Concept Paper[1]

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1. Objective of the note and conceptual underpinnings

This note outlines a conceptual framework for evaluating the consequences of standards for corporate disclosure and reporting on capital markets and the economy more generally. By identifying potential economic consequences of standards based on extant research, this note provides relevant context on how the Foundation could assess and measure its success.

With this goal in mind, we provide a selective summary and discussion of what in our view are the key empirical findings in the academic literature on corporate financial and sustainability disclosure and reporting standards in Section 2 and 3. We end the paper with a Section outlining the main takeaways of the analysis and defining select issues that deserve attention by the trustees. In the introductory section we lay out the basic conceptual underpinnings.

When thinking about the economic consequences of corporate reporting (financial or sustainability), two general effects must be considered:

- Capital-market effects, namely how the reported information is priced and how it affects (debt or equity) investors.
- Consequences beyond capital markets, which consist of effects on other stakeholders and other real effects. Forcing companies to disclose material information can have real effects because investors and other stakeholders respond to the disclosed information. These responses, in turn, lead firms to adjust their behavior. Such real effects may be intended or unintended. Importantly, these real effects can occur even if the standards are set primarily with a focus on investors. The reason is that corporate disclosures are publicly available; anybody can use the information once it is reported, including competitors, suppliers, customers or the general public, giving rise to other stakeholder effects. Therefore, real and other stakeholder effects are important economic consequences that need to be considered.

Below, we provide a brief conceptual discussion of both effects.

[1] We thank Richard Barker and Thorsten Sellhorn for very helpful comments.

Capital market effects

It is generally acknowledged in accounting, finance and econonomics that corporate information matters to investors. The pricing of relevant corporate information is central to the capital allocation function of financial markets. Better information should reduce investor uncertainty, estimation risk, and firms' cost of capital. Corporate transparency (or the lack thereof) also affects secondary market liquidity and trading because disclosing corporate information publicly to all investors alleviates the problem of asymmetric information (the possibility that the counterparty one trades with may be better informed) and thus adverse selection. This, in turn, increases market liquidity, which reduces investors' transaction costs when trading and also lowers the cost of raising capital in primary markets by increasing firms' market valuations.

However, to justify corporate disclosure standards and, in particular, mandatory standards, it is not sufficient to point to empirical evidence of the aforementioned capital market effects. We also need evidence that (a) there are information externalities, (b) standardization of information helps valuations, or (c) standards enhance the quality of corporate information beyond what firms disclose voluntarily.

On the first point, a firm's private disclosure incentives are geared towards improving its own valuation (or its cost of capital), not the valuation (or cost of capital) of other firms, or the pricing of risk in the market as a whole. Thus, just relying on voluntary corporate disclosure does not result in socially optimal information provision. For this reason, a key motivation for disclosure mandates and standards is the existence of (positive) information externalities.[2]

On the second point, standardizing firm disclosure enhances the comparability of reported information across firms and thereby lowers the information processing costs of investors, which is again a positive externality. Although the incremental contribution of each firm's disclosures to inter-firm comparability or the processing of information about other firms is likely to be small, these information transfers could carry substantial benefits for the market or the economy as a whole.[3] But again, firms are unlikely to consider the positive externalities that arise from their own reporting choices, resulting in an economy-wide underinvestment in comparable reporting.

On the third point, what ultimately matters to markets and stakeholders is the informativeness or quality of corporate disclosures. Firms can provide information in more or less useful ways, depending on what their incentives are to inform or obfuscate. Standards govern what information must be disclosed and the way in which the information is to be provided. In other words, standards could improve the information that firms disclose or report, but this effect hinges critically on the extent to which standards force out information that firms would not voluntarily provide and the extent to which standards can constrain

[2] The work of Foster (1980), Dye (1990), Admati and Pfleiderer (2000) suggests that positive information externalities exist and could be important reason for mandating disclosure and reporting. In addition, Lambert et al. (2007) show that because disclosure by one firm helps investors also to estimate the cash flows of other firms, it lowers non-diversifiable estimation risk and hence firms' cost of capital.

[3] Consistent with our argument, Admati and Pleiderer (2000) show standardization is at the center of a fundamental informational externality from disclosure, namely the greater ability to compare company performance relative to other companies, its competitors and peers. Internalizing this informational externality requires mandatory disclosure rules. Companies will not on their own initiative standardize their disclosures, as their disclosure costs will then inevitably be higher and their private benefits from disclosure will not fully reflect the public benefits from intercomparability.

obfuscation or withholding of information. For instance, one way in which standards contribute is by specifying what information is material to investors, which in turn makes it harder for firms not to withhold such information or to claim that such information is immaterial. However, the effectiveness of standards relies on the existence of an enforcement and incentive structure. In the digital world we live in, it also depends on the machine readability of the information disclosed and the ease with which it can be aggregated into datasets.

Other effects beyond capital markets

Reported information can also alter firms' actions and therefore have real effects. For one, the aforementioned capital market effects should have corresponding consequences for firms' actions. A lower cost of capital implies a lower hurdle rate and hence should lead to more corporate investment. If higher-quality reporting reduces information asymmetries that otherwise create frictions in raising external capital, we should see firms raise more external capital. Moreover, corporate disclosure and reporting facilitates monitoring by outside parties, such as institutional investors and analysts, which could improve managerial decision making and, in particular, the efficiency of firms' investment decisions (e.g., Bushman and Smith 2001; Lombardo and Pagano 2002; Lambert et al. 2007).

Similarly, better comparability of corporate disclosures due to reporting standards allows for better monitoring by investors and analysts, which could discipline corporate decisions. More comparable reports also allow firms to make better-informed investment choices due to a better understanding of competing firms. Moreover, firms that have comparable financial reports can more efficiently contract with suppliers and customers, especially across countries (e.g., Hail, Leuz and Wysocki, 2010).

However, mandatory disclosure and forcing firms to provide (potentially unnecessary) information can also have negative effects and costs. Firms often withhold information or oppose reporting mandates because the disclosures would communicate commercially sensitive information to competitors, suppliers or customers (e.g., Verrecchia 1983 and 2001).[4] These information externalities are called proprietary costs. They are negative from the disclosing firm's perspective. As many firms protect their rents from innovation through secrecy, mandatory reporting can reduce firms' incentives to innovate and invest because it forces firms to reveal information about profitable markets, which ultimately dissipates the returns to innovation. However, the spillovers benefit other firms (e.g., Badertscher et al. 2013) and could be beneficial from society's perspective. For instance, such spillovers could speed up the adoption of novel products and processes throughout the economy or generate follow-on innovation by other firms. For this reason, the aggregate and distributional effects of reporting regulation on innovation and investment are complex (e.g., Breuer, Leuz and Vanhaverbeke 2025).

