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# Not so myopic: Investors lowering short-term growth expectations under high industry ESG-sales-related dynamism and predictability

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## ABSTRACT

Past studies on the effects of environmental, social, and governance (ESG) scores on firm performance have found mixed support. To further unpack these findings, we focus on the effects of industry-level dynamism and the predictability of ESG scores on sales and investor expectations on the prospects of firm growth. Dynamism (predictability) is based on the standard error (R-squared) of industry ESG ratings regressed on industry sales. Taking an investor's perspective, we focus on a forward-looking performance measure, specifically, the implied volatility in a firm's 365-day at-the-money call options. Our findings show that although industry ESG-sales dynamism and predictability lower a firm's implied volatility, a higher firm-level ESG rating mitigates the decline in the implied volatility under increasing ESG-sales dynamism. The findings show that investors expect lower short-term growth potential of industry firms with experimentation in leveraging ESG to increase sales (i.e., dynamism) and only lower their discounts in growth expectations for firms with higher ESG scores. The industry-level dynamics among ESG scores and sales and investor growth expectations in the form of implied volatility are added considerations in studying ESG and performance relationships.

## 1. Introduction

Environmental, social, and governance (ESG) ratings are increasingly important to stakeholders (Busch et al., 2016; Drempec et al., 2019). ESG ratings are defined as the "evaluations of a company based on a comparative assessment of their quality, standard or performance on environmental, social or governance issues" (SustainAbility 2018, pg. 4). Ratings evaluate a firm on its ESG attributes, including environmental performance, labor practices, governance, and transparency, among others (Clementino & Perkins, 2020); and provide a composite score of overall ESG performance. ESG ratings improve transparency, accountability, and market discipline and are central to assessing the degree to which a firm effectively manages ESG initiatives, exploits ESG-related opportunities, and improves the overall well-being of its stakeholders. ESG ratings also increase the mimetic and isomorphic pressures in the industry to lower the deviance in ESG activities among competitors (Martínez-Ferrero & García-Sánchez, 2017). Much of the ESG research has focused on its effect on firm performance (Aouadi & Marsat, 2018; Duque-Grisales & Aguilera-Caracuel, 2019) with studies finding support for a positive association (Cahan et al., 2015; Eccles,

Ioannou, & Serafeim, 2014; Fatemi et al., 2015; Filbeck et al., 2009; Lo & Sheu, 2007; Rodriguez-Fernandez, 2016; Wang and Sarkis, 2017), a negative association (Branco and Rodrigues, 2008; Brammer et al., 2006), and no association (Galema et al., 2008; Statman, 2006; Horváthová, 2010; Orlitzky et al., 2003). Other studies have found that a higher ESG score lowers firm risk in general (Dorfleitner et al., 2015; Sassen et al., 2016) and downside risk in particular (Hoepner et al., 2018).

The mixed findings could be driven by, among other factors, the limited consideration of ESG in the industry and by investors valuing growth prospects. The extent to which industry sales are sensitive to ESG scores is an important consideration as the monetization of ESG efforts could be tied to the degree to which the industry as a collective has identified means to convert ESG scores to sales. Building on Dess and Beard (1984) and the ESG literature, two temporal patterns of industry ESG and sales are important, i.e., dynamism and predictability. Dynamism is measured using the standard error of industry ESG scores regressed on sales over time, indicating the level of experimentation used to derive higher sales from ESG in the industry. Predictability is measured using the R-squared of industry ESG scores regressed on

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industry sales. Predictability is the degree to which past industry ESG predict future sales. How industry-level ESG moves in tandem with industry sales could be an important consideration for value creation from ESG.

ESG initiatives, among other initiatives, can increase the implied volatility of firm value. Implied volatility focuses on the forward-looking growth prospects measured as the 365-day implied volatility of at-the-money-forward call options (Alfaro, Bloom, & Lin, 2017). Though Although past studies have used Tobin's Q as a proxy for growth prospects, the measure is limited in gauging the implied volatility in a firm's growth prospects. The consideration of forward-looking volatility is therefore an important proxy for the ESG literature. Based on the Black–Scholes formula, higher implied volatility increases the value of a call option. In our work, the 365-day forward-looking volatility in the money call option signals an improved outlook on firm performance, and the 365-day horizon is associated with yearly executive compensation contracts. Implied volatility provides a novel measure to assess firm performance and, for the first time, provides a forward-looking measure of performance for ESG research. It can be used to assess how much investors value ESG in the short term and whether they take a broader industry perspective.

We ask if investors focus on industry ESG-sales activity to value a firm's short-term growth prospects. If industry ESG-sales activity is characterized by higher dynamism or predictability, it is expected that industry peers are developing or experimenting with business models to strengthen the ESG-sales association. However, these actions come to fruition in the longer term. Thus, an ESG-sensitive investor would discount short-term growth prospects, adopt a watch-and-wait approach, and only lower the discount (i.e., mitigation effect) for firms with higher ESG scores. The study provides a pivotal litmus test for whether stockholders who are typically short-term oriented value industry ESG-sales activity enough to discount firms in the short term. Expecting a shorter-term horizon from forward-looking implied volatility, a higher ESG score might play a mitigating role as the full extent of gains from ESG may not be realized within a year. Therefore, the degree of the negative association between ESG sales and dynamism or predictability will be weaker.

Our research aims to make the following contributions. First, given the mixed effects seen in empirical findings on ESG's impact on firm performance, our framework considers a firm's implied volatility that is not captured in accounting or Tobin's Q-type outcome measures. The distinctive measure of implied volatility allows us to test how investors consider industry ESG-sales activity in valuing short-term growth prospects. Compared with prior studies using the standard deviation of the ROA (Sassen et al., 2016) or idiosyncratic risk based on Fama–French models (Lee & Faff, 2009; Maiti, 2020), we use the implied volatility–based measure to provide a forward-looking measure of expected performance. Our framework echoes recent studies on the effect of ESG

on systematic risk (akin to industry-level ESG activity), which asks “whether ESG is currently regarded as a systematic factor, i.e., a broad market movement or a change that (is) relevant to all investors” (Jin, 2018).

Second, our framework proposes an important dynamic of ESG and sales at the industry level. Industry-level ESG-sales dynamism and predictability may lower the implied volatility or short-term stock price outlook. Studies on CSR have found that firms with higher CSR scores engage in higher risk-taking (Ayadi et al., 2014; Erhemjams et al., 2013) or reduce their excessive risk-taking (Harjoto, Laksmana, & Lee, 2015). Studies on ESG and firm risk find that higher ESG activity decreases total and idiosyncratic risk (Salama et al., 2011; Sassen et al., 2016) and lowers downside risk (Hoepner et al., 2018; Giese et al., 2019). Our research complements these studies by highlighting the role of industry ESG activity as a critical consideration in managing forward-looking performance.

