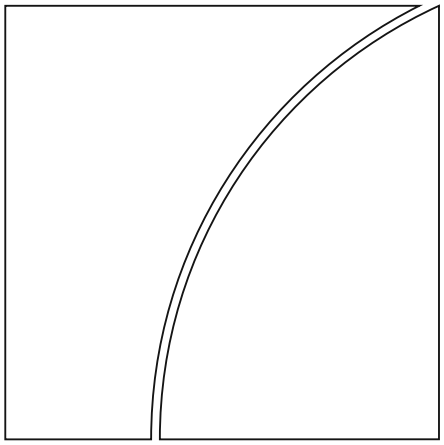

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Information governance in sustainable finance[1]

Sirio Aramonte and Frank Packer*

Abstract

Financial markets depend on information flows that facilitate capital allocation. Information governance is the set of regulatory provisions designed to mitigate conflicts of interest that could interfere with these flows, so to ensure that all market participants receive a baseline of reliable information. In this paper, we discuss ways to enhance information governance in sustainable finance, a sector of funding markets that, in addition to financial returns, considers social and environmental benefits. We adapt lessons from research in traditional finance to the unique features of sustainable finance. In particular, assessing the impact of corporate actions on a wide variety of stakeholders requires specialised data and knowledge. This observation has broad implications for disclosures, assurance, ratings and for the role of public bodies in information production. Adequate governance can also help market participants to gauge more accurately how much financial markets can contribute to achieving sustainability outcomes.

Keywords: sustainable finance, disclosures, ratings, governance.

JEL classification: G14, G28, G38.

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1. Introduction

To function properly, the financial system depends on information flows that facilitate capital allocation. These flows comprise information disclosed by companies that raise funds, collected and disseminated by third-party intermediaries such as rating agencies, and privately acquired by individual investors. The first two channels are often subject to regulations to ensure that market participants, including the less sophisticated ones, receive a baseline of reliable information. These regulations are the bedrock of *information governance* in financial markets.[2] They are designed to contain *market failures*, which arise from the inability of private contracting to fully contain opportunistic behaviour in the information-production process. Instead, regulatory provisions are needed to constrain actions and, in turn, curb the incidence of conflicts of interest.

In this paper, we focus on information governance in sustainable finance, a sector of funding markets that, in addition to financial returns, considers social and environmental benefits. In such a context, the production of accurate information is particularly useful in addressing excessive pollution, which is the quintessential "tragedy of the commons". Governments, firms and households over-pollute because they do not pay the full price of their actions. Information produced by financial-market participants can help to set the appropriate price for externalities (eg carbon taxes), thus enhancing the sustainability of economic activity.

At a high level, there are many points of contact between information governance in sustainable finance and in traditional finance. In both cases, the key objective is to ensure the integrity of corporate disclosures and of various types of external ratings. At the same time, new challenges emerge from the novelty of sustainable finance and the complexity of the information needed to gauge its impact. In this context, the main risk is greenwashing, whereby companies or raters disclose biased information for financial benefits such as business volume. By improving information quality, governance frameworks can help steer funds towards objectives consistent with sustainability preferences and policy objectives, all the while mitigating the risk of capital misallocation that can, eventually, affect financial stability (Borio et al (2022)).

Our work has two main thematic points. In one, we draw on the traditional literature on the governance of information produced about companies that issue securities in public capital markets – chiefly in relation to corporate disclosures and credit ratings – and show its relevance to sustainable finance. In another, we draw on more recent literature related to sustainable finance and lay out policy recommendations that are useful for information production in the area. In related work, Christensen et al (2021) compile a broad survey of the research on corporate disclosures, distilling lessons applicable to sustainability reporting. The key difference

[2] Shleifer and Vishny (1997) define corporate governance in terms of agency problems between investors and managers. The issue arises from asymmetric information and contract incompleteness (Grossman and Hart (1986)), which imply that managers have significant discretion in how to conduct business. While this flexibility is essential for the operation of a company, it could also be used to misappropriate value that should accrue to investors. The presence of legal protections that limit managerial behavior most at risk of conflicts of interest, such as self-dealing, is a key element of governance.

lies in our focus on the governance of the information-production environment, which includes firms, rating agencies, providers of third-party assurance, as well as regulators.

Our paper is related to the work undertaken by public bodies and stakeholder coalitions to develop guidelines that improve the information available to sustainable finance investors. The IMF underscores the need for a strong "climate information architecture" built on data availability, disclosure standards and classification approaches (Ferreira et al (2021)). Our focus on how to address market failures complements the IMF's framework, particularly from the perspective of disclosures. In general, policymakers emphasise the need to improve data collection and, in particular, comparability across jurisdictions (FSB (2021), OECD (2022), TCFD (2017)). Similarly to our work, IOSCO (2021a) highlights that the accuracy of sustainable finance ratings could be adversely affected by potential conflicts of interests between raters and rated entities. As discussed by NGFS (2022b), external review plays an important role in ensuring that securities issuance and use of proceeds align with the declared criteria.[3]

Enhancing the availability of high-quality information in sustainable finance is particularly important for two reasons. The first is that, as some investors exhibit a strong preference for companies with a well-developed sustainability profile, inaccurate assessments can lead to substantial investment inefficiencies. The second is that governments and central banks have increasingly expressed interest in deploying public resources to bolster sustainable finance, amplifying the risk of capital misallocation if information is imprecise. We provide additional details on each topic in the remainder of the introduction.

