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WHAT SHOULD BANK SUPERVISORS DO ABOUT CLIMATE RISKS?

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INTRODUCTION

Climate change and the related economic, social, and political innovations that accompany climate transition paths create financial risks. Bank supervisors and other financial authorities must take these risks into account as they execute their mandates related to the stability of financial systems and the soundness of banks and similar institutions within those systems. Core missions of supervisory and regulatory authorities require them to ensure that risks are identified, assessed, and managed. As stated by the Central Banks and Supervisors Network for Greening the Financial System (NGFS, 2019), "Climate-related risks are a source of financial risk and it therefore falls squarely within the mandates of central banks and supervisors to ensure the financial system is resilient to these risks."

Officials at central banks and other financial supervisory and regulatory authorities now broadly agree that they must account for climate change when pursuing their core objectives, such as price and financial stability, as well as in relevant aspects of balance sheet management. Whether their responsibilities should go beyond risk mitigation to encompass a more active climate policy role is a more contested issue and depends on their mandates.[1] For example, according to Federal Reserve Board Chair Jerome Powell (2023), "The Fed does have narrow, but important, responsibilities regarding climate-related financial risks … tightly linked to our responsibilities for bank supervision.… But without explicit … legislation, it would be inappropriate for us to use our monetary policy or supervisory tools to promote a greener economy or to achieve other climate-based goals. We are not, and will not be, a 'climate policymaker.'" The ECB has pursued a somewhat different path that reflects its broader mandate, taking a variety of steps to integrate a climate risk focus into areas such as collateral, disclosure, risk management, bond purchases, as well as into supervision and regulation of financial institutions. But at the same time, the ECB recognizes boundaries around the extent of its involvement in climate-related policy; as stated by ECB Board member Frank Elderson (2022), "Do not expect us to act to regulate or enforce environmental policies. We will stick to our mandate. Our mandate is to keep under control the risk that banks and financial system are facing." The Bank of Japan (2021) encourages financial institutions to conduct stress tests to assess the impact of climate change, and has introduced a mechanism to provide bank funding for investments and loans that address climate-change issues, but at the same time carefully states that it will not become involved in micro-level resource allocation through financial regulation or monetary policy.

The emerging consensus thus envisions a definite need for financial supervisors and regulators to address climate risks to the financial system within certain bounds. At the same time, translating this general statement of principle into supervisory and regulatory practice is challenging; the perimeter of a risk-focused approach requires reinterpretation of mandates in a notably new and challenging setting. This note discusses potentially productive avenues for central bankers and other authorities responsible for the prudential oversight of banks and similar financial institutions to consider, with a preference for

[1] Tirole (2019) makes a strong case for resisting a push to significantly broaden the mandates of central banks to address broader climate-related issues, as does Cochrane (2020).

supervisory and regulatory activities that clearly fall within the current mandates of most responsible authorities.[2]

CLIMATE RISKS AND CAPITAL REQUIREMENTS

What can and should be done to address climate-related financial risks within existing supervisory and regulatory mandates? Some recent discussions of this question seem to quickly devolve to a narrower question: how should regulatory capital requirements reflect climate concerns? It is not surprising to find capital requirements at the center of much of the discussion. Bank capital requirements have been a focus of extensive international collaboration through the Basel Committee for many years, making capital regulations prominent and highly visible in most jurisdictions. And climate-related risks do raise important issues for bank capital adequacy standards. At the very least, capital requirements must be reassessed to ensure that they adequately cover the physical and transition risks faced by financial institutions.[3] This is a significant task for regulatory authorities, and a paper by Holscher et al (2022) provides a clear and fairly comprehensive overview of many of the issues related to bank capital standards.

A guiding principle of prudential supervision and regulation is that bank capital should be adequate to address material risks to the extent possible. That should include climate-related risks. For example, the risk-weighted asset calculations for capital adequacy under the Basel framework should appropriately capture the potential for climate change to manifest in one or more of the risks reflected in those calculations. As discussed by Holscher et al (2022), many elements of the current capital adequacy framework can be expected to adjust automatically to reflect climate risk without structural changes to incorporate climate risk explicitly into regulatory standards. Any initiative to revise capital standards to address climate risks should begin with an assessment of the various relatively automatic avenues of adjustment implicit in the current framework. Financial supervisors would then need to determine whether the net impact on risk-based capital is adequate and appropriate, taking further action if bank capital calculations do not adequately account for climate-related risks.

