

Sustainable Development Principles in Firm Operations: Evidence across Industries

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Design/methodology/approach

Using the U.N. Sustainable Development Goals as a framework, this article conducts an exploratory factor analysis on the sustainable development principles that firms incorporate into their operations from a representative sample (n = 2,832) of firms listed on the NYSE and NASDAQ in 2023.

Purpose

This article aims to identify the factors that organize which sustainable development principles firms incorporate into their operations, comparing firms from the heaviest-emissions industries (energy, materials, and utilities industries) and firms outside them (ex-energy, materials, and utilities).

Findings

For firms within energy, materials, and utilities industries, this article identifies five factors: sustainable human needs, human quality of life, renewable energy, healthy infrastructures, and pollution reduction. Inter-factor correlations reveal that pollution reduction and renewable energy are negatively correlated with one another, and all factors are negatively correlated with human quality of life. For firms outside these industries, this article identifies six factors: sustainable human infrastructure, supply chain sustainability, economic empowerment, medical development, water protection, and renewable energy production. Inter-factor correlations

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identify positive synergies between four of the six factors around environmental sustainability (sustainable human infrastructure, supply chain sustainability, medical development, renewable energy production), but water protection and economic empowerment are negatively correlated with the other factors.

Practical implications

This article identifies the prevailing factors that animate firm decisions on which sustainable development principles to integrate into their operations. The pursuit of sustainable development principles is a landscape of mutually exclusive choices, where a greater propensity to incorporate certain sustainable development principles into revenues (e.g. supply chain sustainability) may be linked to lower propensity to incorporate other principles (e.g. economic empowerment). The findings show the need for industry-specific guidelines on assessing firm pursuits of sustainable development, and illustrate important nuances in the underlying factors that drive sustainability efforts in each area, comprising a series of competing choices where the pursuit of one factor restricts the pursuit of others.

Research implications

This article offers a new way of conceptualizing how firms incorporate sustainable development into their operations: firm pursuits of sustainable development resemble an equilibrium between factors that requires trade-offs. Within energy, materials, and utilities industries, firms that invest in renewable energy are less likely to invest in pollution reduction and human quality of life.

This suggests that while firms are aspiring to become more sustainable, (a) firms may pursue sustainability as a façade to placate stakeholders without significantly altering their production chain, and (b) sustainable products for certain factors, such as promoting human quality of life, may be cost-prohibitive, preventing firms from pursuing sustainable revenues in all factors.

Social implications

This article finds that while firms are responsive to stakeholder pressure, there are also signs that firms behave in an organized hypocrisy when choosing to integrate certain sustainable development principles into their operations at the expense of others. The results illustrate the utility of the U.N. Sustainable Development Goals as a framework for assessing how institutions contribute to sustainable development.

Originality/value

Concerns about how firms contribute to sustainable development are gaining influence, but there remains little research on which sustainable development principles are adopted by firms in their operations across industries. This article offers the first systematic examination of factors that drive firm decisions about sustainable development principles in the context of their own operations, using a sustainable finance dataset statistically representative of publicly-listed firms listed on the NYSE and NASDAQ.

Keywords: sustainable development, firm operations, corporate management, publicly-listed firms

Introduction

Sustainability has become increasingly influential in the decision-making processes of publicly-listed companies (Eccles & Serafeim, 2013). Much of this discussion has centered on two related concepts: sustainability and ESG. ESG reflects a single materiality or a normative institution that measures the effects of environmental, social, and governance concerns on a firm's risk-adjusted returns (Busch, Bauer, & Orlitzky, 2016). Sustainability reflects a double materiality concerning the influence of environmental, social, and governance issues on the firm, as well as the impact of the firm's performance on society at large, across these dimensions (Mohr & Thissen, 2022).

Pursuing ESG has important consequences for firm performance. In an authoritative review of 2,200 financial studies on ESG and firm performance, Friede, Busch, and Bassen (2015) argue that positive ESG compliance is associated with superior performance in most studies. In a systematic analysis of U.S companies listed on the Russell 3000 from 2008 to 2019, Consolandi, Eccles, and Gabbi (2020) similarly find that positive changes to ESG ratings also appear to improve stock returns. More nuanced non-linear models of ESG scores have identified a more reserved, non-linear effect on firm performance, whereby ESG compliance *only* pays off when investments in ESG pass a certain threshold (Cappucci, 2018; Nollet, Filis, & Mitrokostas, 2016). Similarly, using a robust four-factor model and cross-sectional Fama and MacBeth regressions on an ESG portfolio, Halbritter and Dorfleitner (2015) find significant differences between companies with high and low ESG ratings.

The organizing thrust of this work has been to demonstrate that ESG compliance has strategic importance for improving corporate reputation, attracting talent, and increasing the efficiency of capital allocation (Benral-Conesa, de Nieves Nieto, Briones-Peñalver, 2017; Eccles

& Serafeim, 2013). ESG captures a growing interest among investors to observe firms make contributions to sustainability (Eccles & Serafeim, 2013). According to the BlackRock Advisor Center (2023), the largest institutional asset manager worldwide with over \$10 trillion in AUM, the value of sustainable assets grew from \$87 billion in 2016 to \$255 billion by 2022.

However, ESG has often been conflated with sustainability, with confusion over which firms should pursue (Jesse, 2022). Millar and Slack (2024) most recently analyzed investor responses to the International Sustainability Standards Board (ISSB) and showed that the basis and focus of sustainability reporting still escape consensus. They find that there remains considerable dissonance among investors and the ISSB over whether firms should pursue double materiality (sustainability in firm practices) or single materiality (ESG and firm returns) and the definitional clarity about environmental, social, and governance issues.

Distinguishing sustainability from ESG helps recognize that pursuing environmental, social, and governance issues are not merely a driver of shareholder value (the ESG perspective). Rather, these issues enable firms to cultivate relationships with stakeholders beyond shareholders, such as regulators, employees, customers, suppliers, and the communities in which it operates, something that sustainability takes into account which ESG does not (Broadstock et al, 2021; Verheyden, Eccles, & Feiner, 2016). In contrast to neoclassical economic development models that consider environmental or social impacts externalities, sustainable development proposes balancing economic development with environmental health and social equity. Sustainable development has thus been defined by the U.N. Brundtland Commission in its seminal 1987 report *Our Common Future* as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (p.37).

Exemplar sustainable development initiatives have thus focused on carbon emissions reduction, energy efficiency, and sustainable agriculture (Martins et al., 2023).

This article seeks to examine how firms incorporate sustainable development principles into their operations by examining their revenue sources. Revenues traditionally reflect a company's capacity to meet consumer demand, navigate competitive pressures, and invest in innovation. But other than a financial metric, revenue diversification and sources capture a company's operational contributions to environmental stewardship and social equity (Agrawal, 2021; Naciti et al., 2020; Wolf, 2013).

The Exxon Valdez oil spill in Alaska in 1989 that led to the creation of the Global Reporting Initiative (GRI) was a clear example of how firms' revenue sources (such as depleting natural resources rather than using renewable energy) hold significant consequences for sustainable development in society (Adams, 2002). As the GRI has since posited, firms can affect sustainable development through their operations. Although firms have historically been conceptualized as profit-driven entities focused on maximizing shareholder value, recent decades have energized calls for firms to contribute to broader sustainable development, including environmental stewardship, social equity, and long-term economic resilience (Eccles et al., 2020; Gong et al., 2019).

However, even though sustainability reporting has increased over time, there remains a gap in understanding how firms define and incorporate sustainable development principles into their operations. Addressing this gap, this article inductively examines how firms incorporate sustainable development principles into their operations, based on a number of environmental, social, and governance issues captured in the U.N.'s Sustainable Development Goals (SDGs). The data are derived from a private sustainable finance database from Morningstar.

Sustainability Development Principles and Firm Operations: A Factor Approach

Corporate commitments to sustainable development principles and moral business practices are disclosed in reports to offer stakeholders transparent insight into how firms are contributing to sustainable development in three general categories (Eccles et al., 2014; Lee, 2018). These categories typically include environmental issues focused on reducing corporate impact on climate change, social issues on corporate relations with multiple stakeholders (such as employees and communities in which firms operates), and governance issues concerning leadership and equity within the corporation (such as internal controls, shareholder rights, and board diversity).

