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The impact of ESG scores on the value relevance of fair value hierarchy of financial instruments: Evidence from European Banks☆

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ABSTRACT

Using hand-collected accounting data on 154 European banks, we investigate the impact of ESG scores on the value-relevance of the fair value hierarchy (FVH) of financial instruments held on their balance sheets. Our findings are multi-faceted. Banks that possess an ESG score are valued at a premium on book value and the presence of the ESG score is associated with lower (higher) value-relevance of the reported fair value of Level 1 (Level 2 and 3) items. The value relevance of Level 2 and 3 FVH levels, however, decreases in the ESG score. These findings imply that, while availability of ESG scores proxies for market visibility, stock market investors either do not treat the ESG score as a reliable measure of ESG performance or, embracing the "overinvestment view" rather than the "risk mitigation view" of Corporate Social Responsibility (CSR), do not associate positive ESG performance to greater corporate transparency and trustworthiness.

1. Introduction

Over the last two decades, environmental, social and governance (ESG) issues have received increasing attention from researchers and policy makers. At least since the seminal contribution of Dahlsrud (2008), who sought to define the disciplinary boundaries of the study of Corporate Social Responsibility (CSR), a large body of research has focused on the effects that adherence to ESG principles can have on the market value of claims issued by corporations (Lock and Seele, 2015) and on the nexus between relevance of ESG issues for non-investor stakeholders and shareholder value creation (Cornell and Shapiro, 2021). Amongst the wide range of firms that have been studied in the ESG literature, banks have attracted considerable attention. Our study belongs to this stream of literature, focusing on ESG disclosure value-relevance for investors and analysts. More specifically, we focus on the interaction between ESG disclosure and the value relevance of the fair value hierarchy (FVH) of financial instruments held on balance sheets of banks.

FVH is a ranking of financial instruments introduced by the international financial reporting standards (IFRS 13). For disclosure comparability purposes, it categorizes the inputs to financial reporting valuation into three levels (IFRS 13.72): Level 1, Level 2, Level 3. The fair value hierarchy gives the highest ranking to quoted prices (unadjusted) in active markets for identical assets or liabilities (Level 1), and the lowest one to unobservable inputs (Level 3). When inputs used to measure fair value of a given balance sheet item fall

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into different levels, the whole fair value measurement of that item is categorized in the same level as the lowest level input that is significant to the entire measurement (IFRS 13.73, 75). That is, financial instruments on the balance sheet inherit the FVH ranking of their lowest level valuation input. We shall refer for brevity to balance sheet items with opaque or subjective valuation inputs as *opaque items*. Such opacity decreases in moving from Level 3 to Level 1 of the FVH.

A basic tenet in the literature on disclosure value relevance is that, when estimation of the fair value of claims must rely on inputs that lack objectivity, the information asymmetry between management and outsider investors is more severe (Song et al., 2010) and, *ceteris paribus*, the financial market will treat the reported value of such opaque claims as less reliable. Consequently, the reported value of these claims will be reflected to a lesser extent in the market value of the liabilities issued by the company. In other words, the opaquer the valuation inputs, the less value-relevant the valuation disclosure.[1] Conversely, but by the same token, in the presence of more opaque valuation inputs, the difference in terms of value-relevance between items with different FVH classification is more pronounced, and the FVH is more value-relevant. In the presence of opaque valuation inputs, valuation disclosure is *less* value-relevant whereas the FVH is *more* value-relevant.

Consistent with this, previous studies on banks' balance sheets have found lower value-relevance for Level 2 and Level 3 items than for the less opaque Level 1 items, hence evidence of FVH value-relevance. There is typically an especially deep discount in the valuation of Level 3 items, resulting from undervaluation of assets and overvaluation of liabilities, but this discount is lower when management provide investors with high voluntary fair value disclosure (see, i.e., (Song et al., 2010; Bagna et al., 2015; Goh et al., 2015; Tama-Sweet and Zhang, 2015; Siekkinen, 2016; Kolev, 2019). The literature has also examined how FVH depends on governance (Song et al., 2010) and investor protection (Siekkinen, 2016). There is also a relatively recent but rapidly growing literature on the value relevance of ESG disclosure and the relation between CSR and firm value (Aureli et al., 2020; Bose et al., 2020; Carnevale et al., 2012; Cordazzo et al., 2020; Jain et al., 2016; Miralles-Quirós et al., 2019; Qureshi et al., 2020; Servaes and Tamayo, 2013; Zuraida et al., 2018).

To the best of our knowledge, despite the large literature on the value relevance of both FVH and ESG performance disclosure, no study has investigated their nexus, namely the association between ESG performance disclosure, particularly through measures of ESG performance such as ESG scores, and the value relevance of fair value measurements for financial instruments held on the balance sheets of financial institutions. This is the key aim of our study.

Our motivation is twofold. The first one is that we want to empirically assess the value-relevance of ESG disclosure, thus contributing to the relatively recent but rapidly growing literature on ESG disclosure in the banking sector. The growth of ESG engagement, disclosure and scoring has been driven by a quest to meet investors' demand for useful frameworks to support their economic decision-making process. Since ESG disclosure is voluntary and left to management discretion, at the heart of the current debate is the question about its relation with firm value. The question is investigated in our paper by assessing the value relevance of ESG disclosure, hence whether ESG disclosure can provide reliable and relevant information to assess firm value. Secondly, and more innovatively, we want to test alternative *market* views of CSR, through testing the empirical admissibility of their different implications for the effect of ESG scores on the value relevance of the FVH of financial statement items. The two alternative views that we consider are the "risk mitigation view" and the "overinvestment view", as they have been labelled by Goss and Roberts (2011). Importantly, our aim is not to establish which view of CSR is valid or otherwise, but rather to assess (through the observation of the impact of ESG scores on the value relevance of the FVH) which view is deemed valid by stock market investors.

To assess the relation between ESG performance disclosure and the FVH of financial instruments, we use data on 154 European banks from 2010 to 2018, including hand-collected data from the notes to their financial statements.

As our measure of *disclosed* ESG performance, we use the ESG scores produced by Refinitiv.[2] There are several reasons for this choice. *Firstly*, Refinitiv is well established and popular among stock market investors, which is one reason to expect its ESG scores to be value-relevant.[3] *Secondly*, as noted by Berg et al. (2022), Refinitiv has the most granular set of indicators (282 vs. only 163 of Sustainalytics, the rating agency that uses the second largest set of indicators). Consequently, it can assign noticeably different ESG ratings even when the ratings assigned by other rating agencies are nearly indistinguishable. This is very important in our context, because we work with a sample of European banks, which constitute a relatively homogeneous set of firms, since they are in the same sector and this sector is highly regulated, under the same regulatory framework (the EU one). Moreover, the Refinitiv scores place relatively more weight on long-term economic sustainability. In fact, as also emphasized by Berg et al. (2022), Refinitiv's "economic dimension … contains indicators, such as net income growth or capital expenditure that other rating agencies do not consider". For all these reasons, we deem the Refinitiv scores as a good choice for our purposes. In this regard, it is important to appreciate that we do not need a good proxy for ESG performance, but rather a good proxy for *disclosed* ESG performance that investors are likely to consider.

Our findings are important and multifaceted. First, we shows that banks with an ESG score are valued at a premium on book value and that the value relevance of Level 2 and 3 FVH levels decreases in the ESG score although, in line with the literature (including (Song et al., 2010; Goh et al., 2015; Tama-Sweet and Zhang, 2015; Siekkinen, 2016; Kolev, 2019), we also find a discount on Level 3

[1] On this field, Pavlopoulos *et al.* (2019), for an international sample of 82 non-financial firms from 2011 to 2015, find that the quality of integrated reporting (IR) disclosure improves the value relevance of summary accounting information and can create value. According to the authors, a high IR disclosure quality tends to display high market value per share.

[2] Environmental, Social, and Governance (ESG) from Refinitiv. *Refinitiv*. April 2020. While we experiment also with ESG scores produced by other raters, we report results only for the Refinitiv ones.

[3] Refinitiv has also been used as the source of ESG scores in recent literature (Di Tommaso and Thornton, 2020; Miralles-Quirós et al., 2019), and several authors consider Refinitiv one of the most trustworthy sources of ESG information (Stellner *et al.* (2015); Utz (2018)).

fair values. Consistent with the assumption that the ESG score is a measure of ESG performance, and that the latter mitigates information asymmetries, the discount on Level 3 items is highly mitigated for banks that are covered by ESG scores, in comparison with non-covered banks. This result, taken at face value, suggests an effect of ESG performance in terms of reduced information asymmetry and moral hazard perceived by investors.

Surprisingly, however, this is the case even for low ESG scores and, for covered banks, the relation between the level of the ESG score and fair value relevance for Level 2 and 3 balance sheet items is negative rather than positive. This casts doubts on either the validity of the ESG score as a measure of ESG performance or on the extent to which ESG performance mitigates market concerns regarding information asymmetries, and thus on the validity of the risk mitigation view.

