

Do Sustainability Index Inclusions Impact Audit Fees? Insights from the Turkish Capital Market

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Sürdürülebilirlik Endeksine Dahil Olmak Denetim Ücretlerini Etkiler Mi? Türk Sermaye Piyasasından Bulgular

Abstract

Sustainability influences corporate strategy and finance, with indices like the BIST Sustainability Index encouraging responsible investment. This study investigates whether inclusion in the BIST 50 Index affects audit fees for firms from 2020 to 2024, using panel data analysis. The results show that the inclusion of the sustainability index does not significantly affect audit fees. However, firm age, total assets, and group affiliation positively affect audit fees, while financial leverage has a negative effect. These findings offer insights into how sustainability performance relates to audit fees in an emerging market context, contributing to the broader literature on corporate sustainability and financial outcomes.

Keywords : Stock Market, Financial Ratios, Sustainability Index, Audit Fees, Non-Bank Financial Institutions.

JEL Classification Codes : G10, G23, G32, M40.

Öz

Sürdürülebilirlik, kurumsal stratejiyi ve finansal kararları etkilemekte; BIST Sürdürülebilirlik Endeksi gibi endeksler ise sorumlu yatırımları teşvik etmektedir. Çalışma, 2020-2024 yılları arasında BIST 50 Endeksi'nde yer alan şirketler için sürdürülebilirlik endeksine dahil olmanın denetim ücretlerini etkileyip etkilemediğini panel veri analiziyle incelemektedir. Sonuçlar, sürdürülebilirlik endeksine dahil olmanın denetim ücretleri üzerinde anlamlı bir etkisi olmadığını göstermektedir. Ancak firma yaşı, toplam varlıklar ve grup bağlantısı denetim ücretlerini olumlu yönde etkilerken, finansal kaldıraç olumsuz etki yaratmaktadır. Bulgular, sürdürülebilirlik performansının denetim ücretleriyle nasıl ilişkilendirildiğine dair gelişmekte olan bir piyasa bağlamında önemli içgörüler sunmakta ve kurumsal sürdürülebilirlik ile finansal sonuçlara ilişkin literatüre katkı sağlamaktadır.

Anahtar Sözcükler : Hisse Senedi Piyasası, Finansal Oranlar, Sürdürülebilirlik Endeksi, Denetim Ücretleri, Banka Dışı Finansal Kurumlar.

1. Introduction

Sustainability is generally regarded as a concept encompassing social equity, environmental protection, and economic development, aiming to ensure responsible resource consumption for future generations, promote environmentally and socially conscious living conditions, and establish a more efficient economic system. From a corporate perspective, sustainability involves aligning financial, environmental, social, and ethical considerations with corporate culture, ensuring that a long-term sustainable mindset becomes an integral part of the organisational structure. As the growing significance and urgency of sustainability issues have compelled firms to take appropriate action, a series of studies has begun to examine the relationship between sustainability and audit fees. For instance, studies (Rabarison et al., 2024; Wu et al., 2023; Xin et al., 2022; Aprianti et al., 2021; Kim & Jung, 2020; Kim et al., 2019) found that sustainability matters like corporate social responsibility (CSR), sustainability disclosure, environmental administrative penalties and green innovations significantly influence audit fees.

Al-Shaer (2020) studied the relationship between sustainability reporting and audit fees. Hou et al. (2022) showed the impact of environmental, social, and governance (ESG) performance on audit fees. Cahyaningati et al. (2022) investigated the relationship between CSR and audit costs.

Undoubtedly, the evolution of sustainability practices has a direct impact on financial markets. At this stage, stock exchanges feel compelled to introduce innovations to meet investors' needs. Among the most notable of these innovations are sustainability indices, introduced by various stock markets worldwide. These indices encourage responsible investment and serve as a platform connecting companies that prioritise sustainability with investors seeking such opportunities.

Borsa Istanbul A.Ş. (BIST) holds a significant position among global stock exchanges as a securities market that offers its investors a sustainability index (SI) service. Due to the limited availability of ESG data in Türkiye, this study uses the SI as a proxy for firms' sustainability performance. The index serves as a market-recognised benchmark, helping investors identify sustainable firms. Given the limited empirical research on ESG and audit fees in emerging markets, this paper investigates the impact of sustainability performance on audit fees of BIST 50 non-financial firms in Türkiye between 2020 and 2024 through panel data analysis. The necessary data were obtained through an extensive literature review and by analysing changes in audit fees of the firms included in the index.

As discussed above in the related literature, prior research (Wu et al., 2023; Cahyaningati et al., 2022) has primarily focused on the influence of sustainability and environmental factors, such as green policy implementation, sustainability products, environmental regulations, and climate-related risks, on audit practices. This study broadens the scope by investigating whether a company's listing on the sustainability index affects its audit fees. According to Al Ani et al. (2024: 658), sustainability practices may present new

opportunities for companies to pursue sustainable growth, as many seek to achieve their sustainability objectives by addressing sustainability issues that may directly influence their operations and financial standing. Moreover, the financial impact of such a thing affects the scope of audit services provided and, consequently, the fees paid to auditors. In this context, this study centres on BIST 50 non-financial firms in Türkiye from 2020 to 2024, exploring the impact of sustainability performance on their audit fees through panel data analysis. The study aims to fill the following gaps in the literature and offer the contributions outlined below:

