

Article

Corporate Sustainability Disclosure and Investment Efficiency: The Saudi Arabian Context

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Abstract: Drawing on legitimacy and stakeholders' perspectives, this research aims to investigate the association between investment efficiency, a value-added corporate activity important to firm viability and profitability, and the environmental, social, and governance (ESG) reporting extent in a Saudi Arabian context. A sample of 25 Saudi firms reporting ESG information is used to test the research hypotheses. The sample is listed on the Saudi Exchange, with the research period spanning from 2014 to 2021. An OLS regression analysis shows that adopting ESG disclosure practices promote and maintain corporate investment efficiency. It displays a significant effect of corporate sustainability disclosure on the under- and over-investment levels of Saudi indexed firms. These findings are important in terms of sustainable reporting and development for the Middle East region in general and for Saudi Arabia in particular. They provide confirmation of the importance of ESG reporting as a key driver of enhanced corporate investment and bring additional evidence for regulators, policymakers, and standard-setters in terms of the effect of ESG on each sector.

Keywords: investment efficiency; under-investing; over-investing; sustainable investment; ESG disclosure; environmental pillar; social pillar; governance pillar; social return on investment; sustainable Saudi Arabia



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1. Introduction

Information asymmetry and agency problems are the two key factors examined in the theoretical and empirical literature to clarify the deviation from an optimal level of investment [1,2]. Firms provide positive or negative signals for shareholders. Signaling information helps to reduce the information asymmetry problems between a firm and outside parties [3]. Investment expenditure provides positive signal on the subsequent corporate growth, hence boosting the stock price used as a firm value indicator [4]. Therefore, a better investment decision will end in optimal performance. This offers a positive signal to investors. According to the stakeholder and legitimacy approaches, socially responsible firms are shown to be related to less information asymmetry, less agency conflict, and high stakeholder solidarity [5–7]. A firm with poor socially responsible practices may suffer from adverse signals and decreases in sales, engendering in firm value decline, while a firm that effectively conveys a positive sign and image and legitimizes its social action may gain the advantage of increased customer loyalty [8].

Voluntary sustainable disclosure is a form of soft law, as it cannot be legally enforced or required by regulations. However, it can no longer be ignored and businesses that ignore it will face the risk of being unable to improve their bottom line and shareholder value. Various firms' sustainable, responsible, or ethical operations fall under the ESG umbrella: (i) The environmental pillar refers to how an organization performs as a steward of nature. Concerns that fall under this category can include carbon emissions, waste management, water management, raw material sourcing, and climate change vulnerability. (ii) The social pillar examines how firms handle relations with employees, customers, and the larger

community. This can involve concerns related to corporate social responsibility (CSR) practices, labor management, data privacy, general security, health, safety, addressing racial injustice, diversity, and equity. (iii) The governance pillar implies issues related to business ethics, leadership, executive pay, audits, internal controls, intellectual property protection, and shareholder rights. The products/services customers buy create the demand that keeps businesses profitable. Nowadays, consumers' spending habits have changed, with social responsibility becoming their main priority. More customers than ever are willing to spend money on products/services that meet their own beliefs and stand-up for an issue they care about. As CSR is being a customer retention tool, the corporation should balance profit-making activities with activities that benefit society and be aware that its customers are concerned today with transparency, business ethical practices, and involvement in social justice issues locally and globally (e.g., affordable healthcare, climate change, and racial equality). A company that implements a CSR model and engage in active CSR efforts, ensures that there are positive social and environmental effects associated with the way it operates [9]. The implementation of CSR models helps benefiting both corporation and society. Having a good economic, social, and environment reputation can generate positive impacts on the overall profitability and success of a business. It will result in increasing revenue and promoting change and progress all over the world, by aiding nations with a lack of resources and addressing ethical, cultural, and social issues.

Investment efficiency is influenced by the external environment [10], including the economic, environmental, and social dimensions. The literature suggests both positive and negative impacts of voluntary disclosure of information on investment efficiency and ESG firms have been shown to be associated with reduced information asymmetry and agency conflict [1,5,11–13]. This study is motivated by the important role of ESG disclosures on corporate decisions. Therefore, the purpose of this study is investigating whether ESG disclosure is a determinant of investment efficiency in Saudi Arabian companies. Data from 25 Saudi indexed companies were collected from the Thomson Reuters database (Asset4 and Datastream), for the period 2014 to 2021. To examine the developed hypotheses, an OLS analysis was applied, and findings show that a greater propensity for ESG-related disclosure of Saudi public firms promotes investment efficiency.