Third, our study contributes to the ESG literature by proposing industry-level ESG-sales activity. We build upon Dess and Beard's (1984) framework by proposing two new measures that could inform future research in considering industry-level ESG activity as a mainstay in explaining firm-level performance. The extent to which industry competitors invest in ESG and realize variable returns is a signal of industry-level experimentation with ESG in driving sales. The dynamism and predictability of ESG provide starting points for the inclusion of industry-related factors and further the understanding of the ESG-performance association. With a considerable amount of ESG research focused on executive and firm-level assessments, industry-level dynamics from institutional theory and organizational deviance from industry ESG activity can provide new insights and understanding.

The remainder of this article is organized as follows. We start with the theoretical framework and develop the hypotheses. Then, we describe the sample, data, and methodology. Finally, we report our results, discuss the theoretical contributions, and provide directions for future research.

2. Theoretical development and hypotheses

Researchers have conducted extensive studies on the physical hazards and socioeconomic impacts of climate change and the value of sustainability. ESG initiatives are critical given the studies' distressing predictions, including the rise of global temperature to 2.0 degrees Celsius above preindustrial levels, up from 1.1 degrees in 2020 (Woetzel et al., 2020; Parks et al., 2020). Based on the environmental damage that is already evident and the concern that too little is being done to stop climate change, there are several distressing specific predictions for 2050 (Otto et al., 2020). These predictions include droughts throughout North, Central, and South America; sharp decreases in surface water supplies among many areas of the world; rising ocean temperatures that

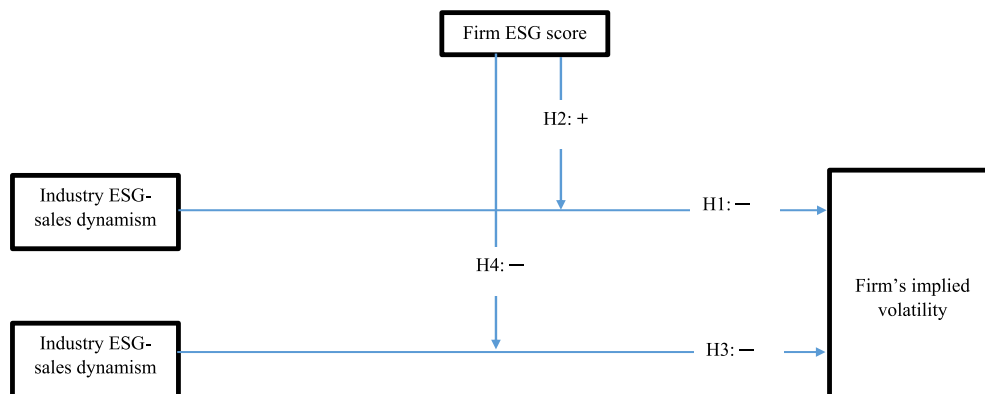


Fig. 1. Conceptual Model.

will reduce fish yields by 35 percent; steep declines in beef production; and lethal heatwaves annually (Free et al., 2019).

Due to climate concerns, ESG disclosures are used by some investors to supplement financial reports and to evaluate a company's performance and contributions to sustainability. ESG disclosures are becoming an increasingly common element of company reports. In 2011, 20 percent of S&P 500 companies published reports featuring ESG data; in 2018, this number jumped to 86 percent (Holger, 2019). In 2014, 18 percent of professionally managed assets in the United States were invested considering corporate levels of sustainability compared to 26 percent five years later (Holger, 2019). The recent increase in ESG reporting is a positive sign that businesses and their constituencies are paying increasing attention to environmental concerns. Academic research is also more frequently examining the claims regarding the costs of ESG and the benefits that businesses can derive by engaging in ESG initiatives.

Research seeking to determine the financial performance consequences for a firm investing in ESG is in the foundational stage. However, as discussed in the introduction, the findings on the effects of ESG on performance remain mixed but generally favor lower downside risk from higher ESG. In particular, companies that are early movers in their industry may benefit from positive investor evaluations of ESG (Hamilton, Jo, & Statman, 1993). Moreover, companies may benefit from being committed to sustainability to offset the negative volatility within their industry.

Despite the role of industry in explaining a wide range of organizational outcomes, research has overlooked industry ESG activity that may also drive ESG priorities and investments and stakeholder participation. Specifically, the ESG activity of industry competitors increases isomorphic and mimetic pressures and provides an impetus to improve competencies around ESG. The conceptual model is presented in Fig. 1. Our proposed measures of the industry's ESG-sales dynamism and predictability are indicative of the value creation through ESG in an industry (Miller & Glick, 2006; Patel et al., 2020). Industry ESG-sales dynamism highlights the level of experimentation in ESG activities to improve industry sales. A higher industry ESG-sales dynamism signals that industry participants are actively developing and exploiting various ESG-sale combinations. Analogous to the conceptualization of industry dynamism or the variability in industry sales over time, the industry's ESG-sales dynamism indicates the level of instability in novel ESG experimentation efforts in the industry. However, the industry's ESG-sales dynamism could play a constraining role when ESG investments take resources away from value-creating non-ESG strategic activities (Cheng et al., 2014). Therefore, although ESG-sales dynamism signals vitality in developing economically feasible ESG returns, it could lower the yearly implied volatility of the firm.

Alternatively, given that investors cannot predict the winners in the ESG-sales dynamism condition, they may discount a firm's short-term growth prospects. Based on the mimetic isomorphism logic (Jackson et al., 2020; Montiel et al., 2020), predictability in ESG activities provides the initial set of symbols, discourses, and actions to help develop ESG norms in the industry. Investors may further consider predictability to be less important than value creation models. ESG levels are generally known in an industry, and they may be discounted by investors when estimating short-term growth prospects.

### 2.1. Industry ESG dynamism and firm-implied volatility

We build on the measure of dynamism by proposing an industry ESG-sales dynamism concept to reflect the degree to which industry ESG investments and sales are volatile. We expect that an industry's ESG-sales dynamism may be negatively associated with the implied volatility of a 365-day call option. Higher industry ESG-sales dynamism implies increased experimentation and novelty in an industry by leveraging ESG with higher sales. ESG-sales volatility implies that industry firms are experimenting with a variety of alternative models to

leverage ESG. Consequently, ESG-sales volatility improves growth and value creation in the long term (Josée Ledoux, Cormier, & Houle, 2014).