However, there has been growing awareness of differences between firms over how to incorporate sustainable development principles into their revenue sources, considering ever-evolving issues pertaining to corporate governance, social responsibility, and environmental stewardship. Concerns have arisen about the accuracy and comparability of corporate sustainability, or whether or not companies are doing good—or simply saying they are (Eccles & Serafeim, 2013). Critics have meaningfully raised, for instance, concerns about “greenwashing,” where firms misrepresent or overstate their sustainability credentials to placate stakeholders agitating for change (Bauer & Hann, 2010).

A consensus holds that firms should consider their environmental impact when choosing how to incorporate sustainable development principles into their operations. However, finer-level analyses uncover extensive variance in the possible environmental issues that firms focus on, from conservation of natural resources to treatment of animals, and even pollution and waste reduction (Chatterji et al., 2016). As proof of this variability, the number of ESG shareholder

resolutions filed have risen to over 1,000 per year (United States Sustainable Investment Forum, 2023), but the substance of these resolutions has fragmented over time to draw scrutiny from the largest institutional owners of firms, such as BlackRock (Kerber & Binnie, 2023).

Regardless, most academic research attempting to parse out this variability in sustainability efforts takes place on the firm-level. Chu et al (2019) focus on organizational culture and its effect on how sustainability innovations are integrated into firm revenues. Cultures that are more open and flexible are more likely to enhance the effect, while cultures that are more managed tend to weaken it. A systematic review of sustainable technology innovation (e.g. attempts to reduce firm emissions, improve energy efficiency, and reduce their carbon footprint) at the firm level reveals that environmental management systems are crucial for developing innovative environmental products that firms sell and render their operations more sustainable (Hermundsdottir & Aspelund, 2021; see also Amores-Salvadó et al, 2015).

However, what affects firm decisions to pursue sustainable development principles and what variations might we see beyond the firm level? This article extends this work to the industry level by identifying the factors that drive the adoption of different sustainable development principles among firms across different industries. The industry that a firm operates in determines the business model it follows, its institutional shareholder preferences, and, by extension, its preferences for sustainability. Industry-level effects are entrenched in reports by regional regulatory boards for emissions (Department for Energy Security and Net Zero, 2021) and supranational organizations (IPCC, 2022; UNIDO, 2023).

The EPA (2024), for instance, stresses that most domestic greenhouse gas emissions in the U.S. come from industrial production and electricity production. Roughly 60% of electricity used in end-use sectors (transportation, commercial, residential, and industrial activity) are

sourced to burning fossil fuels. Industrial production also produces substantial quantities of greenhouse gases directly by burning fossil fuels or creating chemical reactions in materials processing, as well as indirectly by purchasing electricity for end use. In a similar vein, the United Nations Industrial Development Organization's (UNIDO) *Industry Decarbonization* agenda focuses on decarbonization in basic materials processing. This refers to discovering or processing raw materials, which extends to the extraction and processing of commodities and chemical products, such as iron ore.

In addition, econometric evidence from national-level data in emerging markets suggests that industrial production has been responsible for the most emissions production (Azevedo et al, 2018; Karakurt & Aydin, 2023; Wu et al, 2015). These findings suggest that specific industries are more responsible for exacerbating climate change and, as a result, are more impacted by sustainability initiatives: energy production, basic materials, and utilities. Institutional shareholder preferences likely follow the rift in emissions between energy, basic materials, and utilities and all other industries (ex-energy, basic materials, and utilities). Given that energy, basic materials, and utilities industries are more exposed to sustainability initiatives than others, institutional shareholders are likely to recognize that firms in these industries have less space for incorporating sustainable development principles concerning environmental stewardship without seriously impacting revenue stability and profitability, and accordingly resist their adoption.

In 2016, for instance, shareholders tabled a resolution for major oil producer Exxon to begin disclosing in a special annual report a regular climate risk analysis investigating its ecological impact on (and financial repercussions from multinational initiatives to reduce) greenhouse gas emissions, such as the United Nations' Sustainable Development Goals (SDGs).

Pitted against hostile managers who resisted corporate disclosure pertinent to climate change, the resolution lost with only the support of 38.1% of shareholder votes (ExxonMobil, 2016).

In 2023, activist group Follow This made a consortium of the largest oil producers worldwide (Shell, British Petroleum, ExxonMobil, Chevron, and TotalEnergies) the target of a new shareholder resolution to conform their 2030 end-use emissions targets with the Paris climate pact. The resolution was ultimately rejected by institutional shareholders in 2023, as it was in 2022 when a similar resolution was proposed.

I parse out differences in the sustainable development principles that firms integrate into their revenues and how these variations compare between energy, basic materials, and utilities industries versus ex-energy, basic materials, and utilities industries. To offer an alternative framework for finding common areas of sustainability amid lack of standardization, I use the U.N. Sustainable Development Goals (SDGs) to inductively examine what sustainable development principles firms elect to pursue. The SDGs were developed in September 2015 by the U.N. General Assembly under its 2030 Agenda for Sustainable Development at the U.N. Sustainable Development Summit. Vowing to end poverty and improve human rights, the Agenda forwarded 17 core SDGs for stakeholders including governments, private enterprises, civil society associations, and branches of the U.N.

SDGs are thus one possible framework for understanding the factors drive firm managerial decisions about which sustainable development principles to incorporate into their revenues. In a bibliometric review of all management studies related to SDGs, Pizzi et al (2020) find that SDGs have been instrumental in orienting managerial attention toward technological innovation, sustainable operations in developing nations, non-financial information, and further public awareness of SDGs. The legitimacy of SDGs as a standard for measuring sustainable

development contributions thus derives from its administration by the U.N., widely recognized by firms, governments, and institutions worldwide.

Incorporating Sustainable Development Principles in Firm Revenues

This article contextualizes sustainability initiatives within a broader theorization of firm strategies for deciding capital allocation. I draw upon stakeholder theory, organized hypocrisy, and political economic perspectives of the firm to theorize firm attitudes toward incorporating sustainable development principles into their firm revenues and ultimately the decision of how to make revenues sustainable, if at all.

Stakeholder theory is a theory about organizational management and stresses the importance of attending to non-shareholder interests (Freeman, 1984; Phillips, Freeman, & Wicks, 2003). Although common adaptations of this theory have associated it with an instrumentalist lean, such as to describe non-shareholder interests as but another means to achieve organizational goals (Jensen, 2002; Jones, Harrison, & Felps, 2018), an important contribution of stakeholder theory was to make space for values in the process of managing firms. Within this scope, sustainability constitutes one possible variety of values as grounds for analysis, namely, as a moral ends for cooperative activity between managers and stakeholders (Freeman et al, 2010, p.235). Implicit in stakeholder theory is thus the recognition of moral foundations for action that depart from shareholder value maximization. Parmar et al (2010) go further to emphasize the importance of sustainability by casting financial crises as a consequence of “separating ethics [concern for sustainability] from capitalism” (p.10).

Building on stakeholder theory, organized hypocrisy emerged as a theory that centers discourse, decision, and action in the analysis of firm behaviours. Organized hypocrisy is based

on the fundamental idea that firms pursue superior reputations, but primarily do so through talk and discourse, rather than action (Brunsson, 2007; Cho et al, 2015). It thus maintains that firms seek legitimacy more for latitude to pursue rent-seeking activities, rather than for an authentic desire to “do good.” As Brunsson (2007) more eloquently expresses it, firms pursue organized hypocrisy as “a way of handling conflicts by reflecting them in inconsistencies among talk, decisions, and actions” (2007, p.115).

As such, firms can be accused of hypocrisy for “failing to act in accordance with the ideals it espouses” (Lipson, 2007, p.5). While scholars have debated the causality of discourse and decision on one other, a consensus holds that they are instruments for creating legitimacy for the firm (Brunsson, 2007; Cho, Freedman, & Patten, 2012). In both stakeholder theory and organized hypocrisy theory, firms are understood to seek stakeholder legitimacy in order to create markets for future goods and services (Freeman et al, 2010). This need for legitimacy is particularly true for firms that exhibit uncertainty to stakeholders, such as young firms with little history. For this reason, talk and decisions in organized hypocrisy are not only inconsistent with action, but meant to compensate for inaction (Brunsson, 2007).

This applies to the present study, because of possible deficiencies in firm choices about whether and how to pursue sustainability through sustainable development principles. Firms can pursue organized hypocrisy: since pivoting products to sustainable sources requires capex and time to execute, firms may be uninterested in pursuing sustainability in practice, but feel pressured to advertise their concerns about sustainable development principles and SDGs in their disclosures (la Cour & Kromann, 2011).

