Do investors really care about sustainability? Evidence from European companies on the relationship between ESG performance and stock liquidity

Sebnem Yasar[1], Hakan Ozkaya[2]

[1] *Dokuz Eylul University, Izmir Vocational School, Department of Accounting and Tax Applications, Turkey, ORCID: 0000-0001-6173-5148, sebnem.yasar@deu.edu.tr (corresponding author);*
[2] *Dokuz Eylul University, School of Applied Sciences, Department of International Trade, Turkey, ORCID: 0000-0001-7810-5943, hakan.ozkaya@deu.edu.tr.*

Abstract: *This study examines the impact of corporate environmental, social and governance (ESG) performance on capital market efficiency, namely stock liquidity. Drawing on a dataset of 1,693 publicly traded firms across 23 European stock exchanges between 2002 and 2022, we investigate whether companies with stronger ESG credentials benefit from more liquid equity markets. Our results provide strong evidence that ESG performance has a significant positive effect on stock liquidity. This suggests that a substantial portion of European investors today prefer to invest in companies that act environmentally friendly, value social rights and equality, and engage in good governance. Among the three ESG dimensions, the environmental component exhibits the most significant effect, indicating that investors particularly value firms that engage in environmentally responsible practices. Furthermore, the analysis reveals notable regional differences in the importance assigned to ESG factors, showing that investors in Western and Northern European countries show a stronger preference for sustainability-oriented firms compared to their counterparts in Eastern and Southern Europe. These findings highlight the influence of regional economic, cultural, and regulatory contexts on investment behavior. Overall, our study contributes to the growing literature on sustainable finance by underscoring the role of ESG performance not only as a tool for ethical or reputational enhancement but also as a mechanism that can directly improve financial market outcomes. By identifying ESG performance as a determinant of stock liquidity, this research also supports the integration of ESG considerations into investment decision-making and corporate strategy.*

Keywords: *Stock liquidity, ESG, sustainability, European stock markets, investor behavior.*

JEL Classification: *M14, G10, G11, Q01.*

APA Style Citation: Yasar, S., & Ozkaya, H. (2026). Do investors really care about sustainability? Evidence from European companies on the relationship between ESG performance and stock liquidity. *E&M Economics and Management, 29*(2), 177–196. https://doi.org/10.15240/tul/001/2026-2-012

Introduction

The asset's market liquidity indicates the ability of investors to buy and sell substantial amounts of assets quickly, at low cost, and without significant price concessions. Amihud et al. (2006) stated that stock market liquidity indicates the existence of willing buyers and sellers who agree to exchange a certain amount

of securities at the specified price without any delay. As a fundamental market feature, its presence secures the smooth functioning of the market and its absence creates unrest in it. Stock liquidity is closely related to market recognition and largely reflects how corporate decisions and activities are evaluated by market actors. Therefore, companies' business missions, principles, and values are represented by stock market liquidity to a great extent, and environmental, social and governance (ESG) philosophy is no exception.

Global warming and climate change have revealed the importance of developing environmental protection awareness, and in this regard, the roles and responsibilities of companies have begun to be discussed. Today, corporate information on issues related to greenhouse gas emissions, energy and water consumption, recycling or disposal of waste materials, and actions of the companies to decrease the negative effects of their activities on nature are of foremost significance. In addition, companies are expected to attach utmost importance to issues related to human rights and gender equality, take part in social responsibility activities, and always prioritize transparency and accountability in corporate governance processes.

ESG is a non-financial business evaluation system focusing on environmental, social, and governance performance, and aims to measure the sustainable development ability of firms and determine whether they have adequate corporate environmental, social, and governance responsibility awareness. ESG was created by the United Nations Global Compact in 2004, and with this concept, businesses were required to give due attention to environmental protection, social responsibility, and corporate governance in their operations and business development processes and to quantify their non-financial performances. The purpose of conducting ESG assessment is to encourage businesses to invest in ESG and to help them integrate ESG priorities into their strategic decision-making processes and allocate their resources more effectively.

Recent studies increasingly emphasize that stock liquidity is influenced not only by financial indicators but also by non-financial performance factors such as ESG. ESG is increasingly recognized by all stakeholders, especially investors, and companies' ESG ratings are increasingly taken into account in decision-making processes (Bihari et al., 2025; Bhowmick et al., 2025; Hutchings, 2025; Sanseverino et al., 2024). Companies with strong ESG performance typically enjoy higher investor confidence, lower transaction costs, and better market accessibility (Broadstock et al., 2021; Chen & Xie, 2022; S. Chen et al., 2023; Mohammad et al., 2021). As a result, more and more firms are trying to disclose their ESG activities.

The purpose of this study is to examine the effect of ESG performance on capital market performance. The main research question is whether ESG performance improves stock liquidity in European capital markets. Specifically, we examine whether higher ESG performance leads to higher stock liquidity, whether this effect varies across European regions, and through which possible channels ESG performance may influence stock liquidity. For this purpose, we test the relationship between ESG scores and the stock liquidity of European companies. Although there are different views, the majority of the literature shows that ESG activities and disclosures decrease information asymmetry between the firms and the investors, enhance corporate reputation, decrease firm risk, and attract more attention and interest from institutional investors, all of which affect stock liquidity.

Our dataset includes European listed companies between 2002–2022 with ESG scores obtained from Refinitiv Eikon database. To ensure the robustness of our findings we conduct a series of robustness tests, including alternative model specifications and control variables.

Our study contributes to literature in several ways. First, there is no comprehensive study in the literature investigating the relationship between ESG performance and stock liquidity for European companies. Therefore, this study fills this gap and enriches the literature by shedding light on the impact of ESG scores on stock liquidity. Second, it extends studies on factors affecting stock liquidity by identifying ESG performance as an impact factor in capital markets. Third, this study provides empirical support for encouraging ESG investments by revealing the positive impact of ESG performance on performance in capital markets. Finally, this study reveals regional differences in investors' reactions to ESG scores, providing insight into the regions where efforts to increase environmental, social and/or

governmental responsibility awareness should be concentrated.

