Frontloading ESG risks and benefits into the capital charge to incentivise green financing

Received (in revised form): 23rd March, 2023

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Abstract Climate-related physical and transition risks are at the top of the financial regulators, supervisors and the financial institutions' (FI) agendas. The financial regulators/supervisors' objective is to keep the system safe and sound during the transition to a greener economy. The key initiatives include incorporation of climate-related risk into risk and capital management frameworks and the related Pillar III Financial Disclosures. Macroprudential stress tests to investigate how climate-related risks propagate through the real economy and the financial system have been, and are being, published. This paper examines these initiatives and challenges and makes the argument that while these initiatives are necessary, they are not sufficient. A systemic solution is needed. The expected transition to a lower-carbon economy is estimated to require around US$1tn in investments each year for the foreseeable future. This makes the role of the financial sector during the transition imperative. The paper argues that the policy objective should be not only that the financial system simply remains resilient during the transition, but that it also helps facilitate the transition. This facilitation must be on an equal playing field for FIs and should emerge as the natural outcome of their profit maximising behaviour in a competitive marketplace. A solution is proposed to do so. It effectively frontloads the longer term environmental, social and governance (ESG) risks and benefits into the current capital and, thus, pricing and profitability frameworks. Numerical examples are provided to explain.

Keywords: *environmental risk, environmental, social and governance (ESG), green financing, banking capital and funding, competition in financial systems, bank regulation, bank profitability*

INTRODUCTION

The UN informs us that[1] we are not on track to meet the Paris Agreement target to keep global temperatures from exceeding 1.5°C above pre-industrial levels, which is considered the upper limit to avoid the worst fallout from climate change. On the current path of carbon dioxide emissions, temperatures could increase by as much as 4.4°C by the end of the century. While the emissions must *drop* 7.6 per cent per year from 2020 to 2030, countries are actually planning and projecting an average annual *increase* of 2 per cent, which, by 2030, would result in more than double the production consistent with the 1.5°C limit.

'We are heading in the wrong direction', according to a new multi-agency report coordinated by the World Meteorological Organization (WMO),[2] which highlights the huge gap between aspirations and reality. Without a significantly more ambitious action, the physical and socioeconomic impacts of climate change will be increasingly devastating for both people and planet, it warns.

Financial institutions (FIs), as the providers of the private sector funds for both green and brown industries, and their regulators/supervisors, who are responsible for the stability and resiliency of the financial system, are also at the forefront of the issue. Financial regulators/supervisors are strongly encouraging FIs to develop a risk management framework for climate-related risks, and guiding the development of climate-related Pillar III Financial Disclosures by FIs. They also conduct macroprudential stress tests to assess climate-related risks. For example, the Canadian regulator, The Office of the Superintendent of Financial Institutions (OSFI), states that[3]

> Climate change and the global response to the threats it poses have the potential to significantly impact the safety and soundness of federally regulated financial institutions (FRFIs), and the financial system more broadly. These risks, also known as 'climate-related risks,' are broadly categorized as physical and transition risks.
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> 'Physical risks' refer to the financial risks from the increasing severity and frequency of extreme climate change-related weather events (i.e., acute physical risks); longer-term gradual shifts of the climate (ie chronic physical risks); and indirect effects of climate change such as public health implications (eg morbidity and mortality impacts).
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> 'Transition risks' refer to the financial risks related to the process of adjustment towards a low-greenhouse gas (GHG) economy. These risks can emerge from current or future government policies, legislation, and regulation to limit GHG emissions, as well as technological advancements, and changes in market and customer sentiment towards a low-GHG economy.

FIs are beginning to incorporate environment, social and governance (ESG) risk into their risk identification, measurement and management frameworks. The impacts of ESG risks are wide ranging, which cover underwriting, credit adjudication, pricing, stress testing, scenario analysis, capital management, pricing and ultimately asset allocation and business mix optimisation.

The regulatory papers and academic literature on the issue of climate-related risk in the context of the financial system are fast-growing. For example, Anderson *et al.*, who provide a comprehensive overview of the climate change risk the banks face,[4] discuss climate risk in terms of both physical risk (such as sea level rise) and transition risk such as climate related policy changes (eg efficiency requirements or carbon taxes), technological innovations and changing customer preferences. They discuss the wide range of exposure channels through which climate related risks can affect banks' risk profiles with particular attention to credit risk, the dominant risk for banks. They also cover climate scenarios and stress testing, as well as relevant developments in bank supervision.

The Basel Committee has published various papers on climate-related financial risk.[5–7] The general themes include:

1. Climate risk drivers can be captured in traditional financial risk categories, but additional progress is needed to better estimate these risks. Challenges remain in the estimation process, including data gaps and uncertainty associated with the long-term nature and unpredictability of climate change.
2. The Committee recommends that the banks themselves consider how to incorporate climate-related financial risks in their interpretation and application of the existing Basel Framework, and continuously develop their capacity and expertise in relation to climate-related financial risks.
3. The climate-related financial risks can be captured within the banks' risk management processes in terms of
    a. individual credit management by incorporating climate-related risk assessments during the client onboarding, credit application and credit review processes, and in ongoing monitoring and engagement with clients as well as in new product or business approval processes;

   b. portfolio management in terms of risk appetite frameworks and portfolio limits;
   c. capital, business and strategic risks while transitioning to a greener economy;
   d. the banks' internal governance frameworks, including the three lines of defence, management and the board.
4. Climate-related financial risks can be addressed within the Basel Framework in
   a. Pillar I by means of incorporating climate-related financial risk within the risk drivers of capital estimation. For credit risk, for example, this can be done by incorporating climate-related financial risks and data uncertainties (in terms of margin of conservatism) into probability of default (PD) and loss-given default (LGD). Where risk weights are directly applied, due diligence with respect to climate-related financial risk is required to ensure the risk weight applied is appropriate and prudent;
   b. Pillar II in terms of climate-related stress testing, scenario analysis, ICAAP, etc;
   c. Pillar III in terms of disclosures of climate-related financial risks applicable to the bank.

The key message is that the Basel Committee is relying on the banks' own capabilities to capture the climate-related financial risks and their translations into capital requirement as opposed taking a direct, consistent and centralised approach in modifying the RWAs with respect to climate-related financial risks. Pillar I is where this translation directly occurs, and it only occurs to the extent that the banks capture the climate-related financial risks within the risk drivers of the Pillar I capital estimation.

The discussion paper by the European Banking Authority (EBA) on the Role of Environmental Risks in the Prudential Framework[8] agrees with this view. The paper concludes that

1. The purpose of the prudential framework is not to achieve specific environmental objectives.
2. Environmental risks are already reflected in the Pillar I own funds requirements via internal and external ratings, valuation of financial instruments and collateral, or scenario analysis.
3. Considering #1 and #2 above, modifications to the prudential framework within the Pillar I framework at this stage are therefore *not* deemed appropriate.

There is growing support from the researchers to the contrary. Esposito, Mastromatteo and Molocchi propose a modifier within the Pillar I Framework.[9] Prudentially calculated RWAs are modified to arrive at an environment-risk weighted asset (ERWA) to take into account the environmental dimension. The ERWA is calculated by multiplying RWAs by pollution-based risk coefficients for capital requirements. The pollution coefficient can be between 0.5 and 1.5 where values below 1 are only assigned to activities producing zero or positive environmental impacts. On the other hand, a green weighted factor (GWF) triggers a negative (up to 24 per cent in the case of brown projects or borrowers) or positive (up to 50 per cent in the case of green projects or borrowers) adjustment of RWAs depending on their sustainability rating. This is, in practice, applied by one financial institution for internal analytical purposes and the methodology differs between special-purpose loans and general lending. Both modifications attempt to capture the environmental impact on future financial risks.

