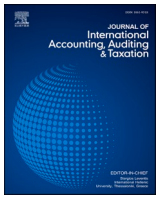
Journal of International Accounting, Auditing and Taxation 55 (2024) 100620

Contents lists available at ScienceDirect

Journal of International Accounting, Auditing and Taxation



Value relevance of accounting numbers and sustainability information in Europe: Empirical evidence from nonfinancial companies

Alessandro Migliavacca

Department of Economics and Statistics "Cognetti de'Martiis", Università degli Studi di Torino, Italy

ARTICLE INFO

JEL codes:
M41
G32
Q56

Keywords:
Value relevance
Accounting numbers
Book values
Earnings
ESG ratings
Sustainability information

ERC Panel:
SH1_5

ABSTRACT

Information is considered value relevant when used by financial markets in equity valuation and is reflected in market values. The value relevance of different information, such as accounting numbers, changes according to shifts in investors' needs. Given the rising importance of environmental and social agendas for policymakers and practitioners, this study examines whether accounting numbers have lost explanatory power and sustainability information has become value relevant. The analysis focuses on 3025 nonfinancial companies operating in the eurozone from 2005 to 2020. This study makes several contributions to the extant literature. First, analyzing the trend in the value relevance of financial accounting numbers, the results point to an overall decrease in the explanatory power of book values and earnings, particularly for environmental, social, and governance (ESG)-rated companies. However, the results indicate that ESG ratings have not gained value relevance over time. These findings have important implications for policymakers and practitioners. In line with the concept of "double materiality," implementing ESG agendas will be possible only by redirecting corporate investment decision and increasing awareness of sustainability issues. This paper documents that such a shift has not yet been accomplished, despite the increasing commitment of the European Union to the ESG agenda.

1. Introduction

Since the Lisbon Treaty came into force, and even more after the Paris Agreement and Sustainable Development Goals, the sustainability of nonfinancial companies has become key to the European Union (EU)'s agenda. EU institutions are increasingly incorporating environmental and social aspects into regulations., including the Nonfinancial Reporting Directive in 2014, the Sustainable Finance Disclosure Regulation in 2019, the Corporate Sustainability Reporting Directive in 2022, and the Corporate Sustainability Due Diligence Directive in 2023, and action plans, such as the 2018 Action Plan on Sustainable Finance and the 2019 Green Deal. In parallel, public awareness of environmental and social issues has grown alongside fund flows toward sustainable activities (Cornell, 2021; Matos, 2020), and professional investors are increasingly integrating sustainability information into their decision-making processes (e.g., Amel-Zadeh & Serafeim, 2018; Global Sustainable Investment Alliance, 2020). In a survey of finance professionals, Amel-Zadeh and Serafeim (2018) reported that 82 % of the sample considered sustainability information in their investment decisions, and 63 % deemed it material to investment performance. Despite their critique of the usefulness of environmental, social, and governance (ESG) information, Cornell and Damodaran (2020) recognize that sustainability criteria are key for high-profile institutional investors.

From an economic perspective, markets are not informationally perfect and base their evaluations on a limited portion of all available information (Grossman & Stiglitz, 1980). A piece of information is value relevant when either it explains variation in share prices or it has a predicted association with equity market values (Amir et al., 1993; Barth et al., 2008; Onali et al., 2017) As the economy evolves, equity valuation processes consider different elements and information, and considers shifts in investors' needs (Barth et al., 2023). In line with this theoretical perspective, the most recent literature posits that value relevance studies should not be based only on a limited number of items, such as earnings and book values. Research should consider a larger number of proxies for external influences, economic conditions, and additional non-accounting data to capture overall firm performance (Barth et al., 2023; Dunham & Grandstaff, 2022). Hence, over time, equity valuations could have changed their association with accounting measures, such as earnings and book values, to make way for additional information utilizing alternative accounting measures (Barth et al., 2023) and sustainability performance (Jadoon et al., 2021).

Prior research has found mixed trends in the value relevance of

E-mail address: alessandro.migliavacca@unito.it.

https://doi.org/10.1016/j.intaccaudtax.2024.100620

Available online 25 April 2024
1061-9518/© 2024 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

accounting numbers (for a review, see Dunham & Grandstaff (2022). A large body of literature discusses the role of sustainability information on corporate performance (e.g., Giglio et al., 2021; Gillan et al., 2021). The few studies dedicated to the value relevance of sustainability information have been mainly conducted at the regional or local level (e.g., Cordazzo et al., 2020; Veltri & Silvestri, 2020). The literature indicates that to analyze the relevance of sustainability information, it is most appropriate to jointly consider economic performance and ESG information (Jadoon et al., 2021; Sidhoum & Serra, 2018).

This study investigates the change in the value relevance of economic and sustainability performance information (Jadoon et al., 2021), focusing on a sample of European nonfinancial firms from 2005 to 2020. Sustainability performance data are available for an increasing number of companies, however, data is still not available for most firms that disclose sustainability information (Eliwa et al., 2021). This study asks whether increasing environmental and social awareness has changed the value relevance of accounting numbers to make way for additional information. Further, focusing on companies with retrievable ESG performance data, this study investigates whether sustainability information has gained value relevance.

This study contributes to the literature in two ways. First, the results provide evidence of an overall decrease in value relevance of accounting numbers from 2005 to 2020. Overall, adopting the Ohlson (1995) Price Regression Model, the findings suggest that accounting measures in 2020 have lower explanatory power for market values than those in 2005. This reduction affected both earnings and book value in companies with ESG ratings. By contrast, the reduction is only observed in book values in companies with no sustainability scores. This finding is consistent with the notion that investors' information requirements change over time and that increasing concern about sustainability could have modified how investors value companies.

Second, the results show that including sustainability information proxied by ESG ratings in a Price Regression Model does not add explanatory power or modify the relationship between share prices and accounting measures. Thus, ESG ratings do not explain variations in market value.

The findings of this study should be of interest to practitioners and policymakers. Transitioning to more sustainable economic paradigms and implementing the EU's Taxonomies and Action Plans will be possible only by redirecting investment decision processes and increasing corporate awareness of sustainability issues, in line with the "double materiality" concept. This paper documents that such a shift has not yet been accomplished, despite the fact that the EU has recently been dedicated to the ESG agenda.

The remainder of this paper is organized as follows. Section 2 reviews the literature on the value relevance of financial accounting and sustainability information, and outlines the research hypotheses. Section 3 presents the research design, sample selection process, and data. Section 4 reports the results of the analysis. Finally, Section 5 discusses the findings and concludes the paper.

2. Literature review and research hypotheses

2.1. Value relevance of accounting numbers

Financial accounting research has largely investigated the value relevance of book value, earnings, and other types of accounting information. A large body of literature has evolved since the first works published by Beaver (1968) and Ball and Brown (1968). This research has influenced policymakers to regulate financial statements and improve their completeness, comparability, and consistency with investors' needs (e.g., Barth et al., 2023; Dunham & Grandstaff, 2022).

Nonetheless, research focusing on the evolution of the value relevance of accounting numbers reports mixed evidence (e.g., Barth et al., 2023; Dunham & Grandstaff, 2022). One stream of literature highlights the decreasing trends in the value relevance of earnings and book values (e.g., Brown et al., 1999; Lev & Gu, 2016). In contrast, other studies found no evidence of a reduction but rather a shift in value relevance between different types of information (e.g., Barth et al., 2023; Collins et al., 1997; Francis & Schipper, 1999). This divergence arises partly from different research designs.[1] Other differences in value relevance trends have been linked to economic conditions and cycles, such as uncertainty (e.g., Loh & Stulz, 2018), economic crises (e.g., Adwan et al., 2020), financial bubbles (e.g., Morris & Alam, 2012), or volatility of market returns (e.g., Francis & Schipper, 1999; Song, 2015). Lastly, value relevance has been linked with country-level industry-specific factors (e.g., Demers & Lev, 2001). For example, these factors include the implementation of International Financial Reporting Standards (IFRS) (e.g., Barth et al., 2012; Callao et al., 2007), or other country-specific economic environments and macroeconomic conditions (e.g., Barton et al., 2010).

Several studies focused on European companies. For instance, Onali et al. (2017) investigated the impact of unobserved heterogeneity on value relevance regression models for a sample of firms between 2005 and 2013. Adwan et al. (2020) examined whether and how the adoption of fair value accounting moderates the changes in the value relevance of book values and earnings during crises, confirming prior literature that the value relevance of equity book values increases while that of net income decreases during financial crises. Harasheh et al. (2021) studied the Other Comprehensive Income (OCI) value relevance of EuroSTOXX50 companies over the 2010–2016 period. However, none of those studies examined whether or how the value relevance of accounting information changed over the periods considered.

Therefore, extant literature does not identify a trend in the value relevance of accounting numbers, particularly when focusing on European nonfinancial companies. The first research question of this study aims to determine whether investors' requirements changed during the last decade and whether accounting numbers lost part of their power to explain variations in share prices. Accordingly, the following null hypothesis is formulated:

> ***H1**: The value relevance of earnings and book values in the EU did not change from 2005 to 2020.*

The first hypothesis does not directly focus on sustainability information because such data are produced by an increasing but still limited number of companies in the period under analysis. Therefore, this study first verifies whether increasing environmental and social awareness changes the value relevance of accounting numbers to make way for additional information. Moreover, this change can be highlighted by comparing the results for firms with and without sustainability performance data.

2.2. Value relevance of sustainability information

ESG, Corporate Social Responsibility (CSR), and other keywords for sustainability practices have been linked to several firm attributes, such as the cost of capital, risk, probability of default, and performance (e.g., Gillan et al., 2021; Li et al., 2022). Most studies focus on a single aspect of sustainability. These include environmental practices (e.g., Hassel et al., 2005; Palea et al., 2023), disclosure practices (e.g., Clarkson et al., 2013; Cormier & Magnan, 2007), and reporting standards (e.g.,

[1] For instance, Collins et al. (1997) and Brown et al. (1999) analyzed the same sample over 40 years with different approaches. They respectively highlighted a slight increase and a decrease in the combined value relevance of book values and earnings over 40 years, with a shift in value relevance from earnings to book values. Similarly, Lev and Zarowin (1999) also found that the value relevance of earnings and book values was reduced over time, in contrast to earlier studies (e.g., Collins et al., 1997; Francis & Schipper, 1999), deeming the inconsistency due to the examination of different periods.

Baboukardos & Rimmel, 2016; Veltri & Silvestri, 2020). Studies focusing on a wider information set are usually limited in their geographical scope (e.g., Cardamone et al., 2012; Cordazzo et al., 2020; Ricci et al., 2020), sample size (e.g., Berthelot et al., 2012; de Villiers & Marques, 2016), or time frame (Zuraida et al., 2018).

Among these topics, the research connecting stock financial performance and sustainability information dates back to the 1970s (e.g., Belkaoui, 1976; Moskowitz, 1972) and has hitherto evolved (Brooks & Oikonomou, 2018), albeit not to the extent of the "mainstream" value relevance literature. Some researchers have found that sustainability information and disclosure are either costly and detrimental to share prices (e.g., Cardamone et al., 2012; Moneva & Cuellar, 2009) or neutral and ineffective (e.g., Cordazzo et al., 2020). In contrast, other studies have found a positive relationship between sustainability performance and market value (e.g., Jadoon et al., 2021; Kaspereit & Lopatta, 2016; Miralles-Quirós et al., 2019).