The remaining parts of the paper are organized as follows. Section 1 includes a comprehensive literature review, and the hypothesis of the study developed in this context. Section 2 outlines the data of the research, and defines the research methodology. Section 3 presents the results of the analysis and the robustness tests, and discusses the findings.

1 Theoretical background and hypothesis development

1.1 ESG and stock liquidity

There are a few studies in the literature examining the impact of ESG disclosures on stock liquidity, and in all of these studies, a positive relationship between ESG performance and stock liquidity was found (Aboud & Diab, 2019; R. Chen et al., 2023; He et al., 2023; Liang et al., 2023; Luo, 2022; Meng-tao et al., 2023; Subramaniam et al., 2016; Wang et al., 2023; Zhang et al., 2024). Wang et al. (2023) stated that ESG performance increases firms' stock liquidity by reducing corporate risks and increasing stakeholders' support. Meng-tao et al. (2023) attributed the increase in stock liquidity to the decrease in corporate risks and the increase in institutional investors. R. Chen et al. (2023) found that good ESG performance increases stock liquidity by reducing agency costs, increasing foreign ownership, and improving corporate reputation. Zhang et al. (2024) suggested that high ESG scores lead to high stock liquidity by leading to an increase in corporate transparency and risk mitigation.

In addition to the studies mentioned above, literature examining the relationship between ESG, financial performance and firm value can also be used to understand the dynamics of the relationship between ESG performance and stock liquidity.

1.2 ESG, financial performance, and firm value

The question of how ESG ratings affect companies' financial performance and firm values is a controversial issue, often based on one of two contrasting theoretical perspectives: (i) the shareholder theory; and (ii) the stakeholder theory.

(i) Shareholder theory: the first of these is Friedman's shareholder theory, which argues that the company's only responsibility is to its shareholders. Friedman (1970) criticized the increasing attention to corporate social responsibility among companies and the academic community, stating that the only goal of a company is maximizing its profits, and any activity carried out under the name of social responsibility will create conflict between different stakeholders of the company. From this perspective, investments in ESG are regarded as irrational decisions that undermine shareholders' interests by creating more virtuous companies at higher costs, which in turn negatively affect financial performance, and are likely to be perceived unfavorably by existing and potential investors.

(ii) Stakeholder theory: the second theory is Freeman's stakeholder theory, which argues that the company's responsibility is not only to its shareholders but to all its stakeholders. Freeman (1984) defined stakeholders as any group or individual who can affect a company's achievement of its goal or is affected by the company's actions and stated that the true success of a company depends on satisfying all its stakeholders. According to this perspective, social responsibility has both economic and moral dimensions, and companies that can effectively manage these dimensions will gain competitive advantage. In this regard, it can be expected that capital markets will not remain unresponsive to the ESG scores of companies that increase their corporate reputation and reliability by considering the demands of their stakeholders and will reward high performance.

In parallel with these two views, which are in complete contradiction with each other, studies in literature also exhibit contradictory results. Much of the previous literature has suggested that ESG disclosures help improve financial performance (Aboud & Diab, 2019; Kao, 2023; Lins et al., 2017; Malik & Kashiramka, 2024; Margolis, 2009; Noja et al., 2024; Rossi & Harjoto, 2020; Ye et al., 2022; Yoo et al., 2022) and firm value (Aydoğmuş et al., 2022; Bagh et al., 2024; Fatemi et al., 2015; Krüger, 2015; Miralles-Quirós et al., 2018; Sassen et al., 2016). However, some studies have found that non-financial information disclosures reduce financial performance and firm value (Alareeni & Hamdan, 2020; Brammer et al., 2006; Chen et al., 2018; Duque-Grisales & Aguilera-Caracuel, 2021; Khan & Liu, 2023). Agarwala et al. (2024) have revealed the existence of a U-shaped relationship between ESG scores and firm value

meaning that the firms must exceed a certain threshold for a positive relationship to occur. Fatemi et al. (2018) have stated that ESG activities increase firm value, but ESG disclosures reduce firm value. Saygili et al. (2022) found that while social and governance disclosures have positive effect, environmental disclosures have negative effect on financial performance. Liu et al. (2022) have found out that social dimension has a more significant effect on financial performance of energy companies compared to the other two dimensions. Some other studies have argued that there is no relationship between ESG, financial performance, and firm value (Atan et al., 2018; Horvathova, 2010; Nag & Bhattacharyya, 2016). Capelle-Blancard and Petit (2019) have found that investors react negatively to negative ESG performance, but the reaction to good performance is insignificant.

1.3 Mechanisms linking ESG and stock liquidity

High ESG performance is expected to alleviate information asymmetry and agency conflicts, reduce corporate risks and improve risk management through better corporate governance practices, enhance corporate reputation, and attract institutional investors. As a result, good ESG performance has the potential to increase stock liquidity in capital markets by positively affecting financial performance and firm value.

According to agency theory, the separation of ownership and control in companies creates an agency relationship, and the agency relationship creates information asymmetry between shareholders and managers. With more information, management has the opportunity to make decisions against investors, and this leads to conflicts of interest and agency costs between the principal and the agent (Jensen & Meckling, 1976). Diamond and Verrecchia (1991) revealed that information asymmetry creates implicit costs between companies and the market and can lead to misallocation of resources, and policies that reduce this asymmetry can increase stock liquidity. When investors buy or sell shares, they rely on the private information they have about the company. This information may be financial or non-financial information such as ESG disclosures. ESG disclosures enable investors to view the company's situation from perspectives other than its financial performance (Fatemi et al., 2018; Li et al., 2018; Mulchandani et al., 2022; Ng & Rezaee, 2020). The decrease in information asymmetry resulting from ESG disclosures improves transparency, reduces agency costs, strengthens investor confidence by reducing uncertainty, and can ultimately increase stock liquidity (R. Chen et al., 2023; Cui et al., 2018; Liang et al., 2023; Meng-tao et al., 2023; Wong & Zhang, 2021).