Importantly, the real effects of reporting are not limited to corporate investments and can manifest themselves in other firm actions, depending on what firms are required to disclose. These real effects can be intended or unintended. For instance, as we discuss below, the disclosure of corporate emissions could incentivize firms to reduce their emissions. Cutting emissions is beneficial to stakeholders and

[4] However, it should also be noted that managers could be reluctant to disclosure for ulterior reasons, e.g., because it would reveal poor managerial performance to shareholders (Leuz 2004; Berger and Hann 2007). Other disclosure costs to firms could stem from potential litigation as well as the costs of gathering and processing information.

society. However, there are other, possibly unintended effects that could be negative, not only from a firm's but also a societal perspective.

2. Empirical evidence for financial reporting standards

The empirical literature on the effects of financial reporting and accounting standards is very large. In particular, the worldwide adoption of IFRS has spawned a large number of studies, for one, because it has provided scholars with a laboratory to estimate the economic effects from the introduction of mandatory reporting standards. We very briefly summarize the main findings here, relying on a combination of key empirical studies and several review papers.[5]

Daske, Hail, Leuz and Verdi (2008) is the first major study on the introduction of mandatory IFRS reporting. It covers 26 countries around the world, a sample of over 3,100 firms that are mandated to adopt IFRS, and analyzes the effects around IFRS adoption for stock market liquidity, cost of equity capital, and firm value.

Three main findings emerge from this study:

- Firms experience statistically significant increases in market liquidity after IFRS reporting becomes mandatory in their home countries, with effects ranging in magnitude from 3% to 6% relative to the levels of market liquidity prior to IFRS adoption.
- Consistent with the liquidity improvements, there is a decrease in firms' cost of capital and a corresponding increase in Tobin's q [defined as the market-to-book ratio of total assets] when one accounts for anticipation effects in these market-based proxies prior to the official IFRS adoption date.
- There is substantial heterogeneity in the capital market effects around IFRS adoption across countries. The strongest effects are observed in countries where firms have incentives to be transparent and where legal enforcement is strong.

Importantly, however, the study cautions that it is not clear to what extent the findings can be attributed solely or even primarily to the introduction of the IFRS mandate. The authors highlight that many IFRS adopting countries made concurrent efforts to improve their enforcement and governance regimes. In addition, countries' IFRS adoption is clustered in time and overlaps with other market reforms, especially in the EU. These concurrent regulatory events likely play into the findings of this study (as well as most IFRS studies).

Recognizing the existence of *unrelated* institutional reforms in the EU and elsewhere, Christensen, Hail and Leuz (2013) employ a research design that can control for such regulatory changes. Using this approach, they still find significant increases in market liquidity around IFRS adoption (in some countries), which suggests that the liquidity changes are indeed related to financial reporting changes. However, this finding does not imply that the changes in market liquidity are necessarily driven by the adoption of the new accounting standards. As noted earlier, countries have also made other changes to their financial reporting system that often were meant to support IFRS adoption. For instance, several countries used

[5] For reviews of the literature see Soderstrom and Sun (2007), Hail, Leuz and Wysocki (2010), Brüggemann et al. (2013), De George et al. (2016) and Leuz and Wysocki (2016).

the introduction of IFRS as an opportunity to improve the enforcement of financial reporting. In this case, capital-market outcomes reflect the joint effect of the bundled changes to the financial reporting system.

Consistent with the concern about bundled changes to the financial reporting system, Christensen, Hail, and Leuz (2013) show that the liquidity effects around IFRS introduction are concentrated in five EU countries that concurrently made substantive changes in their reporting enforcement. There is little evidence of liquidity benefits in IFRS adopting countries without substantive enforcement changes, even when they generally have strong legal and regulatory systems. This finding for the latter set of countries poses the question whether the market liquidity effects can really be attributed to IFRS adoption, rather than the respective enforcement changes.

Leuz and Wysocki (2016) provide a review of the empirical literature on disclosure and reporting regulation. They note that the case in favor or against disclosure and reporting regulation is not ex ante obvious and that the various costs and benefits that arise from a mandate are largely an empirical matter. Unfortunately, however, evidence on the causal effects of disclosure and financial reporting regulation is often difficult to obtain or quite setting specific. As a result, the literature is still far from enabling policy makers and standard setters to conduct quantitative cost–benefit analyses. Leuz and Wysocki (2016) also point out that there is a paucity of evidence on market-wide effects from regulation, especially on externalities. As we noted in Section 1, such evidence is central to the economic justification of reporting regulation and standards in the first place.

With respect to IFRS adoption, Leuz and Wysocki (2016) conclude that only few studies are able to establish clear causal connections between IFRS adoption and studied outcomes. They echo the two key problems highlighted in Christensen et al. (2013). IFRS were often adopted amidst a series of other institutional reforms, making it difficult to identify the effects of IFRS adoption separately from other unrelated institutional changes. Moreover, several countries have adopted IFRS together with explicit changes to the financial reporting infrastructure (e.g., stricter enforcement), often with the intention to support IFRS adoption, which further complicates the identification of IFRS effects. These methodological issues plague much of this literature.

However, some key findings are relevant for our discussion:

a. *Better corporate disclosure and reporting increases market liquidity.* There is robust evidence from various settings and studies. This is the capital-market effects that is best supported by empirical evidence.
b. *Complementarities and interactions between reporting systems and various institutional factors*. Disclosure rules and reporting standards should not be considered in isolation. Their effects depend on supporting institutions. Consistent with this notion, the effects around IFRS adoption are significantly stronger in countries with stricter and better functioning legal systems. Beginning with Daske, Hail, Leuz and Verdi (2008), studies generally find that the observed capital-market outcomes surrounding the mandatory introduction of IFRS are weaker, or even nonexistent, in countries with weaker legal regimes and reporting incentives.
c. *Enforcement is key for finding significant capital market effects*. As discussed above, Christensen, Hail, and Leuz (2013) find that the market liquidity effects around IFRS introduction are limited to five EU countries that concurrently made substantive changes in reporting enforcement. They also find liquidity improvements when countries make substantive enforcement changes well after they have adopted IFRS (e.g., Sweden) or without first adopting IFRS (e.g., Japan). The

conclusion is that IFRS adoption had little stand-alone effects on market liquidity and that changes in reporting enforcement (e.g., the creation of pro-active enforcement regimes) play a crucial role for the observed liquidity effects.