To illustrate, firms often construct narratives in their investor relations that give the illusion of concern for sustainable development, but without any material action in pivoting their

revenue sources. This inaction culminates in the modern phenomenon of “greenwashing” or misconstruing sustainability credentials (Bauer & Hann, 2010). Firms thus manage their impressions to “create organizational legitimacy in the eyes of stakeholders...” (Cho et al, 2015, p.82). Only those that can manage a façade are “relatively stable” (ibid) and can “reassure their organizational stakeholders of the legitimacy of the organization and its management” (Abrahamson & Baumard, 2008, p.437). This façade merely *signals* intentions using disclosures, even if they go unfulfilled. As Abrahamson and Baumard (2008, p.445) note, a façade must “not only fit the norms of rationality, but they must also mirror norms of progress,” namely, sustainable development.

Here, Freeman, Phillips, and Sisodia (2020) usefully raise key shortcomings in stakeholder theory, such as the assumption that all stakeholders are cooperative, and identify the absence of consensus over the moral minimums in sustainability. Thus, stakeholder theory and organized hypocrisy theory lend credence to my approach by illustrating (a) the need for inductive examination of moral minimums in sustainability, namely, which sustainable development principles matter most to firms in different industries, and (b) the implicit role that industries play in shaping firm decisions about the importance of these different areas.

I refresh an important point about the boundaries between sustainability and ESG. From a regulatory perspective, ESG and sustainability are distinct from one another, because ESG is concerned about firm returns, whereas sustainability additionally accounts for impact on broader society. Firms that pursue sustainability (through incorporating sustainable development principles into their operations) may do so to simply improve their profitability (ESG), while others may do so for the sake of impacting society in addition to profitability concerns (Barney & Harrison, 2020; Freeman, Phillips, & Sisodia, 2020; Parmar et al, 2010).

From a firm perspective, however, the two are often conflated. This has fueled a political economic view of the firm, which gives credence to the diametric opposition between stakeholder (sustainability) and shareholder interests (profitability). This view fundamentally problematizes shareholder ownership as a tool for concentrating firm control into a handful of private owners who will inevitably push the firm to prioritize profits over employee wellbeing (Fligstein & Goldstein, 2022; Rose-Ackerman, 2010; Weiss, 2021).

A political economic view is critical of firm attachments to shareholders (see Bebchuk & Tallarita, 2020), stressing a general decline in appetite for sustainability (and by extension, sustainable development principles) by firms and their investors alike. In a 2021 survey by PricewaterhouseCoopers, 81% of investors reported that they would accept only as much as a 1% reduction in investment returns in pursuit of sustainability, while 49% reported they were unwilling to accept any reduction. Similarly, Vanguard's support for environmental and social issues at investee firms fell from 12% in 2022 to 2% in 2023 (Smith, 2023), even going so far as to withdraw from the Net Zero Asset Managers Initiative, an alliance striving to achieve net-zero portfolio carbon emissions by 2050 (Pucker, 2023). Managers have also been observed to financialize environmental, social, and governance issues in their models, coopting sustainability efforts by prioritizing shareholder value over stakeholder value (Arjaliès & Bansal, 2018; Crane et al., 2015; Du Rietz, 2014).

However, drawing from stakeholder theory and organized hypocrisy theory, I do not go so far as to say that all firm decisions are reducible to rent-seeking behaviours, nor that firm managers are *sui generis* apathetic to social issues. The decline in shareholder resolution approvals, after all, may reflect the fact that discussions are working in the background, namely,

when stakeholders are pushing for consistency in sustainability resolutions or even challenging managerial practices on sustainability issues in different ways.

I thus make the case that the boundaries of capital allocation decisions follow legislative developments and firms are left to invent their own boundary choices about how to incorporate sustainable development principles into their operations. This provides insight into why there exists a lack of consensus over the ethics of what firms *ought* to do, even in stakeholder adaptations of firm theories (Freeman, Phillips, & Sisodia, 2020). It also provides insight into what types of sustainable development principles firms across different industries incorporate into operations.

Data and Methods

This article draws on data from a larger study on ESG in corporations. This study constructed its dataset by drawing from Morningstar Direct, a private and proprietary sustainable finance database maintained by Sustainalytics and Morningstar that covers firms and investors globally. This database is one of the few that includes information on ESG-related accomplishments, management practices, and the degree to which each firm is exposed to ESG challenges (Garz & Volk, 2019).

This study developed several filters to construct its sample from all 20,578 firms listed on U.S. exchanges: (1) only firms listed on the NYSE and NASDAQ were included due to their strict financial requirements for inclusion, as the two most well-known exchanges for public listings. Regarded as the gold standard for publicly-listed firms, NYSE and NASDAQ listing requirements include the most significant and profitable companies in the American economy: aggregate earnings (adjusted pre-tax income) of over US\$10 million for the preceding three and

over US\$2 million for the past two) or US\$200 million value in global market capitalization (or US\$60 million for the market value of shares sub insider and founder family-owned shares).

(2) American Depositary Receipts (ADRs) were excluded. ADRs are a special share classification designed for foreign companies located outside of the U.S. to list onshore. (3) Special purpose acquisition companies (SPACs) were also excluded. SPACs are essentially blank check holding corporations that trade publicly for two years, after which they might seek a public listing through a different route (as opposed to the typical IPO) by merging with or fully acquiring a private firm. Due to their lack of independent operations, SPACs are not productive firms in the economy.

(4) Only shares with voting rights were included, to be parsimonious and to avoid double-counting firms with multiple share classes. Certain firms, such as Alphabet, have issued multiple share classes for public trading based on the voting rights that are attached. Class A shares, for instance, have voting rights, whereas Class C shares do not.

(5) Only firms with recorded data on their adoption of sustainable development principles. These principles included areas such as supply chain and direct resource management, human rights, data security, waste management, direct and indirect carbon emissions, corruption, biodiversity, land use impact, and occupational safety, as well as how each firm controls its exposure to potential infringements of sustainable development principles.

The final sample included 2,832 firms ($n = 2,832$) that are statistically representative of operating firms in the U.S for 2023, the latest year as of writing and the most comprehensive in terms of ESG reporting. For each firm, I drew on Morningstar Direct, but corroborated its data with relevant U.S. Securities and Exchange Commissions (SEC) Form 13F files, annual reports, and 10-K forms from EDGAR.

Using Morningstar Direct, which provides data on the sustainable sources of a firm's revenues as a proxy for its contributions to sustainable development and U.N. Sustainable Developmental Goals or SDGs (U.N., 2023), I coded and categorized firm initiatives with respect to the SDGs in Table 1. Morningstar Direct reports the proportion of revenues that each firm dedicates to each SDG and non-SDG item as a proxy for its commitment to each sustainability issue. I recorded corporate activity in four non-SDG general categories by Morningstar Direct that I believe also capture sustainability and which may fall outside of conventional SDGs: human development, resource security, basic needs, and healthy ecosystems. Morningstar collects data on the sustainable products that make up a firm's revenues from each firm's annual reports, public documents available on their investor relations, and direct communications with firm managers.

Morningstar does not include goods that are related to Principle Adverse Impact (PAI) infractions, such as regulatory infractions or class-action lawsuits with significant traction (Deloitte, 2024). For instance, opioid production by drug manufacturers is not considered as part of sustainable revenues under SDG 3 good health and wellbeing, since it caused a prominent crisis that has resulted in ongoing lawsuits and settlements.

---Insert Table 1---

There are obvious limits to this approach of using (proportion of) revenues as a proxy for incorporating of sustainable development principles or sustainability commitment. I anticipate several important counterarguments to be made, namely, that revenues may be said to be customer-driven, whereas investments in capex or operational expenses are firm-driven. However, I refresh an important point from stakeholder theory that alleges the reverse and offers some vindication for the importance of revenues: the products that a firm sells (whether they are

ethically sourced, for instance) is dependent on firm managerial decisions, not consumers (Freeman et al, 2010). Consumers are not often fully aware of sustainability implications for a given firm's products, so much as their own need for such products. Such awareness is also short-lived, as consumers often give up their personal dissatisfaction with a firm to accommodate their needs.

Nestle offers a powerful example of these trade-offs. Despite scandals that include the infant formula controversy and subsequent consumer backlash, consumers continued to buy its products to the tune of \$100 billion in annual revenue (Boyd, 2012), in large part because their necessities simply included Nestle products. Other consumer boycotts often falter for the same reasons, as consumers' personal values and awareness about the sustainability of a firm's products often do not exert enough influence over their decision to buy them (Sergius Koku, 2012). Most recently, conservative consumers boycotted the beer brand Bud Light by Anheuser-Busch Inbev because of their disagreement with Dylan Mulvaney, a transgender woman serving as its spokesperson. The boycotting consumers then pivoted to purchase other beer brands Modelo Especial and Michelob Ultra, without realizing that these brands were also owned by Anheuser-Busch Inbev (Miller, 2024). As such, I caution not to overestimate the impact of consumers on a firm's decisions to pursue sustainable options for their products, since these products are often substitutable to consumers regardless of their origins.

