Sub Index 1 Indicators

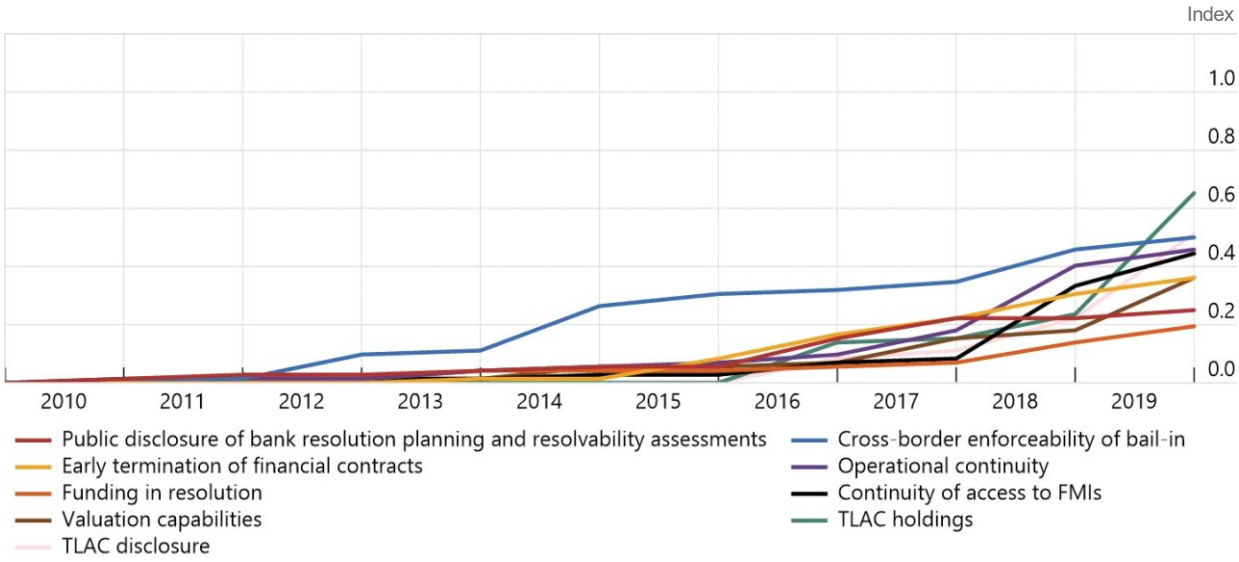
Figure 35



Source: FSB

RRI scores for Sub Index 2 Indicators

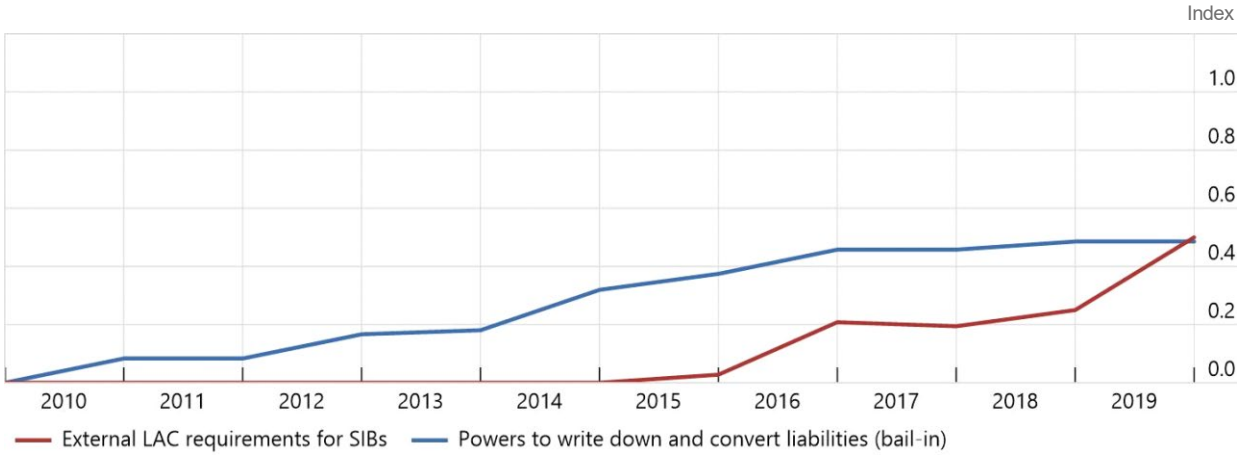
Figure 36



Source: FSB

RRI scores for Sub Index 3 Indicators

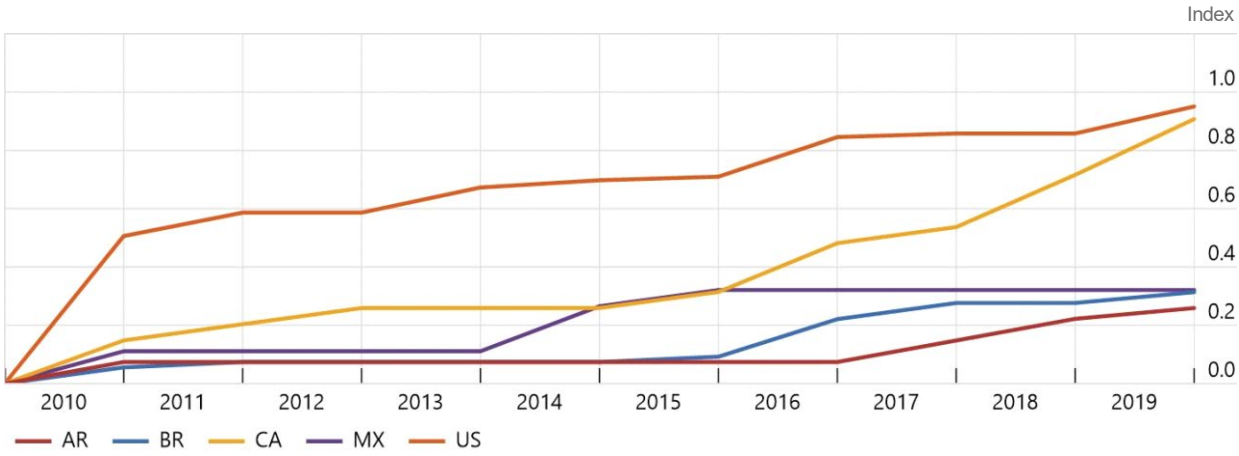
Figure 37



Source: FSB

RRI scores – Americas

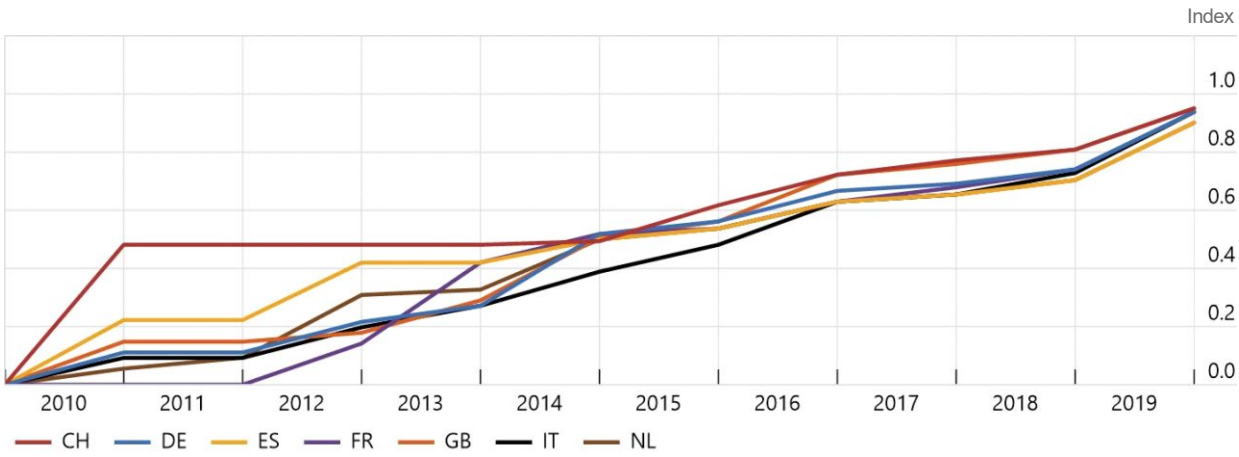
Figure 38



Source: FSB

RRI scores - Europe

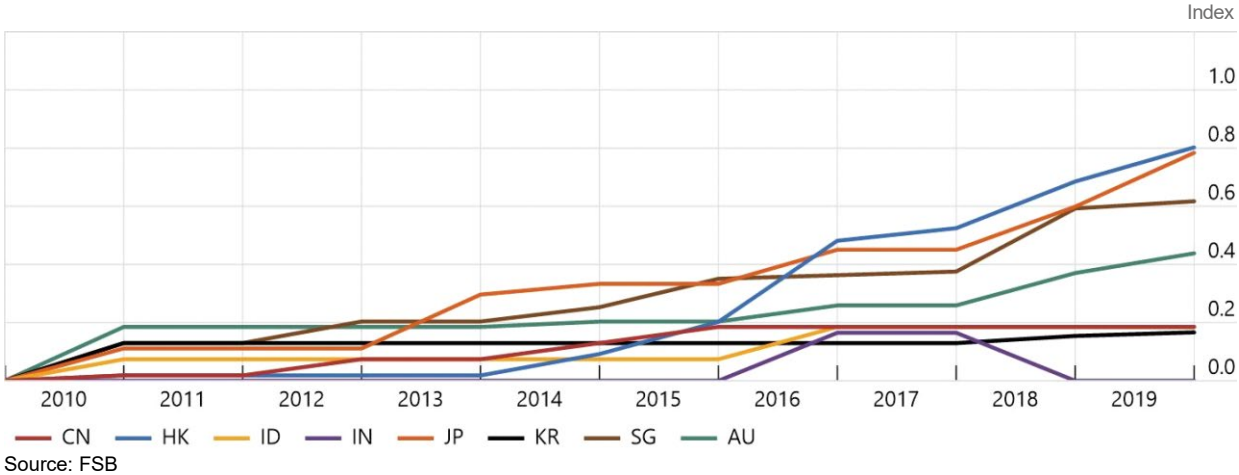
Figure 39



Source: FSB

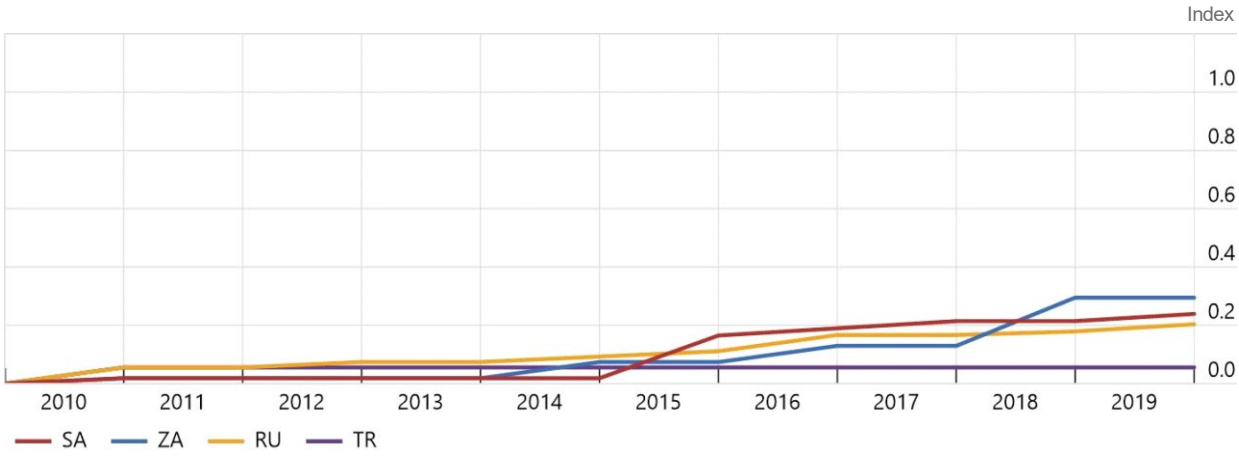
RRI scores – Asia-Pacific

Figure 40



Source: FSB

RRI scores – Rest of the world **Figure 41**



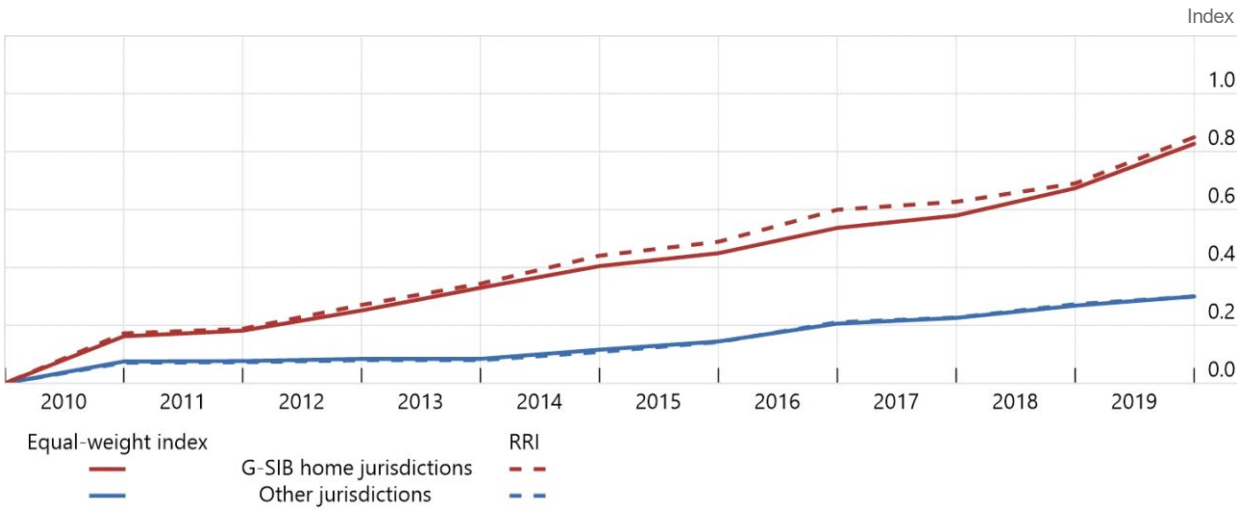
Source: FSB

Robustness tests

To test the extent to which the chosen weighting system affects the RRI, an alternative equally-weighted index was created. The equally-weighted index was constructed by taking a simple average of the scores assigned to the 17 component items of the RRI for each jurisdiction. Each item therefore has a 5.8% weight in this index. As a robustness check the equally-weighted index was also used as a variable in the regression analyses.

The weighting system has a limited impact (see figure below). The effect of the weighting system is most significant for G-SIB home and material host jurisdictions, particularly during the middle years of the period. However, the conclusions drawn above remain valid in either specification.

Comparing the RRI with the equally-weighted index **Figure 42**



Source: FSB

Annex E: Literature review

The evaluation carried out an extensive review of the literature to assess the impact of the TBTF reforms. This annex summarises the literature, following the same structure as the main report. First the annex reports results on the feasibility of resolution, then the market's perceptions of the credibility of reforms and, finally, on the behaviour of banks in response to reforms.

Feasibility of Resolution

Progress in implementing the TBTF resolution reforms

The evaluation reviewed a number of papers which discuss the approaches to ending the problem of TBTF. Although the papers do not address the question directly, they provide evidence of broad support for the implementation of TBTF reforms and highlighted issues that banks need to consider when implementing the reforms.