Few studies have focused on European nonfinancial corporations. For instance, Moneva and Cuellar (2009) reported that while financial and environmental disclosures are value relevant, nonfinancial information is not, even though it increased slightly after the introduction of standards on environmental issues reporting. Cordazzo et al. (2020) analyzed the effects of the EU Nonfinancial Reporting Directive implementation in Italian listed companies. They found that sustainability information is not value relevant under voluntary or mandatory disclosure.

Permasatari and Narsa (2021) reported that sustainability reporting, separate from annual reports, is more value relevant than integrated reporting, although both could reinforce the relevance of accounting information. Jadoon et al. (2021) analyzed a sample of European firms and found that investors include corporate sustainability performance information in their valuations, along with financial and economic performance data.

However, none of these studies specifically focused on the evolution of the explanatory power of sustainability information over time. Hence, the extant literature does not provide sufficient hints about the direction of trends in the value relevance of sustainability information. Therefore, this study tested the following null hypothesis:

H2: The value relevance of ESG ratings in the EU did not change from 2005 to 2020.

3. Research design

As mentioned, sustainability information is being disclosed by an increasing but limited number of companies. Of these companies, even fewer have an ESG performance rating (Eliwa et al., 2021). Prior research found that finance professionals increasingly use sustainability information to make investment decisions (Amel-Zadeh & Serafeim, 2018; Christensen et al., 2022). To access such information, investors need dependable and accessible datasets (Dimson et al., 2020) to increase the reliability and comparability of the data, which are considered one of the main drivers of sustainable investment (Amel-Zadeh & Serafeim, 2018; Jonsdottir et al., 2022). Therefore, ESG ratings provide a simple yet informative element of a firm's sustainability performance and are widely used by investors in their investment decision-making processes (Baker et al., 2022; Hübel & Scholz, 2020).

This study acknowledges that a large number of financial analytics companies issuing ESG ratings (Eccles et al., 2020), which usually adopt private and undisclosed methodologies that could lead to diverging results over a single firm's scores (e.g., Atta-Darkua et al., 2020; Christensen et al., 2022; Dimson et al., 2020). Albeit limiting the study, this represents the most viable solution to keep the sample size as large as possible to improve inferences and reduce self-selection bias (Halbritter & Dorfleitner, 2015).

3.1. Empirical model

The value relevance of accounting numbers is usually determined by adopting two models based on stock prices or returns (Onali et al., 2017). The Price Regression Model (Ohlson, 1995) regresses market value (i.e., stock price) (*P*) on equity book value per share (*BV*) and earnings per share (*EPS*), while the Return Regression Model (e.g., Francis & Schipper, 1999) regresses stock returns on earnings and changes in earnings.

To explore the first research question and test H1, this study adapts Ohlson's (1995) framework as the baseline empirical model, and the Return Regression Model serves as a robustness check. The baseline model is as follows:

$$P_{ith} = \beta_0 + \beta_1 BV_{ith} + \beta_2 EPS_{ith} + Industry_i + Country_i + Interim_h + \varepsilon_{ith} \quad (1)$$

where i indicates firms, $t = 1, 2, \cdots, 16$ represents each year from 2005 to 2020, h is an indicator of the half- and full-year data. Country ($Country_i$) and sector-effects ($Industry_i$) control for unobserved heterogeneity, and $Interim_h$ is a dummy to control for fixed effects related to half-year data. The robustness checks include different baseline model specifications and alternative accounting numbers. In line with Barth and Clinch's (2009) findings, all financial accounting variables are deflated by outstanding share numbers to avoid scale effects. The regressions include both half-year interim and annual report data.[2]

To test H2 and answer the second research question, the previous model was supplemented with ESG data as follows:

$$P_{ith} = \beta_0 + \beta_1 BV_{ith} + \beta_2 EPS_{ith} + \beta_3 ESG_{it} + Industry_i + Country_i + Interim_h + \varepsilon_{ith} \quad (2)$$

where *ESG* is sustainability performance information, proxied by ESG ratings.

In both models, P_{ith} is determined as the mean of all share prices recorded between three and six months after the end of the fiscal period.[3] All financial statement (deflated) variables are winsorized at the 1st and 99th percentiles to limit the impact of extreme outliers (e.g., Adwan et al., 2020; Barth et al., 2023). In the analyses, industry sectors are grouped according to Fama and French's 48-industries classification (Fama & French, 1999, 2023b).

3.2. Methodology for testing trend hypotheses

Both hypotheses require an analysis of variations in value relevance

[2] Dunham and Grandstaff (2022) suggested that quarterly data capture more fluctuations than the usually adopted annual view of economic conditions, albeit annual data is provided with a more detailed audit process. Only half-year data is used since quarterly financial reports in the EU was abolished by Directive 2013/50/EU to "*reduce the administrative burden on smaller issuers.*".

[3] The justification for this choice is twofold. First, accounting information is usually released in the form of general financial reports at least three months and up to six months after the end of the fiscal period. For this reason, prior studies usually adopt the stock price at three months (e.g., Collins et al., 1997) or six months after the fiscal year-end (e.g., Barth et al., 2008; Onali et al., 2017). However, after its release, accounting information is also used as a historical base for price determination. Therefore, an average price should capture not only the value relevance of different information at its release but also over a short-term period of influence. P_{it1} is the share price of the firm i at the year t recorded after the release of first semester interim data and is determined as the mean of the weekly prices recorded between September 30 and December 31 of the same year. P_{it2} is the share price of the firm i at the year t recorded after the release of annual report data and is determined as the mean of weekly prices recorded between April 1 and June 30 of the following year t+1. In the regressions, P_{it1} is correlated with interim data released after the first semester and P_{it2} with annual report data. Robustness checks also include a test for point prices at three and six months.

Table 1
Explanatory powers notations and mnemonics.

Notation	Description	Mnemonic	Note
$\overline{R}^2_T$	Total explanatory power of Equation (1).	BASELINE	A
$\overline{R}^2_S$	Total explanatory power of Equation (2)	SUPPLEMENTED	B
$\overline{R}^2_R$	Joint explanatory power of the *sector and country* factors and the *half-year* dummy. Obtained as explanatory power of Equation (3).	RESIDUAL	
$\overline{R}^2_A$	Difference between BASELINE and RESIDUAL.It also represents the sum incrBV + incrEPS + COMMON	incrACC	A
$\overline{R}^2_{BV}$	Incremental explanatory power of the *Book Value* variable. Obtained as difference between BASELINE and explanatory power of Equation (5)	incrBV	A
$\overline{R}^2_E$	Incremental explanatory power of the *Earnings* variable. Obtained as difference between BASELINE and explanatory power of Equation (4)	incrEPS	A
$\overline{R}^2_C$	Incremental explanatory power common to both *Book Value* and *Earnings* variable. Obtained as incrACC – incrBV – incrEPS	COMMON	A
$\overline{R}^2_{ESG}$	Incremental explanatory power of ESG data. Is computed using ESG rating (incrESG_Rating), pillars (incrESG_Pillars), or separate scores (incrESG_Scores). Obtained as difference between SUPPLEMENTED and BASELINE.	incrESG	B

Notes: A) the Mnemonic can be also attached with _Full, _Unrated, or _Rated, to inform on what sample the explanatory power is computed. B) the Mnemonic can also be attached with _Rating, _Pillars, or _Scores, to inform on what type of ESG data is used in the equation to compute the explanatory power. All other variables are defined in the Appendix.

over time. The measurement of value relevance is commonly based on the adjusted-R^2 (e.g., Ball & Nikolaev, 2022; Barth et al., 2023).[4] This study adopts the methodology of Collins et al. (1997) by separately estimating 16 yearly cross-sectional Price Regression Models (2005–2020), gauging value relevance with the adjusted-R^2 (hereafter, simply $\overline{R}^2$). Equation (1) estimates are used to determine the total coefficient of determination $\overline{R}^2_T$ (hereafter also referred to as "BASELINE"), which represents the joint explanatory power of all the parameters in the baseline regression. Estimates from Equation (2) are used to determine the $\overline{R}^2_S$ (hereafter also referred to as "SUPPLEMENTED"), which is the joint explanatory power of the supplemented model.

BASELINE and SUPPLEMENTED indicate the explanatory power of the full model, including all the specified variables. Each yearly explanatory power can be decomposed into the incremental explanatory powers of different information to determine the contribution of each variable to the total coefficient of determination (Collins et al., 1997). To do so, let

$$P_{ith} = \beta_0 + Industry_i + Country_i + Interim_h + \varepsilon_{ith} \quad (3)$$

Equation (3) estimates are used to calculate the coefficient of determination $\overline{R}^2_R$ (hereafter also referred to as "RESIDUAL"), which represents the explanatory power of the country and sector-level characteristics and the half-year dummy.

The difference between BASELINE and RESIDUAL represents the incremental explanatory power of the accounting numbers. $\overline{R}^2_A = \overline{R}^2_T - \overline{R}^2_R$ (hereafter "incrACC"), i.e., the portion of market values variations explained by book values and earnings. IncrACC can be further split into the incremental explanatory power of book values (hereafter "incrBV"), the incremental explanatory power of earnings (hereafter "incrEPS"), and the common explanatory power of both accounting numbers (hereafter "COMMON"). To do so, let

$$P_{ith} = \beta_0 + \beta_1 BV_{ith} + Industry_i + Country_i + Interim_h + \varepsilon_{ith} \quad (4)$$

and

$$P_{ith} = \beta_0 + \beta_1 EPS_{ith} + Industry_i + Country_i + Interim_h + \varepsilon_{ith} \quad (5)$$

Estimates from Equations (4) and (5) are used to determine two partial coefficients of determination, respectively named $\overline{R}^2_{P1}$ and $\overline{R}^2_{P2}$. The incrEPS is determined as $\overline{R}^2_E = \overline{R}^2_T - \overline{R}^2_{P1}$, which is the difference between BASELINE and the R^2 of Equation (4) estimates. The incrBV is determined as $\overline{R}^2_{BV} = \overline{R}^2_T - \overline{R}^2_{P2}$, which is the difference between BASELINE and the R^2 of Equation (5) estimates. Lastly, the COMMON is determined as $\overline{R}^2_C = \overline{R}^2_A - \overline{R}^2_{BV} - \overline{R}^2_E$, that is the difference between incrACC and the sum of incrBV and incrEPS. COMMON represents share price variations explained by book values or earnings because these accounting items are closely related.

The adjusted coefficients of determination are robust to the addition of variables to the model, therefore BASELINE corresponds to the sum of incrACC and RESIDUAL ($\overline{R}^2_T = \overline{R}^2_A + \overline{R}^2_R$), where incrACC is the sum of incrBV, incrEPS, and COMMON ($\overline{R}^2_A = \overline{R}^2_{BV} + \overline{R}^2_E + \overline{R}^2_C$).

