



Disentangling the Effect of ESG on Analysts' Forecasts

Abstract

We examine the effect of firms' ESG performance on two different types of analysts' forecasts, both revenues and earnings per share (EPS) forecasts. Based on limited evidence on the association between ESG and analysts' forecasts, we argue that some aspects of ESG blur the ability of analysts to fully incorporate it into their forecasts. More specifically, we posit that while the ESG initiatives reported can be a channel to communicate better practices to investors and consumers that are reflected in revenues, disentangling the costs related to ESG performance in the financial reporting can be a very difficult task to be performed increasing the error of EPS forecasts. Considering a sample of 12,577 US firm-year observations between 2011 and 2019, our findings demonstrate that ESG performance reduces analysts' revenues forecasts errors, but not EPS forecasts ones. Our results are robust by splitting the ESG into its three components individually, as well as considering a battery of robustness tests. Even though a greater ESG engagement can improve firms' sales through better customer relationships, and consequently helping analysts to better forecast revenues, we posit that the costs related to ESG are fuzzy to uncover and hardly to be incorporated as inputs into their forecasts.

Keywords: analysts' forecasts, ESG, capital market, analysts, corporate governance.

1. Introduction

The Environmental, Social, and Governance (hereafter, ESG) pillars became an essential attribute for firms that seek value from the investors and customers perspective and differentiation in the capital market. In fact, the firms' investments in ESG initiatives are massive. A survey conducted in December 2020 by NAVEX Global (2021), a leader in integrated risk and compliance management solutions, including responses from 1,250 management and senior level executives in the U.S., U.K., France and Germany, reveals that 88% of publicly traded companies have ESG initiatives in place followed by 79% of venture and private equity-backed companies and 67% of privately-owned companies, according to respondents. A recent report from Bloomberg Intelligence (2021) show that global ESG assets are on track to exceed \$53 trillion by 2025, representing more than a third of the \$140.5 trillion in projected total assets under management, having the United States (US) a strongest expansion in 2021 and with good perspective to dominate the category in 2022 over Europe and Asia.

Given the growing interest by market participants and stakeholders in ESG, previous literature provides evidence of the benefits associated with a higher level of ESG disclosure by firms, such as lower levels of cost of capital (Ng and Rezaee, 2015) and information asymmetry (Siew et al., 2016), as well as a high-quality of the board of directors (Gangi et al., 2022) and improvements in firm' performance (Alareeni and Hamdan, 2020). The literature also has documented that the relationship between ESG and analysts' forecasts benefits investors and the accuracy of analysts (e.g., Dhaliwal et al., 2012; Cormier and Magnan, 2014; Lee et al., 2018; Krasodomska and Cho, 2017). This literature shows tension to practitioners and academics due to mixed evidence, which is growing. Most part of studies usually focuses only on analysts' earnings forecast – more specifically on analysts' projections of earnings per share (EPS). Based on such limited evidence, we examine the effect of firms' ESG on analysts'

forecasts by disentangling analysts' forecasts into two components, namely analysts' sales forecasts and analysts' earnings per share (EPS) forecasts.

We posit that the ESG can be more easily incorporated into sales forecasts than EPS forecasts due to two main reasons: (i) the perception of ESG initiatives from investors and customers can benefit these firms by increasing sales, then the accuracy of analysts' forecasts of sales can be positively associated with ESG and (ii) because there is no direct channel linking ESG with firm performance as well as enough disclosure about the costs of these initiative in financial statements and other reports, it's hard to incorporate into EPS forecasts, reducing the accuracy. More specifically, we argue that ESG can affect the behavior of investors and customers, suggesting that firms with high ESG can attract more attention from market participants, which affects revenue growth from clients' perspectives or more market capitalization from investors' mindset. Thus, firms' ESG could help to increase demand for firms' products or services and consequently boost their revenues. The increase in revenues resulting from a higher engagement in ESG could be directly observable by the market, including financial analysts, and therefore reducing analysts' sales forecast error. However, the costs associated with ESG investments are not straight and fully observed in financial statements nor in notes. In other words, disentangling the ESG expenditures in financial reporting can be a challenging task to be performed by analysts and investors.

Thus, from the product market perspective, analysts could improve their forecasts (accuracy) on revenues, however from the standpoint of the ESG expenditures, it is not clear how to identify them all when reflected in income statement or cash flow statement due to the aggregate aspect of accounting disclosures. We base our empirical analyses on a sample of U.S. firms with analyst coverage between 2011 and 2019. Our empirical results, in general, show that high levels of ESG improve analysts' sales forecasts, while we find no evidence for EPS forecasts. In order to disentangle these findings, in additional analyses, we split our ESG measure into its three components (i.e., environmental, social, and governance constructs, individually) and find similar evidence. Our results are also robust considering different econometric estimations procedures, looking at analysts' forecasts error standing for one-, two-, and three-year ahead, and considering alternative measures for both analysts' forecasts and firms' ESG engagement.

Our findings shed some new light on the effect of ESG on analysts' forecasts and make several contributions to the literature and market participants. First, customers and investors are relevant players in the product and capital markets and their behavior is expected to be captured in analysts' forecasts to some extent. Second, since our results are robust for several estimates and different procedures, the economic effect of ESG reflects the "fuzzy effect" of ESG information on financial reporting. This is important for regulators to consider, as they provide some ESG standards or rules. Finally, our study expands on prior findings (Dhaliwal et al., 2012), especially by broadening the discussion on the association between firms' sustainability and social practices and analysts' forecasts, either through sales or EPS estimates.

The remainder of this paper is organized as follows. Section 2 discusses the previous literature and outlines the hypotheses. Section 3 presents the research design. Section 4 shows both the main empirical findings and additional/robustness tests. Finally, Section 6 delivers concluding remarks.

2. Hypotheses Development

There is a growing demand from the market participants to better understand the corporate governance including environmental and social initiatives, broadly defined as ESG initiatives¹.

