

ESG ratings inconsistency and its effects on information in capital market

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ESG ratings inconsistency and its effects on information in capital market

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Abstract

Purpose – This study explores how inconsistency in environmental, social and governance (ESG) ratings affects the information environment of publicly traded companies in emerging markets.

Design/methodology/approach – Drawing on data from six ESG rating agencies covering listed Chinese firms from 2010 to 2022, we construct measures of pairwise ESG rating divergence and average them across 15 unique rater pairs. We then employ a battery of econometric methods to examine how inconsistencies in ESG ratings affect stock return synchronicity in the Chinese capital market.

Findings – Our findings indicate that greater ESG rating divergence correlates with increased stock return synchronicity, suggesting a decline in the dissemination of firm-specific information. Supporting evidence for this relationship includes reduced private information flow, heightened opportunistic executive sales and decreased stock turnover for firms associated with higher ESG rating divergence. Our analysis suggests that such divergence hinders informed trading by institutional investors and the effect is more pronounced for firms with lower transparency, such as those with fewer analysts, limited investor oversight and sparse ESG disclosure, as well as for firms in non-polluting industries. These findings emphasize that ESG rating divergence exacerbates uncertainty about firms' future performance, discourages informed trading and ultimately restricts the integration of firm-specific information into stock prices.

Originality/value – This study adds to the literature on ESG ratings and market efficiency by highlighting the importance of standardizing rating methodologies and improving corporate disclosure to counteract the adverse impacts of rating divergence.

Keywords ESG rating inconsistency, Uncertainty, Firm information environment

Paper type Research article

1. Introduction

Environmental, social and governance (ESG) performance has gained significant attention across global capital markets for use in assessing long-term risks and opportunities that traditional financial metrics might miss, as well as for supporting the growth of sustainable investment strategies (Dhaliwal, Li, Tsang, & Yang, 2011; Dhaliwal, Radhakrishnan, Tsang, & Yang, 2012; Clarkson, Fang, Li, & Richardson, 2013; Griffin & Sun, 2013) [1]. ESG ratings also assist in evaluating firms' responsible investment and sustainability practices (Amel-Zadeh, 2018; Chava, 2014). However, different rating agencies use different methodologies, scopes and priorities (Chatterji, Durand, Levine, & Touboul, 2016; Berg, Koelbel, & Rigobon,

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2022). This inconsistency creates divergence in their subsequent ratings, even for the same firm, which can increase risk, return volatility and price movements while also reducing the likelihood of firms issuing external financing, all of which reduce overall demand for equities (Gibson Brandon, Krueger, & Schmidt, 2021; Avramov, Cheng, Lioui, & Tarelli, 2022; Christensen, Serafeim, & Sikochi, 2022). In addition to these negative effects on sustainable investing, variability in ESG ratings also may have broader, as yet unclear implications for information flow in capital markets.

This lack of standardization in ESG ratings raises a critical question for investors and regulators: Does the disparity contribute to market inefficiencies or could it enhance the flow of firm-specific information? On the one hand, divergent ESG ratings could increase uncertainty, especially in markets where ESG frameworks are not yet fully standardized (Gibson Brandon *et al.*, 2021; Avramov *et al.*, 2022; Christensen *et al.*, 2022). Such uncertainty or information confusion, may influence how investors process firm-specific information (Hirshleifer & Teoh, 2003; Zhang, 2006) and cause ambiguity aversion (Caskey, 2008). For example, they may find it challenging to identify reliable firm data, leading them to underreact to firm-specific information, which in turn leads to decreased trading activity based on company fundamentals. These ambiguity-averse investors instead opt for trades based on aggregate market signals or broad economic indicators. As informed trading diminishes, the diversity of ESG ratings might paradoxically hinder rather than facilitate dissemination of meaningful information, leading to broader market trends overshadowing individual firm characteristics. This phenomenon is the essence of the *divergence-induced uncertainty view*.

On the other hand, diversity in ESG ratings can provide a comprehensive view of firm performance by highlighting various aspects of its ESG activities (Berg *et al.*, 2022) and by offering investors a wider range of perspectives. The additional data thus offers more informed trading and better incorporation of firm-specific information into stock prices. It also stimulates further inquiry and informed decision making as investors seek to reconcile differing viewpoints (Rahi & Zigrand, 2018; Rahi, 2021). In theory, such diversity should enhance the flow of firm-specific information, making markets more efficient. This perspective is the foundation of the *divergence-induced diversity view*.

To explore these competing views, this study investigates how inconsistency in various ESG ratings for the same firm affects the incorporation of firm-specific information into stock prices. Although this issue is globally relevant, the specific context of China's capital markets provides a unique and insightful case for analysis. In recent years, China has experienced a surge in ESG rating activities by both domestic and international agencies, leading to substantial inconsistency in its third-party ESG assessments (Chen & Xie, 2022; Liu, Dai, Dong, & Liu, 2024). As an emerging market, China presents distinct challenges and opportunities for understanding how disagreement across these ESG ratings impacts market behaviour, particularly in an environment where ESG integration is still evolving (Johnson, Boone, Breach, & Friedman, 2000; Chari & Blair Henry, 2008). Additionally, previous literature documents that less firm-specific information is produced in emerging markets (Morck, Yeung, & Yu, 2000), which has been shown to adversely affect the capital market's resource allocation capabilities (Morck *et al.*, 2000; Wurgler, 2000; Jin & Myers, 2006; Gul, Kim, & Qiu, 2010). Therefore, China's market context, with its rapid ESG development and ongoing efforts to improve information dissemination, provides a relevant and timely setting for examining the broader effects of ESG rating misalignment on market efficiency.

Our analysis leverages 22,384 firm-year observations from 4,343 unique listed firms in China's stock markets between 2010 and 2022. We measure ESG rating divergence using the standard deviation of ESG ratings across six major rating agencies in China: SustainWave, SynTao Green Finance, Russell, Bloomberg, Huazheng, and Wind. To evaluate how well stock prices incorporate firm-specific information, we use stock price synchronicity, a widely recognized indicator in the literature (Morck *et al.*, 2000; Jin & Myers, 2006; Fernandes & Ferreira, 2008; Hutton, Marcus, & Tehranian, 2009; Dang, Moshirian, & Zhang, 2015, among others). If ESG rating divergence induces uncertainty, as suggested by the divergence-induced

uncertainty view, we would expect higher synchronicity. Conversely, if it leads to enhanced information diversity, we might anticipate lower synchronicity as more firm-specific information becomes integrated into the stock price, supporting the divergence-induced diversity view.

Consistent with divergence-induced uncertainty, our benchmark and regression analyses reveal a significant positive relationship between ESG rating uncertainty and stock price synchronicity. Several robustness tests confirm this result, including the use of alternative proxies for ESG rating divergence and synchronicity, firm and province fixed effects regressions, instrumental variable (IV) two-stage least squares (2SLS) regressions, and propensity score matching methods. Our mechanism test shows that higher divergence reduces informed trading by institutional investors. We observe lower private information flow, higher opportunistic executive selling and lower stock turnover among firms with higher ESG rating divergence, indicating decreased firm information dissemination in the capital market. Further analysis also demonstrates that this relationship is more pronounced for companies with less analyst coverage, less investor investigation, and less ESG self-disclosure – all of which are associated with lower transparency. Finally, we find that this relationship is more significant for firms in non-polluting industries, where ESG ratings may have a stronger influence on investor perceptions.

This study contributes to several strands of literature. First, we build on the extensive research examining the information environment of listed firms, including the capital market effects of media (Fang & Peress, 2009; Kothari, Li, & Short, 2009; Bushee, Core, Guay, & Hamm, 2010; Drake, Thornock, & Twedt, 2017; Feng & Johansson, 2019), professional reports (Drake, Guest, & Twedt, 2014; Dai, Parwada, & Zhang, 2015) and ESG disclosure (Boulton, 2024; Ruan, Li, & Huang, 2024). Our study adds to this body of work by showing that disagreement across ESG ratings, as a non-financial information friction, impairs the incorporation of firm-specific information into stock prices. In doing so, we position ESG rating divergence as a novel determinant of the information environment, complementing prior findings on return synchronicity (Morck *et al.*, 2000) and informed trading (Piotroski & Roulstone, 2004).