But it is unlikely that climate-related financial risk will have major implications for bank capital adequacy. Recognize that by design, bank capital is intended to protect financial institutions against unexpected losses due to non-diversifiable risks over some horizon.[4] A

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[2] Philosophically, this note reflects the relatively mainstream view that the primary role of regulation is to address market failure, a view characterized by Oman et al (2023) as just one possible "tale" of financial supervision.

[3] Capital requirements may also be used as a macroprudential tool directed at financial stability, for example to restrain overall credit creation in the economy; this note does not address capital requirements that reflect considerations other than the soundness of individual institutions.

[4] The emphasis on coverage of non-diversifiable risk is explicit in the Basel IRB approach, and implicit in other approaches to capital adequacy. Note that just because climate change is "global" does not mean it is non-diversifiable in the context of portfolio management for capital purposes. Not all physical risks will manifest simultaneously. Similarly, transition risks are not perfectly correlated over time for all sectors or geographic regions. Lack of perfect correlation creates opportunities for diversification of climate-related financial risks that institutions should and likely will take advantage of, reducing the overall capital required for any given degree of prudential protection.

typical horizon reflected in bank capital standards is the next one year, or in some instances 3 or 4 years at most. For example, in the internal ratings-based approaches, the focus is on default losses within the next one year. At this horizon, climate effects are currently less likely to be material. In addition, bank capital is intended to cover unexpected losses, with expected losses covered through other mechanisms such as loss provisions or pricing. The question then is, what unexpected climate-related events might occur within the relatively short time horizons that are the concern of capital adequacy, and how much additional capital if any is required to cover them? The potentially large impact of climate change on global economies seems at times to be taken as prima facie evidence that something equally large must be done with bank capital standards. But if the focus is properly on potential unexpected losses over more limited horizons such as those relevant under existing capital and provisioning regimes (rather than, for example, the next 30 years) the capital implications probably are relatively minor.

In some specific bank risk areas, the implications for capital may be relatively more substantial. For example, Acharya et al (2023) observe that for market-related exposures, the evolution of market expectations is likely what matters most, and such expectations could change quite a bit over short periods with consequent impact on market prices that could affect bank capital. However, for most banks market-related risks are a relatively small part of overall risk, and very little of the public discussion of bank capital standards to date has focused on market risk. [5]

It may be that climate change presents challenges for calculations of expected loss that underpin loss provisioning or reserving at banks. Developments in this area have become more prominent in recent years due to the broad shift in accounting standards towards a focus on expected credit losses. As climate effects become predictable with reasonable confidence over shorter horizons, accounting standards will require institutions to take climate-related effects into account in their financial reporting, with consequences for provisioning or reserving. Near-term policy attention might productively be shifted to some degree away from capital standards and toward methodologies for projecting expected losses under applicable accounting standards.[6]

As a practical matter, one mechanism for reflecting climate-related risks in minimum capital requirements would be through the risk weights assigned to different types of exposures for calculations of risk-based capital. The weighting of credit risk exposures, for example, could distinguish between lending to activities with higher climate risk versus lower climate risk exposures. There is some scope for this within the Basel capital framework, as certain exposures currently can be assigned to risk buckets with higher risk weights if the bank concludes that a higher risk weight is warranted.[7] A practical constraint on this

[5] BIS data show that capital for market risk accounted for less than 5% of minimum required capital at global banks as of the end of 2023 (see Basel Committee, March 2024).

[6] If current methodologies require further development before they accurately capture expected losses due to the impact of climate change, near-term expected loss estimates may be understated. In that case, supervisors could require banks to hold additional capital as a buffer to compensate. Such a buffer is consistent with the current global capital framework, and should be seen as a temporary measure rather than a permanent one.

[7] For example, under the Basel capital framework, when using external ratings to assign risk weights, "Banks must perform due diligence to ensure that the external ratings appropriately and conservatively

approach is that bucket reassignment yields fairly large and discrete risk-weight changes, and buckets are few, so the scope for this type of re-weighting is limited and coarse-grained.