¹ Recent study on ESG has shown that some ESG measures are correlated among them as well as companies' rating (Berg et al. 2019).



The ESG measures that capture firms' initiatives grow from seminal studies on corporate governance and sustainability, later on integrating the social context of firms, even though the terms "corporate social responsibility" and ESG to be frequently used interchangeably in the literature (e.g., Gillan et al., 2021).

Prior literature shows that not only firm-level governance improves the information environment, but also the quality of corporate governance system that is associated with better analysts' forecasts (Ali et al. 2012; Lee et al. 2018). The underlying assumption is that firms in an environment with investor protection, strong enforcement, good quality of accounting standards and other country-level attributes that can be combined with strong corporate governance mechanisms better protect investors and creditors (Shleifer and Vishny, 1997) and improve information environment measured by analysts' accuracy (Byard, Li and Weintrop, 2006; Bhat, Hope and Kang, 2006).

Dhaliwal et al. (2012) investigate how companies' corporate social responsibility (CSR) disclosure impacts analyst forecast in 31 countries and find that CSR disclosure improves analysts' EPS accuracy. They also find that the impact of CSR disclosure on forecast accuracy lasts for up to 3 years in the future. We use some specifications in our analyses based on Dhaliwal et al. (2012). Lee et al. (2018) examine the value of analyst stock recommendations driven by voluntary CSR disclosure. The authors state that voluntary reporting of CSR improves investors' information set, and it can thereby make analyst stock recommendations less relevant, since it could reduce the need for information from analysts. Their main findings show that the value of recommendations reduces for upgrades and increases for downgrades. In addition, Krasodomska and Cho (2017) investigate the impact of CSR disclosure on sell-side analysts and buy-side analysts separately. They survey the two types of analysts and investigate if analysts incorporate the CSR information. While the authors document that analysts do not fully incorporate the CSR information yet, there is certainly a tendency to move towards incorporating CSR information in their analysis. Cormier and Magnan (2014) investigate the impact of CSR disclosure on analyst forecast accuracy, and whether corporate governance has a mediating role in this link. They document that more CSR disclosure results into tighter analyst forecast consensus, and further find that CSR disclosure, via its effect on governance, indirectly influences forecast accuracy. These findings suggest that ESG measures overcome the need for corporate governance mechanisms as control since governance is a pillar of ESG. However, using each pillar of ESG separately, they provide mixed evidence.

Hsu et al. (2018) find that when companies report earnings, both positive and adverse CSR disclosure influences analyst forecast revisions. Ioannou & Serafeim (2014) analysts' perceptions about firms' CSR disclosure has changed over the years. They document that in 1990s, analysts issued more pessimistic forecasts for firms with high CSR ratings. However, that trend is changing, and analysts are now issuing more favorable forecasts for firms with high CSR ratings. Lou et al. (2015) show that CSR disclosure can be ambiguous and uncertain. In the absence of specific regulation, absorbing this kind of information can be tricky. The authors document that analysts can benefit from CSR disclosure showing a positive relation between CSR and analyst stock recommendations.

All this research shows that CSR influences investors as well as analysts. However, the existing research show mixed evidence on two main points. First, how does firms' ESG vis-à-vis firms' CSR influence analysts. ESG encompasses a comprehensive perspective than CSR, and is thereby also more difficult to quantify. This suggests that it is still not fully clear and consolidated in the literature which aspect of firms' ESG drives analyst forecasts. Moreover, the aggregate information of ESG generates confusion (Berg et al. 2019). Second, what is the channel through which reduces analyst forecast error – is it analysts better incorporating ESG information or because companies with effective ESG initiatives perform better, thereby



closing the gap on analyst forecasts? As we can see above, it is still unclear whether analysts (fully) incorporate information on ESG.

Our paper fills this gap in the literature by investigating the effect of firms' ESG on analyst forecast error (accuracy). Further, we examine two types of analysts' forecasts: sales and EPS. Our identification strategy allows us to better understand the channel through which ESG or each initiative is fully or partially incorporated into analysts' forecasts. For instance, if ESG work as a cornerstone to investor and consumers, this would reflect in sales performance and this channel would be incorporate into analysts' forecasts, which makes us to develop the following hypothesis:

H1: The level of ESG is negatively associated with the level of analysts' sales forecasts errors.

It is not clear in the literature and in financial reporting how the costs related to ESG transit through income statement, cash flow statement or is seen in balance sheet in both sides assets and liabilities. For instance, a firm can buy a property to do social initiatives and this place could be an asset (property) and its depreciation is aggregate to other assets depreciation. This information could be hard to pick them up from financial reporting due to their aggregate characteristic incorporated in costs/expenses with other types of expenditures. In such case, we posit that the costs related to ESG are aggregate with many other costs increasing the difficult to analysts fully incorporate the ESG information into their forecasts. However, not all ESG expenditures are mixed with other costs/expenses, for instance, the compensation of directors is directly observed while costs related to develop an environmental policy or revise code of ethics and so on are not easily found, neither in notes. Even for highly transparent firms in their reports showing their initiatives that benefit the society, it is still in an aggregate manner and hard to translate into specific accounting figures. This condition affects the ability to uncover ESG costs that directly impact the bottom line of income statement (net income or EPS for analysts).

Moreover, the non-audited nature of ESG disclosure, in the majority of cases, could also make it not credible, then these disclosures are unlikely to be informative, and consequently, having any significant effect on analyst forecast accuracy (Muslu et al., 2019). Aligned with that, if ESG mainly serves opportunistic motives, a higher level of this type of information in the market "will have no association – or even a significant negative association – with analyst forecast accuracy" (Hinze and Sump, 2019, p. 131). Furthermore, previous empirical studies point out the fact that firms' reports related to ESG are usually associated with hundreds of pages long because they are filed with an enormous amount of information (Stone and Lodhia, 2019), which could make this information even more difficult to be incorporated in earnings forecasting models by analysts.