Dynamism refers to volatility in the environment (Duncan, 1972; Dess & Beard, 1984; Wang, 2007). It leads to the reconsideration of and possible changes in a firm's strategy and requires an assessment of complex and impactful variables (Milliken, 1990; Simerly & Li, 2000; Tung, 1979). Dynamism increases the challenges to managerial and resource allocation decisions (Ghosh & Olsen, 2009). The upside potential from implied volatility may not be realized from ESG investments in the short term. Therefore, in dynamic ESG-sales environments, while ESG-specific innovations may allow value appropriations, the total net value would be lower in rapidly changing environments. Our rationale for lower implied volatility under higher ESG-sales dynamism is based on studies finding benefits of ESG to portfolio diversification (Hoepner, 2010; Verheyden et al., 2016) or lower downside risk (Jin, 2018).

Higher ESG-sales dynamism requires in-depth assessments of the cause-and-effect relationships by managers. Additional ESG modifications to strategic actions may not materialize in the short term; indeed, they may not directly contribute to a firm's bottom line due to higher volatility in returns to sales. As firms attempt to respond to a changing industry environment under high ESG-sales dynamism, the reaction triggered in the industry could steer attention away from the core business models.

The changes are also likely to require a renegotiation of the relationships with investors, stockholders, managers and employees, customers, creditors, communities, governments, and other stakeholders. Among the likely consequences of these in-depth realignments is the need for a company to revise its structure to allocate existing resources and attract new capabilities necessitated by its environmental dynamism. These response-related challenges lower implied volatility as new information and relationships must be integrated into the decision-making process throughout the business (Milliken, 1987).

As such, ESG-sales dynamism and firm-implied volatility are expected to be weak.

**Hypothesis 1:** Higher industry ESG-sales dynamism is negatively associated with a firm's implied volatility.

An industry exhibits particular characteristics that affect all of the companies that comprise it, albeit in different ways and with different consequences (Hambrick, 1984; Gupta et al., 2019; Sandhu & Kulik, 2019). For example, investor receptivity to ESG initiatives may impact all competitors when it increases the instability in the industry. Consequently, within an industry, firm success will be enhanced by a match between a firm's investment in ESG and the reward that investors attach to that particular type and level of engagement. The set of environmental factors that alter the stability of the competitive landscape and mandate the rate of change within an industry is captured by the concept of environmental dynamism (Child, 1972). Based on environment-fit theory, we expect that firms with higher ESG scores under increasing dynamism may invest more in unique sets of resources and competencies to respond to higher ESG-sales dynamism (Drazin & de Ven, 1985).

Firms that invest in ESG under greater ESG-sales dynamism may be able to mitigate a further decline in implied volatility. Thereafter, the rate of decline in implied volatility may be lower. With a higher ESG-sales dynamism score, the returns may be uncertain. Therefore, the stock market may undervalue the growth prospects of such firms in the short term. However, companies with higher ESG scores are at lower risk since they may lead the pack in improving ESG returns. High industry ESG-sales dynamism also signals higher volatility in customer demand for ESG-driven products, requires frequent upgrades in products and services, and involves ESG-specific innovations.

A firm's non-ESG-specific competencies could be strengthened due to ESG initiatives rather than by developing innovations and responses under a volatile ESG-sales relationship. With greater difficulty identifying and developing competencies under high variability, ESG payoffs

**Table 1**  
Industrywise distribution statistics.

SIC2	Industry	Firm implied volatility	Industry ESG-to-sales	ESG Predictability	ESG Score
01	Agricultural production: crops	0.312 [0.100]	2.906 [1.510]	0.007 [0.007]	34.711 [20.724]
10	Metal mining	0.508 [0.150]	0.97 [0.125]	0.006 [0.009]	31.133 [23.555]
13	Oil and gas extraction	0.416 [0.159]	0.46 [0.074]	0.008 [0.007]	23.424 [15.412]
14	Mining and quarrying of nonmetallic minerals, except fuels	0.358 [0.148]	1.89 [0.522]	0.118 [0.095]	25 [12.846]
15	Construction: general contractors and operative builders	0.391 [0.096]	0.807 [0.405]	0.009 [0.010]	14.763 [3.638]
16	Heavy construction, except building construction, contractors	0.376 [0.083]	0.816 [0.123]	0.003 [0.003]	18.696 [10.342]
17	Construction: special trade contractors	0.374 [0.172]	0.623 [0.281]	0.04 [0.052]	14.012 [3.074]
20	Food and kindred products	0.281 [0.093]	0.762 [0.223]	0 [0.000]	25.019 [14.242]
21	Tobacco products	0.173 [0.011]	5.154 [2.971]	0.292 [0.128]	45.248 [4.467]
22	Textile mill products	0.336 [0.078]	1.663 [0.415]	0.091 [0.100]	22.639 [14.810]
23	Apparel, finished products from fabrics and similar materials	0.33 [0.072]	1.046 [0.109]	0.026 [0.019]	21.178 [9.176]
24	Lumber and wood products, except furniture	0.393 [0.100]	1.945 [0.625]	0.003 [0.003]	15.007 [4.643]
25	Furniture and fixtures	0.335 [0.080]	2.847 [1.045]	0 [0.001]	19.624 [11.187]
26	Paper and allied products	0.285 [0.105]	1.401 [0.287]	0.005 [0.004]	30.737 [17.373]
27	Printing, publishing and allied industries	0.369 [0.104]	0.744 [0.165]	0.013 [0.010]	15.246 [4.710]
28	Chemicals and allied products	0.499 [0.238]	0.192 [0.062]	0 [0.000]	19.076 [13.516]
29	Petroleum refining and related industries	0.332 [0.115]	0.695 [0.092]	0.001 [0.001]	22.216 [14.949]
30	Rubber and miscellaneous plastic products	0.302 [0.080]	1.123 [0.219]	0.02 [0.019]	23.569 [13.123]
31	Leather and leather products	0.368 [0.056]	2.141 [0.146]	0.041 [0.052]	15.636 [4.342]
32	Stone, clay, glass, and concrete products	0.382 [0.115]	2.563 [0.720]	0.003 [0.002]	21.361 [15.016]
33	Primary metal industries	0.386 [0.121]	0.676 [0.137]	0.003 [0.004]	17.098 [8.756]
34	Fabricated metal products	0.324 [0.106]	0.66 [0.166]	0.006 [0.008]	17 [8.885]
35	Industrial and commercial machinery and computer equipment	0.354 [0.114]	0.335 [0.069]	0.002 [0.001]	20.334 [10.944]
36	Electronic and other electrical equipment and components	0.396 [0.127]	0.365 [0.057]	0.004 [0.002]	18.74 [12.446]
37	Transportation equipment	0.345 [0.117]	0.513 [0.092]	0.005 [0.003]	20.366 [11.942]
38	Measuring, photographic, medical, and optical goods and clocks	0.372 [0.158]	0.318 [0.080]	0.003 [0.003]	17.173 [9.738]
39	Miscellaneous manufacturing industries	0.37 [0.116]	1.515 [0.288]	0.004 [0.007]	19.535 [13.399]
40	Railroad transportation	0.237 [0.036]	2.166 [0.381]	0.039 [0.081]	41.397 [15.487]
42	Motor freight transportation	0.311 [0.113]	1.213 [0.317]	0.001 [0.002]	17.387 [13.451]
44	Water transportation	0.412 [0.257]	1.188 [0.298]	0.001 [0.001]	16.709 [3.981]
45	Air transportation	0.368 [0.089]	0.726 [0.113]	0.006 [0.008]	25.839 [16.936]
46	Pipelines, except natural gas	0.239 [0.085]	3.01 [0.731]	0.031 [0.041]	6.198 [1.012]
47	Transportation services	0.37 [0.135]	0.962 [0.302]	0.021 [0.025]	14.3 [3.649]
48	Communications	0.4 [0.156]	0.353 [0.052]	0.004 [0.005]	16.095 [8.188]
50	Wholesale trade: durable goods	0.305 [0.088]	0.543 [0.132]	0.015 [0.014]	16.127 [6.297]
51	Wholesale trade: nondurable goods	0.338 [0.120]	0.488 [0.081]	0.005 [0.004]	18.852 [9.395]