d. *Large cross-sectional heterogeneity in economic outcomes around IFRS adoption even within countries*. Studies find significant within-country heterogeity across firms in the observed effects around disclosure regulation and IFRS adoption. For example, Daske et al. (2013) show substantial heterogeneity in firm outcomes after voluntary and mandatory IFRS adoption. They highlight that firms differ in their motivations and ways in which they apply or implement the new standards. Some firms may adopt new standards merely in name without making material changes to their reporting policies; others adopt them as part of a broader strategy to strengthen their commitment to transparency. The former are likely firms that were forced to adopt the standards, whereas the latter are more likely firms that adopted (or would have adopted) IFRS voluntarily. This heterogeneity in firm outcomes highlights the importance of firms' reporting incentives, which come into play through the discretion in reporting standards. An important implication of this insight is that standards alone are unlikely to achieve a convergence in reporting practices and hence information quality, unless other elements of the institutional framework are harmonized as well (e.g., Burgstahler, Hail and Leuz, 2006; Hail, Leuz and Wysocki, 2010).
e. *Real effects.* A growing body of evidence suggests that disclosure regulation and reporting standards can also affect corporate investment decisions and investment efficiency (e.g., Leuz and Wysocki 2016; Roychowdhury et al. (2019). Some of this evidence stems from IFRS adoption (e.g., Schleicher et al. 2010) and some from differences in firms' reporting quality (e.g., Biddle et al., 2009). However, due to the slow moving nature of corporate investments, the causal identification of real effects is generally even more challenging than for capital market effects and, as a result, the empirical literature is less conclusive in this area.
f. *Proprietary costs are an important consideration.* The relation between corporate disclosures and proprietary costs is complex, but there is increasing evidence that forcing firms to disclosure or report can have significant competitive effects and proprietary costs, which also can reduce firms' incentives to invest or innovate, or even to go seek a stock market listing (e.g., Breuer et al. 2025).

3. Empirical evidence for standards on corporate sustainability reporting [CSR]

The empirical literature on the effects of regulation or standards for CSR is more limited than that of financial reporting since this type of reporting is much more recent. Mandatory carbon emissions reporting as well as other climate and environmental disclosure rules have only been introduced recently in a few jurisdictions. Christensen, Hail and Leuz (2021) conduct a comprehensive review of the empirical literature on sustainability reporting, much of which precedes these regulatory developments and hence is largely based on voluntary sustainability reporting (see also Christensen, Hail and Leuz 2018 for tabular review of the literature). Based on their review of the literature as well as the broader literature on financial reporting, Christensen et al. (2021) provide a series of conjectures on what can plausibly be expected from mandatory sustainability reporting. However, these conjectures come with two important caveats.

First, in studying voluntary sustainability reporting researchers face three major challenges in identifying the economic effects, which all relate one way or another to the fact that voluntary disclosure is an endogenous decision by firms, so that it is not possible to identify effects by simply comparing outcomes of companies that choose to disclose to the outcomes of companies that do not choose to disclose. A first major difficulty is to separate the effects of sustainability disclosure *per se* (i.e., the effects of the information that has been revealed) from the effects of the company's operations on its sustainability (which is only observed through the disclosure). Thus, is it the performance or the disclosure of the performance that moves stock prices? A second major difficulty are selection effects in voluntary disclosure. The companies that disclose have different characteristics or economic circumstances from those that don't and these differences could drive the disclosure decision in the first place, making it difficult to separate the effects of the voluntary disclosure from the effects that are linked to company characteristics that are associated with the disclosure decision. A third major difficulty relates to the quality and integrity of the information that is disclosed, given that sustainability metrics may be subject to managerial influence (or even manipulation or greenwashing), and that these disclosures are typically not subject to a rigorous auditing process.

Despite these limitations, the existing literature on sustainability disclosures provides a useful "inventory" of potential economic effects that might result from sustainability reporting mandates or the introduction of standards. Moreover, studies on voluntary disclosures can inform us how firms view the costs and benefits of a particular disclosure (e.g., non-disclosure is a sign that the costs exceed the benefits), which in turn allows us to better predict which firms will likely comply with or resist a mandate. In addition, the literature on financial reporting provides a number of insights that likely carry over to sustainability reporting. For instance, many of the economic effects of corporate disclosure and reporting that we discussed in Sections 1 and 2 should be relevant considerations for sustainability disclosures to the extent that such disclosures provide new information. For instance, we would expect new information to be used in the pricing of firms and such disclosures to reduce information asymmetries between investors.

Second, it is important to recognize that mandatory disclosure regulations do not arise in a vacuum. For example, prior to the introduction of mandatory reporting in the U.S. in 1933 and 1934, listed companies were already disclosing substantial financial information. Thus, the effects of mandating financial disclosures can only be evaluated relatively to what was already there. These effects arise from either the additional information that companies are required to provide, or from the standardization of disclosures that companies were already making on a voluntary basis. The same applies in the context of sustainability reporting, considering that companies already provide substantial voluntary disclosures. Thus, in evaluating the potential economic effects of a mandate, it is important to determine the additional information that firms will provide as a result of sustainability reporting requirements as well as to consider the effects of standardization.

In the remainer of this section, we first provide a high-level discussion of what can plausibly be expected from mandatory CSR based on the extant literature. This discussion largely follows Christensen et al. (2021). Thereafter, we summarize more recent research findings obtained by studying the reporting of carbon emissions, distinguishing between studies which focus on voluntary reporting and those which focus on the effects of mandatory carbon reporting.