Therefore, since analysts forecasts EPS, we posit that ESG affect analysts' forecasts increasing the error of EPS forecasts (lower accuracy). Our second hypothesis is:

H2: The level of ESG is positively associated with analysts' EPS forecasts errors.

3. Research Design

3.1. Sample Selection

We use US firm-level data for both analyst' forecast and ESG, as well as available data for control variables (all variables are defined on Appendix A). We retrieve the accounting figures, analysts' forecasts and ESG initiatives, from Refinitiv Eikon database. Our sample rages from 2011 to 2019, resulting in a sample of 12,577 US firm-year observations excluding financial industry. Table 1 shows the sample distribution over years in Panel A and over industries in Panel B:



Table 1. Sample Distribution

Panel A - Year breakdown

Year	Freq.	Percent	Cum.
2011	1,102	8.76	8.76
2012	1,133	9.01	17.77
2013	1,143	9.09	26.86
2014	1,160	9.22	36.08
2015	1,200	9.54	45.62
2016	1,513	12.03	57.65
2017	1,686	13.41	71.06
2018	1,813	14.42	85.47
2019	1,827	14.53	100.00
Total	12,577	100.00	-

Panel B - Industry breakdown

SIC-Code	Freq.	Percent	Cum.
Mining	1,581	12.57	12.57
Construction	211	1.68	14.25
Manufacturing	7,605	60.47	74.72
Transportation & Public Utilities	323	2.57	77.28
Wholesale Trade	209	1.66	78.95
Retail Trade	556	4.42	83.37
Services	2,092	16.63	100.00
Total	12,577	100.00	-

3.2. Empirical Model and Variables

To test hypothesis H1 (H2) – whether the ESG is negatively (positively) associated with the analysts' sales (EPS) forecasts errors – we consider analysts' sales (EPS) forecasts errors as the dependent variable, and firms' ESG initiatives as the main independent one, according to Equation (3):

$$FORECASTS\ ERROR_{it} = \alpha_0 + \beta_1 ESG_{it} + \gamma \sum Controls_{it} + \varepsilon \quad (1)$$

where, for each firm i in year t , *FORECASTS ERROR* is both analysts' sales (*ERROR SALES*) and EPS (*ERROR EPS*) forecasts errors. *ESG* is the firms' engagement with ESG initiatives, according to the Refinitiv Eikon database. *Controls* is a vector of control variables including *SIZE*, *LEVERAGE*, *LOSS*, *CHANGE SALES*, *CHANGE EPS*, *RETURN ON EQUITY*, *BOOK-TO-MARKET* AND *LN_ANALYSTS*, all defined in Table 2.

For Equation (1), considering *ERROR SALES* (*ERROR EPS*) as the dependent variable, we expect the coefficient β_1 to be negative (positive) and statistically significant– suggesting that the level of ESG is negatively (positively) associated with the level of analysts' sales (EPS) forecasts errors. In all estimations, we also include a vector of the control variables (*Controls*) based on prior studies that are associated with analysts' forecasts (e.g., García Lara et al., 2014; Liang and Riedl, 2014; Glaum et al., 2013).

Equation (1) is estimated based on Ordinary Least Squares (OLS) with industry and year fixed effects following prior studies (Dhaliwal et al., 2012; Muslu et al., 2019). To adjust for possible cross-sectional and serial correlations, standard errors are clustered at firm-level (Petersen, 2009). All continuous firm variables, except the *ESG*, are winsorized at 1% and 99% on each tail.

Table 2. Variables Definition

Dependent Variables	
<i>ERROR SALES</i>	is the absolute value of the analysts' sales forecast errors (the difference between the realized sales and the mean sales consensus forecast for firm <i>i</i> for year <i>t</i>) scaled with the reported firms' sales.
<i>ERROR EPS</i>	is the absolute value of the analysts' EPS forecast errors (the difference between the realized EPS and the mean EPS consensus forecast for firm <i>i</i> for year <i>t</i>) scaled with the reported firms' EPS.
Independent Variable	
<i>ESG</i>	is the combined score from the E, S and G initiatives from the Thomson Reuters Refinitiv ESG measure.
Control Variables	
<i>SIZE</i>	is the natural logarithm of total assets.
<i>LEVERAGE</i>	is the total leverage scaled by total assets.
<i>LOSS</i>	is a dummy variable, which equals one for firm-year observations if net income is lower than 0, and zero otherwise.
<i>CHANGE SALES</i>	is the relative change of sales realized in the year in comparison with the previous year.
<i>CHANGE EPS</i>	is the relative change of EPS realized in the year in comparison with the previous year.
<i>RETURN ON EQUITY</i>	is the net income divided by total shareholders' equity.
<i>BOOK TO MARKET</i>	is the book value of equity scaled total market value of equity.
<i>LN_ANALYSTS</i>	is the natural logarithm of one plus the total number of analysts following firm <i>i</i> .

3.2.1. Analysts' Forecasts Errors

Following a large and consistent stream of analyst forecast literature (e.g., Dittmar and Thakor, 2007; Orens and Lybaert, 2007; García Lara et al., 2011; García Lara et al., 2014), we measure analysts' sales (EPS) forecasts errors based on the absolute difference between the realized sales (EPS) and the mean sales consensus forecast for firm *i* for year *t*, scaled with the realized firms' sales (EPS), according to Equations (2) and (3). Our main empirical findings are robust by taking the median value of sales (EPS) to calculate analysts' consensus forecast.

$$ERROR\ SALES_{it} = \frac{|ACTUAL\ SALES_{it} - FORECAST\ SALES_{it}|}{ACTUAL\ SALES_{it}} \quad (2)$$

$$ERROR\ EPS_{it} = \frac{|ACTUAL\ EPS_{it} - FORECAST\ EPS_{it}|}{ACTUAL\ EPS_{it}} \quad (3)$$

where, for each firm *i* in year *t*, *SALES ERROR* (*EPS ERROR*) is the analysts' sales (EPS) forecasts errors. *ACTUAL SALES* (*ACTUAL EPS*) is the realized sales (EPS). *FORECAST SALES* (*FORECAST EPS*) is the mean sales (EPS) consensus forecast.