The papers suggest that while G-SIBs and D-SIBs have made progress in implementing the TBTF reforms, they still have work to do to be deemed resolvable. Bernanke (2016) highlights that a government's strategy for ending TBTF should lead to "right-sizing" of banks both from a social perspective and in terms of efficiency, not only in terms of the balance sheet size. White and Yorulmazer (2014) propose a framework to assess the feasibility and costs of bank resolution methods. They compare two banks with identical balance sheets and subject them to three resolution approaches: whole-bank purchase and assumption (P&A), liquidation and recapitalisation. They conclude that, while private resolution methods such as merger and P&A are the preferred options, as they minimise resolution costs, they may not be feasible when the failing institution is large and complex or when its failure occurs during a systemic crisis. Therefore, the design of resolution strategies and resolution plans needs to take into account that certain preferred options may not be available during a systemic crisis.

The papers also suggest that in general, there is broad support for the implementation of a statutory bail-in framework and the Basel III standards requiring TBTF banks to have more capital and liquidity. Philippon and Salord (2017) study nine European bank failures between 2008 and 2013 and find that bail-in can make a very significant contribution to protecting public finances: the contribution of private investors to the recapitalisation of the banks would have doubled if an 8% loss were imposed on private investors. Conlon and Cotter (2014) examine the EU bail-in framework retrospectively in the context of EU banks that failed during the global financial crisis and find that equity and subordinated bond holders would have been the main losers from the €535bn impairment loss realised by European banks. This implies a large potential impact on bank funding costs in the event of a severe banking crisis and hence provides support for the need to have a larger capital base to absorb asset risks.

Orderly resolution of a SIB facilitated by the implemented reforms

While there is no direct evidence that the reforms have facilitated the orderly resolution of a SIB, there is evidence suggesting that resolution costs have declined following progress in implementing the reforms. Blix Grimaldi et al. (2016) estimate the costs associated with bank resolution, both in terms of the expected costs that might arise should a bank fail (i.e. "ex-post" costs), as well as the cost associated with the likelihood that a solvent bank might fail (i.e. "ex-

ante" costs) over the next year. Expected ex-post costs fell from the peak of the global financial crisis, and ex-ante costs, which increased sharply after 2008, subsequently subsided, although they remained above the level before the global financial crisis. Overall, the results support the notion that recent financial sector reforms have had an impact on facilitating the orderly resolution of a SIB and reducing the costs associated with bank failure. Similarly, Grimaldi and Linder (2018) find that following the global financial crisis, resolution costs in Sweden declined significantly and that the announcement of the EU Bank Recovery and Resolution Directive (BRRD) contributed to the decline of bank resolution costs in Sweden and most EU countries.

The literature also highlights that policymakers play a key role in making SIBs resolvable. Kupiec (2015) assesses the FSB's TLAC standards using a stylised model of a bank holding company and an equilibrium asset pricing model to value financial claims. He concludes that to meet the FSB's goals, standards should include mandatory TLAC requirements for the subsidiaries of SIBs and restrictions on how TLAC funds are used. Alternatively, policymakers could significantly increase regulatory capital requirements on subsidiaries of SIBs. Jarque et al. (2018) construct an "impact score" to compare expected losses in the economy stemming from a resolution in bankruptcy with those expected under an assisted resolution or a bailout. The results show that whether a failing bank is resolvable or should be bailed out depended on policymakers' assessment of how a firm's characteristics may translate into costs to society.

Remaining obstacles to the orderly resolution of a SIB

A number of papers also assess obstacles to resolution. Inconsistent implementation of the international standards and varied progress across jurisdictions are common obstacles mentioned by the literature. Coleman et al. (2018) study whether the BRRD has fulfilled the requirements of the FSB Key Attributes. They find that the BRRD and the FSB Key Attributes are broadly consistent. However, the resolution of financial institutions other than banks depends on domestic legal frameworks pending progress with regard to other parallel EU initiatives to harmonise the resolution of CCPs and insolvency of firms. Greater harmonisation of the process of financial resolution in relation to non-banks in line with the FSB Key Attributes will help to facilitate swift and well-coordinated action across jurisdictions.

For many SIBs, the literature suggests that loss-absorbing and recapitalisation capacity is still in the build-up phase and hence solely private-sector burden-sharing in the event of a systemic crisis could facilitate contagion. Schich et al. (2015) estimate the sectoral loss distribution from a potential bail-in using 2012 euro area accounts data published by Eurostat and the ECB and found considerable heterogeneity across countries. They conclude that there is a need to better understand the loss absorbing capacity of individual sectors and to have more transparency about the composition of bank creditors.

In addition, the widespread lack of sufficient public backstops especially for liquidity in resolution could obstruct the orderly resolution of a SIB. Acharya et al. (2009) suggest that in addition to defining when a bank will be resolved, an orderly resolution regime should also define a liquidity support policy. The liquidity policy will affect the amount and quality of liquid assets banks hold, which in turn will affect an authority's ability to resolve them. Schoenmaker (2016) also points out the importance of having clarity on the provision of emergency liquidity assistance to a resolved bank.

Finally, there are papers that look at the systemic implications of resolution policies. The literature does not suggest more obstacles to the orderly resolution of a SIB but highlights the importance of putting in place policies to preserve financial stability and minimise widespread disruption to the financial system during a crisis.

There is some evidence demonstrating the effectiveness of post-crisis reforms aimed at minimising contagion risk. Hüser et al. (2017) simulate the bail-in of each of the 26 largest euro area banking groups in order to identify the effects of direct contagion to other banks in the network. They show that (i) no creditor bank defaults owing to a bail-in at one of its counterparties; and (ii) spillovers are small owing to low levels of securities cross-holdings.

There is also some evidence to support the argument that under severe stress, relying on private burden-sharing alone may magnify the fragility of the system rather than enhancing its resilience. Beck et al. (2020) suggest that bail-in has some limitations in dealing with negative system-wide shocks as it could increase, rather than reduce, systemic risk. Keister (2015) concludes that the costs associated with a no-bailouts policy will, in many cases, outweigh the benefits, for two reasons. First, concentrating all risk on the private sector when eliminating bailouts will cause financial intermediaries to become too cautious and lead to under-provision of financial services. Secondly, more private investors will be prone to run at the first sign of trouble. Similarly Navaretti et al. (2016) highlight that while the bail-in mechanism has helped to strengthen the resilience of banks' balance sheets, excessively restricting policymakers' use of public funds and failing to set up adequate mutualised fiscal backstops can instil fragility.

The market's perceptions of the credibility of reforms

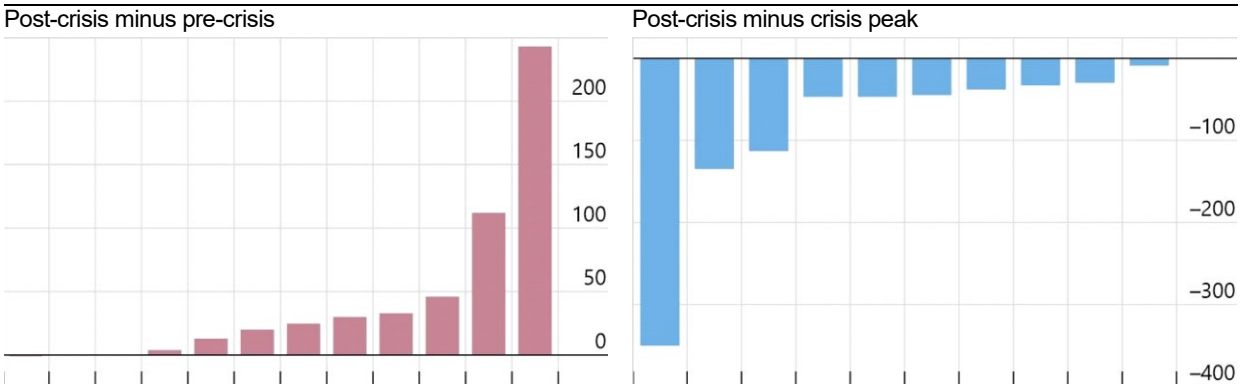
The literature suggests that the estimated funding cost advantages peaked during the global financial crisis of 2007-08, remained high for a number of years and then declined. These results are illustrated in Figure 43 below. Most papers show a decline in funding cost advantages relative to the crisis peak. However, relative to the average pre-crisis level, most studies find that funding cost advantages have been either unchanged or even increased since then. In addition, some studies find that the spread between large and small financial firms has become more sensitive to firm size after the crisis, consistent with an increased market perception of subsidies associated with TBTF guarantees (Ahmed et al., 2015; Poghosyan et al., 2016).