These findings imply, on the one hand, that ESG scores proxy for market visibility and, on the other hand, that stock market investors either do not treat the ESG score as a reliable measure of ESG performance or, embracing the "overinvestment view" rather than the "risk mitigation view" of Corporate Social Responsibility (CSR), do not associate positive ESG performance to greater corporate transparency and trustworthiness. This challenges either the view that ESG performance mitigates information asymmetry concerns, or the assumption that the ESG score is a reliable measure of ESG performance. Either way, this finding warrants further research and supports recommendations made in policy circles to improve assurance of extended external reporting (EER). See, for example, Krasodomska et al. (2021)[4].

In the next section, we briefly review the relevant literature and develop our hypotheses of interest. In Section 3, we illustrate the models that we estimated to make inference on these hypotheses. In Section 4, we describe our dataset and the variable construction methodology. In Section 5, we report and discuss our empirical results. Section 6 checks the robustness of our results. Sections 7–8 offer a discussion of our main results and our conclusions.

2. Theoretical framework

2.1. The literature on FVH value-relevance

As noted by Song (2010), the motivation for the FVH introduced by FAS No. 157 is that, in the absence of observed market prices, fair value measurements might be unreliable due to intrinsic measurement error (noise) and management-induced error (bias). Previous studies conducted on the banking sector have shown lower value relevance for Level 2 and Level 3 financial instruments and found a discount in their pricing, especially for Level 3 items. (Song et al., 2010; Goh et al., 2015; Tama-Sweet and Zhang, 2015; Siekkinen, 2016; Kolev, 2019) argue that financial instruments measured with mark-to-model techniques (Level 3) are priced at a discount due to higher information risk. Using the Ohlson (1995) framework on a sample of European listed banks from 2008 to 2012, Bagna et al. (2015) find that the potential sources of the discount for Level 3 are the lack of disclosure, earnings management, and lack of liquidity. They also find, however, that the discount on Level 3 is lower when management provide investors with high voluntary fair value disclosure since it reduces opacity of fair value estimates and improves perceptions about their reliability. Song et al.(2010) show that corporate governance mechanisms coupled with disclosure requirements contribute to reduce the estimation errors in Level 3 fair value measurement. Bagna et al. (2015) also argue that additional disclosure beyond that required by accounting standards can eliminate the discount on Level 3 fair values. In line with these authors, Chung et al. (2017) show evidence that firms understand the valuation implications of information asymmetry and opaqueness of their financial reporting inputs, in that firms with more opaque estimates in their financial reporting are more likely to provide more disclosure, and investors value reliability disclosures provided by external and independent assessment of fair value estimates.

2.2. Alternative CSR views

The common theme in the literature on the value-relevance of the FVH is the link between opacity of financial report inputs and value-relevance of financial reporting, under conditions of information asymmetry between outsider investors (e.g., non-controlling shareholders) and corporate insiders (e.g., controlling shareholders, managers). The two prevailing alternative views of CRS, namely the "*risk mitigation view*" and the "*overinvestment view*" (Goss and Roberts (2011)), have radically different implications for the nexus between this link and ESG reporting, and therefore for the effect of ESG ratings on the value-relevance of FVH.

The "*risk mitigation view*" of CSR argues that firms choosing to act irresponsibly externalize a portion of the cost of production, taking the risk that society at some point no longer accepts this and reacts by imposing not only the privatization of these negative externalities but also penalties for the past externalization thereof. These firms create *de facto* hidden (i.e., unreported) liabilities, demonstrating a propensity to expropriate stakeholders. It then follows that good ESG performance, from the point of view of (outsider) equity market investors who adopt this view, plays two roles. Firstly, it represents a direct albeit noisy measure of propensity

[4] Their article cautions that Enhanced External Reporting (EER) needs validation by trusted providers of "assurance". As emphasized in the article, Vladimir Skobarev, Partner and Head of Corporate Governance and Sustainability FBK Grant Thornton Russian Federation, recommended that "assurance become mandatory for entities listed on stock exchanges, calculations of sustainable development ratings, and NFI reporting competitions".

to transparent reporting, for the part of the ESG performance that pertains to governance quality. Secondly and equally importantly, for the part that pertains to the environmental and social impact of the firm's activities, it is a signal that firm management is inclined to act in the interest of all stakeholders, both insiders and outsiders.[5] This is a signal that the firm management may not be prone to misrepresenting the value of financial instruments on the firm balance sheet.

The "*risk mitigation view*", therefore, maintains that favorable ESG performance, by implying a benign governance and, more broadly, an environment that supports investors' protection and caters for all stakeholders, results in outsiders (including minority shareholders and ordinary market investors) suffering information asymmetry to a lesser extent. Consequently, according to this view, financial reporting by firms with a good ESG performance must be more reliable and, therefore, more value relevant. More specifically, reliability of financial reporting is an essential ingredient of a CSR-oriented firm strategy and culture that intends to protect and maintain good relationships with all stakeholders. Under the "risk mitigation view" of CSR, ESG performance should be seen by the market as a measure of reliability of corporate disclosure and commitment to transparency, if we assume that ESG performance is a measure of CSR. Then, assuming further that the market views the ESG score as a reliable measure of ESG performance, the ESG score should be not only value relevant but also impact the value relevance of FVH of financial instruments, reducing the discount of Level 3 fair value. In other words, a better ESG score should have a negative effect on the value relevance of the FVH of financial statement items (i.e., the *lower*-level financial instruments should be *more* value-relevant).

Furthermore, consistent with stakeholder theory (Freeman, 2010; Parmar et al., 2010), the risk mitigation view of CSR implies that improving ESG performance can reduce firm risk by maintaining a good relationship with all stakeholders and thus a steady cash flow.[6] Items at the low levels of the FVH, *ceteris paribus*, can be expected to be less opaque in firms with good ESG performance, due to the general reduction of uncertainty that it brings about, since opacity is known to be an increasing function of uncertainty (Song et al., 2010). This implies that, under the risk mitigation view of CSR, items on the balance sheet of different firms that are classified as being equally opaque according to the FVH, are less opaque in actual terms in the firms with better ESG performance. ESG performance diminishes actual opacity for any given FVH level. Achieving a favorable ESG score should suggest to investors who believe in the risk mitigation view of CSR that the management of the corporation cares about stakeholders and is likely to have embraced transparency. This should result in investors perceiving reduced information asymmetries both ex ante (lemon problem) and ex post (moral hazard).

The opposite view is that firms may overinvest in the pursuit of ESG performance to satisfy the desire of managers to enshrine their reputation as responsible stewards of industry at the expense of shareholders. Goss and Roberts (2011) label it the "*overinvestment view*". This is a possibility recently considered by Wang et al. (2021), who find evidence of declining market performance for firms that acquire M&A targets with overinvestment in CSR, and Al-Shaer et al. (2023), who discriminate between optimal and excessive CSR engagement and find evidence that has a greater value relevance than the latter to shareholders. If this view were correct, ESG performance would signal agency problems and a propensity by insiders to expropriate outsiders. If the market adopted such view, financial reporting of firms with a better ESG performance should be less value relevant. In this case, *lower*-level financial instruments should be *less* value-relevant in the presence of a better ESG scores, which would then have a *positive* effect on the value relevance of the FVH of financial statement items.

It is conceivable, however, that the very availability of an the ESG score for a given firm, even regardless of whether the score is favorable, is a measure of visibility by investors, in that the score is issued for any company included in an index which Refinitiv covers. The reason is that index inclusion, by itself, brings about such a heightened visibility. For example, Elliott et al. (2006) find that increased investor awareness (rather than a host of other possible explanations, including price pressure, downward-sloping demand curves, improved liquidity and improved operating performance) is the primary factor behind the cross-section of abnormal returns around index inclusion announcements. Becker-Blease and Paul (2010) show that this can be the case also regarding inclusion in smaller indices. Refinitiv strives to cover as many indices as possible and appears to include indices in its coverage based on the popularity among investors. Hence, availability of an ESG score amounts to inclusion in a major index. Then, if firms included in investable indices enjoy more visibility than those not included, this means that the availability of an ESG score for a given firm in our sample can be treated as a measure of visibility (low opacity) of the firm by investors, whether ESG-conscious or otherwise. This should imply reduced perceived information asymmetries between outside investors and insiders (management, controlling shareholders) regardless of whether ESG performance is a measure of CSR and even regardless of the signaling value of the ESG score for ESG performance.

2.3. Hypotheses of interest

To assess which one amongst these alternative views of CSR prevails among market investors, as well as to assess the signaling value of the ESG score for ESG performance, we test the following hypotheses:

H_1. : Banks with an ESG score (covered banks) exhibit higher value relevance of all levels of the FVH of financial instruments on their balance sheet compared with non-covered banks;

[5] This can be seen broadly as consistent with the normative implications of stakeholder theory (Freeman, 2010; Parmar et al., 2010), in so far as such theory normatively prescribes that managers have similar fiduciary duties to all stakeholders (Parmar et al., 2010) rather than only to insiders (e.g., the managers themselves, shareholders, owners, other insider investors).

[6] This is consistent the "shared value" perspective, according to which socially responsible practices are mutually beneficial for firms and stakeholders (Porter and Kramer, 2006; Porter and Kramer, 2019).

H_2. : The presence of an ESG score reduces the discount on the reported fair value of lower-level (especially Level 3) financial instruments;

H_3. : There is a positive association between the level of the ESG score and the value relevance of lower-level (especially Level 3) financial instruments (or, equivalently, the value-relevance of the FVH of financial instruments decreases with the ESG score).