The choice of Saudi Arabia as context for this study is explained by the fact that this country is the biggest economy in the Middle East and the wealthiest Arab country. The Saudi Gross Domestic Product (GDP) at current prices is worth 695.6 billion US dollars in Q1/2020, according to the General Authority for Statistics. The strategy of large-scale public works assumed by the authorities, as well as external direct investment and the robustness of the banking and financial structure, have permitted the country to become a leader in the regional economy and one of the greatest in the world. Further, the Saudi Council of Economic and Development Affairs established 13 "Realization Programs" within the Saudi Vision 2030 launched in 2016. This vision involves national companies' promotion and financial sector development programs.

This work adds to the literature in two ways. First, according to our information, this is the first effort to explore the association between ESG reporting and investment efficiency in a Saudi Arabian context using the DEA approach. Second, while previous studies show that financial reporting quality, government intervention, and state and foreign titles are important factors contributing to investment efficiency, this research develops the literature and demonstrates that ESG reporting is also an important determinant of investment efficiency.

This paper is structured as follows: Section 2 develops the theoretical framework and the hypotheses. Section 3 describes the sample selection and the methodology used, followed by the results and further robustness checks in Section 4. Section 5 provides conclusions and contributions.

2. Conceptual Framework and Hypothesis Development

2.1. Sustainable Developments in Saudi Arabia

Saudi social cultural elements have a great impact on the country's social life and in promoting the corporate social responsibility initiatives. It is possible to outline two stages in the development of CSR activities in KSA. Traditionally, the priority of Saudi corporations was on environmental, philanthropic, and charitable activities, which have been integrated into their missions and goals. Therefore, the CSR initiatives have been treated as charity, sponsorships, or philanthropy. Saudi Aramco's Environmental Protection Department (EPD) measures the environmental performance of different facilities, raises awareness, and tracks the compliance against environmental indicators. An Environmental Management System (EMS) was introduced in 2011 by the EPD to facilitate the development of internal processes for recognizing and mitigating environmental influences.

Nowadays, many corporations consider CSR in their bottom-line value. According to the United Nations (UNIDO), CSR is used to integrate and balance the three components of sustainable development: economic, social, and environmental dimensions (the triple bottom line approach), thereby addressing all stakeholders' expectations through this commitment. In this sense, CSR strategies are shown to be a strategic business management concept and a business approach that contributes to sustainable development by carrying economic, social, and environmental advantages for all stakeholders. Over the last decades, the Arab world adopted certain standards of CSR practices, with a focus on environmental sustainability, water conservation, and healthy living. The Arab Forum for Environment and Development (AFED) has underscored the major challenges that Arab environment have faced since 2008. The AFED report (2009) noticed that the effect of climate change in the Arab region will increase the risk of water and food shortages. Moreover, the AFED report (2010) realized that the area is facing an impending catastrophic water scarcity. The effective use of energy, oil and gas, and renewable energy will help Arab countries reduce emissions. "Given these challenges, transitioning to the Green Economy is not only an option for the Arab region; rather it is an obligation to secure a proper path to sustainable development" (AFED, 2011, p. 7). These objectives are consistent with CSR and the increasing role of business in the global and domestic economy. An important feature of CSR activities is that businesses have a legitimate, ethical domain in which they can improve community health, boost social well-being, and contribute to sustainable development.

Incorporating sustainable concerns give rise to a significant question within corporations: How can sustainability be employed to assess firm performance? Numerous works examined this matter and concentrated on the role of sustainability practices in enhancing corporate performance. The findings helped to suggest how corporations could drive corporate sustainable performance in an efficient way [9,14,15]. A new way to define corporate sustainable performance was advanced by [16]: the triple bottom line (TBL) approach. This perspective considers the concept of sustainable performance through managing three factors: profit (economic), people (social), and planet (environmental). The TBL perspective believes that companies have to put as much emphasis on social and environmental matters as they do on profits.

2.2. Hypothesis Development

Social and political theories (e.g., legitimacy, stakeholder, and institutional) offer insightful theoretical points of view on sustainable disclosure. Legitimacy theory implies that a "social contract" exists between a corporation and society [8,17]. "Organisations can only continue to exist if the society in which they are based perceives the organisation to be operating to a value system that is commensurate with the society's own value system" [18] (p. 28). Hence, the firm continually certifies that it works within the rules and standards of the society in which it runs. Corporations do not exist in isolation, and they need sustained collaborations with society at large. The expectations of society must be fulfilled by the corporations [19]. To align with legitimacy existence, corporations might engage in voluntary sustainable reporting to prove their legitimacy [8].