Figure 44 indicates considerable variation in the range of FCA across studies, suggesting that their results should be interpreted with caution. For example, relative to the crisis peak, the reduction in IFS range between 9 and 340 basis points. With respect to the pre-crisis average, the changes in IFS are estimated to be between -1 and +243 basis points. These dispersions occur in part due to differences in the methodologies used and the jurisdictions examined, as seen in Figure 44. For example, the reduction in IFS from the crisis peak is almost 120 basis points using contingent claims modelling (CCM) and about 55 basis points using CDS. The crisis peak to post-crisis reduction in IFS is about 40 basis points for EU firms and 61 basis points for US firms.

Changes in implicit funding subsidies relative to pre-crisis average and crisis peak

In basis points

Figure 43

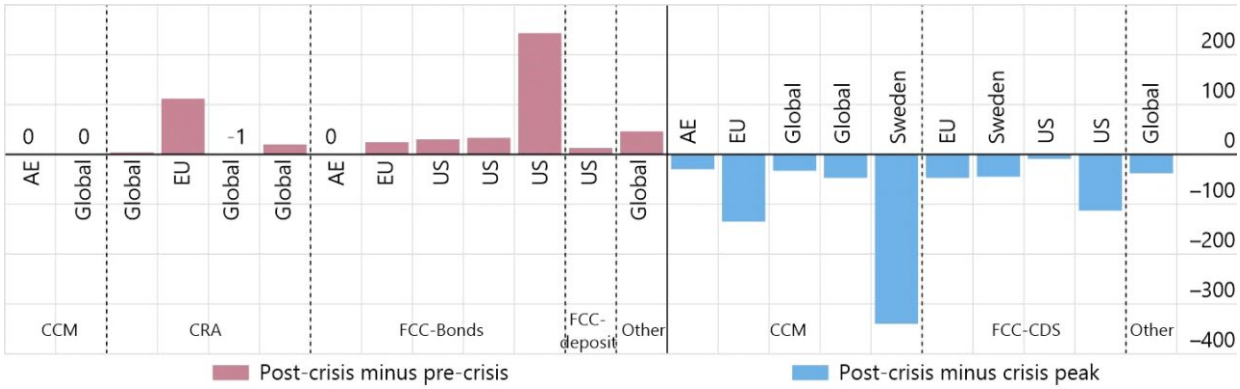


Note: Each bar indicates the result from one study. Sources: For post-crisis minus pre-crisis estimates: Acharya, Anginer, and Warburton (2016); Gudmundsson (2016); IMF (2014); Lester and Kumar(2014); Li, Qu, and Zhang (2011); Mora (2018); Schich and Aydin (2014); Schich and Lindh (2012); Schich, Bijlsma, and Mocking (2014); Tsesmelidakis and Merton (2013); Ueda and Weder di Mauro (2013); Zhao (2018). For post-crisis minus crisis peak estimates: Bijlsma, Lukkezen, and Marinova (2014); Blix Grimaldi, Crosta, David, and Linder (2019); Gudmundsson (2016); IMF (2014); Lester and Kumar (2014); Schich and Aydin (2014); Schich and Lindh (2012); Schich, Bijlsma, and Mocking (2014); Tsesmelidakis and Merton (2013).

Changes in implicit funding subsidies relative to pre-crisis average and crisis peak, by empirical approach and jurisdiction

In basis points

Figure 44



Note: Each bar indicates the result from one study. CCM=Contingent claims model; CRA=Credit ratings approach; FCC=Funding cost comparison. AE = advanced economies.

Sources: For post-crisis minus pre-crisis estimates: Acharya, Anginer, and Warburton (2016); Gudmundsson (2016); IMF (2014); Lester and Kumar (2014); Li, Qu, and Zhang (2011); Mora (2018); Schich and Aydin (2014); Schich and Lindh (2012); Schich, Bijlsma, and Mocking (2014); Tsesmelidakis and Merton (2013); Ueda and Weder di Mauro (2013); Zhao (2018). For post-crisis minus crisis peak estimates: Bijlsma, Lukkezen, and Marinova (2014); Blix Grimaldi, Crosta, David, and Linder (2019); Gudmundsson (2016); IMF (2014); Lester and Kumar (2014); Schich and Aydin (2014); Schich and Lindh (2012); Schich, Bijlsma, and Mocking (2014); Tsesmelidakis and Merton (2013)

Even as funding cost advantages have fallen from crisis peaks, their magnitude remains large, although with differences across regions. Some US-based studies suggest that funding cost advantages shrank substantially (IMF, 2014, and Berndt et al., 2018), but others (Tsesmelidakis and Merton, 2013; Acharya et al., 2016) find evidence that the TBTF subsidies remain material. Outside the US, post-crisis funding cost advantages remain substantial for large Australian, Canadian and European banks (Cummings and Guo, 2019; Mora, 2018; Tölö et. al., 2015, respectively), as well as for international G-SIBs (Schich and Toader, 2017).

Funding cost advantages of the banking sector compared to non-banks (financial firms and the non-financial sector)

Within the financial sector, there is evidence that insurance firms also enjoyed subsidies (Billio et al., 2012; Santos, 2014). Following the publication of the list of systemically important insurers, such insurers experience positive abnormal stock returns (Dewenter and Riddick, 2018), suggesting that the identification of these firms as systemically important by regulators changed market perceptions.

Prior to the crisis, financial firms generally exhibited lower spreads than non-financial firms and their spreads were less sensitive to size than spreads of non-financials. However, the advantage of systemically important financial firms was not substantial relative to non-financial firms (Santos, 2014; Ahmed et al., 2015).

Funding cost advantages and TBTF policies

The reduction in funding cost advantages can be attributed to TBTF-policies only in some cases, as the samples cover the implementation of key regulatory measures (e.g. Basel III and resolution reforms) only in part. Moreover, the studies generally do not separate TBTF reforms from other reforms. For example, the papers ignore the overhaul in the supervision of G-SIBs.

Given these caveats, the evidence is consistent with the hypothesis that TBTF reforms had a moderating effect on funding cost advantages. For example, Blix Grimaldi et al. (2019) find that the TBTF premium for Swedish banks has continued to decline after the implementation of key reforms (from approximately 250 basis points in the autumn of 2009 to approximately 25 basis points in the autumn of 2018). Berndt et al. (2018) argue that bailout probabilities decreased significantly for G-SIBs following the failure of Lehman Brothers, and suggest that the changes may be attributable to resolution reforms. The GAO (2014) finds that US reforms have reduced expectations of government support as the funding cost advantage of large banks over small ones may have declined or reversed since the financial crisis. Other authors attribute any reduction in subsidies to reasons unrelated to TBTF reforms. Thus, Gudmundsson (2016) and Schich and Toader (2017) suggest that reductions in funding cost advantages are due at least in part to lower volatility, higher bank capitalisation, and a few resolution cases where bondholders faced haircuts.

Papers studying US data have often focused on the Dodd-Frank Act rather than the G20 reforms. For example, Acharya et al. (2016) find that the Dodd-Frank Act had a significant causal impact on funding costs. In addition, Cetorelli et al. (2018) find that US banks submitting living wills have experienced an increase in their weighed average cost of capital.

Funding cost advantages and cyclical changes in investors' risk aversion

Increased bank capital and improved economic outlook, as well as the announcement of the BRRD, appear to have contributed to a decline in the TBTF premium across a sample of European SIBs (Blix Grimaldi and Linder, 2018; Blix Grimaldi et al., 2019). The willingness and ability of the government to provide support also matters (Demirgüç-Kunt and Huizinga, 2013, and Schich, 2018). Finally, lower aggregate volatility results in lower funding cost advantages (Gudmundsson, 2016).