Second, we extend the understanding of ESG rating divergence, which has primarily been studied in terms of risk and investor behavior (Gibson Brandon *et al.*, 2021; Avramov *et al.*, 2022; Christensen *et al.*, 2022). By focusing on how this divergence affects the flow of firm-specific information in emerging markets like China, we highlight that it not only influences financing outcomes but also reshapes how information is disseminated in capital markets. This discussion expands the ESG rating divergence literature (Berg *et al.*, 2022; Avramov *et al.*, 2022) by linking it to information efficiency and market microstructure.

Finally, we advance the literature on the interaction between non-financial information and informed trading (Brown, 2011; Hanley, 2010). We provide evidence that ESG rating divergence discourages institutional investors from engaging in informed trading, thereby reducing the transmission of firm-specific information and increasing return synchronicity. Identifying institutional trading as a key mechanism links the ESG rating divergence literature to the information environment literature (Morck *et al.*, 2000; Piotroski & Roulstone, 2004) and underscores the role of institutional investors in mediating the informational consequences of ESG rating disagreement.

The rest of the study is organized as follows. Section 2 introduces the divergence of ESG ratings and develops the hypotheses. Section 3 reports the empirical results, including the data and methodology, baseline findings, mechanism analysis and heterogeneity tests. Section 4 concludes the study.

2. Literature and hypothesis

2.1 Literature review on ESG rating divergence

The global financial market has experienced significant growth in sustainable investing, where ESG factors play a central role in investment decisions (Hartzmark & Sussman, 2019; Avramov *et al.*, 2022). As a result, investors want detailed information on firms' ESG

performance and rely heavily on ESG rating providers to evaluate relevant corporate practices (Berg *et al.*, 2022; Boulton, 2024). These rating agencies use various metrics and methodologies to meet the capital market's increasing demand for ESG data and sustainable investment choices (Christensen *et al.*, 2022). Ideally, competition among rating agencies and the drive for reputational enhancement should motivate these agencies to produce high-quality ESG ratings that add real value to the market (Tsang, Frost, & Cao, 2023). However, as dependence on these ratings has intensified, so too have concerns regarding their consistency and reliability.

A major issue is the divergence in ratings from different agencies for the same firm. For example, in 2018, Tesla was rated highly by MSCI for its environmental practices, whereas FTSE gave the company a much lower rating on the same criteria (Mackintosh, 2018). Such inconsistencies have been observed across various industries, drawing attention from news outlets, policy-oriented think tanks and industry publications (Doyle, 2018; Wigglesworth, 2018; Matos, 2020). The issue is sufficiently widespread that Berg *et al.* (2022) have categorized the divergences into three interrelated types: scope, measurement and weight. Although the underlying reasons are unclear, Chatterji *et al.* (2016) highlight differences in theorization and low commensurability as key contributors to the inconsistency.

ESG rating divergence can have a significant impact on the capital market. The uncertainty it creates diminishes the ratings' effectiveness in investment guidance. For example, Gibson Brandon *et al.* (2021) find that ESG rating disagreement is linked to higher stock returns, suggesting a risk premium driven by rating uncertainty. ESG rating divergence also negatively affects investor preference (Dimson, Marsh, & Staunton, 2020; Billio, Costola, Hristova, Latino, & Pelizzon, 2021), leading to more cautious selection of ESG data providers, and it can hinder market reactions to ESG news and reduce the predictive power of ESG consensus (Serafeim & Yoon, 2022). In examining the asset pricing and portfolio implications of ESG uncertainty, Avramov *et al.* (2022) show that higher market premiums and reduced stock demand accompany ESG rating uncertainty, alongside increases in the capital asset pricing model alpha and effective beta. Zhou, Lei, and Yu (2024) find that ESG rating divergence may affect a firm's green innovation strategy. Liu *et al.* (2024) show that greater ESG rating disagreement is associated with higher forecast errors and greater dispersion among analysts.

Substantial research has focused on how ESG rating divergence affects investors, analysts and firm managers. Less attention has been paid to its impact on information flow in capital markets. Previous studies suggest that a firm's ESG performance, as a form of non-financial information, can enhance transparency and provide valuable insights to financial markets (Dhaliwal *et al.*, 2011; El Ghoul, Guedhami, Kwok, & Mishra, 2011; Cui, Jo, & Na, 2012; Boulton, 2024; Ruan *et al.*, 2024). However, given that ESG rating agencies are the primary sources of ESG information for investors (Chelli & Gendron, 2013), disagreement among these agencies can disrupt the flow of information, potentially leading to mispricing and inefficiencies in the market.

2.2 Hypothesis development

The divergence-induced uncertainty view argues that discrepancies in ESG ratings increase firm-level uncertainty, which can disrupt the flow of firm-specific information in the market. This view is grounded in the concept of information uncertainty and its implications for investor behavior. ESG rating divergence increases information uncertainty, which refers to ambiguity in firm performance arising from both volatility in firm fundamentals and poor information quality (Zhang, 2006; Jiang, Lee, & Zhang, 2005). This concept reflects the difficulty in estimating firm value, even for well-informed investors. ESG rating divergence can further complicate this task, especially if the ratings are based on incomplete or opaque data or non-standardized methodologies (Avramov *et al.*, 2022).

Uncertain environments can provoke two key behavioral responses from investors: underreaction to firm-specific information and ambiguity aversion, both of which deter firm

information flow. [Hirshleifer and Teoh \(2003\)](#) suggest that increased uncertainty and insufficient feedback on stock fundamentals allow psychological biases to influence decision making. [Zhang \(2006\)](#) shows that investors are more likely to underreact to public information as information uncertainty increases. In the context of ESG rating divergence, conflicting information about a firm's ESG profile may cause investors to become less responsive to company-specific developments because they find it challenging to distinguish between reliable data and noise. This uncertainty reduces their willingness to incorporate firm-specific information into their trading decisions, leading to less trading activity based on company fundamentals.

Ambiguity aversion refers to the tendency of investors to avoid stocks with high levels of uncertainty. As demonstrated by [Caskey \(2008\)](#), when investors face uncertain or unclear information – such as conflicting signals about a firm's ESG performance – they may prefer to base their trades on aggregate signals (e.g. overall market trends or broad economic indicators), rather than on ambiguous firm-specific information. Similarly, [Epstein and Schneider \(2008\)](#) show that when information is less reliable – such as in the case of ESG rating divergence – investors are more likely to avoid firm-specific information and instead gravitate toward safer investments, further reducing the flow of firm-specific information into stock prices. [Dimmock, Kouwenberg, Mitchell, and Peijnenburg \(2016\)](#) demonstrated that ambiguity-averse individuals are less likely to invest in assets with uncertain outcomes, which also reduces the incorporation of firm-specific information into asset prices.

When ESG rating divergence causes investors to deemphasize firm-specific news and avoid ambiguity, informed trading decreases. Stock prices then are less likely to reflect individual company characteristics and more likely to be synchronized with broader market movements, ultimately leading to higher stock price synchronicity. We thus propose the following hypothesis:

- H1a.* (Divergence-induced uncertainty view): ESG rating divergence increases information uncertainty, thereby reducing the amount of firm-specific information available in the market.

In contrast, the divergence-enhanced diversity view suggests that ESG rating divergence can provide more insights to the market and promote the dissemination of firm information. First, ESG rating divergence stems from different rating agencies evaluating corporate ESG performance through distinct lenses and methodologies ([Berg et al., 2022](#)). For example, each agency may focus on different aspects of a firm's ESG practices, reflecting their unique interpretations and analytical approaches. This diversity adds depth to the information available in the market, providing investors with a broader and more nuanced understanding of a firm's ESG performance. As a result, investors can make more rational and informed judgments based on multiple perspectives, rather than relying on a single, potentially biased view.