At a more conceptual level, capital standards currently are designed such that in principle differences in risk weights reflect differences in loss probability and severity stemming largely from differences in the correlation of bank exposures with the single systematic factor assumed to underly loss generation. Exposures warrant different risk weights if differences in their carbon-intensity or other aspects of exposure to climate-related financial risk correspond to differences in unexpected losses driven by correlation with the systematic factor. This is an empirical question that should be carefully addressed. If or when climate-risk related differences in systematic risk exposure are identified through such analysis, then risk weightings should be adjusted accordingly.[8]

In a separate dimension of climate-related policy, it may be tempting to consider using capital requirements to increase capital costs for carbon-intensive activities, quite apart from purely prudential consideration of risk to viability of financial institutions. The aim would be to influence the flow of credit, rather than solely to promote institutional viability in a risky world. While capital requirements in practice likely do influence the allocation of credit across sectors or borrowers – and certainly there are examples of capital requirements motivated by an apparent intent to discourage certain types of bank activity – in general this has been an appropriately limited consideration in the design of bank capital requirements. Modifying capital standards to influence the direction of capital flows would be a significant departure for capital requirements, and should be accompanied by a comprehensive review of the international approach to bank capital adequacy as a whole to ensure that any such revisions do not compromise its broader suitability for meeting prudential objectives.

Initiatives to use capital requirements as an intermediate tool to influence credit flows in this way also are complicated by the lack of a clear and accepted understanding of the full linkage between bank capital requirements and banking activity. Higher capital requirements applied to some portion of bank activity almost certainly reduce the supply of credit in some way. However, little is actually known about the empirical magnitude of such effects or whether increased capital requirements on one activity affect only that activity or others as well. There is similarly limited understanding of other factors needed to calibrate changes in regulatory capital requirements to achieve specific policy objectives. For example, since many banks operate with capital levels well above regulatory minimums, credit pricing may depend on internal allocations of capital that are only loosely related to formal regulatory requirements. The complexity of this linkage would obscure and possibly limit the impact of any regulatory capital change, complicating the overall linkage between changes in capital requirements and achievement of any stated policy objective and making this a path fraught with potential for unintended consequences.

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reflect the creditworthiness of the bank counterparties. If the due diligence analysis reflects higher risk characteristics … the bank must assign a risk weight at least one bucket higher than the base risk weight determined by the external rating." (Basel Committee on Bank Supervision, January 2023, paragraph 20).

[8] One could argue that requiring such a case be made is too conceptually fastidious, since in practice differential risk weightings within the capital framework have been established with less precision, tending to reflect broader differences in the risk of default or loss.

WHAT ELSE BEYOND CAPITAL REGULATION?

In view of the complexities related to the use of capital requirements to influence climate risk, widening the policy focus beyond capital would be productive. Capital standards are only one of many policy tools in the regulatory and supervisory toolkit to accomplish relevant policy objectives in this case. For example, consider another regulatory tool, concentration limits. The Basel Committee has developed standards for addressing concentration risk, although to date the BCBS has chosen to limit the scope of those standards to one narrow form of concentration risk: large exposures to individual borrowers. Other regulators have gone beyond this relatively narrow view of concentration risk to consider other types of concentrations within portfolios. For example, for commercial real estate exposures, US banking regulators have specified thresholds that are taken to signal potential safety and soundness concerns. Such an approach conceivably could be applied to climate-related financial risk, for example in the form of concentration limits applied to an appropriate measure of climate-related financial risk within portfolios such as carbon emissions or some other relevant metric.

Many of the potentially relevant tools for addressing climate-related risks are encompassed within the scope of supervision as opposed to regulation. The terms "regulation" and "supervision" are sometimes used interchangeably, but they are best understood as referring to two distinct and complementary elements of the oversight of financial institutions by prudential authorities. Regulation is the specification of rules or requirements, generally with the force of law, that must be obeyed by regulated persons or entities. Regulated firms either meet regulatory requirements or they fail to do so. If they do not satisfy the requirements of a regulation, they are in violation and subject to some kind of penalty. Supervision on the other hand is typically a less formal process that involves interaction between authorities and supervised institutions to achieve prudential mandates, including but in most cases not limited to the extent to which banks comply with specific regulatory requirements. This might involve activities by supervisors to assess such factors as the quality of management, the design and operation of information systems, the adequacy of internal controls, or the coverage of policies and procedures.

As a general matter, Barr (2024) succinctly states the goals of supervision as "to help bank managers and boards focus their attention on weaknesses in their risk measurement and management practices, compliance with law, and the sufficiency of the bank's capital and liquidity resources given its risk profile" and to help supervised firms "address issues before they grow so large as to threaten the bank." Supervisory assessments at institutions are coupled with the use of various tools and methods to influence or apply pressure on supervised institutions to improve if necessary. Eisenbach et al (2015) provide a valuable discussion of what supervisors actually do in practice, and how supervisory activity differs from regulation. In the US, for example, supervisors bring written "matters requiring attention" to the senior management and boards of directors of banks after examinations of those banks. If banks fail to respond adequately, supervisors may escalate pressure through "memoranda of understanding" or a legal order to "cease and desist" from certain practices, and may impose monetary penalties. In the more specific context of climate-related risks, Elderson (2024) notes the use of similar tools in the European context, with the potential imposition of periodic penalty payments if supervisors conclude that banks are failing to meet expectations.