Effects of mandatory sustainability reporting that can plausibly be expected

a. *Reporting incentives and costs matter for non-disclosure*. It is likely that (some) firms are presently withholding substantial amounts of material sustainability information. The extent to which the introduction of CSR standards can force out such sustainability information is difficult to predict. Firms for which the costs of disclosure outweigh the benefits will engage in avoidance even with mandatory CSR standards (e.g., provide uninformative boilerplate disclosures), which limits how much new information is really provided. What will matter is reporting incentives and reporting costs.
b. *Heterogeneity of practices will prevail*. The role of reporting incentives also implies that we can expect substantial heterogeneity across firms in sustainability reporting practices. The pre-existing heterogeneity in firms' voluntary reporting practices suggests that CSR standards could in principle yield substantial harmonization benefits. However, the significant challenges for measurement, comparability, and standardization in a sustainability context, questions the extent to which CSR standards will in fact substantially harmonize firms' sustainability reporting practices.
c. *Costs are determined by firm size*. Not much research has been done on costs of (sustainability or even financial) reporting. However, the fact that the amount and quality of reporting is robustly linked to firm size suggests that there are substantial economies of scale. One area for which we have evidence on the indirect costs of reporting is the proprietary cost literature for financial reporting (and patent disclosures), showing among other things that more disclosures can reduce firms' innovation incentives. These costs and concerns should equally apply to CSR. They are less relevant for aggregated disclosures (e.g., firm-level GHG emissions) but can arise for fairly granular, process-oriented or detailed disclosures, especially for smaller firms.
d. *There will be real effects, especially when using double materiality*. Real effects are particularly relevant in the sustainability context, as CSR standards are seen by some as an instrument to influence firms' sustainability activities and policies. Real effects are more likely to follow from reporting mandates than from voluntary disclosures. The effects can be intentional and unintentional, and they are not always beneficial from a firm's or a societal perspective. Due to the many potential real effects, an assessment of potential firm responses to a CSR standards is difficult. However, it seems reasonable to predict that CSR standards based on a double materiality perspective are likely to have a wider range of intended and unintended real effects than standards that are based on a single materiality perspective. Moreover, it is unclear at this point how effective CSR standards are in order to drive corporate behavior towards societal goals. We report some results on effects of reporting on emissions at the end of this Section.
e. *Assurance and enforcement are key*. The interaction of CSR reporting standards with other institutional arrangements deserves considerable attention. In particular, assurance and proper enforcement of CSR standards are critical and require a substantial (public or private) infrastructure. A central issue is whether CSR standards apply to firms' regulatory filings and are subject to enforcement by the exchanges or national enforcement agencies and/or private auditing. In many cases, CSR standards are likely harder to enforce than financial accounting standards, particularly when it comes to the materiality issues.
f. *The quality of institutions matters*. The interaction with countries' institutional infrastructures implies that we should expect CSR standards to have very different effects across countries, and especially across developed and developing countries, which in turn could further exacerbate the differences in firms' sustainability reporting (practices) in different jurisdictions. In particular, it seems reasonable to expect some firms with good reporting incentives in developed economies will use the introduction of CSR standards as an opportunity to improve their reporting and to differentiate from their peers

with weaker reporting incentives. Such heterogeneous responses to CSR standards could in turn lead to less (rather than more) convergence in practices overall.

Prevalence and Effects of Carbon Emissions Disclosure

In this section, we briefly discuss the fast-evolving literature on carbon emissions. Broadly speaking, this literature consists of studies examining how firms' carbon emissions and the resulting exposures are priced in capital markets (see Appendix) as well as studies on the prevalence and the effects of carbon emission disclosures, including disclosure mandates. We realize that IFRS sustainablility reporting standards go well beyond the disclosure of carbon emissions, which is only one of the requirements.[6] Nevertheless, we believe studies on carbon emissions are useful for understanding what we can expect from sustainability reporting standards and in particular the application of IFRS S2. Our review is again selective but highlights several insights that should be relevant when evaluating the economic consequences of CSR standards.

Much of the literature on carbon emissions has benefited from the existence of the GHG protocol, which provides detailed guidelines to corporations on how to measure emissions, distinguish between different types of emissions and how to aggregate them into CO2-equivalent units. In addition, data providers such as CDP, MSCI, S&P Trucost, Sustainalytics, Refinitiv, Bloomberg and others have amalgamated dispersed carbon disclosures into more standardized data. They also provide estimates of carbon emissions for companies that do not disclose, based on what is known about the carbon intensity of their operations or industries. For indirect emissions, they use input-output models to determine emissions in the value chain, both upstream and downstream. The availability of these data have greatly facilitated research in this area. Their availability, however, also imply that investors have access to information on companies' (estimated or presumed) emissions even in the absence of corporate reporting or reporting standards.

a. Evidence from voluntary carbon emissions disclosure

The number of listed companies that voluntarily disclose their carbon emissions is quite small relative to the universe but has been steadily rising around the world. The most recent evidence by Aldy et al. (2023) finds that there has been a consistent and steady increase in GHG emissions disclosure, across all scopes, from 2010 to 2020 by US listed companies. About a quarter of all large cap U.S. firms currently provide some climate disclosure (Scope 3 rates still sit below 10%). However, major sectoral variation exists in disclosure rates.

Interestingly, carbon-intensive corporates in the utilities, energy, and materials sectors disclose at much greater rates than those in lower carbon-intensive sectors. This pattern could reflect that firms in other

[6] IFRS S1 sets out general requirements for the content and presentation of information about sustainability-related risks and opportunities that is relevant for investors. Disclosure standards relate to the governance process, the strategy adopted by the company to manage sustainability risks and opportunities and performance. IFRS S2 sets standards specifically for climate disclosure: "IFRS S2 requires an entity to disclose information about climate-related risks and opportunities that could reasonably be expected to affect the entity's cash flows, its access to finance or cost of capital over the short, medium or long term (collectively referred to as 'climate-related risks and opportunities that could reasonably be expected to affect the entity's prospects')." These disclosures involve information on the exposure to climate-related physical and transition risks as well as climate-related opportunities available to the entity and follow the principles laid out in IFRS S1.

industries find that they do not have much to gain by disclosing GHG emissions when their operations are known to generate low emissions. One important question is whether voluntary disclosure subsequently leads to emissions reductions. Aldy et al. (2023) find that companies disclosing emissions data have, on average, 21% lower emissions in the year following the disclosure, compared to those that do not disclose. Initiating a CDP pledge has no statistically significant correlation with future emissions levels, though firms that have signed SBTi commitments, on average, have 21% lower emissions the following year compared to those without these commitments. All these relations most likely reflect selection effects given that firms with lower emissions are more likely to disclose and make SBTi commitments in the first place. Consistent with this interpretation, Aldy et al. (2023) find that disclosure of GHG emissions is a predictor of future decarbonization commitments, as firms that have voluntarily disclosed their emissions have a 48% greater probability of making a future pledge. In light of the selection effects, the question of real effects of carbon emissions disclosure is difficult to answer by voluntary disclosure studies. We therefore come back to this question below when discussing mandatory disclosure studies.

Voluntary disclosure studies in turn are useful to shed light on the existence of certain costs and benefits from corporate disclosure and and reporting (Leuz and Wysocki, 2016). Generally speaking, firms do not disclose voluntarily when the costs exceed the benefits. In this regard, it is interesting to note that in Aldy et al. (2023), no more than 12% of listed companies globally disclose their carbon emissions.

A separate question is whether disclosure has an effect on the cost of capital. There is some evidence that carbon disclosure lowers firms' cost of capital. Aldy et al. (2023) explore the valuation effects of carbon disclosure for Russell 3000 companies by linking carbon emissions to price-to-earnings ratios and by estimating the extent to which companies can undo the valuation discount associated with carbon emissions by voluntarily disclosing their emissions. Confirming other work by Bolton and Kacperczyk (2021b), they find a statistically significant negative relationship between Scope 1 emissions and P/E ratios. Furthermore, they find that disclosing Scope 1 emissions offsets a portion of this valuation discount. They estimate that a firm is expected to have an 0.6% higher P/E ratio as a result of disclosure, meaning that the increase in disclosure can offset 48% of the P/E discount tied to emissions. They also find that the valuation effects of disclosure vary significantly across sectors. Emissions-intensive sectors (energy, industrials, materials, and utilities) all show outsized valuation boosts from disclosure relative to less carbon-intensive industries. When it comes to decarbonization pledges, Aldy et al. (2023) find that corporate pledges produce the same directional valuation effects as disclosure, but at a much smaller magnitude and with limited statistical significance.