ESG disclosure becomes progressively common. Therefore, it should be considered with the same attention as the financial disclosure. The introduction of sustainable disclosure results in an improved accounting quality by enhancing the reporting transparency and including more comparability. This provides shareholders with a low level of information asymmetry. The higher level of disclosed information permits shareholders to efficiently compare value-creating investment projects with value-destroying investment projects, enhancing the visibility of the managers' investment policies to investors and, therefore, decreasing the information asymmetry [20,21]. Indeed, sustainable disclosure suggests various advantages for investors. Comprehensive and timely information helps decrease the risk to investors due to the fact that information is not provided by other sources, lowering the cost of treating the information.

Many social researchers have grown in importance in recent years and surveys have been carried out to analyze the ESG reporting implementation, reporting quality, and investment efficiency. Findings show that sustainable reporting improves the transparency level, mitigates information asymmetry and agency problems, and, therefore, enhances investment firms [22–24]. The effect of voluntary reporting on corporate investment efficiency has been investigated in the literature. The authors of [25] discovered that reporting internal control weakness improves investment efficiency across superior supervising and enhanced financial reporting quality. Additionally, Ref. [26] documented that rising market risk disclosures improve a corporation's investment efficiency. Further, the literature revealed that by increasing the CSR disclosing level, future cash flows and capital stock would decrease investment deviation [27]. Reference [28] showed that managers may over invest in information acquisition and select risky projects where there is elevated cost of ignorance at the investment phase due to the voluntary disclosure, resulting in investment inefficiency. A recent study by [22], performed in the Middle East region, examined the effects of ESG reporting and financial reporting quality on investment efficiency. With a sample of Emirates firms from 2010 to 2019, the findings document a significant and robust decline in under-investment. Using an Indonesian nonfinancial sample, Ref. [10] investigated the link between investment efficiency and ESG reporting. The authors found that investment inefficiency is a determinant of ESG disclosure quality. However, they assumed that a positive relationship between investment inefficiency and ESG disclosure is not sustained in all circumstances.

The literature suggests that a firm's ESG disclosure results in an enhancement in the investment efficiency level, and this finding would have a great effect on the current and future state of the Middle East region in general. Therefore, it seems important to test this association in Saudi Arabia in particular. Therefore, we postulate the following hypotheses:

Hypothesis 1 (H.1). *There is a negative association between greater propensity for ESG-related disclosure and corporate under- and over-investment.*

H1.1. *A greater propensity for environmental-related disclosure decreases corporate investment inefficiency.*

H1.2. *A greater propensity for social-related disclosure decreases corporate investment inefficiency.*

H1.3. *A greater propensity for governance-related disclosure decreases corporate investment inefficiency.*

3. Research Methodology

3.1. Sample Selection

This study explores the link between ESG disclosure and investment efficiency in Saudi listed companies (see Figure 1). We selected a sample of 43 Saudi firms indexed on the Saudi Exchange from Thomson Reuters ASSET4. These firms do report ESG information. From the initial sample, we exclude the bank sector (10 banks), financial services sector (2 institutions), life insurance sector (1 firm), non-life insurance sector (3 firms), real estate investment service sector (2 firms), and firms with missing data (1 firm). The time frame of our sample data runs from 2014 to 2021. Our sample selection is summarized in Table 1. Data on

ESG score and pillars, investment decision, and firm characteristics were collected from Thomson Reuters ASSET4 and Datastream databases. We tested the research hypotheses using the following regressions:

$$INVEST_{it} = \alpha_0 + \alpha_1 ESGDS_{it} + \alpha_2 FSIZE_{it} + \alpha_3 BSIZE_{it} + \alpha_4 LEV_{it} + \alpha_5 OWNER_{it} + \alpha_6 BIG_{it} + \alpha_7 ROA_{it} + \sum YEARS \text{ DUMMIES} + \sum INDUSTRIES \text{ DUMMIES} \quad (1)$$

$$INVEST_{it} = \beta_0 + \beta_1 ENV_{it} + \beta_2 FSIZE_{it} + \beta_3 BSIZE_{it} + \beta_4 LEV_{it} + \beta_5 OWNER_{it} + \beta_6 BIG_{it} + \beta_7 ROA_{it} + \sum YEARS \text{ DUMMIES} + \sum INDUSTRIES \text{ DUMMIES} \quad (2)$$

$$INVEST_{it} = \gamma_0 + \gamma_1 SOCIALS_{it} + \gamma_2 FSIZE_{it} + \gamma_3 BSIZE_{it} + \gamma_4 LEV_{it} + \gamma_5 OWNER_{it} + \gamma_6 BIG_{it} + \gamma_7 ROA_{it} + \sum YEARS \text{ DUMMIES} + \sum INDUSTRIES \text{ DUMMIES} \quad (3)$$