3.2.2. ESG

We proxy firm-level ESG based on the firms' ESG scores from Refinitiv Eikon database, which reflects company's ESG performance, commitment and effectiveness based on publicly-reported information. More specifically, Refinitiv Eikon captures and calculates over 500 company-level ESG measures, of which a subset of 186 of the most comparable and material per industry, power the overall company assessment and scoring process. These are grouped into 10 categories which represents the environmental (resource use, emissions, innovation), social (product responsibility, human rights, community, workforce) and governance (management, shareholders, corporate social responsibility strategy) pillars (Refinitiv, 2022). Actually, one of the advantages of ESG Refinitiv score over potential alternative databases is

that its metrics are transparent and based on publicly-reported information (Reber et al., 2021), and therefore has been used by many studies (e.g., Stolowy and Paugam, 2018; Drempetic et al., 2020; Batae et al., 2021; Bose et al., 2021).

4. Results

4.1. Descriptive Statistics

Table 3 shows the descriptive statistics concerning the dependent, independent and control variables. The mean of *ERROR SALES* (*ERROR EPS*) is 0.0130 (0.0252). We also find that the mean of *ESG* is 53.36, aligned with prior studies based on ESG Refinitiv score in the U.S. capital market (e.g., Bofinger et al., 2022; Kim et al., 2019). Panel B in Table 3 shows that there is difference of forecasts error of sales (*ERROR SALES*) of firms with high ESG versus firms with low ESG, however, is not statistically significant the difference for *ERROR EPS*.

Table 3. Descriptive statistics

Panel A – Variables

Variables	N	Mean	p25	Median	p75	SD
<i>ERROR SALES</i>	12,577	0.0130	0.0024	0.0057	0.0122	0.0251
<i>ERROR EPS</i>	12,577	0.0252	0.0035	0.0131	0.0394	0.1901
<i>ESG</i>	12,577	53.3603	37.3900	53.5900	69.5000	19.8104
<i>SIZE</i>	12,577	23.1670	22.0239	23.1197	24.2718	1.5532
<i>LEVERAGE</i>	12,577	0.6252	0.4748	0.6092	0.7712	0.2416
<i>LOSS</i>	12,577	0.0790	0.0000	0.0000	0.0000	0.2697
<i>CHANGE SALES</i>	12,577	0.0775	-0.0162	0.0517	0.1429	0.2058
<i>CHANGE EPS</i>	12,577	-0.0001	-0.0812	0.0857	0.2119	1.1073
<i>RETURN ON EQUITY</i>	12,577	0.2106	0.1015	0.2029	0.3472	1.2847
<i>BOOK TO MARKET</i>	12,577	0.3822	0.1486	0.3004	0.5155	0.3863
<i>LN_ANALYSTS</i>	12,577	2.8854	2.5649	2.9957	3.2581	0.5692

Panel B – Mean Comparison

	High-ESG (> percentil 50)			Low-ESG (≤ percentil 50)	
	N	Mean		N	Mean
<i>Error Sales</i>	6,283	0.0104	***	6,294	0.0155
<i>Error EPS</i>	6,283	0.0230		6,294	0.0273

This table presents descriptive statistics of the variables included in our estimations. *ERROR SALES* (*ERROR EPS*) is the analysts' sales (EPS) forecast error. *ESG* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. *SIZE* is the natural logarithm of end of year total assets. *LEVERAGE* is the end of year total leverage scaled by end of year total assets. *LOSS* is a dummy variable, which equals one for firm-year observations if net income is lower than 0, and zero otherwise. *CHANGE SALES* (*CHANGE EPS*) is the relative change of sales (EPS) realized in the reported year in comparison with the previous year. *RETURN ON EQUITY* is the earnings before interest and tax scaled by end of year total equity. *BOOK TO MARKET* is the book value of equity scaled by end of year total market value of equity. *LN_ANALYSTS* is the natural logarithm of one plus the total number of analysts following each firm. ***, **, * indicate statistical significance at 1%, 5% and 10% level, respectively.

Table 4 presents the Pearson correlation matrix between the variables included in our estimations. Both *ERROR SALES* and *ERROR EPS* are negatively and statistically correlated with *ESG* (-0.1248***, and -0.0214*, respectively). Even though, both correlations coefficients are statistically significant, the association between Error EPS and ESG is almost economically insignificant (i.e., around 2%).

Therefore, although based only on univariate analysis, these findings are overall aligned with H1 and H2, suggesting that the level of ESG is negatively associated (not associated) with the level of analysts' sales (EPS) forecasts errors. Moreover, we observe that both *ERROR SALES* and *ERROR EPS* are also significantly correlated at conventional levels with all control variables, which suggests the importance of controlling for these variables in multivariate

analyses as observed in the previous literature (e.g., García Lara et al., 2014; Liang and Riedl, 2014; Glaum et al., 2013). Finally, our estimates show no multicollinearity problems.