In addition, there is evidence that investors value information about carbon emissions and more broadly information about firms' environmental impacts, including their ESG scores. Based on a survey of institutional investor preferences on carbon disclosure, Ilhan, Krueger, Sautner, and Starks (2020) find that the majority of respondents put equal weight on carbon disclosure as on financial disclosure. Respondents also believe that under-reporting of climate-risk leads to mispricing. They supplement the survey study with an empirical analysis of the determinants of carbon disclosure and show that firms are more likely to disclose if they have higher institutional ownership.

How can we reconcile the evidence on the low prevalence of voluntary carbon emissions disclosure with the evidence that carbon disclosure lowers firms' cost of capital and that investors value carbon emission information? One basic explanation from the literature is related to selection: Companies are more eager to disclose good news than bad news. By that principle, the companies that have chosen not to disclose are more likely to be companies that have something to hide. They are also more likely to have higher

emissions than investors have estimated and prefer to keep that information private. Another potential explanation is that companies do not want to disclose information that could give a competitive advantage to their competitors. Although it is possible that there is some strategic information content in the disclosure of carbon emissions, this explanation seems a priori less likely. Yet another explanation could be that carbon emissions disclosure involves substantial transaction costs. This is more likely to be the case for smaller companies, as disclosure involves a fixed cost. Yet, one may wonder whether these costs are commensurate with the P/E discounts these companies incur by not disclosing. A more indirect cost to firms could be that disclosed emissions make it easier for institutional investors to implement exclusionary screens based on carbon emissions.

b. Evidence from mandatory carbon disclosure

Carbon emissions reporting has become mandatory in a growing number of jurisdictions and several studies have been undertaken to measure the effects of mandatory carbon disclosure. In these settings, the effects of carbon disclosure can be identified by comparing outcomes for a treatment group of companies forced to disclose relative to a control group that comprises companies that are excluded from the regulation or companies that are already voluntarily reporting their GHG emissions.

One of the earliest mandates is the U.S. GHG Reporting Program, which requires emissions reporting for thousands of manufacturing facilities, starting in 2010. Tomar (2023) studies this requirement and finds that facilities reduce emissions by roughly 8% once forced to disclosure. He also explores the mechanism for the reduction and finds evidence consistent with peer learning and benchmarking. That is, facilities are able to assess their relative GHG performance once they can observe peer disclosures.

Most of the other studies examine the introduction of mandatory carbon disclosure in the U.K. in October 2013. The studies find that mandatory carbon disclosure affects both firms' financial performance and their emissions, thereby providing evidence on the real effects of disclosure rules.

- Jouvenot and Krueger (2019) show that U.K. listed firms have decreased their emissions after 2013 relative to a control group of firms listed outside the U.K. on European exchanges.
- Similarly, De Bettignies, Liu, and Robinson (2020) conduct a difference-in-difference analysis around the introduction of the U.K. carbon disclosure regime. They highlight the policy requires firms to at least try to obtain information about their emissions, but leaves them with the option not to disclose their GHG emissions by claiming that it is not "practical" for them to obtain this information. They show that increased private signal availability (due to required measurement) can discipline and lower CSR engagement.
- Downar et al. (2021) perform a difference-in-differences test around the U.K. mandatory carbon disclosure regulations and find that the firms that were required to disclose, subsequently reduce their emissions relative to a control group of European firms. They also find that the emission reductions did not affect their profitability.
- Bolton and Kacperczyk (2021c) consider a different design for the difference-in-differences test around the U.K. mandatory carbon disclosure regulations. They exploit the fact that before carbon disclosure was mandated, a significant fraction of U.K. companies was already voluntarily disclosing carbon emissions. These companies can be thought of as a control group, given that they were already in compliance with the new regulations. The treated group is then composed of all the other companies that had not previously disclosed their emissions and that began disclosing after 2013. By looking at the differential effects of the new rules between the two groups, Bolton and Kacperczyk

(2021c) find that the effect of mandated disclosure on the treated firms has been to reduce the cost of capital for these firms. Also, among the newly disclosing firms the ones with the largest levels of emissions have seen their cost of capital increase. They also find that both stock price volatility and turnover of the treated stocks decrease after mandatory disclosure, indicating that disclosure reduces uncertainty. In addition, Bolton and Kacperczyk (2021c) explore the spillover effects of the UK mandatory disclosure law on other jurisdictions. They find surprisingly strong spillover effects. The largest effects are on European companies, but even Asian companies are affected.

Thus, on the question of real effects from mandatory carbon disclosures, the evidence suggests emission reductions on the order of 8-15%.

In closing, we note that studies on mandatory corporate sustainability reporting and standards are starting to emerge. For example, Lin et al. (2024) provide systematic evidence on the evolution of E&S disclosure in annual reports over the past two decades and shed light on how voluntary and mandatory standards have shaped global E&S reporting practices. Their results asuggest that E&S disclosure quality improves after the adoption of voluntary ESG reporting frameworks but deteriorates after disclosure mandates. The latter likely reflects that firms with poor (private) reporting incentives are forced to disclose by the mandates. Krueger, Sautner, Tang and Zhong (2024) analyze mandatory ESG disclosure around the world with respect to stock market liquidity. They document a positive effect of ESG disclosure mandates on firm-level stock liquidity. The effects are strongest if the disclosure requirements are implemented by government institutions, not on a comply-or-explain basis, and coupled with strong enforcement by informal institutions. Overall, these two studies reinforce the conjectures of the effects of mandatory CSR reporting discussed earlier.