As a matter of policy design, regulation is most effective in situations for which most or all possibilities can be specified in detail in advance so that the conditions of compliance and non-compliance can be clearly enumerated or articulated; for example, a capital ratio either exceeds 8 percent or it does not. But if significant judgement is required to determine whether specific actions or conditions are compliant, regulation is less likely to be effective, and a more discretionary, judgment-based supervisory process is likely to be the preferred way to achieve policy objectives. In practice, the most effective measures to ensure the continuing soundness of financial institutions take place in the supervisory sphere. The balance between regulation and supervision often depends on the complexity of specific issues, with greater complexity favoring supervision. Given the current state of knowledge and practice around climate risk and its effect on financial institutions and the financial system, the supervisory process is likely to generate more rapid movement toward desired outcomes than approaches that lean more heavily on regulation for a solution. [9]

Prudential supervisors monitor institutions on an ongoing basis using a wide variety of information sources, and engage in dialogue and interaction to encourage practices that foster sound financial institutions. For example, management is a critical determinant of the soundness of an institution, but management varies in quality; supervisory interaction facilitates assessment of the quality of management, including risk management, and provides a channel to influence that quality. As noted above, supervisors do this in various ways, ranging from conversations with executives to written examination or inspection findings or even to monetary penalties and restrictions on banking activities.

Ongoing supervisory processes allow supervisors to respond agilely to complex and changing circumstances without resorting to rulemaking, guided in their responses by principles and experience. Effective supervisory processes have benefits for both the supervisors and the supervised. Supervised entities receive ongoing communication from supervisors about supervisory expectations, emerging risks, and the range of sound practice. Supervisors gain detailed information about the operations and condition of institutions that, in addition to generally being non-public, is both more frequent and more nuanced than what periodic regulatory reporting or disclosures can provide. Hirtle et al (2020) find clear empirical evidence of the effectiveness of bank supervision.

There is no question that the nature and extent of supervisory influence and authority varies across jurisdictions, and that it is neither perfect nor omnipotent in any jurisdiction. But nothing prevents supervisors from considering ways to immediately apply the powers they already possess to effectively address banking risks, including those related to climate. Of course, the effectiveness of supervision does depend on the competence, incentives, and influence of supervisory staff. The need to address climate-related risk through supervision has arisen relatively recently, and therefore could require new or modified approaches to certain aspects of supervision. Relying on supervision and the judgement of supervisors thus likely requires a serious investment in hiring and training good supervisors, giving them the tools they need to evaluate and influence the behavior of

[9] Pillar 2 of the Basel capital adequacy framework formally recognizes the importance of supervision in one specific context, that of capital adequacy. While the Basel "three pillars" approach is a useful way to think about the key elements of capital adequacy, the Basel framework addresses just that -- capital adequacy. As noted above, capital is unlikely to be the only, or even the most important, policy tool for addressing climate risk issues. It is probably misleading and likely counterproductive therefore to simplistically characterize a focus on supervision as "use Pillar 2."

institutions, and in most jurisdictions paying careful attention to insulating supervisors from inappropriate outside pressure. If supervisory approaches are indeed the most promising near-term approach for addressing climate-related financial risks, then investing now in better supervision should pay higher-than-usual returns.

BUILD UPON EXISTING RISK MANAGEMENT PROCESSES

Risk management is a well-developed discipline in finance generally and in banking more specifically.[10] Consequently, financial institutions have significant existing capabilities to evaluate and manage risk, and those capabilities can and should be leveraged to address new sources of risk such as those related to climate change. Supervisors should ensure that these capabilities are enhanced and deployed.

A supervisory approach to climate-related financial risk emphasizing risk management has the distinct advantage of building upon an existing knowledge base developed through many years of experience. The key elements are well known. Sources of risk must be identified, and the magnitude and impact of identified risks must be assessed and quantified or measured to the extent possible. Processes should be implemented under clear risk management policies by competent risk managers, guided by a risk appetite established through a robust governance process involving senior management and boards of directors. Good risk management frameworks often reflect a "three lines of defense" approach to risk management with clear roles and responsibilities for business lines, independent risk management or compliance functions, and internal audit. Risks are monitored and managed on an ongoing basis.