(continued on next page)

Table 1 (continued)

SIC2	Industry	Firm implied volatility	Industry ESG-to-sales	ESG predictability	ESG score
52	Building materials, hardware, garden supplies, and mobile homes	0.301 [0.125]	0.795 [0.240]	0.023 [0.033]	24.017 [8.681]
53	General merchandise stores	0.297 [0.108]	0.879 [0.288]	0.003 [0.004]	26.536 [12.004]
54	Food stores	0.345 [0.086]	0.598 [0.159]	0.013 [0.025]	16.244 [7.463]
55	Automotive dealers and gasoline service stations	0.345 [0.117]	1.093 [0.552]	0.011 [0.012]	14.704 [6.480]
56	Apparel and accessory stores	0.359 [0.095]	0.737 [0.224]	0.005 [0.005]	19.237 [8.970]
57	Home furniture, furnishings and equipment stores	0.4 [0.096]	0.732 [0.159]	0.013 [0.016]	19.057 [10.013]
58	Eating and drinking establishments	0.329 [0.093]	0.874 [0.293]	0.001 [0.001]	19.522 [10.184]
59	Miscellaneous retail	0.377 [0.120]	0.536 [0.122]	0.003 [0.004]	17.95 [9.142]
62	Security and commodity brokers, dealers, exchanges, and services	0.396 [0.021]	0.936 [0.247]	0.012 [0.013]	11.157 [0.000]
65	Real estate	0.282 [0.040]	0.503 [0.178]	0.009 [0.008]	11.157 [0.000]
67	Holding and other investment offices	0.278 [0.067]	0.304 [0.072]	0 [0.000]	13.238 [2.593]
70	Hotels, rooming houses, camps, and other lodging places	0.267 [0.050]	1.578 [0.722]	0.005 [0.008]	30.599 [9.713]
72	Personal services	0.294 [0.081]	0.742 [0.296]	0.008 [0.008]	14.367 [3.779]
73	Business services	0.384 [0.128]	0.233 [0.052]	0.001 [0.001]	15.945 [9.294]
75	Automotive repair, services and parking	0.332 [0.070]	2.458 [0.346]	0.004 [0.005]	17.92 [10.042]
78	Motion pictures	0.362 [0.090]	0.522 [0.093]	0.011 [0.015]	12.879 [2.066]
79	Amusement and recreation services	0.367 [0.122]	0.882 [0.151]	0.013 [0.010]	17.772 [9.607]
80	Health services	0.377 [0.146]	0.485 [0.100]	0.002 [0.002]	15.118 [6.699]
82	Educational services	0.42 [0.115]	0.432 [0.110]	0.003 [0.004]	13.092 [2.281]
83	Social services	0.29 [0.068]	8.019 [11.327]	0.75 [0.000]	12.948 [3.101]
87	Engineering, accounting, research, and management services	0.34 [0.117]	0.67 [0.132]	0.003 [0.004]	15.567 [6.429]
99	Nonclassifiable establishments	0.433 [0.184]	1.249 [0.123]	0.016 [0.026]	17.701 [10.157]
	Total	0.379 [0.153]	0.579 [0.621]	0.006 [0.026]	18.807 [11.641]

under increasing ESG-sales dynamism could supplement existing competencies to mitigate a decline in implied volatility.

**Hypothesis 2:** The negative association between higher dynamism (industry ESG score to sales) and a firm's implied volatility is mitigated when a firm has a high ESG score.

## 2.2. Industry ESG predictability and implied volatility

Distinct from dynamism, which refers to variation in industry sales or outcomes around the expected mean, predictability refers to the degree to which "the future can be anticipated solely based on knowledge of the past" (Wholey & Brittain, 1989, p. 869). Based on this premise, predictability is a condition where past information has documented value in forecasting firm performance. While dynamism refers to volatility in performance, predictability refers to the variance explained by past factors in forecasting future industry outcomes. The predictability of ESG in forecasting sales further lowers a firm's implied volatility as the competitive basis of ESG would be widely known among industry competitors. We therefore expect the following:

**Hypothesis 3:** Industry predictability in ESG is negatively associated with a firm's implied volatility.

As ESG-sales predictability increases, implied volatility could

decrease. Although task environment characteristics vary by industry, higher industry ESG-sales predictability signals that the stock market may not value significant ESG investments as the basis of ESG-based competition. Strong inertial forces, the realignment of relationships with stakeholders, and resource fungibility may further limit gains from ESG-sales predictability. Engaging in actions that increase ESG under high predictability in sales returns from such investments can challenge the ingrained culture and standardized routines and result in a small gain in returns (Hannan & Freeman, 1989; Quinn & Cameron, 1983).

Limited resource availability and restricted fungibility of currently deployed resources constrain managerial latitude as a firm attempts to retain current products and processes while adding predictable ESG-sales investments (Carnes et al., 2019). In addition, the likelihood of underperforming ESG-related innovations is the highest when ESG-sales predictability is high and a firm increases its ESG score (cf. Anderson & Tushman, 1990). The broader argument is that ESG-related investments are highly specific because they are tailored to identifiable sets of stakeholders. With greater specificity, internal routines must be realigned, and firms may face greater difficulty with adaptations and changes. Non-ESG-related competencies may increase inertia (Hannan & Freeman, 1989), and ESG-specific investments under greater predictability may help improve a firm's implied volatility. We, therefore, expect that increasing ESG under greater ESG-sales predictability may mitigate a decline in implied volatility.