Investors show a preference for sustainable investments, effectively leading to segmented markets where optimal portfolios depend on company sustainability (Pedersen et al (2021)). This segmentation, which is particularly strong for securities certified by external third parties (Baker et al (2018)), is a form of product differentiation (Albuquerque et al (2019)). The preference for sustainable securities is driven by non-monetary considerations (Bauer et al (2021) and Riedl and Smeets (2017)), since first-principles arguments posit that sustainable investments are bound to achieve lower financial returns (Oehmke and Opp (2022), P´astor et al (2021)). Correspondingly, equity valuations tend to be higher than intrinsic values for firms focused on sustainability (Bofinger et al (2022)). High realised returns in recent years have reflected elevated demand pressure (Bialkowski and Starks (2016), Bansal et al (2022), P´astor et al (2022)).

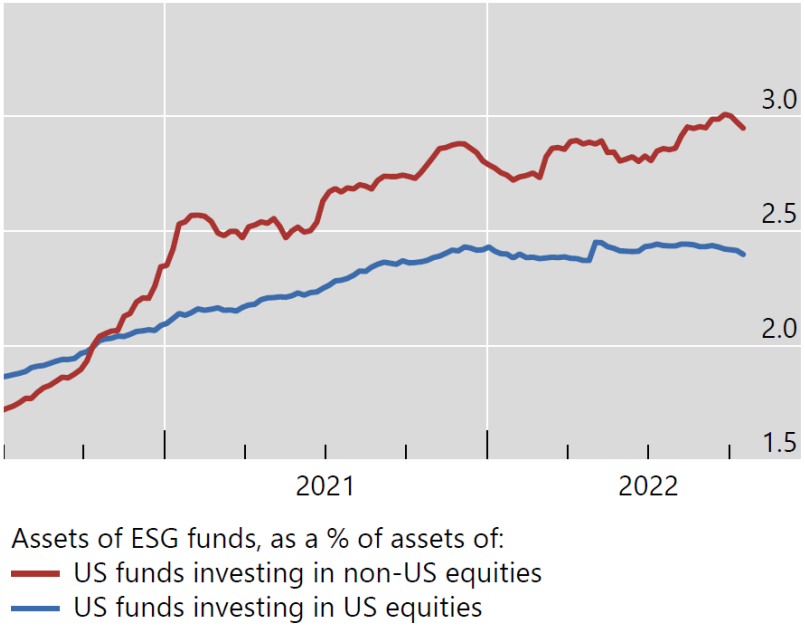
Strong investor demand for sustainable investments is often routed through mutual funds and exchange-traded funds. To bolster their own sustainability ratings and gain inflows, funds shift holdings towards less polluting companies (Ceccarelli et al (2021)). However, even if non-pecuniary benefits are a significant incentive (Hartzman and Sussman (2019)), performance ratings remain important, and hence the reallocation fades over time as funds avoid purchasing more richly valued firms (Gantchev et al (2021)). In some instances, companies held by mutual funds have a less benign sustainability profile than implied by ratings, since corporate

[3] Financial regulators have undertaken work focused specifically on their supervised entities. Disclosures are an important element being considered for the banking and insurance sectors (BCBS (2022) and IAIS (2020)). For asset managers, IOSCO (2021b) recommended considering the development of dedicated supervisory assessment tools.

commitments to sustainability do not always lead to commensurate actions (Raghunandan and Rajgopal (2021), Raghunandan and Rajgopal (2022)). Investor preferences about sustainable securities also feed into liquidity management by mutual funds, which are exposed to daily redemptions even when investing in illiquid assets. In particular, funds tend to sell bonds issued by firms with higher carbon emissions due to concerns that redemption risk is more elevated when holding these bonds (Cao et al (2022)). Crucially, investment funds focused on sustainability represent a meaningful and growing share of international capital flows (Graph 1), highlighting the importance of cross-country consistency in the production of sustainability-related information.