Ability and willingness of authorities to resolve failing SIBs in time without loss to taxpayers – views of market participants

There is a broad field of literature which discusses market expectations of government support and the effects of bank bail-ins. It provides tentative evidence that resolution is considered credible by market participants, and has become more so since the financial crisis. The papers mainly focus on the implicit funding subsidy and only address the question of credibility indirectly. None of the literature isolates an implied market-perceived probability of bailout or bail-in.

Research on bail-in expectations provides evidence to support bail-in over bailout. Beck et al. (2018) examine the credit supply and real effects of bank bail-ins under a shock due to the sudden failure and resolution of a major Portuguese bank. They found that banks more exposed to bail-ins significantly reduced credit supply after the shock, but affected firms were able to compensate for this credit contraction with other sources of funding including new lending relationships. The results imply that a bank resolution framework that includes a bail-in of shareholders and bondholders can mitigate the impact of bank failures on credit supply. Acharya et al. (2014) analyse the sovereign CDS and bank-level CDS changes of 36 European banks headquartered in euro area countries, Denmark, Norway, Sweden, Switzerland, and the United Kingdom from January 2007 to April 2011. They find that bailouts triggered a rise in sovereign credit risk as evidenced by a rise in sovereign CDS rates.

There is also evidence that points to a reduction in the value of funding cost advantages as a result of bank regulatory reforms, suggesting that the perceived credibility of resolution regimes has increased. Schich et al. (2014) analyse 114 European banks between data from January 2008 and July 2013 and find that the value of implicit subsidies declined in line with bank regulatory reform efforts. Gudmundsson (2016) employs a jump diffusion option pricing model to capture the extent and development of funding cost advantages, using data on 11 most systemically important G-SIBs between 2005 and 2015. The weighted average subsidy for the 11 G-SIBs peaked at 70 bps during the crisis and declined to approximately 35 bps in the post-crisis period.

Analysis of bank CDS rates and stock returns also points to a reduction in expectations of bailout as a result of bank regulatory reforms. Kartasheva et al. (2017) provide evidence that the issuance of contingent convertible bonds (CoCos) resulted in statistically significant falls in issuers' CDS spreads. This suggests that CoCos are seen as a credible loss absorption mechanism and that holders of CDS contracts believe that the underlying debt will bear loss with some positive probability. Schäfer et al. (2017) analyse the reactions of CDS spreads and stock returns in response to bank bail-in events and the implementation of the Single Resolution Mechanism for the EU Banking Union in 2014. Their analysis provides evidence that the occurrence of a bail-in indeed led to a reduction in bailout expectations, as evidenced by strong rise in CDS spreads in response to bail-in events.

Ability and willingness of authorities to resolve failing SIBs in time without loss to taxpayers – views of other stakeholders

A number of papers also discussed the outcomes of bailouts and the relationship between bank complexity and systemic risk. While the papers do not address the question of credibility directly, they demonstrate that difficulties in measuring bank complexity, discretion in using the

bail-in tool and the temptation to bail out distressed banks could reduce the extent to which investors believe in the authorities' ability to resolve failing SIBs without loss to taxpayers.

It is difficult for stakeholders to infer whether a specific bank is resolvable. Public information is limited (e.g. living wills) or even non-existent, especially regarding the resolution authorities' own assessment. Hamandi et al. (2016) analyse US G-SIBs' public living wills from 2014-2015 and concluded that there was insufficient information for market participants to assess the process for managing a G-SIB failure and resolution.

Similarly, Benczur et al. (2016) carry out a simulation on more than 3,000 EU banks and find that public financing needs would drop from 3.7% to 2.7% of EU GDP should banks meet a capital requirement of 10.5% RWAs. Public financing needs fall to 1% of GDP after a bail-in of 8% of total assets, and to 0.5% of GDP if the resolution fund intervenes for an amount equal to 5% of total assets.

There is also evidence that large banks are riskier and create more systemic risk, hence validating indirectly the scope of the TBTF reforms. Dávila and Walther (2017) explore the funding decisions of large and small banks and conclude that the presence of large banks increases aggregate leverage and the magnitude of government bailouts. Laeven et al. (2014) sampled 370 publicly traded banks from 52 countries for the period from July 2007 to December 2008. The paper measured (i) bank risk at the individual firm level using bank stock returns during the recent financial crisis; and (ii) a bank's contribution to systemic risk using SRISK (Brownlees and Engle, 2012, and Acharya et al., 2012). The authors conclude that large banks create more individual and systemic risk than smaller banks. Large banks also create more systemic risk when they engage in more market-based activities or are more organisationally complex. The findings from these two papers support the argument that policymakers must pay attention to large financial institutions and add credibility to the scope of the TBTF reforms, e.g. the G-SIB assessment framework, living wills and resolution frameworks.

In addition, conceptual analyses point out that the resolution authorities' discretion in using the bail-in tool – for instance by excluding certain liabilities – leads ex-ante to a lack of predictability. Tröger (2018) argues that investors in bank debt are uncertain how they will be treated in resolution, which renders the pricing of debt instruments difficult and may impede the exercise of market discipline, one of the goals of the TBTF reforms. He proposes to separate the private-sector contribution to the recapitalisation of a bank in distress from the broader resolution process by defining clear trigger events in going concern and suggests that the capital layer that absorbs losses does not have to be perfectly adjusted to an institution's recapitalisation needs in resolution.

Government may need to impose ex-ante regulations to eliminate their incentives to bail out failing banks. Chari and Kehoe (2016) find that, even when private markets are efficient, costly bankruptcies will occur, and governments who have not pre-committed to any policy will still bail out distressed banks to minimise these costs.

In order to enhance transparency and to improve comparability between studies, the TBTF literature on funding costs will be implemented in FRAME, the BIS's interactive online repository that includes studies on the effects of financial regulations.[97]

Banks' response to reforms

Few papers explicitly examine the impact of the post-crisis TBTF reforms on banks' behaviour and structure. Those that do (in particular Violon et al. (2017) and BCBS (2019) for the G-SIB framework) find some evidence of behavioural adjustment, in line with expectations. Asset growth decreased and the leverage ratio improved for the most systemically important banks, relative to a control group. The evidence on risk-taking is more mixed: although there is a relative increase in average risk weights, non-performing loan ratios for G-SIBs tended to decline, while there are no indications of a general change in asset and liability structure or a reduction in lending relative to the control group. In addition, G-SIB indicators tended to decline for G-SIBs, relative to other banks. As mentioned above, there is also some evidence that reforms may have strengthened market discipline, though this evidence focuses on funding costs rather than behavioural adjustments (e.g. Berndt et al., 2018).

There is, however, a broad literature studying the effects of TBTF status on bank structure and behaviour more generally. A number of papers assess which properties of banks contribute to the probability of default or to systemic impact in case of distress or failure. And several papers examine how TBTF status affects the behaviour of banks, e.g. the extent to which they engage in risk-taking or activities driven by implicit subsidies.

Balance sheets and business models

The effect of TBTF status on bank behaviour and structure has long been studied (see Stern and Feldman, 2004, for an early overview). Davies and Tracey (2014) suggest that TBTF status creates economies of scale by lowering funding costs. After controlling for TBTF factors they no longer find evidence of scale economies in large banks. Moreover, French et al. (2010) argue that perceived benefits from TBTF status lead smaller banks to expand in size and leverage, in a systemically dangerous form of competition or "race for leverage" (a similar analysis is in Dávila and Walther, 2017).