**Table 2**  
Descriptives.

variable	N (firm-years)	mean	sd	min	max	1	2	3	4	5	6	7	8	9	
1 Firm implied volatility	6782	0.3792	0.1525	0.1594	1.2817	1									
2 Dynamism (industry ESG-to-sales)	6782	0.5787	0.6210	0.1375	21.0661	-0.1230*	1								
3 ESG score	6782	18.8066	11.6408	5.3719	77.2727	-0.3670*	0.1017*	1							
4 Industry predictability in ESG	6782	0.0061	0.0262	0	0.7500	-0.0798*	0.3796*	0.0871*	1						
5 Log of market capitalization	6782	7.6877	1.3836	5.6217	10.9688	-0.5907*	0.0459*	0.6376*		1					
6 ROA	6782	2.9740	11.9490	-41.3704	21.5890	-0.5804*	0.1296*	0.1575*	0.0464*	0.2825*	1				
7 Log of long-term debt	6782	15.7567	8.1695	0	23.6290	-0.3057*	0.1353*	0.3313*	0.0737*	0.3918*	0.0913*	1			
8 Operating margin	6782	1.4182	37.4302	-177.7737	59.5864	-0.5963*	0.1190*	0.1503*	0.0510*	0.2449*	0.8150*	0.1761*	1		
9 Log of cash holdings	6782	18.7379	1.6716	13.9136	22.2342	-0.3775*	-0.0118	0.5133*	0.0206	0.7100*	0.1638*	0.2556*	0.1654*	1	
10 Year	6782	2014	1	2012	2016	0.0003	-0.1531*	0.0704*	0.1111*	0.1020*	-0.1030*	0.0650*	0.0206	1	
11 State	6782	26	17	2	56	-0.1039*	0.0652*	0.0648*	0.0221	0.0481*	0.1101*	0.1144*	0.0896*	-0.0089	0.0002

Note. \*  $p < 0.05$  (two-tailed).

**Hypothesis 4:** The negative association between industry predictability (industry ESG score explaining sales) and a firm’s implied volatility is exacerbated for firms with a high ESG score.

**3. Data and methods**

To test the hypotheses, we draw on three data sources: (i) [Alfaro, Bloom, and Lin’s \(2017\)](#) firm-implied volatility data; (ii) Bloomberg ESG score data; and (iii) Compustat. The ESG score data are available from 2012 to 2018. Alfaro, Bloom, and Lin (hereafter, ABL) provide data on firm-level implied volatility and describe the measure in detail. Our merged sample includes data on 2797 firms and 6782 firm-years from 2012 to 2018.

**3.1. Measures**

**3.1.1. Dependent variable: firm-implied volatility.**

ABL (2017) provides a measure of firm-implied volatility. The measure of the implied volatility of a call option has a positive construal compared with the negative construal of volatility in general. The implied volatility (IV) of a call option contract, based on the Black–Scholes option pricing formula, is the value of the volatility of the underlying instrument. When input in an option pricing model, implied volatility will return a theoretical value equal to the current market price of said option.

The implied volatility measure from ABL uses differences in industry exposure to 10 forward-looking options based on the second moment of seven bilateral exchange rates with the U.S. dollar. Specifically, the dollar is compared with the Euro, Canadian dollar, Japanese yen, British pound, Swiss franc, Australian dollar, and Swedish krona; crude oil prices; economic policy uncertainty; and 10-year U.S. treasury forward-implied volatilities. The measure of implied volatility was constructed using the 365-day implied volatility of “at-the-money-forward” call options.

**3.1.2. Predictor and moderator variables**

**3.1.2.1. Firm ESG score.** The Bloomberg data, tracking the firms listed in Compustat, includes a firm-year composite measure of ESG disclosure score and its components—environmental, social, and governance disclosure scores. According to *Bloomberg*, a proprietary Bloomberg score is based on a company’s ESG disclosure. “...The score is also tailored to different industry sectors.” The composite ESG score ranges from 0.1 for firms that disclose a minimum amount of ESG data to 100 for corporations that disclose every data point collected by *Bloomberg*.

The data are based on an annual evaluation of the public ESG information disclosed by companies through corporate social responsibility (CSR) or sustainability reports, annual reports and websites, other public sources, and direct contact with companies. The data cover 120 indicators, including carbon emissions, climate change effects, pollution, waste disposal, renewable energy, resource depletion, supply chains, political contributions, discrimination, diversity, community relations, human rights, cumulative voting, executive compensation, shareholders’ rights, takeover defense, staggered boards, and independent directors.

**3.1.2.2. Industry ESG-to-sales dynamism.** In line with prior research on industry dynamism, our measure of industry ESG-to-sales dynamism is derived by regressing ESG scores over the log of sales over three-year rolling windows for each two-digit industry. The standard error of the regression derived for each industry is the measure of the industry’s responsiveness of ESG to sales. A higher standard error indicates greater dynamism in an ESG-sales relationship over time and indicates an increasing level of experimentation in deriving economic value from an ESG-sales relationship.



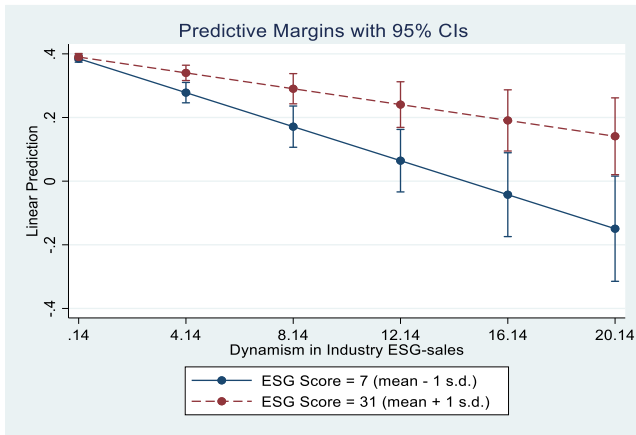


Fig. 2. Two-way moderation effects of ESG score.

3.1.2.3. *Industry predictability in ESG.* To assess the predictability of the industry ESG score over time, for each two-digit industry code, we regress the ESG scores for each year for three-year rolling windows. Based on [Wholey and Brittain \(1989\)](#), the R-squared for each industry is the extent to which ESG scores are predictable over time. A higher R-squared indicates greater predictability of an ESG score in driving industry sales, thereby suggesting that the ESG-to-sales business models are widely diffused. Higher predictability may limit additional value creation from ESG.

3.1.3. *Controls*

We control for a variety of confounding factors. Because a firm’s size could impact the reputation and legitimacy concerns in ESG disclosures, we control for the log of market capitalization. Next, to control for accounting-based financial performance, we include return on assets. Debt concerns could impact ESG investments ([Devalle, 2017](#)), so we control for the log of long-term debt. To control for operational efficacy, we control the operating margin. Cash holdings may provide the necessary flexibility to invest in ESG initiatives. Therefore, we control the log of cash holdings. Finally, we control year dummies and the state of a firm’s headquarters.

Tables 1 and 2 present the descriptive statistics.