Table 4. Correlation Matrix

	1.	2.	3.	4.	5.
1. <i>ERROR SALES</i>	-				
2. <i>ERROR EPS</i>	0.0655***	-			
3. <i>ESG</i>	-0.1248***	-0.0214*	-		
4. <i>SIZE</i>	-0.0708***	-0.0247**	0.6257***	-	
5. <i>LEVERAGE</i>	-0.0751***	-0.0527***	0.1763***	0.0950***	-
6. <i>LOSS</i>	0.2046***	-0.1242***	-0.1960***	-0.1873***	-0.0297***
7. <i>CHANGE SALES</i>	-0.0841***	0.0349***	-0.2304***	-0.1187***	-0.1841***
8. <i>CHANGE EPS</i>	-0.0569***	0.0275**	0.0263**	0.0332***	-0.0700***
9. <i>ROE</i>	-0.0200*	0.0214*	0.0622***	0.0892***	-0.0489***
10. <i>BOOK TO MARKET</i>	0.1676***	0.0544***	-0.1380***	-0.0151	-0.3848***
11. <i>LN_ANALYSTS</i>	-0.0474***	-0.0235**	0.3169***	0.6044***	-0.1447***
	6.	7.	8.	9.	10.
6. <i>LOSS</i>	-				
7. <i>CHANGE SALES</i>	-0.0371***	1.0000			
8. <i>CHANGE EPS</i>	-0.1351***	0.1115***	1.0000		
9. <i>ROE</i>	-0.1018***	-0.0063	0.0397***	1.0000	
10. <i>BOOK TO MARKET</i>	0.1781***	-0.0378***	-0.0530***	-0.0139	1.0000
11. <i>LN_ANALYSTS</i>	-0.0625***	0.0506***	0.0273**	0.0274**	-0.0565***

This table presents the correlation matrix of the variables included in our estimations. *ERROR SALES* (*ERROR EPS*) is the analysts' sales (EPS) forecast error. *ESG* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. *SIZE* is the natural logarithm of end of year total assets. *LEVERAGE* is the end of year total leverage scaled by end of year total assets. *LOSS* is a dummy variable, which equals one for firm-year observations if net income is lower than 0, and zero otherwise. *CHANGE SALES* (*CHANGE EPS*) is the relative change of sales (EPS) realized in the reported year in comparison with the previous year. *RETURN ON EQUITY* is the earnings before interest and tax scaled by end of year total equity. *BOOK TO MARKET* is the book value of equity scaled by end of year total market value of equity. *LN_ANALYSTS* is the natural logarithm of one plus the total number of analysts following. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively.

4.2. Regression Results

Our identification strategy follows the following steps: (i) examine the association between ESG and analysts' forecasts according to H1 and H2; (ii) examine the breakdown of the ESG components on analysts' forecasts; (iii) robustness tests using future forecasts (on up to three years ahead) following Dhaliwal et al (2012), different estimators, breaking down the sample into quartiles of ESG and *ERROR SALES* to check whether the level of accuracy of sales affect accuracy of EPS and substitute ESG to CSR Committee.

Table 5 presents the results of our estimates to test hypothesis H1 (H2) – whether the level of ESG is negatively associated (positively associated) with the level of analysts' sales (EPS) forecasts errors. For *ERROR SALES* estimation in columns (1) and (2), we find that the coefficient of *ESG* is significantly negative in all estimations: Column (1) shows the results for the estimation with no control variables and including industry- and year-fixed effects (-0.015***, *t*-stat = -10.26); and the regression in Column (2) includes the control variables and both industry- and year-fixed effects (-0.012***, *t*-stat = -6.56). These empirical findings suggest that higher levels of firms' engagements in ESG initiatives are negatively associated with analysts' sales forecast errors. In other words, it seems that high levels of ESG performance benefits analysts to better predict the future sales at firm-level. These findings support H1.

Table 5. The association between analyst' forecast error and ESG

$$\text{Forecasts Error}_{it} = \alpha_0 + \beta_1 \text{ESG Performance}_{it} + \gamma \sum \text{Controls}_{it} + \varepsilon$$

	ERROR SALES		ERROR EPS	
	(1)	(2)	(3)	(4)
Constant	0.036*** (34.82)	0.036*** (7.65)	0.024 (1.39)	0.174*** (4.60)
ESG	-0.015*** (-10.26)	-0.012*** (-6.56)	-0.003 (-0.29)	0.010 (0.74)
SIZE		0.001* (1.87)		-0.006*** (-2.81)
LEVERAGE		-0.006*** (-4.63)		-0.036*** (-3.61)
LOSS		0.011*** (7.96)		-0.106*** (-7.36)
RETURN ON EQUITY		0.000 (0.92)		0.001* (1.93)
BOOK TO MARKET		-0.000 (-0.40)		0.030*** (3.26)
LN_ANALYSTS		-0.004*** (-5.15)		-0.004 (-0.70)
CHANGE SALES		-0.013*** (-6.68)		
CHANGE EPS				0.002 (0.92)
Industry-FE	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes
Observations	12,577	12,577	12,577	12,577
R-squared	0.1457	0.1718	0.0168	0.0421

This table presents estimates from OLS regressions in order to test association between analyst' forecast error and ESG practices. The dependent variable is *ERROR SALES* (*ERROR EPS*), the analysts' sales (EPS) forecast error. *ESG PERFORMANCE* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. *SIZE* is the natural logarithm of end of year total assets. *LEVERAGE* is the end of year total leverage scaled by end of year total assets. *LOSS* is a dummy variable, which equals one for firm-year observations if net income is lower than 0, and zero otherwise. *CHANGE SALES* (*CHANGE EPS*) is the relative change of sales (EPS) realized in the reported year in comparison with the previous year. *ROE* is the earnings before interest and tax scaled by end of year total equity. *BOOK TO MARKET* is the book value of equity scaled by end of year total market value of equity. *LN_ANALYSTS* is the natural logarithm of one plus the total number of analysts following. The *t*-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively.

Moreover, for *ERROR EPS* estimation in Table 5, we find that the coefficient of *ESG* is not statistically significant in all scenarios. In column (3) we report the estimation without control variables and with both industry- and year-fixed effects (-0.003, *t*-stat = -0.29); and in Column (4) the model with control variables and both industry- and year-fixed effects (0.010, *t*-stat = 0.74). These findings suggest that higher levels of firms' engagements in ESG initiatives are not associated with analysts' EPS forecast errors. In other words, it seems that high levels of ESG do not favor analysts to better predict the firm-level EPS, which a possible explanation is the difficult to exploit ESG information directly and objectively in financial reporting. These findings do not support H2.