Moreover, firms pivoting into sustainable options for their revenue products are often substitutable. If an energy producer pivots most of its energy production to wind, solar, and renewable sources, consumers may not purchase more or less energy because of this fact alone – but the impact that the firm has on carbon emissions still holds. The point here is that many goods and services, including energy, are substitutable to consumers, but nonetheless carry

through an impact for sustainability and suggests that revenue offers a decent measure of how well a firm is contributing to sustainable development.

It may also be said the revenues can be misleading, since pricing elasticity can inflate a firm's commitment to sustainability. An energy firm that increases its prices at $t + 1$, for instance, might give the impression that it is more sustainable than at t because of higher revenues, when it is simply an artifact of pricing. However, I contend that the effects of pricing elasticity would be true of capex and operating expenses as well: that firms paying for the same amount of renewable goods (e.g. energy-efficient lightbulbs) at $t + 1$ due to inflation may give the impression it is more sustainable than at t , when it is simply being charged more. Moreover, I focus on the proportion of revenues, which offers a partial control for price elasticity. If an energy firm increases its prices at $t + 1$ but derives all of it from coal rather than solar, the proportion of revenue committed to renewable energy here stays the same. Using capex and operating expenses to assess a firm's impact on sustainable development is also far more difficult (if not impossible) to assess and collect data for because of information asymmetries. Firms simply do not ever fully know what their suppliers are doing. Firm revenues thus have the benefit of tapping into greater information transparency, as managers have access to far more data about their own organization than others.

Proportions of revenues have the benefit of quantifying otherwise difficult-to-quantify standards in the study of sustainable development, such as focusing on the word choice of disclosures. In their study of firm disclosures, Chen et al (2014) identify that while firm legitimacy may be associated with more specific word choices in disclosures, word choices are also disconnected from projections of actual sustainable development efforts and that "language specificity is... being used in an attempt to enhance credibility via word choice, as opposed to

being about improved transparency and accountability.” After prominent oil spills and disasters, for instance, oil companies like British Petroleum, ExxonMobil, and Royal Dutch Shell increased their “green rhetoric” in word count simply as latitude to avoid scrutiny, even when their actual practices did not change (de Freitas Netto et al, 2020; Yu et al, 2020). Rather than miring itself in the complexities and vagaries of language that are manipulable (ibid), proportions of revenues dedicated to sustainable development principles circumvent this issue. Proportions of revenues offer an easily interpretable measure of an empirical reality (namely, how much of a firm’s products and services are sustainable) that is a useful launching point for further assessments of sustainability impact.

Finally, I stress that the categorization of sustainable revenues itself is widely taken as the predominant (and only) measure of firm commitments to sustainable development by Morningstar Direct and S&P Global. This has important meta-level consequences. Morningstar Direct and S&P Global are widely used by institutional investors, financial institutions, and firms themselves as sources of information and analysis, with which to make judgments about firm performance and investment decisions (Watson et al, 2011). In sum, these measures of sustainability are important because they are a predominant method for (fund) managers currently to gauge firm commitment to sustainable development. As such, the substantive findings (what factors drive sustainability based on revenues) and shortcomings (the limits of using revenues themselves) that this analysis identify capture a consensus already existent among a large pool of investors and managers. By tapping into this consensus, this paper opens dialogue on the promises and pitfalls of current approaches to gauging firm commitment to sustainable development.

In addition, I chose to refine the SDGs provided by Morningstar to accommodate for important theoretical reasons. Namely, I did not include SDGs 1, 5, 8, 10, 16, and 17 even though data on some of these were provided, as these difficult are to quantify or measure on account of their amorphous nature. SDG 1, for instance, refers to ending poverty, SDG 5 refers to gender equality, SDG 8 refers to sustainable economic growth, and SDG 10 refers to reducing inequality. Given that these three initiatives refer to macro-level initiatives on the level of nation-states, they are difficult for companies to accomplish and methodologically challenging to observe in company-level initiatives. SDG 16 refers to peace in societies and SDG 17 refers to partnerships for SDGs, both of which defy quantification. Corporations generally have little role in shaping peace or conflict resolution initiatives, and most corporate initiatives generally involve collaboration with multiple stakeholders.

Each SDG and non-SDG item in Table 1 was included in the factor analyses, which I additionally refined by classifying each firm by the industry that they operate in for more industry-specific variants of the factor analyses. Consistent with research on sustainability disclosures and sustainable development initiatives in firms (Phillips & Ormsby, 2016), I classified firm industry based on the Global Industry Classification Standard (GICS) framework to make measurements parsimonious. I compared firms in emissions-heavy energy, materials, and utilities industries and those outside them (consumer discretionary, consumer staples, financials, healthcare, producer durables, and technology). I supplemented the factor analysis by conducting content analysis on annual reports and drawing on insights from stakeholder theory, organized hypocrisy theory, and political economic theory to interpret the factors and inter-factor relations. The content analysis was both deductive and inductive. To understand the meanings that firms impute to each factor, I coded references to each factor in the annual reports and firm

filings that reported on the relationships between their operations and SDG-related sustainable development efforts.

Analyses

I conducted exploratory factor analysis on the data to identify the underlying constructs that organize firm investments in key ESG issues. Factor analysis is a branch of applied mathematics that reduces a body of data so that a maximum of the variance is extracted. In other words, the method is causal whereby it identifies the common variance among a set of items by reducing their relations to latent dimensions called factors (Harman, 1968, p.15; Shrestha, 2021).

I draw inspiration from Jennrich (2007) and Harman (1968) to express my model of factor analysis as:

$$x = \mu + \Omega f + u \quad (1)$$

Let x be the vector of observed sustainability areas, f be a vector of common factors, u be a vector of unique factors, and Ω is a matrix of p by k factor loadings. I adopt the same base assumptions that vectors f and u are uncorrelated and have mean zero, that the components of f have variance one, and that the components of u are uncorrelated, that μ is the mean of x .

These assumptions prescribe a covariance matrix of α of x with the structure

$$\alpha = \Lambda \Pi \Lambda' + \psi \quad (2)$$

where Π is the covariance of f , ψ is the diagonal covariance of u . Under exploratory analysis, I extract factors by estimating

$$\beta = \Lambda \Pi \Lambda' \quad (3)$$

and Π from a sample of values x , and rotate factors by estimating Λ and correlation matrix Π from the estimate of β . I adopt a standard approach of choosing a rotation criterion R that assigns

numerical complexity from $R(\Lambda)$ to Λ . The rotated value of Λ corresponding to R is that which satisfies (3) for some correlation matrix Π .

Firms that are expected to comply with guidelines for environmental sustainability are also widely expected to comply with expectations of social wellbeing and equitable corporate governance. Consistent with this conceptualization, I assume that the factors are correlated. I accordingly model the factor analysis as an oblique model, which approximates correlations in a loading matrix that resembles a Thurstone structure, the most parsimonious way of visualizing factor loadings. Unlike a complete simple structure, a Thurstone structure captures correlations to a finer decimal level.

The latent factors are assumed to cause or motivate the sustainability areas (Table 1) by firms (van der Eijk & Rose 2015). I reduced the dimensionality of the many areas of sustainable development, capturing firm-level investments in diverse areas of environmental sustainability, social wellbeing, and corporate governance, to distill from them factors that may thus be treated as core goals or foci of sustainable development by firm managers.

I conducted several goodness-of-fit tests to ascertain the veracity of the factors. I computed factor loadings and reduced those less than 0.4 to ensure that all factors included were most relevant. I additionally adopted a simulation-based approach to identify the most theoretically and empirically significant factors (Montoya & Edwards, 2021; Song & Xie, 2021). This involves combining a scree plot with parallel analysis. I first calculated the eigenvalues for all factors based on their sum of square loadings, after which I plotted them and identified the number of factors with the least decline (Cattell & Vogelmann, 1977; Yu et al, 2022).

However, I supplement this with simulations by generating random datasets of the same size (the number of sustainability items and sample size) and re-running the exploratory factor

analysis on them. I then compared the eigenvalues of the simulations with those of the real data to identify the threshold where the real factors surpassed simulated ones and, by extension, the number of real factors with the best model fit.