The relationship between ESG performance and corporate reputation can be explained by signaling theory. The information asymmetry results in outsiders interpreting any additional information beyond the mandatory financial reports as a signal to financial markets (Spence, 1973). A high ESG score is a signal that shows a high level of social and environmental responsibility and indicates that the business has a strategy that creates diversified integrated value and protects stakeholders. This positive signal sent to the markets not only attracts sensitive investors in terms of social responsibility and environmental awareness but also increases trust and support from all investors. The positive image and increased corporate reputation created in this context can influence investors' decisions in capital markets by enabling businesses to increase their financial performance and competitive advantages in the market (Wong et al., 2021; Wong & Zhang, 2021) and can increase stock liquidity by supporting stock trading (R. Chen et al., 2023; Luo, 2022).

ESG ratings also play a significant role in improving analyst forecast accuracy for companies and reducing firm risk (R. Chen et al., 2023; Meng-tao et al., 2023; Rossi & Harjoto, 2020). A good ESG performance indicates that the company has a solid corporate governance mechanism that attaches importance to continuous improvement, complies with relevant laws and regulations and is less likely to be penalized, has a higher sense of social responsibility, and has a high corporate reputation (Luo & Wu, 2022). Sassen et al. (2016) have demonstrated empirical evidence that businesses that provide non-financial information to the market with ESG disclosures can reduce firm risks, especially idiosyncratic risks. Investors are likely to turn to risky investments to obtain returns above the expected returns. However, past financial crises have shown that risk-taking behavior can cause great losses to investors. The risk-averse preferences of many investors,

whether individual or corporate, are a factor that restricts them from investing in companies with a high-risk profile. Low firm risk has the potential to increase stock trading volume and liquidity to the extent that it raises investors' expectations about the company's future.

Institutional investors, as one of the main participants in capital markets, play a vital role in stock liquidity. ESG performance is an important dimension that provides a competitive advantage to businesses and provides data for measuring the sustainable development performance and long-term investment values of businesses. Institutional investors are not willing to invest in companies with low environmental and social performance (Dyck et al., 2019; Nofsinger et al., 2019). Therefore, high ESG performance has the potential to attract the attention of domestic and foreign institutional investors and encourage them to invest in these companies or increase their existing investments, which ultimately strengthens liquidity (R. Chen et al., 2023). Institutions have a scale advantage compared to individual investors in acquiring and processing information, with their professional and advanced investment knowledge and skills. Therefore, institutional investors are generally considered knowledgeable representatives. Co-investment behavior, which occurs as a result of the positive reaction of institutional investors to ESG performance being perceived by individual investors as a signal to invest in these companies, can pave the way for further increase in liquidity (Bai et al., 2022; R. Chen et al., 2023; Ding et al., 2017).

1.4 Hypothesis development

Based on the discussion above, two contrasting perspectives emerge. From the shareholder theory viewpoint, ESG activities can be seen as possible source of inefficiency or value destruction. In contrast, stakeholder theory suggests that ESG engagement enhances reputation, transparency, and investor confidence, thereby increasing market efficiency and liquidity. Accordingly, and consistent with the stakeholder-oriented perspective, we formulate our hypothesis as follows:

H1: Higher ESG scores enhance stock liquidity.

To the best of our knowledge, there is no prior study employing a comprehensive, large-scale, multi-country dataset and a robust methodology to test the ESG – liquidity nexus across Europe. This study thus provides a novel contribution to the literature by evaluating the impact of ESG performance on stock liquidity in European capital markets.

2 Research methodology

2.1 Data

European firms comprise the sample of this study. Both financial data and ESG data of firms listed in European stock exchanges were collected from the Refinitiv Eikon database for the period 2002 and 2022. Since ESG scores have been available since 2002, the sample period of the study starts in 2002. While some former papers (i.e., R. Chen et al., 2023; Meng-tao et al., 2023) obtained ESG scores from the Bloomberg database, we obtained ESG data for European listed firms from Refinitiv Eikon database (formerly known as Thomson Reuters Eikon) which is a highly utilized platform that provides financial data. It is one of the most frequently used databases for obtaining ESG scores, especially for European companies (i.e., Candio, 2024; Gawęda, 2024; Janicka & Sajnóg, 2023; Menicucci & Paolucci, 2025; Pinheiro et al., 2024). We started to form our sample by searching for European companies with ESG scores from the Refinitiv Eikon database between 2002 and 2022. This search yielded ESG scores for 2,188 firms from 25 countries (EU-27 excluding Bulgaria, Croatia, Estonia, Latvia, Lithuania, Malta, and including Iceland, Norway, Switzerland, and the United Kingdom) operating in 11 different industries according to TRBC economic sector classification given by Thomson Reuters. A total of 17,752 firm-year observations were yielded at the end of the first screening. Following previous studies (i.e., R. Chen et al., 2023; Meng-tao et al., 2023; Wang et al., 2023) firms operating in financial industries (TRBC code 55) were eliminated (3,178 firm-year observations) due to their unique reporting and regulatory requirements. The academic and educational services industry (TRBC code 63) was also eliminated (10 firm-year observations) due to its poor representation. Observations with missing data for variables in the baseline regression model were excluded and firm level continuous variables without upper/lower boundaries were winsorized by 1% from the bottom and top to control for the misleading effects

of outliers. The final sample included 1,693 firms from nine industries and 12,052 firm-year observations. The distributions of the observations through countries, regions, industries, and years are shown in Tab. A1 in the appendix.