$$INVEST_{it} = \delta_0 + \delta_1 GOVS_{it} + \delta_2 FSIZE_{it} + \delta_3 BSIZE_{it} + \delta_4 LEV_{it} + \delta_5 OWNER_{it} + \delta_6 BIG_{it} + \delta_7 ROA_{it} + \sum YEARS \text{ DUMMIES} + \sum INDUSTRIES \text{ DUMMIES} \quad (4)$$

where INVEST is the investment efficiency, ESGDS is corporate sustainability disclosure, ENV is the environmental disclosure score, SOCIALS is the social disclosure score, GOVS is the governmental disclosure score, FSIZE is the firm size, BSIZE is the board of directors' size, LEV is the firm's debt level, OWNER is ownership concentration, BIG is a Big4 audit firm, ROA is the firm's performance, and YEARS and INDUSTRIES are series of dichotomous variables for years and industries.

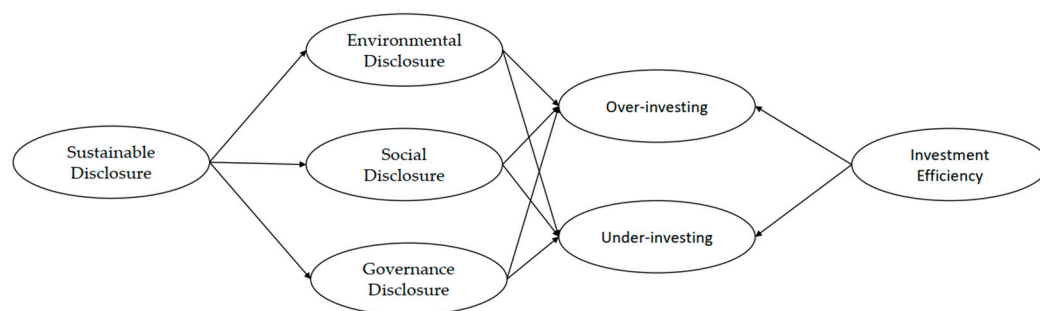


Figure 1. The research model.

Table 1. Sample distribution according to the 1st level GICS and the average ESG disclosure score (0–100).

Sector	#Firms	%	Average ESG Score
Energy	1	4	19.27
Material	9	36	19.61
Industrials	2	8	18.65
Consumer discretionary	3	12	22.74
Consumers staples	3	12	22.89
Healthcare	2	8	17.98
Communication services	3	12	23.40
Utilities	2	8	18.86
Total firms	25	100	
#Observations	175		

3.2. Measurements

3.2.1. Corporate-Level Investment Inefficiency

This works examines the influence of corporate ESG disclosure extent on the level of investment efficiency through the deviation of the actual investment level from the expected one (inefficiency). We used a non-parametric method—data envelopment analysis (DEA)—that distinguishes between corporate overinvestment and underinvestment to

measure investment inefficiency score. We opt for the production approach initiated by [29]. According to this approach, investment is considered as multiple input and output combinations. We follow previous literature and selected 3 inputs and 2 outputs [30–32]. Inputs used were sales growth, debt (debt/total assets), and human capital (number of employees). Outputs used were total capital expenditures to total sales and total investments to total sales.

We estimated the research model for the two groups of firms: the over-investment group, with positive residuals from the investment efficiency equation (Equation (5)); and the under-investment group, with the absolute value of the negative residuals from the investment equation. The investment equation is as follow:

$$\text{INVEST}_{it} = \alpha_0 + \alpha_1 \text{NEG}_{it-1} + \alpha_2 \% \text{SGROWTH}_{it-1} + \alpha_3 \text{NEG}_{it-1} \times \text{SGROWTH}_{it-1} + \varepsilon_{it} \quad (5)$$

where INVEST_{it} is the sum of new investment in machinery, equipment, vehicles, land, buildings, and research and development expenditures, less the sale of fixed assets, and scaled by lagged total assets for firm i in year t ; NEG_{it-1} is an indicator variable taking the value of 1 for negative sales growth and 0 otherwise; $\% \text{SGrowth}_{it-1}$ is the annual sales growth rate for firm i in year $t - 1$; and ε is the firm-specific residuals, measuring the firm's investment deviation from its expected level. The investment model is estimated cross-sectionally with at least ten observations in each sector. All variables were Winsorized at the 1% and 99% levels to mitigate the effect of outliers.

3.2.2. Corporate Sustainability Disclosure Measure (ESGDS)

To measure the extent of ESG disclosure, we use an aggregated ESG index based on prior works [11,33,34]. The index was constructed using the annual environmental, social, and governance factors provided by Thomson Reuters-ASSET4. We followed the convention established by [35,36] to weigh each measure. The three pillars are composed of 10 themes based on publicly reported data: the environmental pillar (resource use, emissions, product/innovation), social pillar (workforce, human rights, community, product responsibility), and governmental pillar (management, shareholders, CSR strategy). The variable ESGDS is the equally weighted average of the three scores.