Investors use information about a company's sustainability profile in different ways. At one end of the spectrum, they divest from firms that do not meet certain thresholds. In general, this approach appears to have only a limited effect on the cost of capital (Berk and van Bisbergen (2022)), although investment approaches that regularly exclude the most polluting firms can deliver the same risk-adjusted returns with a dramatically lower carbon footprint (Jondeau et al (2021)). Further, while high sustainability ratings do not necessarily encourage long-term flows to funds obtaining those ratings (Gantchev et al (2022)), a precipitous reduction of funding to assets with a low sustainability profile can affect financial stability (Borio et al (2022)). On the opposite end of the spectrum, investors can engage with firms in their portfolios in a coordinated fashion (Dimson et al (2015) and Dimson et al (2021)). By doing so, they push for improved sustainability profiles while allowing firms to maintain funding access (Edmans et al (2022)). Banks with relatively high sustainability ratings play a similar role through their lending relationships (Houston and Shan (2022)).

Sustainable finance and international capital flows — Graph 1



The panel shows the assets managed by funds classified as focused on environmental, social, and governance (ESG) issues, expressed as a share of overall assets held by the indicated fund categories. The data are from EPFR, and the sample covers July 2020 to October 2022.

Government policies can also benefit from enhanced information flows in sustainable finance. In particular, public authorities can more readily aim for reductions in the cost of capital for less polluting firms or investments.[4] One approach entails outright purchases of the relevant securities. For instance, the European Central Bank changed its monetary policy framework to explicitly include climate change considerations, partly to support the transition to a climate neutral economy (ECB (2022)). More broadly, ensuring that climate risks are properly reflected in credit ratings, which are an important factor in central-bank asset purchases, would indirectly boost the relevance of sustainable finance for monetary operations (NGFS (2022a)). Another approach entails de-risking sustainable finance instruments purchased by the private sector, typically through partial loss absorption by public bodies (eg, G20 (2021)). In all these cases, appropriate governance can improve information accuracy and benefit the public sector.

Adequate information governance can also help to gauge more accurately what sustainable finance can achieve and, in particular, to what extent it can lead – rather than support – efforts to achieve sustainability outcomes (Borio et al (2022)). Risks to both financial stability and to the long-term robustness of the green transition are thus reduced by information governance, since it helps to ensure that investor enthusiasm and fund managers' desire to generate fees do not run too far ahead of any documented benefits.

In the remainder of the paper, we first sketch the flows of information about security issuers in financial markets via corporate disclosures and information intermediaries (Section 2). We identify similarities and differences in the nature of these information flows in sustainable versus conventional financial markets. In the subsequent section, we review common market failures in corporate disclosures and ratings provision, as well as the governance mechanisms used to address them (Section 3). We then conclude with policy recommendations for sustainable finance, based on the relevant lessons learned from the literature on information governance (Section 4).

2. Information flows in financial markets

Investors acquire information about the companies they finance through a variety of channels. Besides private efforts, they rely on corporate disclosures, information intermediaries (eg rating agencies), and financial intermediaries (eg banks) that provide advice or use market intelligence when managing client money (Healy and Palepu, 2001). In the remainder of the paper, we focus on corporate disclosures and information intermediaries, since, for entities such as banks, information production is woven into their core processes (Holmstrom and Tirole (1997)) and directly affects their profitability. As a result, and also thanks to the extensive regulatory framework

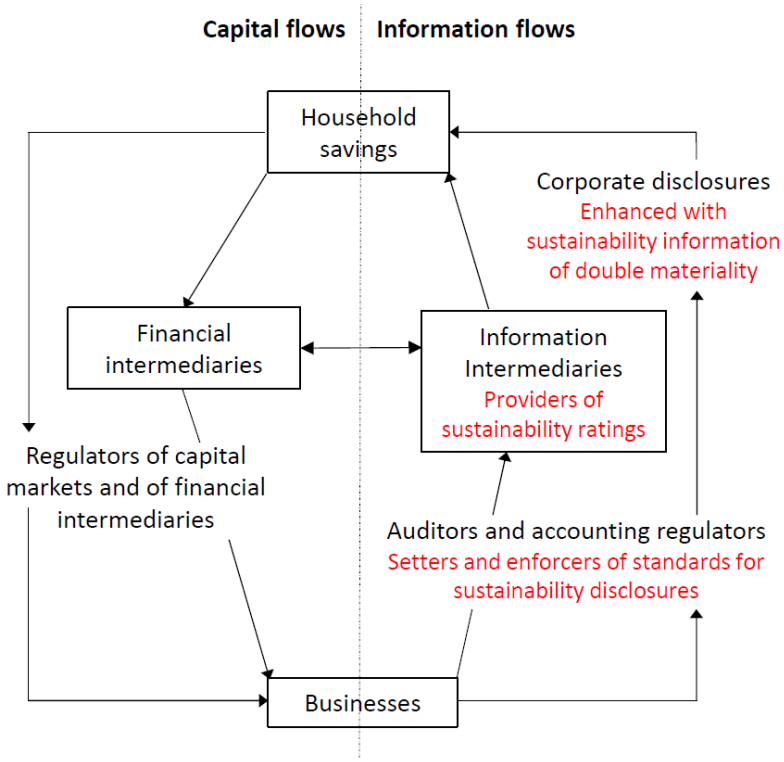
[4] Here we focus on public activity where the government is reducing the costs of financing for sustainable investment for private firms, rather than public sector green expenditures (eg on carbon emissions reduction) per se. Under certain assumptions, public sector allocations will not have the same information problems due to conflicts of interest as those of the private sector, they will also incorporate the value of social returns, although they still will face technical issues of validation and they will frequently need to depend on private external experts to assess the impact on sustainability.

to which they are subject, market failures are less likely.[5] In Graph 2, which largely reproduces Figure 1 in Healy and Palepu (2001), we highlight the key intermediaries and activities that contribute to information production in sustainable finance.