Bolton *et al.*[10] use the Basel three-pillar framework for capital adequacy to consider how climate risk could be incorporated into microprudential banking regulation and supervision. In Pillar I, regulators and supervisors could change risk weights assigned to assets by considering climate risk exposure. 'Green' assets would thus receive lower risk weights than 'brown' assets. In Pillar II, regulators and supervisors could, at their discretion, impose higher capital requirements for banks with relatively poor practices in their risk management of climate change exposure. Finally, in Pillar III, they could require disclosure of climate related risk exposure for more effective market discipline.

Another paper, by Neisen, Bruhn and Lienland[11] proposes a similar approach focusing mainly on EU regulatory guidance, where Pillar I capital requirements could be derived based on a green supporting factor or a brown penalty factor. Further granularity can be achieved based on ESG ratings. A harmonised ESG rating definition can be established and the resulting ESG ratings can be mapped to sustainability factors (SFs). For example, the best

ESG rating, A, can correspond to SF = 0.9 and the worst ESG rating, J, can correspond to SF = 1.1. The credit risk weight of an obligor is multiplied by the SF corresponding to its ESG rating and, therefore, good ESG ratings with SF < 1 correspond to a decrease in the obligor's capital requirement and *vice versa*. The authors draw attention to the non-standard nature of current ESG rating methodologies, citing that, in several studies, correlation analyses between ESG ratings of different rating providers for a fixed set of companies yielded correlation coefficients as little as 50–70 per cent. Therefore, for the use of internally developed ESG methodologies for regulatory capital estimation purposes, harmonisation efforts have to be undertaken by the regulators, similar to the development observed in credit ratings in 2004 with the introduction of Basel II. The authors also highlight data and modelling difficulties, given that the expected climate effects have not been observed in the past.

This paper is in support of the above-mentioned approaches within Pillar I from Esposito, *et al.*, Bolton *et al.* and Neisen *et al.* It explains why the Pillar II and Pillar III solutions alone are unlikely to succeed within the required timeframe. It discusses the importance of FIs as part of the solution, the need for a direct intervention by the regulators, and that the solution needs to appeal to the profit maximising behaviour of FIs in a competitive marketplace. It also suggests an alternative Pillar I capital modification approach to achieve this.

First, the idea that 'the purpose of the prudential framework is not to achieve specific environmental objectives' needs to receive critical attention. The issue is now simply too crucial to fall between the cracks of regulatory mandates. This paper argues that, while various regulators and government bodies must work together, bank lending is an absolute facilitator for asset reallocation. The policy objective should not be limited to keeping the financial system resilient during the necessary transition to a greener economy, so that it does not contribute to the problem, but, rather, the key participants of the financial system need to be part of the solution. These key participants, banks (lending), insurance companies including re-insurers (underwriting), asset managers (asset management), and asset owners, which include public and private-sector pension plans, endowments, and foundations (investing), should not only stay safe but also facilitate the movement of the private funds to lower-carbon economies and initiatives. Climate risk is a systemic problem that needs a systemic solution. Financial regulators' facilitation is required to manage the systemic risk resulting from climate change to achieve the safety and soundness of the system. Interestingly, the idea of using a supporting factor on credit risk capital requirements is not new.[12] Since 2014, the small and medium-sized enterprises (SME) factor has been used to anchor the political will to support SMEs in banking supervision law. The SME factor is applied to the risk weights (RW) under the standardised credit risk approach (SA) as well as the internal ratings-based approach (IRBA).

In summary, regulators currently appear to prefer that the banks themselves capture ESG risks within their risk and capital management frameworks. In Pillar I, this would be limited to the extent that the banks capture the climate-related financial risks within the risk drivers of the Pillar I capital estimation. In Pillar II, stress testing, scenario analysis and ICAAP are among the tools available to banks. Pillar III disclosures on climate-related financial risk can facilitate market discipline for reallocation of assets and pricing of ESG risks.

This paper, intended to contribute to the discussion, argues that the policy objective should be not only that the financial system simply remains resilient during the transition, but that it also helps to facilitate the transition. This facilitation must ensure an equal playing field for FIs and should emerge as the natural outcome of their profit maximising behaviour in a competitive marketplace. It further argues that it is no longer feasible to afford to rely on social conscience and market discipline alone to distribute funds from brown to green industries. It is also not reasonable realistically to expect financial institutions to outpace the market discipline in implementing effective environmental risk management frameworks and bear the cost. The process of relying on social conscience and market discipline

alone would take too long, be subject to biases, and be handicapped by the current lack of transparency, standardisation and common taxonomy. There are viable tools in green financing, but their fast-track implementation and adoption in a competitive market would only be possible if it affects the bottom line, ie the profitability of the providers of these funds. The most effective way of doing this is through capital, incorporating ESG risk multipliers into the capital charge in lending within the Pillar I framework. Unlike the other papers, this paper argues that ESG risk multipliers be determined by the regulator in a centralised and standardised manner as the workable solution. The alternative modifiers proposed in this paper are for industry risk and, separately, for loan purposes. The paper provides numerical examples and explains that the approach would effectively capture the longer term ESG risks into the current capital and, thus, pricing and profitability frameworks. Historical evidence on the expected effectiveness of the approach is provided and the paper is primarily written from a Canadian perspective.

This paper starts with the role of the financial regulators/supervisors in mitigating the climate risk and their corresponding expectations and mandates for FIs. It continues with what is being done by FIs and discusses the implementation challenges. It then proposes a capital management solution to capture and incorporate ESG risk in lending, which also effectively facilitates mobilising funds into the borrowers and industries where ESG risk is low and to the efforts to lower it, and explains the advantages of the proposed solution. A numerical example is provided. The last section is the conclusion.

The terms climate-related risks and ESG risks are widely used. For the purposes of this paper, they are used interchangeably.

WHAT IS THE RESPONSIBILITY OF THE FINANCIAL REGULATOR IN CLIMATE-RELATED RISK?

Naturally, there are government agencies other than the financial regulators/supervisors whose sole mandate is to manage and mitigate the environment-related risk for the general population.

Financial regulators/supervisors, on the other hand, regulate the FIs and are responsible for the safety and soundness of the financial system.[13] The environment-related risk manifests itself in terms of physical and transition risks, as discussed before. But, more importantly, environment-related risk is a strategic risk for an FI and managing it is essential for its long-term survival. An FI must be able to adapt its asset mix as well as its lending and financing practices to the forthcoming, new, greener and more socially responsible economy while remaining sufficiently profitable during the transition. As, hopefully, the transition to a greener economy is fast tracked, enabling mitigation of, and coping with, environment-related risk, FIs will need to have adapted their practices to the new economy (or all bets are off anyway, with the most catastrophic environmental scenarios having been realised).

Financial regulators/supervisors are responsible for the safety and soundness of the financial system and thus must ensure FIs identify, mitigate and manage the physical, transition and strategic risk resulting from the environment-related risk. That is, at the individual FI level, similar to ensuring that the individual FI can manage its credit, market and operational risks. However, more importantly, the financial regulators/supervisors are responsible for managing systemic risk, and, by its very nature, the environment-related risk is systemic. Managing the systemic risk in the financial system is a much more onerous task than ensuring each bank has incorporated ESG risk into their risk management framework. Mitigating this, potentially catastrophic, systemic risk requires a more immediate, hands-on, direct and systemic intervention from the financial regulators/supervisors. This direct intervention must result in active, direct promotion of green financing and that sufficient and prompt funding be channelled to a greener economy. Therefore, there are two parts to the solution: (1) the financial regulator must ensure that each individual FI incorporates ESG risk into their risk management framework, and (2) the financial regulator must also mitigate the systemic risk with effective tools. This paper discusses both.