- While prior studies (Xue & O'Sullivan, 2023; Al-Shaer, 2020) have extensively examined the relationship between sustainability practices and audit fees in developed markets, there is limited research (Cengiz & Öksüz, 2023) focusing on emerging economies such as Türkiye. The Turkish capital market, characterised by its emerging-market status, lower investor protection, and evolving corporate governance structures, offers a distinct environment in which the implications of sustainability-related disclosures and index inclusion may differ from those observed in more mature economies. By focusing on this underexplored context, our study contributes new insights to the growing body of literature on sustainability and assurance services.
- The impact of recent regulatory changes, such as the implementation of Türkiye Sustainability Reporting Standards (TSRS) in 2024, on audit fees remains underexplored. The relatively recent introduction of the TSRS represents a significant regulatory shift aimed at aligning corporate sustainability practices with international standards. This regulatory evolution creates a timely and relevant setting for investigating how market participants, including auditors, respond to sustainability-driven corporate changes. This study examines whether these regulations have altered audit cost structures for sustainability-focused firms.
- Previous research presents mixed findings regarding the impact of sustainability practices on audit fees; some studies find positive effects, like Sun et al. (2020) and Lobo et al. (2018), while others report negative effects, such as Al Ani et al. (2024) and Wu et al. (2023) or insignificant (Cahyaningati et al., 2022) impacts. This study provides empirical evidence that the inclusion of sustainability indices does not increase audit fees, offering a new perspective on the ongoing debate.
- Although factors such as firm age, total assets, and group affiliation have been studied in various contexts, their role in the sustainability-audit fee nexus is not well understood. This study explores these determinants within the framework of sustainability performance.
- While prior research (Xue & O'Sullivan, 2023; Ahmed & Goyal, 2005) suggests that Big Four auditors may charge higher fees due to additional sustainability-related risks, this study finds no significant relationship between Big Four audit firms and audit fees in the context of the SI.

2. Literature Review and Hypothesis Development

2.1. Determinants of Audit Fees

There are numerous studies in the literature that examine the determinants of audit fees by focusing on a single country or market (Saleh & Ragab, 2023; Ardianingsih & Setiawan, 2022; Cunha Silva et al., 2020; ElGammal & Gharzeddine, 2020; Gah, 2020; Owusu & Amoah Bekoe, 2019; Rewczuk & Modzelewski, 2019; Musah, 2017; Afesha, 2016; De Lima Castro et al., 2015; Kikhia, 2014; Amba & Al-Hajeri, 2013; Thinggaard & Kiertzner, 2008; Leventis et al., 2005; Ho & Ng, 1996; Low et al., 1990). However, studies specifically focusing on Türkiye and Borsa Istanbul are relatively scarce (Cengiz & Öksüz, 2023). This is primarily because audit fees were not disclosed in the financial statement footnotes until 2021. Since no official data on audit fees in Türkiye were available in previous years, academic studies on this subject were not feasible.

Audit fee refers to the remuneration earned by auditors for providing professional services (Ye, 2020: 250). Auditors and their teams are entitled to this fee as compensation for their efforts during the contract period. The primary basis for determining the fee is the estimated workload and the time required to complete the audit. However, assessing this workload is not straightforward. Numerous studies have been conducted since the 1980s to establish methods for determining audit fees. A summary of these studies is presented in Table 1.

Table: 1
Summary of Studies Regarding Audit Fees

Author	Sample	Explanatory Variables	Findings
Simunic (1990)	367 U.S. companies (1977 data)	Firm size (total assets), number of subsidiaries, number of industries operated in, receivables-inventory ratio, profit/loss status, auditor tenure, and whether the auditor is a Big Eight firm.	Audit fees are positively correlated with firm size, complexity, the magnitude of receivables and inventories, and whether the auditor is a Big Eight firm, and negatively correlated with auditor tenure.
Low et al. (1990)	291 publicly listed companies on the Singapore Stock Exchange (1986 data)	Company size, accounts receivable to total assets ratio, inventory to total assets ratio, losses in the last three years, presence of contingent liabilities, long-term debt to total funds ratio, current ratio, and qualified opinion in the auditor's report.	The most significant determinant of audit fees is company size. The number of industries (complexity) and inventory ratios are meaningful in specific sectors. Accounts receivable ratio, loss history, and contingent liabilities are significant in certain industries. The impact of contingent opinions in the auditor's report is generally weak. In industry-based analyses, the model's explanatory power has increased, and the importance of variables varies across sectors.
Ho and Ng (1996)	Companies listed on the Hong Kong Stock Exchange: 313 companies (1992) and 396 companies (1993)	Total assets, revenue, debt ratio, liquidity ratio, profitability, number of subsidiaries, auditor size, auditor change, fiscal year-end period, and audit delay.	Audit fees were most influenced by company size (total assets and revenue), operational complexity (number of subsidiaries), and audit timing (fiscal year-end and audit delay). A positive and significant relationship was found between auditor size and audit fees. Debt ratio and liquidity variables were significant in specific periods. Auditor change showed a negative relationship, supporting lower fees in the first year.