2.1 Corporate disclosures

In the presence of asymmetric information, disclosures are useful because they ameliorate the adverse-selection problem that, in the spirit of Akerlof (1970), can impair market functioning (Grossman and Hart (1986), Milgrom (1981)). In capital markets, this issue would take the form of reduced funding flows and higher financing costs.

Information flows in financial markets — Graph 2



The diagram, which is largely a reproduction of Figure 1 in Healy and Palepu (2001), is a schematic representation of capital flows and information flows in financial markets. We highlight in red key intermediaries and activities in the production of information relevant for sustainable finance.

As highlighted in the literature survey of Christensen et al (2021), corporate disclosures have indeed been shown to be instrumental to reducing asymmetric information and agency conflicts between firms and investors. Work on disclosures comprises a vast body of research that goes back at least to the 1970s (see Healy and Palepu (2001) for an earlier survey), highlighting the importance of disclosure

[5] Goss and Roberts (2011), who analyse the cost of banks loans for sustainable firms, write that "banks are able to discriminate between sincere attempts to align the goals of the firm with the broader societal good and value-destroying agency costs" (p 1795). By contrast, the recent literature on the pricing of climate risks concludes that the information available to investors about these risks and their consequences is often incomplete or imperfect (see Eren et al, 2022 for an overview).

requirements to the ecosystem that produces financial information. Disclosures help to make prices less noisy (Bushee and Friedman (2016)) and less subject to spillovers thanks to better risk assessment (Blacconiere and Patten (1994)). In addition, they generally have positive effects on stock returns, liquidity (Healey et al (1999) and Leuz and Verrecchia (2000)), and the efficiency of physical investments (O¨ stberg (2006)). Well-designed corporate disclosures appear to be especially beneficial for less sophisticated investors with long holding horizons (Lawrence (2013)).

Disclosures can be voluntary. Consistent with the benefits noted above, firms have various incentives to provide information (Healy and Palepu (2001)), chiefly facilitating corporate funding (Lang and Lundholm (1997), Healey et al (1999); see Dhaliwal et al (2011) and Matsumura et al (2014) for evidence specific to sustainable finance) and potentially reducing litigation risk (Skinner (1997)). Of note, there are reasons to expect that litigation risk is higher when forward-looking disclosures are involved (Healey et al (1999)). Third party assurance provided by auditors is a common avenue to buttress the credibility of disclosures, even when not required by regulations (Healy and Palepu (2001)).

While there is ample evidence that disclosures improve market functioning, the associated costs, including the above-mentioned assurance, can be meaningful (see the discussion in sections 2.4.1 and 5 of Christensen et al (2021) and references therein). Besides direct expenses linked to collecting and processing data, certain indirect costs arise from how the type of disclosed information affects the behaviour of competitors and, in turn, of the company itself. In particular, disclosures favour learning by peer firms (Cao et al (2019)) and concentration of innovative activity among large firms, since the costs of information spillovers are relatively more important for small innovative firms (Breuer et al (2022)).

2.2 Information intermediaries

Information intermediaries specialise in assessing the prospects of companies using public data and their own research. Credit rating agencies are a prime example of these information-gathering entities (Millon and Thakor (1985)), as are financial analysts (Asquith et al (2005), Womack (1996)). Credit rating agencies "help pierce the fog of asymmetric information" (White (2010), p 213) by offering opinions on the creditworthiness of debt securities. Their judgment generally conveys useful information (Elton et al (2011), L¨offler (2004)), even if ratings can differ due to distinct methodologies (Cantor and Packer (1997)) and to the opacity of some firms (Morgan (2002), Hyytinen and Pajarinen (2008)). In part, the usefulness of these intermediaries stems from the likelihood that they may obtain non-public information from companies (Kisgen, 2006).