2.2 Model specification

Our baseline regression model for examining the relationship between ESG score and stock liquidity, which is exactly the same model used by R. Chen et al. (2023), Meng-tao et al. (2023), is specified in Equation (1). To the best of our knowledge, this approach has not been used for robustly testing the relationship between ESG score and stock liquidity across European Union states. We used the cluster(id) option to use robust standard errors to control for heteroskedasticity and autocorrelation.

$$\begin{aligned} Stock\ Liquidity_{i,t} &= c + \beta \times \\ &\times ESG\ Performance + \gamma \times \\ &\times Control\ Variables + \theta \times firmFE + \\ &+ \alpha \times yearFE + \varepsilon_{i,t} \end{aligned} \quad (1)$$

2.3 Variable description

Stock liquidity, which is the dependent variable of the study, is captured by the illiquidity measure of Amihud (2002) as in Equation (2). The illiquidity measure of Amihud (2002) has been reported as one of the best proxies among compared liquidity proxies (Fong et al., 2017; Marcelo & Quirós, 2006). Amihud (2002) defines illiquidity as the ratio of the absolute daily returns to the daily transaction volume in dollars averaged by the number of trading days. Since Equation (2) yields an illiquidity measure, following previous literature, the stock liquidity is calculated annually for each firm by the natural logarithm of illiquidity measure of Amihud (2002) (Equation (2)) multiplied by −1 so that it can be interpreted as the higher the values, the higher the stock liquidity. The illiquidity measure is calculated as follows:

$$ILLIQ_{i,y} = \frac{1}{D_{i,y}} \sum_{t=0}^{D_{i,y}} \frac{|R_{i,y,d}|}{VOL_{i,y,d}} \quad (2)$$

where: $|R_{i,y,d}|$ – the absolute daily stock returns (calculated by ln(price(*d*)/price(*d* − 1)) of stock *i* on day *d* of the year *y*; $Vol_{i,y,d}$ – the daily trading volumes (measured by transaction volumes in USD) of stock *i* on day *d* of year *y*; $D_{i,y}$ – the number of the trading days for stock *i* in year *y*.

As the measure for ESG performance, we used ESG scores by the Refinitiv Eikon database for the period 2002 and 2022. Apart from the data accessibility we chose the Refinitiv Eikon database as it covers over 90% of the global market cap (LSEG, 2023) in terms of ESG score which is the variable of interest of this study. We used ESG combined scores (ESG_COMB) as the main variable of interest as well as scores of ESG dimensions (ESG_E, ESG_S and ESG_G) where applicable.

Based on the previous literature we identified the following variables to control for the effects of firm level characteristics on stock liquidity to capture the effect of ESG more properly. The descriptives for the variables in our baseline regression are presented in Tab. 1.

Tab. 1: Descriptive statistics

	Mean	Median	Max.	Min.	Std. dev.	Obs.
LIQ	19.23	19.61	24.07	10.43	2.53	12,052
ESG_COMB	50.07	50.94	95.71	0.63	19.33	12,052
ROA	0.12	0.12	0.51	-0.30	0.09	12,052
LEV	0.26	0.25	0.75	0.00	0.15	12,052
SIZE	21.92	21.96	25.96	17.28	1.68	12,052
AGE	42.67	27.00	123.00	1.00	37.04	12,052
STR_INV	0.29	0.25	1.00	0.00	0.25	12,052
CASH	0.11	0.09	0.72	0.00	0.10	12,052

Source: own

The control variables are return on assets (ROA) which is calculated as the EBITDA over total assets, leverage (LEV) which is calculated as total debt over total assets, size (SIZE) which is proxied by the natural logarithm of total assets, age (AGE) measured by the natural logarithm of 2022 minus the incorporation year, strategic investors ratio (STR_INV) measured by shares held by strategic investors, and cash intensity (CASH) measured by cash and short term investments over total assets.

The descriptive statistics for the variables are shown in Tab. 1.

3 Results and discussion

3.1 Baseline regression results

The results of the baseline regression given by Equation (1) are shown in Tab. 2. Equation (1) is estimated with firm and year fixed effects. Regression results of the variable of interest, ESG combined score (ESG_COMB), and stock liquidity (LIQ) are shown without control variables in Model 1 and with control variables in Model 2. Models 3–5 show the results of subdimensions of combined ESG score (ESG_E, ESG_S, and ESG_G) and stock liquidity with control variables.

The baseline regression results reveal that higher ESG scores are positively associated with stock liquidity. Model 1 shows that higher ESG combined scores enhance stock liquidity alone, while Model 2 shows that this effect survives with the inclusion of control variables. This positive association shows that ESG endeavors have reflections in capital markets.

Besides the statistical significance of the estimated coefficients, which reveal the positive relationship, they suggest that ESG performance exerts a meaningful and economically non-negligible impact on firms' stock liquidity as well. Given in the variable description section that our dependent variable is defined

Tab. 2: Baseline regression results – Part 1

Dependent	Model 1	Model 2	Model 3	Model 4	Model 5
	LIQ	*LIQ*	*LIQ*	*LIQ*	*LIQ*
ESG_COMB	0.010***	0.004***			
	(6.028)	(4.157)			
ESG_E			0.003***		
			(3.661)		
ESG_S				0.002**	
				(1.662)	
ESG_G					0.001***
					(1.707)
ROA		2.369***	2.367***	2.367***	2.372***
		(10.243)	(10.168)	(10.142)	(10.166)
LEV		−1.388***	−1.399***	−1.386***	−1.383***
		(−7.683)	(−7.780)	(−7.659)	(−7.674)
SIZE		1.102***	1.103***	1.115***	1.116***
		(21.407)	(21.413)	(21.645)	(21.684)
AGE		−0.007	−0.006	−0.001	0.002
		(−0.119)	(−0.101)	(−0.013)	(0.025)
STR_INV		−1.780***	−1.783***	−1.785***	−1.772***
		(−9.375)	(−9.410)	(−9.400)	(−9.312)
CASH		0.674***	0.672***	0.675***	0.681***
		(2.940)	(2.937)	(2.936)	(2.948)

Tab. 2: Baseline regression results – Part 2

Dependent	Model 1	Model 2	Model 3	Model 4	Model 5
	LIQ	*LIQ*	*LIQ*	*LIQ*	*LIQ*
Cons	17.576***	−5.052***	−4.994***	−5.271***	−5.312***
	(147.690)	(−4.622)	(−4.557)	(−4.818)	(−4.863)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	12,052	12,052	12,051	12,051	12,052
F	171.400	171.420	171.330	171.470	171.670
Adj. R^2	0.187	0.728	0.726	0.725	0.724

Note: *** significant at 1%, ** significant at 5%.