There is also an important question to consider. So far, the objective of the regulators/supervisors has been to ensure that the financial system 'is protected' against the climate-related risks. The four industries they focus on are banks (lending), insurance companies including re-insurers (underwriting), asset managers (asset management) and asset owners, which include public and private-sector pension plans, endowments and foundations (investing). The expected transition to a lower-carbon economy is estimated to require around US$1tn of investments a year for the foreseeable future.[14] This makes the role of the financial sector imperative during the transition. The financial sector, in particular the four previously mentioned industries, is a key lever in facilitating the change. So, the question is, should the policy objective be that the financial system simply remains resilient during the transition, or should it also significantly help facilitate the transition? The value to the economy and society of helping to facilitate is undeniable, as long as this does not conflict with FIs' objective of profit maximising. In other words, can FIs be incentivised so that as they profit maximise, they also help facilitate the transition? For the regulators/supervisors, is it not that ensuring the transition, which can only be achieved with facilitation by the financial industry, the only way to manage the systemic risk after all?

Before this is discussed, it is useful to see what the financial regulators/supervisors are mandating to FIs now in the management of environment-related risk.

WHAT ARE THE FINANCIAL REGULATORS/SUPERVISORS MANDATING NOW?

So far, the financial regulators/supervisors have a light touch. They are not mandating but rather 'providing guidance, providing insight, supporting, encouraging, facilitating and developing awareness'. Their efforts are broadly concentrated in three areas:

1. Encouraging individual FIs to incorporate climate-related risk into their risk and capital risk management frameworks.
2. Providing guidance to FIs developing Pillar III Financial Disclosures on climate-related risk.
3. Conducting scenario analysis to assess climate transition risk to financial assets, in particular debt and equity that FIs hold.

For example, OSFI set out its principle-based expectations for Governance and Risk Management and Disclosures for Climate-Related Financial Risk. According to the guideline FRFIs are expected to:

- Understand and mitigate against potential impacts of climate-related risks to its business model and strategy.
- Establish appropriate governance and risk management practices to manage identified climate-related risks.
- Remain financially resilient through severe, yet plausible, climate risk scenarios, and operationally resilient through disruption due to climate-related disasters.

Climate-related financial disclosures are particularly important in regulatory agendas. Mark Carney has stated that[15] 'in general, inadequate information about risks can lead to a mispricing of assets and misallocation of capital and can potentially give rise to concerns about financial stability since markets can be vulnerable to abrupt corrections'. The report[16] from the Task Force on Climate-Related Financial Disclosures (TCFD) states that the current reporting practices are fragmented and lack focus on financial impacts, which prevent investors, lenders, insurance underwriters and other users of disclosures (including regulators/supervisors) from accessing complete information that can inform their economic decisions. Improved data and analytics incorporated in climate-related financial disclosures would facilitate an early assessment of these risks and market discipline and, ultimately, support more appropriate pricing of risks and allocation of capital in the global economy.

Regulators/supervisors have started to utilise macroprudential stress testing to assess climate-related risks, aiming to understand how climate-related risks propagate through the real economy and the financial system. At least 31 central banks and regulators/supervisors around the world have adopted scenario analysis to better understand the macroeconomic and financial impacts of climate change. For example, the Bank of Canada and OSFI published the results of the

Scenario Analysis to Assess Climate Transition Risk[17] with the stated purpose of:

1. Building the capability of authorities and participating financial institutions to do climate transition scenario analysis.
2. Supporting the Canadian financial sector in improving its assessment and disclosure of climate-related risks.
3. Contributing to the understanding of the potential exposure of the financial sector to climate transition risk. Furthermore, it has improved authorities' understanding of financial institutions' governance and risk management practices around climate-related risks and opportunities.

The Bank of Canada and OSFI acknowledge that enhancing the understanding and assessment of climate change impacts on system-wide market and credit risks will help them assess system-wide vulnerabilities.

BANKS' CURRENT PRACTICES

FIs in Canada are in the early stages of incorporating climate-related risks into their governance, risk management, strategy frameworks and disclosures. OSFI conducted a survey of current practices[18] at six pilot participants of a climate-related risk scenario analysis study and shared insights from the information gathered.[19] The survey found that all participants are still in the early stages of incorporating climate-related risks into the risk management frameworks. As a key finding, loan pricing frameworks do not explicitly reflect credit risk appetite and business strategy with regard to climate-related risks. Other findings include that

- Most pilot participants view climate-related risks as risks manifesting in existing risk categories (eg credit, market, liquidity, operational and insurance risks).
- Overall, physical risk is better understood than transition risk.
- Most of the participants have climate-related risks incorporated into their risk appetite frameworks (RAFs). The approaches vary, ranging from incorporating climate related risks as a stand-alone risk to integrating elements of climate-related risks into other risk categories (eg strategic, credit, market, insurance or operational). Most participants have not incorporated quantitative climate-related risk measures (eg key risk indicators, limits) into their RAFs, but the majority intend to do so.
- All participants have indicated that they are adapting their business models and strategies to the changing climate. They are in the process of identifying risks arising from climate change for key sectors, geographic areas and related products and services for markets where they are active or are considering becoming active. The participants recognise that, as a prudent practice, greater scrutiny is required for transactions in certain high-emitting sectors. More restrictions have been imposed for lending or investment activities in these areas. Implementing changes to business models and strategies mainly coincide with evolving risk management practices, while large-scale strategy changes are still in development.
- In credit risk management most are still in the early stages of developing capabilities and incorporating climate-related risks as drivers into their risk management framework. Generally, collateral valuation does not take into account climate-related risks.
- In market risk management, less than half of the pilot participants consider climate-related risk factors in their market risk frameworks.
- In liquidity risk management, most pilot participants do not consider climate-related risks directly in their liquidity risk management or buffer calibrations.
- In insurance risk management, some respondents include climate-related risks in their insurance underwriting processes, while others address climate-related risks on a portfolio basis.
- While all pilot participants conduct climate-related stress tests to some degree, current practices and capabilities for physical risk assessment are more developed than those for the assessment of transition risk.

FIs in Europe are also in the early stages of identifying and quantifying climate-related risk

exposures. Christine Lagarde, President of the ECB, pointed out that[20]

> Recent analysis of the 12 largest banks and 14 largest insurers in the euro area shows that a majority disclose the impact of their business travel, commuting and other energy usage. Yet most of their exposure to climate-related risk is likely to stem from their financial activities. Only 5 out of the 26 partially disclose the impact of their financial assets, and none of them provide full disclosure.[21]

An examination of the large Canadian banks' recent disclosures[22] for sustainable finance and ESG shows that they declare a commitment to promoting a sustainable future and inclusive society. All declare commitment to mobilising funds towards sustainable finance, often with specific amounts by specific target dates. For example, RBC states that its climate strategy and roadmap[23] combines short and long-term actions and commitments that support achieving net-zero in its lending by 2050.[24]

Among the mechanisms to mobilise funds, participation in green, sustainability-linked, ESG-themed bonds are often mentioned. A number of the Canadian banks are committed to compliance with the Equator Principles[25] for project finance, project-related corporate loans, bridge loans, and project-related refinance and project-related acquisition finance. In direct lending for example, Scotiabank offers consumer loans with lower interest rates and skip payments for green vehicles.

In comparison, the Bank of China, in their 2021 Corporate Social Responsibility Report, states that[26] differentiated interest rates, credit lines, loan scale and other resources were tilted to green enterprises to support their green and low-carbon production and improvement in energy-saving and carbon reducing technology.

The commitment from the banks to mobilise the funds to facilitate the transformation is clear. Differentiating the interest rates based on ESG scores or equivalently providing ESG-based pricing would clearly be an effective tool. However, being able to do so in a competitive market while remaining profitable relative to the competition in the shorter term is no easy task. The next section discusses the challenges to the necessary transition.