All of this well-developed and well-understood risk management theory and practice can be applied today to climate-related financial risk, without new regulation or legislation, and its impact would be material and immediate. Banks are now generally well aware of climate risk as an issue; they are aware that the nature of the risks may differ from most traditional risk sources, as noted by Schnabel (2023), and many have at least started taking this into account. Most banks have begun identifying the sources of financial exposure to climate risks for the bank and assessing the magnitude of those risks. Progress in this area is undeniably challenging, in part because desirable data can be difficult to acquire and appropriate risk analytics are both complex and new. Banks generally recognize the limitations of current analytical methods, as well as the significant uncertainty around future climate developments that presents such a challenge to many existing risk methodologies. But methods will continue to be refined, particularly as information about climate impact improves. A proper role of supervisors is to support and encourage these developments,

[10] The set of activities described as risk management within institutions comprises the economic concept of "risk" as well as the related concept of "uncertainty." Some methods (such as those based on distributional assumptions) are more clearly addressing risk, while others (such as contingency planning) seem more oriented toward dealing with uncertainty. Distinguishing the two concepts appears not to be viewed as very important in practice.

and to use their unquestionable supervisory influence to push lagging firms to move more quickly as necessary.

Improvements in risk management may also help address concerns about bank capital adequacy. Bank capital often includes a buffer to account for uncertainty in risk assessments; improvements in risk identification and risk management improve risk coverage for any given level of bank capital, without necessarily requiring an increase in capital.

STATEMENTS OF SUPERVISORY PRINCIPLES AS ROADMAPS

Various official institutions have recently issued statements of principles for the management of climate-related financial risks. The Basel Committee on Banking Supervision has issued a statement of principles, as have other authorities such as the federal banking authorities in the US and the Office of the Superintendent of Financial Institutions (OSFI) in Canada. The Basel Committee has incorporated coverage of climate-related financial risks in proposed revisions to the Committee's core principles for effective banking supervision. Some authorities go further to formalize principles in the form of guidance to supervised institutions. For example, the European Central Bank has issued guidance, and the Hong Kong Monetary Authority has published a supervision policy manual on climate risk management.

Such statements of supervisory principles are a relatively simple yet productive near-term step. The BCBS principles illustrate the ground that can be covered by a strong set of climate risk principles.[11] Principles are divided into two groups: principles for institutional risk management, and principles for supervision of climate-related financial risks. For institutions, the principles appropriately cover aspects such as roles and responsibilities within a clear internal risk governance structure, the development of policies and procedures, assessment of the impact of climate change within the traditional categories of risk such as credit, market, operational, and liquidity risk, risk data aggregation, and so on – the foundational cornerstones for managing risk of any type, but tailored to address this newly emerging source of risk. On the supervisory side, the principles provide a framework for assessing the corresponding activities of firms. They also help emphasize the importance of having the right quantity and type of resources for supervising climate-related financial risk management. For both supervisors and firms, the principles articulate a role for stress testing and scenario analysis (more on this below).

It can be tempting to minimize the importance and impact of statements of principles and even guidance documents that do not take the form of binding requirements with which institutions must comply. But the role of statements of principles should be viewed as a complement to the broader supervisory process discussed above; as a highly interactive and subjective process, supervision is most effective if institutions and supervisors share an understanding of the central tenets of effective risk management as

[11] See Basel Committee on Banking Supervision (November 2023) for a summary of progress on implementing these principles across member jurisdictions.

well as the overall aims of supervision. Given the importance of the supervisory process at this stage in the development of thought and practice for climate-related financial risk, articulating principles for banks and supervisory approaches to climate-related financial risk management should be a highly useful and productive step.[12] Indeed, without clearly articulated principles to frame the supervisory expectations and dialogue, both supervision and risk management are left groping for common ground on which to proceed. History has shown that clear statements of principles by supervisors can promote a productive, unified approach that moves the state of practice forward.[13]

Authorities can use the supervisory process to identify and encourage better practices and foster the diffusion of those practices across the supervised sector, using a set of agreed principles as a guide. Cross-jurisdictional agreement on principles is likely to be far more easily achievable than agreement on specific practices or requirements. The nature of supervisory powers varies across jurisdictions, and each jurisdiction needs to determine the best way to translate principles into effective practice taking into account local constraints and requirements.[14] Individual authorities can marshal their available supervisory processes to ensure that relevant structures are established within institutions, staffed by competent individuals with clear and appropriate internal authority and responsibility and stature, and with clear incentives to manage risk as a primary goal – all within a commonly agreed set of guiding principles.