Source: own

as the negative natural logarithm of Amihud's (2002) illiquidity ratio ($LIQ = -\ln(ILLIQ_{Amihud})$), a positive coefficient indicates a reduction in illiquidity; hence an improvement in liquidity. The coefficient of 0.004 on the combined ESG score (Model 2) implies that a one-point increase in the ESG score (ranging from 0 to 100) leads, on average, to a 0.004 increase in $-\ln(ILLIQ)$. This corresponds approximately to a 0.4% decline in illiquidity, or equivalently, a 0.4% enhancement in stock liquidity. Therefore, a 10-point rise in a firm's ESG score (e.g., from 50 to 60) is associated with roughly a 4% improvement in liquidity, ceteris paribus. When decomposed into environmental, social, and governance pillars, the coefficients of 0.003, 0.002, and 0.001 respectively translate into 0.3, 0.2, and 0.1% reductions in illiquidity for each one-point increase. Here it should be noted that, since ESG scores are ordinal (rather than cardinal) in nature (Avramov, 2022), one should be cautious in operationalizing the economic interpretation of the results.

The association of control variables with stock liquidity is in line with the expectations. While ROA, SIZE, and CASH variables have statistically significant positive effect on stock liquidity, LEV and STR_INV variables have statistically significant negative effect.

The association of subdimensions of ESG with stock liquidity was tested by Model 3, Model 4, and Model 5. Each subdimension was found to affect stock liquidity positively. Judging by the economic significance (i.e., coefficient) and the statistical significance level (i.e., *t*-statistics) we found that the environmental subdimension of the combined ESG score has the highest effect, and the social subdimension of the combined ESG score has the lowest effect. According to our results, firms can expect positive effects of the disclosures they make regarding environmental, social, and governance issues on their stock liquidity, and prioritizing environmental disclosures among others would be more effective.

Besides, return on asset (ROA), size (SIZE), and cash intensity (CASH) were found to have a significantly positive effect, while leverage (LEV) and strategic investors ratio (STR_INV) were found to have a significantly negative effect on stock liquidity.

3.2 The effect of geographical region

Effects of regional characteristics on the relationship between ESG and stock liquidity are analyzed by subsample regressions. To explore the effect of geographical regions on the relationship between ESG and stock liquidity, we grouped European countries in our sample into four regions (namely Eastern Europe, Northern Europe, Southern Europe, and Western Europe) by using the United Nations geoscheme based on the M49 coding classification (United Nations, 2023). According to the UN geoscheme, Poland, Hungary, the Czech Republic, and Romania are considered as Eastern Europe. Western Europe includes Austria, Belgium, France, Germany, Luxembourg, the Netherlands, and Switzerland. Northern Europe is composed of Denmark, Finland,

Iceland, the Republic of Ireland, Norway, Sweden, and the United Kingdom. Greece, Italy, Portugal, Slovenia, and Spain are classified as Southern Europe.

Regression results for the subsamples based on the geographical regions are presented in Tab. 3. While liquidity (LIQ) is the dependent variable for each model, ESG combined score

Tab. 3: Effect of ESG by region

Region	*ESG_COMB*	*ESG_E*	*ESG_S*	*ESG_G*	*Obs.*	Adj. R^2	*F*	Controls
Eastern	0.004				304	0.512	5.940	Included
	(0.663)							
		0.009**			304	0.521	6.230	Included
		(2.130)						
			0.006		304	0.520	6.010	Included
			(1.230)					
				-0.002	304	0.494	5.930	Included
				(-0.580)				
Northern	0.008***				5,680	0.740	89.370	Included
	(5.141)							
		0.005***			5,679	0.736	87.520	Included
		(3.796)						
			0.005***		5,680	0.737	89.900	Included
			(3.039)					
				0.001	5,680	0.733	88.100	Included
				(0.915)				
Southern	0.003				1,461	0.574	44.200	Included
	(0.842)							
		0.003			1,461	0.574	42.000	Included
		(1.150)						
			0.001		1,461	0.569	42.770	Included
			(0.127)					
				0.001	1,461	0.570	44.750	Included
				(0.508)				
Western	0.004***				4,607	0.723	83.300	Included
	(2.794)							
		0.004***			4,607	0.719	85.300	Included
		(2.819)						
			0.001		4,607	0.719	83.100	Included
			(0.936)					
				0.002**	4,607	0.721	83.250	Included
				(2.161)				

Source: own

(ESG_COMB) and subdimensions of ESG are the independent variables and the control variables defined earlier are also included. The results showed that while the coefficients of ESG_COMB were not statistically significant for Eastern and Southern European companies, they were significant for Northern and Western European companies. ESG combined scores were reflected in the stock liquidity for companies only operating in Northern and Western Europe. The effect of subdimensions of ESG on liquidity was not found homogeneous across geographical regions either. First, for none of the regions, every subdimension was found statistically significant. While environmental score (ESG_E) and social score (ESG_S) were found to have statistically positive effect on liquidity for Northern European companies, environmental score (ESG_E) and governance score (ESG_G) were found significant for Western European companies. While none of the subdimensions were found to have significant effect on liquidity for Southern European companies, only environmental score (ESG_E) was found to be significant for Eastern European companies. Out of the three subdimensions, environmental score (ESG_E) was found to be the most influential on stock liquidity.