Ahmed and Goyal (2005)	566 companies: 118 from Bangladesh, 219 from India, and 229 from Pakistan (1998 data)	Company size, multinational company affiliation, financial condition, operational complexity, and auditor size.	Audit fees were most influenced by company size, multinational company affiliation, and auditor size. Big 4 auditors demand higher fees. The financial condition variable was significant only for Pakistan. The operational complexity variable was not found to be significant. Companies in India paid higher audit fees compared to those in Bangladesh and Pakistan.
Naser and Hassan (2013)	22 non-financial companies, Dubai Financial Market (2011 data)	Company size, profitability, financial risk, company complexity, industry type, auditor size, audit report delay, and audit committee independence.	Audit fees showed a positive and significant relationship with company size and audit committee independence. A significant negative relationship was found between company complexity (COMP) and audit fees. Financial risk, profitability, industry type, auditor status, and audit report delay variables were not found to be significant.
Xue and O'Sullivan (2023)	453 companies, UK Alternative Investment Market (2016 data)	Accounts receivable to total assets ratio, inventory to total assets ratio, subsidiary presence in the US, return on assets ratio, leverage ratio, liquidity ratio, listing duration, and non-revenue generating status. Independent board members ratio, audit committee disclosure, audit committee size, presence of executive members in audit committee, financial expertise of audit committee members, auditor size, previous year's audit fee, company size, number of subsidiaries, non-audit services provided by the auditor, auditor's London-based location, intensive audit period, and auditor change.	Audit fees are negatively and significantly related to the company's liquidity ratio and listing duration. The proportion of independent board members increases audit fees. Audit committee disclosures are associated with higher audit fees. Big 4 auditors demand a 4.6% premium on audit fees. Company size and the presence of non-audit services positively and significantly influence audit fees. Among the control variables, the previous year's audit fee is identified as one of the strongest determinants.
Cengiz and Öksüz (2023)	98 manufacturing sector companies in BIST-100 (2020-2022 period)	Auditor size, type of audit opinion, duration of the relationship between the auditing firm and the audited company, return on assets, asset size, and financial leverage ratio.	A positive and significant relationship was found between the size of the auditing firm and audit fees. A negative and significant relationship was identified between the duration of the relationship between the auditing firm and the company and audit fees. No significant relationship was found between the type of audit opinion and audit fees. The return on assets and asset size positively and significantly influence audit fees, while the financial leverage ratio shows a negative and significant relationship.
Hidayat et al. (2024)	Manufacturing companies listed on the Indonesia Stock Exchange (2018-2021 period)	Company complexity, company size, independent commission, and audit quality.	According to the partial test results, with audit costs as the dependent variable, audit complexity has a positive effect on audit quality, whereas company size and independent commission members do not affect it. Furthermore, company complexity and audit quality positively affect audit fees. Company size and independent commission members did not influence audit fees. Company complexity affected audit costs using audit quality as a mediating variable, indicating that the type of mediation is complementary.

2.2. Sustainability and Audit Fees

Sustainability has become increasingly prominent on firms' agendas and is also affecting stakeholders. As this interaction intensifies, a series of studies have begun to examine the impact of sustainability and social and environmental performance on audit fees. Drawing on previous studies on voluntary assurance and sustainability reports, as well as audit fees, both domestically and internationally, Zhao (2017) selected a set of alternative data reflecting the current state of voluntary assurance for sustainability reports among Australian-listed companies. Based on the data, a comprehensive review was conducted to examine whether the voluntary assurance of sustainability reports affects auditors' audit fees. Finally, the author found that voluntary assurance of sustainability reporting affects audit fees.

Al-Shaer (2020) explores the relationship between high-quality sustainability reporting and earnings management, investigating whether firms with better sustainability reports engage in less earnings manipulation, thereby producing more transparent and reliable financial information. The study also examines whether the impact of sustainability reporting quality on post-audit financial reporting depends on audit effort. Using data from FTSE 350 companies between 2007 and 2018, the study finds a significant negative relationship between high-quality sustainability reports and earnings management. Importantly, this relationship is influenced by audit effort, as measured by audit fees, suggesting that auditors consider the quality of sustainability reporting in their risk assessments. The results remain consistent after sensitivity tests. The study concludes that firms investing in high-quality sustainability reports demonstrate a broader commitment to quality, reducing auditors' concerns about opportunistic behaviour and, consequently, lowering audit effort.

Cahyaningati et al. (2022) investigated the impact of CSR and good corporate governance (GCG) on audit costs and firm value, focusing on whether audit costs mediate the relationship between CSR and firm value. Data was collected from Indonesian companies listed on the Corporate Governance Perception Index between 2016 and 2018. The findings show that CSR does not affect audit costs or firm value, while GCG increases audit fees but negatively impacts firm value. Audit fees do not mediate the relationship between CSR, GCG, and firm value. Xin et al. (2022) investigated the impact of environmental administrative penalties on audit fees, focusing on heterogeneity effects and underlying mechanisms. Using data from heavily polluting listed firms in China, they found that environmental administrative penalties lead to higher audit fees. In another study, the relationship between ESG performance and audit fees for A-share listed companies in Shanghai and Shenzhen from 2011 to 2020 is examined (Hou et al., 2022). Using a two-way fixed-effects model, the paper finds a strong negative association between better ESG performance and lower audit fees. The negative effect is more significant for non-state-owned firms and those audited by Big Four accounting firms. The findings enrich the understanding of ESG performance's impact on firms and expand research on the factors influencing audit fees.