Lastly, the incremental explanatory power of ESG data (hereafter "incrESG") is the difference between SUPPLEMENTED and BASELINE computed on the same firm-years, ($\overline{R}^2_{ESG} = \overline{R}^2_S - \overline{R}^2_T$). The notation of explanatory powers, similar to the one used by Collins et al. (1997), is listed in Table 1.

In line with Collins et al. (1997), this study then tests both hypotheses by regressing the decomposed incremental coefficients of determination on a time-trend variable (*TimeTrend)*. This approach returns a linear estimate of the variation in explanatory power for the variation of one period (i.e., year), so let

$$\overline{R}^2_{*t} = \beta_0 + \beta_1 TimeTrend_t + \varepsilon_t \quad (6)$$

where $\overline{R}^2_{*t}$ identifies one of the incremental explanatory powers in Table 1; $t = 1, 2, \cdots, 16$ is each year from 2005 to 2020, and $TimeTrend_t = 1, 2, \ldots, 16$ is the independent variable. Based on Equation (6), H1 is tested on incrBV ($\overline{R}^2_{BV,t}$), incrEPS ($\overline{R}^2_{E,t}$), and COMMON ($\overline{R}^2_{C,t}$), and H2 on incrESG ($\overline{R}^2_{ESG,t}$).

3.3. Sample selection and data

This study relies on Refinitiv's databases to construct the sample. The geographical scope is restricted to EU member states that adopted the euro in 2001 to improve the comparability of data and the homogeneity of firms' regulatory frameworks. To exclude biases arising from different accounting principles, this study focuses on the period following the mandatory switch to IFRS in the considered countries (2005–2020) since these standards have been linked to variations in accounting numbers' value relevance (e.g., Aharony et al., 2010; Barth et al., 2012).

[4] To test the change in value relevance, one should compare the variation of the adjusted-R^2 through time. In this paper, using a simple fixed-effects panel regression is not a suitable methodology since it estimates the relationship between the dependent and the independent variables, reporting the sign of correlation, its effect size, and the standard errors of the estimate. Since fixed-effects panel regression computes all years together, it is not capable of explaining "how" the explanatory power changed across the timeframe because it can determine a single overall coefficient of determination for the whole model.

The sample only includes data from nonfinancial companies (NFC). NFCs are more directly related to sustainable investments and their direct impact on the economy and society, as they invest in fixed and intangible assets to perform productive economic activities. Financial companies typically have different regulatory frameworks and adopt different accounting and financial statement preparation rules. Based on these conditions, the analysis covers 16 annual and half-year consolidated IFRS financial reports and sustainability information covering 2005 to 2020. The final sample consists of 58884 unbalanced firm-years from 3025 companies. Table 2 shows the sample selection process steps, while Table 3 shows the distribution of observations by country and sector (Panel A), and the evolution of frequency in time by country (Panel B) and sector (Panel C).

As shown in Table 3, Panels A and B, French and German companies consistently represent most firms of the sample, with slight variations through time. The third most frequent firms are in Italy, increasing substantially from 9.2 % in 2005 to 15.6 % in 2020, followed by Greece, which decreased from 13.5 % to 10.8 % in the same period. Panel C shows that the more represented sectors are manufacturing industries (i.e., *consumer durables* and *non-durables*, which cumulatively represent almost 20 %, and *manufacturing*), followed by retail services. *Retail, manufacturing,* and *consumer non-durable* observations slightly decreased over time, while *healthcare* slightly increased, and the remaining sectors stayed approximately the same percentage. The *other* category, residual and cumulative, represents almost one out of five firm-years across the timeline.

The study uses Refinitiv's Datastream and Worldscope datasets to extract firm-level data (i.e., prices, EPS, book values per share, earnings before interest, taxes, depreciation and amortization (EBITDA), cash flow from operations, research and development (R&D) expenses, sector, and country). In line with prior studies (Aguilera-Caracuel et al., 2017; Forcadell et al., 2020; for a review see de Villiers et al., 2022), the firm's sustainability performance is proxied by Refinitiv's ESG (formerly Thomson Reuters ASSET4) ratings.[5] Refinitiv's ESG scores have three tiers: (i) the separate scores, (ii) the pillars scores, and (iii) the single combined rating (Refinitiv, 2022).[6] All three tiers are used in the analysis. Because the provider updates ESG data annually, the last available rating is used each time. For robustness checks, other dummy variables were extracted to test the impact of the Global Reporting Initiative (GRI) guidelines, CSR auditing, and specific industries on the value relevance of ESG data. A detailed description of variables definition and extraction codes is provided in the Appendix.

4. Results

4.1. Descriptive statistics

Table 4 presents the descriptive statistics for the full sample of 58,884 firm-year observations with 18.56 % ESG rated and 81.44 % unrated firms.

[5] We only use Refinitiv's data for several different reasons. First, Refinitiv contains extensive data on many companies under both accounting and ESG information, thereby avoiding the problems of using data from different sources. Then, the analyses try to determine what variables were used by investors to determine share prices, which are usually computed using the most readily available data to minimize disclosure costs (Blankespoor et al., 2020). Moreover, Refinitiv is among the most used sources of ESG data and has a longer historical record of sustainability ratings (Baker et al., 2022; de Villiers et al., 2022), with first datapoints dating back to 2002.

[6] The ten separate scores are the most granular, divided into three areas (three Environmental, four Social, and three Governance scores); hereafter, they are referred to as "ESG scores." The pillar scores are one for each area and represent an average of the pertaining separate scores (hereafter, also called "ESG pillars"). Finally, the single-combined score is a weighted average of the pillars' scores (hereafter, also referred to as "ESG rating").

Table 2
Sample selection process.

Selection process steps	# of Firms
Database: Equity	314,882
Exclusion criteria:	
Non-equity instruments	−66,330
Non-traded in Euro, financial sectors, outside Eurozone countries	−234,226
Non-primary quotes	−5496
Firms without WorldScope data	−1968
Firms with data from non-IFRS statements, unconsolidated reports, non-Euro currency, or outside 2005–2020 period	−1899
Firms with SIC code 6000–6799	−636
Dual listings	−967
Cleansing (unusable data, incomplete observations for the main model)	−335
Final number of firms in sample	3,025
# of firm-year observations (2005–2020, half-year and annual data)	**58,884**

The full-sample mean (median) of *P* is 29.74 (7.43). The average share price for ESG-rated companies is significantly higher, albeit less dispersed, around the mean. *BV* mean (median) is 18.45 (4.41) for the full sample, which is almost two-thirds of the market value. The descriptive statistics suggest that even if the average book values per share are not significantly different in the two subsamples (p-value = 0.471), rated firms have a greater market-to-book ratio (39.77/18.17 = 2.19) than unrated companies (27.46/18.51 = 1.48), highlighting greater shareholders' expectations of a firm's growth (Collins et al., 1997, 2017). The average *EPS* of the entire sample is 1.52 (0.23), CV 3.0. Firm size is greatly dispersed and skewed to the left, with a long right tail of very large companies influencing the mean value. On average, ESG-rated firms are significantly larger than unrated firms.

Compared to prior studies, the mean price of 29.74 is higher than 19.96 in Barth et al. (2021), 16.98 in Brown et al. (1999), and 17.58 in Collins et al. (1997), whereas it was lower than 69.55 in Onali et al. (2017). Analogously, the mean book values (earnings) of 15.11 (1.52) are higher, albeit to a lesser extent, respectively to those of previous studies of 10.85 (0.90) in Barth et al. (2021), 11.06 (1.10) in Brown et al. (1999), and 12.65 (1.29) in Collins et al. (1997), whereas they are lower compared to 50.82 (5.44) in Onali et al. (2017). While the differences in the means of this study from Barth et al. (2021), Collins et al. (1997), and Brown et al. (1999) reflects the different geographical scope, timespan, market characteristics of the samples, and currencies, they still present values in the same order of size. In contrast, differences from Onali et al. (2017) purportedly arise from the large share of financial companies in their sample.

ESG-rated companies score, on average, an ESG rating of 54.5 out of 100 and Environmental, Social, and Governance pillars of 52.3, 58.2, and 50.3, respectively. The dispersion of scores around the mean is quite contained (CV approximately 0.5), the median is generally higher; suggesting that a few extreme values influence the mean, and the distribution is skewed to the right towards higher scores.

The correlation matrix in Table 5 shows that market values are strongly correlated ($\rho \simeq 0.5$–0.8) to all the financial statements variables except for the natural logarithm of Total Assets (*TotalAssets*) ($\rho \simeq 0.1$). Consistent with the literature, the coefficients suggest that each accounting variable is positively associated with market value. On the other hand, the ESG rating and pillar scores show small correlation coefficients with share prices (except for the governance pillar) and other accounting variables, all with p-values lower than 0.01.

Table 3
Sample distribution.

Panel A. Country and Sector (firm-years)	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Luxemb.	Netherl.	Portugal	Spain	Total
1 – Consumer Non-Durables	153	342	360	2,021	1,045	1,212	179	965	64	254	110	432	7,137
2 – Consumer Durables	154	–	6	611	657	106	–	528	–	73	32	72	2,239
3 – Manufacturing	511	400	752	2,072	2,411	1,067	118	1,125	–	331	164	570	9,521
4 – Energy	64	–	32	291	121	82	52	104	26	68	29	45	914
5 – Chemicals	32	160	62	492	531	210	–	83	–	164	10	80	1,824
6 – Business Equipment	136	350	725	4,087	4,036	576	52	878	15	539	162	240	11,796
7 – Telecom	40	124	41	437	336	156	22	250	66	62	160	208	1,902
8 – Utilities	73	53	34	332	488	172	–	603	40	64	58	176	2,093
9 – Retail	70	218	304	1,684	984	1,156	9	456	–	306	160	202	5,549
10 – Healthcare	78	129	168	1,106	1,045	218	61	252	–	90	38	289	3,474
12 – Other	105	501	659	4,037	2,746	1,148	242	1,169	8	669	306	845	12,435
Firm-years	1,416	2,277	3,143	17,170	14,400	6,103	735	6,413	219	2,620	1,229	3,159	58,884

Panel B. Country and year (%)[A]	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total %
Austria	2.4	2.6	2.7	2.6	2.6	2.4	2.4	2.5	2.3	2.5	2.5	2.3	2.2	2.2	2.2	2.1	2.4
Belgium	4.0	3.7	4.0	4.1	4.1	4.1	4.0	4.1	4.0	3.9	3.8	3.8	3.8	3.4	3.6	3.5	3.9
Finland	5.0	4.8	4.7	4.7	4.8	4.9	4.9	4.9	5.0	5.1	5.5	5.8	6.0	6.4	6.5	6.8	5.3
France	28.0	28.3	28.5	28.8	28.8	29.0	29.1	29.1	29.7	30.3	30.8	30.8	30.1	29.2	28.8	27.9	29.2
Germany	25.0	25.4	25.9	26.1	25.7	25.7	25.9	25.4	24.8	23.7	23.3	22.8	22.3	22.8	23.0	22.6	24.5
Greece	13.1	12.3	11.6	11.3	11.4	11.4	11.0	11.0	10.6	10.3	9.8	9.3	8.6	8.2	7.8	7.3	10.4
Ireland	1.3	1.3	1.5	1.4	1.3	1.3	1.2	1.2	1.2	1.3	1.2	1.2	1.2	1.2	1.1	1.0	1.3
Italy	9.2	9.7	9.8	9.9	10.2	10.2	10.3	10.3	10.4	10.4	10.3	10.5	11.8	12.8	13.3	15.6	10.9
Luxembourg	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4
Netherlands	5.4	5.2	4.9	4.4	4.3	4.2	4.2	4.1	4.2	4.2	4.1	4.3	4.4	4.5	4.5	4.2	4.5
Portugal	2.2	2.2	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.2	2.1	2.1	1.9	2.1
Spain	4.1	4.2	4.2	4.3	4.4	4.5	4.6	5.1	5.5	5.7	6.0	6.5	7.0	6.9	6.9	6.8	5.4
Firm-years	3,792	3,861	4,005	3,986	3,865	3,771	3,703	3,608	3,589	3,547	3,491	3,508	3,566	3,584	3,516	3,492	58,884