Empirical support for all three hypotheses, namely H_1 and H_2 as well as H_3, means that ESG performance / CSR is so appreciated by investors that not only it improves the value relevance of low vs. high FVH level items, but it also improves the valuation of high-level items. It would mean that companies are valued more if they perform well in terms of CSR. This is possible for at least two reasons, both consistent with the adoption by the market of the risk-mitigation view of CSR. First, the ESG score may reveal information about the sustainability of the bank strategy and value creation over the long-term, which should be seen by investors as an intangible asset (Heal, 2005; Kaspereit and Lopatta, 2016). Second, it may reveal information about the quality of corporate governance, which should imply more prudent risk-taking (Di Tommaso and Thornton, 2020) and less severe information asymmetry concerns held by non-insider shareholders.

3. Econometric specification

3.1. The Extended Ohlson Model

To investigate the effect of the ESG score on the value relevance of FVH, we employed the Residual Income Model (RIM) proposed by Ohlson (1995). In its original formulation, this model specifies the market value of equity (MV) as a function of the Book Value of equity (BV) and of Net Income (NI). Barth et al. (2005) propose the following extended form of the Ohlson (1995) model:

$$MV = \alpha_0 + \beta_1 BV + \beta_2 NI + \sum_{k \notin \{1,\ 2\}} \beta_k v_k + \varepsilon \tag{1a}$$

Here, the variables v_k convey value-relevant information from the point of view of investors. Our value relevance model is based on the extended form of the Ohlson (1995) model in (1.a), which augments the model in [1.a] with the inclusion among the v_k variables of variables needed to test our hypotheses of interest (H_1, H_2 and H_3). Consistent with (Barth and Kallapur, 1996; Bagna et al., 2015), we also scale MV and NI by Tangible Book Value (TBV). This way, we reformulate the model with the Price to Tangible Book Value (PTBV) multiple as the dependent variable, and of Return on Tangible Equity (ROTE) as the independent variable. Scaling variables by tangible book value of equity allows us to capture the incremental effect, expressed in terms of premium or discount, of the information conveyed to investors by the variables on the right hand-side of the model. Our version of the (Ohlson, 1995) model is thus as follows:

$$PTBV_{i,t} = \alpha_0 + \beta_1 ROTE_{i,t} + \beta_2 D\_NEGROTE_{i,t} + \beta_3 LOSS_{i,t} + \sum_{k \notin \{1,2,3\}} \beta_k v_k + \sum \gamma_k Control\ Variable_{k,i,t} + CountryFE_{i,t} + YearFE_{i,t} + \varepsilon_{i,t} \tag{1b}$$

To test our three hypotheses of interest, we consider alternative versions of the model in [1.b] that differ in terms of variables included in v_k. We illustrate first all other variables in [1.b] and then, in subsequent dedicated sub-sections, we proceed to the explanation and discussion of the v_k variables that we include in the specifications of [1.b] that we estimate to test our hypotheses of interest.

In [1.b], $PTBV_{i,t}$ is the price to tangible book value multiple for bank i calculated as stock price at the end of March of fiscal year t+1 scaled by the reciprocal of $TBV_{i,t}$ (tangible equity book value) per share at[7] the end of the fiscal year t, $ROTE_{i,t}$ (Return On Tangible Equity) is the ratio of net income (NI) adjusted for intangible assets' amortization net of fiscal charges[8] and TBV (tangible book value of equity), $D\_NEGROTE_{i,t}$ is a multiplicative dummy variable taking a value equal to $ROTE_{i,t}$ if $ROTE_{i,t}$ is negative and zero otherwise (Barth et al., 1998; Bagna et al., 2015; Di Martino, 2019), and the binary variable $LOSS_{i,t}$ equals one if the bank's net income is negative and zero otherwise. The coefficient of $ROTE_{i,t}$ captures the value of the assets in place.[9] $Control\ Variable_{k,i,t}$ are a set of control variables. These include leverage ($LEV_{i,t}$, calculated as ratio of total asset to consolidated book value of equity),[10] the market $BETA_{i,t}$ of the bank (given by the market model beta estimate, to control for systematic market risk), $RETPRE_{i,t}$ (calculated as cumulative stock returns over the thirty days preceding the end of March of each year, to control for price momentum, as in (Clement et al., 2011); $GROWTH_{i,t}$ (computed as percent change in total assets (Pavlopoulos *et al.* (2019)), included as a proxy of the bank's growth factor). We considered the possible diversification discount by introducing the variable $SEGMENTS_{i,t}$ (Di Martino, 2019), calculated as the natural log of one plus the number of business segments of the bank.[11] To control for stock liquidity, we included the $TURNOVER_{i,t}$ variable, calculated as

[7] The value relevance literature does not prescribe any specific time lag. However, to double check on the reliability and robustness of our analysis, we also run the regression using variables normalized by the stock prices at the end of December. The results are essentially in line.

[8] We used the corporate tax rates provided by KPMG at the following website:https://home.kpmg/it/it/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html

[9] We thus expect a positive sign.

[10] The sign for $LEV_{i,t}$ is not clear *a priori*. In the banking sector, leverage deriving from debt and deposits is positively assessed by investors if invested in low-risk activity but is negatively assessed if invested in high-risk assets. We expect a positive correlation with the $PTBV_{i,t}$.

[11] For this variable, we expect a negative coefficient sign.

cumulative volume of trading on the stock over the course of a year in relation to the number of shares outstanding. Since ESG ratings are available only for publicly traded banks or very large banks (Bedendo et al., 2023), we also controlled for bank size by including among the regressors the variable $SIZE_{i,t}$ calculated as the natural logarithm of total assets (Pavlopoulos *et al.* (2019)).[12] Reforms introduced during the recent global financial crisis to improve corporate governance and disclosure might have affected the banks' value (Fernández Sánchez et al., 2020; Mülbert, 2010). Therefore, we included a binary variable ($D\_CRISIS_{i,t}$) equal to one for observations between 2010 and 2013 and zero otherwise. Lastly, we introduce YEAR and COUNTRY fixed effects to control for unobserved variables. Following (Carnevale et al., 2012), we did not consider a random-effect (RE) model, since the Hausman test results reject the assumption that the unobserved heterogeneity factors are uncorrelated with the regressors in our model. We used White's heteroscedasticity-consistent standard errors (White, 1980) to mitigate the impact of possible heteroskedasticity on our inferences.

3.2. Estimated models

We now illustrate the alternative specifications of [1.b] that we use to test the hypotheses of interest. These include *baseline models* and *extensions* that differ in terms of the variables v_k included in the right-hand side.

3.2.1. Baseline models (Models 1 and 2)

Our baseline specification of [1.b], with the elements of v_k given by $FVL1_{i,t}$, $FVL2_{i,t}$ and $FVL3_{i,t}$, and $D\_ESG_{i,t}$, is the following:

$$\begin{aligned} PTBV_{i,t} = {} & \alpha_0 + \beta_1 ROTE_{i,t} + \beta_2 D\_NEGROTE_{i,t} + \beta_3 LOSS_{i,t} + \beta_4 FVL1_{i,t} \quad + \beta_5 FVL2_{i,t} \quad + \beta_6 FVL3_{i,t} + \beta_7 D\_ESG_{i,t} \\ & + \sum \gamma_k Control\ Variable_{k,i,t} + CountryFE_{i,t} + YearFE_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{2}$$

The variables $FVL1_{i,t}$, $FVL2_{i,t}$ and $FVL3_{i,t}$ are the fair value of Level 1, Level 2 and Level 3 net assets on the bank balance sheet at the end-fiscal year normalized by tangible book value ($TBV_{i,t}$), whereas $D\_ESG_{i,t}$ is a binary variable which is equal to one if bank i is covered at time t with an ESG score and zero otherwise. They are the key variables for testing H_1.

Regarding $FVL1_{i,t}$, $FVL2_{i,t}$ and $FVL3_{i,t}$, their coefficients represent value-relevance premia (if positive) or discounts (if negative) with respect to the average value-relevance of the reported valuation of the overall trading book already captured by the constant of the model (Goh et al., 2015; Bagna et al., 2015; Kolev, 2019).[13] For the variable FVL1, a positive coefficient implies that Level 1 financial instruments are valued in net terms at a premium over the trading book, which would be the case if the FVH is value-relevant as in Song et al. (2010). To the contrary, the coefficient of the variable FVL3 in this case would be negative since the valuation inputs for these financial instruments are more opaque and, therefore, these financial instruments should price at discount with respect to their book value if the FVH is value-relevant (Bagna et al., 2015; Song et al., 2010). For the variable FVL2, we expect in this case a coefficient in between the coefficients of FVL1 and FVL3.

We first consider a version of [2] with β_7 set to zero and then a version without restrictions on this coefficient. We label these specifications *Model 1* and *Model 2*, respectively. An implication of H_1 is that banks covered with an ESG score are valued at a premium compared to non-covered banks. This is because, for any composition of the balance sheet in terms of FVH levels, greater value relevance of all levels translates into higher valuation of equity. Therefore, banks covered with an ESG score will have price-to-book value (PTBV, henceforth) multiples higher than other banks. Hence, under H_1, we expect a positive coefficient of $D\_ESG_{i,t}$, $\beta_7 > 0$, in [2].