3.3 Robustness tests

First, we checked for possible multicollinearity by tabulating cross-correlations of the variables. Cross-correlation coefficients are presented in Tab. 4. The correlation coefficients between independent variable pairs vary between 0.01 and 0.45, which do not indicate a series multicollinearity problem.

Tab. 4: Cross correlation of variables

	LIQ	*ESG_COMB*	*ROA*	*LEV*	*SIZE*	*AGE*	*STR_INV*	*CASH*
LIQ	1.00	0.42	0.14	0.01	0.77	0.02	−0.31	−0.10
ESG_COMB		1.00	0.00	0.09	0.45	0.12	−0.10	−0.07
ROA			1.00	−0.15	−0.09	−0.01	−0.02	0.01
LEV				1.00	0.18	−0.01	0.04	−0.25
SIZE					1.00	0.05	−0.07	−0.24
AGE						1.00	0.04	−0.05
STR_INV							1.00	0.08
CASH								1.00

Source: own

Second, the positive relationship between ESG and stock liquidity revealed by the analyses was also checked for possible endogeneity problems. Following Meng-tao et al. (2023), we estimated Equation (1) by using lagged independent variable of interest (ESG_COMB) or leaded dependent variable (LIQ). Control variables, described before, and firm and year fixed effects were included. Results presented in Tab. 5 show that both the economic and statistical significance and the direction of the coefficients persisted when the lagged or leaded variables were employed.

In order to add robustness to the results obtained by the baseline regressions, we estimated Equation (1) by using different parameters and checked whether the significant positive relationship between ESG and stock liquidity survived.

Differing from baseline regressions where firm and year fixed effects were included, Equation (1) was estimated by the inclusion of country fixed effects and year fixed effects (Model 1), by the inclusion of industry fixed effects and year fixed effects (Model 2), and Model 3 estimated the relationship by pooled OLS. To check the effect of the transition from local regulations to IFRS in 2005 on reporting standards, we ran the tests with data between 2005 and 2022 in Model 4. Finally, we used different control

Tab. 5: Lagging independent and leading dependent variable

	LIQ	*LIQ*	*LIQ* (*t* + 1)	*LIQ* (*t* + 2)
ESG_COMB			0.004***	0.004***
			(3.381)	(2.859)
ESG_COMB (*t* − 1)	0.004***			
	(3.501)			
ESG_COMB (*t* − 2)		0.003***		
		(2.871)		
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	Included	Included	Included	Included
Observations	10,117	8,540	10,117	8,540
Firm FE	168.440	158.440	152.950	132.710
Adj. R^2	0.729	0.714	0.721	0.670

Note: *** significant at 1%.

Source: own

Tab. 6: Robustness checks – Part 1

Dependent	Panel A				Dependent	Panel B
	Model 1	Model 2	Model 3	Model 4		Model 5
	LIQ	*LIQ*	*LIQ*	*LIQ*		*LIQ*
ESG_COMB	0.01***	0.01***	0.01***	0.01***	***ESG_COMB***	0.01***
	(6.44)	(6.28)	(5.43)	(3.45)		(4.29)
ROA	2.51***	2.48***	5.52***	2.43***	***ROA2***	1.58***
	(11.33)	(11.17)	(16.95)	(10.63)		(6.96)
LEV	−1.48***	−1.41***	−1.34***	−1.33***	***LEV2***	−1.26***
	(−9.15)	(−8.65)	(−7.00)	(−7.57)		(−6.34)
SIZE	1.11***	1.13***	1.17***	1.10***	***SIZE2***	0.74***
	(40.21)	(41.59)	(61.40)	(20.44)		(9.77)
AGE	−0.08***	−0.03	−0.04	−0.02	***AGE***	0.01
	(−2.33)	(−0.82)	(−1.36)	(−0.36)		(0.05)
STR_INV	−2.07***	−2.03***	−2.52***	−1.86***	***STR_INV***	−2.00***
	(−13.30)	(−13.39)	(−18.87)	(−9.65)		(−9.83)
CASH	1.04***	0.95***	2.21***	0.55**	***CASH2***	0.01
	(5.02)	(4.54)	(8.18)	(2.49)		(−0.39)
CONS	−5.53***	−5.69***	−6.54***	0.00	***CONS***	3.53
	(−8.51)	(−9.53)	(−16.02)	(−3.39)		(2.22)

Tab. 6: Robustness checks – Part 2

Dependent	Panel A				Dependent	Panel B
	Model 1	Model 2	Model 3	Model 4		Model 5
	LIQ	*LIQ*	*LIQ*	*LIQ*		*LIQ*
Firm FE	No	No	No	Yes	**Firm FE**	Yes
Year FE	Yes	Yes	No	Yes	**Year FE**	Yes
Country FE	Yes	No	No	No	**Country FE**	No
Industry FE	No	Yes	No	No	**Industry FE**	No
Observations	12,052	12,052	12,052	11,634	**Observations**	11,989
Wald chi²	2.33E+16	6,422.16			**Wald chi²**	
F			870.23	178.42	***F***	160.49
Adj. R^2	0.75	0.75	0.71	0.73	**Adj. R^2**	0.63

Source: own

variables instead of the ones used in baseline regression. Profitability was measured by return on average total assets (ROA2) instead of EBITDA over total assets (ROA). Leverage was calculated by total liabilities over total assets (LEV2) instead of total debt over total assets (LEV). Size was proxied by the natural logarithm of sales (SIZE2) instead of the natural logarithm of total assets (SIZE), and cash intensity was measured by the current ratio (CASH2) instead of cash and short-term investments over total assets. Tab. 6 shows the results of alternative models. The positive and significant effect of ESG on stock liquidity did not change.

3.4 Discussion

Our findings confirm the general consensus in the literature that ESG performance enhances stock liquidity. Similar to Aboud and Diab (2019), R. Chen et al. (2023), He et al. (2023), and Meng-tao et al. (2023), we find a positive and statistically significant relationship between ESG scores and stock liquidity. These studies argue that ESG activities reduce information asymmetry, improve corporate transparency, and attract institutional investors; the findings are also supported by our empirical results.