4. Empirical Findings and Discussions

4.1. Descriptive and Multicollinearity Analysis

The descriptive statistics are displayed in Table 2, presenting two panels of summary statistics for our sample of firms. Panel A displays the mean, median, standard deviation, skewness, and kurtosis. All variables were Winsorized at the 1 percent and 99 percent levels to mitigate the effect of outliers. The average of the ESG disclosure score (ESGDS) is 20.23. This result shows an improvement of this score among Saudi listed firms compared to the results found in previous studies. The authors of [37], for a study period from 2010 to 2019 using Saudi listed companies' sample, found an average ESG disclosure score equaling 14.62. This improvement is due to the efforts made to promote sustainable growth in the kingdom. Concerning control variables, the mean (median) firm size is about 17.63 (14.46). This result indicates that there is vast disparity in the size of the Saudi indexed firms. Further, the mean value of ROA is 0.11. Therefore, the Saudi firms disclosing ESG information can generate earnings of 11 percent from the assets held. Skewness statistics for all the equations' variables are very near to zero, indicating that distributions are symmetrically distributed.

Panel B shows the frequencies of the observations. Approximately 36 percent of the firm observations belong to the over-investment group, while 64 percent belong to the under-investment group. This result implies that Saudi listed firms, owing to their difficulties in offering and ensuring external financing, are more inclined to under-invest rather than over-invest. Hence, the issue of over-investment is less common in Saudi Arabia and firms keep long-term relationships with banks for long-term investment horizons.

Further, Table 2 displays that 57 percent of the analyzed observations are from firms audited by at least one of the Big4 auditors.

Table 2. Descriptive statistics.

Panel A. Descriptive statistics of the explanatory variables										
	ESGDS	ENVS	SOCIALS	GOVS	SGROWTH	FSIZE	BSIZE	LEV	OWNER	ROA
Mean	20.23	16.58	18.55	41.74	8.30	17.63	9.17	21.83	52.74	0.11
Median	17.11	12.85	13.05	37.12	15.68	14.46	7.93	24.17	50.66	0.09
Std. Dev.	18.97	14.31	15.77	40.64	10.30	2.81	3.05	0.12	43.92	0.06
Skewness	0.57	0.43	0.52	0.76	0.24	−0.32	0.58	0.64	0.81	0.17
Kurtosis	5.16	3.24	3.69	8.05	2.11	4.65	1.71	3.56	7.13	6.74
Panel B. Frequencies Statistics										
	#Obs.		%							
Under-investment Obs.	112		64							
Over-investment Obs.	63		36							
BIG (indicator = 1)	100		57							

This table reports descriptive statistics. ESGDS is the corporate sustainability disclosure score; ENVS is the environmental disclosure score; SOCIALS is the social disclosure score; GOVS is the governmental disclosure score; SGROWTH is the sales growth; FSIZE is the firm size; BSIZE is the board of directors' size; LEV is the firm debt level; OWNER is the ownership concentration; BIG is a Big4 audit firm; and ROA is the firm's performance. All variables were Winsorized at the 1% and 99% levels to mitigate the effect of outliers. Please refer to the Appendix A for the variables' measurement.

We tested for possible multicollinearity identification and the results of the Pearson matrix and Variance Inflation Factors (VIFs) coefficients are outlined in Table 3. Based on the matrix, higher correlations are observed between the environmental disclosure score, social disclosure score, and governance disclosure score; these coefficients are significant at the 1 percent level. These elevated correlations are mechanical, since the ESGDS is the sum of the ENVS, SOCIALS, and GOVS. All other correlation coefficients are less than 0.5 and higher than −0.5. Further, according to [38], a VIF value of less than 10 is acceptable; the VIF values among our variables are all lower than 3. These results suggest that the collinearity problem may not be a concern.

Table 3. Pearson correlation matrix.