The business of ratings traces back to entities that assessed the ability of merchants to pay financial obligations (Cantor and Packer (1995)), and pre-dates the availability of regulated disclosures. Over time, rating agencies became central to steering capital market flows as both information intermediaries and providers of key inputs to regulatory requirements. As a result, they are subject to some level of public oversight (White (2010)), even though maintaining their reputations has, for a long time, been seen as the key incentive to providing unbiased opinions. While ratings generally convey useful information, interpreting ratings is not always straightforward

(Cantor and Packer (1995)), not least because of their focus on medium to long-term risk (Altman and Rijken (2004)).[6]

2.3 Sustainable finance vs. traditional finance

2.3.1 Similarities

The discussion above focuses on general-purpose corporate disclosures and credit ratings, but there is evidence that similar issues and dynamics apply to sustainable finance. Just as for traditional corporate disclosures, setting common standards is useful to improve the quality, relevance and comparability of information (Pucker (2021)). Underscoring the synergies between the two types of disclosure, the International Sustainability Standards Board operates under the auspices of the International Financial Reporting Standard Foundation. Also, assurance is an important supplementary mechanism for improving disclosures in sustainable finance (NGFS (2022b)), especially for companies that are seeking to establish their reputation (Simnett et al (2009), Ioannou and Serafeim (2019)). Similar to conventional finance, strong demand for assurance providers could limit the access of smaller firms to their services (Christensen et al (2021)).

Also paralleling findings in conventional finance, early studies that predate the rapid expansion of the field suggest that higher sustainability ratings anticipate better firm performance (Khan et al (2016)) and cheaper cost of equity (El Ghoul et al (2011)). More generally, financial ecosystems with greater information processing capacity lead to more efficient sustainability-related spending (Adhikari (2016)) and outcomes (Boubakri et al (2016)). Furthermore, the variety of data points and methodologies that can be used to assess a company's sustainability score fosters disagreement (Berg et al (2020), Christensen et al (2022)), not unlike standard credit ratings, and by some metrics to an even greater extent (Berg et al (2022)).

2.3.2 Differences: double materiality

In certain respects, however, sustainable finance is inherently different. By definition, it is attentive to a broader set of stakeholders than just investors in a company's equity or debt securities. As a result, a common view is that disseminated information should be material to both investors and other stakeholders (a concept known as "double materiality" or "impact materiality", see Graph 2, right-hand side).

Another school of thought holds that it is sufficient to focus on the disclosure of sustainability information relevant for assessing the value of the firm ("single materiality", or "financial materiality"). The newly established International Sustainability Standards Board is charged with setting best standards for sustainability disclosure on this basis (Lloyd (2022)). One of the principal arguments for single materiality is that sustainability-related information that reflects the impact on other stakeholders is likely to be financially relevant for a company – due to the risks of litigation or a regulatory response – and would thus be reported in any case.

That said, there are number of problems with this approach. To begin with, sustainability disclosures are rarely described in monetary units, and the benefits tend to be longer-term in nature. Another argument against a narrow focus on disclosure

[6] Other types of ratings, such as those the rank the quality of mutual funds, are also relevant inputs to investment decisions. See Ben-David et al (2021).

tied to shareholder value is that both theory and empirical work suggest that investors are not solely concerned with financial returns, and thus shareholder welfare is not necessarily equivalent to shareholder value. Oehmke and Opp (2022) conclude in their theoretical examination that investors focused on sustainability, unlike purely profit-driven investors, will accept lower financial returns in exchange for improved firm behaviour. And indeed, despite the fact that green bonds represent claims on the issuing firm with the same default risk as for its conventional bonds, there is some evidence of a "greenium", or a lower yield, on green bonds than on conventional bonds (Zerbib, 2019).

Other experts argue that the value of double-materiality standards lies in accounting for the externalities that a firm imposes on the environment in which it operates (see Section 6.2.2 in Christensen et al (2021) for a detailed discussion). Since there is likely to be substantial uncertainty on how to quantify these externalities, the adoption of double-materiality standards could improve the quality and comparability of the information provided (Pucker and King (2022)).

To be sure, requiring broad disclosures under double materiality is partly a policy choice: the availability of more information could encourage scrutiny into the activities of a company, thus incentivising alignment with sustainability goals decided at the highest levels of government. At the same time, broader disclosure mandates could generate significant additional costs for firms, not least because they require technical skills in possibly numerous non-core fields for a company. In particular, mandates could impose meaningful burdens on small firms or those in industries where quantifying the financial cost of externalities is more complex. This observation, in turn, would argue for applying principles of proportionality when implementing a broad-brush sustainability disclosure regime.

2.3.3 Differences: data complexity

Sustainability-related data needs are inherently higher than those in conventional finance, whether to assess the impact of activity on enterprise value, or on stakeholders and the environment. Generally speaking, these needs arise because of the breadth and complexity of data relevant for sustainable finance, which also requires specialised scientific knowledge across a variety of fields.

In many instances, evaluating a company's entire sustainability profile often entails assessing the effects of the business on the environment together with its impact on broader social goals, as well as reviewing the quality of its corporate governance (the three ESG pillars). The measures of these attributes are not necessarily highly correlated, meaning that the information required to jointly assess ESG dimensions will be much broader than what might be required when focusing on a single one. Similarly, the applicable methodologies should by no means be expected to be similar across pillars.