While not always targeting SIBs specifically, there is a vast range of studies examining how banks adjust capital ratios in response to changes in regulatory requirements, often distinguishing between short- and long-term effects (Berger et al., 2008; Gropp and Heider, 2010; Cohen and Scatigna, 2016; Gropp et al., 2018; Degryse et al., 2019). Besides documenting changes in the ratios, these papers often also analyse the channels through which adjustments took place, e.g. distinguishing between the issuance of equity, retention of profits, or adjustments in the amount or composition of assets. For the purpose of the evaluation, the main references as to the impact of reforms on banks' balance sheets and business models are Violon et al. (2017) and BCBS (2019).

[97] Available at https://stats.bis.org/frame/

Given the relative novelty of the instruments, the literature on the effects of reforms requiring banks to have loss-absorbing capacity is still in its infancy. A notable exception is studies by regulatory bodies assessing the amount of TLAC shortfalls (e.g., BCBS, 2018).

Lending and credit allocation

Turning first to the asset side, many empirical studies assess the effects of regulation on bank lending. In this literature, the dependent variable is often defined as the level of, or changes in, a bank's loan portfolio or, at the sectoral level, lending to households or to non-financial corporations.

A number of studies make use of granular credit register data to analyse the effects of policies on lending, including on risk-taking and the allocation of credit (e.g., Jiménez et al., 2014). Using a difference-in-differences approach, Gropp et al. (2014) use a natural experiment – the announcement of the removal of an explicit government guarantee – to assess TBTF subsidies in Germany. The results suggest that banks whose government guarantee was removed reduced credit risk by cutting off the riskiest borrowers from credit. Savings banks adjusted their liabilities away from risk-sensitive debt instruments and their bond spreads increased significantly after the announcement of the removal of the guarantee.

Risks and profitability

On risk-taking, there is extensive research which suggests that expectations of government support detrimentally affect risk-taking and risk management, though findings differ as to how this affects the banking sector. For example, Afonso et al. (2015) find a correlation between levels of impaired loans and government support as proxied by credit ratings, while Brandao-Marques et al. (2020) find that bank risk, as proxied by z-scores, is linked to expectations of government support. Gadanecz et al (2008) approach the issue through pricing decisions and find that banks perceived by market participants as being likely to receive support in the event of distress. underprice risk. Gropp et al. (2011), however, find a stronger impact on competitor banks, which, they argue, increase risk-taking while that of banks affected by guarantees does not change.

The conventional view in the theoretical literature is that capital requirements serve as a risk-mitigating mechanism that forces banks to put more of their own funds at risk ("skin in the game") and internalise possible losses, thereby reducing the need for government intervention (Kashyap et al., 2008). However, empirical results on the relationship between capital requirements and risk-taking are mixed (for comprehensive reviews of the literature, see VanHoose, 2007 or Behr et al., 2009). The diverging results seem to be affected by whether (i) banks are examined as utility-maximising firms operating in complete or incomplete markets and within a purely static or a more dynamic framework, (ii) the limited liability of bank shareholders, the debt overhang problem and the behaviour-distorting effects of deposit insurance are fully considered, and (iii) information asymmetries and monitoring incentives on the asset side as well as banks' ownership and market structure are accounted for.

Moreover, there is evidence suggesting that supervisors' ability to enforce capital regulation is a decisive factor in explaining the diverse results (Delis and Staikouras, 2011). In particular, effective enforcement of capital requirements may constitute an incentive for banks to curtail their portfolio and leverage risk, as well as reduce the value of their deposit insurance put

option (Flannery, 1989; Milne, 2002). In contrast, supervisory forbearance may be viewed as a form of government subsidy, inducing banks to increase their risky assets (Allen and Rai, 1996; Galloway et al., 1997).

Lucchetta et al. (2018) find that the impact of government bailouts on bank risk-taking depends on the (arguably) exogenous level of systematic risk. More generous bailouts may or may not induce banks to take on more risk depending on systematic risk; in particular if the systematic risk is high (low), a more generous bailout decreases (increases) bank risk taking.

Finally, there are some papers making use of market measures of risk in order to assess the effects of TBTF reforms. For example, Sarin and Summers (2016) test the theory that substantial declines in market measures of risk are expected after reforms using stock price volatility, option-based estimates of future volatility, beta, CDSs, price-earnings ratios and yields on preferred stock. They find that this provides little support for the view that major institutions are significantly safer than they were before the crisis, and some support for the notion that risks have actually increased.

The interplay between risk-taking and profitability is also discussed in the literature. For example, the level of profitability may affect a firm's willingness to take risk. According to conventional theory, risk-taking incentives should decrease in the level of profitability, as more profitable firms, which have a higher charter value, risk losing more if downside risks materialise (Keeley, 1990). However, Martynova et al. (2015) develop a model to show that this effect may be reversed in the banking sector, since a more profitable core business allows a bank to borrow more and take side risks on a larger scale, offsetting lower incentives to take risk. Conversely, the level of risk-taking may also affect profitability, since activities involving higher risks usually yield higher expected returns.

Violon et al. (2017) find that G-SIB designation depresses return on equity, but not return on assets, relative to other banks. In other words, while aggregate profitability per unit of assets was not affected by the G-SIB reforms, higher capital ratios pushed down the profit per unit of equity.

Systemic importance and complexity

A recent study by the Basel Committee on Banking Supervision (2019) finds that most G-SIBs have reduced their G-SIB scores in the aftermath of the reforms, changing their balance sheets in ways that are consistent with the aims of the G-SIB framework. This contrasts with the evolution of the same indicators for the non-G-SIB comparison group, which tended to increase over the same period, although the results differ across jurisdictions.

On the individual dimensions of systemic importance, there are a number of papers on complexity, suggesting that it can be a considerable obstacle to resolution and may induce a bias in official authorities' decisions regarding a bailout (Carmassi and Herring, 2016; Barth and Wihlborg, 2017). Generally, the literature distinguishes three types of complexity, all of which may be affected by post-crisis reforms on TBTF (Cetorelli and Goldberg, 2014; Goldberg and Meehl 2020): (i) organisational complexity (the number of affiliates), (ii) business complexity (the types and variety of activities conducted), and (iii) geographical complexity (the global diversity of operations). The results suggest that there is a substantial degree of diversity in the forms that complexity of global banking organisations takes. They show that large US

bank holding companies (BHCs) remain complex, with some declines in organisational and geographical complexity. The numbers of legal entities within some large BHCs have fallen. By contrast, the business lines spanned by legal entities within the BHCs have shifted more than they have declined, especially within the financial sector. Fewer large BHCs have global affiliates, and the geographic span of the most complex has declined.

Finally, McCauley et al. (2019) analyse the decline in cross-border banking since 2007, showing that in particular European banks shrank their international exposures in the aftermath of the crisis in an attempt to restore their regulatory capital ratios, while the global footprints of Japanese, Canadian and US banks have expanded since 2007.

Annex F: Views of credit rating agencies on resolution reforms

Introduction

Credit rating agencies (CRAs) assess a bank's risk of default, and their ratings influence its funding costs. They also assess the likely losses that would fall on bondholders in the event of default, and in order to do so they assess the loss given default. This depends on what happens in the event of failure. They therefore also evaluate resolution frameworks.

The evaluation team had discussions with the three largest CRAs: Fitch, Moody's and Standard & Poor's.

The credit rating of banks

Bank ratings comprise two elements:

1. a bank's stand-alone strength; and
2. the likelihood of its receiving external support, either from the sovereign or from other group entities

There are some differences in the way in which CRAs approach their assessments of the likelihood of receiving external support. Moody's and S&P produce a "standalone" rating capturing the bank's intrinsic strength, and an "all-in" rating which includes the possibility of external support. The possibility of support means that the all-in rating is typically higher than the standalone rating. Fitch, by contrast, uses a Support Rating Floor, which is a minimum long-term rating that reflects the likelihood of the bank receiving state support.