Concerning control variables, the results in Table 5 also suggest that larger (*SIZE*), less leveraged (*LEVERAGE*), loss firms (*LOSS*), followed by fewer analysts (*LN_ANALYSTS*), and with lower levels of changing in sales (*CHANGE SALES*) are associated with high levels of analysts' sales forecast errors. We also find that smaller, less leveraged, firms with positive results, more profitable, and with high book-to-market levels are associated with high levels of analysts' EPS forecast errors.

These initial results suggest that the effect of ESG on analysts' forecasts is a puzzle. Thus, we disentangle the effect of ESG on analysts' forecasts in several ways. Firstly, we

breakdown each component of ESG to better understand the magnitude of each one on forecasts accuracy. Secondly, we follow prior study (Dhaliwal et al 2012) using future analysts' forecasts from one up to three years, and finally, several robustness tests.

Looking for additional evidence on the association between ESG and analysts' forecast errors, we analyze Equation (1) by considering the performance of environmental, social, and governance pillars of ESG individually. The results are presented in Table 6. For *SALES ERROR*, we find that all ESG pillars performed as expected in H1, namely all coefficients are negatively associated with analysts' sales forecast errors, in Column 1 the coefficient of *ENV(E)* = -0.007*** (*t*-stat = -5.28), Column 2 shows *SOCIAL(S)* = -0.005*** (*t*-stat = -3.22) and Column 3 shows *GOV(G)* = -0.006*** (*t*-stat = -4.90). Moreover, For *EPS ERROR*, in columns 4, 5 and 6, we overall find positive coefficients, but not statistically significant for all ESG pillars individually.

Table 6. The association between analyst' forecast error and each component of ESG

	$Forecasts Error_{it} = \alpha_0 + \beta_n \sum E, S, G_{it} + \gamma \sum Controls_{it} + \varepsilon$					
	<i>ERROR SALES</i>			<i>ERROR EPS</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Constant</i>	0.036*** (7.32)	0.050*** (11.93)	0.043*** (8.71)	0.191*** (4.65)	0.161*** (4.80)	0.182*** (4.99)
<i>ENV(E)</i>	-0.007*** (-5.28)			0.014 (1.50)		
<i>SOCIAL(S)</i>		-0.005*** (-3.22)			0.014 (1.29)	
<i>GOV(G)</i>			-0.006*** (-4.90)			-0.013 (-1.34)
<i>SIZE</i>	0.000 (1.30)	-0.000 (-1.11)	0.000 (0.08)	-0.007*** (-3.06)	-0.005** (-2.57)	-0.006*** (-3.23)
<i>LEVERAGE</i>	-0.007*** (-4.91)	-0.006*** (-4.77)	-0.007*** (-4.96)	-0.036*** (-3.68)	-0.033*** (-3.44)	-0.036*** (-3.67)
<i>LOSS</i>	0.011*** (8.21)	0.011*** (7.96)	0.011*** (8.17)	-0.106*** (-7.40)	-0.107*** (-7.47)	-0.106*** (-7.39)
<i>RETURN ON EQUITY</i>	0.000 (1.18)	0.000 (0.64)	0.000 (0.86)	0.001* (1.83)	0.001* (1.91)	0.001* (1.91)
<i>BOOK TO MARKET</i>	-0.000 (-0.27)	0.000 (0.09)	-0.000 (-0.25)	0.031*** (3.29)	0.030*** (3.26)	0.031*** (3.29)
<i>LN_ANALYSTS</i>	-0.004*** (-5.41)	-0.004*** (-5.21)	-0.004*** (-5.35)	-0.004 (-0.67)	-0.004 (-0.63)	-0.004 (-0.71)
<i>CHANGE SALES</i>	-0.012*** (-6.30)	-0.012*** (-6.40)	-0.012*** (-6.20)			
<i>CHANGE EPS</i>				0.002 (0.91)	0.002 (0.86)	0.002 (0.90)
Industry-FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,577	12,577	12,577	12,577	12,577	12,577
R-squared	0.1700	0.1698	0.1688	0.0422	0.0422	0.0422

This table presents estimates from OLS regressions in order to test association between analyst' forecast error and ESG. The dependent variable is *ERROR SALES* (*ERROR EPS*), the analysts' sales (EPS) forecast error. E,S,G represents each pillar tested individually: *ENVPERF* is the score of Environmental Performance, *SOCIALPERF* is the Social Performance and *GOVPERF* is the Corporate Governance Performance retrieved from the Thomson Reuters Refinitiv. *SIZE* is the natural logarithm of end of year total assets. *LEVERAGE* is the end of year total leverage scaled by end of year total assets. *LOSS* is a dummy variable, which equals one for firm-year observations if net income is lower than 0, and zero otherwise. *CHANGE SALES* (*CHANGE EPS*) is the relative change of sales (EPS) realized in the reported year in comparison with the previous year. *RETURN ON EQUITY* is the earnings before interest and tax scaled by end of year total equity. *BOOK TO MARKET* is the book value of equity scaled by end of year total market value of equity. *LN_ANALYSTS* is the natural logarithm of one plus the total number of analysts following. The *t*-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. The standard-error is clustered at firm-level (Petersen, 2009).

Taking the empirical findings as a whole, we find evidence that ESG seems to help analysts better predict future sales, but not EPS. Based on such evidence on sales forecasts error, we argue that a greater firms' involvement with ESG initiatives can potentially translate into higher sales volumes through better customer interests in firms or products associated with ESG. Indeed, the incorporation of social and environmental initiatives into firms' strategy is increasingly viewed as a source of financial benefits (Krasodomska and Cho, 2017). Our additional analysis in the following section confirms this assumption. In this sense, analysts are able to directly incorporate this marginal effect from ESG initiatives into their sales forecasts. On the other hand, concerning EPS forecasts, the prior findings and the expectation are the opposite, given the costs associated with ESG activities are not directly detected in financial reporting. This argument is in line with prior literature which points out that analysts in fact give low assessments to the quality of corporate social responsibility disclosure, consequently making them rarely use this type of information in their predictions (Krasodomska and Cho, 2017).