3.2.2. Extended baseline models (Model 3–4)

To test H_1 and H_2, we estimated further models that include the interactive dummy variables $\text{D\_ESG} \times \text{FVL}_\text{L}$, which equals $\text{FVL}_\text{L} \in \{FVL1_{i,t}, FVL2_{i,t}, FVL3_{i,t}\}$ if D_ESG is one and zero otherwise, for each level of fair value in the FVH. Specifically, we want to test whether, for banks with an ESG score, the three levels of fair value of net financial instruments are priced at a premium (H_1) and the discount in the pricing of Level 3 fair value net assets is mitigated (H_2). The model takes the following form:

$$\begin{aligned} PTBV_{i,t} = {} & \alpha_0 + \beta_1 ROTE_{i,t} + \beta_2 D_{NEGROTE\,i,t} + \beta_3 LOSS_{i,t} \\ & + \beta_4 FVL1_{i,t} \quad + \beta_5 FVL2_{i,t} \quad + \beta_6 FVL3_{i,t} + \beta_7 D\_ESG_{i,t} + \sum \beta_{8,L} D\_ESG_{i,t} \times FVL_{L,i,t} + \sum \gamma_k Control\ Variable_{k,i,t} \\ & + CountryFE_{i,t} \quad + YearFE_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{3}$$

Here, $FVL_{L,i,t} \in \{FVL1_{i,t}, FVL2_{i,t}, FVL3_{i,t}\}$ and all other variables are denoted as before. If, as posited by H_1, the availability of an ESG score improves the value-relevance of fair value measurements for all FVH levels, then the coefficients of the interaction variables should be positive. That is, it should be $\beta_{8,L} > 0\ \forall L \in \{1,\ 2,\ 3\}$. If, as posited by H_2, it reduces the value-relevance of the FVH by reducing the discount over fair value of Level 3 net assets reported in the financial statements, the coefficients of the interaction dummy variables for Level 2 and Level 3 should be positive and larger than the coefficient for the interaction dummy variable for Level 1. We label this specification *Model 3*. We also consider a restricted version thereof, which we label *Model 4*, with $\beta_7 = 0$.

[12] Its coefficient is expected to be positive because size is negatively correlated with the systematic risk and therefore the multiple should be higher.

[13] See also Bagna et al. (Bagna et al., 2015); Chung et al. (Chung et al., 2017); Goh et al. (Goh et al., 2015); Kolev (Kolev, 2019); Siekkinen (Siekkinen, 2016); Song et al. (Song et al., 2010), Tama-Sweet and Zhang (Tama-Sweet and Zhang, 2015).

3.2.3. Further extensions (Models 5–7)

To make inferences on H_3, we must assess to what extent the different levels of ESG score impact the value relevance of instruments across FVH levels. To this end, we considered a version of [3] in which we replaced the dummy D_ESG with three dummy variables D_LOW_ESG, D_MED_ESG and D_HIGH_ESG, which take a value of 1 for banks with low, medium and high, respectively, levels of ESG score, and zero for banks with no ESG score. More specifically, D_LOW_ESG is equal to one if ESG score is under 25 (included) and zero otherwise, D_MED_ESG is equal to one if ESG score ranges from 25 to 75 included and zero otherwise and D_HIGH_ESG is higher than 75 (the maximum level is 100) and zero otherwise. These dummy variables should capture the marginal effect on the PTBV multiple of the different level of ESG score. The intercept of the model represents in this case the average value of the multiple for banks non-covered with ESG score. The model is the following:

$$\begin{aligned} PTBV_{i,t} = {} & \alpha_0 + \beta_1 ROTE_{i,t} + \beta_2 D\_NEGROTE_{i,t} + \beta_3 LOSS_{i,t} + \beta_4 FVL1_{i,t} \quad + \beta_5 FVL2_{i,t} \quad + \beta_6 FVL3_{i,t} + \sum \beta_{7,q} D\_ESG\ Level_{q,i,t} \\ & + \sum \beta_{8,q,L} D\_ESG\ Level_{q,i,t} \times FVL_{L,i,t} + \sum \gamma_k Control\ Variable_{k,i,t} + CountryFE_{i,t} + Year\ FE_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{4}$$

Here, $D\_ESG\ Level_{q,i,t} \in \{D\_LOW\_ESG_{i,t}, D\_MED\_ESG_{i,t}, \quad D\_HIGH\_ESG_{i,t}\}$ indicate the aforementioned ESG score level (D_LOW_ESG, D_MED_ESG and D_HIGH_ESG) related to each level L, with $L \in \{1, 2, 3\}$, in the FVH of bank i at year t. We consider a specification that excludes the interactions between the ESG score and the FVH level, a specification that includes all variables and one that excludes the ESG level dummies. We label these specifications *Model 5*, *Model 6 and Model 7*, respectively.

4. Sample selection and data

Our sample comprises 154 European Commercial Banks listed in the European Union stock markets (28 countries), plus Norway and Switzerland (EU + NO + CH, in total 30 countries), during the period 2010–2018. Since this is a time before Brexit, our sample includes UK banks.

We focus on the banking sector because of its broad exposure to fair value accounting, as well as for its importance as a channel for the transmission of ESG-oriented policies and investors' choices. Referring to European banks allows us to deal with a relatively homogeneous set of accounting standards (IAS/IFRS adoption is mandatory in the European Union since 2005) and a common institutional setting, at least since the enactment of Directive 2014/95/EU (also known as the Non-Financial Reporting Directive, NFRD).[14]

The choice of the sample period is also motivated by several considerations. Refinitiv scores, before they are marked as 'definitive', are updated for five years on a continuous basis as new data becomes available. Hence, by ending the sample period in 2018, we include only one year for which the scores are not definitive, yet the sample period is long enough to include the Directive 2014/95/EU. While this directive was transposed into national legislation at different times in different EU countries, many European banks disclose their non-financial information on a mandatory basis since at least 2017. Thus, our sample period covers a time of important change, during which ESG scoring benefited from increasingly rich non-financial information disclosure, while leaving out the COVID years, which we will study in dedicated follow up research. In addition, the end of our sample period (2018) is arguably antecedent enough to Brexit to allow us to ignore its influence on the subset of UK banks. The effect of the introduction of the NFRD directive is arguably reflected in the upward trend in the average ESG score from 2014 onwards that is visible in Fig. 1, in that the introduction of the directive and related policies likely provided banks with incentives to increase their effort to improve their performance in terms of ESG metrics.

We gathered the accounting and financial variables data from two sources. The accounting and market data are obtained from Factset. As for the amounts of Level 1, Level 2 and Level 3 net financial assets, we hand-collected this data to ensure its integrity and comparability, since this kind of data is not standardized and therefore differ from bank to bank (often even within the same country). We obtained these data directly from the notes to the financial reporting.

We collected the bank financial reporting data from Factset by employing a selection procedure involving several steps. The first step involved the selection of banks listed in the European Union, Norway and Switzerland on the basis of the Standard Industry Classification (SIC) Code 60 – "Depositary Institutions". This way, we obtained an initial selection of 229 banks. To ensure that the banks in our study adopt comparable accounting standards, we excluded 58 banks that did not adopt the International Accounting Standards (IAS/IFRS). Also, for the sake of ensuring comparability among the banks in our sample, we selected only commercial banks thus further excluding 17 banks (sub-SIC Codes 6019 – "Central Reserve Depository Institutions, Not Elsewhere Classified" and 6099 – "Functions Related to Depository Banking, Not Elsewhere Classified"). In the end, this resulted in a sample of 1114 observations over the period 2010–2018 covering 154 commercial banks listed in European countries (European Union, Norway and Switzerland). This is an unbalanced sample because of 272 missing data points for different banks.

Panel B of Table 1 shows the distribution by country of the included banks along with the value of their total assets as of fiscal year 2018. Norway is the most represented country with 21 banks (13.64 % of the total), followed by Italy and France with, respectively, 18 (11.69 % of the total) and 17 (11.04 % of the total) banks. Overall, the average of total assets is Eur 159.6 billion compared to a median

[14] This directive requires large (i.e., public interest entities that either have a balance sheet total that exceeds €20,000,000 or a turnover that exceeds €40,000,000) 'Public Interest Entities' (PIEs) with more than 500 employees to include non-financial statements as an integral part of their annual public reporting obligations. Since 2022 these statements must be made in compliance with the Taxonomy Regulation set out by Regulation (EU) 2019/2088, also known as Sustainable Finance Disclosure Regulation (SFDR).