CHALLENGES

Politicisation of climate-related risks

Climate-related risk and transition risk are politically positioned as two opposing risks. The climate-related risk is uncertain and longer term. A fast-tracked transition to a greener economy has been argued to result in excessive transition risk with significant negative shorter-term economic impact, unemployment in certain segments or even a severe recession. That is, the belief that fast tracking the transition to a greener economy creates too much shorter-term transition risk to the detriment of the economy. With the natural human bias (discussed later in this paper) to avoid the shorter-term risks and heavily discount both the longer-term climate-related risk and the transition opportunities, transition risk has outweighed climate-related risk in their politicised trade off. This has resulted in a strong avoidance of the transition risk, thus a slower transition.

Reliance on social conscience and market discipline

As discussed earlier in the paper, the regulators/supervisors facilitate improving disclosures by the financial sector with the hope that these disclosures 'could foster an early assessment of climate-related risks and opportunities, improve pricing of climate-related risks, and lead to more informed capital allocation decisions'.[27] If the investors could understand the inherent ESG risks for individual companies, as well as the FIs holding these assets in terms of lending or otherwise investing, the ESG risks would be captured and reflected in the pricing of these assets, the stock prices of these firms, as well as the FIs holding these assets. This would create a strong market discipline to manage the ESG risks.

The prerequisite to this is that the market needs to be efficient with respect to ESG risk, the understanding of which requires data, transparency and standardisation. This is not the case today.

The Bank of Canada and OSFI state that a common message heard from a broad range of financial institutions was that there is a need to develop and standardise methodologies for climate risk assessment and to improve the availability of

climate-related data.[28] This is true for the Eurosystem as well, as explained by Christine Lagarde in a speech in London on 27 February 2020:[29]

> The Eurosystem is now reviewing the extent to which climate-related risks are understood and priced by the market and is paying close attention to how credit-rating agencies incorporate such risks into their assessments of creditworthiness. We will continue to evaluate the implications for our own management of risk, in particular through our collateral framework. ECB Banking Supervision is assessing banks' approaches to climate risks and developing supervisory expectations on those risks.

The TCFD, in its 2017 report,[30] also states that climate-related disclosures are inconsistent and non-comparable, and lack information on the financial implications of the climate-related aspects on an organisation's business. As a result, market participants are unable to incorporate climate-related risks and opportunities in their investment, lending and insurance underwriting decisions over the medium and long term. In addition, evidence suggests that the lack of consistent information hinders investors and others from considering climate-related issues in their asset valuation and allocation processes.

Disclosure of climate change risk (and around environmental, social and governance (ESG) considerations more generally) in external credit ratings is certainly valuable, as external credit ratings inform the investors. Moreover, it motivates FIs to manage their ESG risks due to their need to maintain their external credit ratings. However, a recent study found that the current level of disclosure does not allow a user of credit ratings to draw a definite conclusion on what would have been the credit rating in the absence of climate change risk.[31]

Access to risk information will need to be consistent, comparable, reliable and clear. Creating a common taxonomy and following standardisation are only the first steps. The data challenges will need to be overcome. The measurement of the climate-related financial risks re their impact on credit, market, operational and liquidity risk will be a journey. Only after all of these fundamental steps are taken, and only after the market participants educate themselves on these complex issues, which will be a long process, can market discipline be relied upon for the management of climate-related risk. This raises the following questions:

1. Do we have the luxury of time for this long process to work itself out?
2. Can we afford to rely on individual firms and FIs to self-manage climate-related risk with only guidance and support from the regulators/supervisors? Even with the best intentions, this is a complex endeavour, especially in a competitive environment where FIs need to maintain their comparative income and profitability while waiting for the market to become more efficient with respect to understanding and pricing climate-related risk.
3. Even if individual firms and FIs had the capability and the market were sufficiently efficient in understanding and pricing the climate-related risk, would this be the right approach, ie to rely on the market discipline alone? After all, this is not done elsewhere when the public safety is concerned. For example, governments and regulators/supervisors do not allow the use of materials known to be hazardous to human health, as opposed to relying on market discipline to deter this behaviour. Other safety standards are established, for example, for aircraft maintenance as opposed to relying on market discipline to discount the stock price of the airlines whose safety standards are lower than those of their competition.

Long time horizon and inherent uncertainty

The TCFD created by the Financial Stability Board states that

> the exact timing and severity of physical effects are difficult to estimate. The large-scale and long-term nature of the problem makes it uniquely challenging, especially in the context of economic decision making. Accordingly, many organizations incorrectly perceive the implications of climate change to be long term and, therefore, not necessarily relevant to decisions made today.[32]

The time horizon as well as the uncertainty around climate-related risk indeed complicates the issue, which is further examined below, both in terms of the perspective of the human lifespan and a firm's decision and capital management horizon.

People

Certain cognitive biases, for example confirmation bias, loss aversion and cognitive dissonance can cause deviation from rationality in judgment and work against taking climate action.[33] Research also shows that people who are wealthier and older are less concerned with the environment. For example:

- Baby boomers are bringing higher levels of consumption to middle and later life. They currently have the highest carbon footprint of any other age group.[34]
- A survey conducted for the University of Cardiff (Spence *et al*., 2010)[35] demonstrates that while older people are concerned about climate change, this age group generally does not feel they will be affected. Nor do they feel that they are able personally to take action to stop it.
- Another study finds 70 per cent of Americans aged 18–34 worry about global warming. This compares with 62 per cent of those aged 35–54, and 56 per cent who are 55 or older.[36]
- In his report, 'Party Polarization on Environmental Issues: Prospects for Change', Karol observed that: 'Millennials were raised in an era in which the problem of climate change was widely discussed. This is not true of baby boomers and previous generations'.[37]
- Personal wealth, more than national wealth explains the sources of emissions. Climate progress means first curbing the carbon output of the wealthier among us.[38] Quantitative research shows that highly affluent consumers drive biophysical resource use directly through high consumption, and through the power of their status, and driving consumption norms across the population.[39]

In the end, it is the people who will need to solve the problem. If we think about the demographics of many of the decision makers across the boards of directors, management of the firms and governments, these biases, at a minimum, can complicate the solution to the climate problem.

The shorter-term nature of capital measurement and management, and the key mismatch between the time horizons of capital management and materialisation of climate events

Capital is a key risk metric. It measures the amount of shareholders' equity required (in terms of CET1, Tier 1 etc forms of capital) in order to maintain the target risk rating of the company in relation to the amount of risk this company takes.[40] In common with all risk metrics, it has a risk horizon. That is one year. Regulatory capital under Basel and Solvency Regimes is measured over a one-year risk horizon in order to establish an equity buffer for the unexpected but plausible adverse events that can occur over one year. Economic capital, internally estimated by FIs, also typically has a one-year risk horizon. Both regulatory and economic capital are sometimes referred to as risk capital by banks and required capital by insurance companies.

Banks conduct the Internal Capital Adequacy Assessment Process (ICAAP) and insurance companies the Own Risk and Solvency Assessment (ORSA) process to ensure that they have sufficient capital to be able to execute their business and strategic plans. These plans are prepared for a three-to-five-year horizon. If it is for five years, effectively the capital measured over a one-year risk horizon is forecasted for the next five years under the business and strategic plan.

OSFI in its (draft) Climate Risk Management Guideline, B15, states that the FRFI should incorporate climate-related risks into its ICAAP or ORSA process. As part of this process, the FRFI should consider its capital requirements under severe, yet plausible, climate-related scenarios, and climate-related risks that could materialise beyond the FRFI's standard capital planning horizon.[41] OSFI also states in the same (draft) Guideline that

> the FRFI should develop and implement a Climate Transition Plan (Plan), in line with its business plan and strategy. The FRFI should incorporate the implications of climate change and the transition to a

low-greenhouse gas (GHG) economy to the FRFI in its business model and strategy.