Sustainable Development Factors in Energy, Materials, and Utilities Firms

Using Equation (1) to determine correlations across sustainable development areas and extracting the factors using Equation (3), I present the sustainable development factors for energy, materials, and utilities firms in Table 2. I identify five factors, each of which is taken to represent a different paradigm. The factors are theoretically and empirically salient, capturing a wide range of firm initiatives toward sustainable development outcomes, but which have traditionally been ignored by observers.

---Insert Table 2---

Sustainable human needs. Factor 1 includes SDG 6 (clean water and sanitation), SDG 11 (sustainable cities and communities), SDG 12 (responsible consumption and production), non-SDG resource security, and non-SDG basic needs. An important commonality across firms' incorporation of these SDGs into their revenues is a preoccupation with sustainable human needs, that is, ensuring that goods consumption by individuals and the urban infrastructure that supports production are sustainable. This means that basic needs, including clean water, are met without compromising resource security, ensuring that water sources are stable.

Human quality of life. Factor 2 includes SDG 3 (good health and wellbeing), SDG 4 (quality education), SDG 7 (affordable and clean energy), and SDG 15 (life on land). This factor emphasizes quality of life, which reaches into issues of access to basic resources needed for survival. In this factor, this access issue is exemplified in resources such as health (healthcare),

education, and affordable infrastructure (in terms of energy consumption and housing). This is an important difference from ex-energy firms. Rather than emphasizing the emissions production issues behind their revenues, they instead cast their revenues as a solution for affordability issues and as a way of offering access to basic resources needed for quality of life.

Renewable energy. Factor 3 is one of the narrowest factors in scope, capturing just SDG 7 (affordable and clean energy) and SDG 13 (climate action). This factor is evidence that energy firms are attempting to diversify their revenues away from emissions-heavy energy sources and toward renewable energy sources. This includes products and services that come from renewable sources, such as the sale of wind and solar energy.

Healthy infrastructures. Factor 4 captures SDG 12 (responsible consumption and production), SDG 15 (life on land), non-SDG resource security, and non-SDG healthy ecosystems. This factor captures common firm initiatives to pursue sustainability in the industrial production chain, namely, with lower emissions-producing technology that minimizes disruptions to ecosystems. This includes, for instance, sustainable forest management in forestry firms that incorporate selective logging into their revenues. Consistent with stakeholder theory, Factors 3 and 4 appear to show that stakeholder pressure is working in the background to address emissions and sustainability issues documented at energy, materials, and utilities firms.

Pollution. Factor 5 captures only SDG 2 (food security and sustainable agriculture) and SDG 14 (life below water). The exclusivity of these two areas exhibits a firm focus on sustainable production with respect to primary production, raw goods or commodities extraction in terms of agricultural products (such as potash) and underwater (such as offshore drilling). Like Factor 3, Factor 5 is extremely narrow. Consistent with organized hypocrisy theory, this means that wherever energy, materials, and utilities firms do incorporate emissions-reducing initiatives

into their revenues, they appear to isolate it from the rest of their sustainability efforts, evinced by the isolation of SDGs 7 and 13 in Factor 3 and the isolation of SDGs 12 and 15 in Factor 5 from all other areas.

Sustainable Development Factors in Ex-Energy, Materials, and Utilities Firms

Using Equation (1) to determine correlations across sustainable development areas and extracting the factors using Equation (3), I present the factors for ex-energy, materials, and utilities firms, namely, firms in consumer discretionary, consumer staples, financials, healthcare, producer durables, and technology (Table 3). I identify six factors, each of which is taken to represent a different paradigm.

---Insert Table 3---

Sustainable human infrastructure. Factor 1 includes SDG 11 (sustainable cities and communities), SDG 12 (responsible consumption and production), SDG 13 (climate action), and non-SDG resource security. This factor broadly captures sustainable human infrastructure. An important commonality across these SDGs is a preoccupation with sustainable human infrastructure, that is, ensuring that goods consumption by households and the urban infrastructure that supports production are sustainable. This often involves reducing the carbon footprint of production activities. Factor 1 (sustainable human infrastructure) for ex-energy, materials, and utilities firms here is similar to Factor 1 (sustainable human needs) identified with energy, materials, and utilities firms. However, they differ in that where firms within the energy, materials, and utilities industries emphasize basic human needs, firms outside of them adopt initiatives that are more related to reducing the carbon footprint of production activities.

Supply chain sustainability. Factor 2 includes SDG 2 (food security and sustainable agriculture), SDG 11 (sustainable cities and communities), SDG 13 (climate action), SDG 14 (life below water), non-SDG resource security, and non-SDG healthy ecosystems. Similar to Factors 3 (renewable energy) and 4 (healthy infrastructures) among energy, materials, and utilities firms, this factor captures common firm initiatives to incorporate sustainable development into their supply chains, namely, food production through sustainable agriculture and aquaculture.

Economic empowerment. Factor 3 includes SDG 9 (building industry, innovation, and infrastructure) and non-SDG human development. Consistent with the U.N.'s focus on poverty alleviation, this factor captures common firm initiatives in empowering socioeconomically impoverished populations by incorporating microfinance and education initiatives into their revenues. Firms are increasingly supporting micro-loans to enable households to repay extant debt and jumpstart entrepreneurial, income-generating activities in a bid to reverse their economic precarity (Buera et al., 2021; Sengupta & Aubuchon, 2008).

Medical development. Factor 4 includes SDG 3 (good health and wellbeing) and non-SDG basic needs. This factor captures firm revenues from medical services and products for physical health maintenance, such as pharmaceuticals and medical engineering. While similar to Factor 2 (basic human needs) in energy, materials, and utilities firms that focuses on access to quality of life (e.g. education, income), Factor 4 (medical development) here focuses on explicit goods and services more narrowly focused on medicine.

Renewable energy production. Factor 5 includes SDG 7 (affordable and clean energy). This factor focuses on renewable energy production that are part of the firm's revenues. Some firms, for instance, listed breakdowns of their energy use by types of renewable energy sources,

including wind, solar, and others and sought to rely on more renewable sources to produce their goods.

Water protection. Factor 6 only includes SDG 6 (clean water and sanitation). This lends for a straightforward interpretation of the factor as a preoccupation with reducing water-based pollution, as well as firm sales of sanitation systems for waste management, waste reduction, and water treatment.

Sustainable Development Factor Pairings

Are the factors related? While conventional assumptions about sustainability hold that firm activities in each dimension (environmental, social, and governmental criteria) are related, the evidence does not appear to support these assumptions. Using Equation (2), I calculate a covariance matrix to determine inter-factor correlations for firms within and outside of emissions-heavy energy, materials, and utilities industries.

---Insert Table 4---

For firms within energy, materials, and utilities industries (Table 4), I observe important positive pairings between the factors. Factor 1 (sustainable human needs) is correlated with all factors except for Factor 2 (human quality of life), which exhibits a negative correlation. Factor 3 (renewable energy) is correlated positively only with Factor 1 and Factor 4 (healthy infrastructures), but negatively correlated with Factors 2 (human quality of life) and 5 (pollution). Factor 4 (healthy infrastructures) is positively correlated with all factors except for Factor 2, which again shows a negative correlation.

Consistent with organized hypocrisy theory, firms in energy, materials, and utilities industries isolate efforts to build renewable energy into their revenues away from efforts to sell technologies that directly reduce pollution. This disconnection reflects a similar position from

organized hypocrisy, namely, that firms are more concerned about a façade of progress, and do the least possible insofar as sustainability to appease stakeholders. Renewable energy, after all, would require new and substantial capital expenditures to change their production chain. Firms in energy and industrial production industries are the heaviest polluters, deriving their core revenues from processing of oil and gas energy.

While this might seem in line with a political economic view of the firm that distrusts shareholders and firms altogether, the inter-factor relations are better captured by organized hypocrisy within a stakeholder theoretical framework. I stress that firms are *still* committed to sustainable development, but in more complex ways than a political economic view is inclined to believe. I observe that firms in these industries are committed to sustainable development, but diversify their revenue streams into renewable energy sources. Moreover, this push into renewable energy is a separate initiative from pollution technologies that might reverse or resolve the emissions already produced. Organized hypocrisy theory tentatively offers an account of these pairings by stressing that firms seek to render their revenues sustainable to “create organizational legitimacy in the eyes of stakeholders” (Cho et al, 2015, p.82), which offers an explanation for the puzzling fragmentation I observe between pollution and renewable energy initiatives when firms excessively “manage their impressions” (ibid).