Second, ESG rating divergence, as firm-level unconfirmed information, may trigger more investigation into a firm's specific information. According to [Rahi and Zigrand \(2018\)](#) and [Rahi \(2021\)](#), when there is more disagreement (i.e. diversity in opinions or valuations), agents may be more motivated to acquire additional private information to better understand the underlying asset value, thereby improving the accuracy of their assessments. By seeking out additional data, investors are likely to uncover more firm-specific information, which aligns with the principles of Bayesian updating ([Kandel & Stambaugh, 1996](#); [Pastor & Veronesi, 2009](#)). This enhanced information gathering and analysis facilitates incorporation of firm-specific information into stock prices, thereby reducing stock price synchronicity ([Morck et al., 2000](#); [Durnev, Morck, Yeung, & Zarowin, 2003](#)). Based on this reasoning, we propose the following alternative hypothesis:

- H1b.* (Divergence-enhanced diversity view): ESG rating divergence enhances informational diversity by providing heterogeneous perspectives on firms' ESG performance, thereby enriching the amount of firm-specific information available in the market.

3. Results

3.1 Data and sample construction

Our sample comprises all Chinese listed firms from 2010 to 2022, with ESG divergence ratings covering 2009–2021. We exclude firms with fewer than 30 trading weeks in a given year, those in financial sectors, and those with missing variables. The final sample comprises 22,384 firm-year observations across 4,343 unique firms. Financial data for the listed companies were sourced from the China security market and accounting research (CSMAR) database. All continuous variables were winsorized at the 1% and 99% level.

3.1.1 ESG rating divergence measure. Following [Avramov et al. \(2022\)](#), we focus on pairwise ESG rating divergence and then average the results across 15 rater pairs from six data providers (SusallWave, SynTao Green Finance, Russell, Bloomberg, Huazheng and Wind) focusing on Chinese listed companies. [Appendix B](#) provides detailed information on the coverage periods for each rating agency. For each rater pair and year, stocks covered by both are ranked based on each rater's original ranking. A normalized percentile rank (between zero and one) is assigned to each stock-rater pair. The rating divergence for each stock is then determined by calculating the standard deviation of the rankings assigned by each rater. Firm-level ESG rating divergence is computed as the average rating difference across all rater pairs.

3.1.2 Firm-specific informativeness measure. Following [Durnev, Morck, and Yeung \(2004\)](#), [Gul et al. \(2010\)](#), [An and Zhang \(2013\)](#) and [Xu, Jiang, Chan, and Yi \(2013\)](#), we apply the market model to measure stock price synchronicity in relation to information flow in the capital market. This model enables us to break down return variation into market-wide and firm-specific components. Specifically, we compute stock return synchronicity using the R^2 from the following expanded index model:

$$Ret_{i,t} = \alpha + \beta_{m,t}Ret_{m,t} + \beta_{Ind,t}Ret_{Ind,t} + \varepsilon_{i,t} \quad (1)$$

where $Ret_{i,t}$ is the return of stock i in week t . $Ret_{m,t}$ is the market return in week t , calculated as the weekly tradable market value-weighted returns of all Chinese listed firms. $Ret_{Ind,t}$ is the industry return in week t . As R^2 is bounded between zero and one, we follow [Morck et al. \(2000\)](#) and use the natural logistic transformation to define stock return synchronicity (Syn) as

$$Syn = \ln\left(\frac{R^2}{1 - R^2}\right) \quad (2)$$

As noted by [Roll \(1988\)](#), when stock price variation is driven primarily by market-wide news, the changes are largely explained by variables in the market model, resulting in a relatively high R^2 . Consequently, a high Syn value indicates that less firm-specific information is reflected in the stock price ([Morck et al., 2000](#)) and vice versa.

3.1.3 Control variables. We control for a battery of firm- and industry-level characteristics that are likely to affect the firm information environment. Firm-level characteristics include: *Size*, which is the natural logarithm of total assets of firm i at the end of year $t - 1$; *Lev*, calculated as the ratio of total liabilities to total assets for firm i at the end of year $t - 1$; *ROE*, return on equity, defined as net profits divided by total equity for firm i at the end of year $t - 1$; *Volume*, the natural logarithm of shares trading volume for firm i at year t ; *Volatility*, the standard deviation of stock returns for firm i at year t ; *Top1*, the shareholding ratio of the largest shareholder for firm i at the end of year $t - 1$; *INST*, the proportion of institutional shareholdings, calculated as the total shares held by institutional investors divided by outstanding shares of firm i at the end of year $t - 1$; and *SOE*, a dummy variable that equals one if the firm is state-controlled and zero otherwise. We also control for industry competition, captured by *HHI*, the Herfindahl-Hirschman Index. Details of the variable definition are provided in [Appendix A](#).

[Table 1](#) presents summary statistics for the key variables in our investigated sample. The mean and median of R^2 are 0.362 and 0.353, respectively. The descriptive value is

Table 1. Summary statistics

Variables	Obs	Mean	SD	P25	Median	P75
<i>R2</i>	22,384	0.362	0.196	0.207	0.353	0.510
<i>Syn</i>	22,384	−0.740	1.137	−1.344	−0.608	0.039
<i>Divergence</i>	22,384	0.193	0.134	0.088	0.171	0.271
<i>Size</i>	22,384	22.520	1.376	21.545	22.347	23.318
<i>Lev</i>	22,384	0.443	0.206	0.283	0.439	0.595
<i>ROE</i>	22,384	0.031	1.522	0.025	0.073	0.129
<i>Top1</i>	22,384	0.348	0.154	0.228	0.324	0.452
<i>INST</i>	22,384	0.417	0.242	0.221	0.425	0.607
<i>Volatility</i>	22,384	0.436	0.211	0.302	0.395	0.517
<i>Volume</i>	22,384	21.489	1.089	20.748	21.510	22.243
<i>HHI</i>	22,384	0.094	0.101	0.032	0.065	0.115
<i>SOE</i>	22,384	0.378	0.485	0.000	0.000	1.000

Note(s): This table presents the summary statistics for the main variables in this study. The sample contains 4,343 firms over 2010–2022. All continuous variables are winsorized at the 1st and 99th percentiles. See [Appendix A](#) for variable definitions

Source(s): Authors' own work

comparable with previous studies (e.g. [Feng & Johansson, 2019](#); [Dang, Dang, Hoang, Nguyen, & Phan, 2020](#)) and is larger than studies focusing on US markets, such as [Dang et al. \(2020\)](#), with a mean value of 0.24 for R^2 . The mean *Syn* in our sample is −0.740, which is larger than that (−1.755) in the US sample of [Dang et al. \(2020\)](#). Our result is in line with that of [Morck et al. \(2000\)](#), who found that the level of synchronicity is higher in emerging markets than in developed markets. The standard deviation of *Syn* (1.137) exceeds its mean, indicating significant variation in the flow of firm-specific information into the stock market among firms in our sample. [Table 1](#) also shows that the mean and median of *Divergence* are 0.193 and 0.171, respectively, comparable with those in the US sample of [Avramov et al. \(2022\)](#).

[Table 2](#) presents the correlations between our major variables. The upper triangle shows the Pearson correlation coefficients and the lower triangle shows the Spearman correlation coefficients. Consistent with our expectations, the Pearson correlation shows that *Syn* is positively related to *Divergence*, in line with our [Hypothesis 1a](#). The similar magnitude in the Spearman correlation suggests that the relationship between *Divergence* and *Syn* is consistent across both linear and rank-based analyses.