Wu et al. (2023) explore the impact of diversity in green innovation on audit fees, using a sample of 4,901 listed Chinese firms from 2010 to 2021. The findings indicate that greater diversity in green innovation is associated with lower external audit fees. This relationship is driven by enhanced information transparency and improved corporate environmental performance. A heterogeneity analysis reveals that the effect of green innovation on audit fees is stronger in smaller firms, those receiving higher government subsidies, and firms in greener industries. Yang et al. (2023) investigated the impact of firms' climate-related risks on audit fees. Using indicators of physical and transition climate risks, the findings reveal that climate-related risks significantly increase audit fees.

Kammoun and Khoufi (2023) investigate how engagement in sustainable practices moderates the relationship between conditional conservatism and audit fees. Using a sample

of 3,767 firm-year observations from 14 EU countries (2006-2019), the authors conduct a panel data analysis using ordinary least squares to examine the effect of conditional conservatism on audit fees and the moderating role of ESG scores. The findings show that conditional conservatism reduces audit fees, meaning auditors charge lower fees to more conservative clients. However, firms that engage in ESG actions, either individually or in combination, pay higher audit fees. The negative relationship between conditional conservatism and audit fees is weakened only when ESG performance is included, suggesting that firms less committed to ESG sustainability practices may pay lower audit fees when adopting more conservative reporting. In their study, Suryandari and Saripah (2023) aim to provide empirical evidence on how audit committees, firm complexity, and profitability influence audit fees, with firm size moderating these effects. The study population comprises manufacturing companies listed on the Indonesia Stock Exchange between 2019 and 2021. The results show that audit committees have a significant negative effect on audit fees, whereas company complexity and profitability do not affect them. Additionally, firm size weakens the influence of audit committees on audit fees but does not moderate the effect of company complexity and profitability on audit fees. Al Ani et al. (2024) investigate whether firms with high sustainability products pay higher audit fees. Using data from 261 European firms (2010-2019), the study finds that high sustainability products are positively associated with audit fees. The presence of a sustainability committee moderates this relationship, such that environmental and eco-design products are negatively associated with audit fees.

It is thought that investing in sustainable practices may offer companies new opportunities to achieve better results. The financial and non-financial effects of such results may expand the scope of audit services and audit fees. Therefore, H1 was developed as follows:

Hypothesis 1 (H1): Listing in the sustainability index will lead to an increase in audit fees.

3. Data & Methodology

3.1. Data and Sample

This paper focuses on publicly listed companies in the BIST 50 index between fiscal years 2020 and 2024. The BIST 50 Index is selected because the firms included in this index provide more consistent and accessible data regarding sustainability practices and publicly disclosed audit fees. BIST 50 companies generally exhibit stronger corporate governance structures and sustainability strategies and attract greater attention from the public and investors. Moreover, because disclosure of audit fees in Türkiye became mandatory only in 2021, focusing on the BIST 50 ensures greater data reliability and enhances the study's statistical validity by avoiding potential data gaps that would arise with a broader sample. Among these 50 firms, we selected only non-financial firms listed in the SI. We excluded 9 firms due to missing data, outliers, and their operations in the finance industry. After

excluding 9 firms, our sample comprises 41 firms (82% of the initial sample) and 115 firm-year observations. Table 2 provides an overview of the sample utilised in this study.

We collected financial data from the Public Disclosure Platform (PDP) database. PDP is an electronic platform that facilitates the public disclosure of electronically signed statements mandated by capital market regulations and Borsa Istanbul rules. We also utilised the firms’ own websites for their financials. Additionally, we used Stata 14.0 to estimate a panel data model in the study.

Table: 2
Sample by Firms and Industry

Industry	Number	%
Holding and Investment Companies	8	19,51
Chemicals, Petroleum, Rubber and Plastic Products	5	12,20
Transportation And Storage	2	4,88
Electricity, Gas, and Water	3	7,32
Wholesale and Retail Trade	4	9,76
Telecommunication	2	4,88
Food, Beverage and Tobacco	3	7,32
Basic Metal	3	7,32
Fabricated Metal Products, Machinery, Electrical Equipment, and Transportation Vehicles	5	12,20
Other	6	14,63
Total	41	100

3.2. Variables

3.2.1. Dependent Variable

To examine the impact of being listed in a sustainability index on audit fees, the study refers to the existing literature to select AF (Al Ani et al., 2024; Wu et al., 2023; Cahyaningati et al., 2022; Hou et al., 2022; Al-Shaer, 2020) as the dependent variable. The fees consist of three components: audit and assurance fees, tax consulting fees, and other assurance services fees, received from independent audit firms by year. The fees have been included in the fees of all subsidiaries and joint ventures. The dependent variable was measured by the natural logarithm of the total amount of audit fees paid by the firms in the current year.

3.2.2. Independent Variable

The sustainability performance of firms was measured by their listing in the SI during the research period. Given that sustainability practices are linked to sustainability performance and play a significant role in firms' sustainability outcomes, this article denotes listing in the sustainability index as “SUST” in the research model.