c. Carbon data limitations

As much as the GHG protocol has helped in standardizing the measurement and aggregation of carbon emissions from operations, there remain important limitations in the accurate measurement and reporting of corporate carbon emissions. All carbon emissions data providers rely on the GHG protocol, so much so that their data on direct emissions are broadly comparable. However, this is far less the case for indirect (scope 3) emissions. One study by Busch, Johnson, Pioch, and Kopp (2022) has found that the correlation in direct (scope 1 & 2 emissions) data across data providers is very high for reported emissions, indicating that all the data providers essentially take the reported numbers at face value. The correlation is high for estimated emissions, which suggests that the methodology for estimating direct emissions is robust. However, there is substantial disagreement among data providers on corporate indirect (scope 3) emissions. The problem with estimating indirect emissions is that for many (unlisted) companies in the supply chain there is no accurate data available on their direct emissions. Moreover, determining indirect emissions ultimataley involves an attribution problem, which the data providers resolve by using propriatory input-output methodologies. Given that they do not follow the same methodologies, it is not surprising that there is substantial variation across data providers in their scope 3 estimates. This is an important open issue for carbon disclosure policies. Should corporations be required to report scope 3 (upstream and downstream) emissions? If so, should they do their own analysis or can they rely on the estimates of data providers? Who is best placed in determining indirect emissions, the individual corporations, or data providers who can rely on large carbon emission data sets and deploy sophisticated input-output methodologies? If scope 3 emissions are obtained from data providers, how should the discrepancy in estimates be addressed? In the interest of maximizing data integrity, it is tempting to simply leave out indirect emissions and only focus on what can be accurately measured. But

this would result in highly distorted measures of corporate carbon emissions, since in some sectors like energy, most of the corporate emissions are indirect. This suggests that any carbon disclosure regulation/standardization may require sectoral adjustments.

The evidence of Aldy et al. (2023) suggests that there is still too much uncertainty about the informational content (or the credibility) of corporate decarbonization pledges, which could explain why there no clear valuation effects associated with commitments to decarbonize.

An important under-researched issue is the extent to which standardization of carbon emissions reporting is impeded by the current GHG protocol, which gives companies substantial discretion on what GHG to include, and how they aggregate and classify their emissions. Indeed, under the GHG Protocol companies can choose between operational and financial control definitions to classify their direct and indirect emissions. Similarly, the scope of all the relevant GHG the company should report is also subject to companies' discretion. The GHG protocol is 20 years old and is currently in the process of being revised. There may be substantial benefits from an in-depth update of the protocol and from streamlining and better standardizing the calculation of scope 1 and 2 emissions (see Comello et al. 2023 for a discussion of the GHG protocol and the proposal to adopt a time-consistent corporate carbon reporting standard).

Finally, an important gap in carbon disclosures relates to estimates of the potential future emissions of companies. For energy companies, this potential is related to their (proven) reserves. But carbon emissions from extracting and burning all these reserves far exceed the IPCC global carbon budget estimates compatible with a 1.5^0C or 2^0C warming limit. They also exceed total cumulative emissions associated with NZ targets. This means that not all reserves are likely to be extracted, but energy companies are valued on the assumption of full extraction. Accordingly, as multiple studies have pointed out, a significant fraction of reserves are stranded assets. This exposes investors to stranded asset risk. The latest estimates are that up to $557 trillion of assets may become stranded.[7] Currently companies are reluctant to disclose their estimates of stranded assets, exposing investors and others to substantial risk.

4. Takeaways and Issues for Discussion

Our review draws several lessons emerging from the still young literature on sustainability reporting and the more mature one on financial reporting.

We highlight the following issues as relevant and likely to be key for the trustees' strategic discussion on the future of the work of the ISSB and its success.

The first issue is that, although the existing evidence on financial reporting and the emerging evidence on sustainability reporting suggest that standards will have significant capital market and real effects, the magnitude of these effects is hard to predict. Much depends on the materiality concepts of the standards, especially when it comes to real effects. Moreover, not all capital market and real effects will be positive or intended, even when the standards focus solely on the information needs of shareholders

[7] See https://www.thisismatter.com/insights/stranded-assets-an-emerging-challenge-for-professional-investors

and on financial materiality. Thus, standard setting requires careful consideration of potential positive and negative effects.

A second issue is that the effects of standards crucially depend on the institutional infrastructure in which they are embedded or implemented. Standards alone may not matter much if this eco-system is under-developed. For one, the effects of standards depend crucially on their enforcement and hence on countries' legal frameworks, financial regulations, oversight institutions, regulatory agencies, and assurance mechanisms like auditing. But it is not just a matter of enforcement. The institutional infrastructure broadly understood also shapes firms' reporting incentives, including the way firms exercise discretion left by the standards. Considering these incentives is crucial because the harmonization of reporting practices is one of the key benefits of (mandatory) reporting standards (e.g., by which they help capital allocation). However, the existing heterogeneity in reporting incentives, including the fact that companies are mindful of costs, implies that standards are unlikely to achieve harmonized reporting practices when firms' incentives to report and how to report continue to vary across different jurisdictions (and across firms of different scale).

The second issue suggests that focusing exclusively on the adoption of standards as a measure of success might be the wrong approach or insufficient. The success of standards ultimately depends on the quality of the information that firms provide to their users as a result of the standardization. Consistent with this notion, the Foundation's constitution defines its mission as enhancing the decision usefulness of information. These arguments imply that a framework for the evaluation of the degree of success of the ISSB (and the IASB for that matter) must include the evaluation of the quality of the ecosystem and how standards contribute to this eco system. This also suggests that the development of a constructive relationship with other regulatory agencies should be considered a key priority for the Foundation.

A third issue is cost considerations, as reporting standards can have substantial implementation costs for firms. Unfortunately, there is very little research that allows us to quantify these costs (beyond their existence). Moreover, these costs likely differ across company types and jurisdictions, creating a tradeoff between how extensive/expansive standards are and their efficiency. The IFRS should devote more resources to studying this topic further and establish criteria for the pace of ISSB implementation, the scope of mandatory reporting and the coverage of company types (e.g., size, listing). In this regard, focusing on materiality (what matters to users), the quality of the reported information, and what ultimately creates value) and quality of the standards is key. Importantly, cost, enforcement and incentive considerations imply that there is a tradeoff between expanding the adoption and coverage of the standards and the quality of the reporting. Moreover, differences in countries' institutional infrastructures and firms' reporting incentives implies that the same (or common) standards are applied differently across countries and firms, which in turn could lead to less (rather than more) convergence in practices overall.

In sum, our recommendation is to use these considerations as a basis to discuss and design a set of criteria that the Foundation can use to evaluate its success. We argue that these criteria should be broader than just the breadth and speed of adoption and we note that establishing these criteria is important as they ultimately are or should be the basis for any post-implementation review of the standards. Moreover, having established these criteria will help the Foundation to communicate the purpose of the standards as they are issued so that internal and external evaluation can be performed in a transparent way. Finally, recognizing that, while standards serve both preparers on the one hand and

investors and other users on the other, there should nevertheless be a rebalancing towards the latter for whom comparability is an important concern.