SCENARIO ANALYSIS HELPS ASSESS AND MANAGE CLIMATE-RELATED FINANCIAL RISK

Virtually every statement of principles, guidance, or standards in relation to climate-related financial risk issued to date incorporates a prominent role for stress testing or scenario analysis as a central analytical tool, and supervisory authorities have been rapid adopters. A survey by the Financial Stability Board (2022) summarizes the range of supervisory practice as well as the findings of exercises conducted to date.

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[12] It must be noted that official support for these principles is not universal. For example, U.S. Federal Reserve Governor Bowman (2024) states that "the principles seem oriented toward contributing to a policy matter that extends well beyond prudential bank regulation—namely how the U.S. and other governments around the world should address climate change."

[13] The supervisory guidance on model risk management issued in parallel by the Federal Reserve and the OCC in the US in 2011 provides an instructive example (Federal Reserve SR 11-7 and OCC Bulletin 2011-12). Although that guidance is largely principles-based and is non-binding, it has fundamentally and permanently changed the management of model risk by US banks, turning model risk management into a formal and distinct discipline across the banking industry in the U.S.

[14] Differences in the *results* of supervisory processes may be narrower than apparent differences across jurisdictions in supervisory *approaches*. Variation in legal, economic, and cultural environments may in fact *require* that different supervisory approaches be used to achieve the same ends. Shared principles help promote a focus on common objectives, with the details of how to achieve those objectives within each jurisdiction left to the discretion of local supervisors. This flexibility is a strength that stands in contrast to, for example, the uniformity of global regulatory capital standards; identical standards adopted within different jurisdictions can lead to disparate outcomes, due to differences in the operating environment in which the regulations are applied.

While the terms "climate stress testing" and "climate scenario analysis" are sometimes used interchangeably, it seems helpful to distinguish them, as in the FSOC (2021) report on climate risk. In this analytical setting, a scenario is an articulation of a set of hypothetical outcomes or paths for a group of important economic, financial, or physical variables that affect the financial condition of institutions. Scenario analysis is an assessment of the hypothetical impact of those scenario variables on the institution or the financial system. Stress tests are best understood as a specific type of scenario analysis, typically relying on a small number of severe but plausible (low likelihood) scenarios.

Given the current state of knowledge and the uncertainty around the nature and ultimate impact of climate trends, it is hard to assign even rough probabilities to alternative climate scenarios. It is correspondingly challenging to identify which scenarios are both severe enough and plausible enough to be good stress tests. Under such conditions, instead of aiming to identify a small number of "stress scenarios" for analysis a better approach is to widen the lens, assessing the impact of a broader set of scenarios to develop a sense of the full range of possible outcomes as well as the factors that drive material differences between scenario outcomes. Put differently, at this stage there are many possible paths climate change and related transition trajectories could take, and one of them will turn out to be the actual path; we simply have very limited ability at present to know which one it will be. By evaluating a wide range of scenarios, supervisors, institutions, and others can learn more and be better prepared for the one that turns out to be closest to ultimate realization, whatever that is. They can also identify various scenarios that produce especially stressful results and engage in contingency planning as appropriate. This approach is more robust to underlying climate uncertainty. Unexpected side benefits also may emerge from the process, such as identifying business strategies or portfolio allocations that perform well across a wide range of potential climate outcomes.

Successful scenario analysis depends on several key infrastructural elements, and supervisors should be encouraging initiatives to develop infrastructure immediately. More work should be done on the design of scenarios that yield productive results for risk management, as well as on the analytical tools that link climate paths to economic and financial variables. Some elements of existing infrastructure developed for capital and liquidity stress testing likely can be repurposed for a climate risk focus, which helpfully facilitates climate-related financial risk management activities in the near term. But new types of data will certainly be required, so additional emphasis on data collection and data management is essential. Past experience with other newly emergent risks suggests that initiatives to enhance scenario analysis are likely to highlight prominent data deficiencies and opportunities for improvement, some of them previously unrecognized. Data needs are discussed further below. Finally, a critical and often overlooked element of infrastructure is the transformation of scenario analytic results into actionable information; serious thought must be given to how to summarize and present the results of climate scenario analysis to make those results even more useful and decision-relevant.