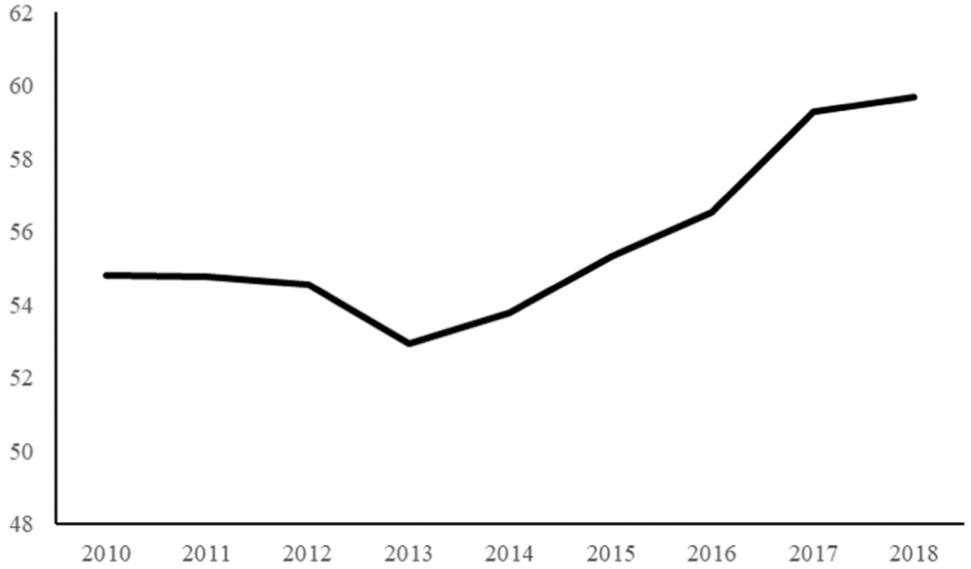

Fig. 1. Average ESG score by year. Note. This figure shows the average ESG score for all the banks in our sample by year.

Table 1
This Table reports, in the columns labelled as "N" and "Freq.", respectively, the number and fraction of observations by country and, in the other columns, corresponding descriptive statistics on total assets as of 2018. The sample consists of 154 banks listed in the EU (which at the time included the UK) and associated countries (Norway and Switzerland) during the period 2010–2018, for a total of 1114 observations.

Number of listed European Commercial Banks and Total Assets as of FY 2018 (mln of Euro)						
Country	N	Freq.	Mean	p25	Median	p75
AUSTRIA	7	4.55 %	60,496	2428	11,630	140,115
BELGIUM	2	1.30 %	221,306	158,804	221,306	283,808
BULGARIA	3	1.95 %	2848	731	2903	4909
CYPRUS	1	0.65 %	16,126	16,126	16,126	16,126
CZECH REPUBLIC	2	1.30 %	24,612	8040	24,612	41,183
DENMARK	9	5.84 %	66,809	955	6653	18,830
ESTONIA	1	0.65 %	1677	1677	1677	1677
FINLAND	2	1.30 %	7412	5558	7412	9266
FRANCE	17	11.04 %	326,116	13,168	21,305	51,962
GERMANY	9	5.84 %	221,018	20,425	26,924	57,769
GREECE	5	3.25 %	49,863	57,984	61,007	61,880
HUNGARY	1	0.65 %	45,481	45,481	45,481	45,481
IRELAND	3	1.95 %	45,140	21,810	22,075	91,536
ITALY	18	11.69 %	132,324	12,698	33,800	125,306
LITHUANIA	1	0.65 %	2262	2262	2262	2262
MALTA	2	1.30 %	9229	6311	9229	12,147
NETHERLANDS	2	1.30 %	634,163	381,295	634,163	887,030
NORWAY	21	13.64 %	19,314	1587	4241	12,236
POLAND	13	8.44 %	25,729	11,559	18,792	33,939
PORTUGAL	2	1.30 %	54,002	31,568	54,002	76,435
ROMANIA	3	1.95 %	9822	761	11,970	16,734
SLOVAK REPUBLIC	2	1.30 %	9036	1412	9036	16,660
SPAIN	8	5.19 %	390,420	67,003	213,773	531,656
SWEDEN	5	3.25 %	264,428	221,617	253,332	293,850
SWITZERLAND	3	1.95 %	49,089	20,320	35,637	91,310
UNITED KINGDOM	12	7.79 %	491,529	3777	49,527	831,036
Total	154	100.00 %	159,602	5874	20,905	75,504

of Eur 20.9 billion.

Table 2 shows the distribution of the observations by country and year. As we can see in Panel A, France, Norway and Italy are the most represented with observations representing 13.29 %, 12.57 % and 12.35 %, respectively, of the total. Panel B shows the histogram by year, which suggests that the observations are relatively uniformly distributed across calendar years.

As explained and motivated in the introduction, we obtained the ESG scores from ASSET4 - Refinitiv. They release, for each company in their database, a yearly global ESG score based on three pillars, namely environmental, social and governance (ESG)

Table 2
Panel A and Panel B show the sample distribution by country and by year, respectively. The sample consists of 154 banks listed in Europe (EU + NO + CH) during the period 2010–2018 for a total of 1114 bank-years observations.

Panel A: Distribution of observations by country			Panel B: Distribution of observations by year	
Country	N	Percent	Year	Percent
AUSTRIA	58	5.21	2010	9.87
BELGIUM	15	1.35	2011	10.32
BULGARIA	6	0.54	2012	10.05
CZECH REPUBLIC	11	0.99	2013	10.86
DENMARK	58	5.21	2014	11.67
ESTONIA	3	0.27	2015	12.21
FINLAND	13	1.17	2016	12.66
FRANCE	148	13.29	2017	11.40
GERMANY	58	5.21	2018	10.95
GREECE	33	2.96	Total	100.00
HUNGARY	9	0.81		
IRELAND	20	1.80		
ITALY	135	12.12		
LITHUANIA	7	0.63		
MALTA	16	1.44		
NETHERLANDS	13	1.17		
NORWAY	140	12.57		
POLAND	105	9.43		
PORTUGAL	21	1.89		
ROMANIA	24	2.15		
SLOVAK REPUBLIC	18	1.62		
SPAIN	64	5.75		
SWEDEN	38	3.41		
SWITZERLAND	27	2.42		
UNITED KINGDOM	74	6.64		
Total	1114	100.00		

factors. Each pillar is based on data on a number of indicators. The environmental pillar, for instance, is constructed using data on *Emissions* (15 %), *Resource use* (15 %), *Innovation* (13 %).[15] To calculate the overall score, Refinitv applies a transparent weighting scheme within each pillar and across the three pillars.

In Table 3, we displayed the distribution of the ESG scores by country (Panel A) and by year (Panel B) as well as descriptive statistics. Overall, during the period 2010–2018 we have a total of 561 ESG scores out of 1114 sample observations with a score average of 55.92 and a median of 60.31. Italy presents the largest number of ESG score observations with a percentage of 15.33 % followed by Poland and Spain with 14.62 % and 10.34 %, respectively. However, France has the highest ESG scores with an average of 78.30 followed by Spain with 72.60 and Netherlands and United Kingdom with an average score closely (72.36 and 71.15, respectively). In Panel B, we observe a growing trend of ESG scores in the last six years, increasing from an average of 52.92 in 2013–59.68 in 2018, with a break of tree points in 2017 and 2018. This trend is consistent with a growing interest in the banking sector as environmental, social and governance factors become relevant for investors and other stakeholders (Miralles-Quirós et al., 2019).

Table 4 provides descriptive statistics on the variables used in the regression models. To mitigate the influence of outliers, we winsorized all continuous variables (except for log variables) at 2.5 % and 97.5 %. The sample is roughly equally split between observations on banks covered with an ESG score (50.4 %) and non-covered banks (49.6 %). Considering the whole sample, observations with LOW score represent 6.0 % of the total while those with MED score and HIGH score represent 32.3 % and 12.0 %, respectively.

5. Empirical results

5.1. Preliminary univariate analysis

The mean (median) PTBV of banks covered with ESG score is 1.153 (1.016), much higher than for non-covered banks, which is 0.836 (0.524). These differences are substantial, as well as statistically significant at the 1 % level. These preliminary findings suggest that PTBV multiples of banks covered with ESG score reflect higher growth opportunities, since the difference in median ROTE is not statistically significant. It is worth noting that, at banks with an ESG score, the net book value of Level 1 financial instruments is much higher than at non-covered banks, whereas the net book value of Level 3 instruments is lower. This is consistent with their size being larger, as also confirmed by the positive correlation between the variables FVL1 and SIZE (29.1 %, statistically significant at the 10 % level). These banks have also higher systematic risk as showed by the relatively high mean (median) BETA and are more liquid as

[15] The categories for each pillar and the relative weights in brackets (Refinitiv, 2020) are as follows: *Environmental:* Emission (15 %), Resource Use (15 %), Innovation (13 %); *Social:* Community (9 %), Human Rights (5 %), Product Responsibility (4 %), Workforce (13 %); *Governance:* Shareholders (5 %), CSR Strategy (3 %), Management (17 %).

Table 3
Panel A and Panel B report the distribution of the observations of banks covered with ESG score by country and by year, respectively. The sample includes 561 observations out of 1114 related to banks covered with ESG during the period 2010–2018.