These observations are likely to have implications for information intermediaries: while some of them might provide summary sustainability assessments, we could also see the emergence of bespoke institutions of certification and verification, potentially specializing in the various elements of sustainability profiles. To the extent that these institutions use different approaches, appraisals may diverge: for instance, even within the environmental pillar of ESG, one score may reflect low current carbon emissions, or a documented transition plan to lower emissions; another score may reflect a focus on ensuring the sustainability of water supply. In the case of traditional credit ratings, back-testing using actual defaults can help to ascertain which of various ratings is the

better measure. In sustainable finance, such an assessment is more difficult due to the lack of historical data as well as uncertainty around the measurement of outcomes. In any event, the overall costs of assessing performance on multiple dimensions are likely to be higher than for individual aspects.

The above discussion highlights the breadth of sustainability performance indicators, but the complexity of these indicators is another distinguishing feature of sustainable finance. As an illustration, it is useful to focus on one specific example, namely greenhouse gas emissions and their trajectory. It often is noted that investors should care about the firm's overall carbon footprint, but the broadest of measures – which includes upstream and downstream emissions (Scope 3) – is very difficult to gauge precisely and, given current data limitations, requires numerous assumptions.

Even if dependable measures of current carbon emissions were available, assessing the credibility of estimated trajectories towards net zero requires specific technical knowledge along many dimensions. In particular, verifiers need a good sense of the technological frontier in various industries, including its evolution over time. These assessments require forecasts over much longer periods than the three- to five-year horizons used by credit-ratings agencies to rank likelihoods of default.

3. Market failures and information governance

While the previous section described the rationale for disclosure and information intermediaries, this section focuses on problems in information production that can be described as "market failures". Many of these relate to familiar conflicts of interest. Once again, while such failures in sustainable finance share many similarities with those of conventional finance, there are also unique problems in this sphere.

3.1 Corporate disclosures

The usefulness of disclosures depends on their credibility, which is a function of, first, the incentive to report biased information, and, second, the ability of investors to spot such behaviour. As detailed by Rogers and Stocken (2005), the likelihood of deliberate misreporting increases with four main factors: (1) lower litigation risk; (2) higher incidence of insider transactions; (3) financial distress; (4) within-industry concentration, since incumbents downplay profitability to deter entrance. The ability of investors to spot bias is a function of uncertainty about future prospects, volatility in realised results, and financial distress.

Turning to sustainable finance, recent research highlights issues that are generally comparable with those relating to general-purpose disclosures. To start, a significant portion of sustainability reports are restated (Pinnuck et al (2021)). Recent under-performance raises the likelihood that signalling a focus on sustainability is not followed by concrete actions (Gibson Brandon et al (2022)). In some jurisdictions, firms sometimes use their reputed commitment to sustainability to build political connections that prove economically advantageous (Lin et al (2015)).

At the same time, certain patterns in sustainable finance can heighten or reduce the severity of market failures. These nuances should be taken into account when designing governance frameworks specific to this sector. Data availability and reliability are prime concerns, and partly originate from the broad and complex nature

of the information needed to assess a company's sustainability profile, as discussed in the previous section (also see Pucker (2021)).

The presence of complex supply chains poses specific challenges and opportunities for disclosure. While the focus on sustainability appears to propagate through supply chains (Dai et al (2021)), the difficulty of quantifying a company's sustainability standing is greatly complicated by the presence of global supply chains and multinational groups. Pressure to meet sustainability expectations can lead firms to transfer controversial activities to countries with weaker monitoring frameworks (Surroca et al (2013)). Sourcing data from remote locations can also be technically difficult, even when explicitly mandated by law (Kim and Davis (2016)). Even so, governments are increasingly mandating that companies assess the activities of suppliers with whom they have business relationships.[7]

Market failures in corporate disclosures are tackled with mandatory standards and assurance (see Section 6.4 in Christensen et al (2021)). Besides enhancing cross-sectional and time-series comparability, standards ensure that information is available also when it runs counter to the profit incentive (Östberg (2006)). Explicitly requiring the inclusion of negative events in sustainability reports reduces the frequency of such events (Christensen et al (2017), Krueger et al (2021)), since reputational costs are increased by broader dissemination. There are also positive spillovers, since other information intermediaries – such as financial analysts – have access to better data and can improve their forecasts (Krueger et al (2021)). Assurance is itself subject to standards to limit the potential for conflicts of interest, but standards can also limit the flexibility of auditors to use professional judgement (Gao and Zhang (2019)).

3.2 Ratings

Rating agencies could face conflicts of interest because they are paid for their service by the entities they rate. The desire of agencies to protect their reputation was seen as a key reason why credit ratings remained conservative through the 1990s, even after the earlier switch from an "investor pays" to an "issuer pays" model (White (2010)). However, the contribution of overly generous ratings for structured products to the 2007-09 financial crisis highlighted a number of market failures. Indeed, the relatively few ratings still paid by investors appear more timely and are profitably followed by small institutional investors (see Cornaggia and Cornaggia (2013), Bhattacharya et al (2019)).