However, it is important to note that Factor 2 (human quality of life) is negatively correlated with all other factors. These inter-factor relations suggest that firm pursuits of sustainable development are not universal across all areas, but comprise a set of competing choices, especially for firms in energy, materials, and utilities industries. Despite the apparently wide reach of Factor 2 across SDG areas, quality of life remains isolated from larger sustainable

development efforts in the areas of energy and pollution. These findings lay bare impossible trade-offs between factors for firms.

There are several interpretations that may be simultaneously true. First, consistent with organized hypocrisy theory, firms in these industries manage a façade about the positive population health outcomes from their renewable energy and pollution production chain overhauls, when in reality their sustainability practices are disconnected from direct efforts at improving health outcomes. Second, the negative inter-factor relations may suggest that having sustainable revenues in the human quality of life space is cost-prohibitive and inhibits firms from pursuing sustainable revenues in other areas (or vice versa).

How do these inter-factor relations change for firms outside of emissions-heavy energy, materials, and utilities industries? For firms in ex-energy, materials, and utilities industries, I observe a different picture of inter-factor relations (Table 5).

---Insert Table 5---

Factor 1 (sustainable human infrastructure) captures the most salient tranche of synergies in sustainable development factors. Factor 1 (sustainable human infrastructure) is positively correlated with Factor 2 (supply chain sustainability), Factor 5 (renewable energy production), and Factor 6 (water protection). Within this scope, Factor 2 (supply chain sustainability) is also positively correlated with Factor 6 (water protection). Factor 6 is also positively correlated with Factor 1, Factor 2, and Factor 4 (medical development).

These synergies demonstrate that the most prominent focus of firm sustainable development factors is centered around environmental sustainability initiatives and reducing the environmental impact of corporate activity, such as carbon emissions reductions. Firms that are more likely to incorporate “greening” urban centers into their revenues are also more likely to

incorporate efforts to produce renewable energy products and reduce carbon emissions by intermediaries in the supply chain.

However, in addition to positive pairings, I observe significant negative pairings. Negative pairings are important because they suggest constraints in capital allocation with respect to sustainable development factors. Just like with firms in energy, materials, and utilities industries, firms outside of these industries also demonstrate important nuances in sustainable development factors, comprising a landscape of competing choices. Firm efforts to incorporate certain sustainable development principles into their operations are linked to fewer efforts to incorporate other principles.

Factor 3 (economic empowerment) is negatively correlated with all other factors. Economic empowerment does not fit easily within the broader environmental sustainability efforts that enjoy greater popularity among firms. Given that environmental sustainability (positive pairings surrounding Factor 1) is the dominant factor, it stands to reason that firms are generally less likely to incorporate into their revenues microfinance and microcredit initiatives to alleviate poverty among impoverished households.

Factor 6 (water protection) is negatively correlated with all factors except for Factor 1 (sustainable human infrastructure). Firms that pursue virtually any other sustainable development principle appear less likely to pursue water protection. Put differently, pursuing economic empowerment and water protection appear to be disincentives for corporate pursuits of all other sustainable development factors. Firms would *rather* pursue sustainable revenues in any other area.

Robustness Checks

---Insert Figure 1---

---Insert Figure 2---

To confirm the number of factors with the most explanatory power, I conducted simulations, the results for which are presented in Figures 1 and 2. Comparing the eigenvalues for factors derived from real data and simulations, I find that the eigenvalues of real factors approach those of simulated ones around six for energy, materials, and utilities industry firms. Past this point, eigenvalues decline rapidly, suggesting that five factors are the ideal number of factors for interpreting the data. Similarly, I find that the eigenvalues of real factors approach those of simulated ones around seven for ex-energy, materials, and utilities industry firms, suggesting that six factors are ideal.

---Insert Table 6---

---Insert Table 7---

For energy, materials, and utilities industry firms, five factors were ideal, rather than six, because the eigenvalues of the real factors fell below that of the simulated ones. I traced the raw sum of square loadings and the variance explained by the sustainability factors in Tables 6 and 7. Though the variance explained varies across factors, all factors have a significant sum of square loadings (above 1) for firms within and outside of energy, materials, and utilities industries. These factors also explain a cumulative (85.2%) 89.1% of variance in sustainability initiatives by firms in (ex-)energy, material, and utilities industries in the sample, a salient level of explanatory power.

Discussion

Drawing on a statistically representative dataset of publicly-listed firms in the U.S., I identify factors that organize all firm efforts to incorporate sustainable development into their operations. Within this scope, I observe a number of novel development principles that have not been observed in previous studies, such as aquacultural sustainability and micro-finance for economic empowerment. Reducing carbon footprint in production and supply chains as well as improving agricultural and aquacultural sustainability also represent innovative attempts to pursue environmental sustainability efforts.

Contrary to the popular narrative that firms seek to incorporate environmental, social, and governmental development principles into their operations with equal zeal (Eccles & Serafeim, 2013), I observe important nuances in the underlying factors that drive efforts in each area, comprising a series of competing choices. Adopting an industry-level focus on emissions, I analyze differences in these factors between firms within and outside of the emissions-heavy energy, materials, and utilities industries.

I observe differences in sustainable development factors across industries. Firms in energy, materials, and utilities industries are driven by factors with two overt themes: quality of life and green energy. Factors gravitated toward providing access to resources needed for quality of life and health equity, presumably as an outcome of green energy. However, inter-factor relations reveal that the two sets of factors are negatively correlated. Even within green energy, renewable energy and pollution reduction efforts were disconnected from one another.

There are two possible explanations that I take stock of. First, stakeholder theory and organized hypocrisy theory may find these findings consistent with their core propositions about the purpose of the firm. On the one hand, the fact that firms are aspiring to become more sustainable shows that stakeholders are succeeding in pushing firms to become sustainable. On

the other hand, the disconnection between health, pollution, and renewable energy efforts shows that pursuits of sustainable development have an element of the façade that organized hypocrisy theorists conceptualize of firm behaviors (Brunsson, 2007).

Second, the negative inter-factor relations between certain factors may be indicative of underlying market dynamics or sustainable revenue costs. The pursuit of sustainable products dedicated to human quality of life may be cost-prohibitive, preventing firms from producing products for human quality of life and sustainable revenues in other factors simultaneously.

Ultimately, the findings suggest that firms pursue sustainable development principles as an *equilibrium* between factors that calls upon trade-offs. For firms outside of energy, materials, and utilities industries, pursuits of sustainable development principles such as resources and quality of life are broken down into economic and medical development as separately specialized factors. Many of the other factors revolve around “greening” urban centers, pivot to renewable technology, and reducing carbon emissions in the supply chain, all of which demonstrate positive synergies. However, inter-factor relations reveal that firms more likely to incorporate this positive synergy of sustainability efforts are less likely to pursue economic empowerment (poverty alleviation) and water protection factors.

Policy Development

In response to growing demand from stakeholders for greater transparency about the sustainability impacts of publicly-listed companies, market regulatory bodies worldwide are increasingly mandating sustainability disclosures. In Europe, the European Commission implemented its Corporate Sustainability Reporting Directive (CSRD, 2022). Succeeding the Non-Financial Reporting Directive (NFRD), the CSRDⁱ requires companies to publish reports on

policies they implemented in relation to environmental stewardship, social responsibility and treatment of employees, human rights, anti-corruption and bribery, and age, gender, educational and professional background diversity on company boards.

Internationally, the International Sustainability Standards Board (ISSB) was established in 2021 due to “investor, company and international policy maker (including the G20, G7, IOSCO and the Financial Stability Board) demand for decision-useful, comparable information” (IFRS, 2024, para 7). In 2023, the ISSB released two of the foremost standards for operationalizing metrics for sustainability-related reporting: the International Financial Reporting Standards (IFRS) S1 (ISSB, 2023a), a general core framework for disclosures, and the IFRS S2 (ISSB, 2023b), the first thematic standard related to climate disclosures. IFRS S2 more specifically highlights cross-industry greenhouse gas emissions, climate-related risks and opportunities, and capital deployment for achieving environmental sustainability. The two guidelines make important contributions to sustainability reporting by stressing transparency in methodology and metrics for measuring sustainability.

However, these guidelines are not comprehensive. The ISSB itself concedes that firms “need not provide quantitative information about... sustainability-related risk or opportunity if [a firm] determines that those effects are not separately identifiable... [or if a firm] does not have the... resources to provide that quantitative information” (ISSB, 2023a, para 38-39). With only a thematic standard on climate change in the IFRS S2, for instance, the ISSB leaves absent standards for social equity and corporate governance. In the IFRS S1’s provisions themselves, the ISSB recognizes that firms may encounter “absences of an IFRS Sustainability Disclosure Standard that specifically apply to a sustainability-related risk or opportunity” (ISSB, 2023a,

para 47), whereupon firms need only “apply [their] own judgment to identify applicable metrics” (para 57).