Panel A: Distribution of ESG scores by country								
Country	N	Freq.	Mean	SD	p25	Median	p75	**Max**
AUSTRIA	18	3.21 %	51.32	12.23	42.29	50.27	56.71	82.95
BELGIUM	15	2.67 %	49.08	21.67	25.97	61.82	67.34	71.41
CZECH REPUBLIC	11	1.96 %	42.33	8.93	35.97	42.86	51.37	51.81
DENMARK	25	4.46 %	37.16	25.22	13.35	27.08	63.59	77.56
FINLAND	1	0.18 %	43.80	.	43.80	43.80	43.80	43.80
FRANCE	27	4.81 %	78.30	11.07	67.35	83.03	88.04	93.50
GERMANY	29	5.17 %	66.97	13.84	60.17	68.13	80.16	83.95
GREECE	25	4.46 %	63.76	10.41	55.63	65.39	70.50	86.40
HUNGARY	9	1.60 %	52.35	10.00	47.17	47.33	52.15	71.93
IRELAND	20	3.57 %	40.67	13.50	30.89	37.83	46.69	67.95
ITALY	86	15.33 %	48.94	24.71	24.41	46.88	77.44	85.81
NETHERLANDS	13	2.32 %	72.36	5.89	67.97	70.48	76.35	82.78
NORWAY	12	2.14 %	58.45	13.89	50.54	62.74	69.55	72.62
POLAND	82	14.62 %	40.80	18.69	28.90	44.88	52.87	88.61
PORTUGAL	17	3.03 %	48.74	23.46	26.00	57.23	68.80	76.32
ROMANIA	4	0.71 %	39.46	3.01	37.70	40.66	41.23	41.54
SPAIN	58	10.34 %	72.60	12.88	63.64	74.99	82.49	90.59
SWEDEN	35	6.24 %	67.41	7.31	61.34	68.19	74.03	80.38
SWITZERLAND	19	3.39 %	35.40	15.68	19.71	40.34	48.63	63.13
UNITED KINGDOM	55	9.80 %	71.15	16.28	69.35	76.58	82.52	87.16
Total	561	100.00 %	55.92	21.86	40.39	60.31	74.26	**93.50**
Panel B: Distribution of ESG scores by year								
Year	N	Freq.	Mean	SD	p25	Median	p75	**Max**
2010	58	10.34 %	54.81	22.18	35.56	58.90	72.24	87.67
2011	55	9.80 %	54.76	23.33	39.27	61.34	74.57	85.21
2012	53	9.45 %	54.54	22.67	37.68	60.29	70.78	84.07
2013	57	10.16 %	52.92	23.23	35.97	56.78	71.28	84.93
2014	62	11.05 %	53.76	21.77	37.28	57.66	74.14	86.01
2015	66	11.76 %	55.33	21.83	40.39	57.44	73.80	91.69
2016	69	12.30 %	56.54	21.70	35.34	61.08	75.48	92.00
2017	67	11.94 %	59.27	21.29	43.39	62.00	77.08	93.50
2018	74	13.19 %	59.68	19.77	44.93	62.45	76.02	90.94
Total	561	100.00 %	55.92	21.86	40.39	60.31	74.26	**93.50**

showed by the higher TURNOVER. These differences are statistically significant at the 1 % level. The dummy D_ESG is also positively correlated (20.7 % and significant at the 10 % level) with the PTBV multiple, supporting the idea that banks covered by ESG score are more appreciated by investors. Table 5

5.2. *Multivariate panel regression analysis*

Table 6 reports estimates of *Model 1–2* and *Model 3–4* described by [2] and [3], respectively. The models are estimated with country and year fixed effects. For each model, we report in the table the coefficient estimates along with the corresponding t-statistics in parentheses, the adjusted coefficient of determination R^2, the statistics and level of significance for an F-test, the Hausman test and the Wald test.

The estimated regression models exhibit a good fit as shown by the adjusted R^2 above 65 % in all cases. The sign of the estimated coefficients of the control variables is generally consistent with previous literature in all specifications considered in Table 6,[16] suggesting that model specification is not a concern. The VIF (unreported but available upon request) does not exceed the conventional critical value[17] of 10 for any of the variables, suggesting we can rule out multicollinearity as a serious problem in our analysis. Moreover, the Hausman test statistic is highly significant and corroborates the choice of using a fixed effects regression model,[18] while the Wald test confirms the incremental value relevance of the additional variables beyond the intercept.

The sign of the coefficient estimates for $FVL1_{i,t}$ and $FVL2_{i,t}$ is positive, with the coefficient for the former larger than for the latter, implying that Level 1 and, to a lesser extent, Level 2 financial instruments are valued at a relative premium to their book value. The

[16] This is also the case of the coefficient of D_CRISIS is positive and consistent with the Di Tommaso and Thornton (Di Tommaso and Thornton, 2020)'s study.

[17] The value of VIF equal to 10 is suggested by Chatterjee and Hadi (Chatterjee and Hadi, 2012) as the threshold for considering high correlation among variables.

[18] We perform the Hausman test to validate the choice of using fixed effects. Though the regression model does not include bank fixed effects, we use country and year fixed effects to capture distinct specific characteristics/unobserved variables which are country and time-invariant, respectively. The choice of not including bank fixed effects is motivated by the need to retain degrees of freedom to ensure efficiency of the estimates.

Table 4
The table shows the descriptive statistics for all variables. The total sample includes 1114 bank-years observations between 2010 and 2018. All continuous variables (except for log variables) are winsorized at 2.5 % and 97.5 %.

Panel A

Descriptive statistics

Variables	N	Mean	SD	Min	Median	p75
PTBV	1114	0.996	0.766	0.149	0.802	1.301
LOSS	1114	0.120	0.325	0.000	0.000	0.000
ROTE	1114	0.074	0.117	-0.362	0.081	0.127
D_NEGROTE	1114	-0.018	0.066	-0.362	0.000	0.000
FVL1	1114	1.519	1.469	0.000	1.150	2.192
FVL2	1114	0.468	1.104	-1.934	0.237	0.674
FVL3	1114	0.082	0.316	-1.150	0.028	0.134
D_ESG	1114	0.504	0.500	0.000	1.000	1.000
D_LOW_ESG	1114	0.060	0.238	0.000	0.000	0.000
D_MED_ESG	1114	0.323	0.468	0.000	0.000	1.000
D_HIGH_ESG	1114	0.120	0.325	0.000	0.000	0.000
LEV	1114	13.759	5.869	5.741	12.720	16.445
GROWTH	1114	0.048	0.116	-0.159	0.035	0.083
BETA	1114	1.189	0.428	0.560	1.154	1.435
RET	1114	0.041	0.152	-0.336	0.034	0.124
TURNOVER	1114	0.525	0.657	0.001	0.241	0.681
SIZE	1114	10.226	2.097	4.724	9.964	11.648
SEGMENT	1114	1.469	0.468	0.000	1.609	1.792
D_CRISIS	1114	0.411	0.492	0.000	0.000	1.000

Panel B

Description of the main variables

PTBV	Price to tangible book value multiple of each bank at the end of March of year t+1;
LOSS	Dummy variable equal to 1 if bank's net income is negative and zero otherwise;
ROTE	Ratio between net income adjusted for intangible assets amortization net of fiscal charges and tangible book value of equity;
D_NEGROTE	Interactive dummy variable equal to ROTE if ROTE is negative and zero otherwise;
FVL1, FVL2, FVL3	Net amount of fair value of Level 1 to Level 3, respectively, scaled over tangible book value of equity;
D_ESG	Dummy variable equal to one if the bank's observation is covered with ESG score and zero otherwise;
D_LOW_ESG	Dummy variable equal to one if ESG score is under 25 (included) and zero otherwise;
D_MED_ESG	Dummy variable equal to one if ESG score ranges from 25 to 75 included and zero otherwise;
D_HIGH_ESG	Dummy variable equal to one if ESG score is higher than 75 (the maximum level is 100) and zero otherwise;
LEV	Ratio of total asset to the sum of book value of equity and book value of minorities;
GROWTH	Percent change in total assets;
BETA	Market model beta coefficient estimate
RET	Cumulative stock returns over the thirty days preceding the end of March of each year;
TURNOVER	Cumulative volume of trading on the stock over the course of a year in relation to the number of shares outstanding;
SIZE	Natural log of total assets expressed in Euro at the end of each fiscal year;
SEGMENT	Natural log of one plus the number of bank's business segments;
D_CRISIS	Dummy variable equal to one for observations between 2010 and 2013 and zero otherwise.

Notes: The table shows the descriptive statistics for all variables. The total sample includes 1114 bank-years observations between 2010 and 2018. All continuous variables (except for log variables) are winsorized at 2.5 % and 97.5 %.

sign of the coefficient estimate for $FVL3_{i,t}$ is instead negative, implying that Level 3 financial instruments are valued at a relative discount to their book value. These results are consistent with the findings of (Song et al., 2010) and subsequent literature on the value relevance of FVH levels, including (Bagna et al., 2015; Goh et al., 2015; Tama-Sweet and Zhang, 2015; Siekkinen, 2016; Kolev, 2019), among others.