3.2 Baseline results

3.2.1 Univariate tests. We start our analysis of the connection between ESG rating divergence and stock return synchronicity by reviewing R^2 and *Syn* values for firms with varying levels of ESG rating divergence. The high divergence group includes firms with ESG rating divergence above the sample mean, with the remaining firms in the low divergence group. Panel A of [Table 3](#) shows the mean values and *t*-tests between the high and low divergence groups. The results indicate that firms with higher ESG rating divergence exhibit significantly lower R^2 and *Syn* values. Although preliminary, these findings suggest that more substantial ESG rating divergence correlates with less firm-specific information being reflected in stock prices.

3.2.2 Regression analysis. Univariate comparisons may be influenced by observed bias stemming from differences in sample characteristics, potentially affecting the results. To address this bias, we construct the following model:

Table 2. Correlation matrix

	<i>Syn</i>	<i>Divergence</i>	<i>Size</i>	<i>Lev</i>	<i>ROE</i>	<i>Top1</i>	<i>INST</i>	<i>Volatility</i>	<i>Volume</i>	<i>HHI</i>	<i>SOE</i>
<i>Syn</i>	1	0.052***	0.288***	0.085***	0.055***	0.102***	0.153***	−0.171***	0.117***	0.062***	0.231***
<i>Divergence</i>	0.056***	1	0.045***	−0.003	0.026***	0.038***	0.020***	−0.026***	−0.003	−0.006	0.022***
<i>Size</i>	0.284***	0.011	1	0.498***	0.092***	0.203***	0.455***	−0.207***	0.531***	0.193***	0.374***
<i>Lev</i>	0.068***	−0.007	0.479***	1	−0.070***	0.054***	0.194***	−0.018***	0.297***	0.183***	0.260***
<i>ROE</i>	0.027***	0.011*	0.011*	−0.058***	1	0.155***	0.170***	−0.037***	−0.129***	−0.033***	−0.027***
<i>Top1</i>	0.107***	0.037***	0.240***	0.057***	0.026***	1	0.407***	−0.108***	−0.123***	0.175***	0.290***
<i>INST</i>	0.147***	−0.001	0.456***	0.189***	0.022***	0.397***	1	−0.129***	0.098***	0.167***	0.393***
<i>Volatility</i>	−0.198***	−0.018***	−0.179***	−0.000	−0.007	−0.085***	−0.111***	1	0.183***	−0.069***	−0.154***
<i>Volume</i>	0.108***	−0.018***	0.545***	0.303***	−0.017**	−0.104***	0.109***	0.182***	1	0.109***	0.184***
<i>HHI</i>	0.026***	−0.010	0.126***	0.076***	−0.002	0.109***	0.104***	−0.044***	0.087***	1	0.219***
<i>SOE</i>	0.219***	0.015**	0.372***	0.257***	0.008	0.290***	0.391***	−0.117***	0.192***	0.163***	1

Note(s): This table displays the correlation matrix for the primary variables used in this study. The Pearson correlation coefficients are shown in the upper triangle, and the Spearman correlation coefficients are presented in the lower triangle. See [Appendix A](#) for variable definitions. Significance levels are indicated by ***, ** and * for the 1%, 5% and 10% levels, respectively

Source(s): Authors' own work

Table 3. ESG rating divergence and stock return synchronicity

Panel A: mean tests			
	High uncertainty group (<i>N</i> = 9,357) (1)	Low uncertainty group (<i>N</i> = 13,027) (2)	<i>T</i> -statistic for difference between (1) and (2)
<i>Syn</i>	−0.675	−0.787	7.270***
<i>R</i> ²	0.373	0.355	6.733***
Panel B: regression analysis			
Dependent variable	<i>Syn</i> (1)	<i>Syn</i> (2)	
<i>Divergence</i>	0.165*** (0.052)	0.155*** (0.048)	
<i>Size</i>		0.214*** (0.010)	
<i>Lev</i>		−0.500*** (0.046)	
<i>ROE</i>		0.012*** (0.003)	
<i>Top1</i>		−0.230*** (0.056)	
<i>INST</i>		−0.144*** (0.036)	
<i>Volatility</i>		−0.852*** (0.043)	
<i>Volume</i>		−0.014 (0.009)	
<i>HHI</i>		−0.451*** (0.147)	
<i>SOE</i>		0.187*** (0.019)	
Industry FE	Yes	Yes	
Year FE	Yes	Yes	
<i>N</i>	22,384	22,384	
Adj. <i>R</i> ²	0.330	0.407	

Note(s): Panel A presents the *t*-test of the mean value of firm's *R*² and *Synchronicity* in two groups. Column (1) shows the average value across firms with low ESG rating divergence. Column (2) presents the average value across firms with high ESG rating divergence. The last column reports the *T*-test/Wilcoxon–Mann–Whitney test for the difference between high and low ESG rating divergence groups. Panel B presents the multivariate regression results for ESG rating divergence and stock return synchronicity. The dependent variable is the stock return synchronicity measure. The independent variable is the average standard deviation of ESG ratings in 15 agency pairs formed by six rating agencies. See [Appendix A](#) for variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors, clustered at the firm level, are reported in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

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$$\begin{aligned}
 Syn_{i,t} = & \alpha + \beta_1 Divergence_{i,t-1} + \beta_2 Size_{i,t-1} + \beta_3 Lev_{i,t-1} + \beta_4 ROE_{i,t-1} + \beta_5 Top1_{i,t-1} \\
 & + \beta_2 INST_{i,t-1} + \beta_2 Volatility_{i,t} + \beta_2 Volume_{i,t} + \beta_2 HHI_{i,t-1} + \beta_2 SOE_{i,t-1} \\
 & + Industry FE + Year FE + \varepsilon_{i,t}
 \end{aligned} \tag{3}$$

where i represents the firm and t represents the year. $Syn_{i,t}$ denotes the stock return synchronicity of firm i in year t . $Divergence_{i,t-1}$ is the proxy for ESG rating divergence among rating agencies at the end of year $t - 1$. The control variables listed in the baseline model are introduced in Section 3.1.3 above. We also control for year and industry fixed effects. We estimate Eqn. (3) using ordinary least square and cluster standard errors by firm. Table 3, Panel B shows the results. Column (1) shows that after controlling for industry and year fixed effects, *Divergence* shows a positive and significant correlation with stock return synchronicity at the 1% level. Even after controlling for firm characteristics, the regression results in column (2) maintain a significant positive correlation. This relation is also economically significant. After controlling for other firm characteristics, one additional standard deviation in ESG rating divergence leads to a 3% ($0.155 \times 0.134/0.740$) increase in stock return synchronicity relative to its mean. Consistent with our divergence-induced uncertainty view, the results indicate that ESG rating divergence leads to less firm-specific information being incorporated into stock prices. This finding supports our Hypothesis 1a, which posits that ESG rating divergence is positively associated with stock return synchronicity.

3.3 Robustness checks

3.3.1 Alternative synchronicity and ESG divergence measures. To address potential non-synchronous trading biases that may occur when using daily returns to estimate the market model, we include lagged industry and market returns (Scholes & Williams, 1977; French, Schwert, & Stambaugh, 1987). Table 4, column (1) re-estimates our primary regression analysis in Eq. (3) using this alternative measure of stock price synchronicity. Consistent with our previous findings, ESG divergence continues to have a significantly negative impact on *Syn_1*.

To ensure the robustness of our measures for ESG divergence, we re-estimate our main regression analysis in Eq. (3) using an alternative proxy for ESG rating divergence in Table 4, column (2). Specifically, we construct *ESGrange6*, which is the range of ESG ratings from the

Table 4. Robustness check – alternative proxies

Dependent variable	<i>Syn_1</i> (1)	<i>Syn</i> (2)
<i>Divergence</i>	0.099** (0.041)	
<i>ESGrange6</i>		0.011*** (0.004)
<i>Intercept</i>	−3.887*** (0.172)	
Controls	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
<i>N</i>	22,384	22,381
Adj. <i>R</i> ²	0.422	0.407

Note(s): This table reports the regression results of alternative independent variables and dependent variables. In column (1), the dependent variable is an alternative measure of synchronicity, *Syn_1*, where R^2 is from regressions of the market model including lagged industry and market returns with weekly data. In column (2), the dependent variable is the same as in the baseline regression and the independent variable is the alternative measure of ESG rating divergences, *ESGrange6*, which is the range of ESG ratings from the six rating providers. The control variables are the same as in our baseline model. See Appendix A for variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors, clustered at the firm level, are reported in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

Source(s): Authors' own work

six rating providers. The coefficient of this variable also is positively significant at 1% level, further reinforcing our main finding that ESG rating divergence is positively associated with stock return synchronicity.