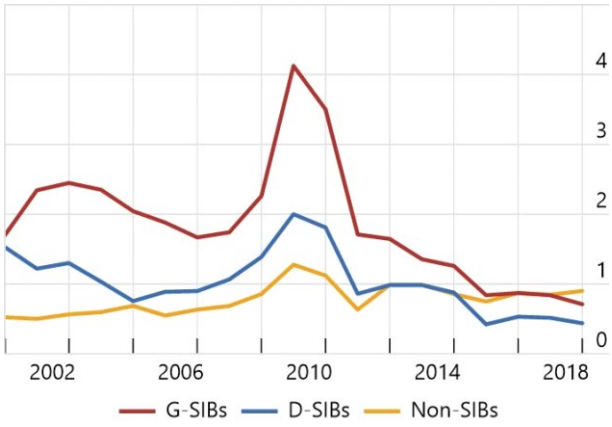
Since the introduction of resolution reforms, all three CRAs have removed or significantly reduced their assessment of the likelihood of sovereign support for banks' ratings in a number of jurisdictions. Moody's and S&P have added new components to their methodologies, in order to capture the amount of resources available absorb losses and to recapitalise a bank at the point of non-viability. A credible resolution framework does not always reduce banks' all-in ratings, as the availability of loss absorbing capacity – which protects senior creditors - replaces government support as the source of issuer rating uplifts. At Fitch, resolution frameworks tend to reduce the uplift because its assessment of the likelihood of government support typically falls. Figure 45 shows the evolution of the bank support uplift according to Fitch.

Fitch Support Rating Uplifts

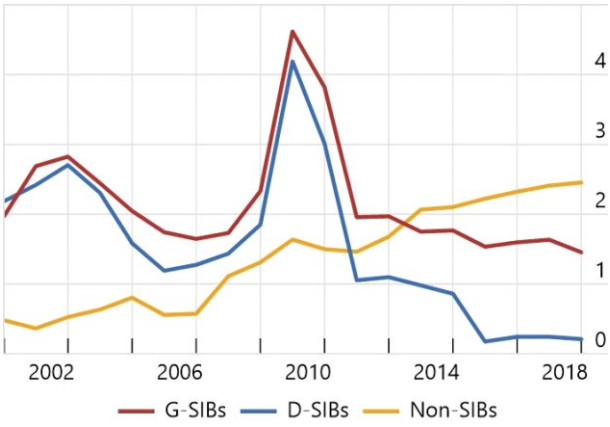
Numerical Scale

Figure 45

Simple Mean



Weighted by Total Assets



Notes: The 'support rating uplift' refers to the difference between a bank's Support Rating Floor and its standalone rating. The value reflects the increased creditworthiness of a bank resulting from expectations of sovereign support. The numerical scale corresponds to the number of notches the Support Rating Floor is above the standalone rating (e.g. a bank with an AA+ Support Rating Floor and an AA standalone rating benefits from a 1-notch support rating uplift). Fitch rating data are used as the rating methodology is constant over the period.

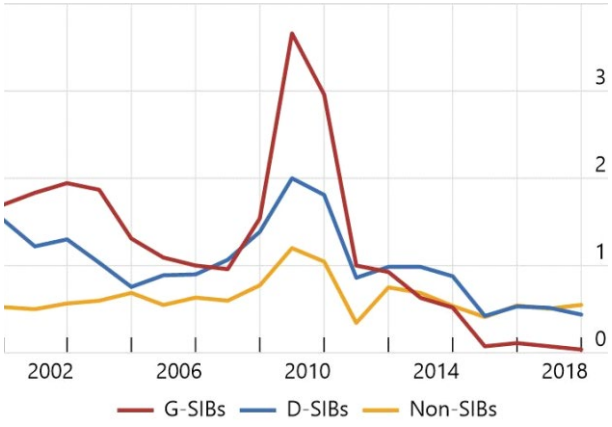
Sources: Fitch; FSB calculations

Fitch Support Rating Uplifts (excluding China)

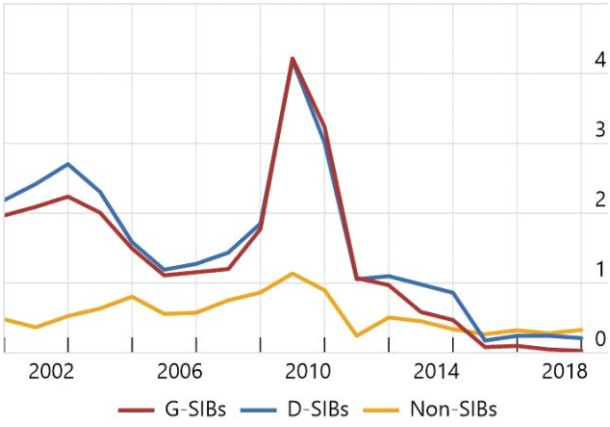
Numerical Scale

Figure 46

Simple Mean



Weighted by Total Assets



Sources: Fitch; FSB calculations

Judging the credibility of the resolution regime and government propensity to support

The methodologies of the three rating agencies require them to assess the effectiveness of a jurisdiction's resolution regime. The rating agencies assess whether the relevant authorities have the powers to resolve SIBs, whether these powers can be used, and whether they will be used. In order to reach these assessments the rating agencies analyse current and planned laws and rules in the relevant jurisdiction, read reports and policy documents of the relevant authorities and hold discussions with the authorities, in order to assess both the ability and the willingness of the authorities to use resolution tools.

Their judgements of resolution frameworks across jurisdictions are similar. Although their terminology varies, they all judge resolution reforms to be effective in the US, Canada, the EU, the UK, Switzerland and Hong Kong. In these jurisdictions, resolution of a failing bank is their

base case. For instance, in Canada the authorities have the power to transfer or sell assets, as well as to bail in liabilities, and systemically important firms must undertake resolution and recovery planning. In the EU, the implementation of the Bank Resolution and Recovery Directive (BRRD) meant, in the view of the CRAs, that resolution would be the base case for larger banks.

However, in some jurisdictions such as Japan, Singapore and Australia, CRAs do not judge the framework to be fully effective, because of the state's propensity to support. Although resolution legislation has been passed giving authorities powers to act, the rating agencies are less certain that resolution powers would be used. In the case of Japan, Article 126-2 of the Deposit Insurance Act enables authorities to use pre-emptive capital injections to maintain financial stability, and the CRAs believe that this would be the preferred approach. In Singapore, the restriction of the bail-in tool to subordinated instruments means that the framework is not "operational" under Moody's methodology. Similarly, in Australia, because only Tier 2 capital would be bailed in, the rating agencies believe that a propensity to support banks remains.

In other jurisdictions, notably in much of Asia and in the Middle East, the frameworks are not judged to be effective, because implementation of reforms is incomplete.

Information constraints

The three CRAs referred to a number of information constraints that may limit the accuracy of their assessments.[98] Central to these is the lack of disclosure, both of resolution frameworks and of bank-specific resolution plans. The agencies argue that more transparency would help demonstrate that banks are resolvable and clarify how losses are distributed between investor classes, and thereby enable credit ratings to more fully reflect how the resolution would work in practice.

[98] See *Shortfalls in TLAC disclosure obscure impact of resolution on creditors of GSIBs* Moody's Investor Services (September 2019) and *Increasing disclosure is set to shine more light on bank resolvability* S&P Global Ratings (March 2019).

Annex G: Selected cases of public assistance or resolution of banks in FSB jurisdictions

The table lists select cases of public assistance or resolution since 2016 for banks with assets over US$10 billion in FSB jurisdictions. The size threshold was chosen in order to restrict the list to medium and large banks, while the choice of year was based on the fact that several FSB jurisdictions adopted comprehensive resolution frameworks as of 2016. The table does not include cases where the original intervention pre-dated 2016 (e.g. HSH Nordbank, Banca delle Marche, Etruria); sector-wide support programmes (e.g. the Italian guarantee scheme to facilitate the securitisation of non-performing loans, which is voluntary and open to all banks); or cases of emergency liquidity assistance by central banks. The banks are listed by asset size (converted to US$ equivalent) at the time of the first public intervention, where possible.