Panel C. Sector and year (%)[B]	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total %
1 – Consumer Non-Durables	13.5	13.0	12.5	12.5	12.5	12.5	12.5	12.3	12.3	12.2	12.0	11.6	11.5	11.1	10.8	10.8	12.1
2 – Consumer Durables	3.6	3.6	3.7	3.8	4.0	4.1	3.9	3.9	3.7	3.6	3.6	3.7	3.8	3.8	4.0	4.0	3.8
3 – Manufacturing	17.0	16.7	16.2	16.0	16.1	16.1	16.2	16.4	16.2	16.3	16.1	16.0	15.7	15.8	16.2	15.7	16.2
4 – Energy	1.2	1.3	1.4	1.5	1.5	1.6	1.7	1.8	1.7	1.8	1.6	1.7	1.7	1.7	1.4	1.4	1.6
5 – Chemicals	3.1	3.2	3.4	3.3	3.1	3.2	3.1	3.1	3.3	3.2	3.1	3.0	3.0	2.9	2.9	2.7	3.1
6 – Business Equipment	19.9	21.2	21.0	21.0	21.1	20.7	20.8	20.2	20.0	19.3	19.3	19.0	18.7	19.1	19.3	19.5	20.0
7 – Telecom	3.4	3.3	3.3	3.1	3.1	3.0	3.0	3.2	3.2	3.3	3.2	3.3	3.4	3.4	3.4	3.3	3.2
8 – Utilities	3.2	3.2	3.4	3.7	3.7	3.6	3.6	3.5	3.7	3.6	3.8	3.7	3.8	3.6	3.4	3.4	3.6
9 – Retail	11.1	10.1	9.8	9.2	9.2	9.1	8.8	9.0	8.8	9.1	9.3	9.1	9.5	9.7	9.6	9.3	9.4
10 – Healthcare	5.2	5.3	5.3	5.5	5.3	5.4	5.4	5.6	5.6	5.9	6.3	6.5	6.7	7.0	6.9	6.9	5.9
12 – Other	18.9	19.1	20.1	20.5	20.5	20.8	21.2	21.1	21.5	21.6	21.7	22.4	22.2	22.0	22.1	22.9	21.1
Firm-years	3,792	3,861	4,005	3,986	3,865	3,771	3,703	3,608	3,589	3,547	3,491	3,508	3,566	3,584	3,516	3,492	58,884

Notes: A. Those countries adopted the Euro as their official currency in or before January 1, 2001. Since the 1990 s, these countries adopted coordinated policies to converge towards Euro adoption (Von Hagen & Mundschenk, 2002). Moreover, since 1998, the European Central Bank has overseen the implementation of monetary policy for the eurozone countries (Clausen & Hayo, 2006). Therefore, firms in these countries operated under homogeneous macroeconomic and regulatory conditions over the period. B. Sectors are reported according to Fama and French's (2023a) 12-industry classification (a superstructure for the 48 industries used in the analysis).

Table 4
Descriptive statistics.

		Full sample	Unrated	ESG-rated	Difference
Firm-years		58,884	47,955	10,929	
Variable	**Statistic**				
*P*Market value per share	Mean	29.74	27.46	39.77	12.31 ($p < 0.001$)
	Median	7.43	5.66	21.57	15.91 ($p < 0.001$)
	SD	80.97	82.9	71.05	*U* test $p < 0.001$
	CV	2.7	3.0	1.8	
*BV*Equity Book value per share	Mean	18.45	18.51	18.17	−0.34 ($p = 0.471$)
	Median	4.41	3.53	9.99	6.46 ($p < 0.001$)
	SD	59.79	63.65	38.62	*U* test $p < 0.001$
	CV	3.2	3.4	2.1	
*EPS*Earnings per share	Mean	1.52	1.4	2.01	0.61 ($p < 0.001$)
	Median	0.23	0.15	1.02	0.87 ($p < 0.001$)
	SD	4.50	4.63	3.80	*U* test $p < 0.001$
	CV	3.0	3.3	1.9	
*TotalAssets*Firm's size – Total Assets Million €, undeflated	Mean	3292.1	534.7	15400	14865.3($p < 0.001$)
	Median	161.7	96.8	4542.7	4445.9 ($p < 0.001$)
	SD	15000	5266.1	30100	*U* test $p < 0.001$
	CV	4.6	9.8	2.0	

ESG Scores (0–100)	**Mean**	**Median**	**SD**	**CV**
ESG Rating	54.5	56.8	20.5	0.4
Environomental Pillar	52.3	56.3	27.6	0.5
Social Pillar	58.2	61.0	24.0	0.4
Governance Pillar	50.3	50.7	22.2	0.4

Notes: SD is the standard deviation. CV is the coefficient of variation (S.D./mean). All variables are defined in the Appendix. All variables except scores are winsorized at the 1st and 99th percentile by year. Differences in means are tested by *t*-test. Differences in medians are tested by χ^2 test. Wilcoxon-Mann-Whitney *U* test *p*-value reported below differences.

Table 5
Correlation matrix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) *P*	1							
(2) *BV*	0.773**	1						
(3) *EPS*	0.691**	0.652**	1					
(4) *TotalAssets*	0.120**	0.089**	0.137**	1				
(5) ESG Rating	0.031**	0.057**	0.038**	0.586**	1			
(6) Environmental Pillar	0.026**	0.069**	0.051**	0.585**	0.862**	1		
(7) Social Pillar	0.030**	0.041**	0.021**	0.487**	0.905**	0.728**	1	
(8) Governance Pillar	0.014	0.024**	0.022**	0.375**	0.685**	0.393**	0.434**	1

Notes: ** means $p < 0.05$. All coefficients are Pearson's ρ. All variables are defined in the Appendix.

4.2. Regression results - Equations (1) and (2)

Table 6 reports the results from Equations (1) and (2)[7] with the related adjusted coefficients of determination $\overline{R}_t^2$ (BASELINE for Panels A-C and SUPPLEMENTED for Panel D). Table 6 shows that both book values and earnings coefficients are positive in full and unrated subsamples, with *p*-values lower than 0.001 (Panels A and B of Table 6). Panel C for the ESG-rated subsample also shows that, albeit remaining positive, book values coefficients had large *p*-values (greater than 0.05) in 2011–2019. This suggests that book values lost explanatory power for ESG-rated firms during this period. As reported in Panel A of Table 6 and by the blue line in Fig. 1, the explanatory power of the price regression model on the full sample (BASELINE_Full) gradually but steadily decreased over time. In 2005–2006, BASELINE_Full slightly increased, in line with the notion that IFRS should increase the value relevance of accounting numbers. However, during 2006–2011, the BASELINE_Full was slowly decreasing from 78.5 % to 73.9 %, with a dip of 73.4 % in 2008, and then shrank to around 69.5 % in 2012 and 60.5 % in 2015, increasing to 63.4 % in 2016 and then decreasing again towards 59.3 % in 2020.

Unrated companies (which represents the majority of the sample), show a general increase of the explanatory power (BASELINE_Unrated) between 2005 (72.3 %) and 2011 (77.8 %), then a decrease up to 2015 (62.7 %) and an increase up to 2020 (69.3 %). These results are generally in line with the notion that IFRS should increase the value relevance of accounting numbers. In contrast, ESG-rated companies, despite their small proportion (on average 12–21 % in 2005–2017, then

[7] The regression results reported in the text and appendixes comply with the American Statistical Association Statement on Statistical Significance and *p*-values (Wasserstein et al., 2019). Accordingly, the *p*-values for regression coefficients are reported, abandoning the dichotomization of results into "significant" and "not significant." This approach treats statistical results as being much more incomplete than the norm, thus, acknowledging that uncertainty exists everywhere in research and that this is exploratory in nature.

Table 6
Regression results.

Panel A. Equation (1), Full Sample	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Book Values (*BV*)	1.264	1.082	0.900	0.607	0.702	0.763	0.527	0.545	0.703	0.816	0.715	0.704	0.767	0.803	0.612	0.739
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Earnings (*EPS*)	6.925	9.247	5.435	3.468	5.867	5.655	4.870	7.141	4.506	4.238	4.394	6.052	6.722	5.769	8.589	8.289
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Firm-years	3,783	3,853	3,999	3,977	3,862	3,770	3,699	3,602	3,583	3,541	3,485	3,501	3,560	3,576	3,504	3,478
Adj-R^2 (BASELINE_Full)	0.736	0.785	0.772	0.734	0.758	0.756	0.739	0.695	0.652	0.634	0.605	0.634	0.634	0.629	0.613	0.593
Panel B. Equation (1), Unrated firms	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Book Values (*BV*)	1.198	1.107	0.947	0.625	0.718	0.790	0.554	0.578	0.795	0.905	0.792	0.788	0.909	0.905	0.794	0.849
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Earnings (*EPS*)	6.741	7.907	4.398	3.067	5.038	4.454	4.595	6.492	3.262	3.107	3.310	4.806	4.642	3.822	5.580	5.869
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(0.003)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Firm-years	3,313	3,368	3,485	3,435	3,307	3,199	3,119	3,017	2,997	2,942	2,883	2,889	2,818	2,505	2,396	2,175
Adj-R^2 (BASELINE_Unrated)	0.723	0.778	0.764	0.740	0.757	0.757	0.778	0.713	0.672	0.658	0.627	0.655	0.667	0.701	0.659	0.693
Panel C. Equation (1), ESG-rated firms	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Book Values (*BV*)	1.851	0.753	0.661	0.572	0.721	0.637	0.126	0.235	0.259	0.139	0.139	0.115	0.177	0.344	0.380	0.615
	(<0.001)	(0.002)	(0.024)	(0.001)	(<0.001)	(0.001)	(0.319)	(0.136)	(0.077)	(0.210)	(0.266)	(0.434)	(0.357)	(0.280)	(0.071)	(0.028)
Earnings (*EPS*)	7.342	18.045	10.074	4.515	9.229	11.377	7.485	9.140	7.763	9.080	6.496	11.022	14.261	10.467	15.838	12.209
	(0.001)	(<0.001)	(<0.001)	(0.011)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Firm-years	470	485	514	542	555	571	580	585	586	599	602	612	742	1,071	1,108	1,303
Adj-R^2 (BASELINE_Rated)	0.900	0.898	0.889	0.760	0.851	0.847	0.509	0.561	0.643	0.646	0.572	0.616	0.577	0.449	0.605	0.471
Panel D. Equation (2), ESG-rated firms	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Book Values (*BV*)	1.847	0.767	0.673	0.575	0.723	0.642	0.132	0.237	0.259	0.136	0.135	0.112	0.184	0.340	0.400	0.607
	(<0.001)	(0.002)	(0.022)	(0.001)	(<0.001)	(0.001)	(0.303)	(0.141)	(0.076)	(0.208)	(0.268)	(0.437)	(0.350)	(0.286)	(0.058)	(0.026)
Earnings (*EPS*)	7.318	17.858	10.031	4.519	9.212	11.351	7.446	9.141	7.772	9.098	6.541	11.004	14.393	10.452	15.853	11.994
	(0.001)	(<0.001)	(<0.001)	(0.011)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
ESG Rating	−0.394	−0.338	−0.310	−0.137	−0.093	−0.208	−0.141	−0.037	0.036	0.096	0.105	0.073	−0.175	0.028	−0.070	0.251
	(<0.001)	(<0.001)	(<0.001)	(0.011)	(0.086)	(0.001)	(0.054)	(0.534)	(0.519)	(0.116)	(0.122)	(0.432)	(0.089)	(0.742)	(0.224)	(<0.001)
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Firm-years	470	485	514	542	555	571	580	585	586	599	602	612	742	1,071	1,108	1,303
Adj-R^2 (SUPPLEMENTED_Rating)	0.903	0.899	0.891	0.762	0.852	0.849	0.510	0.560	0.643	0.647	0.573	0.616	0.578	0.449	0.605	0.476