3.3.2 Additional fixed effects, additional controls and sample. To test the robustness of our baseline results, we relax the assumption that our variable of interest is exogenous and random. Specifically, we apply a fixed-effect regression with firm- and province fixed effects. The fixed-effect regression helps control for unobservable firm-specific and regional factors that could impact stock return synchronicity, mitigating concerns about potential reverse causality in the preceding regression. We also consider additional control variables that have been shown to affect information environments (Dasgupta, Gan, & Gao, 2010). Finally, to avoid periods that could impact stock market informativeness, we exclude samples that include the stock market crash in 2015 and the COVID-19 pandemic crisis in 2020.

Table 5 reports the robustness results. Column (1) shows the regression results with province fixed effects. Column (2) shows the regression results with firm fixed effects. Column (3) presents the results with more control variables. Finally, column (4) reports the results using an alternative sample. The key explanatory variable *Divergence* remains positively significant in all columns, suggesting that the main findings are robust and support Hypothesis 1a that ESG rating divergence leads to a worse information environment.

3.3.3 Instrumental variable analysis. The fixed-effect model may not fully account for potential reverse causality. It is also possible that higher synchronicity could reflect more consistent views among market participants for the firm, which could influence assessments made by rating agencies and lead to greater ESG rating divergence. To address the possibility of such a reciprocal causal relationship, we use a 2SLS IV regression.

We construct two IVs. *IV_RegionalESGcover* is the annual sample median number of rating agencies covering firms in the same city. This variable is likely to be related to the firm's ESG rating divergence. Divergence among ESG raters is largely due to the lack of consensus on the scope and measurement of ESG performance (Berg et al., 2022). As the number of agencies covering a firm increases, the likelihood of divergent ratings across these agencies also increases. Moreover, the number of rating agencies covering firms in a city reflects the broader rating environment in that region. This environment, characterized by the extent to which companies are covered by rating agencies, influences the overall ESG rating divergence across firms. Therefore, firms located in cities with more rating agencies covering local firms are more likely to experience ESG uncertainty. However, the number of rating agencies covering firms in a particular city is external to the specific firms' stock price behavior, making the instrument exogenous with respect to stock price synchronicity. The second IV, *IV_MCA*, captures managerial climate attention at the firm level. It is constructed as the frequency of climate- and environment-related terms in the management discussion and analysis (MD&A) section of a given firm's annual report, sourced from the global climate risk integration database (GCRID). This measure reflects the extent to which managers emphasize climate and environmental risks in their corporate reporting, thereby indicating perceived exposure and the salience of such risks within the firm. This is related to ESG rating divergence, as firms that emphasize climate and environmental issues in their MD&A are more likely to attract the scrutiny of multiple rating agencies. Given differences in methodology and interpretation across agencies, such attention may amplify rating dispersion. However, this mechanism does not necessarily imply a direct association with stock price synchronicity.

Table 6 presents the results. According to the first-stage regression result shown in column (1), the IV coefficients are significant at the 1% level, indicating that the IV indeed is strongly related to ESG rating divergence. To ensure the validity and strength of our IVs, we conducted several diagnostic tests. The Kleibergen–Paap rk LM statistic (p -value of 0.000) rejects the null hypothesis of under-identification, confirming that our instrument is sufficiently correlated with ESG rating uncertainty. Moreover, the Cragg–Donald Wald F statistic of 15.652 exceeds the conventional threshold of 10, suggesting that our instrument is not weak.

Table 5. Robustness checks – fixed effects, additional controls and year exclusions

Dependent variable	Syn (1)	Syn (2)	Syn (3)	Syn (4)
<i>Divergence</i>	0.156*** (0.048)	0.111** (0.056)	0.153*** (0.048)	0.130** (0.053)
<i>Size</i>	0.217*** (0.009)	0.377*** (0.021)	0.199*** (0.011)	0.226*** (0.011)
<i>Lev</i>	−0.506*** (0.046)	−0.768*** (0.079)	−0.466 (0.048)	−0.508*** (0.051)
<i>ROE</i>	0.012*** (0.003)	0.007*** (0.002)	0.009*** (0.003)	0.009*** (0.003)
<i>Top1</i>	−0.222*** (0.056)	−0.464*** (0.140)	−0.188*** (0.059)	−0.108*** (0.040)
<i>INST</i>	−0.143*** (0.036)	−0.084* (0.049)	−0.162*** (0.037)	−0.147*** (0.040)
<i>Volatility</i>	−0.850*** (0.043)	−0.779*** (0.046)	−0.860*** (0.043)	−0.835*** (0.051)
<i>Volume</i>	−0.015* (0.009)	−0.121*** (0.015)	0.006 (0.009)	−0.001 (0.010)
<i>HHI</i>	−0.463*** (0.147)	−1.042*** (0.275)	−0.599*** (0.095)	−0.701*** (0.101)
<i>SOE</i>	0.182*** (0.019)	0.100* (0.051)	0.227*** (0.020)	0.227*** (0.021)
<i>Analyst attention</i>			0.003*** (0.001)	
<i>Mean ESG rating</i>			0.189*** (0.036)	
<i>Media coverage</i>			−0.0012*** (0.000)	
<i>Intercept</i>	−4.625*** (0.201)	−5.718*** (0.492)	−4.811*** (0.214)	−5.164*** (0.220)
Industry FE	Yes	No	Yes	Yes
Firm FE	No	Yes	No	No
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	No	No	No
Sample	Full	Full	Full	Excluding 2015 and 2020
<i>N</i>	22,384	22,384	22,384	18,135
Adj. <i>R</i> ²	0.408	0.481	0.392	0.401

Note(s): This table reports robustness checks for the relationship between ESG rating divergence and stock return synchronicity. The dependent variable is *Syn*. The independent variable of interest is *Divergence*. Control variables are the same as in the baseline model unless otherwise noted. Column (1) includes province fixed effects, and column (2) includes firm fixed effects. Column (3) adds further controls. Column (4) uses a reduced sample that excludes observations from 2015 and 2020 to ensure the results are not driven by the stock market turbulence of 2015 or the COVID-19 pandemic in 2020. See [Appendix A](#) for variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are clustered at the firm level and reported in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

Source(s): Authors' own work

In the second-stage regression, the predicted ESG rating divergence is positive and significant at the 1% level. Overall, the results of the IV analysis remain robust, supporting our hypothesis that ESG rating divergence creates uncertainty and a weaker information environment.

3.3.4 Matching method analysis. Identifying a suitable IV for a 2SLS analysis is always challenging. In light of this, we perform additional robustness tests using matching samples, specifically propensity score matching (PSM) methods. Our main goal is to identify control firms that share similar characteristics but exhibit different levels of ESG rating divergence.