3.2. *Research methodology*

Due to the panel nature of the data, we test whether a fixed or random effects regression is applicable. The Hausman test supports the use of fixed effects estimates. Furthermore, because the structure of the variation in the data is not known, we use robust standard errors. We use the `-xtreg, fe` robust- routine in Stata 16.1.

3.3. *Results*

Revisiting our earlier discussion, higher implied volatility indicates that growth prospects are favorable over the 365-day horizon. In [Table 3](#), supporting [Hypothesis 1](#), we find that industry ESG-to-sales is negatively associated with firm-implied volatility (Models 2 and 7). The negative association implies that investors do not consider higher short-term growth prospects given intensive experimentation in the industry to realize economic value from ESG investments. The negative coefficient suggests that given the dynamism, the stock price may not rise substantially in the short term, suggesting the long-sightedness of stock investors in discounting firms in the industry as a clear winner in converting ESG to sales has yet to emerge.

For [Hypothesis 2](#), we proposed that the negative association between ESG and sales industry dynamism and a firm’s implied volatility is ameliorated (the negative effects are reduced) when firms have a high

Table 4 Robustness analysis: standardized ESG score fixed-effects estimates.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dynamism (industry ESG-to-sales)		-0.0332*** (0.00435)	-0.0290*** (0.00422)	-0.544*** (0.0958)	-0.404*** (0.101)	-0.0264*** (0.00430)		-0.0160*** (0.00295)	-0.0195*** (0.00308)			-0.0195*** (0.00316)
Industry predictability in ESG						-0.362*** (0.101)						-0.162** (0.0688)
Standardized ESG score			-0.0625*** (0.00307)		-0.0533*** (0.00229)	-0.0635*** (0.00310)			0.00141 (0.00249)			0.00450** (0.00203)
Dynamism (industry ESG-to-sales) × standardized ESG score			0.0158*** (0.00321)			0.0181*** (0.00354)			0.00680*** (0.00220)			0.00600** (0.00242)
Industry predictability in ESG × standardized ESG score					0.0960 (0.0616)	0.0245 (0.0664)						0.0695* (0.0415)
Controls									Included	Included	Included	Included
Year dummies									Included	Included	Included	Included
State dummies									Included	Included	Included	Included
Year × state dummies									Included	Included	Included	Included
Constant	0.379*** (0.00181)	0.398*** (0.00309)	0.394*** (0.00294)	0.383*** (0.00190)	0.380*** (0.00179)	0.394*** (0.00296)	0.691*** (0.0570)	0.713*** (0.0569)	0.738*** (0.0573)	0.697*** (0.0571)	0.719*** (0.0576)	0.743*** (0.0574)
Observations	6,782	6,782	6,782	6,782	6,782	6,782	6,782	6,782	6,782	6,782	6,782	6,782
R-squared		0.014	0.014	0.008	0.0129	0.0141	0.026	0.028	0.030	0.026	0.027	0.030
Number of firms	2,797	2,797	2,797	2,797	2,797	2,797	2,797	2,797	2,797	2,797	2,797	2,797
Within R2		0.0144	0.0138	0.00803	0.0129	0.0141	0.026	0.028	0.030	0.026	0.027	0.030
Overall R2		0.0151	0.0148	0.00637	0.0138	0.0148	0.016	0.017	0.018	0.016	0.016	0.017
Between R2		0.0118	0.0147	0.00449	0.0142	0.0140	0.0597	0.0594	0.0593	0.0596	0.0596	0.0592

Standard errors are in parentheses  
\*\*\* p < 0.01, \*\* p < 0.05, and \* p < 0.1



**Table 5**  
Fixed estimates for squared terms.

	ESG-Score square (1)	Dynamism (industry ESG-to-sales)-square (2)	Industry predictability in ESG-square (3)	Dynamism (industry ESG-to-sales)-square and industry predictability in ESG-square (4)
Dynamism (industry ESG-to-sales)	-0.0440*** (0.0117)	-0.0987*** (0.0125)	-0.0282*** (0.00559)	-0.0964*** (0.0126)
ESG score	-0.00317*** (0.000867)	-0.000334 (0.000264)	6.90e-05 (0.000226)	-0.000360 (0.000266)
Dynamism (industry ESG-to-sales) × ESG score	0.00191* (0.000984)	0.00204*** (0.000417)	0.000509** (0.000212)	0.00197*** (0.000421)
ESG score-square	5.27e-05*** (1.35e-05)			
Dynamism (industry ESG-to-sales) × ESG score-square	-2.31e-05 (1.58e-05)			
Industry predictability in ESG	-0.585* (0.309)	-0.146 (0.118)	-0.666** (0.285)	-0.458 (0.287)
Industry predictability in ESG × ESG score	0.0424 (0.0278)	0.00551 (0.00390)	0.0221* (0.0121)	0.0181 (0.0122)
Industry predictability in ESG × ESG score-square	-0.000604 (0.000454)			
Dynamism (industry ESG-to-sales)-square		0.0242*** (0.00377)		0.0237*** (0.00379)
Dynamism (industry ESG-to-sales)-square × ESG score		-0.000563*** (0.000107)		-0.000545*** (0.000108)
Industry predictability in ESG-square			0.939* (0.559)	0.673 (0.562)
Industry predictability in ESG-square × ESG score			-0.0412 (0.0339)	-0.0338 (0.0342)
Controls	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
State dummies	Included	Included	Included	Included
Year × state dummies	Included	Included	Included	Included
Constant	0.757*** (0.0575)	0.768*** (0.0569)	0.744*** (0.0572)	0.770*** (0.0570)
Observations	6,782	6,782	6,782	6,782
R-squared	0.632	0.635	0.631	0.635
Number of firms	2,797	2,797	2,797	2,797
Within R2	0.632	0.635	0.631	0.635
Overall R2	0.620	0.483	0.618	0.488
Between R2	0.595	0.249	0.592	0.255

Standard errors are in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$

ESG score. In Models 3 and 8, along with the graph based on Model 8 in Fig. 2, as industry ESG-to-sales volatility increases, a higher firm ESG score lowers the implied volatility. Related to this finding, investors already discount firms when assessing high ESG-sales dynamism. When assessing a firm’s higher ESG score, investors cannot fully discern whether a firm will be among the winners. Nevertheless, a higher ESG score could increase the odds of developing viable ESG-sales business models for a firm, resulting in a lower discount from investors.

For Hypothesis 3, we hypothesize that industry predictability in the ESG score over time would lower implied volatility. In Models 3 and 9, we find support for the hypothesis, consistent with the expected effects. Investors foreseeing predictability in converting ESG to sales will discount a firm and lower the implied volatility.

In Hypothesis 4, we propose that the negative association between industry ESG score predictability and a firm’s implied volatility declines as ESG scores increase. In Models 5 and 11, the effect is not significant.