	1	2	3	4	5	6	7	8	9	10	VIF	1/VIF
1 ESGDS	1.000										1.46	0.68
2 ENVS	0.445 ***	1.000									1.68	0.60
3 SOCIALS	0.474 ***	0.421 ***	1.000								1.02	0.98
4 GOVS	0.495 ***	0.427 ***	0.499 ***	1.000							2.12	0.47
5 SGROWTH	0.091	0.136 *	0.026 **	0.059 *	1.000						2.25	0.44
6 FSIZE	−0.396 ***	0.291 **	−0.323 **	0.358	0.275 ***	1.000					2.37	0.42
7 BSIZE	−0.306	−0.252 ***	0.279 *	−0.295 *	0.104	0.283 **	1.000				1.78	0.56
8 LEV	−0.157 **	−0.123	0.154 ***	0.097 **	0.160 ***	−0.158 **	0.139 **	1.000			1.39	0.72
9 OWNER	−0.181	0.138 *	0.283 *	0.140 **	−0.189 **	0.225 **	0.104 *	0.124	1.000		1.19	0.84
10 ROA	0.054 **	0.012 ***	0.037 **	0.067 ***	0.009 **	0.053 **	0.011 *	−0.002	−0.077	1.000	1.46	0.68

This table reports the multicollinearity tests. ESGDS is the corporate sustainability disclosure score; ENVS is the environmental disclosure score; SOCIALS is the social disclosure score; GOVS is the governance disclosure score; SGROWTH is the sales growth; FSIZE is the firm size; BSIZE is the board of directors' size; LEV is the firm's debt level; OWNER is ownership concentration; BIG is a Big4 audit firm; ROA is the firm's performance. All variables were Winsorized at the 1% and 99% levels to mitigate the effect of outliers. *, **, *** next to a coefficient indicate significance level of 10%, 5%, 1%, respectively. Please refer to the Appendix A for the variables' measurement.

4.2. Empirical Results and Discussions

Table 4 displays the estimation results from Equation (1), assessing the first research hypothesis. We split the total sample into over-investing and under-investing groups, and we performed an OLS regression. The findings show that the sustainable reporting variable (the coefficient on ESGDS is negative) exhibit a negative and statistically significant impact on investment deviation for the two groups.

Table 4. Investment inefficiency and ESG disclosure extent across the under-investing and over-investing groups (testing H.1).

	Panel A: Under-Investing Firms		Panel B: Over-Investing Firms	
	Coef.	t-Stat	Coef.	t-Stat
Constant	0.275 **	(2.36)	0.197 **	(2.20)
ESGDS	−0.064 **	(−2.04)	−0.052 **	(−2.10)
SGROWTH	0.361	(0.81)	0.357	(0.89)
FSIZE	0.192	(1.48)	0.180	(1.38)
BSIZE	−0.232 *	(−1.81)	−0.241 *	(−1.78)
LEV	0.079	(1.18)	0.089	(1.23)
OWNER	−1.137 *	(−1.87)	−1.146 *	(−1.83)
BIG	−0.081 ***	(−2.61)	−0.088 ***	(−2.55)
ROA	−0.049 **	(−2.11)	−0.041 **	(−2.13)
Year dummies	Included		Included	
Industry dummies	Included		Included	
Adj R-squared (%)	22		21	

This table reports the test of impact of ESGD on under- and over-investment decision. ESGDS is the corporate sustainability disclosure score; SGROWTH is the sales growth; FSIZE is the firm size; BSIZE is the board of directors' size; LEV is the firm's debt level; OWNER is ownership concentration; BIG is a Big4 audit firm; ROA is firm performance. All variables were Winsorized at the 1% and 99% levels to mitigate the effect of outliers. *, **, *** next to a coefficient indicate significance level of 10%, 5%, 1%, respectively. Please refer to the Appendix A for the variables' measurement.

The negative coefficients on ESGDS confirm that corporate sustainable disclosure enhances the investment efficiency of Saudi listed firms, and it is a great determinant of it (adj. R sq. of 22 percent and 21 percent). This finding might be because the introduction of sustainable disclosure leads to higher accounting quality by enhancing reporting transparency and involving more comparability, which results in reducing information asymmetry for shareholders. Therefore, the greater level of non-financial information reported can permit shareholders to compare value-creating investment projects with value-destroying investment projects and improve management's investment strategies [20,21]. Sustainable disclosure offers a variety of benefits for investors. In fact, comprehensive and timely sustainable information helps to decrease the investment risk. These results confirm our hypothesis H.1, in that a greater propensity for ESG-related disclosure of Saudi public firms promotes investment efficiency.

For the control variables, the coefficients associated with ownership concentration (OWNER) and boardroom size (BSIZE) are negative and statistically significant for both groups. Drawing on agency and stakeholder theories, the boardroom is found to play a major role in organizational decision-making. The findings could be then attributed to the idea that corporations with an effective governance structure will have managers make investment decisions that aligned with shareholders' interests and long-term firm value, resulting in better firm performance [39,40]. Ownership structure is an important mechanism of corporate governance, mainly in determining agency conflicts due to the separation of ownership and control [41]. The presence of the Big4 is found to decrease corporate investment inefficiency. The coefficients on BIG are negative and statistically significant at the 1 percent level for the two groups. Thus, Big4 audit firms bring better services in terms of quality by taking advantage of information production. The highest quality of information production offered by the Big4 services provide companies with more accurate information, for an efficient investing decision. Since the Big4 have a reputation to maintain, they have strict standards that help eliminate any opportunistic managerial behavior. We may also conclude from the findings that the Big4 function is trusted by both investors and creditors, which is anticipated to help manage the access of companies to external financing, and therefore a stronger investment. The results show that firm performance measured by ROA has a negative and significant impact on investment inefficiency. Therefore, firm performance is improved with investment efficiency.