Notes: Results for Equation (1) and (2). Robust standard errors. *p*-values in parentheses below coefficients. Controls include Intercept, sector, country, and half-year data, which are computed in the model but omitted in the presentation for clarity and brevity. Sectors are grouped according to Fama and French (2022b) 48-industry classification. All variables are defined in the Appendix. The mnemonics for explanatory powers (Adj-R^2) are described in Table 1.

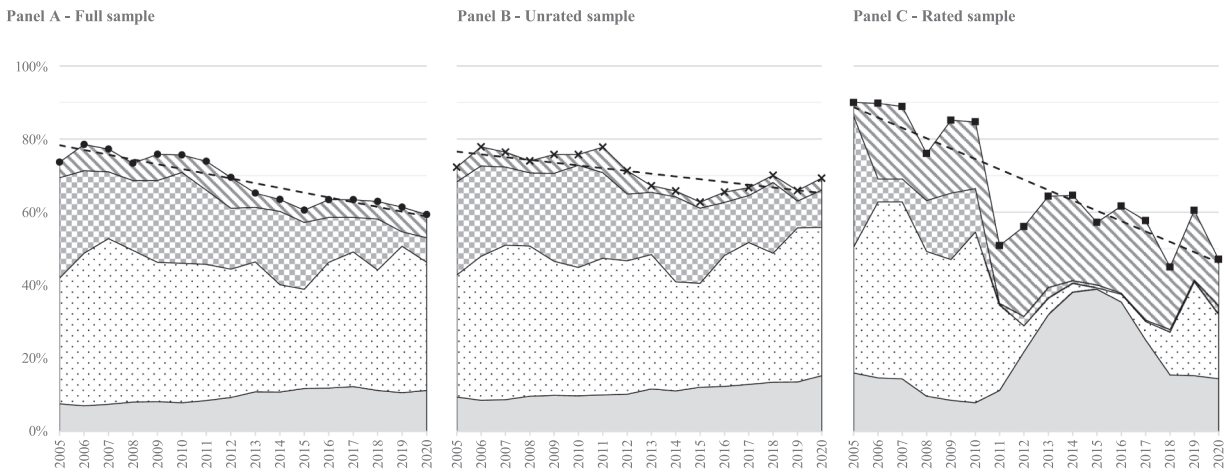


Fig. 1. Value relevance of book values and earnings. Notes: Starting from the top of each graph, the dots, crosses, and squares represent the time series of BASELINE explanatory power, respectively for Full Sample, Unrated Sample, and ESG-Rated Sample. The dashed lines are the regression line from BASELINE coefficients on time (the slope is coefficient on time-trend (TimeTrend), as reported in Table 7, Column 1). Areas represent the breakdown of incremental explanatory power: the striped area is incrEPS, the checkered area is incrBV, the dotted area is COMMON, and the plain grey area is RESIDUAL. All incremental explanatory powers included in the Figure are described in Table 1.

Table 7
Explanatory power of accounting numbers.

Panel A. Full sample					
Explanatory power	BASELINE 1a	incrACC 2a	incrBV 3a	incrEPS 4a	COMMON 5a
TimeTrend	−0.013	−0.016	−0.012	<0.001	−0.004
	(<0.001)	(<0.001)	(<0.001)	(0.633)	(0.082)
Intercept	0.796	0.729	0.269	0.059	0.401
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
R^2	0.844	0.850	0.737	0.017	0.200
Panel B. Unrated firms					
Explanatory power	BASELINE 1b	incrACC 2b	incrBV 3b	incrEPS 4b	COMMON 5b
TimeTrend	−0.008	−0.012	−0.010	−0.002	<0.001
	(0.001)	(<0.001)	(<0.001)	(0.051)	(0.917)
Intercept	0.773	0.695	0.275	0.050	0.371
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
R^2	0.527	0.712	0.616	0.245	0.001
Panel C. ESG-rated firms					
Explanatory power	BASELINE 1c	incrACC 2c	incrBV 3c	incrEPS 4c	COMMON 5c
TimeTrend	−0.028	−0.037	−0.014	0.004	−0.027
	(<0.001)	(<0.001)	(0.003)	(0.247)	(0.003)
Intercept	0.915	0.787	0.183	0.156	0.449
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
R^2	0.722	0.632	0.473	0.095	0.489

Notes: Results for Equation (6) in full- and sub-samples, computed using Adjusted-R^2 from Equation (1) and its breakdown. *p*-values in parentheses below the coefficients. Independent variables are defined in the Appendix. Explanatory powers (dependent variables) are defined in Table 1.

increasing up to 30–37 % in 2018–2020), faced a larger decrease in explanatory power of the independent variables in the baseline model (BASELINE_Rated). The coefficient of determination for the ESG-rated sample (Panel C of Table 6) in 2005 was 90.0 %, decreasing to 84.7 % in 2010, with a dip of 76.0 % in 2008. In 2011, BASELINE_Rated dropped to 50.9 %, increased to 64.6 % in 2014, and then decreased to 47.1 % in 2020, with a dip of 49.9 % in 2018 and a peak of 60.5 % in 2019.

Comparing BASELINE_Rated and BASELINE_Unrated, the market values of ESG-rated companies (on average larger) were more reliant on accounting measures during 2005–2010. In contrast, from 2011 to 2020, the value relevance of accounting measures in unrated companies decreased slightly but remained above 60 %, while it fell below 50 % for ESG-rated companies.

The results for the baseline Equation (1) for ESG-rated firms (Panel C) and supplemented Equation (2) (Panel D) are comparable. The coefficients of book value and earnings have small variations, as well as their *p*-values. ESG ratings (single score) show a small and negative correlation in 2005–2007 and 2010 (p-values ≤ 0.001), a small and positive correlation in 2020 (p-value < 0.001), and no significant coefficients in other years. However, the coefficients of determination (BASELINE_Rated and SUPPLEMENTED_Rating) were almost identical.

The results of Equation (2) for different tiers of ESG scores are untabulated but overall comparable. This finding is in line with the prior literature that reports mixed signs of a correlation between ESG performance and market value. However, the results for 2020 suggest that the trend might change in the future, purportedly because of macroeconomic conditions, the paradigm shift in the EU goals for development, and the inclusion of sustainability criteria in its regulations.

4.3. Changes in value relevance of accounting numbers [H1]

H1, that the value relevance of earnings and book values in the EU has not changed in 2005–2020, is tested using Equation (1) and then computing the incremental explanatory powers. Fig. 1 depicts the incremental explanatory power of different accounting numbers. More specifically, the incremental explanatory power of book values and earnings, the common explanatory power of both accounting numbers, and the residual explanatory power of the model.

Fig. 1 portrays the reduction of the overall explanatory power of the baseline price regression model reported in the previous paragraph. The loss in value relevance is large in the ESG-rated sample (Panel C) but less evident in unrated companies (Panel B). Table 7 reports the results of regressing the decomposed explanatory power on a time trend (*TimeTrend*) using Equation (6).

Overall, H1 is rejected. Traditional accounting measures have lost their value relevance over time in the full sample and in both the ESG-rated and unrated subsamples. The incremental explanatory power of all accounting measures in the full sample (incrACC_Full) decreased by −1.6 % per year (Column 2a). In contrast, incrACC_Unrated lost a −1.2 % per year (Column 2b) and incrACC_Rated decreased by −3.7 % (Column 2c), all p-values < 0.001. However, when the explanatory power is broken down, the results suggest that the reduction is driven mainly by the incremental explanatory power of book values (incrBV), which recorded a loss of explanatory power for all companies. In particular, incrBV_Full reduced by −1.2 % per year ($p < 0.001$, Column 3a), incrBV_Unrated by −1.0 % per year ($p < 0.001$, Column 3b), and incrBV_Rated by −1.4 % per year ($p = 0.003$, Column 3c). By contrast, incrEPS_Unrated decreased slightly (-0.2 % per year, $p = 0.051$), whereas COMMON_Rated decreased significantly (-2.7 % per year, $p = 0.003$). This suggests that in ESG-rated companies, the largest reduction was in the common explanatory power of earnings and book values. However, this result was driven by the dip observed in 2012–2017 (Fig. 1, Panel C), as COMMON_Rated increased again after 2018.

4.4. Changes in value relevance of ESG ratings [H2]

H2 explores whether the value relevance of ESG ratings in the EU has not changed from 2005 to 2020. Fig. 2 shows the incremental explanatory powers of the different tiers of ESG ratings and a comparison with accounting numbers.

Fig. 2, Panel A shows the trend of the incremental explanatory power of ESG rating (incrESG_Rating, full black line), pillar scores (incrESG_Pillars, dashed grey line), and separate scores (incrESG_Scores, dotted grey line). The incrESG_Rating and incrESG_Pillars contribute to the total $\overline{R}^2_S$ of Equation (2) in a range of −0.2 % to + 0.4 %, while the more granular separate scores have an incremental explanatory power (incrESG_Scores) of −0.4 % to +1.5 %. The graph in Fig. 2, panel A, shows three local maximums of incrESG_Scores of +1.5 % in 2008 (global financial crisis), +1.3 % in 2015 (Paris Agreement), and +1.0 % in 2020 (COVID-19 pandemic outbreak), while the absolute minimum of −0.4 % is in 2012 (Sovereign Debt crisis).