Bank	Balance sheet size at time of intervention	SIB (Y/N)	Home jurisdiction	Date measure taken	Description of measure taken	Amount / Source of assistance (if applicable)	Current status of bank
Hengfeng Bank	CNY1.2 tn [US$173bn (2016)]	N	CN	August 2019	Received investment by sovereign wealth fund Central Huijin Investment Ltd. (60 billion shares).	N/A	In operation
Banca Monte dei Paschi di Siena	€143.5 bn [US$164 bn (2017)]	Y	IT	June 2017; November 2019	Received precautionary liquidity support (state guarantee) and recapitalisation; state guarantee program on senior tranches of non-performing loan securitisations.	€15 bn (liquidity guarantee), 5.4 bn (recapitalisation)	In operation, restructuring.
NORD/LB	€146.9 bn [US$160bn (2019)]	Y	DE	December 2019	Received market-conforming measures for strengthening capital and restructuring by its public sector owners.[99]	€2.8 bn investment, €0.8 bn capital relief	In operation
Banco Popular Español	€147 bn [$154.6b (2017)]	Y	ES	June 2017	Determined as failing or likely to fail (FOLTF) by ECB; put into resolution by Single Resolution Board; losses absorbed by equity and subordinated debt; sale to Banco Santander S.A.	No public funds used	Acquired

[99] See https://ec.europa.eu/competition/state_aid/cases1/20203/283125_2123117_150_5.pdf.

Bank of Jinzhou	CNY845.9 bn [US$ 122.4 bn (2018)]	N	CN	July 2019	Received equity investment by three state-run financial institutions (Industrial & Commercial Bank of China Ltd., China Cinda Asset Management Co. Ltd., China Great Wall Asset Management Co. Ltd.).	N/A	In operation
Harbin Bank	CNY615 bn [US$89.3 bn (2018)]	N	CN	November 2019	Two state-run financial institutions (Harbin Economic Development and Investment Co. and Heilongjiang Financial Holdings Group Co. Ltd.) became primary shareholders through share transfer.	N/A	In operation
Baoshang Bank	CNY431 bn [US$62 bn (2016)]	N	CN	May 2019	Taken over by the People's Bank of China and the China Banking and Insurance Regulatory Commission; guarantee on corporate deposits and interbank debts.	TBD	In operation, restructuring.
Bank Otkritie Financial Corporation PJSC	RUB2.6 tn [US$44 bn (2017)]	Y	RU	August 2017; December 2017; August 2018; 2018	Entered resolution; capital injection by the Central Bank of the Russian Federation (CBR); split into good bank and bad bank.	N/A; RUB456.2 bn; RUB42,72 bn; N/A	Good bank merged with B&N Bank and under control of the CBR
Yes Bank Ltd.	INR2.9 tn [US$41 bn (2019)]	N	IN	March 2020	On recommendation of the Reserve Bank of India, a Scheme of Reconstruction was sanctioned by the Government on March 13, 2020. In terms of the Scheme, the State Bank of India (largest public sector bank) and other private sector banks have invested INR100 bn (US$1.40 bn) in Yes Bank. The Board of the bank was also superseded and after a brief period, a new Board was constituted to manage the affairs of the bank.	A public sector bank invested INR60.5 bn (US$0.85 bn) in Yes Bank.	In operation
Banca Popolare di Vicenza	€35 bn [US$37 bn (2016)]	N	IT	January 2017; April 2017; June 2017	Received precautionary liquidity support (state guarantee); declared FOLTF by ECB; negative public interest assessment by SRB; forced administrative liquidation by Bank of Italy; entered compulsory administrative liquidation (including €4.7 bn cash injection and €12 bn state guarantees for combined sale of parts of Banca Popolare di Vicenza and Veneto Banca.)	€3 bn; €2.2 bn	Liquidated

Veneto Banca	€28 bn [US$29 bn (2016)]	N	IT	January 2017; April 2017; June 2017	Received precautionary liquidity support (state guarantee); declared FOLTF by ECB; negative public interest assessment by SRB; forced administrative liquidation by Bank of Italy. Entered compulsory administrative liquidation (including €4.7 bn cash injection and €12 bn state guarantees for combined sale of Banca Popolare di Vicenza and Veneto Banca).	€3.5 bn; €1.4 bn	Liquidated
Banca Carige	€23 bn [US$27 bn (2018)]	N	IT	January 2019	Received precautionary liquidity support in the form of remunerated guarantees that are restricted to solvent banks.[100]	Up to €3 bn	Restructuring
Promsvyaz bank	RUB1.4 tn [US$24 bn (2017)]	Y	RU	December 2017; March-May 2018; 2018	Entered resolution; capital injection and financial aid provided by Deposit Insurance Agency (DIA); split into good bank and bad bank; nationalisation.	N/A; RUB244.2 bn, including capital injection (RUB113.4 bn) and financial aid (RUB130.8 bn) by DIA; N/A	In operation under government control
B&N Bank	RUB1,1 tn [US$19 bn (2017)]	N	RU	September 2017; March 2018; 2018	Entered resolution; capital injection by CBR; split into good bank and bad bank.	N/A; RUB56.9 bn; N/A	Good bank merged with Bank Otkritie and under control of the CBR

[100] See https://ec.europa.eu/competition/state_aid/cases1/201951/277936_2117778_226_2.pdf.

Annex H: Testing bank behaviour

Several elements of the evaluation rely on difference-in differences (DiD) estimations. For the analysis of banks' responses to the reforms, for example, these econometric specifications test whether, in the aftermath of the reforms, G-SIB and D-SIB balance sheets and business models evolved differently from those of other banks.

Ideally, reform effects would be identified in an "experiment" which assigns reform measures to one group (the "treatment" group) and does not assign measures to an otherwise identical "control" group. Differences in behaviour of the two groups could then be directly attributed to the reforms. However, such experiments are not possible in this context.

DiD estimations are statistical techniques that mimic an experiment. They calculate the effect of a "treatment" (in this case a regulatory reform) on an outcome (e.g. bank lending or risk) by comparing the change over time in the outcome variable for the treatment group, compared to the change over time for the control group. In order for the technique to be valid, a number of assumptions need to be fulfilled. The most important assumption is that treatment group and control group behaved similarly before the treatment (the "parallel trends" assumption); if not, the estimates of treatment effects will be biased.

As mentioned in the main report, once empirical challenge throughout this evaluation has been that attributing changes to individual reforms can be difficult, or even to TBTF reforms as a whole, given the many confounding contemporaneous events such as other regulatory reforms and changes in monetary policy.

The identification of treatment and control groups is also a challenge. Some banks in some jurisdictions are not formally designated as SIBs but are nevertheless subject to enhanced requirements on account of (for example) their size and interconnectedness. Hence, these banks have been subject to at least some reform "treatment", and including them in the control group could bias the results. The evaluation identified such banks as "partially treated" banks and added a separate term in the specification.

The identification of the treatment date is not straightforward either. Possible treatment dates include (i) the initial reform announcement at global level, e.g. the 2010 FSB framework; (ii) the announcement of the specific aspects of the reforms at the international level, such as TLAC requirements; and (iii) implementation into national law. The main approach has been to take the publication of the international G-SIB Framework and the FSB Key Attributes at the end of 2011 as a baseline for testing the effects of all the reforms that followed. Alternative dates have been as robustness checks and the results were qualitatively similar (see Technical Appendix).

Annex I: Composition of the evaluation working group

Chair	**Claudia Buch** Vice-President Deutsche Bundesbank[101]
Australia	**Marc-Oliver Thurner** Head of Crisis and Resolution Financial Stability Department Reserve Bank of Australia
Brazil	**Fernanda Martins Bandeira** Deputy Head Macroprudential Division/Regulation Department Banco Central do Brasil
Canada	**Natasha Khan** Director of Financial Stability and Regulatory Policy Bank of Canada
	Moin El-Herraoui Director of Capital Markets Analytics and Modeling Canada Deposit Insurance Corporation (CDIC)
China	**Qin Liu** Head of International Cooperation Financial Stability Bureau People's Bank of China
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