Table 6. Instrumental variable analysis

	First stage (1)	Second stage (2)
<i>Predicted_Divergence</i>		5.109*** (1.848)
<i>IV_MCA</i>	0.324** (0.156)	
<i>IV_RegionalESGcover</i>	0.008*** (0.002)	
<i>Size</i>	0.001 (0.002)	0.204*** (0.013)
<i>Lev</i>	−0.026*** (0.008)	−0.382*** (0.078)
<i>ROE</i>	0.000 (0.000)	0.009** (0.004)
<i>Top1</i>	0.020* (0.011)	−0.337*** (0.087)
<i>SOE</i>	0.000 (0.003)	0.175*** (0.026)
<i>INST</i>	−0.020*** (0.007)	−0.041 (0.063)
<i>Volatility</i>	−0.003 (0.005)	−0.877*** (0.051)
<i>Volume</i>	−0.004** (0.002)	0.013 (0.014)
<i>HHI</i>	−0.001 (0.029)	−0.477** (0.202)
<i>Constant</i>	0.568*** (0.041)	−5.801*** (0.447)
Industry FE	Yes	Yes
Year FE	Yes	Yes
<i>N</i>	20,923	20,923
Adj. <i>R</i> ²	0.036	0.091
Under-identification test		
Kleibergen–Paap rk LM statistic	16.795	
<i>p</i> -value	0.000***	
Weak identification test		
Cragg–Donald Wald <i>F</i> statistic	15.652	
Over identification test		
Sargan test (<i>p</i> -value)	0.12	

Note(s): This table reports the instrument variable/2SLS regression results. Results for the first and second stage are reported in columns (1) and (2), respectively. The instrumental variables are *IV_MCA*, which is firm-level climate attention and *IV_RegionalESGcover*, which is the annual sample median number of rating agencies covering firms in the same city. The Kleibergen–Paap rk LM statistic, Cragg–Donald Wald *F* statistic and Sargan test also are shown. The control variables are the same as in our baseline model. See [Appendix A](#) for variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors, clustered at the firm level, are reported in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

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When the matching models are properly constructed, any differences between the treatment and control samples should primarily stem from the key explanatory variable, *Divergence*.

[Table 7](#) presents the results using the PSM approach. The treatment group (*Treat* = 1) includes firms for which *Divergence* is higher than the sample top tertile (0.13). The control group (*Treat* = 0) includes firms for which *Divergence* is lower than the sample bottom tertile (0.13). We use a Logit regression to predict a firm's propensity for high ESG rating divergence.

Table 7. Propensity score matching analysis

Panel A					
Variables	Treated	Control	% bias	<i>t</i>	<i>P</i> > <i>t</i>
<i>Size</i>	22.495	22.497	−0.1	−0.1	0.923
<i>Lev</i>	0.437	0.43683	0.1	0.06	0.954
<i>ROE</i>	0.04824	0.04531	0.2	0.25	0.806
<i>Top1</i>	0.34897	0.35071	−1.1	−0.75	0.453
<i>INST</i>	0.41112	0.41161	−0.2	−0.14	0.891
<i>Volatility</i>	0.43483	0.43256	1.1	0.73	0.468
<i>Volume</i>	21.464	21.466	−0.2	−0.16	0.874
<i>HHI</i>	0.09174	0.0917	0	0.03	0.98
<i>SOE</i>	0.37137	0.37496	−0.7	−0.5	0.62

Panel B	
Dependent variable	Syn
<i>Treat</i>	0.140*** (0.051)
<i>Intercept</i>	−4.459*** (0.213)
Controls	Yes
Industry fixed effect	Yes
Year fixed effect	Yes
<i>N</i>	17,841
Adj. <i>R</i> ²	0.408

Note(s): Panel A presents the differences in means between the treatment and control groups after propensity score matching, with t-statistics and p-values for each control variable. The treatment group contains firms with high ESG rating divergence, and the control group contains those with low ESG rating divergence. The matched sample is constructed based on propensity score matching. Panel B presents coefficient estimation of the main regression for the matched sample. The control variables are the same as in our baseline model. See [Appendix A](#) for variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors, clustered at the firm level, are reported in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

Source(s): Authors' own work

We then match each high-uncertainty firm with a low-uncertainty firm based on the closest propensity score, ensuring a match within the same year and industry and without replacement.

As [Table 7](#), Panel A shows, after propensity matching, no difference in any of the nine control variables is significant. Thus, the PSM sample achieves covariate balance in the first moment (i.e. mean) for these variables. Panel B re-estimates [Eq. \(3\)](#) based on the PSM sample. It shows that the coefficient on *Treat* is positive and statistically significant, consistent with our baseline results in [Table 3](#).

3.4 Mechanism test

In the preceding analysis, we found that ESG rating divergence is positively related to stock return synchronicity, supporting our hypothesis that the divergence creates uncertainty in the market and hinders incorporation of firm-specific information into stock prices. We speculate that informed trading likely serves as a channel through which ESG rating divergence affects information flow. To investigate this possibility, we focus on institutional trading, which is pivotal in integrating information into stock prices. [Piotroski and Roulstone \(2004\)](#) demonstrated a negative correlation between institutional trading and stock return synchronicity, suggesting that institutions primarily trade based on firm-specific information.

Additionally, [Hartzell and Starks \(2003\)](#) emphasize the significant role of institutional investors in collecting and trading private information. However, in uncertain environments, institutional investors may reduce their investment in firms ([Francis, Hasan, & Zhu, 2021](#)).

From a theoretical perspective, ESG rating divergence increases the ambiguity of firm-specific signals, making ambiguity-averse investors less willing to trade on noisy or conflicting information. These investors instead tend to rely on aggregate market signals ([Caskey, 2008](#); [Epstein & Schneider, 2008](#)). Moreover, institutional investors face limits to attention and allocate resources to assets where private information yields higher expected returns ([Hirshleifer & Teoh, 2003](#)). Consistent with classic informed trading models, divergent ESG assessments increase the cost of processing firm-level information, lowering the expected payoff to informed trading. As [Grossman and Stiglitz \(1980\)](#) argue, the information is incorporated into prices only when the benefits of information acquisition outweigh its costs, whereas [Easley and O'hara \(2004\)](#) emphasize that information-based trading declines when the signal quality deteriorates. ESG rating divergence thus effectively raises the cost and reduces the benefit of information acquisition, thereby discouraging institutional investors from engaging in informed trading.

Building on this reasoning, we propose that institutional trading acts as a key channel through which ESG rating divergence influences the flow of private information. In essence, institutional investors' withdrawal from informed trading explains why greater rating divergence leads to higher stock return synchronicity. To address this issue and test the robustness of the relationship between ESG rating divergence and stock return synchronicity, we estimate the following regression equations:

$$\begin{aligned} Insti_{i,t} = & \alpha + \beta_1 Divergence_{i,t-1} + \beta_2 Size_{i,t-1} + \beta_3 Lev_{i,t-1} + \beta_4 ROE_{i,t-1} + \beta_5 Top1_{i,t-1} \\ & + \beta_2 INST_{i,t-1} + \beta_2 Volatility_{i,t} + \beta_2 Volume_{i,t} + \beta_2 HHI_{i,t-1} + \beta_2 SOE_{i,t-1} \\ & + Industry FE + Year FE + \varepsilon_{i,t} \end{aligned} \quad (4)$$

$$\begin{aligned} Syn_{i,t} = & \alpha + \beta_1 Insti_{i,t} + \beta_2 Size_{i,t-1} + \beta_3 Lev_{i,t-1} + \beta_4 ROE_{i,t-1} + \beta_5 Top1_{i,t-1} + \beta_2 INST_{i,t-1} \\ & + \beta_2 Volatility_{i,t} + \beta_2 Volume_{i,t} + \beta_2 HHI_{i,t-1} + \beta_2 SOE_{i,t-1} + Industry FE \\ & + Year FE + \varepsilon_{i,t} \end{aligned} \quad (5)$$

Here, $Insti_{i,t}$ represents the absolute change in the number of a firm's shares held by institutional investors, expressed as a fraction of the stock's trading volume in year t . If institutional trading act as a mechanism, we expect a negative relationship between *Divergence* and *Insti* and a positive relationship between *Insti* and *Syn*.