However, as shown in Panel B, the coefficient of determination of Equation (2) $\overline{R}^2_S$ using *ESG_Scores* (SUPPLEMENTED explanatory power, dotted black line) is comparable to the Equation (1) baseline model's $\overline{R}^2_T$ of the rated companies (BASELINE_Rated, full grey line). The difference between the two lines is almost unperceivable, and the two lines only barely separate during 2008, 2015, and 2020. Table 8 reports the results of regressing the incremental explanatory powers on the time-trend (*TimeTrend*).

The results in Columns 1 and 2 (BASELINE and incrACC) are the same as those in Table 7, Panel C, Columns 1 and 2. Columns 3, 4, and 5 of Table 8 report the incremental explanatory power of the different ESG data. The incremental explanatory power of the ESG ratings (Column 3) and pillars (Column 4) did not change across the period, with slopes smaller than + 0.001 and p-values greater than 0.5. In contrast, the incremental explanatory power of single scores (incrESG_Scores) shows a larger p-value because it has a more fluctuating trend, with local maximum and minimum in distant years across the entire period. Therefore, the null hypothesis H2 is not rejected because ESG ratings do not change their total explanatory power.

4.5. Additional findings from robustness checks and alternative models

Consistent with prior research, this study checks the robustness of the previous analyses. The robustness checks generally yield results comparable to the trends outlined in the main analyses. The findings are untabulated[8] and reported qualitatively for brevity.

4.5.1. Different dependent variable determinations and regression models

First, we adopt the different share price determination methods of stock prices three and six months after the end of the period. The results are comparable to those of the baseline model.

A Return Regression Model is adopted to test for differences from the baseline model. The recent literature maintains that value relevance research could benefit from comparative analyses between Price and Return regression models to enhance comparability (e.g., Dunham & Grandstaff, 2022; Onali et al., 2017; Singleton-Green, 2015). The Return Regression Model links stock returns to earnings deflated by lagged share prices and earnings changes. This model is suitable for testing the robustness of the price regression model and controlling for other scale effects, as suggested by Brown et al. (1999). However, the Return Regression Model includes only earnings levels and changes in earnings while neglecting other accounting numbers (such as book values, R&D expenses, and alternative performance measures). In line with the prior literature, the Return Regression Model yields a smaller coefficient of determination than the baseline model. Nonetheless, the model highlights the overall decreasing explanatory power of earnings during 2005–2014 and an increase during 2015–2020. Therefore, a linear regression of the yearly coefficients of determination on a time trend (Equation (6) is not viable and yields uninterpretable results due to low coefficients and model fitness. Moreover, the levels of value relevance in 2005 and 2020 are substantially similar (9.6 % vs. 10.6 %).

The results align with the baseline model, highlighting the non-significant trend in incrESG. Unrated and ESG-rated companies exhibit different trends and levels of earnings value relevance. This suggests that the choice of model and sample highly influences research results, as pointed out by Dunham and Grandstaff (2022). Moreover, long-term trends can be overlooked if the research design focuses on smaller timeframes such as 6 to 8 years, as in Onali et al. (2017).

4.5.2. Alternative performance measures and additional accounting numbers

The model is conditioned with other value relevant accounting information, such as growth opportunities indicators and alternative performance measures, including operating cash flow, EBITDA (e.g., Davern et al., 2019; Francis et al., 2003), and intangible assets such as R&D expenses (Barth et al., 2023). Each of these controls is scaled by shares number, winsorized, and added to the model. The results are comparable to those of the paper's main analyses. The incremental

[8] Detailed results can be provided upon request.

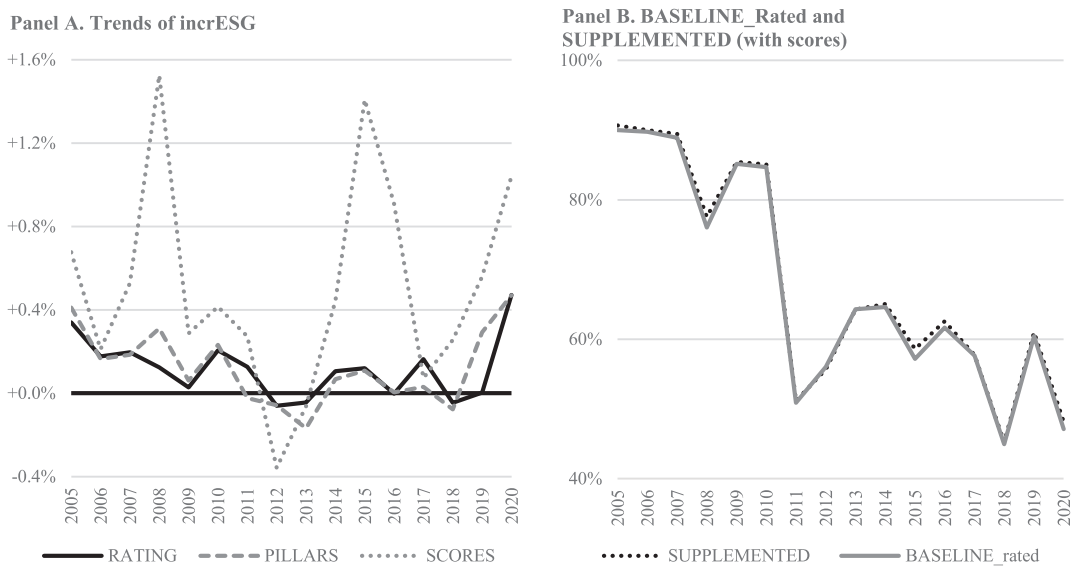


Fig. 2. Value relevance of ESG scores. Note: All incremental explanatory powers included in the Figure are defined in Table 1.

Table 8
Explanatory power of ESG ratings.

			incrESG		
	BASELINE_Rated	incrACC_Rated	_Rating	_Pillars	_Scores
	1	2	3	4	5
TimeTrend	−0.028 (<0.001)	−0.037 (<0.001)	<+0.001 (0.557)	<+0.001 (0.597)	<+0.001 (0.837)
Intercept	0.915 (<0.001)	0.787 (<0.001)	0.002 (0.058)	0.002 (0.100)	0.005 (0.116)
R^2	0.808	0.660	0.220	0.206	0.004

Notes: Results for Equation (6) in ESG-rated subsample, using Adjusted-R^2 computed with the supplemented Equation (2) and its breakdown. *p*-values in parentheses below the coefficients. The explanatory powers (dependent variable) are described in Table 1. The independent variables are described in the Appendix.

explanatory power of EBITDA, operating cash flows, and R&D expenditure, determined similarly to the other incremental explanatory powers in Section 4.1, is rather small. These findings suggest that alternative accounting measures have some explanatory power but do not bridge the gap between earnings and book values left from previous years.

4.5.3. Sector- or firm-specific characteristics and ESG data

Finally, as a robustness check for H2, an additional analysis examines whether the value relevance of sustainability information is affected by sector-specific industry characteristics (e.g., Miralles-Quirós et al., 2019) or by data quality and dependability (e.g., Jadoon et al., 2021; Kaspereit & Lopatta, 2016). The results for H2 suggest that there was no change in the value relevance of ESG information. A fixed-effects panel regression was carried out based on Equations (1) and (2), supplemented with dummy control variables for GRI guideline adoption, CSR audit process implementation, and firms operating in highly polluting industries. The results for the accounting numbers are essentially unchanged, and the coefficients of determination have small variations. Restricting the sample to firms that should ideally be more involved in ESG practices, such as adopting GRI guidance, submitting their CSR reports to audit processes, or belonging to polluting "brown" sectors, does not yield notable changes to the explanatory power of ESG data.

5. Conclusion

The analyses show that the explanatory power of traditional and alternative accounting numbers declined greatly over time, particularly in companies with an ESG external rating. Overall, the results suggest that a firm's market value is less reliant on accounting measures, and investors purportedly determine the market prices of shares using different data (e.g., Dunham & Grandstaff, 2022; He et al., 2022).

These findings partially collide with those of Barth et al. (2023), who maintain that accounting numbers retain value relevance. Two factors are responsible for this difference. First, the results of Barth et al. (2023) are derived from a sample of United States (US) firms, which differ from European firms. Second, they stated that share prices have a more nuanced relationship with accounting numbers beyond earnings and book values and that market values relate "*with a large set of accounting amounts, most notably those related to intangible assets, growth opportunities, and alternative performance measures*." (Barth et al., 2023, p. 23). Conversely, the current study includes these elements in the robustness check, which reveals a positive and significant correlation between prices and alternative accounting numbers, such as R&D, cash flows, and EBITDA. However, incorporating such elements did not yield significantly different results than the baseline model. Therefore, as accounting numbers explain a smaller portion of market value, investors probably rely on different sources of information, either formal or informal (e.g., Dunham & Grandstaff, 2022; Barth et al., 2023).

Given the increasing importance of sustainability issues (e.g., Amel-

Zadeh & Serafeim, 2018; Global Sustainable Investment Alliance, 2020), this study investigates whether sustainability information increases value relevance over time. In line with prior studies (e.g., de Villiers et al., 2022), a company's sustainable behavior is measured by adopting ESG ratings, although such ratings are particularly controversial (e.g., Atta-Darkua et al., 2020; Dimson et al., 2020). According to the results of the analyses, the null hypothesis that the "*value relevance of sustainability information has not changed over time*" is not rejected. Supplementing the price regression model with ESG ratings suggests that the explanatory power of such scores is limited or absent. Compared to the accounting-based standard price regression model, the explanatory power increase is between −0.4 % and + 1.5 % and is larger when sustainability information is proxied by scores for separate components areas of environmental, social, and corporate governance compared to a single unified ESG rating. Restricting the analysis to specific subsamples of firms responding to specific characteristics, such as reporting principles and polluting sectors, does not significantly change the results. Moreover, supplementing the model with ESG data does not change the coefficients and *p*-values of the price on earnings and book values, and the R^2 values of the baseline and supplemented models are practically identical.

Therefore, this study finds that ESG scores had little impact on European firms' market values during 2005–2020, and their importance did not significantly increase or decrease. Although minimal compared to accounting numbers, the incremental explanatory power of separate and more granular ESG ratings shows local peaks during crises (2008 and 2020) and the Paris Agreement settlement (2015). However, in these cases, the impact on the model's explanatory power is limited, and the separate score coefficients generally have *p*-values larger than 0.01 and 0.05. These results, in line with Cordazzo et al. (2020), suggest that implementing the Nonfinancial Reporting Directive (2014) did not significantly affect the value relevance of sustainability information in Europe.

The findings of this study could potentially interest a much broader audience than academia alone. From an institutional and policy perspective, the findings highlight that accounting numbers are indeed losing their relevance, despite adopting IFRS principles that should have increased the informative ability of financial reporting data. This is particularly true for larger companies that are usually ESG-rated, whereas the reduction is less evident for listed companies that are smaller or no ESG ratings.

However, the spread of sustainability reports and the increased awareness of ESG issues have purportedly not led investors to base their decisions on them, as advocated by Moneva and Cuellar (2009). The explanatory power of ESG scores is limited. Because a single proxy for sustainability information is adopted, the results do not indicate that sustainability information is not value relevant. These findings are exploratory and only determine that ESG scores up to 2020 have little correlation with market prices and explain a non-relevant part of their variations. Further research is necessary to determine whether other proxies for sustainability information better explain the share prices that accounting measures no longer explain in recent years.