3.2.3. Control Variables

The paper controlled five firm-specific variables in accordance with previous studies (Al Ani et al., 2024; Kammoun & Khoufi, 2023; Xin et al., 2022). Since prior literature suggests that firm size, measured as the natural logarithm of total assets, influences audit fees (Januarti & Wiryaningrum, 2018; Huguet & Gandia, 2016), we included the variable

TA in the research model. Additionally, we controlled for the materiality of the audit firm (Wu et al., 2023; Cabal-García et al., 2019), represented by the BIG4. To reflect financial stability, we introduced financial leverage (LEV), defined as the ratio of total liabilities to total assets (Rabarison et al., 2024; Kim et al., 2012), and firm age (AGE), measured as the natural logarithm of the number of years since the firm's establishment. The complexity of firms was represented by GROUP, measured as the natural logarithm of the number of subsidiaries owned by the firm (Musa et al., 2021; Silva et al., 2020). Table 3 provides detailed definitions of all variables used in the study.

Table: 3
Definition of Variables

Variable	Code	Description
Audit Fees	AF	Natural logarithm of the total amount of audit fees
Sustainability Performance	SUST	Dummy score of "1" if a firm is listed in the sustainability index, "0" if otherwise
Firm Size	TA	Natural logarithm of total assets
Age of the firm	AGE	Natural logarithm of the number of years since establishment
Complexity	GROUP	Natural logarithm of the number of subsidiaries
Financial Leverage	LEV	Total liabilities/assets
Materiality of the Auditor	BIG4	Dummy score of "1" if the auditor is BIG-4 and "0" if otherwise

3.3. Model Specification

This study employs SUST as the independent variable and AF as the dependent variable to examine the relationship between sustainability performance and audit fees using a panel data model. Given that the analysis includes time series (T) data for a large set of firms, panel data analysis was selected as the appropriate econometric method, as it integrates both cross-sectional (N) and time-series dimensions. Typically, in such analyses, the number of cross-sectional units exceeds the number of time periods, resulting in a structure where $N > T$ (Tatoğlu, 2016: 4).

In panel data models, omitted variables may be correlated with the independent variables, resulting in biased and inconsistent parameter estimates. This issue is known as the problem of endogeneity. Panel data techniques help mitigate this issue by controlling for unobserved heterogeneity, particularly time-invariant omitted variables, thereby reducing estimation bias. Accurately identifying the source of endogeneity is crucial for obtaining consistent estimators. To address potential endogeneity concerns, this study adopts a panel data approach, following the recommendations of Al Ani et al. (2024) and Wu et al. (2023). Specifically, to investigate the impact of sustainability performance on external audit fees, the following regression specification is employed:

$$AF_{it} = \alpha_0 + \alpha_1 SUST_{it} + \alpha_2 Control_{it} + u_i + \vartheta_i + \varepsilon_{it} \quad (1)$$

In Eq. (1), AF_{it} represents external audit fees of firm i in year t . $SUST_{it}$ denotes listing in the sustainability index for firm i in year t . The variable $Control_{it}$ accounts for firm-specific characteristics of firm i in year t . To mitigate the risk of omitting non-time-varying unobservable factors and to prevent bias caused by time trends, the study incorporates firm fixed effects (u_i) and year fixed effects (ϑ_i). The error term is denoted by ε_{it} . Furthermore,

to address autocorrelation, heteroskedasticity and cross-sectional dependence, the study applies firm-level clustered robust standard errors to ensure reliable statistical inference. The firm-level clustering (clustered standard errors at the firm level) method effectively addresses autocorrelation and heteroskedasticity within observations of the same firm over time, and minimises the effects of cross-sectional dependence between firms. This approach was found to be more appropriate given the structure of the panel dataset and the study's objectives. Additionally, using robust standard errors clustered at the firm level enhances the consistency and reliability of the model's parameter estimates, thereby strengthening the interpretation of the results.

At the beginning of the analysis, the study employs the F-test and the Hausman test to determine the appropriate model among the classical, fixed-effects, and random-effects specifications. Subsequently, various specification tests are performed to detect potential issues commonly encountered in panel regression models, such as heteroskedasticity, autocorrelation, and cross-sectional dependency. To assess heteroskedasticity, the study applies the Levene (1960) and Brown and Forsythe (1974) tests. For autocorrelation detection, it utilises the Durbin-Watson (DW) test (Bhargava et al., 1982), the Locally Best Invariant (LBI) test (Baltagi & Wu, 1999), and the Lagrange Multiplier (LM) test (Breusch & Pagan, 1980). To determine cross-sectional dependency, the paper applies the Frees (1995) test. The findings from the heteroskedasticity, autocorrelation and cross-sectional dependency tests are summarised in Table 5.

4. Results

4.1. Descriptive Statistics

Table 4 presents the number of observations (Obs.), mean, standard deviation (Std. Dev.), minimum and maximum values for all variables used in the analysis. AF refers to the log-transformed annual audit fees. SUST is a dummy variable indicating whether a firm is listed in the sustainability index. For variable definitions, see Table 3.