Column (1) of [Table 8](#) reports the estimates of [Eq. \(4\)](#). The estimate of the *Divergence* coefficient β_1 is significantly negative (i.e. ESG rating divergence is associated with institutional trading). Column (2) reports estimates of [Eq. \(5\)](#), showing the coefficient on *Insti* is significantly negative, indicating that higher institutional trading is associated with lower stock price synchronicity. This finding aligns with the idea that institutional investors are more likely to trade on firm-specific information, thereby reducing synchronicity. This finding is consistent with the literature ([Piotroski & Roulstone, 2004](#); [Feng & Johansson, 2019](#)). The results overall support the hypothesis that institutional trading mediates the relationship between ESG rating divergence and information flow reflected in stock return synchronicity.

3.5 Reinforcement tests

In this section, we examine the relationship between ESG rating divergence and several dependent variables that more directly measure information flow. Specifically, we utilize

Table 8. Mechanism of ESG rating divergence and information: institutional trading

Dependent variable	<i>Insti</i> (1)	<i>Syn</i> (2)
<i>Divergence</i>	−0.017** (0.008)	
<i>Insti</i>		−0.184** (0.089)
<i>Size</i>	0.031*** (0.004)	0.220*** (0.008)
<i>Lev</i>	−0.039*** (0.011)	−0.511*** (0.038)
<i>ROE</i>	−0.002*** (0.001)	0.011*** (0.003)
<i>Top1</i>	0.117*** (0.013)	−0.206*** (0.046)
<i>INST</i>	−0.064*** (0.020)	−0.159*** (0.031)
<i>Volatility</i>	0.009*** (0.003)	−0.852*** (0.041)
<i>Volume</i>	−0.028*** (0.002)	−0.020** (0.008)
<i>HHI</i>	0.010 (0.028)	−0.451*** (0.126)
<i>SOE</i>	−0.010*** (0.003)	0.185*** (0.015)
Industry FEs	Yes	Yes
Year FEs	Yes	Yes
<i>N</i>	22,384	22,384
Adj. <i>R</i> ²	0.058	0.408

Note(s): This table presents the regression results of the mechanism of ESG rating divergence and information flow. Column (1) shows the results of the regression with Eq. (4), and column (2) shows the results of the regression with Eq. (5). The dependent variable in column (1) and the independent variable in column (2) is *Insti*, which represents the absolute change in the number of a firm’s shares held by institutional investors as a fraction of the stock’s trading volume in year *t*. The dependent variable in column (2) is *Syn*. The control variables are the same as in our baseline model. See Appendix A for variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors, clustered at the firm level, are reported in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

Source(s): Authors’ own work

alternative measures from the literature, such as private information flow indexes (notably, *VPIN*) and a measure of insider trading (*SELL*). We also explore turnover as an alternative proxy for stock return synchronicity to assess the intensity of private information flow within the market. Theoretical links between trading activity and the quality or amount of private information (Blume, Easley, & O’Hara, 1994) suggest that turnover can serve as an effective measure of private information flow. Specifically, we examine *Dturn*, defined as the annual average of the monthly excess turnover rate.

Insiders, such as executives, typically possess more information about company operations and prospects than do ordinary investors. If firm-specific information is not fully reflected in the stock price – indicating the presence of information asymmetry – executives may exploit this advantage through opportunistic trades. Piotroski and Roulstone (2004) find that insider trades convey firm-specific information. We thus estimate the following regression model:

$$\begin{aligned}
INFO_{i,t} = & \alpha + \beta_1 Divergence_{i,t} + \beta_2 Size_{i,t-1} + \beta_3 Lev_{i,t-1} + \beta_4 ROE_{i,t-1} + \beta_5 Top1_{i,t-1} \\
& + \beta_6 INST_{i,t-1} + \beta_7 Volatility_{i,t} + \beta_8 Volume_{i,t} + \beta_9 HHI_{i,t-1} + \beta_{10} SOE_{i,t-1} \\
& + Industry\ FE + Year\ FE + \varepsilon_{i,t}
\end{aligned} \tag{6}$$

INFO refers to the previously discussed *VPIN*, *SELL* or *Dturn*, with *t* representing an annual index. The regressions include the same control variables as in Eqn. (3). We estimate Eqn. (6) using OLS and cluster standard errors at the firm level.

Column (1) of Table 9 presents results using the *VPIN* measure from Easley, Hvidkjaer, and O'Hara (2002). We find that *VPIN* is negatively related to *Divergence*, supporting our hypothesis that firms with higher rating divergence are less likely to be involved in private information trading. Column (2) presents the results for the turnover regressions, where the coefficient on *Divergence* is both negative and significant, indicating that stocks of firms with higher ESG rating divergence experience lower trading activity. Column (3) presents estimates

Table 9. Reinforcement test

Dependent variable	<i>VPIN</i> (1)	<i>Dturn</i> (2)	<i>SELL</i> (3)
<i>Divergence</i>	−0.005*** (0.001)	−0.061** (0.031)	0.723** (0.368)
<i>Size</i>	−0.005*** (0.000)	−0.050*** (0.004)	0.221*** (0.064)
<i>Lev</i>	0.013*** (0.001)	0.163*** (0.019)	−2.246*** (0.323)
<i>ROE</i>	−0.000* (0.000)	−0.002 (0.002)	0.018 (0.031)
<i>Top1</i>	0.002** (0.001)	−0.106*** (0.035)	−1.630*** (0.423)
<i>INST</i>	−0.003*** (0.001)	0.101*** (0.022)	−2.033*** (0.289)
<i>Volatility</i>	−0.003*** (0.001)	−0.167*** (0.019)	2.967*** (0.255)
<i>Volume</i>	−0.008*** (0.000)	0.181*** (0.006)	−0.220*** (0.070)
<i>HHI</i>	−0.001 (0.003)	−0.052 (0.070)	0.764 (1.055)
<i>SOE</i>	0.002*** (0.000)	0.063*** (0.008)	−2.214*** (0.137)
<i>Intercept</i>	0.464*** (0.004)	−2.890*** (0.099)	4.764*** (1.361)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
<i>N</i>	22,381	21,581	22,384
Adj. <i>R</i> ²	0.589	0.180	0.121

Note(s): This table presents the results of investigating the relationship between ESG rating divergence on other alternative measures of information flow. *VPIN* in column (1) is the annual probability of information-based trading. *Dturn* is defined as the annual stock average monthly excess turnover rate. *SELL* is the measure of insider trading, which is the natural logarithm of the total amount of company stock sold by all executives of a listed company within the accounting year due to opportunistic motives. The control variables are the same as in our baseline model. See Appendix A for variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors, clustered at the firm level, are reported in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

Source(s): Authors' own work

of Eq. (6) using *SELL* as the dependent variable. We find that *SELL* is positively and significantly related to *Divergence*. This result aligns with our conjecture that ESG rating divergence may result in less firm-specific information being reflected in the stock price.

3.6 Heterogeneity tests

We now focus on transparency and industry characteristics to offer a more in-depth analysis of these potential heterogeneities and additional insights into the dynamics of private information flows.

3.6.1 Transparency heterogeneity. We hypothesize that the impact of ESG rating divergence on stock return synchronicity is more salient for firms with less analyst coverage, less investor information searching, and less ESG information disclosure. Analysts, for example, serve as “information lubricants” in the capital market (Schiemann & Tietmeyer, 2022); their professional expertise and analytical abilities provide incremental information to the market and help investors make rational decisions, even in the presence of ESG rating divergence. Similarly, when more investors actively search for information on individual firms, it exposes more firm-specific information, thus mitigating the effects of any information divergence (Chen, Fang, Xiang, Ji, & An, 2023). Last, firms that engage in higher levels of self-disclosure regarding ESG matters provide more firm-specific information (Kimbrough, Wang, Wei, & Zhang, 2024), which can further improve price accuracy and reduce the negative impact of ESG rating divergence.

We build sub-samples based on the firms’ analyst coverage level, investor searching volume and ESG self-disclosure level. We then re-estimate Eq. (3) within these subsamples, Table 10 presents the regression results. Columns (1) and (2) report the estimation results for firms with low and high analyst coverage, respectively, based on the sample median of analysts followed (three analysts). Columns (3) and (4) display results for firms with low and high investor internet search volumes, respectively, using the sample median Baidu search index [2] (i.e. 11.65) as the threshold. Columns (5) and (6) show results for firms with low and high ESG self-disclosure, respectively, categorized by whether they disclose at least seven out of ten ESG factors in their CSR reports.