Our results closely align with R. Chen et al. (2023), who found that ESG performance increases liquidity by lowering agency costs and enhancing corporate reputation. Likewise, Wang et al. (2023) and Zhang et al. (2024) emphasized ESG's role in risk reduction and investor confidence, consistent with our finding that environmental disclosures, in particular, are positively associated with stock liquidity. Our baseline results, backed by robust tests support the notion that ESG activities are not merely ethical commitments but financially material signals that have influence on market efficiency. First, ESG disclosure (especially the governance pillar) can act as a mechanism to enhance the mitigation of some parts of the agency costs (e.g., monitoring costs) defined by Jensen and Meckling (1976). Second, as proposed by the information asymmetry theory, increased public information (hence reduced information asymmetry) can attract large investors because of increased liquidity of the securities (Diamond & Verrecchia, 1991). ESG disclosures can enhance transparency by reducing hidden information and consequently enhance stock liquidity. Firms that voluntarily communicate non-financial performance allow investors to evaluate management of the company beyond traditional financial indicators. This can decrease the uncertainty about firm value and facilitate the trading of the stocks. Third, high ESG scores (or even having ESG scores alone) can serve as credible market signals of management quality as implied by the signaling theory (Certo, 2003; Spence, 1973). Investors can interpret high ESG scores as indicators of sound internal governance, which strengthens confidence and fosters active trading. Last but not least, the

rapidly growing body of theoretical and empirical research on social preferences of investors (e.g., Bauer et al., 2021; Riedl & Smeets, 2017) also suggests that high ESG scores attract sustainability-oriented investors and hence directly enhance stock liquidity.

However, our study diverges from prior research in the relative importance of ESG subdimensions. While Meng-tao et al. (2023) identified governance as the most influential and environmental as the least impactful ESG dimension, our results reveal the opposite: the environmental component exerts the strongest impact, followed by governance and social dimensions. This pattern can be conceptually explained by differences in visibility, measurability, and investor salience. Environmental performance, such as emissions reduction, resource efficiency, and renewable energy use, provides quantifiable and externally verifiable information that sends strong signals of regulatory compliance and operational efficiency. In the European context, where the EU Green Deal and carbon neutrality targets dominate policy discourse, environmental achievements have become particularly salient to investors. In contrast, social performance (e.g., employee welfare or community engagement) often yields longer-term reputational benefits that are less immediately priced by capital markets. This discrepancy may also reflect regional differences in investor priorities. In the European context, especially Northern and Western regions, climate-related issues are more deeply embedded in policy and investment practices, potentially increasing the importance of environmental disclosures.

Our regional analysis adds an important nuance not widely covered in earlier studies. While prior works such as Subramaniam et al. (2016) and Wong and Zhang (2021) provide evidence of a uniform positive relationship between ESG and liquidity, our study highlights that this relationship is not homogeneous across Europe. Specifically, we found that ESG scores are significantly associated with stock liquidity in Northern and Western Europe, but this association is not statistically significant in Southern and Eastern Europe. This regional disparity has not been thoroughly addressed in previous literature, representing a key contribution of our work. Apart from the sample selection constraints this divergence can be better understood and further explored from the viewpoints of some theories. This phenomenon can be explained by varieties of capitalism literature stating that coordination of firms' activities and firms' responses to other actors differ across liberal market economies, coordinated market economies (Hall & Soskice, 2003) and mixed market economies (Hassel, 2014). Institutional complementarities in different European countries, which shape varieties of capitalism across European countries, can also help to understand this divergence (Hall & Soskice, 2003). Organizational legitimacy framework (Suchman, 1995) can also provide an alternative explanation for why sustainability related issues are not equally rewarded in different European stock markets in Northern and Western Europe awareness about sustainability issues can be higher and sustainability regulations such as the EU Non-Financial Reporting Directive (2014/95/EU) and the Sustainable Finance Disclosure Regulation (2021) (European Parliament and Council of the European Union, 2014, 2021) can be more deeply adopted and institutionalized. This can trigger normative pressures for enhanced ESG practices. As a result, firms in these regions experience stronger legitimacy gains and market trust when they perform well on ESG metrics. In contrast, the social and regulatory expectations around sustainability can be weaker in Southern and Eastern Europe; therefore, ESG performance provides a less potent legitimacy signal to investors. Lower enforcement of disclosure standards and smaller sustainability-oriented investor bases reduce the informational and signaling value of ESG data. Consequently, an equivalent improvement in ESG performance leads to a more muted investor response and generates weaker liquidity effects.

While Fatemi et al. (2018) and Saygili et al. (2022) raised concerns about negative or ambiguous ESG effects, our results do not support this view. All three ESG dimensions show positive and significant associations with liquidity. Furthermore, in contrast to Capelle-Blancard and Petit (2019), who reported that markets penalize poor ESG performance but do not reward strong performance, our findings show that high ESG scores are positively recognized, particularly in developed regions.

In summary, our study confirms the positive impact of ESG performance on stock liquidity, while also contributing new evidence of regional disparities and a greater emphasis on environmental factors within European markets.

Conclusions

In this study, the impact of corporate ESG performance on stock liquidity is examined. Our research findings show that this effect is positive, that is, to the extent that firms' ESG performance increases, their performance in capital markets and stock liquidity also increases. The mechanism of this relationship can be briefly summarized as follows. As ESG performance increases, there will likely be a decrease in information asymmetry and corporate risks and an increase in corporate reputation. In addition, institutional investors' investment preferences in favor of high-scored firms result in both these investors carrying out large transaction volumes and individual investors perceiving these transactions as signals and directing their investments to these firms.