While OSFI recognises the crucial mismatch between the time horizons of capital measurement management and materialisation of climate events, the suggested solution of incorporating climate-related risks into the three-to-five-year ICAAP and ORSA processes is easier said than done in practice, as it needs to incorporate competitive market dynamics.

ICAAP and ORSA are conducted with respect to the firm's business and strategic plans. The transition plan should be a core element of these plans. The Climate Transition Plan would effectively drive the ICAAP and ORSA. It affects the firm's asset mix drastically, which, in turn, has an impact on its capital consumption, revenues and expenses. As a firm transitions its assets from brown to green industries, the capital consumption of its assets will change accordingly. So too will the revenues, depending upon the change in the market price (of risk). But this is a dynamic process, the market price will be established not based what an individual firm is doing, but what all market participants are doing. Therefore, trying to capture a firm's capital needs in isolation with respect to transition cannot be done robustly due to uncertainty around the market dynamics. It is not so much how the individual firm is transitioning, but how everyone else is also transitioning, how well the ESG risks are understood and priced in, and how the market dynamics are playing out. This is very much a systematic and even systemic issue, rather than a firm-specific issue. This also shows that the OSFI Principle 3 that 'the FRFI should have processes in place to adequately *price* climate risk-sensitive assets and liabilities' is not achievable in practice.

The other obvious challenge is the robust incorporation of climate-related risk that will materialise *beyond* the 3–5-year ORSA, ICAAP and capital planning horizons.

Need for shorter term comparative profitability and income

The CEOs of publicly traded FIs are heavily judged by the performance of the stock price which is, in turn, heavily influenced by nearer term free cash flows. The more uncertain the future free cash flows are, the more distant their expected realisation is, the heavier the discount rate. This dynamic thus puts the focus on nearer term income and profitability. Climate-related risk is both longer term and has a high degree of uncertainty and, thus, is heavily discounted. Moreover, the market is not yet efficient with respect to pricing the climate-related risk, as discussed previously. These are key issues. Assume a certain FI is more aggressively transitioning its business model towards a greener economy than its competition, moving a larger portion of its assets faster from brown to green industries. The benefits of this are uncertain: how is this going to be priced in a market still inefficient with respect to ESG risk? Moreover, these benefits are longer term as they will be materialised in the future, but the cost is nearer term and more certain. Thus, reduction of assets in certain industries faster than the competition is likely to hurt the shorter term, comparative income and profitability and, ultimately, the stock price.

This dilemma will force the FIs to pace their transition plans with their competition and with the market efficiency, as the pricing of ESG risk gradually improves over time.

OSFI states the [B15] Guideline should be read, and implemented, from a risk-based perspective that allows the FRFI to compete effectively while managing its climate-related risks prudently. These two actions are at odds in the nearer term when relying on market discipline and being affected by competitive behaviours.

SOLUTION FOR LENDING PORTFOLIOS USING ESG RISK MULTIPLIERS WITHIN THE PILLAR I FRAMEWORK

There are generally three sources in green financing: domestic public, international public and private sector. Here, a solution is proposed for private sector lending. The desired solution would help to mobilise private funds from brown to green industries and also towards the companies with a superior ESG track record. As per the discussion so far, the solution would need to be practical, easy to implement, fast

acting, effective and systemic, not require a high degree of market efficiency with respect to ESG risks, and not depend on a competitive dynamic where faster movers in transitioning their asset mixes would be disadvantaged, as discussed above.

ESG risk can be captured in all or a number of risk metrics. It increases both PDs and LGDs and, therefore, it is possible to capture the ESG risk in terms of (an increase to) PDs and LGDs. The downside of this approach is that under the AIRB approach, PDs and LGDs are estimated as long-run, through-the-cycle (TTC) estimates and incorporation of future, not yet realised, climate events is not easy, if possible at all, from a modelling standpoint. Neither is conditioning PDs and LGDs for IFRS-9 purposes on never observed future climate events. We can only train our models for what we have seen in the past. When PDs and LGDs are out (note also they are not used under the standardised approach in the first place), what we have left is the capital as a key risk metric.

Recall for lending portfolios

$$ROE = \frac{After\ tax\ Net\ Income}{Capital}$$

If we estimate ROE with respect to Tier 1 capital[42]

$$ROE = \frac{(Interest\ Income - Interest\ (funding) Cost - \$EL - \$Operating\ Expenses)(1 - tax\ rate)}{\$Tier\ 1\ Capital} \quad (1a)$$

or

$$ROE = \frac{[NIM(1-ER) - EL](1-t)}{RW \times Min.\ Tier\ 1\ Ratio} \quad (1b)$$

where $\$EL$ is the annual expected credit loss, NIM is net interest margin, ER is efficiency ratio, EL is annual expected loss rate, t is tax rate, RW is average risk weight for the lending portfolio and $Min.Tier\ 1\ Ratio$ is the minimum Tier 1 ratio the bank is required to maintain for the portfolio.

RWs for the individual loans are internally estimated[43] by the AIRB banks and prescribed for the standardised banks. RW determines the capital charge for the loan and thus is a key impetus for its profitability. Under AIRB, RW is risk sensitive — the riskier the loan in terms of its PD and LGD, the higher the RW, but also the higher the interest income earned for this loan and thus the NIM, and *vice versa*. For example, in Table 1 ROE is calculated for two illustrative loans using Equation (1b).

Table 1: ROE estimation of two different loans

	Less risky loan	More risky loan
Min. Tier 1 ratio	11.00%	
Efficient ratio (ER)	54.00%	
Tax rate (t)	27.50%	
Expected loss rate (EL)	0.30%	0.60%
Risk weight (RW)	22.0%	35.00%
NIM	1.78%	3.09%
ROE	15.50%	15.50%

In this example, ESG risk is not incorporated for either of the loans. First, we can incorporate the 'industry risk' through the industry risk modifier, γ_1. During the transition, the risk for certain (brown) industries will increase while other (green) industries will decrease. For example, the Scenario Analysis to Assess Climate Transition Risk by the Bank of Canada and OSFI demonstrated that the largest increase in PDs will be observed in the sectors of refined oil products, crops, oil and gas, coal and energy-intensive industries, while gains will be experienced in others (eg certain segments of electricity). The study further examines the various industries under these sectors. For example, within the oil and gas sector, the largest increase would be seen in oil sands extraction while services to oil and gas extraction and contract drilling and crude petroleum from oil shale are the second and third largest. In the commercial transportation sector, air transportation would see a more than 15 per cent increase while rail and other transportation would see a decrease. In the electricity sector, fossil fuel electric power generation would see a very large increase, while electric power transmission/control and distribution, hydro and nuclear and other renewables will experience material declines in PDs.

Therefore, it is possible to interpret γ_1 as an industry risk modifier for RW to incorporate the change in baseline PDs in different industries as a result of the climate-related transition. For example, $\gamma_1 = [0.5, 1.5]$ would range from decreasing RW from 50 per cent to increasing it to 150 per cent.

Table 2: Application of industry risk modifiers to less (or more) risky loans that are otherwise identical, other than the industry the borrowers belong to

	Less risky loan		More risky loan	
Min. Tier 1 ratio	11.00%			
Efficient ratio (ER)	54.00%			
Tax rate (t)	27.50%			
Expected loss rate (EL)	0.30%		0.60%	
NIM	1.78%		3.09%	
Risk weight (RW)	22.0%		35.00%	
Industry risk modifier (γ1)	80.0%	120.0%	80.0%	120.0%
Modified RW	17.6%	26.4%	28.0%	42.0%
ROE	**19.4%**	**12.9%**	**19.4%**	**12.9%**

$$ROE = \frac{[NIM(1-ER)-EL](1-t)}{\gamma_1 \times RW \times Min.\ Tier\ 1\ Ratio} \quad (2)$$

Table 2 provides an example of the incorporation of an industry modifier.