The estimates of the models in [2] and [3] are reported in the other columns of Table 6. In the column labelled as *Model 2*, corresponding to the model in [2] that includes the $D\_ESG_{i,t}$ dummy to allow for an interaction term in the intercept, the estimated coefficient β_7 of $D\_ESG_{i,t}$ is positive and statistically significant. This is consistent with H_1. The column labelled as *Model 3* shows the estimation results for the complete model in [3], which adds to the previous model the multiplicative interactions between the dummy variable D_ESG and the different levels of the FVH. In this specification, the magnitude and statistical significance of the estimated coefficient of $D\_ESG_{i,t}$ increase relative to *Model 2*, which omits the interactions between $D\_ESG_{i,t}$ and $FVL1_{i,t}$, $FVL2_{i,t}$ and $FVL3_{i,t}$. In fact, the estimated coefficient of *D_ESG* for *Model 3* is 0.347, which is almost twice the estimate (i.e., 0.177) for *Model 2*. This means that, to fully understand the value relevance of the ESG score, it is important to consider its effect on the value relevance of the fair value determinations for the different FVH levels, which is in line with the intuition that motivates our analysis. Overall, the estimates

Table 5
The table presents comparison tests for all variables between banks covered with ESG score and banks non-covered. The difference between mean and median is tested through the *t*-test and the Wilcoxon Z, respectively. The total sample includes 1114 bank-years observations between 2010 and 2018. All continuous variables (except for log variables) are winsorized at 2.5 % and 97.5 %. ***, **, * Indicate $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively.

	ESG covered (N° = 561)		ESG Non-covered (N° = 553)		Difference	
Variables	Mean	Median	Mean	Median	Mean (t-Test)	Median (Wilcoxon Z)
PTBV	1.153	1.016	0.836	0.524	*0.317****	*0.492****
LOSS	0.166	0.000	0.074	0.000	*0.092****	*0.000****
ROTE	0.062	0.084	0.093	0.079	*-0.031**	*0.005*
D_NEGROTE	-0.027	0.000	-0.009	0.000	*-0.018****	*0.000****
FVL1	1.932	1.650	1.099	0.486	*0.833****	*1.164****
FVL2	0.466	0.230	0.471	0.243	*-0.005*	*-0.013*
FVL3	0.067	0.041	0.097	0.011	*-0.030*	*0.030****
LEV	15.736	14.814	11.755	10.802	*3.981****	*4.012****
GROWTH	0.030	0.018	0.065	0.048	*-0.035****	*-0.03****
BETA	1.306	1.252	1.071	0.993	*0.235****	*0.259****
RET	0.034	0.032	0.048	0.037	*-0.014*	*-0.005*
TURNOVER	0.901	0.650	0.144	0.093	*0.757****	*0.557****
SIZE	11.716	11.483	8.714	9.103	*3.002****	*2.38****
SEGMENT	1.639	1.609	1.297	1.386	*0.342****	*0.223****
D_CRISIS	0.398	0.000	0.425	0.000	*-0.027*	*0.000*

***, **, * Indicate $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively

of the coefficients of the additional variables included in the models in [2] and [3] show the value relevance of the ESG score availability and its incremental effect on the value relevance of each FVH level. This is consistent with both H_1 and H_2.

For *Model 4*, which drops the ESG score dummy (i.e., the interaction term with the constant), the estimates of the coefficients of the interaction terms with the FVH levels imply that the presence of an ESG score improves the value relevance of low FVH level items, without materially affecting the value relevance of the Level 1 items. This is perfectly in line with H_2 while not being in contrast with H_1.

In Table 7, to test H_3, we report estimates of *Models 5–7* as specified by versions of [4]. The full unrestricted specification (Model 6) includes interactions between the three FVH levels and three different levels of ESG scores: low-level, medium-level and high-level. This way, we aim to make inferences on whether the different levels of the ESG score are perceived differently by investors, looking at the incremental effect on the value relevance of FVH levels. The comparison is, as before, between covered and non-covered banks. In this case, the estimation results are not supportive of the key idea behind the null hypothesis of interest, namely H_3. The results are not supportive of a positive association between the level of ESG score and the value-relevance of items at the lower levels (particularly level 3) of the FVH. In fact, the coefficient of the interaction terms that captures the effect on the value relevance of level 2 and level 3 items decreases in the ESG score and, for high ESG scores, becomes negative, albeit to an insignificant extent.

Rejection of H_3 and empirical support for H_2, especially if also in the presence of empirical support for H_1, means that the ESG score is simply a measure of company visibility and investors' awareness, hence of lack of opacity, due to inclusion in popular market indices. This is because inclusion in such indices motivates the inclusion among the firms to which Refinitiv issues an ESG rating in the first place. It means that the effect of the ESG rating arises because the rating is simply a measure of investors' awareness of the firm and the stocks it issues, whether it is (believed by the market to be) also a measure of ESG performance/CSR or otherwise.

Empirical support for both H_2 and H_3 means that the ESG score is not merely a measure of company visibility and investors' awareness, but investors also recognize it as a measure of ESG performance and CSR and, consistent with the "risk mitigation" view, the market values it as a signal of reliability of the firm financial reporting.

To the contrary, rejecting H_3 in favor of the one-tailed alternative, by finding that a higher ESG score increases the discount on the fair value of Level 3 financial instruments, means support for the possibility that the market adopts the "overinvestment view". Investors either treat the ESG scores as a misleading measure of ESG performance, or that they shun the *risk-mitigation view* in favor of the *over-investment view* previously outlined.

6. Robustness check

As robustness checks, we estimated different additional specifications of our regression models. We estimated a Hierarchical Linear Model (HLM) with nested level of clustering for the dummy variable D_ESG to investigate whether the different bank regulations at country level interact with the ESG score. We performed a three-level mixed model which treats countries as the outermost level (third level) of the hierarchical structure, banks as the second level cluster and unit-year observations as the first level with a fixed effect. We assumed that the effect due to year is systematic to that year and thus common to all banks. This structure enables us to analyze banks' heterogeneity across countries under year fixed effects. We incorporated the heterogeneity at the three different levels by including in our models both random intercepts and random slopes (Rabe-Hesketh & Skrondal, 2008) for the variable D_ESG at bank level and

Table 6
The table shows the results of restricted and unrestricted versions of the regression models in Eq. 2 and Eq 3, labelled as Model 1 to Model 4 as explained in the text. The total sample includes 1114 bank-years observations between 2010 and 2018. All continuous variables (except for log variables) are winsorized at 2.5 % and 97.5 %. All test statistics and significance levels are based on White's heteroscedasticity-consistent standard errors (White, 1980). ***, **, * Indicate $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively. (.) indicates that Hausman test fails to meet asymptotic assumption of test.

Variables	Exp. Sign	Model 1	Model 2	Model 3	Model 4
LOSS	+	0.209***	0.210***	0.195**	0.192**
		(2.610)	(2.656)	(2.402)	(2.321)
ROTE	+	5.727***	5.679***	5.504***	5.632***
		(12.742)	(12.646)	(12.233)	(12.533)
D_NEGROTE	-	-6.476***	-6.432***	-6.413***	-6.519***
		(-10.436)	(-10.305)	(-10.656)	(-10.692)
FVL1	+	0.108***	0.107***	0.174***	0.136***
		(6.791)	(6.692)	(6.716)	(5.396)
FVL2	+	0.069***	0.068***	0.043*	0.028
		(3.933)	(3.909)	(1.788)	(1.128)
FVL3	-	-0.036	-0.042	-0.182*	-0.202**
		(-0.510)	(-0.60)	(-1.914)	(-2.050)
D_ESG	+		0.177**	0.347***	
			(2.572)	(4.303)	
D_ESG x FVL1	+			-0.111***	-0.039
				(-3.549)	(-1.423)
D_ESG x FVL2	+			0.032	0.067**
				(1.001)	(1.985)
D_ESG x FVL3	+			0.249*	0.301**
				(1.810)	(2.164)
LEV	+/-	-0.011**	-0.011**	-0.012**	-0.012**
		(-2.073)	(-2.118)	(-2.410)	(-2.299)
BETA	-	-0.083	-0.096*	-0.096*	-0.091*
		(-1.529)	(-1.774)	(-1.814)	(-1.685)
GROWTH	+	0.534**	0.519**	0.549**	0.533**
		(2.274)	(2.249)	(2.422)	(2.340)
RET	+	0.613***	0.630***	0.629***	0.613***
		(5.279)	(5.376)	(5.634)	(5.427)
TURNOVER	-	-0.069**	-0.102***	-0.089**	-0.057*
		(-2.079)	(-2.771)	(-2.480)	(-1.649)
SIZE	+	0.035**	0.010	0.007	0.035**
		(2.353)	(0.596)	(0.403)	(2.221)
SEGMENT	-	-0.159***	-0.144***	-0.144***	-0.161***
		(-3.560)	(-3.259)	(-3.202)	(-3.599)
D_CRISIS	+	0.257***	0.279***	0.293***	0.260***
		(4.024)	(4.251)	(4.689)	(4.188)
Constant	+	0.527***	0.684***	0.647***	0.545***
		(2.633)	(3.291)	(3.043)	(2.596)
N		1114	1114	1114	1114
Adj. R^2		64.8 %	65.0 %	66.5 %	65.3 %
Country FE		Included	Included	Included	Included
Year FE		Included	Included	Included	Included
F-test		71.25***	69.64***	67.99***	66.44***
Hausman test		47.22***	1155.13***	109.12***	(.)
Wald Test			6.62**	6.09***	3.77**

country level. We also assume that random intercept and slope are uncorrelated.