Development of additional capabilities and infrastructure for scenario analysis (and for other elements of climate-related financial risk management) will have a cost. Significant investment will be required, primarily by financial institutions but also by supervisors as they expand their own capacity to understand and evaluate the quality of climate scenario analysis and climate-related financial risk management more broadly at supervised institutions. This is another dimension in which early and clear supervisory communications, whether in the form of principles or guidance or standards, will promote healthy

development. Costly new initiatives get a better reception from those holding the purse strings (boards of directors and senior management in the case of firms, funding sources in the case of supervisory authorities) if they are shown to be clearly responsive to well-articulated and agreed statements of direction from prudential authorities. Ultimately, investment in enhanced scenario analysis and related risk management will support a range of objectives, including enhancing bank risk management, improving the effectiveness of supervisory oversight, and contributing to systemic risk management.

DISCLOSURE CAN HELP, BUT DATA IS THE PRIORITY

A key element of the management of any risk is the collection and aggregation of appropriate risk information. The quantity and quality of information about climate risk has been a frequent focus of attention to date, motivating corresponding calls for enhanced disclosure of, for example, exposure to climate-related risk, or activities taken to limit financed emissions. The International Sustainability Standards Board (ISSB) has been active internationally, releasing IFRS standards for climate and other environmental risks. In the US, the Securities and Exchange Commission also has proposed disclosure standards for US firms. The Basel Committee has issued a consultative document on a disclosure regime for climate-related financial risks at global banks.

But the primary focus of bodies such as the ISSB and the SEC is on the disclosure needs of investors and a relatively narrow group of other stakeholders, while the focus of supervisors should be on information needed to manage risks at an institutional as well as systemic level. Public disclosure does promote efficiency in the pricing of securities and assets, which in itself can provide valuable impetus and support for the management of risks. But focusing narrowly on information to be disclosed risks neglecting other data needs. For effective supervision and regulation, and perhaps even more so for effective institutional risk management, a more granular type of information focused on risk is generally needed to facilitate the measurement and aggregation of risk information consistently over time. This may or may not be information that is useful to investors, but it is essential for risk management. In fact, some of the information vital for risk management may be inappropriate for disclosure, as it would reveal proprietary, private, or otherwise confidential information about individuals, businesses, or institutions. Supervisors should ensure that appropriate risk-related information is collected and used by institutions (as well as in supervisory activities), regardless of whether it is needed to meet public disclosure requirements. In a recent statement, the Basel Committee (November 2023) identified data limitations as the main impediment for banks and supervisors to implement key principles of climate-related financial risk management.

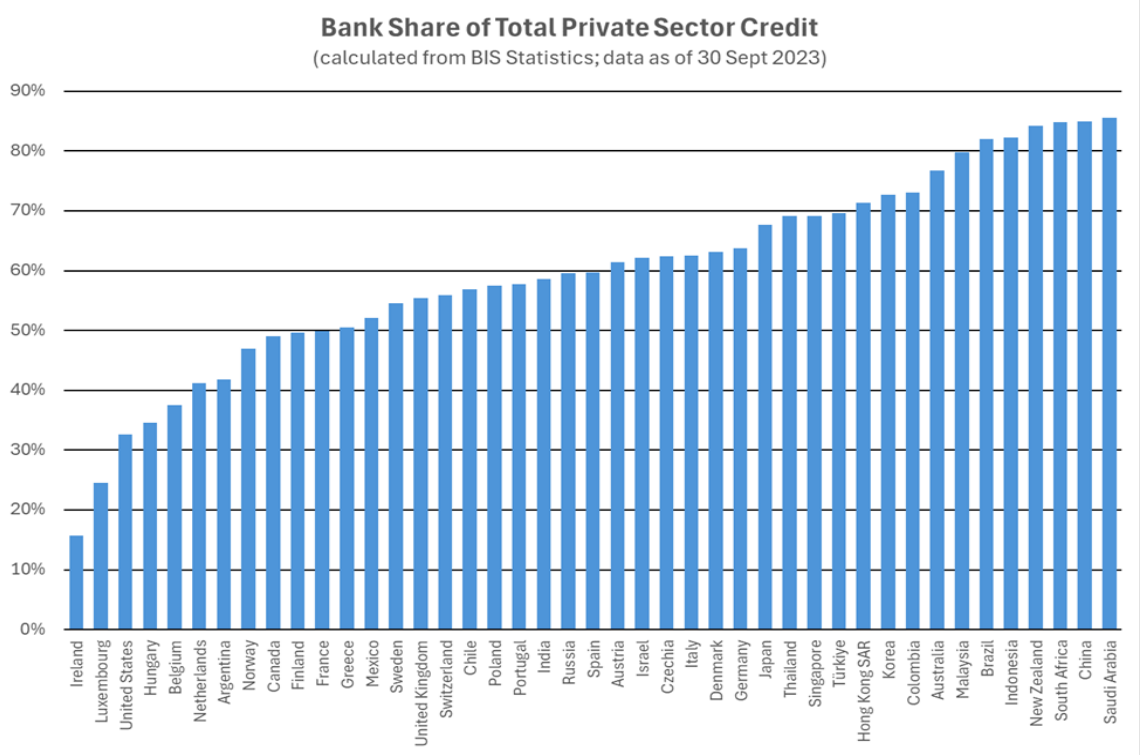
Collecting some of the information needed for climate-related financial risk management will be costly and may be seen as burdensome because some of the information will be of a type not collected in the past. Some of the burden of reporting or collecting needed information likely will fall on counterparties or customers of financial institutions. Financial supervisors can play a valuable role by identifying the broad public benefits, and by creating a clear and public expectation that such information must be collected from all relevant customers by all affected institutions. Doing so removes any competitive disadvantage for a single institution that seeks such information while its