Two identical (less risky) loans which only differ in terms of the industry of the borrower are examined. Also examined are two identical (more risky) loans which only differ in terms of the industry of the borrower.

Two industry risk modifiers were chosen for illustration purposes:

- 80 per cent for a 'green industry', which reduces the less risky loan's RW from 22 per cent to 17.6 per cent and the more risky loan's RW from 35 per cent to 28 per cent.
- 120 per cent for a 'green industry' which increases the less risky loan's RW from 22 per cent to 26.4 per cent and the more risky loan's RW from 35 per cent to 42 per cent.

This creates a sizable differentiation of 19.4 per cent versus 12.9 per cent in terms of ROE for the loans, which are identical other than the industry of the borrower.

Now only consider the loan in the brown industry. Assume one borrower will use the loan in support of its current operations while the other one will use it to reduce its carbon emission. The second loan, while in a brown industry, has a carbon reduction (or other environmental or biodiversity) purpose. This can be differentiated using a loan purpose modifier, γ_2. For example, $\gamma_2 = [0.6,1]$ would reduce RW by up to 40 per cent for a loan used for carbon reduction purposes.

In the example in Table 3 two identical (less risky) loans that only differ in terms of the purpose of the loan are examined. Also examined are two identical (more risky) loans that also only differ in terms of the purpose of the loan. An 85 per cent loan purpose multiplier was used for the loan used for an environmental purpose. This multiplier enables differentiation of modified RW from 22.4 per cent to 26.4 per cent for the less risky loans and from 35.7 per cent to 42.0 per cent for the more risky loans and, ultimately, differentiation of ROE from 15.2 per cent to 12.9 per cent.

$$ROE = \frac{[NIM(1-ER)-EL](1-t)}{\gamma_1 \times \gamma_2 \times RW \times Min.\ Tier\ 1\ Ratio} \quad (3)$$

This naturally changes the prices of these loans. The examples used are illustrative but the point made is that modifiers create material differentiation of the profitability of the loans measured in ROE between otherwise identical loans based on the industry and purpose within a climate-related risk context.

What do the modifiers do?

As discussed, the risk horizon for the capital requirement is one year and this capital over a one-year horizon is calculated five times within a five-year ICAAP/ORSA planning horizon.

Table 3: Application of the loan purpose multiplier also differentiates the RW and, thus, ROE

	Less risky loan		More risky loan	
Min. Tier 1 ratio	11.00%			
Efficient ratio (ER)	54.00%			
Tax rate (t)	27.50%			
Expected loss rate (EL)	0.30%		0.60%	
NIM	1.78%		3.09%	
Risk weight (RW)	22.0%		35.00%	
Industry risk modifier (γ1)	120.0%		120.0%	
Loan purpose modifier (γ2)	85.0%	100.0%	85.0%	100.0%
Modified RW	22.4%	26.4%	35.7%	42.0%
ROE	**15.2%**	**12.9%**	**15.2%**	**12.9%**

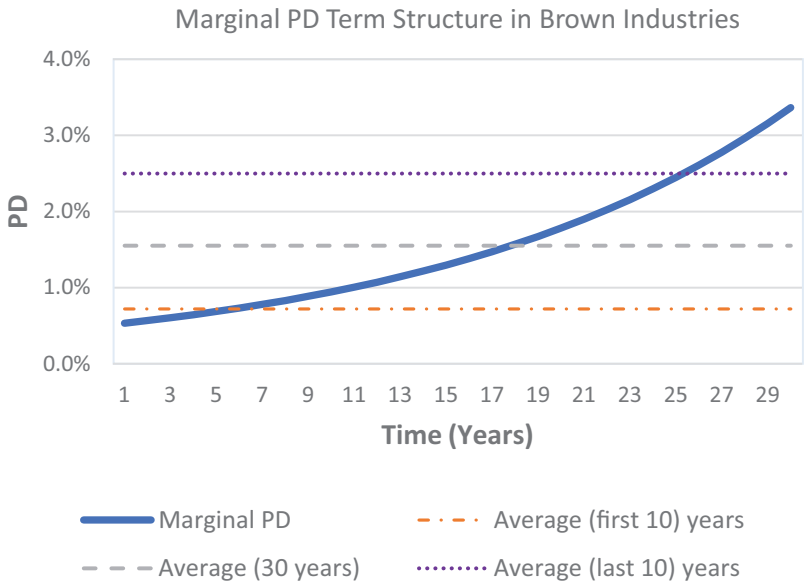

Figure 1a: PDs of the borrowers in brown industries should increase over time

Because the climate-related risk is over a longer risk horizon (ie longer than five years in the future), it is not captured in the capital estimation. The proposed approach effectively frontloads these future risks into the current capital horizon, thus including these long-term risks in the current prices for lending. The concept is explained with a stylistic example.

Figure 1a illustrates the one-year (conditional) term structure of the PD of a borrower in a brown industry over a 30-year horizon. Climate risk-related risk increases at an increasing rate over time, which in turn increases the PD (and LGD). In this illustrative example, the current (one-year) PD is 0.5 per cent, the average of the one-year conditional PDs over the first ten years (ie years 1–10) is 0.72 per cent, the average over the final ten years (ie years 20–30) is 2.44 per cent, and the average of the entire 30 years (ie years 1–30) is 1.52 per cent. This long-term exponential nature of the risk is not captured within the first five years (ie years 1–5) where the average is 0.6 per cent. Therefore, the exponential

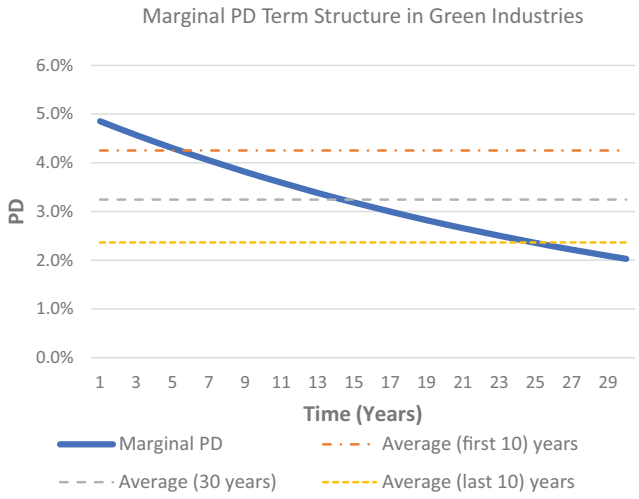

Figure 1b: PDs of the borrowers in green industries should decrease over time

nature of PD (and LGD) is not reflected in the current capital requirement.

The capital multipliers increase the current capital requirement in recognition of the increasing future risk and effectively frontloads these future risks into the current capital horizon, thus including these long-term risks in the current prices for lending. This, in turn, disincentivises lending to certain industries and activities in line with the desired transition. In this sense, it works as an insurance: the coverage is for long-term effects, but the current borrowers in certain industries and conducting certain activities are required to purchase this insurance and start paying the premiums right away in terms of the extra capital charge and, thus, the increased price of lending as a condition of borrowing.

The opposite is true for the lending in desired industries and lending to desired activities where the risk is declining (ie green industries and technologies) over time but mostly beyond the current risk horizon, as demonstrated in Figure 1b. The multipliers decrease the current capital requirement in early recognition of the declining future risk, and effectively frontloads these future benefits into the current capital horizon, allowing favourable current prices for lending, which, in turn, incentivises lending to certain industries and activities in line with the desired transition.