Table: 4
Descriptive Statistics of Key Variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
AF	115	8.99	2.25	5.28	17.33
SUST	115	0.79	0.41	0	1
TA	115	18.43	1.46	15.20	22.14
AGE	115	3.76	0.54	2.19	4.51
GROUP	115	2.60	1.36	0	5.56
LEV	115	0.61	0.17	0.19	1
BIG4	115	0.95	0.22	0	1

The mean value of SUST is 0.79, with a standard deviation of 0.41, indicating that the overall level of sustainability performance among BIST 50 firms is relatively high, but it varies significantly across firms. Regarding AF, the minimum and maximum values are 5.28 and 17.33, respectively, with a standard deviation of 2.25, indicating considerable variation in audit fees across firms.

4.2. Testing of Fundamental Assumptions

Assessing the validity of the classical model specifically, determining whether unit and/or time effects are present, can be accomplished using the F-test in panel data models. This test primarily examines whether there is significant variation in the data across different units. If no substantial differences are detected among units, the classical model is considered appropriate. In the F-test, the null hypothesis ($H_0: \mu_i = 0$) assumes that all unit effects are equal to zero, meaning that individual-specific effects do not significantly influence the model. Therefore, in this study, the F-test was initially performed to decide whether the classical model or an alternative specification, such as the fixed-effects or random-effects model, would be more suitable. Following this, the Hausman test was applied to distinguish between the fixed-effects and random-effects models. We tested our main hypothesis using the empirical model. Table 5 reports the results of key specification tests for model selection, including the F-test, Breusch-Pagan LM test, and Hausman test. It also includes diagnostic tests for heteroskedasticity (Levene, Brown-Forsythe), autocorrelation (Durbin-Watson, Baltagi-Wu, LM), and cross-sectional dependence (Frees test). The results are presented using a 5% level of statistical significance.

Table: 5
Test Results for Panel Data Assumptions

		Model AF
F-test	Prob > F	0.0000
Breusch and Pagan LM test	Prob>chi2	0.0000
Hausman test	Prob>chi2	0.0802
Levene, Brown and Forsythe test for Heteroskedasticity	W0	0.0260
	W50	0.0367
	W10	0.0260
	Durbin-Watson	1.6007
Autocorrelation tests	Baltagi-Wu LBI	2.0565
	ALM	0.0055
	LM	0.0000
Cross-sectional independence	Frees' test	1.074
	Critical value from Frees'	0.6860

Based on the results presented in Table 5, the null hypothesis (H_0) that all unit effects are equal to zero is rejected for the research model, suggesting the presence of significant unit-specific effects. This implies that the classical model should not be used, as it does not account for these variations. The F-test value is calculated as 0.0000.

Breusch and Pagan developed the LM test, which is based on the residuals of the classical model, to assess whether the classical model is appropriate compared to the random-effects model (Tatoğlu, 2016: 178). This test evaluates the null hypothesis ($H_0: \sigma_\mu^2 = 0$), which states that the variance of the random unit effects is zero. If the null hypothesis is rejected, it indicates that the classical model is unsuitable because significant unit-specific effects are present. According to the results, the null hypothesis is rejected, indicating that the variance of unit effects is significantly nonzero. This confirms the presence of unit effects, leading to the conclusion that the classical estimator is not

appropriate for the research model. Consequently, the baseline regression is estimated using the random-effects model.

As a result of the tests conducted, if unit and/or time effects are detected, it becomes necessary to determine whether they are fixed or random. In this study, the Hausman test was applied to distinguish between these two estimators. The Hausman test evaluates the null hypothesis that the random-effects model is appropriate against the alternative that the fixed-effects model is preferable. Based on the test results, the Hausman statistic for the research model was 0.0802 at the 5% confidence level. Since the null hypothesis could not be rejected, the random-effects estimator is appropriate. Therefore, the research model was estimated using the random-effects estimator.

To test for heteroskedasticity, this study applied the Levene (1960) and Brown and Forsythe (1974) tests. The null hypothesis (H_0), which states "the variances of the units are equal", is rejected for the research model, indicating that there is heteroskedasticity in the model. When the autocorrelation results are examined, the basic hypothesis of "there is no autocorrelation" is rejected, and it is concluded that autocorrelation exists. One of the fundamental assumptions in panel data models is that the error terms are independent across units. However, errors often exhibit contemporaneous correlation across cross-sectional units. This phenomenon prevents the correlation matrix from being a unit matrix. Therefore, the assumption of no cross-sectional correlation should be tested. In this study, the Frees (1995) test was used to assess cross-sectional dependence. Since Frees' test statistic is greater than the critical value ($1.074 > 0.6860$), the null hypothesis (H_0) is rejected, indicating the presence of cross-sectional dependence among units.

Multicollinearity refers to the situation in which two or more predictor variables exhibit a high degree of linear relationship with one another. Even if no pair of variables has an exceptionally high correlation, it is still possible for a linear relationship to exist among three or more variables. This phenomenon is called multicollinearity. It occurs when the explanatory variables influence not only the dependent variable but also each other. The magnitude of this effect can reduce the explanatory variables' predictive power in the model. A better way to assess multicollinearity is by calculating the variance inflation factor (VIF). In practice, there is typically a small degree of linearity among the predictors. As a general rule, while a VIF value above 5 suggests problematic multicollinearity, a value above 10 suggests highly problematic multicollinearity (James et al., 2013). To test for multicollinearity in the paper, VIF scores are calculated and presented in Table 6. In addition, the correlation matrix of the study variables is examined to assess multicollinearity in the model (Table 7).