To test for H1.1, H1.2, and H1.3, we re-ran the research model using a parametric measure for investment efficiency and the results are reported in Table 5. We used a parametric measure as a proxy for investment inefficiency, which is the amount of excess investment in assets from the residual of the equation (Equation (5)) of sales growth [42–44].

Table 5. Investment inefficiency, aggregate ESG score, and ESG components of the overall sample (testing H1.1, H1.2, and 1.3).

	Aggregate ESG Score	Environmental Disclosure Score (Equation (2))	Social Disclosure Score (Equation (3))	Governmental Disclosure Score (Equation (4))
Constant	0.257 ** (2.30)	0.197 ** (2.18)	0.188 ** (2.20)	0.195 ** (2.25)
ESGDS	−0.052 ** (−2.09)			
ENVS		−0.063 ** (−2.12)		
SOCIALS			−0.097 *** (−2.61)	
GOVS				−0.078 ** (−2.10)
SGROWTH	0.298 (1.23)	0.175 (1.10)	0.180 (1.19)	0.194 (1.22)
FSIZE	0.183 (1.51)	0.121 (1.55)	0.137 (1.38)	0.175 (1.47)
BSIZE	−0.177 ** (−2.12)	−0.149 * (−1.82)	−0.214 ** (−2.22)	−0.186 * (−1.79)
LEV	0.092 (1.36)	0.076 (1.44)	0.081 (1.46)	0.098 (1.52)
OWNER	−1.078 * (−1.91)	−1.154 * (−1.82)	−1.257 * (−1.79)	−1.195 ** (−2.07)
BIG	−0.081 *** (−2.67)	−0.074 *** (−2.72)	−0.089 *** (−3.10)	−0.067 *** (−3.05)
ROA	−0.072 ** (−2.21)	−0.062 ** (−2.23)	−0.057 *** (−2.58)	−0.081 ** (−2.25)
Year dummies	Included	Included	Included	Included
Industry dummies	Included	Included	Included	Included
Adj R-squared (%)	22	20	23	22

This table reports the impact of the aggregate ESGD score and its separated components on the level of investment inefficiency for the overall sample. ESGDS is the corporate sustainability disclosure score; ENVS is the environmental disclosure score; SOCIALS is the social disclosure score; GOVS is the governmental disclosure score; SGROWTH is the sales growth; FSIZE is the firm size; BSIZE is the board of directors' size; LEV is the firm's debt level; OWNER is the ownership concentration; BIG is a Big4 audit firm; ROA is the firm's performance. All variables were Winsorized at the 1% and 99% levels to mitigate the effect of outliers. *, **, *** next to a coefficient indicate significance level of 10%, 5%, 1%, respectively. Please refer to the Appendix A for the variables' measurement.

The residual (error term) of the investment equation, correspond to the investment deviation, which is either over- or under-investment. Therefore, this residual does not determine if a business over- or under-invests (unobservable characteristic). However, it determines if it is more or less likely to over- or under-invest compared to all other businesses in the same industry each year. A positive residual means that the company is making investments at an elevated rate than estimated according to the sales growth; hence, it over-invests. In turn, a negative residual presumes that a real investment is lower than the required level, indicating an under-investment. We set a dependent variable as a proxy for investment deviation by multiplying the absolute value of the residuals by negative 1 (−1), since both over- and under-investment reveal an unfavorable sign about the efficiency degree.

First, the negative coefficient on ENVS ($\beta = -0.063$) proves that reporting environmental non-financial information, referring to how a corporation behaves as a steward of nature (e.g., include carbon emissions, waste management, water management, raw

material sourcing, and climate change vulnerability), reduces investment inefficiency (over-investing and under-investing decisions). This coefficient is significant at the 5 percent level. It confirms our first sub-hypothesis H1.1. Second, the negative coefficient on SO-CIALS ($\gamma = -0.097$) proves that reporting social non-financial information, exploring how corporations handle relations with employees, customers, and the whole society (e.g., CSR practices, labor management, data privacy, general security, health, safety, addressing racial injustice, diversity, and equity), decreases the corporate investment inefficiency level. This result confirms our second sub-hypothesis H1.2. Finally, the negative coefficient on GOVS ($\delta = -0.078$) demonstrates that reporting non-financial information regarding corporate governance practices, is negatively associated with corporate investment inefficiency. This category of disclosure implies issues related to business ethics, leadership, executive pay, audits, internal controls, intellectual property protection, and shareholder rights. This outcome confirms our third sub-hypothesis H1.3.