The result indicating that the association of ESG performance and stock liquidity differs across European regions is one of the interesting findings of this research, which needs further attention by future studies. Our results show that investors in Eastern and Southern Europe do not attach as much importance to sustainability issues as those in Western and Northern Europe. The fact that Western and Northern European countries have larger economies compared to Eastern and Southern European ones causes the GDP per capita and per capita income to be higher in the West and North (Eurostat, 2023). This situation may result in investors, whether they have environmentally friendly attitudes and values or care deeply about human rights and social equality, directing their relatively limited savings to investment instruments focused on profit maximization, instead of environmentally friendly or socially responsible financial products. There are also differences across Europe in terms of government initiatives supporting sustainable investments. While countries that share the characteristics of the Scandinavian socio-economic model (Denmark, Finland, the Netherlands, and Sweden) and countries with the Anglo-Saxon socio-economic model (England and Ireland) are much more mature in sustainable investing, Mediterranean and Transition countries are further behind in this regard. Our results support the findings of Steurer et al. (2008), which indicate that there is a West-East divide as well as a North-South divide in terms of ESG policies in Europe.

Putting this discrepancy aside, our findings show that investor behavior, which in the past was largely focused on profitability, has transformed and is influenced by the activities carried out by companies in the environmental and social fields and good governance practices. Investors today prefer more sustainable companies in the context of nature protection, social justice, and good governance.

Additionally, our findings show that firms that incorporate ESG into their processes can improve their reputation, reduce their risks, and potentially attract more investors. Investors, as critical stakeholders, have a significant impact on the strategies firms implement and the decisions they make. In this context, investors' support and trust in ESG legitimizes firms' ESG practices. Ignoring sustainability and ESG, which have become one of the most important strategies of all modern organizations around the world in order to maintain competitiveness and long-term success, would be a big strategic mistake.

Like any study, this research has its limitations. Among various ESG information providers, such as Bloomberg, MSCI/KLD, Fortune, and the Dow Jones Sustainability Indices (DJSI), we relied on ESG scores from Refinitiv Eikon due to data availability. Future studies could expand the sample by incorporating these additional ESG sources. Another limitation stems from the regional imbalance in company representation; our conclusion – that investors in Western and Northern Europe prioritize sustainability more than their counterparts in Eastern and Southern Europe – is based on an uneven distribution of companies across these regions. The unequal representation of regions weakens the generalizability of the results. Expanding the sample to include more companies from Eastern and Southern Europe could help address this issue. Besides, the regional differences deserve further research of the relationship between ESG performance and stock liquidity in the context of economic development, cultural structure and government initiatives. Another economic and methodological limitation of our analysis lies in the potential presence of reverse causality between ESG performance and stock liquidity. Firms with higher stock liquidity may have greater visibility and better images in capital markets, which can motivate enhanced ESG practices and disclosure. More liquid stocks are more likely to be traded and

held heavily by institutional investors and are more likely to face closer public scrutiny, which would also enhance ESG practices by these firms. Thus, the positive association observed between ESG scores and stock liquidity may partially reflect a bidirectional relationship rather than a purely causal effect from ESG to liquidity. While firm and year fixed effects were included in our models to account for unobserved heterogeneity, the reverse causality could not be ruled out in our baseline regressions. Although the lagging independent and leading dependent variable in the robustness tests were attempts to mitigate the endogeneity problems (including reverse causality), future research could address this issue by employing more specific tests and methods to more robustly identify the causal direction. Last but not least, the relationship between ESG performance and stock liquidity is an area open to further investigation. The dependent variable of this study, stock liquidity, was proxied by the illiquidity measure of Amihud (2002). Alternative measures of stock liquidity can be used by future research to test the proposed relationships.

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Tab. A1: Distribution of observations among countries and industries

Panel A

	Basic materials	Consumer cyclicals	consumer non-cyclicals	Energy	Healthcare	Industrials	Real estate	Technology	Utilities	Total
Austria	5			20		61	29		4	**119**
Belgium	56	25	18	23	59	46	35	56	15	**333**
Czech Republic									15	**15**
Denmark	43	39	48	28	98	130		39	7	**432**
Finland	91	104	51	17	22	144	11	76	17	**533**
France	90	427	125	67	114	409	102	172	34	**1,540**
Germany	233	218	50	18	155	291	72	288	54	**1,379**
Greece	2	17	4	37		79	4	19	33	**195**
Hungary		3	4	14	10			14		**45**
Iceland			5	2		6		3		**16**
Ireland; Rep.	11	30	35		4		5		2	**87**
Italy	23	132	22	72	28	127	4	65	109	**582**
Luxembourg		6								**6**
Netherlands	89	15	38	59	25	89	29	63		**407**
Norway	70	46	67	158		79	12	52	9	**493**
Poland	40	3	33	28		28	11	47	46	**236**
Portugal	21		38	15		9		32	37	**152**
Romania		1		5	1				1	**8**
Slovenia					4			1		**5**
Spain	48	74	31	34	52	139	34	53	62	**527**
Sweden	164	186	48	20	123	358	109	249	22	**1,279**
Switzerland	123	103	60		92	218	72	145	10	**823**
United Kingdom	369	752	197	168	180	703	229	186	56	**2,840**
Total	**1,478**	**2,181**	**874**	**785**	**967**	**2,916**	**758**	**1,560**	**533**	**12,052**

Panel B

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Eastern							1	7	10	16	16	19	19	20	20	21	22	29	31	35	38	**304**
Northern	39	61	90	128	139	148	156	169	174	179	190	193	202	224	246	263	360	453	674	790	802	**5,680**
Southern	7	19	20	24	31	37	44	46	48	51	54	55	55	61	62	72	104	144	152	183	192	**1,461**
Western	45	67	70	98	113	122	140	151	155	168	173	181	188	199	200	218	327	416	479	542	555	**4,607**
Total	**91**	**147**	**180**	**250**	**283**	**307**	**341**	**373**	**387**	**414**	**433**	**448**	**464**	**504**	**528**	**574**	**813**	**1,042**	**1,336**	**1,550**	**1,587**	**12,052**

Source: own