A first set of issues relate to conflicts of interest at the rating agency level. In a competitive rating industry where issuers can purchase the most favourable rating, the incentive to attract business leads agencies to inflate ratings, especially during market booms (Bolton et al (2012), Griffin et al (2013)). Indeed, the quality of ratings declines when competition increases (Becker and Milbourn (2011)). Distortions caused by this market structure are stronger when the securities in question are complex and represent a large share of business for the agency (Skreta and Veldkamp (2009), Mathis et al (2009)), and for issuers that contribute more revenue to the raters (He et al (2009), Efing and Hau (2015)). A second set of market failures relates to agencies' employees, who tend to provide unduly high ratings to firms that may later

[7] For instance, see the French 2017 Duty of Vigilance Law, which requires large companies to assess the environmental and human rights risks of activities of suppliers.

employ them (Cornaggia et al (2016); Lourie (2019) finds similar patterns for financial analysts).

Conflicts of interest are all the more relevant when differences of opinion allow entities to cherry-pick among competing assessments. Ratings divergences are generally linked to differences in models and criteria (Cantor and Packer (1997)). Some sectors, such as banking, have a higher incidence of differences of opinions in credit ratings, likely due to the inherent opaqueness of factors determining creditworthiness (Morgan (2002)). Ahead of the 2007-09 financial crisis, differences of opinions among agencies on highly complex structured financial products likely exacerbated conflicts of interest (Bolton et al (2012)).

Turning again to sustainable finance, company-specific sustainability ratings[8] are a much more recent development, yet the available evidence indicates that they are important for investment decisions, which makes it particularly important to address market failures. Such ratings generally convey useful information about future company activities (Khan et al (2016)) and affect the cost of capital (El Ghoul et al (2011)). In addition, higher sustainability ratings stabilise flows into mutual funds and the blunt the response of investors to fund performance (El Ghoul and Karoui (2017), P´astor and Vorsatz (2020), and Rzeznik et al (2021)), although performance remains a key concern against which sustainability is traded off (Gantchev et al (2021)).

Combined with the opacity of sustainability information, conflicts of interest could undermine the usefulness and credibility of sustainability ratings. In particular, the lack of transparency and clarity in green definitions and methodologies can lead to greenwashing and misselling of products (NGFS (2022b)).

Even without deleterious effects on ratings, the multifaceted nature of sustainability information means that there can be marked differences in assessment across providers. Indeed, these can be even greater than those observed for credit ratings (Berg et al (2022)). Such uncertainty can increase a firm's cost of capital (Gibson Brandon et al (2021)) and reduce demand for its stock (Avramov et al (2021)), echoing the broad asset-pricing implications of investment under uncertainty (Uppal and Wang (2003)). The sources of rating disagreement are rooted in differences across the models' relevant sustainability attributes (Billio et al (2020)), including their scope, measurement choices, and the weights assigned (Berg et al (2022)). In turn, these differences partly reflect ingrained social characteristics, just as the decision to improve sustainability standings does (Liang and Renneboog (2017)). Observed disagreement could, in part, stem from ex-post revisions to already disseminated sustainability ratings (Berg et al (2020); see Ljungqvist et al (2009) for similar issues with analysts' forecasts). Technological advances that allow to gain direct empirical evidence into the behaviour of a company are a possible avenue for reducing disagreement (Huang et al (2021)).

3.3 Regulators

Regulation plays an important role in addressing market failures and maintaining information and integrity in financial markets. Some of the market failures addressed above have already been considered by governments. In the United States, the regulatory environment for credit rating agencies was strengthened considerably

[8] We use the term "ratings" also to refer to sustainability scores.

with the Dodd-Frank Act after the 2007-09 financial crisis, in part to mitigate such conflicts of interest. This framework emphasises transparency, with disclosures on activities, methodologies and internal controls; and reviews of ratings issued by staff that later joined the rated entity; as well as legal and regulatory liabilities. Studies indicate that these changes reduced the differences between the ratings paid by issuers vis-à-vis those paid by investors (Toscano (2020)), and that rating agencies have become overall more conservative (Dimitrov et al (2015)).

The public sector is bound to play an important role from an international perspective. In the context of global supply chains, governments are increasingly mandating that companies assess and disclose information about suppliers with whom they have business relationships. The policy focus on supply chains stems partly from evidence that global supply chains can act as positive transmission mechanisms for regulatory requirements and sustainable activities across borders (Schiller (2018)). For instance, customers with highly rated environmental and social policies improve the corresponding profile of suppliers/upstream firms. In part, this influence is routed through financial linkages, including the fact that suppliers are more likely to provide trade credit to customers with positive corporate social responsibility scores (Zhang et al (2020)).