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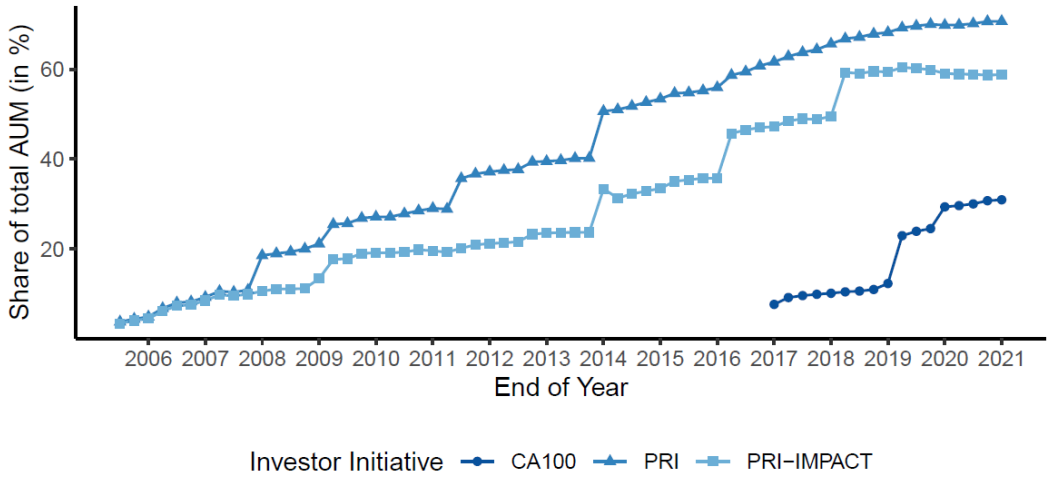
Appendix: Responsible investment and the pricing of carbon risks

To put the discussion on the economic consequences of CSR standards on capital markets and the economy in a broader context, it is useful to discuss some evidence on responsible investment and the extent to which climate risk is reflected in corporate valuations.

There has been a phenomenal rise in responsible investing in the first two decades of the 21st century partly as the result of multiple responsible investor initiatives with growing numbers of institutional investor signatories. The chart below reports the evolution of the share of assets under management (AUM) classified as "sustainable" from 2006 to 2021 as reported in Wiedemann (2023). The chart reports the proportion of assets under management by companies which are signatories of the principles of responsible investment (PRI), IMPACT-PRI (the impact investing sub-set of the PRI group) and Climate Action 100+ (CA100+)[8], relative to total institutional assets under management.

Figure 1: Sustainable investment over time



Source: Wiedemann (2023)

Responsible investing can affect firms' green capital expenditures through two channels: lowering the cost of capital for green projects due to the higher demand (e.g. Heinkel, Kraus, and Zechner, 2001; Bolton and Kacperczyk, 2021; Pástor, Stambaugh, and Taylor, 2021) and through corporate engagement and divestment, i.e., investors entering into discussions with management to push for green capital expenditures (e.g. Broccardo, Hart, and Zingales, 2022; Biais and Landier, 2022; Chowdhry, Davies, and Waters, 2019; Oehmke and Opp, 2022) or divesting from brown firms when their engagement efforts fail (Becht, Pajuste, and Toniolo, 2023). Active governance allows shareholders to introduce internal governance mechanisms to direct managements' capital expenditure decisions.

However, the evidence on the impact of ESG on stock prices and carbon emissions has been disputed. Bolton and Kacperczyk, 2021a, 2023a find consistent evidence that both direct (scope 1) and indirect

[8] The CA100+ initiative is an investor initiative which is considered to be relatively rigorous as it requires investors to engage with target companies' management on decarbonization.

(scope 2 and 3) lagged carbon emissions have a positive association with stock returns after controlling for all other risk factors and company characteristics that can be expected to influence stock returns. In other words, companies with higher levels of carbon emissions, or higher growth rate in emissions, tend to have higher stock returns, holding other things equal. They interpret these higher stock returns as compensation for bearing carbon transition risk exposure demanded by investors. They refer to the higher returns for higher emissions as the carbon premium. In their second study they explore whether this carbon premium is present in other countries than the US, and find that a significant carbon premium has emerged in the years following the Paris Climate Agreement in almost all the 77 countries covered in their study (which includes nearly 15,000 listed companies). A key observation from their analysis, which is relevant for the debate over the impact of ESG, is that the carbon premium is not related to emission intensity, defined as the ratio of carbon emissions to sales revenue, but to the level of emissions and the growth in emissions[9]. Another important observation is that the carbon premium is present in all industries, not just the energy, utility, and transport sectors.

Other studies, in particular Cheema-Fox t al., 2021 and Pastor et al., 2021 reach somewhat different conclusions. Indeed, Cheema-Fox et al., 2021 estimate the returns of portfolios that are long on firms with low carbon intensity and short on firms with high carbon intensity and find positive returns for these portfolios in some sectors and negative returns in others. They view these findings as confirming the hypothesis that stock prices have been gradually adjusting to take account of the transition risks that have been rising as a consequence of regulatory and technological changes. Their portfolio construction is designed to capture the effects of differences in industry and technological characteristics that are correlated with carbon intensity, but it cannot capture within industry differences across firms in terms of their carbon emissions.

Pastor et al. (2021) take a similar approach to identify what they call a "greenium"—a premium on stocks of green companies—rather than a carbon premium. Their analysis covers U.S. listed companies from 2012 to 2020. They classify stocks as "green" and "brown" not on the basis of their emissions, but on their MSCI ESG rating and find that a portfolio of green stocks generated much higher returns than a portfolio of brown stocks over this period. Their findings on returns on green and brown portfolio are reported in Figure 2.

Figure 2. Returns on green and brown portfolios

[9] A note of acution is that these effects are quite uncertain since estimated emissions are projected from firms' financial information.

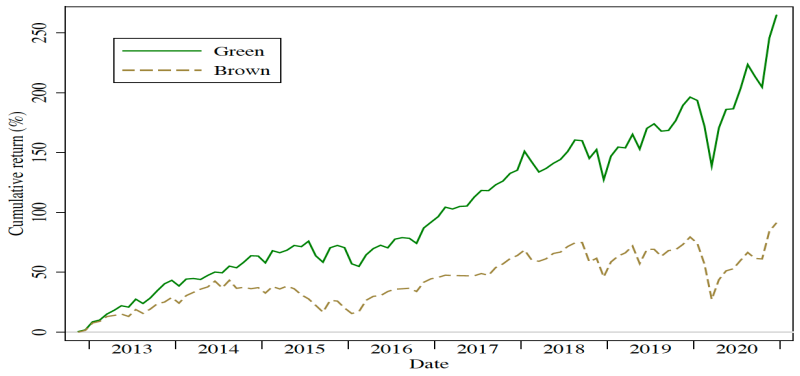
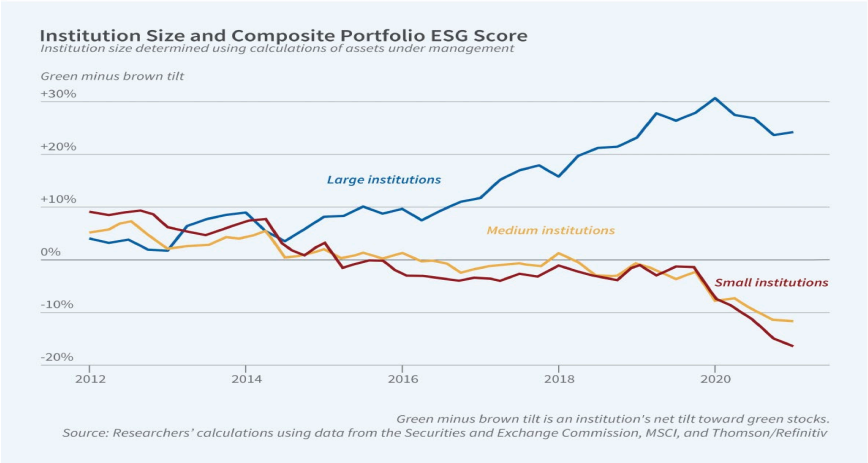