Overall, the results show that greater dynamism in industry ESG score-to-sales (H1) or predictability in the ESG score over time (H2) lowers implied volatility. Investors take a long-term perspective and discount a firm’s implied volatility as a winner is difficult to predict under dynamism. Under predictability, higher implied volatility makes less sense. Taking a longer-term watch-and-wait approach, a firm’s

response by increasing an ESG score only mitigates a decline in implied volatility when dynamism in an industry ESG score-to-sales is higher. However, it has no impact on implied volatility when ESG scores increase and predictability increase. Overall, we find support for Hypotheses 1–3 but not for Hypothesis 4.

### 3.4. Robustness check

#### 3.4.1. Standardized ESG scores.

We conducted additional analysis using standardized ESG scores. Due to potential variation in the measurement scales of ESG components, a standardized ESG score may lower the bias in estimates. Based on Baldini et al. (2018), we use the following approach:

$$ESG \text{ Standardized score}_{it} = \phi^{-1} \left[ \frac{Rank_{it}}{MaxDense_t + 1} \right]$$

In the formula,  $ESG \text{ Standardized score}_{it}$  is the normal score of firm  $i$  during year  $t$ , and  $\phi^{-1}$  is the inverse of the cumulative density normal distribution. The normalized scores have better statistical properties (Cooke, 1998). In Table 4, the estimates are consistent with the main effects.

**Table 6**  
Fixed effect estimates of above or below median market capitalization.

VARIABLES	(1)	(2)	(3)
	Full sample from the main results	Below median	Above median
Dynamism (industry ESG-to-sales)	-0.0293*** (0.00532)	-0.0190** (0.00800)	-0.0626*** (0.0137)
ESG score	0.000132 (0.000197)	-0.000288 (0.000250)	-0.00156* (0.000936)
Dynamism (industry ESG-to-sales) × Standardized ESG score	0.000524*** (0.000187)	0.000291 (0.000250)	0.00231*** (0.000677)
Industry predictability in ESG	-0.213*** (0.0981)	-0.0947 (0.112)	-1.342*** (0.563)
Industry predictability in ESG	0.00587 (0.00383)	0.00173 (0.00360)	0.0607** (0.0258)
Controls	Included	Included	Included
Year dummies	Included	Included	Included
State dummies	Included	Included	Included
Year × State dummies	Included	Included	Included
Constant	0.740*** (0.0279)	0.639*** (0.0381)	0.941*** (0.0658)
Observations	6782	3390	3392
R-squared	0.630	0.529	0.554
Number of firms	2797	2097	2122
Within R2	0.630	0.529	0.554
Overall R2	0.617	0.473	0.516
Between R2	0.592	0.437	0.486

Robust standard errors are in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

### 3.4.2. Squared terms

In Table 5, we squared the term of the ESG-score square (Model 1), dynamism (industry ESG-to-sales)-square (Model 2), industry predictability in ESG-square (Model 3), and dynamism (industry ESG-to-sales)-square and industry predictability in ESG-square (model 4). The effect sizes of the ESG-score squared term are very small or the interaction effects are very small when significant. Overall, we do not find a meaningful nonlinear effect.

### 3.4.3. By firm size

Using market capitalization, we split the sample into firms with above or below median market capitalization. In Table 6, Model 1, we present the full model from Table 3, followed by estimates for the subsample of “at or above or below” market capitalization. Model 3 shows that the effects are salient for those at or above the median market capitalization.

### 3.4.4. Subcomponents of ESG score

To further parse the relationships among ESG scores, we investigated their subcomponents. We found that social and governance disclosure components drive most of the effects, as shown in Table 7. Perhaps due to variations in environmentally responsive practices across industries, the effect of the environmental disclosure index may be less effective in the full sample.

## 4. Discussion

Considering the main analysis and the robustness checks, our findings are encouraging in the sense that a decline in implied volatility indicates that investors value ESG-sales activity in the industry and are not myopic to economic gains in the short term. It is reassuring for ESG supporters to learn that investors consider industry efforts to leverage ESG for economic gains (i.e., sales) to ascribe lower implied volatility for all firms. Investors holding this view are aware that winners may not be known under dynamism and that growth prospects are limited under

predictability. Further demonstrating investor long-termism, those with a higher ESG score only receive a smaller discount, but not a premium, under higher industry ESG-sales dynamism.

### 4.1. Theoretical implications

Our findings provide a meaningful extension to the ongoing conversation on the ESG-performance relationship from an investor's perspective. First, there is ample evidence that stockholders are short-term oriented (Narayanan, 1985; Lee & Veld-Merkoulova, 2016). Whether stockholders value ESG investments that come to fruition in the long term is a less explored question. Our findings show that investors are long-term oriented and ascribe lower implied volatility to firms in industries with higher ESG-sales dynamism or predictability. Greater ESG-sales dynamism drives lower short-run (365-day) growth expectations for a firm as dynamism presents significant experimentation that may not necessarily mean the focal firm will be a winner. Investors value ESG investment by mitigating discounts in implied volatility for firms investing in ESG. They ascribe lower implied volatility when ESG-sales predictability is higher and do not reward firms increasing their ESG under predictability. Overall, investors consider industry-level ESG-sales dynamics in ascribing a firm's short-term growth prospects and are conscientious in only lowering the discount on implied volatility for firms with a higher ESG score under greater ESG-sales dynamism.

Second, following the retrospective approach to the ESG-performance relationship, we enact a prospective performance approach by focusing on implied volatility in 365-day at-the-money call options as an indicator of a one-year stock price growth prospects. We further propose two novel measures of ESG-sales dynamism and predictability to explain the overlooked value of industry-level ESG activity. We find that ESG scores under ESG-sales dynamism mitigate (but do not increase) the implied volatility of call options.

Strategic management research has highlighted the value of the task environment in driving strategic actions (Porter, 1980). Given the differences in ESG across industries, the proposed measures provide an additional mode for testing the value of ESG-industry dynamics. Our findings make several contributions. Past studies have focused on the role of a firm and its managers in explaining firm performance. Largely absent in ESG studies is the role of industry dynamics. A firm's task environment can play a pivotal role in influencing ESG outcomes as ESG investments could be based on mimicry (Gillet-Monjarret, 2018). Due to the inherent uncertainty in the returns on most ESG investments, industry firms may resort to the mimetic approach to maintain legitimacy in the ESG space. The business case for ESG is developed over time as the industry's competitors make investments in ESG to derive economic returns. Inhibiting this analysis is the lack of industry-level measures on ESG viability from an economic perspective.