From an academic perspective, this study lays the groundwork for future research. In ESG-rated European nonfinancial companies, the value relevance of accounting numbers was reduced dramatically and is not being replaced by alternative value relevant accounting items or ESG ratings. Further insights in this field should determine which information has been included in the investment decision process in Europe to the detriment of accounting numbers and the extent to which sustainability information has been implemented in market value determination. The increasingly normative requirements for sustainability reporting from both corporations and investors are expected to support the production of more reliable, comparable, and accessible data that will be easier to implement in investment decision-making processes and empirical research.

Finally, these findings are of interest to policymakers, regulators, and standard setters. The transition to a more sustainable economic model and implementation of the EU's taxonomy and action plans will be possible only with a decisive shift in investment decision processes and corporate awareness of sustainability issues, in line with the concept of "double materiality" incorporated in the EU's Corporate Sustainable Reporting Directive. This paper documents that such a shift has not yet been accomplished, even with the increasing urgency of the most recent social, geopolitical, economic, and environmental turmoil. While the EU has recently dedicated itself to the ESG agenda, it is not enough that ESG issues are discussed in professional and academic environments. Sustainability information disclosure mandated by policy and lawmakers is helpful and sustainability data providers will probably proliferate. But that is insufficient. Instead, it is necessary to drive investors towards a common awareness of sustainable economic paradigms by introducing the double materiality principle at the firm level to achieve a transformative shift in day-to-day industrial processes and financial investors' behaviors.

CRediT authorship contribution statement

Alessandro Migliavacca: Conceptualization, Data Curation, Writing – original draft, Writing – review & editing, Formal analysis, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Acknowledgments

The Author is grateful to Robert K. Larson (editor) and the two anonymous referees for the suggestions provided and their constructive approach in the review process. The Author also greatly appreciated the comments received from the anonymous reviewers and participants at 2023 European Accounting Association Congress.

Appendix. Variables definitions

Variable	Symbol	Datastream Code	Frequency	Equations	Tables
Share Price or Market value is the average share price determined from mean of all share prices recorded between three and six months after the end of the fiscal period	*P*	P	Weekly (see paragraph 3.1)	1, 2, 3	4, 5, 6
Earnings per share is the reported earnings in the interim or annual statement, deflated by the number of shares	*EPS*	EPS	Full and Half-year	1, 2, 5	4, 5, 6

(*continued on next page*)

(*continued*)

Variable	Symbol	Datastream Code	Frequency	Equations	Tables
Equity Book Values is the common shareholders equity outstanding per share, reported in the interim or annual statement	*BV*	WC05476		1, 2, 4	4, 5, 6
Share-deflated earnings before interest, taxes, depreciation, and amortization (EBITDA)	*EBITDA*	WC18198		Untabulated robustness checks	Untabulated robustness checks
Cash Flow from Operations, share deflated	*CFO*	WC04201			
Research and development expenses, share deflated	*R&D*	WC01201			
Firm's Size, log of Total Assets	*TotalAssets*	WC02999			4, 5
ESG Rating, is the weighted average of the scores for the Environmental Pillar, the Social Pillar, and the Governance Pillar.	*ESGRating*	TRESGS	Full year (see paragraph 3.3)	2	4, 5, 6D
Environmental Pillar, is average of Energy Use Score, Environmental Innovation Score, and Resource Consumption Use Score.	*ESGPillars*	ENSCORE		2	4, 5
Social Pillar, is average of Community Score, Human Rights Score, Product Responsibility Score, and Human Rights Score.		SOSCORE		2	4, 5
Governance Pillar, is average of Management Score, Shareholders Score, and CSR Strategy Score.		CGSCORE		2	4, 5
Energy Use Score	*ESGScores*	TRESGENERS		2	Untabulated results for main analysis (H2).
Environmental Innovation Score		TRESGENPIS		2	
Resource Consumption Score		TRESGENRRS		2	
Community Score		TRESGSOCOS		2	
Human Rights Score		TRESGSOHRS		2	
Product Responsibility Score		TRESGSOPRS		2	
Workforce Score		TRESGSOWOS		2	
Management Score		TRESGCGBDS		2	
Shareholders Score		TRESGCGSRS		2	
CSR Strategy Score		TRESGCGVSS		2	
Industry / Sector dummy variables	*Industry*	WC07021 (used to determine Fama & French 48-industry sector)	Time-invariant	1, 2, 3, 4, 5	3A, 6
Country dummy variables	*Country*	CODOC (see section 3.3)	Time-invariant	1, 2, 3, 4, 5	3B, 6
Half-year dummy indicates whether the data point is extracted from annual (0) or interim (1) report	*Interim*	Half-year (interim report)	Yearly	1, 2, 3, 4, 5	6
Time-trend variable identifies the year of our sample (i.e., 1 means 2005 and 16 means 2020).	*TimeTrend*	Year (annual report)	Yearly	6	7, 8

References

Adwan, S., Alhaj-Ismail, A., & Girardone, C. (2020). Fair value accounting and value relevance of equity book value and net income for European financial firms during the crisis. *Journal of International Accounting, Auditing and Taxation, 39*, Article 100320. https://doi.org/10.1016/j.intaccaudtax.2020.100320

Aguilera-Caracuel, J., Guerrero-Villegas, J., & García-Sánchez, E. (2017). Reputation of multinational companies: Corporate social responsibility and internationalization. *European Journal of Management and Business Economics, 26*(3), 329–346. https://doi.org/10.1108/EJMBE-10-2017-019

Aharony, J., Barniv, R., & Falk, H. (2010). The impact of mandatory IFRS adoption on equity valuation of accounting numbers for security investors in the EU. *European Accounting Review, 19*(3), 535–578. https://doi.org/10.1080/09638180.2010.506285

Amel-Zadeh, A., & Serafeim, G. (2018). Why and how investors use ESG information: Evidence from a global survey. *Financial Analysts Journal, 74*(3), 87–103. https://doi.org/10.2469/faj.v74.n3.2

Amir, E., Harris, T. S., & Venuti, E. K. (1993). A comparison of the value-relevance of U.S. versus non-U.S. GAAP accounting measures using Form 20-F reconciliations. *Journal of Accounting Research, 31*(Supplement), 230–264. https://doi.org/10.2307/2491172

Atta-Darkua, V., Chambers, D., Dimson, E., Ran, Z., & Yu, T. (2020). Strategies for responsible investing: Emerging academic evidence. *Journal of Portfolio Management, 46*(3), 26–35. https://doi.org/10.3905/jpm.2020.46.3.026

Baboukardos, D., & Rimmel, G. (2016). Value relevance of accounting information under an integrated reporting approach: A research note. *Journal of Accounting and Public Policy, 35*(4), 437–452. https://doi.org/10.1016/j.jaccpubpol.2016.04.004

Baker, M., Egan, M. L., & Sarkar, S. K. (2022). *How Do Investors Value ESG?* (NBER Working Paper No. 30708). National Bureau of Economic Research. Retrieved from Doi: 10.3386/w30708. Accessed June 30, 2023.

Ball, R., & Brown, P. (1968). An empirical evaluation of accounting income numbers. *Journal of Accounting Research, 6*(2), 159–178. https://doi.org/10.2307/2490232

Ball, R., & Nikolaev, V. V. (2022). On earnings and cash flows as predictors of future cash flows. *Journal of Accounting and Economics, 73*(1), Article 101430. https://doi.org/10.1016/j.jacceco.2021.101430

Barth, M. E., & Clinch, G. (2009). Scale effects in capital markets-based accounting research. *Journal of Business Finance and Accounting, 36*(3–4), 253–288. https://doi.org/10.1111/j.1468-5957.2009.02133.x

Barth, M. E., Landsman, W. R., Lang, M., & Williams, C. (2012). Are IFRS-based and US GAAP-based accounting amounts comparable? *Journal of Accounting and Economics, 54*(1), 68–93. https://doi.org/10.1016/j.jacceco.2012.03.001

Barth, M. E., Li, K., & McClure, C. (2023). Evolution in value relevance of accounting information. *The Accounting Review, 98*(1), 1–28. https://doi.org/10.2308/TAR-2019-0521

Barton, J., Hansen, T. B., & Pownall, G. (2010). Which performance measures do investors aound the world value the most—And why? *The Accounting Review, 85*(3), 753–789. https://doi.org/10.2308/accr.2010.85.3.753

Beaver, W. H. (1968). The information content of annual earnings announcements. *Journal of Accounting Research, 6*, 67–92. https://doi.org/10.2307/2490070

Belkaoui, A. (1976). The impact of the disclosure of the environmental effects of organizational behavior on the market. *Financial Management, 5*(4), 26–31. https://doi.org/10.2307/3665454

Berthelot, S., Coulmont, M., & Serret, V. (2012). Do investors value sustainability reports? A Canadian study. *Corporate Social Responsibility and Environmental Management, 19*(6), 355–363. https://doi.org/10.1002/csr.285

Blankespoor, E., deHaan, E., & Marinovic, I. (2020). Disclosure processing costs, investors' information choice, and equity market outcomes: A review. *Journal of Accounting and Economics, 70*(2), Article 101344. https://doi.org/10.1016/j.jacceco.2020.101344

Brooks, C., & Oikonomou, I. (2018). The effects of environmental, social and governance disclosures and performance on firm value: A review of the literature in accounting and finance. *The British Accounting Review, 50*(1), 1–15. https://doi.org/10.1016/j.bar.2017.11.005

Brown, S., Lo, K., & Lys, T. (1999). Use of R2 in accounting research: Measuring changes in value relevance over the last four decades. *Journal of Accounting and Economics, 28*(2), 83–115. https://doi.org/10.1016/S0165-4101(99)00023-3

Callao, S., Jarne, J. I., & Laínez, J. A. (2007). Adoption of IFRS in Spain: Effect on the comparability and relevance of financial reporting. *Journal of International Accounting, Auditing and Taxation, 16*(2), 148–178. https://doi.org/10.1016/j.intaccaudtax.2007.06.002

Cardamone, P., Carnevale, C., & Giunta, F. (2012). The value relevance of social reporting: Evidence from listed Italian companies. *Journal of Applied Accounting Research, 13*(3), 255–269. https://doi.org/10.1108/09675421211281326

Christensen, D. M., Serafeim, G., & Sikochi, A. (2022). Why is corporate virtue in the eye of the beholder? The case of ESG ratings. *The Accounting Review, 97*(1), 147–175. https://doi.org/10.2308/TAR-2019-0506

Clarkson, P. M., Fang, X., Li, Y., & Richardson, G. (2013). The relevance of environmental disclosures: Are such disclosures incrementally informative? *Journal of Accounting and Public Policy, 32*(5), 410–431. https://doi.org/10.1016/j.jaccpubpol.2013.06.008

Collins, D. W., Maydew, E. L., & Weiss, I. S. (1997). Changes in the value-relevance of earnings and book values over the past forty years. *Journal of Accounting and Economics, 24*(1), 39–67. https://doi.org/10.1016/S0165-4101(97)00015-3