We employed OLS estimation for linear panel data models; however, there still is a possible endogeneity problem in the link between investment inefficiency and ESG disclosure extent. Thus, we evaluated the robustness of our main results. We re-ran the research models using a firm fixed effect to control for endogeneity due to time-invariant omitted variables. We found the same results and the conclusions remain unchanged.

5. Conclusions and Contributions

Sustainable investing is about investing in development and distinguishing that firms resolving the world's biggest challenges should be best placed to develop. It is about pioneering best practices of doing business and producing the force to inspire more and more businesses to opt into the future.

With the mixture of traditional investment methods with environmental, social, and governance (ESG) concerns, firms take a sustainable approach in pursuing their investment goals. This article examined the association between ESG disclosure extent and investment efficiency, a value-added corporate activity that is crucial to firm viability and profitability. To test the research hypothesis, we selected a sample of 25 Saudi listed firms from 2014 to 2021. The choice of the Kingdom of Saudi Arabia is explained by the following reasons: Saudi Arabia was described as the "giant of the Middle East"; it has a suitable commercial environment distinguished by a promising degree of competitiveness, a developed judicial system, and a robust investment environment. Furthermore, Saudi Arabia has been classified as the 11th most powerful country worldwide and first in the Islamic and Arab world, according to numerous aspects such as political stability, economic impact, defense budget, state weapons, scientific alliances, military power, and global influence (2021's annual ranking by CEOWORLD magazine). The Saudi stock market also is among those in the developing world that has been consistently reporting high development, particularly in the Middle East and Asia. Based on the DEA approach, an OLS regression analysis shows that the three pillars of the ESG score are associated negatively with investment inefficiency. This result holds for both under-investing and over-investing firms.

To date, limited research efforts have been directed towards the investigation of the link between nonfinancial disclosure and corporate investment decisions in the Saudi Arabian context. The outcomes of this research extend the literature about the relationship between investment efficiency and sustainable reporting. They provide confirmation of the importance of ESG reporting as a key driver of enhanced corporate investment and support the existent literature based on the impact of ESG reporting on under- and over-investment of Saudi indexed firms and bring additional evidence for the Middle East region in terms of sustainable development. Regulators, policymakers, and standard-setters may find these results interesting as they signal the importance of launching the disclosure guidelines to raise awareness on the importance of ESG within the Saudi capital market (e.g., the efforts of the Saudi Exchange). Additionally, this study may offer suggestions for firm management concerning the importance of ESG disclosure in enhancing firm investment

decisions. Finally, our findings may be beneficial for investors when evaluating corporate investment and decision-making strategies.

Our contributions may have two limitations, associated with the restrictions imposed by the research context. First, a limit of studying an emerging market is that data are limited. Consequently, we do not have access to some possible control variables used in prior studies. Second, a small number of firms represents Saudi Arabia. Moreover, sustainable reporting is a new field in this country, although it has been initiated with the Kingdom Vision of 2030. These constraints should not hide the significant findings found in this work.

We end with future research directions. In fact, this work does not suggest an exhaustive list of all potential investment efficiency measures. Accordingly, an investigation of other proxies is left to future works. Additionally, we suggest reporting the effect of ESG for each sector separately, to observe which sector is most impacted. Such a finding would be important and would convey a critical message to policymakers.

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Appendix A

Table A1. Variables measurement.

Variables	Symbol	Description	Data Source
Investment Efficiency	INVEST	Residual from an investment equation (Equation (5)).	Thomson Reuters Eikon
Corporate Sustainability Disclosure Score	ESGDS	The equally weighted average of the environmental, social and governance scores for each observation.	Thomson Reuters Eikon
Firm Size	FSIZE	Natural logarithm of total assets.	Thomson Reuters Eikon
Board Size	BSIZE	Number of members in the board.	Thomson Reuters Eikon
Firm Leverage Level	LEV	Long-term liabilities divided by lagged total assets.	Annual Reports
Ownership Concentration	OWNER	Sum of equity shares held by the three largest shareholders.	Thomson Reuters Eikon
Auditor Reputation	BIG	Indicator variable takes the value of 1 if the company is audited by at least one of the Big4 audit firm; 0 otherwise.	Annual Reports
Firm Performance	ROA	Income before extraordinary items divided by total assets.	Thomson Reuters Eikon

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