Table: 6
VIF for Explanatory Variables

Variable	VIF	1/VIF
TA	1.42	0.704453
SUST	1.23	0.812523
AGE	1.21	0.828601
GROUP	1.17	0.852030
LEV	1.16	0.865510
BIG4	1.05	0.954203

Table 6 displays the VIF and reciprocal VIF (1/VIF) values for each independent variable in the regression model. A VIF above 5 typically indicates potential multicollinearity concerns. All variables in this study fall within the acceptable range.

Table: 7
Correlation Matrix Between the Variables

	SUST	AGE	LEV	TA	BIG4	GROUP
SUST	1					
AGE	0.1722	1				
LEV	-0.1354	0.2590	1			
TA	-0.3175	-0.3042	-0.1618	1		
BIG4	0.1571	-0.0391	-0.1341	-0.0874	1	
GROUP	-0.0718	-0.0355	0.0982	-0.3123	0.0392	1

Overall, the correlation coefficients are mostly low to moderate, as shown in Table 7, indicating no strong linear relationships between the variables. Specifically, the correlations between the SUST variable and other variables remain low to moderate, suggesting that listing in the sustainability index is negatively associated with TA and LEV. Furthermore, when assessed alongside the VIF scores in Table 6, the correlation matrix confirms that all VIF values fall within the acceptable range, indicating that multicollinearity is not a concern in the research model. Therefore, the explanatory variables do not exhibit strong linear relationships with each other.

4.3. Robustness Tests

The analysis detected autocorrelation, heteroskedasticity, and cross-sectional dependence in the research model. To mitigate these issues and obtain more reliable standard errors, the research model specified in Equation (1) was re-estimated using the robust estimators proposed by Huber (1967), Eicker (1967) and White (1980). The revised estimation results are reported in Table 8.

Table: 8
Estimated Robustness Results of the Regression Model with AF as the Dependent Variable

Variable	Coefficient	z	P> z
SUST	-.213	-0.88	0.376
AGE	.798*	1.86	0.063
LEV	-.818*	-1.68	0.093
TA	1.023***	20.27	0.000
BIG4	.090	0.17	0.863
GROUP	.353**	2.04	0.041
Constant	-13.201***	-7.86	0.000
Observations = 115			
R-squared = 0.5367			
Wald chi2(6) = 588.52			
Prob > chi2 = 0.0000			

Note: Coefficients are based on firm-level clustered robust standard errors. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

According to Table 8, the estimated AF model is statistically significant (Wald test for the AF model, $P=0.0000<0.05$). As shown in Column (2) of Table 4, the coefficients of the AGE, TA and GROUP estimated by robust estimators were significantly positive, indicating the presence of autocorrelation, heteroskedasticity and cross-sectional dependence in the model, which needed to be re-estimated. Column (2) of Table 8 also shows that LEV has a negative and statistically significant effect on audit fees. However, the effects of the listed sustainability index and auditor size on audit fees were not statistically significant.

5. Discussion

Sustainability represents a collective mindset that embraces the future. In this sense, it has increasingly become one of the most compelling topics. As a developing country, Türkiye has been undertaking various initiatives to enhance awareness of sustainability. From the perspective of Türkiye's capital markets, the SI stands out as one of the most significant of these initiatives. Thanks to the index, publicly listed firms with high corporate sustainability performance are included, providing responsible investors with the opportunity to invest in such companies. Therefore, although it is expected that the inclusion of companies in the index would enhance their public recognition and reputation, the findings do not support this assumption and suggest that it has no impact on audit fees. According to these results, H1 is not supported.

There are several possible reasons why being listed in the sustainability index does not have a significant impact on audit fees in this paper. First, audit fees are typically influenced by other factors such as operational complexity, firm size, industry characteristics, and audit risk. Being listed in the sustainability index may not significantly alter auditors' risk assessments, as firms in the index often already comply with certain ESG criteria. If these firms have already established well-structured corporate governance and sustainability practices, auditors may not perceive a substantial increase in their workload, which prevents a significant rise in audit fees.

Firms included in the sustainability index generally have strong corporate governance and effective internal controls, which enhance financial transparency and reduce auditors' workload, limiting the need for extra audit procedures. The mandatory implementation of TSRS since January 1, 2024, standardises sustainability reporting and may reduce audit effort, although its recent introduction means its impact on audit fees is not yet evident. Consequently, high transparency and regulatory compliance help prevent increases in audit fees for these firms.

Additionally, inclusion in the sustainability index may not require significant changes in firms' financial reporting or internal controls, as many likely already comply with sustainability regulations. Consequently, this does not add to the audit process, which helps explain why audit fees remain stable. Moreover, as one of Türkiye's top 50 firms, they likely have strong governance that supports compliance.

Lastly, the widespread adoption of sustainability reporting, supported by regulators and market expectations, has likely made these practices more cost-effective for firms. Additionally, audit firms may have standardised sustainability audit procedures, enabling them to integrate these procedures efficiently without significantly increasing their workload, which helps explain the lack of a noticeable impact on audit fees for firms listed in the sustainability index.