The estimates reported in Table 8 are essentially unchanged. Therefore, the puzzling finding above appears to be robust to alternative specifications and robustness checks. Possible explanations are that either one or both of the key assumptions underpinning H_3 are invalid, hence that (a) either the ESG score is not valued by stock market investors as a reliable signal of ESG performance or (b) that ESG performance does not reduce information asymmetries.

7. Discussion of results

In this study, we find that banks covered with an ESG score are valued with a PTBV multiple of 17.7 % higher than non-covered banks and the value relevance of the FVH is mitigated, in the sense that for covered banks the value relevance of FVH Level 1 financial instruments is reduced whereas it increases for Level 2 and especially Level 3 instruments. In other words, a key finding of our study is that the presence of an ESG score diminishes the discrepancy in terms of fair value relevance between Level 1 instruments and Level 2 and 3 ones. This result is consistent with the view that ESG performance is associated with reduced information asymmetry and less moral hazard perceived by investors, but also with the possibility that the availability of an ESG score, by depending on the inclusion in investment indices, is simply a proxy for visibility of the firm among investors.

Table 7
The table shows the results of restricted and unrestricted versions of the regression models in Eq. 4, labelled as Model 5–7 as explained in the text. The total sample includes 1114 bank-years observations between 2010 and 2018. All continuous variables (except for log variables) are winsorized at 2.5 % and 97.5 %. All test statistics and significance levels are based on White's heteroscedasticity-consistent standard errors (White, 1980). ***, **, * Indicate $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively. (.) indicates that Hausman test fails to meet asymptotic assumption of test.

Variables	Exp. Sign	Model 5	Model 6	Model 7
LOSS	+	0.218***	0.197**	0.190**
		(2.797)	(2.467)	(2.344)
ROTE	+	5.586***	5.386***	5.514***
		(12.385)	(12.129)	(12.454)
D_NEGROTE	-	-6.359***	-6.316***	-6.430***
		(-10.196)	(-10.468)	(-10.583)
D_LOW_ESG	+	0.02	0.219	
		(0.229)	(1.554)	
D_MED_ESG	+	0.255***	0.319***	
		(3.447)	(3.617)	
D_HIGH_ESG	+	0.249***	0.503***	
		(2.977)	(4.978)	
FVL1	+	0.107***	0.165***	0.134***
		(6.763)	(6.372)	(5.301)
FVL2	+	0.065***	0.038	0.025
		(3.811)	(1.589)	(1.031)
FVL3	-	-0.043	-0.178*	-0.193**
		(-0.636)	(-1.867)	(-1.967)
D_LOW_ESG x FVL1	+		-0.132***	-0.090***
			(-2.622)	(-2.790)
D_MEDIUM_ESG x FVL1	+		-0.080**	-0.025
			(-2.262)	(-0.848)
D_HIGH_ESG x FVL1	+		-0.126***	-0.031
			(-3.621)	(-0.991)
D_LOW_ESG x FVL2	+		0.122**	0.159***
			(2.398)	(3.368)
D_MEDIUM_ESG x FVL2	+		0.067*	0.097**
			(1.779)	(2.532)
D_HIGH_ESG x FVL2	+		-0.021	0.024
			(-0.568)	(0.614)
D_LOW_ESG x FVL3	+		0.497**	0.527***
			(2.508)	(2.626)
D_MEDIUM_ESG x FVL3	+		0.256*	0.321**
			(1.647)	(2.087)
D_HIGH_ESG x FVL3	+		-0.176	-0.176
			(-1.135)	(-1.035)
Constant	+	0.738***	0.728***	0.601***
		(3.53)	(3.413)	(2.869)
N		1114	1114	1114
Adj. R^2		65.4 %	66.8 %	66.2 %
Country FE		Included	Included	Included
Year FE		Included	Included	Included
F-test		72.72***	66.99***	65.62***
Hausman test		871.20***	(.)	(.)
Wald Test			3.18***	3.30***

Our other major finding is that there is a negative association between the level of the ESG score and the value-relevance of the FVH of financial instruments, especially those of Level 2 and 3, held on the balance sheets of the financial institutions in our sample. Taken at face value, and assuming that the ESG score is a meaningful measure of ESG performance, this finding is in contrast with studies that advocate a positive association between ESG performance and market value (Jadoon et al., 2021; Kaspereit and Lopatta, 2016; Miralles-Quirós et al., 2019). It is also in contrast with previous literature that finds that higher ESG scores warrant a reduction of the cost of equity capital (El Ghoul et al., 2011; Martínez-Ferrero and García-Sánchez, 2017).[19] This finding is thus in contrast with the *risk-mitigation view* of CSR. This is because, according to this view of CSR, ESG performance (e.g., implementation of ESG-oriented policies) mitigates concerns about information asymmetry, especially among minority shareholders. Therefore, while higher levels of ESG performance (as measured by the ESG score) should be associated with higher value relevance of financial instruments at all levels of the FVH, the effect should be stronger the lower the FVH level. Hence, the value relevance of the ESG score should be stronger for lower (not for higher, as we find) ESG scores, if the ESG score is seen by the market as a reliable measure of ESG performance.

The finding, while in contrast with the *risk-mitigation view* of CSR, is instead in line with the findings of Carnevale et al. (2012), who report that, for their sample of European-listed banks, social reporting is not relevant for investors. This is important because

[19] This could also be because they are associated with lower risk-taking (Di Tommaso and Thornton, 2020).

Table 8
The table shows estimates of the country effect using a hierarchical multi-level model with nested random parameters as in Eq 5. The total sample includes 1114 bank-years observations between 2010 and 2018. All continuous variables (except for log variables) are winsorized at 2.5 % and 97.5 %. All test statistics and significance levels are based on White's heteroscedasticity-consistent standard errors (White, 1980). ***, **, * Indicate $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively. See the caption of Table 6 for a detailed description of the above variables.

Variables	Estimates
LOSS	0.049
	(0.831)
ROTE	2.411***
	(6.646)
D_NEGROTE	-3.332***
	(-8.484)
FVL1	0.132***
	(3.181)
FVL2	0.061**
	(2.128)
FVL3	-0.052
	(-0.763)
D_ESG	0.397***
	(3.077)
D_ESG x FVL1	-0.107*
	(-1.761)
D_ESG x FVL2	-0.039
	(-1.270)
D_ESG x FVL3	0.166***
	(2.565)
LEV	0.002
	(0.162)
BETA	-0.126***
	(-4.010)
GROWTH	0.237*
	(1.718)
RET	0.490***
	(4.311)
TURNOVER	-0.091**
	(-2.361)
SIZE	-0.057
	(-1.348)
SEGMENT	-0.147**
	(-2.160)
D_CRISIS	0.306***
	(3.340)
Constant	1.315***
	(3.749)
N	1114
Year FE	Included
Random-Effect Parameters	
Country - L3	
SD(D_ESG)	0.000
	(.)
SD(Constant)	0.289
Bank - L2	
SD(D_ESG)	0.250
	(0.065)
SD(Constant)	0.448
	(0.063)

(Carnevale et al., 2012) use a sample period from the second quarter of 2002 to the second quarter of 2008, whereas the sample period for our study ranges from 2010 to 2018. Thus our findings extend the evidence against the *risk-mitigation view* of CSR provided by Carnevale et al. (2012) to a sample period that is not only more recent but also coincides with a time during which ESG considerations are widely deemed to have become more salient in investors' view.[20]

[20] For example, many studies advocate (e.g., (Porter and Kramer, 2019) the increasing awareness among investors of sustainability as a crucial factor for business development in long-term and the viewpoint that investors have a positive perception of sustainability as a driver of performance (Jadoon et al., 2021).

8. Conclusions

Our study belongs to the broad literature on ESG scores and their market impact. Our focus is the banking sector. In the extant literature, the typical finding is that fair value determinations reported in banking balance sheets exhibit lower value relevance when they refer to Level 2 and Level 3 financial instruments, and a pricing discount in the case of Level 3 instruments. We confirm this finding, adding however that the value-relevance of the FVH is impacted negatively by the availability of an ESG score.

The estimated negative impact of the ESG score on the value-relevance of the FVH, as discussed in the previous section, challenges either the view that ESG performance mitigates information asymmetry concerns in the eyes of investors, against the *risk-mitigation view* of CSR, or the assumption that the ESG score is a reliable measure of ESG performance.

Another possible explanation is that ESG performance and the ESG score are at least partially endogenous, in the sense that firms with more opaque estimates in the financial reporting are more likely to strive for a better ESG performance in the belief (which is widely held) that this can mitigate perceived information asymmetries and is positively valued by investors. This explanation would be a generalization of the mechanism put forth by Chung et al. (2017), who argue that firms with more opaque estimates in the financial reporting are more likely to provide more disclosure. At present, however, this can be only a conjecture. We leave for future research further investigation of this result and possible explanations.

A final caveat is in order. Our study concerns European banks, and the extension of our conclusions to other settings should be considered with caution, because of differences in accounting standards, regulatory landscapes, and enforcement of rules on non-financial reporting. We leave extensions to other settings, which should duly acknowledge and take these differences into account, for future research.

Data Availability

Data will be made available on request.

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