However, are regulators themselves immune from conflicts of interest that can interfere with their statutory mandates? There is evidence that certain elements may impinge on regulatory effectiveness.

In particular, entities that are more important for the economy over which a regulator has jurisdiction may receive a more favourable treatment. Agarwal et al (2014) study this issue in the context of federal and state bank regulators in the United States, although their findings likely have more general validity. There is also evidence that competition among regulators can lead to more lenient oversight, at least temporarily when banks switch regulator (Rezende (2014)). In addition, political influence appears to play a role in shaping regulatory efforts (Papadimitri et al (2021)). From the perspective of employees at regulatory agencies, their efforts depend on monetary incentives (Kalmenovitz (2021)).

4. Relevant lessons for sustainable finance

When seeking to develop information governance in sustainable finance, it is useful to consider the market failures that affect information production in corporate reporting – and the solutions developed to address them. The reason is that, despite the specific features of this emerging field, the underlying information infrastructure and incentives are similar.

This section puts forward recommendations for the design of corporate disclosures, assurance, ratings, and regulation in sustainable finance. These suggestions build on the large body of research discussed in the previous sections, and are shaped by three important features of sustainable finance: the complexity of data sourcing; the need for technical expertise in interpreting the data; and the uncertainty that inevitably complicates the assessment of emerging sectors, especially in the presence of global supply chains.

4.1 Mandatory baseline disclosure standards

Investors' ability to identify misleading statements is key to ensuring that firms share accurate reports, but, as discussed above, this monitoring capability is reduced relative to general corporate disclosure. As a result:

(i) Mandatory baseline standards would be particularly useful to improve the comparability of sustainability-related information across firms;
(ii) Focusing on historical developments would be more practical than requiring forward-looking information, which is by definition more ambiguous. Furthermore, companies could hesitate to share meaningful forward-looking insights that could be the basis for future lawsuits or regulatory actions, and would likely rely on boilerplate statements of limited benefit;
(iii) A documented trend of objective improvements can establish a company's reputation and reduce uncertainty around its commitments to sustainability. As a result, there should be clear requirements to fully disclose negative events, since their reputational costs would incentivise preventative efforts.

4.2 Different disclosure regimes for SMEs

Small- and medium-sized enterprises (SMEs) are inherently less able to acquire and process complex data. Holding them to the same standards as larger firms would impose proportionally grater costs. As a result, disclosures by SMEs could build on granular information that these firms already have, such as the consumption of various resources, and aggregate these details into a template prepared by regulators to convey the most relevant information. This methodology would build on principles similar to those that underpin the "standardised approach" to calculating certain bank capital requirements.

A different disclosure regime for smaller firms could also solve the issue of limited availability of assurance services, which consist in the external auditing of corporate filings. Many firms are already voluntarily subjecting their sustainability disclosures to third-party review. While a broad application of assurance to all mandatory disclosures appears desirable, there are already concerns that blanket requirements may be too onerous, especially for small firms, and the question arises whether random assurance reviews are a more reasonable option. Assurance is itself subject to standards, but data complexity and the need for specialised knowledge favour giving reviewers more discretion in assessing disclosures, at the cost of more stringent ex-post monitoring by assurance regulators.

4.3 Limiting raters' leeway to justify lenient assessments

The complexity and multi-dimensionality of sustainability data also implies that rating agencies could, in principle, more easily find justifications for leniency that helps them to attract business. Solutions include the following policy options, variations of which have been considered by jurisdictions with regard to conventional credit ratings:

(i) Restricting competition among rating agencies to avoid "ratings shopping";
(ii) Giving more weight to ratings from agencies with significant volume outside sustainable finance;
(iii) Requiring upfront payment for and disclosure of all solicited ratings;
(iv) In-depth "look-back" reviews for rating analysts who join the companies they

previously covered;

(v) More pointed regulatory monitoring during booms, since the gains from lower standards are larger at such times, and when issuers contribute a substantial amount of revenue to the agencies;

(vi) Provisions to ensure the integrity of commercial data repositories, to prevent ratings and other information from being changed ex-post.

4.4 Public sector support for information production

Regulators and public bodies are bound to play a pivotal role in supporting the production of information about the sustainability of the corporate sector. Besides devising and enforcing provisions that reduce market failures, the public sector can leverage its broad set of scientific competencies. For instance, these skills can be used to advance the general understanding of the environmental impact of corporate activities. In this context, international cooperation is particularly relevant both for conducting impact assessments in different jurisdictions and to facilitate information sharing among companies.

4.5 Independence of regulators focused on sustainability issues

Regulators may internalise the effect of their actions on economic activity in the community they serve, and might prove more lenient towards large companies. The existence of country-wide (rather than regional) regulators or the adoption of internationally agreed standards are likely to contain this issue. More generally, the effectiveness of public actions is enhanced by the absence of political influence on the technical regulatory process, as well as by pecuniary incentives for staff that align their compensation with the regulatory mission.

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