4.3. Robustness and Additional Analyses

We run a battery of robustness tests to strengthen our results. First, to complement our main analysis, we regress firms' sales and EPS, both scaled by total assets, on *ESG* (untabulated), based on Equation (1). We find that the coefficient of *ESG* is positive and significant (non-significant) in firms' sales (EPS) estimation. Those findings are in line with the theoretical background, by suggesting that there is a channel through which ESG is linked to sales (forecasts and realized), and firms more involved in ESG initiatives in fact seem to have higher levels of sales, while ESG does not seem to be reflected in higher levels of EPS accuracy.

Table 7. Robustness tests

Panel A – Two-dimensional cluster adjustment		
	<i>ERROR SALES</i>	<i>ERROR EPS</i>
	(1)	(2)
<i>Constant</i>	0.010 (1.03)	0.156 (5.23)
<i>ESG</i>	-0.014*** (-3.66)	-0.009 (-0.40)
Control Variables	<i>Yes</i>	<i>Yes</i>
Industry-FE	<i>N/A</i>	<i>N/A</i>
Year-FE	<i>N/A</i>	<i>N/A</i>
Observations	12,577	12,577
R-squared	0.1718	0.0421
Panel B – Firm-fixed effects		
	<i>ERROR SALES</i>	<i>ERROR EPS</i>
	(1)	(2)
<i>Constant</i>	0.036*** (7.65)	0.174*** (4.60)
<i>ESG</i>	-0.012*** (-6.56)	0.010 (0.74)
Control Variables	<i>Yes</i>	<i>Yes</i>
Industry-FE	<i>N/A</i>	<i>N/A</i>
Year-FE	<i>Yes</i>	<i>Yes</i>
Observations	12,577	12,577
R-squared	0.1718	0.0421

This table presents estimates from OLS regressions in order to test association between analyst' forecast error and ESG. The dependent variable is *ERROR SALES* (*ERROR EPS*), the analysts' sales (EPS) forecast error. *ESG Practice* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. Control variables as described in Appendix A. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. The standard-error is clustered at firm-level (Petersen, 2009).

Second, in order to strength our main empirical findings, we follow prior literature (Lara et al., 2020; Kim et al., 2012; Biddle et al., 2009) and apply a two-dimensional cluster adjustment at the firm and year level in *t*-statistics related to the variables' coefficients included in Equation (1), instead of clustering standard error only at firm-level. The results are presented in Table 7, Panel A. We find a negative and significant (non-significant) coefficient at conventional levels for *ESG* in *ERROR SALES* (*ERROR EPS*) estimations, confirming our main empirical findings presented in Table 5. Third, we also estimate Equation (3) by including double fixed effects (firm and year) (see Table 7, Panel B). Once again, we find the same results as those presented in Table 5, confirming our main empirical findings. Fourth, we substitute the mean for the median value of sales (EPS) to calculate analysts' consensus forecast (untabulated table). The results are still robust and qualitatively similar to those presented in Table 5.

Fifth, following Muslu et al. (2019) and Dhaliwal et al (2012), we additionally look at analysts' forecasts error standing for one- (*ERROR SALES_F1* and *ERROR EPS_F1*), two- (*ERROR SALES_F2* and *ERROR EPS_F2*), and three-year (*ERROR SALES_F3* and *ERROR EPS_F3*) ahead. The results are presented in Table 8, Panel A. We consistently find a negative and significant (non-significant) coefficient for all the three future *ERROR SALES* (*ERROR EPS*). Those findings suggest that firms' involvement with ESG initiatives seems to help analysts predict future sales (i.e., up to three years ahead), while not helping them to predict future EPS.

Table 8. Additional analysis

Panel A – Forecasts in one-, two-, and three-year ahead						
	<i>ERROR SALES_F1</i>	<i>ERROR SALES_F2</i>	<i>ERROR SALES_F3</i>	<i>ERROR EPS_F1</i>	<i>ERROR EPS_F2</i>	<i>ERROR EPS_F3</i>
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Constant</i>	0.045*** (8.71)	0.047*** (8.01)	0.035*** (6.33)	0.196*** (4.33)	0.167*** (3.30)	0.189*** (3.50)
<i>ESG</i>	-0.008*** (-4.23)	-0.009*** (-4.05)	-0.007*** (-2.90)	0.006 (0.40)	0.021 (1.26)	-0.010 (-0.55)
Control Variables	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Industry-FE	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Year-FE	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Observations	10,725	8,652	6,838	10,725	8,652	6,838
R-squared	0.1386	0.1419	0.1746	0.0231	0.0319	0.0519
Panel B – CSR Committee						
	<i>ERROR SALES</i>		<i>ERROR EPS</i>			
	(1)		(2)			
<i>Constant</i>	0.053*** (8.49)		0.139*** (3.04)			
<i>CSR Committee</i>	-0.003*** (-3.64)		-0.002 (-0.35)			
Control Variables	<i>Yes</i>		<i>Yes</i>			
Industry-FE	<i>Yes</i>		<i>Yes</i>			
Year-FE	<i>Yes</i>		<i>Yes</i>			
Observations	9,054		9,054			
R-squared	0.1634		0.0398			

This table presents estimates from OLS regressions in order to test association between analyst' forecast error and ESG. The dependent variable is *ERROR SALES* (*ERROR EPS*), the analysts' sales (EPS) forecast error. *ESG Practice* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. Control variables as described in Appendix A. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. The standard-error is clustered at firm-level (Petersen, 2009).