Amid these encouraging attempts to regulate sustainability efforts by firms, this article concludes by identifying the need for IFRS standards on social equity and corporate governance. Moreover, this article illustrates the need for *industry-specific* standards on how to incorporate sustainable development principles into firm operationsⁱⁱ. As the two sets of factors identified in the results show, firms in energy, materials, and utilities industries are more concerned with U.N. SDGs on clean energy and good health, whereas firms outside these industries are more concerned with food security and sustainable agriculture. These differences tentatively show that firms are not equipped to pursue every sustainable development principle, but only a subset that overlaps with their industry.

Practical Contributions

In parallel with the need for greater clarity among regulating bodies for industry-specific guidelines on sustainable development principles and firm operations, there exists a need for sustainability analysts to embrace isomorphism in developing their benchmarks for appraising how firms contribute to sustainable development.

Analysts who are values-driven may focus on negative externalities and their consequences for society, while others who are value-driven may instead focus on financial performance, in which environmental, social, and governance sustainability concerns become a way of assessing the internalized costs of negative externalities. Tracing the methodologies for developing sustainability measures at KLD Research & Analytics and Innovest Strategic Value Advisors, Eccles and Strohle (2020) argue that environmental, social, and governance principles

are socially constructed and vary greatly across companies. They find that the two companies differed in terms of motivation, methods, and assessments of ESG compliance because of underlying philosophies. KLD, motivated by a belief in sustainable development, “focused its ESG assessment on the benefit or harm to the wider society and not on the financial benefit for investors” (p.580). By contrast, Innovest was more oriented toward financial returns and accordingly created measures focused on financial materiality.

This lack of consensus conflates ESG and sustainability, and adds to the noise surrounding what sustainable development principles firms deem important to integrate into their operations and how (Agrawal, 2021). This article has offered an intuitive, exemplar standard for analysts to adopt in benchmarking their standards: U.N. SDGs. SDGs enjoy legitimacy benefits from the multi-jurisdictional reach of the U.N. The SDGs thus offer the foundation for benchmarks of sustainable development that are not only applicable and referred to by firms, but by governments, NGOs, analysts, and other institutions. Taken together, this constitutes a powerful framework for understanding the factors drive institutional decisions about which sustainable development principles to incorporate into operations. While this framework has been applied in the present context of firms, there is similar space to adopt this framework in analyst benchmarks of sustainable development and to apply this framework to understand state contributions to sustainable development.

Research Limitations

There are limitations to this study and observations I make that serve as grounds for future research. Across both sets of firms, the vast majority of factors are focused on environmental sustainability. Overtly missing are concerns with social wellbeing and corporate

governance. This tentatively suggests that firms are far more concerned with incorporating environmental sustainability issues into their operations than social and governance ones. This is not to say that firms do not care about the latter outright, but that sustainable development principles across these three areas are a set of competing choices.

On that note, I do not imply that the factors I identify are universal. Rather, this article contributes an understanding of how industry might influence over sustainability decisions at the firm-level, giving credence to more fine-grained research in the future about specific industry comparisons. I also do not claim that my core measure, proportions of revenues dedicated to sustainable development principles, is a perfect measure. This is a point recognized by the many studies of sustainability discourse and “greenwashing,” which have urged for attention to firm actions beyond the easily manipulable limits of language (Chen et al, 2014; Yu et al, 2022).

This study contributes to this conversation by examining sustainable development in terms of firm operations, with one form being the amount of revenues that a firm dedicates to sustainable issues. I stress the necessity of examining sustainable development in firms from multiple aspects, and anticipate that this study opens dialogue on one possible measure (proportion of revenues) of such, especially given its current adoption by Morningstar and S&P Global as proxies for firm commitment to sustainable development.

Just as studies of sustainability disclosures invited scrutiny about the follies of using language as a proxy, I also raise important points about the limits of using revenues. Not all SDG and non-SDG issues can be captured by revenues, such as poverty or inequality alleviation, a point that I have raised and accounted for in my methodological choices (removing the difficult-to-quantify SDG issues), but remains a bigger problem in current sustainability databases like the one I use in this paper. Furthermore, I stress the importance of assessing other measures of firm

commitment to sustainable development, such as direct funding for sustainability issues or philanthropic efforts separate from firm revenues (e.g. reforestation, etc.), that are currently not publicly used or recorded by sustainability databases.

Though the sustainability factors identify order in a cross-sectional sample, I raise the point that absent IFRS sustainable development standards in areas such as social equity and corporate governance, other patterns of how firms incorporate sustainable development principles into their operations may emerge in the future and become candidates for inclusion in factor models. So long as this absence persists, factor models are confronted with the possibility of degenerating into long lists of factors, towed whichever way the wind swings with exogeneous cultural and political influences (e.g. rising anti-ESG legislation at the state-level that opposes both ESG and sustainability). To prevent this empty data dredging, future research would do well to evaluate the efficiency of sustainability factors, and outline the legal ordinances required to sustain the balance between the negative inter-factor relations identified in this study as well as between single and double materiality at large.

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Figures

Figure 1. Scree plot of eigenvalues for factors derived from real data and simulations for energy, materials, and utilities.

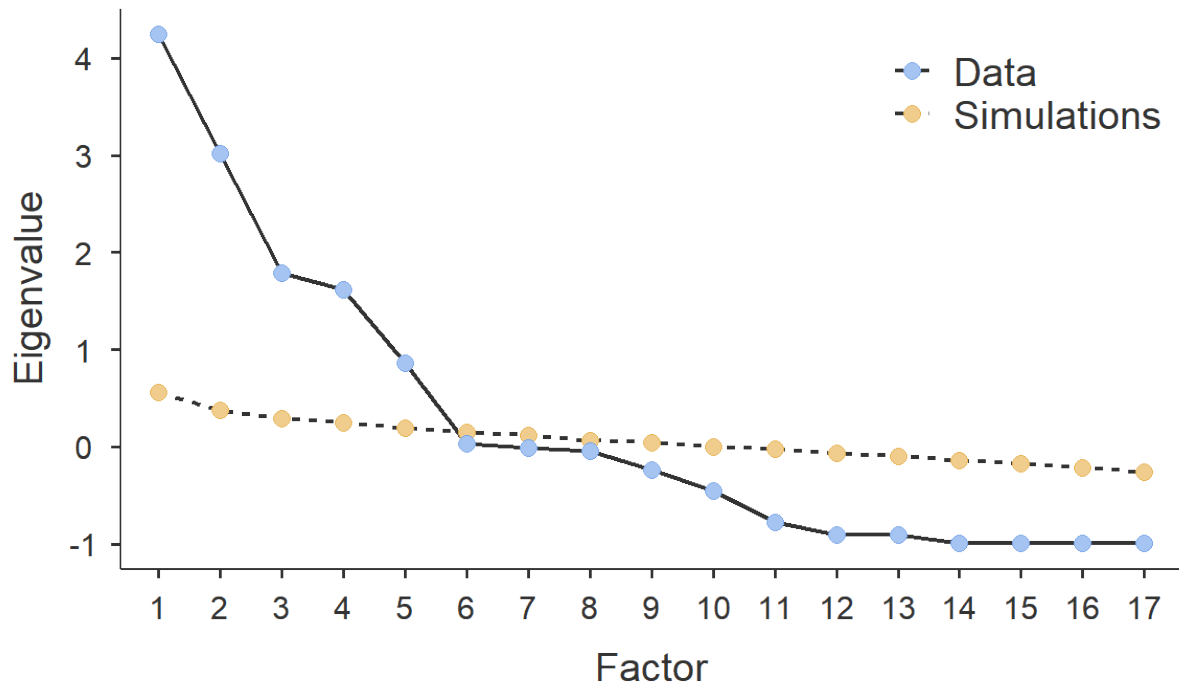
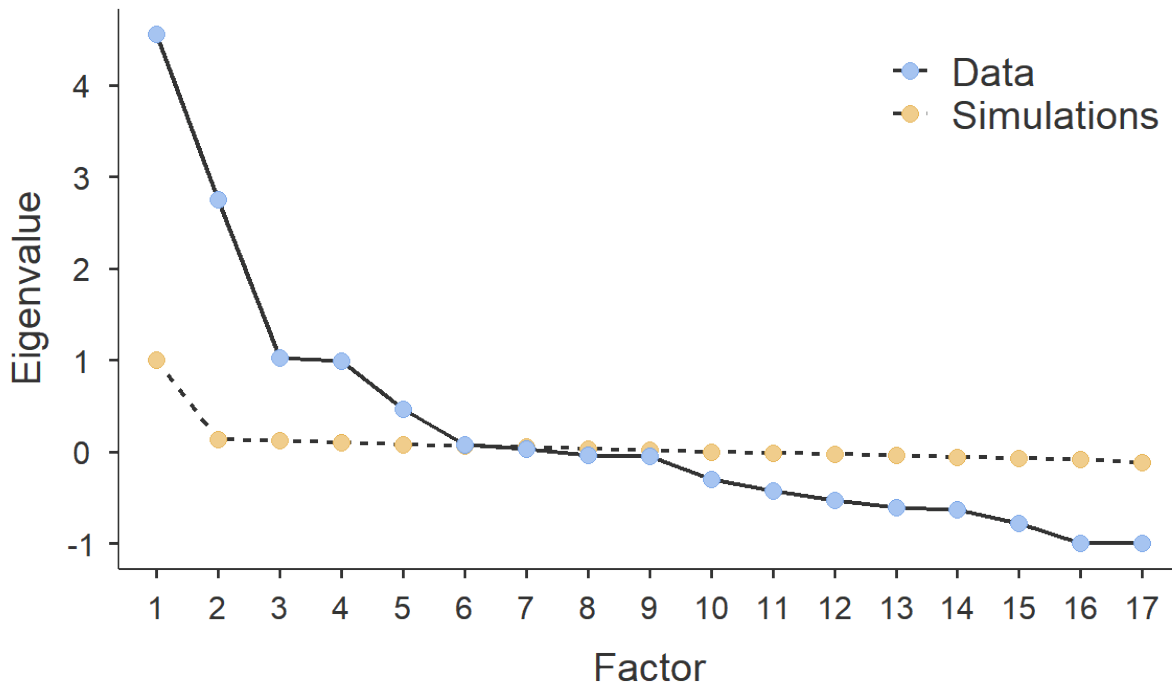