Figure 3. Returns on value-weighted green and brown portfolios. This figure plots the green and brown portfolios' cumulative returns. The values of the green and brown lines at the end of 2020 are 264.9 and 91.3, implying green stocks outperformed brown by 264.9 − 91.3 = 174 percentage points over this period.

Source: Pastor et al. (2021).

The finding has often been interpreted as evidence that there is no carbon premium; that the opposite is true, that there is a greenium reward in the form of above-market returns for investors holding green companies. But Pastor et al., 2021 caution against such an interpretation, noting that such "outperformance likely reflects an unanticipated increase in environmental concerns." In other words, these returns are best viewed as reflecting a one-time market recognition and adjustment process; and as part of such a process, those returns are unlikely to be repeated in the future, and thus should not be viewed as a component of expected returns going forward.

The point about the evolution of investor preferences towards greater concerns over sustainability has been refined in a recent study by Pastor et al. (2023) that estimates the tilt towards green portfolios by institutional investors. The tilt is computed by comparing the actual portfolio holdings with a counterfactual that describes what their portfolio holdings would have been in the absence of any ESG considerations. Figure 3 shows the green-minus-brown tilt:



Source: Pastor et al. (2023)

The results suggest that about 6 percent of US equity investment allocations represent ESG tilt, a much lower figure than the percentage of total assets that are held by institutions that subscribe to ESG principles. The extent of green tilt is positively related to the assets under management of the 13F-filing institution. It is also greater for institutions — accounting for 76 percent of the assets under management in the sample — that have signed the United Nations' Principles for Responsible Investment. In other recent research, Bolton et al. 2024 find that, although there is significant underweighting of companies with higher carbon emissions by institutional investors, this underweighting is mostly of foreign companies with high carbon emissions. If anything, there is overweighting of domestic companies with high carbon emissions, albeit by a smaller magnitude. These findings reveal the presence of a carbon home bias for domestic companies with high carbon emissions and highlight that ESG tilts may have overly impacted capital flows to EMDEs.

The existence of a relation between stock returns and carbon intensity is disputed. Based on a cross-section of US listed companies, Aswani et al., 2021 find that, when limiting the sample to companies that disclose their emissions (rather than the full sample of firms with disclosed and estimated emissions), there is no relation between emissions and stock returns. They conclude from that that the carbon premium is entirely caused by biases in emission estimates for companies that have not disclosed their emissions. For those companies, emissions are projected by financial numbers and these numbers are related to stock returns so that the carbon premium reflect this correlation. However, in their analysis of the effects of (voluntary and mandatory) carbon disclosure, Bolton and Kacperczyk (2021b) find that the carbon premium for companies that disclose their emissions, although smaller than that of non-disclosing companies, is positive and highly statistically significant. As they point out, a smaller carbon premium is to be expected if only because disclosure reduces uncertainty for investors, especially in the case of reported yearly growth in emissions, which cannot easily be predicted based on the level of past emissions. The claim of Aswani et al., 2021 that the carbon premium is an artifact of carbon emissions estimation biases must also be set against the parallel trends of both a rising carbon disclosure rate and a rising carbon premium in the years following the Paris Climate Agreement. That is, despite the rise in the fraction of companies that disclose their emissions, the average carbon premium has increased. Also, although disclosure rates vary a lot across countries, Bolton and Kacperczyk (2021b) find that the carbon premium is very similar across countries.

The pricing of carbon transition risk can be looked at by linking stock returns to (lagged) carbon emissions, or by looking at how market-to-book and price-earnings (P/E) ratios are associated with carbon emissions. Bolton et al., 2022 complements the analysis of Bolton and Kacperczyk (2021a, 2023) by exploring how corporate GHG emissions are associated with P/E Ratios in the US and in Europe. They find that the level of carbon emissions has had a significant and increasingly negative impact on price-to-earnings ratios. They also find that P/E discount is much larger in some sectors (it is largest in the highest-emitting sectors) and for large companies. Comparing carbon discounts for U.S. and European companies, they also find that the P/E discounts are similar for large-cap companies, but are significantly larger for smaller-cap U.S. companies than for their European counterparts.

It should be stressed that, in the absence of a comprehensive standardized disclosure regime, investors can only have a blurred view of a firm's climate impact and how it compares to other firms' impacts. The lack of a standardized measurement framework also induces firms to communicate on a range of metrics, including GHG emissions, water usage, total waste, green revenue, natural capital levels, ESG scores, and other information of climate-related physical or regulatory risk exposure. Unsurprisingly, the choice of

metric isn't altogether random: in a study of seven large firms' carbon emission reduction goals and reporting of their progress toward those objectives, Comello et al., 2021 found that firms' definitions of certain metrics in their calculation of their carbon footprint were strategic, and their choices were typically influenced by their emissions profile which in illustration of the point made earlier that incentives shape reporting practice.

Beyond communicating information about their climate impact and carbon footprint, corporations have increasingly made pledges to decarbonize, providing indications to investors about the future evolution of their carbon footprint. There has been minimal empirical work on corporate pledges and how they fit in with corporations' broader sustainability communication strategy. Bolton and Kacperczyk (2023) offers a mixed outlook: companies that make commitments do indeed reduce their subsequent emissions, but not by much. Moreover, the firms that are most likely to commit and make the most ambitious commitments are typically companies with lower carbon emissions in the first place. Again this result highlights the strategic nature of firms' disclosure.

Given this evidence, it seems that information on firms' GHG emissions, climate risks and exposures is likely useful to investors. However, the literature is not yet settled. As standards will be adopted more widely, more data will be available to firmly establish facts.