Although firm stakeholders have not felt sustainability activities in Türkiye, there are some studies in the literature showing the positive (Sun et al., 2020; Lobo et al., 2018) and negative (Al Ani et al., 2024; Wu et al., 2023; Xin et al., 2022) relationship between sustainability performance and audit fees. Research findings support the conclusions of Cahyaningati et al. (2022, 2021), indicating that sustainability practices have no impact on audit fees.

On the other hand, the results show that the coefficients of AGE, TA, and GROUP are positive and significant at the 10%, 1%, and 5% levels, respectively, indicating that all of these variables had a significant positive effect on audit fees. AGE may positively impact audit fees due to increased complexity, regulatory scrutiny, and risk over time. As firms grow, their financial transactions become more complex, requiring more extensive audits. Older firms also face stricter compliance requirements and have larger financial histories, increasing auditors' workload. Additionally, the risk of misstatements or fraud may rise, prompting more thorough assessments. While strong corporate governance enhances transparency, it also demands detailed evaluations. Higher stakeholder expectations and the need for customised audit approaches further increase audit costs. These factors collectively explain why older firms incur higher audit fees. The positive effect of TA on audit fees can be attributed to several factors. Larger firms generally have more complex financial structures, with more assets, transactions, and detailed reporting requirements, thereby increasing auditors' workload. This leads to more time-consuming and complicated audit processes. Additionally, larger firms are often subject to greater regulatory oversight, which requires auditors to devote more effort to compliance and risk assessments. The size of the

firm also raises expectations for accuracy and transparency in financial reporting, further driving up audit fees. The positive effect of GROUP on audit fees is related to the increased complexity of financial structures and operations. Subsidiaries introduce additional audit requirements such as intercompany transactions, consolidation, and compliance with different regulatory frameworks. Each subsidiary must prepare its own financial reports, which need to be accurately consolidated at the group level. This process requires auditors to review more transactions and documents, making the audit process more time-consuming and complex. Furthermore, analysing and reporting on the relationships between the activities and financial positions of group companies requires greater expertise and resources, ultimately increasing audit fees. The coefficient on LEV is negative and significant at the 10% level, indicating a significant negative effect on audit fees. The negative effect of financial leverage on audit fees is generally related to how a firm's debt level can reduce audit complexity. While high financial leverage increases a firm's debt exposure, such debt is often associated with fixed financial obligations, which may limit the number of transactions and documents auditors need to review. As a result, simpler financial structures and fewer complex transactions can lead to a more straightforward and less time-consuming audit process. Additionally, when financial leverage is high, the firm's risk profile may be lower because the debt payments are typically fixed and predictable. This reduces variability and risk during the audit, ultimately resulting in lower audit fees. Finally, no statistically significant relationship was found between BIG4 and audit fees.

Although the current study accounts for various conditions, the paper has several limitations that present opportunities for future research. First, the study examines the relationship between the sustainable performance of firms selected from Türkiye and audit fees. While Türkiye is an emerging market, it differs from developed countries such as the USA in its economic system and market characteristics. Thus, samples from other countries may generate different results. Second, the firms examined were not included in the sustainability index during the same periods. Third, because audit fee disclosure to the public began in Türkiye in 2021, this limits the study period. If data acquisition spans a broader time period, the sample size could be increased.

6. Conclusions

In this paper, we investigated how a sustainable performance profile impacts audit fees. The findings of this paper offer policy recommendations for a wide range of stakeholders, including policymakers, managers, and auditors. Based on these findings, it appears that being listed on the sustainability index does not significantly affect audit fees. This is an important finding, particularly regarding how sustainability practices and policies are reflected in firms' cost structures.

Policymakers can encourage sustainability by offering tax cuts or incentives that drive companies towards environmentally friendly practices. Additionally, it can standardise and make certain audit processes more transparent for firms listed on the sustainability index. This could help make participation in the sustainability index a strategy that delivers

long-term benefits rather than a financial burden for them. Furthermore, regulations could be developed to ensure audit fees are determined more equitably and transparently. This could help firms better manage the costs related to sustainability reporting.

Audit firms can employ more sustainability specialists to audit companies listed on the sustainability index. While the study has shown that these expertise requirements do not significantly affect audit fees, developing specialised audit processes for sustainability could still be beneficial. Additionally, audit firms can offer more affordable packages for companies engaged in sustainability reporting, thereby helping them achieve sustainability goals at a lower cost.

Firms should view sustainability practices as a strategic investment and recognise that they do not significantly affect short-term costs, such as audit fees. Instead, sustainability practices can increase brand value and enhance the company's reputation in the long run. Firms should not overlook that participating in the sustainability index not only helps fulfil environmental and social responsibilities but also offers long-term financial benefits. Therefore, sustainability practices should be integrated into the company's overall strategy.

The findings of this study also have important implications for audit practices in other emerging markets with similar regulatory environments, suggesting that standardising sustainability audit procedures can improve efficiency and reduce costs, thus encouraging broader adoption of sustainability practices. Policymakers in these markets should develop clear and consistent frameworks for sustainability reporting and assurance, drawing on best practices such as the TSRS, while enhancing sustainability indices by incorporating dynamic, multidimensional metrics and third-party certifications to boost credibility. Collaboration among regulators, audit firms, and firms is essential to improve reporting standards and auditor expertise continuously, and is supported by targeted training programs. Finally, promoting longitudinal and cross-country research will help refine policies and audit methodologies, supporting sustainable development in emerging economies.

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