competitors do not. Data collection to combat financial crimes provides an illustrative example in this regard. In most jurisdictions today, borrowers and counterparties know that information on identity and beneficial ownership will be required by virtually any institution with which they deal; they cannot avoid providing the information by switching financial institutions. Regulatory bodies can play a similarly useful coordinating role by setting standards and expectations for climate-risk related information that is to be collected from the customers of financial institutions.

Box: Banks are not the only source of bank-like services

Banks and other regulated lenders are not the only sources of credit and other banking services in modern financial systems. In particular, the relative importance of bank credit varies considerably across jurisdictions. For perspective, the accompanying chart shows bank credit as a share of overall private-sector credit for various economies around the world. Banks in the United States account for less than one third of credit flowing to the private sector. In Argentina, Norway, and Canada, the bank share is less than half. At the other end of the spectrum, banks are the dominant providers of credit to the private sector in jurisdictions such as Malaysia, Brazil, Indonesia, New Zealand, South Africa, China, and Saudi Arabia.

This diversity in the relative importance of banks across countries is not in itself an impediment to effectively addressing climate-related financial risks as discussed in this paper. But it does have two important implications for policies that aim to achieve climate objectives by influencing the direction or focus of banking activity. First, where banks are less central to the overall credit system, bank-centric policies probably have less impact, and therefore are less effective in achieving desired policy objectives. Second, to the extent that non-bank credit can substitute for bank credit, initiatives that lean on banks to achieve climate policy objectives could push credit activity toward less regulated non-bank lenders that are not subject to such constraints.



THE NEAR-TERM PATH FORWARD

A consensus on near-term steps will support productive action. From this discussion, several key points emerge for defining an appropriate and productive climate-risk related role for financial institution supervisors in the near term.

- Prudential financial authorities have an important role to play in ensuring that climate risks are recognized and managed by the institutions they regulate and supervise.
- Capital requirements may play an important role, but other supervisory and regulatory tools should receive more emphasis than they currently do, given the current state of policy and practice and the fact that the impact of climate risks on overall required bank capital may be relatively small.
- Direct concentration limits based on relevant metrics of climate risk exposure would be a more direct approach to limiting risk than relying on bank capital requirements.
- The impact of climate-related risks on expected loss estimation, where methods generally are governed by accounting standards, is one area meriting greater attention than it currently appears to receive.
- The supervisory (as opposed to regulatory) process is likely the most effective tool given the current state of knowledge and practice.
- Supervision should foster sound risk management of climate-related risks through clear statements of principles for supervision and risk management.
- Scenario analysis has a crucial role to play in the near to medium term, a role that will be supported by continuing advances in data, methods, and related governance and infrastructure.
- Disclosure is valuable, but a focus on disclosure is probably too narrow to fully cover the range of data needed for effective management of climate-related risks.
- Supervisory authorities should support and facilitate, and perhaps require, the collection of granular data for management of climate-related risks by financial institutions, and supervised entities should continue to invest in the systems needed to manage and use new types and quantities of such data.

Over time as supervisors and institutions learn more, and as the actual path of climate change and its impact comes into clearer focus, the range of supervisory tools will continue to evolve, and enhanced use of rules-based regulatory tools may become more appropriate. However, the supervisory process seems likely to retain a prominent role relative to regulation in effectively promoting management of climate-related risks by financial institutions.

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