As shown, the positive relationship between *Divergence* and *Syn* is significant only in the low analyst coverage, low investor searching and low self-ESG disclosure groups. This result suggests that (1) analysts efficiently process ESG information and alleviate disturbances in ESG rating divergence for the market; (2) investors’ active information-seeking ensures that firm-specific information is accurately reflected in stock prices, which helps mitigate the impact of ESG rating divergence and (3) firm-initiated disclosure reduces the influence of third-party rating divergence by providing direct information, enhancing transparency and reducing uncertainty.

3.6.2 Industry heterogeneity. We explore how industry characteristics, specifically whether a firm belongs to a polluting or non-polluting industry, might influence how ESG factors are perceived and weighted across different industries. In industries where ESG factors are more critical to firm reputation and investor perception, ESG divergence likely creates greater uncertainty. Investors in these sectors may rely more heavily on ESG ratings to assess firm value. Therefore, ESG rating divergence should have a stronger impact on stock return synchronicity in non-polluting industries. Conversely, in polluting industries, where negative ESG impacts are often expected, the divergence in ESG ratings might have less influence on investor perceptions. As a result, the effect of ESG divergence on synchronicity is likely to be weaker in these industries.

Based on this discussion, we categorize our sample firms into two groups: those in a polluting industry and those not in a polluting industry. Table 11 presents the results of a regression analysis of Eq. (3) for each group. The findings indicate that the significance is stronger for the non-polluting group, compared with the polluting group, suggesting that the impact of ESG rating uncertainty is more pronounced for non-polluting firms.

Table 10. Heterogeneity test: transparency

	(1) Low analyst coverage	(2) High analyst coverage	(3) Low investor search	(4) High investor search	(5) Low self- disclosure	(6) High self- disclosure
<i>Divergence</i>	0.196*** (0.071)	0.068 (0.061)	0.254*** (0.068)	0.049 (0.065)	0.175*** (0.057)	0.131 (0.084)
<i>Size</i>	0.255*** (0.014)	0.100*** (0.013)	0.239*** (0.013)	0.186*** (0.012)	0.210*** (0.011)	0.197*** (0.015)
<i>Lev</i>	−0.606*** (0.058)	−0.175*** (0.066)	−0.586*** (0.063)	−0.379*** (0.061)	−0.510*** (0.052)	−0.419*** (0.079)
<i>ROE</i>	0.010*** (0.003)	0.006 (0.056)	0.002 (0.006)	0.015*** (0.004)	0.010*** (0.003)	0.021*** (0.007)
<i>Top1</i>	−0.220*** (0.076)	−0.150** (0.072)	−0.179** (0.074)	−0.280*** (0.077)	−0.243*** (0.064)	−0.205** (0.094)
<i>INST</i>	−0.194*** (0.053)	−0.134*** (0.047)	−0.202*** (0.046)	−0.079 (0.053)	−0.200*** (0.042)	−0.044 (0.062)
<i>Volatility</i>	−1.003*** (0.060)	−0.620*** (0.058)	−0.981*** (0.075)	−0.797*** (0.052)	−0.901*** (0.054)	−0.763*** (0.067)
<i>Volume</i>	−0.058*** (0.012)	0.072*** (0.012)	−0.054*** (0.013)	0.016 (0.013)	−0.026** (0.011)	0.006 (0.015)
<i>HHI</i>	−0.479** (0.197)	−0.407** (0.176)	−0.678*** (0.257)	−0.351** (0.169)	−0.530*** (0.161)	−0.176 (0.276)
<i>SOE</i>	0.210*** (0.025)	0.216*** (0.026)	0.223*** (0.028)	0.161*** (0.024)	0.198*** (0.022)	0.163*** (0.030)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	10,521	11,857	10,403	11,980	14,526	7,856
Adj. <i>R</i> ²	0.422	0.353	0.379	0.410	0.408	0.413

Note(s): This table shows our regression in different subsamples to test the impact of firm transparency heterogeneity on the relationship between ESG rating divergence and synchronicity. See [Appendix A](#) for variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors, clustered at the firm level, are reported in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

Source(s): Authors' own work

4. Conclusion

This study investigates the impact of ESG rating divergence on the information environment of firms in China, providing robust empirical evidence that rating divergence heightens market uncertainty, diminishes firm-specific information dissemination and increases stock return synchronicity. The results hold across various robustness tests and reveal that the negative relationship between ESG rating divergence and information dissemination is stronger among firms with lower analyst coverage, less investor scrutiny and reduced ESG self-disclosure. This effect is also more pronounced in non-pollutant industries, where ESG ratings are viewed as more critical. Our mechanism test shows that higher divergence reduces informed trading by institutional investors. We observe lower private information flow, higher opportunistic executive selling and lower stock turnover among firms with higher ESG rating divergence, indicating decreased firm information dissemination in the capital market.

These findings underscore the challenges posed by ESG information as a non-financial data source, particularly given the lack of standardization and consistency across rating agencies. Excessive divergence in ratings can negatively impact market efficiency by increasing uncertainty and reducing the accuracy of firm-specific information in stock prices. However, our research also suggests that proactive measures, such as enhanced ESG disclosures by firms and deeper analysis by both analysts and investors, can mitigate these adverse effects. For regulators, promoting standardized ESG rating methodologies and

Table 11. Heterogeneity test: industry characteristics

Dependent variable	Polluting industry (1)	Non-polluting industry (2)
<i>Divergence</i>	0.073 (0.103)	0.189*** (0.054)
<i>Size</i>	0.169*** (0.021)	0.227*** (0.011)
<i>Lev</i>	−0.292*** (0.095)	−0.547*** (0.053)
<i>ROE</i>	0.014*** (0.002)	0.008 (0.006)
<i>Top1</i>	−0.217* (0.122)	−0.227*** (0.063)
<i>INST</i>	−0.071 (0.082)	−0.176*** (0.040)
<i>Volatility</i>	−0.892*** (0.089)	−0.866*** (0.049)
<i>Volume</i>	0.062*** (0.020)	−0.037*** (0.010)
<i>HHI</i>	−0.476 (0.347)	−0.420*** (0.159)
<i>SOE</i>	0.197*** (0.041)	0.181*** (0.021)
Industry FE	Yes	Yes
Year FE	Yes	Yes
<i>N</i>	5,199	17,167
Adj. <i>R</i> ²	0.368	0.420

Note(s): This table shows our regression in different subsamples to test the impact of industry characteristic on the relationship between ESG rating divergence and synchronicity. Column (1) is regression results in polluting industry while the results in column (2) presents the findings in column (2). See [Appendix A](#) for variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors, clustered at the firm level, are reported in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

Source(s): Authors’ own work

strengthening the oversight of rating providers may reduce inconsistencies and enhance comparability, thus preserving the information value of ESG data. By promoting clear and consistent ESG information, these actions can help ensure that firm-specific details are better incorporated into stock prices.

Given the growing importance of ESG considerations globally, encouraging comprehensive and transparent ESG disclosures, as well as developing expertise in ESG analysis, is crucial for mitigating the negative impacts of rating divergence, enhancing market efficiency and promoting sustainable investment.

Notes

1. A survey of institutional investors conducted by [EY \(2020\)](#) revealed that 98% of those who evaluate ESG factors now perform a structured assessment of ESG performance. This marks a significant rise from the 32% reported in the survey conducted two years prior. Moreover, nonfinancial performance indicators, including ESG factors, have gained considerable importance in investment decisions. Around nine out of ten investors reported that nonfinancial performance had a crucial impact on their investment choices over the past 12 months.
2. The natural logarithm of the sum the Baidu search indices for each stock.

Supplementary material

The supplementary material for this article can be found online.

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