Collins, D. W., Pungaliya, R. S., & Vijh, A. M. (2017). The effects of firm growth and model specification choices on tests of earnings management in quarterly settings. *The Accounting Review, 92*(2), 69–100. https://doi.org/10.2308/accr-51551

Cordazzo, M., Bini, L., & Marzo, G. (2020). Does the EU Directive on non-financial information influence the value relevance of ESG disclosure? Italian evidence. *Business Strategy & the Environment, 29*(8), 3470–3483. https://doi.org/10.1002/bse.2589

Cormier, D., & Magnan, M. (2007). The revisited contribution of environmental reporting to investors' valuation of a firm's earnings: An international perspective. *Ecological Economics, 62*(3–4), 613–626. https://doi.org/10.1016/j.ecolecon.2006.07.030

Cornell, B. (2021). ESG preferences, risk and return. *European Financial Management, 27*(1), 12–19. https://doi.org/10.1111/eufm.12295

Cornell, B., & Damodaran, A. (2020). Valuing ESG: Doing good or sounding good? *The Journal of Impact and ESG Investing, 1*(1), 76–93. https://doi.org/10.3905/jesg.2020.1.1.076

Davern, M., Gyles, N., Hanlon, D., & Pinnuck, M. (2019). Is financial reporting still useful? Australian evidence. *Abacus, 55*(1), 237–272. https://doi.org/10.1111/abac.12152

de Villiers, C., Jia, J., & Li, Z. (2022). Corporate social responsibility: A review of empirical research using Thomson Reuters Asset4 data. *Accounting & Finance, 62*(4), 4523–4568. https://doi.org/10.1111/acfi.13004

de Villiers, C., & Marques, A. (2016). Corporate social responsibility, country-level predispositions, and the consequences of choosing a level of disclosure. *Accounting and Business Research, 46*(2), 167–195. https://doi.org/10.1080/00014788.2015.1039476

Demers, E., & Lev, B. (2001). A rude awakening: Internet shakeout in 2000. *Review of Accounting Studies, 6*(2), 331–359. https://doi.org/10.1023/A:1011675227890

Dimson, E., Marsh, P., & Staunton, M. (2020). Divergent ESG ratings. *Journal of Portfolio Management, 47*(1), 75–86. https://doi.org/10.3905/JPM.2020.1.175

Dunham, L. M., & Grandstaff, J. L. (2022). The value relevance of earnings, book values, and other accounting information and the role of economic conditions in value relevance: A literature review. *Accounting Perspectives, 21*(2), 237–272. https://doi.org/10.1111/1911-3838.12280

Eccles, R. G., Lee, L.-E., & Stroehle, J. C. (2020). The social origins of ESG: An analysis of Innovest and KLD. *Organization & Environment, 33*(4), 575–596. https://doi.org/10.1177/1086026619888994

Eliwa, Y., Aboud, A., & Saleh, A. (2021). ESG practices and the cost of debt: Evidence from EU countries. *Critical Perspectives on Accounting, 79*, Article 102097. https://doi.org/10.1016/j.cpa.2019.102097

Fama, E. F., & French, K. R. (1999). The corporate cost of capital and the return on corporate investment. *The Journal of Finance, 54*(6), 1939–1967. https://doi.org/10.1111/0022-1082.00178

Fama, E. F., & French, K. R. (2023a). *Detail for 48 Industry Portfolios.* Retrieved from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_48_ind_port.html. Accessed June 30, 2023.

Fama, E. F., & French, K. R. (2023b). *Detail for 12 Industry Portfolios.* Retrieved from https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library/det_12_ind_port.html. Accessed June 30, 2023.

Forcadell, F. J., Aracil, E., & Ubeda, F. (2020). Using reputation for corporate sustainability to tackle banks digitalization challenges. *Business Strategy and the Environment, 29*(6), 2181–2193. https://doi.org/10.1002/bse.2494

Francis, J., & Schipper, K. (1999). Have financial statements lost their relevance? *Journal of Accounting Research, 37*(2), 319–352. https://doi.org/10.2307/2491412

Francis, J., Schipper, K., & Vincent, L. (2003). The relative and incremental explanatory power of earnings and alternative (to earnings) performance measures for returns. *Contemporary Accounting Research, 20*(1), 121–164. https://doi.org/10.1506/XVQV-NQ4A-08EX-FC8A

Giglio, S., Kelly, B., & Stroebel, J. (2021). Climate finance. *Annual Review of Financial Economics, 13*, 15–36.

Gillan, S. L., Koch, A., & Starks, L. T. (2021). Firms and social responsibility: A review of ESG and CSR research in corporate finance. *Journal of Corporate Finance, 66*, Article 101889. https://doi.org/10.1016/j.jcorpfin.2021.101889

Global Sustainable Investment Alliance. (2020). *Global Sustainable Investment Review 2020*. Retrieved from http://www.gsi-alliance.org/wp-content/uploads/2021/08/GSIR-20201.pdf. Accessed June 30, 2023.

Grossman, S. J., & Stiglitz, J. E. (1980). On the impossibility of informationally efficient markets. *The American Economic Review, 70*(3), 393–408. https://www.jstor.org/stable/1805228.

Halbritter, G., & Dorfleitner, G. (2015). The wages of social responsibility — where are they? A critical review of ESG investing. *Review of Financial Economics, 26*, 25–35. https://doi.org/10.1016/j.rfe.2015.03.004

Harasheh, M., Doni, F., Franceschelli, M. V., & Amaduzzi, A. (2021). The value relevance of Other Comprehensive Income: Extensive evidence from Europe. *International Journal of Finance & Economics, 26*(3), 3835–3851. https://doi.org/10.1002/ijfe.1990

Hassel, L., Nilsson, H., & Nyquist, S. (2005). The value relevance of environmental performance. *European Accounting Review, 14*(1), 41–61. https://doi.org/10.1080/0963818042000279722

He, F., Feng, Y., & Hao, J. (2022). Information disclosure source, investors' searching and stock price crash risk. *Economics Letters, 210*, Article 110202. https://doi.org/10.1016/j.econlet.2021.110202

Hübel, B., & Scholz, H. (2020). Integrating sustainability risks in asset management: The role of ESG exposures and ESG ratings. *Journal of Asset Management, 21*(1), 52–69. https://doi.org/10.1057/s41260-019-00139-z

Jadoon, I. A., Ali, A., Ayub, U., Tahir, M., & Mumtaz, R. (2021). The impact of sustainability reporting quality on the value relevance of corporate sustainability performance. *Sustainable Development, 29*(1), 155–175. https://doi.org/10.1002/sd.2138

Jonsdottir, B., Sigurjonsson, T. O., Johannsdottir, L., & Wendt, S. (2022). Barriers to using ESG data for investment decisions. *Sustainability, 14*(9), Article 9. https://doi.org/10.3390/su14095157

Kaspereit, T., & Lopatta, K. (2016). The value relevance of SAM's corporate sustainability ranking and GRI sustainability reporting in the European stock markets. *Business Ethics: A European Review, 25*(1), 1–24. https://doi.org/10.1111/beer.12079

Lev, B., & Gu, F. (2016). *The end of accounting and the path forward for investors and managers*. John Wiley & Sons.

Li, H., Zhang, X., & Zhao, Y. (2022). ESG and firm's default risk. *Finance Research Letters, 47*(B), Article 102713. https://doi.org/10.1016/j.frl.2022.102713

Loh, R. K., & Stulz, R. M. (2018). Is sell-side research more valuable in bad times? *The Journal of Finance, 73*(3), 959–1013. https://doi.org/10.1111/jofi.12611

Matos, P. (2020). *ESG and responsible institutional investing around the world: A critical review*. John Wiley & Sons.

Miralles-Quirós, M. M., Miralles-Quirós, J. L., & Redondo-Hernández, J. (2019). The impact of environmental, social, and governance performance on stock prices: Evidence from the banking industry. *Corporate Social Responsibility and Environmental Management, 26*(6), 1446–1456. https://doi.org/10.1002/csr.1759

Moneva, J. M., & Cuellar, B. (2009). The value relevance of financial and non-financial environmental reporting. *Environmental and Resource Economics, 44*(3), 441–456. https://doi.org/10.1007/s10640-009-9294-4

Morris, J. J., & Alam, P. (2012). Value relevance and the dot-com bubble of the 1990s. *The Quarterly Review of Economics and Finance, 52*(2), 243–255. https://doi.org/10.1016/j.qref.2012.04.001

Moskowitz, M. (1972). Choosing socially responsible stocks. *Business and Society Review, 1*(1), 71–75.

Ohlson, J. A. (1995). Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research, 11*(2), 661–687. https://doi.org/10.1111/j.1911-3846.1995.tb00461.x

Onali, E., Ginesti, G., & Vasilakis, C. (2017). How should we estimate value-relevance models? Insights from European data. *The British Accounting Review, 49*(5), 460–473. https://doi.org/10.1016/j.bar.2017.05.006

Palea, V., Santhià, C., & Miazza, A. (2023). Are circular economy strategies economically successful? Evidence from a longitudinal panel. *Journal of Environmental Management, 337*, Article 117726. https://doi.org/10.1016/j.jenvman.2023.117726

Ricci, F., Scafarto, V., Ferri, S., & Tron, A. (2020). Value relevance of digitalization: The moderating role of corporate sustainability. An empirical study of Italian listed companies. *Journal of Cleaner Production, 276*, Article 123282. https://doi.org/10.1016/j.jclepro.2020.123282

Sidhoum, A. A., & Serra, T. (2018). Corporate sustainable development. Revisiting the relationship between corporate social responsibility dimensions. *Sustainable Development, 26*(4), 365–378. https://doi.org/10.1002/sd.1711

Refinitiv. (2022). *ESG Scores methodology*. Retrieved from https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf. Accessed June 30, 2023.

Singleton-Green, B. (2015). *The effects of mandatory IFRS adoption in the EU: A review of empirical research* (ICAEW Report No. 2515391). ICAEW. Retrieved from www.icaew.com/-/media/corporate/files/technical/financial-reporting/information-for-better-markets/ifbm-reports/effects-of-mandatory-ifrs-adoption.ashx. Accessed June 30, 2023.

Song, X. (2015). Value relevance of fair values. Empirical evidence of the impact of market volatility. *Accounting Perspectives, 14*(2), 91–116. https://doi.org/10.1111/1911-3838.12045

Veltri, S., & Silvestri, A. (2020). The value relevance of corporate financial and nonfinancial information provided by the integrated report: A systematic review. *Business Strategy and the Environment, 29*(8), 3038–3054. https://doi.org/10.1002/bse.2556

Wasserstein, R. L., Schirm, A. L., & Lazar, N. A. (2019). Moving to a world beyond "p< 0.05". *The American Statistician, 73*(sup1), 1–19. https://doi.org/10.1080/00031305.2019.1583913

Zuraida, Z., Houqe, M. N., & van Zijl, T. (2018). Value relevance of environmental, social and governance disclosure. In S. Boubaker, D. Cumming, & D. Khuong Nguyen (Eds.), *Research Handbook of Finance and Sustainability* (pp. 458–483). Edward Elgar Publishing.