Who should determine the modifiers?

The natural follow-up question is: who determines the modifiers? One option is to leave the banks to their own devices. But this option would not alleviate many of the issues raised above. Not every bank will have the expertise to do so, and even for the ones who can develop the expertise, it will take time. There will be no standardisation, as different banks will take different views and have different expertise. As also discussed above, the differences among the banks will create an uneven playing field as the banks applying more aggressive modifiers, and thus facilitating a faster transition, may be disadvantaged in the shorter run.

Therefore, if the multipliers are determined centrally by a governing body similar to other key policy issues, such as Basel or Solvency or IFRS implementation, these issues would be evaded. Arguably, which green industries and which green purposes would be incentivised and by how much, and which brown industries should be taxed and by how much, as well as the target speed of transition, should a public policy issue anyway. The government bodies with expertise and responsibility in environment and climate, economy and financial regulations can collaborate to set the transition policy and its translation into the multipliers centrally.

The term structure of PDs (and LGD) discussed in the previous section can also be used in the calibration of the modifiers. Regulators and supervisors already have good indications of how the PDs will increase in the different industries through their Scenario Analysis to Assess Climate Transition Risk.

WOULD THIS ACTUALLY WORK?

The use of taxation on improving environment quality has been studied. In their 2019 paper, Renström, Spataro and Marsiliani[44] show that the first-best tax structure consists of positive taxation of pollution and either zero or negative taxation of production-factor incomes. Their 2021 study[45] examines the impact of pollution taxes and subsides and showed that abatement subsidies have a more positive effect than climate related taxes. The paper shows that an increase of the pollution tax, while reducing pollution, also depresses

consumption, the scale of the economy and the pollution premium. An increase of subsidies on abatement activity increases the scale of the economy and can also decrease pollution and the pollution premium and increase per-capita consumption. In an economy populated by socially responsible investors, pollution abatement is not necessarily at odds with economic performance. In fact, while the subsidy for abatement has somewhat smaller quantitative effects on pollution (relative to the tax on pollution), other things being equal, it increases steady state consumption and capital. For these reasons an abatement subsidy may be politically more feasible than taxation, especially in economies characterised by investors with stronger social responsibility motives.

These findings make a case for the asymmetrical use of γ_1 as an industry risk modifier, where $\gamma_1 < 1$ is more strongly favoured, for example, $\gamma_1 = [0.5, 1.2]$ as opposed to $\gamma_1 = [0.5, 1.5]$. This is because $\gamma_1 < 1$ is a subsidy, whereas $\gamma_1 > 1$ is a tax. It also makes a case for a stronger use of the loan purpose modifier, γ_2, which is always a subsidy as it is bounded by 1. For example, $\gamma_2 = [0.6, 1]$ would provide up to a 40 per cent subsidy and no additional tax as it is bounded by 1.

EXAMINATION OF HISTORICAL EVIDENCE

The capital requirement for lending activities is a very important factor of the banks' profitability. Transitioning from Basel I to Basel II, conducted in a coordinated fashion by international financial regulators and supervisors under the leadership of the Basel Committee, significantly altered the capital requirements for different kinds of lending. As a result, the new rules made certain services and types of lending more profitable, while making others less profitable. In Figure 2, the Canadian large banks' asset mix before and after Basel II can be seen. It is noticeable that the capital requirement and the resultant profitability determined what services and products were offered in what capacity. The credit portfolios were altered very significantly; the credit that became more profitable through reduced capital requirements under the Basel II rules has increased significantly, and *vice versa*.

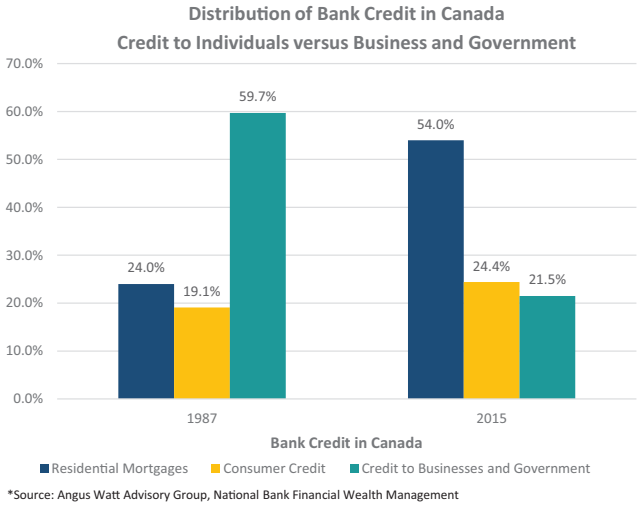

Figure 2: Distribution of bank credit before and after Basel II
Source: Angus Watt Advisory Group, National Bank Financial Wealth Management

BENEFITS OF THE APPROACH

The following discussion delineates the supporting arguments for the proposed industry modifier solution.

Perhaps most important, the proposed solution has historically been observed to work in changing the asset mix and funding as seen in Figure 2 above.

Risk management frameworks for ESG risks are in the initial stages. In the absence of advanced ESG risk management frameworks, capital as an immediate mitigant is required as also stated by, for example, OSFI: 'the Federally Regulated FI (FRFI) should maintain sufficient capital and liquidity buffers for its climate-related risks'.[46] Frontloading the future risks and benefits into the current capital horizon, and thus including them in the current prices for lending, smooths out the transition. The Bank of Canada and OSFI Scenario Analysis shows that the sharper the transition, the worse the economic impact: 'Delayed climate policy action increases the overall economic impacts and the risks to financial stability of a sudden repricing of assets . . . Delayed or sudden climate policy action could pose greater risks of financial market dislocation'. The proposed modifier approach effectively works as an early braking system in brown industries and early acceleration in green industries and projects, leading to a smooth transitioning, thus avoiding hard braking and acceleration that could be require at later stages if we delay further.

Christine Lagarde, President of the ECB stated that 'Achieving the transition almost certainly requires intervention by public authorities through regulation and taxation'.[47] The proposed solution provides the desired effect of taxation (negative or positive ie subsides), but utilises the banks' need for profitability as a lever without the negative connotation of taxation. It works through regulation to mobilise the funds for transition, without creating an uneven playing field for FIs, and without eroding the FIs path to profitability during the transition period. Considering these, the proposed modifier approach should be an acceptable solution from the banks' perspective. After all, the banks have already publicly committed themselves to mobilising the funds. The proposed solution only provides a vehicle to do so.

The simplicity of the solution lowers the implementation cost relative to the in-house capabilities they would have to develop themselves. For example, OSFI requires that:

> The FRFI should monitor developments in climate-related risk quantification (eg additional transmission channels for climate-climate-related risks etc) and incorporate them into the FRFI's governance and risk management practices, as appropriate. Among other things, the FRFI should continuously enhance its climate data and analytics capabilities to support its climate risk management.[48]

While FIs still should develop in-house capabilities in line with the above requirements, the scope, cost and effort required by individual FIs would be much less under the proposed centralised solution.

Most crucially, under the proposed solution they would not worry about the competitive reaction in managing their income, profitability and, thus, stock price, as the multipliers affect every FI in the same way. They can maintain and even improve their profitability by changing their asset mix in accordance with the modified capital charges, as they were able to do in transiting from Basel I to Basel II. As seen in Figure 2, for example, Canadian banks were able to alter their credit portfolios very significantly; they increased the credit that became more profitable under the Basel II rules, and *vice versa*, and even increased their profitability.

A 2021 study[49] shows that

> the lack of a globally accepted taxonomy on what constitutes sustainable activities, of regulatory clarity and of high-quality data allowing for comparisons across industries and regions, together with practical and behavioural complexities are major critical issues that discourage [Socially Responsible Investment] SRI industry at the global level.