Consistent with institutional theory, the ESG scores are used to increase awareness and engagement; the findings make an economic case for limited effects of ESG scores on expected firm performance. Our findings run counter to arguments claiming that “corporations consider these rules and the expectations of powerful stakeholder groups as economic restrictions in their course toward maximizing profits” (Palazzo & Scherer, 2006, p. 72). We find that ESG initiatives are an important consideration that complements the stakeholder perspective. These initiatives further demonstrate that an incentive mechanism to ceremonially invest in ESGs beyond any stakeholder pressure or managerial discretion may exist. Our framework provides a more in-depth assessment of the ongoing debate on ESG. It adds a dimension for considering the role of industry-level ESG-sales dynamics and an incentive for forward-looking aspects of performance.

### 4.2. Managerial implications

Our findings call on managers to focus on the value of implied volatility and industry ESG dynamics. Implied volatility is a forward-

Table 7

Fixed effects estimate breakdown by score subcomponents.

	(1) Full sample with all of the score components	(2) Social disclosure score	(3) Governance disclosure score	(4) Environmental disclosure score
Dynamism (industry ESG-to-sales)	-0.0293*** (0.00532)	-0.0261*** (0.00680)	-0.0695*** (0.0165)	-0.0227*** (0.00807)
Industry predictability in ESG	-0.213** (0.0981)	-0.421* (0.228)	-0.198 (0.393)	0.316 (0.266)
ESG score	0.000132 (0.000197)			
Dynamism (industry ESG-to-sales) × ESG score	0.000524*** (0.000187)			
ESG score × industry predictability in ESG	0.00587 (0.00383)			
Social disclosure score		-0.000437* (0.000224)		
Dynamism (industry ESG-to-sales) × social disclosure score		0.000588*** (0.000222)		
Industry predictability in ESG × social disclosure score		0.0123* (0.00689)		
Governance disclosure score			-0.000478 (0.000392)	
Dynamism (industry ESG-to-sales) × governance disclosure score			0.000998*** (0.000295)	
Industry predictability in ESG × governance disclosure score			0.00287 (0.00737)	
Environmental disclosure score				-0.000154 (0.000257)
Dynamism (industry ESG-to-sales) × environmental disclosure score				0.000201 (0.000246)
Industry predictability in ESG × environmental disclosure score				-0.00662 (0.00832)
Constant	0.740*** (0.0279)	0.719*** (0.0334)	0.744*** (0.0326)	0.659*** (0.0673)
Observations	6782	4258	6782	2366
R-squared	0.630	0.629	0.629	0.582
Number of firms	2797	2368	2797	1677
Within R2	0.630	0.629	0.629	0.582
Overall R2	0.617	0.613	0.618	0.0120
Between R2	0.592	0.594	0.594	0.0109

Robust standard errors are in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , and \*  $p < 0.1$ .

looking measure of the stock price. Our findings show that it can supplement or replace accounting or long-term growth indicators such as Tobin's Q. Implied volatility represents the yearly growth prospects of the stock. Because many executive compensation packages are reevaluated annually, the yearly implied volatility in a call option could drive executive choices of ESG as a tool for improving economic performance. A call option's implied volatility provides meaningful information for understanding executive annual pay sensitivity in evaluating social, environmental, and governance decisions.

#### 4.3. Limitations

The inferences must be interpreted in light of their limitations. First, similar to most studies on upper echelons and stakeholder dynamics, the microdynamics of stakeholder interaction are not observable in our sample. Although we rely on an accepted database and incorporate three different data sources—Bloomberg ESG, Compustat, and implied volatility data—future studies can focus on alternate measures and specifications. We highlight that our findings are robust to fixed effect and alternate specifications.

Second, similar to past ESG studies, the ESG scores, irrespective of the source, are subject to reporting bias; and among industries, heterogeneity cannot be ruled out. Future studies could focus on an expanded

sample and period to further address the complex dynamics of the industry-level value of ESG in driving economic performance, forward-looking performance expectations, and discretion in ESG investments. Finally, future research could further delve into the managerial agency versus environmental fatalism debate in the broader population ecology literature (Thietart, 2016).

Third, ESG rating scales are problematic, and Bloomberg ESG ratings have limitations. Currently, oil and gas companies rank highly on some ESG rating scales because some ESG methods reward a company solely for tracking and reporting its sustainability data. This approach can result in companies being scored poorly regardless of their impact on the environment because they may be reporting insufficient data. In 2018, 10 percent of top-rated ESG companies in the European corporate bond index were issued to fossil fuel-producing companies, suggesting that such flaws exist (Scaggs, 2019). Additionally, some ESG rankings measure relative social responsibility for a company compared with its industry. This practice allows a few companies with harmful impacts to be ranked highly and qualify for inclusion in a socially responsible portfolio because they are better performers than their worse peers. An important direction for future research is to compare the variations in rating accuracies across industries and weight these ratings against industry ESG norms. For example, in oil and gas, ESG ratings should be discounted as ESG efforts would only mitigate environmental harm. In contrast, ESG

ratings in, for example, food services could be overweighted as ESG efforts could improve environmental outcomes.

Fourth, the inferences are correlational, and causality is not implied. However, implied volatility may influence ESG undertakings within a firm. Furthermore, the unobservables in the error term (e.g., corporate culture) can influence implied volatility and ESG scores. Therefore, exogenous means to parse out the interlinkages among financial performance, ESG, and corporate characteristics are limited; therefore, causality is not implied and remains a limitation of the study. Furthermore, we are unable to assess more complex interrelationships among the effects of firm ownership, organizational capabilities, strategic integration, stakeholder engagement in CSR activities, and gender

parity. We call on future studies to further explore these relationships.

#### 4.4. Conclusion

If the industry activities are salient, regardless of whether they involve excessive ESG investments or deviate from the established industry norms, ESG-sales dynamism and predictability are important considerations for executives. When the industry's ESG improves longer-term implied volatility, a member firm's current financial success is an essential consideration for managers when determining the most beneficial level of future ESG investment.

## Appendix A

### Glossary of key terms

Term	Definition	Description	Association with firm-implied volatility
Firm-implied volatility	Implied volatility in 365-day at-the-money forward call option.	Higher implied volatility in the call option implies a higher probability of a stock price increase.	N/A
ESG-sales dynamism	The standard error of the three-year rolling window regression of ESG scores on the log of sales in a two-digit SIC industry	A higher ESG-sales dynamism implies greater experimentation in increasing sales with higher ESG scores.	Negative. The volatility in returns from ESG score to sales may be less favorable as the business model of ESG in increasing sales is not well developed.
ESG-sales predictability	R-squared of the three-year rolling window regression of ESG scores on the log of sales in a two-digit SIC industry	Higher predictability in the ESG-sales relationship implies that past ESG scores are less valuable in predicting future sales, implying high uncertainty in ESG investments.	Negative. The predictability in returns from ESG score to sales may be less favorable as it indicates that the returns from ESG are much less predictable, indicating lower prospects of an increased stock price.

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