Sixth, we also look at alternative firms' ESG measures. Based on previous literature (e.g., Baraibar-Diez and Odriozola, 2019), we consider that firms with CSR committees are more engaged in ESG initiatives than companies without CSR committees. We retrieve firms' CSR committees' information from Refinitiv database, and we find that, indeed, firms with CSR committees present on average high levels of *ESG* ($N = 5,901$; *ESG* mean = 0.6355) than companies without CSR committees ($N = 3,103$; *ESG* mean = 0.3685). This difference is statistically significant at conventional levels. Therefore, we replace *ESG* for a dummy variable (*CSR Committee*) which represents whether firms have or not a CSR committee. The results are presented in Table 8, Panel B. The results overall corroborate those presented in our main analysis, by demonstrating a negative and significant association between CSR committees and analysts' sales forecasts errors, while we find no evidence for EPS forecasts.

Table 8. Estimates using quartiles of *ERROR SALES*

	<i>ERROR EPS</i>			
	lower levels of analysts' sales accuracy	medium-lower levels of analysts' sales accuracy	medium-higher levels of analysts' sales accuracy	higher levels of analysts' sales accuracy
	(1)	(2)	(3)	(4)
<i>Constant</i>	0.486*** (4.74)	0.377*** (5.69)	-0.136 (-1.60)	-0.017 (-0.60)
<i>ESG</i>	0.001*** (2.74)	0.000 (1.13)	-0.000 (-0.30)	-0.001*** (-3.97)
<i>SIZE</i>	-0.019*** (-3.40)	-0.018*** (-4.53)	0.002 (0.58)	0.003 (1.28)
<i>LEVERAGE</i>	-0.133*** (-4.95)	0.023 (1.07)	-0.031* (-1.88)	0.007 (0.55)
<i>LOSS</i>	-0.097*** (-3.76)	-0.129*** (-5.62)	-0.033 (-1.17)	-0.237*** (-9.10)
<i>RETURN ON EQUITY</i>	0.006* (1.95)	-0.002** (-2.22)	0.001 (1.12)	0.003** (1.99)
<i>BOOK TO MARKET</i>	0.005 (0.32)	0.042*** (3.08)	0.042* (1.82)	0.041*** (2.96)
<i>LN_ANALYSTS</i>	-0.013 (-0.95)	0.024*** (2.61)	-0.011 (-1.09)	-0.004 (-0.42)
<i>CHANGE EPS</i>	0.010*** (3.45)	-0.002 (-0.57)	-0.012** (-1.99)	-0.010* (-1.83)
Industry-FE	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes
Observations	3,138	3,149	3,145	3,145
R-squared	0.0813	0.1003	0.0810	0.2592

This table presents estimates from OLS regressions in order to additionally investigate the association between analyst' EPS forecast error and ESG. The dependent variable is *ERROR EPS*, the level of analysts' EPS forecast error. *ESG PERFORMANCE* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. *SIZE* is the natural logarithm of end of year total assets. *LEVERAGE* is the end of year total leverage scaled by end of year total assets. *LOSS* is a dummy variable, which equals one for firm-year observations if net income is lower than 0, and zero otherwise. *CHANGE SALES (CHANGE EPS)* is the relative change of sales (EPS) realized in the reported year in comparison with the previous year. *RETURN ON EQUITY* is the earnings before interest and tax scaled by end of year total equity. *BOOK TO MARKET* is the book value of equity scaled by end of year total market value of equity. *LN_ANALYSTS* is the natural logarithm of one plus the total number of analysts following. The *t*-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. The standard-error is clustered at firm-level (Petersen, 2009).

Finally, considering that part of prior literature suggests that ESG could actually improve analysts' EPS forecast (e.g., Dhaliwal et al., 2012; Cormier and Magnan, 2014), we also complement our main analyzes by diving into a more detailed analysis of this relationship. More specifically, we investigate whether part of the relationship between ESG and analysts'



EPS forecast can eventually be explained as a function of the analysts' sales accuracy levels. We split our sample into four distinct groups through quartiles of the dependent variable *ERROR SALES*, namely: low, medium-low, medium-high and high levels of analysts' sales accuracy. Then, we estimate Equation (1) considering *ERROR EPS* as the dependent variable and looking at coefficient of variable *ESG* is eventually different among the groups, according to Table 8.

We find that the coefficient of *ESG* is significantly positive in firms with lower levels of analysts' sales accuracy (0.001***, t -stat = 2.74), but significantly negative in firms with higher levels of analysts' sales accuracy (-0.001***, t -stat = -3.97). This results suggest that, in the group where analysts sales consensus is closer to the sales reported, ESG in fact improves the EPS forecasts, and, in the opposite direction, analysts with low accuracy of sales the lower the EPS accuracy as well, suggesting that ESG does not help to improve EPS forecast for this group.

5. Conclusion

We examine the role of ESG on analysts' forecasts error. Our results suggest that ESG is incorporated in sales forecasts, but no evidence that ESG reflects an improvement on EPS forecasts. We shed some new light on the growing demand for the understanding of the ESG effects in the information environment and how analysts incorporate this information on their sales and EPS forecasts.

Our findings contribute to the debate about the consequences of ESG on firms' performance. Moreover, the findings show that information intermediaries like analysts would benefit from the transparency of the related ESG expenditures to be used as input in their financial modeling, since the error of EPS forecasts is higher than the error for sales forecasts.

Our findings are relevant for several reasons. First, our findings show the importance of ESG to firm operations, that is sales. In addition, it also shows that while ESG performance improves sales, at the moment, it also leads to additional costs that can weigh down on the incremental benefit (higher sales). Second, it also shows the impact of firms' ESG performance rather than mere disclosure. Our paper documents the real impact of ESG performance and shows that the three aspects of ESG are equally important in driving the benefits of ESG. Third, our results are important to firms that want to manage their ESG performance and want to drive a lasting impact from ESG. Fourth, our results are also important to regulators; knowing that ESG performance drives real benefits are important but allowing firms to manage incremental costs is equally important.

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