Under the proposed solution, the industry and loan purpose modifiers are established centrally based on the ESG scores developed for different industries and for various abatement activities. This centralisation leads to accumulation of data and expertise and, thus, faster achievement of the necessary standardisation when the ESG factors are determined and adjusted by experts in a transparent way. This transparency and standardisation are crucial in achieving a higher degree of market efficiency with respect to pricing the ESG risks. As the oversight of omission is conducted by a centralised expert body, greater scrutiny can be established for certain high-emitting sectors and their abatement activities.

Industry and loan purpose modifiers can be staged to reflect the policy objectives. For example, the policy makers may want to start with less aggressive modifiers to allow for acclimatisation and adjustment initially and tighten it gradually. Or they may want to start more aggressively in providing incentives for abatement activities they consider crucial (ie a lower γ_2). The modifiers, therefore, effectively provide the policy makers with a lever, similar to the Central Banks' use of a monetary policy, to influence the speed of transition with respect to the corresponding pulse of the economy, with the greatest transparency possible facilitating the public debate and understanding of the policy. Policy makers can balance the relative weights so that it works as more of a carrot (ie $\gamma_1 < 1$ and $\gamma_2 < 1$) than a stick $\gamma_1 > 1$. Moreover, the policy makers would have the opportunity to observe the realised speed of transition relative to the targets, as well as the corresponding economic activity, and dynamically adjust and fine-tune the modifiers accordingly. Table 4 summarises the pros and cons of the proposed approach.

Table 4: Pros and cons of the proposed approach

	Pros	Cons
Centralised determination of the multipliers by the regulators within Pillar I, minimum capital requirements	• Fastest implementation, leading to a smooth transitioning, thus avoiding hard braking and acceleration that could be required at later stages if delayed. • Has historically been observed to work in changing the asset mix. • Standardised implementation by the centralised expert body. • Data aggregation. • Equal playing field for the banks and without the concerns about competitive dynamics. • Low implementation cost for the banks. • Ability to implement policy objectives, ability to pace and dynamically adjust them.	• Banks' own views are not taken into account. Therefore, the banks may want to develop their own ESG risk assessment frameworks and incorporate them in their economic capital estimation in Pillar II. • However, the banks maybe disincentivised to develop their Pillar II and risk management capabilities, effectively delegating the management of the ESG risk to the regulators. Pillar I minimum capital requirements are only one aspect of risk management, where management of underwriting risk, counterparty risk, portfolio management and stress testing are also crucial. • There could be a double counting between the regulatory multipliers that capture ESG risks and banks' own capture of them in their PD and LGD estimation. This cannot be the case for the standardised approach, where PDs and LGDs are not estimated but prescribed RWs are relied upon. For IRB, this could result in a double count to the extent that the banks themselves can capture ESG risks in PDs and LGDs, which would, however, be limited due to the long-term nature of ESG risk, data and modelling difficulties. Nevertheless, if a bank believes there is already a significant long-term ESG risk add-on in its PD and LGD estimation, it may choose to use these PDs/LGDs in its Pillar II economic capital estimation without the multipliers, and use PDs/LGDs without the ESG add-ons in its Pillar I minimum capital estimation where the multipliers already intend to capture the ESG risks.
Industry multipliers	• Through regulatory Scenario Analysis to Assess Climate Transition Risk, the increase in PDs in different sectors/industries becomes available. These data can be utilised for the calibration of the industry multipliers.	• Certain industries will be subject to large PD increases resulting in higher multipliers (eg oil sands extraction, fossil fuel electric power generation, air transportation etc). Banks with higher concentration of these assets will require to change their asset mix faster. It may take time to be able to grow in more favourable industries, especially if it takes time for these industries to grow to create demand. Phasing by the regulator to increase the multipliers gradually is crucial to give these banks time to adapt.
Loan purpose multipliers	• Incentivises carbon reduction in brown industries	• The loan purpose criteria and the corresponding multipliers are established by the regulators, while the banks themselves need to determine the purpose of a specific loan against the regulatory criteria. This creates complexity and need for monitoring.

CONCLUSIONS

The financial regulators/supervisors have increasingly focused on maintaining the financial stability of the system during the necessary transition to a greener economy. It is widely recognised that during this transition, there will be winners and losers, there will be increasing physical and transition risk and FIs must prepare for both. The financial regulators/supervisors have started setting and communicating their expectations for FIs to identify and manage the climate-related risk. There are implicit assumptions in this approach:

1. This can be achieved at the individual FI level. That is, the individual FIs can develop the capabilities to identify, measure and mitigate their climate-related risk effectively and sufficiently fast enough. For the IRB banks, to the extent that ESG risks are added on to PD/LGD estimations, they are also added on to the minimum capital requirements under Pillar I. Stress testing/scenario analysis tools are also available under Pillar II.
2. Climate related Pillar III Financial Disclosures can be the facilitator. As the investors and others' abilities to appropriately assess and price climate-related risk and opportunities improve, it will create a market discipline to motivate FIs to transition their businesses towards a greener economy in order to maintain and increase the value of their organisation.
3. The objective of the financial regulators/supervisors is to ensure the resilience of the financial system during the transition towards a green economy.

This paper challenges all three assumptions above. Regarding No. 1, it is argued that it would not be realistic to expect FIs to tackle climate-related risk individually in an effective and fast enough manner. Development of climate-related risk management capabilities, and especially its measurement, is not an easy task and will certainly take time. Time that is no longer available. Development of modern risk management capabilities for more easily measurable financial risk took decades. Moreover, the individual FIs will need to worry about competitive dynamics: who is doing what, especially in transitioning their assets, and at what speed will be a key concern as they need to stay competitive in their shorter-term earnings, profitability and stock price in a market that is currently not efficient with respect to pricing ESG risk. This is related to implicit assumption No. 2. Better climate-related Pillar III Financial Disclosures would certainly help increase the market efficiency with respect to ESG-related risk and its pricing. But this is a long process even after the necessary development of the standardised taxonomy.

Therefore, re Nos. 1 and 2, the argument is made that the luxury of time in relying on the FIs' own efforts or the market discipline alone is no longer available, and, therefore, a more direct, centralised and standardised approach is needed.

The paper also makes the argument that the main objective of the financial regulation (No. 3) should not be limited to ensuring the financial system remains resilient during the transition, but that the financial system can play a more active role. The financial system should not only be protected so that it does not contribute to the problem, but it can also be a key part of the solution. Directing private funds towards green industries and abatement activities is a required part of the transition solution. The paper argues that this can be achieved.

In a competitive marketplace, FIs are, and should be, driven by profitability. The proposed industry modifier solution frontloads the risk and benefits of the transition into FIs' capital requirements and, thus, enables their immediate pricing of various industries. As both ESG risks and benefits are priced in, it affects the relative profitability and motivates FIs to mobilise their funds and change their asset mix towards a greener economy as a profit maximising behaviour. This has already been observed in the transition from Basel I to Basel II, where FIs materially modified their asset mixes following their relative profitability. As proved under the Basel II transition, changing the profitability structure changes the asset mix, and, therefore, relative capital requirements and the resulting differentiation of profitability is a proved, effective lever.

The proposed solution explained in this paper provides a number of other benefits while creating an equal playing field for the FIs, enabling them to maintain their profitability during the transition without worrying about the competitive dynamics

and cuts their implementation cost relative to do-it-yourself ESG risk management and quantification.

ACKNOWLEDGEMENT

I would like to thank Angela Higgins for her assistance and support in writing this paper.

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$$ROE = \frac{\left[NIM(1-ER)-EL\right](1-t)}{RW \times Min.\ CET\ 1\ Ratio}.$$

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