Figure 2. Scree plot of eigenvalues for factors derived from real data and simulations for ex-
energy, materials, and utilities (consumer discretionary, consumer staples, financials, healthcare,
producer durables, and technology).



Tables*Table 1.* U.N. Sustainable Development Goals (SDGs) and their operationalization in company practices.

SDG	Definition	Operationalization
SDG 2	Food security and sustainable agriculture	Proportion of revenues from products or services supporting sustainable agriculture, aquaculture, and food manufacturing.
SDG 3	Good health and wellbeing	Proportion of revenues from medicine production, technology development, and equipment production for diseases.
SDG 4	Quality education	Proportion of revenues from education products and services.
SDG 6	Clean water and sanitation	Proportion of revenues from pollution prevention, treatment, water utilities and technologies, and watershed adaptation.
SDG 7	Affordable and clean energy	Proportion of revenues from renewable energy products and energy generation. This may include green transportation infrastructure, vehicles, renewable energy generation, and renewable energy products.
SDG 9	Building industry, innovation, and infrastructure	Proportion of revenues from microcredit and microfinance.
SDG 11	Sustainable cities and communities	Proportion of revenues from green building development and green transportation infrastructure services or vehicles.
SDG 12	Responsible consumption and production	Proportion of revenues from pollution remediation, energy efficient industrial processes, and resource recovery, such as recycling.
SDG 13	Climate action	Proportion of revenues from products and services that are supported by renewable energy.
SDG 14	Life below water	Proportion of revenues from products or services supporting sustainable agriculture, aquaculture, and food manufacturing.
SDG 15	Life on land	Proportion of revenues from sustainable forestry.
Non-SDG	Human Development	Proportion of revenues from education products and services and microfinance.
Non-SDG	Resource Security	Proportion of revenues from green building development, sustainable agriculture, recycling and resource recovery, sustainable forestry, and watershed adaptation.
Non-SDG	Basic Needs	Proportion of revenues from medicine production, medical technology and equipment, and water technologies.
Non-SDG	Healthy Ecosystems	Proportion of revenues from pollution prevention, reduction, remediation, and sustainable food manufacturing and forestry.

Table 2. Factor loadings across all sustainability areas for energy, materials, and utilities firms.

SDG	Definition	Factors					Uniqueness
		1	2	3	4	5	
SDG 2	Food security and sustainable agriculture					0.995	0.004
SDG 3	Good health and wellbeing		0.999				0.001
SDG 4	Quality education		0.999				0.001
SDG 6	Clean water and sanitation	0.919					0.121
SDG 7	Affordable and clean energy		0.999	0.733			0.457
SDG 9	Building industry, innovation, and infrastructure						0.001
SDG 11	Sustainable cities and communities	0.933					0.083
SDG 12	Responsible consumption and production	0.851			0.472		0.024
SDG 13	Climate action			0.994			-0.003
SDG 14	Life below water					0.995	0.004
SDG 15	Life on land		0.999		0.985		0.020
Non-SDG	Human Development						0.001
Non-SDG	Resource Security	0.851			0.472		0.024
Non-SDG	Basic Needs	0.919					0.121
Non-SDG	Healthy Ecosystems				0.985		0.019

Table 3. Factor loadings across all sustainability areas for ex-energy, materials, and utilities firms.

SDG	Definition	Factors						Uniqueness
		1	2	3	4	5	6	
SDG 2	Food security and sustainable agriculture		0.943					0.107
SDG 3	Good health and wellbeing				0.990			0.009
SDG 4	Quality education							0.999
SDG 6	Clean water and sanitation						0.979	0.005
SDG 7	Affordable and clean energy					0.983		0.029
SDG 9	Building industry, innovation, and infrastructure			0.998				0.003
SDG 11	Sustainable cities and communities	0.969	0.429					0.005
SDG 12	Responsible consumption and production	0.873						0.003
SDG 13	Climate action	0.939	0.938					0.082
SDG 14	Life below water		0.957					0.113
SDG 15	Life on land							0.077
Non-SDG	Human Development			0.998				0.003
Non-SDG	Resource Security	0.882	0.415					0.019
Non-SDG	Basic Needs				0.979			0.004
Non-SDG	Healthy Ecosystems		0.959					0.071

Table 4. Inter-factor correlations for energy, materials, and utilities firms.

Factors	1	2	3	4	5
1	—				
2	-0.024	—			
3	0.254	-0.035	—		
4	0.423	-0.028	0.123	—	
5	0.036	-0.006	-0.027	0.276	—

Table 5. Inter-factor correlations for ex-energy, materials, and utilities firms.

Factors	1	2	3	4	5	6
1	—					
2	0.377	—				
3	-0.039	-0.027	—			
4	-0.023	-0.025	-0.008	—		
5	0.412	-0.013	-0.004	-0.054	—	
6	0.496	0.302	-0.014	0.202	-0.003	—

Table 6. Variance explained by factor loadings for energy, materials, and utilities firms.

Factor	Sum of square loadings	Variance explained	Cumulative variance explained
1	4.07	23.9%	23.9%
2	4.01	23.6%	47.5%
3	2.67	15.7%	63.2%
4	2.43	14.3%	77.5%
5	2.00	11.7%	89.2%

Table 7. Variance explained by factor loadings for ex-energy, materials, and utilities firms.

Factor	Sum of square loadings	Variance explained	Cumulative variance explained
1	4.05	23.81%	23.8%
2	3.98	23.41%	47.2%
3	2.00	11.74%	59.0%
4	1.96	11.51%	70.5%
5	1.32	7.77%	78.2%
6	1.17	6.91%	85.1%

ⁱ These Directives are distinct from other regulations that govern ESG concerns. In the U.K., the Financial Reporting Council (FRC, 2021) published a Statement of Intent on Environmental, Social and Governance (ESG) that encouraged companies and financial institutions to report their ESG practices and disclose their climate-related risks. In the U.S., the Securities and Exchange Commission (SEC) similarly proposed ESG disclosure requirements. In 2020, the SEC proposed a rule that would require publicly traded companies to disclose how they manage risks related to ESG factors (SEC, 2020). These provisions were expanded in 2022 to include disclosure of greenhouse gas emissions, and potential effects of climate change on their operations and financial stability (SEC, 2022).

ⁱⁱ The Global Reporting Initiative's (GRI) Sector Standards program, currently under development, is a step in this direction.