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Does Being Included in The Sustainability Index Affect Financial Performance and Firm Value? Evidence From Borsa Istanbul

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Sürdürülebilirlik Endeksinde Yer Almak Finansal Performansı ve Firma Değerini Etkiler Mi? Borsa İstanbul'dan Kanıtlar

Abstract

This study investigates the effect of being included in the Borsa Istanbul Sustainability Index on financial performance and firm value. The company data contained in the BIST Sustainability Index for 2018Q1-2023Q3 are analysed with the Driscoll-Kraay estimator. According to the results of Model A, it is understood that the inclusion of the company in the sustainability index does not have a significant effect on financial performance, while according to Model B, it is understood that the inclusion of the company in the sustainability index has a positive and significant impact on firm value. The publication of sustainability reports by enterprises in the sustainability index conveys more accessible information to investors. Investigating the effect of being included in the sustainability index on firm value reveals the originality of this study.

Keywords : Sustainability Index, Financial Performance, Firm Value.

JEL Classification Codes : Q56, L25, C58.

Öz

Bu çalışmanın amacı Borsa İstanbul Sürdürülebilirlik endeksinde yer almanın finansal performans ve firma değeri üzerindeki etkisinin araştırılmasıdır. Çalışmada BIST Sürdürülebilirlik endeksinde yer alan işletmenin 2018Q1-2023Q3 dönemine ait veriler Driscoll-Kraay Dirençli Tahminci ile incelenmiştir. Model A'nın sonuçlarına göre; işletmenin sürdürülebilirlik endeksinde yer almasının finansal performans üzerinde anlamlı bir etkiye sahip olmadığı anlaşılmakta iken Model B'ye göre işletmenin sürdürülebilirlik endeksinde yer almasının firma değeri üzerinde pozitif ve anlamlı bir etkiye sahip olduğu anlaşılmaktadır. Sürdürülebilirlik endeksinde yer alan işletmelerin sürdürülebilirlik raporlarını yayınlaması yatırımcılara daha fazla ulaşılabilir bilgi aktarmaktadır. Sürdürülebilirlik endeksinde yer almanın firma değerine olan etkisinin araştırılması ise bu çalışmanın özgünlüğünü ortaya koymaktadır.

Anahtar Sözcükler : Sürdürülebilirlik Endeksi, Finansal Performans, Firma Değeri.

1. Introduction

With the beginning of industrialisation, increasing demand and consumption have led to a deterioration of the ecological balance and environmental problems due to the unlimited use of the world's resources. The accelerated pace of industrialisation and the change in consumption habits have had a global impact, creating the conditions for events such as the climate crisis. These events, which caused all balances to change, turned into an economic structure where resources should be protected and brought the concept of sustainability to the forefront (Ozmerdivanli, 2023). While Haigh (2012) expresses the concept of sustainability as the responsibility to protect the stock of wealth that a society can claim, Gladwin and Kennelly et al. (1995) refer to it as the prudent use of all resources as a social orientation. In addition, Yu & Zhao (2015) define the concept of sustainability today by stating that the three phenomena (social responsibility, environmental responsibility, and economic viability) that should be together to create long-term value are not only the management of the tangible and physical environment and natural resources but also a phenomenon that directs the business processes. Corporate sustainability, which refers to integrating economic, environmental, and social factors into business operations and decision-making processes through corporate governance principles to create long-term value, has become increasingly significant within Borsa Istanbul (BIST). In line with this, the BIST Sustainability Index has been calculated since November 2014. The BIST Sustainability Index is crucial as it guides businesses in formulating policies regarding environmental, social, and governance risks and provides a platform for conveying information about companies' sustainability policies to investors (BIST, 2024).

The Principles for Socially Responsible Investment, including environmental, social, and corporate governance factors, published by the United Nations (UN) in 2006, brought the concept of sustainability to the forefront and pioneered the harmonisation of corporate financial statements with sustainability principles (Gurunlu, 2019). Companies are required to publish sustainability reports in which they can present their economic, environmental, and social performance to stakeholders reliably and transparently (Gray & Milne, 2004: 8; Aksoy-Hazir, 2018: 40). This has become important for investors, who consider socio-economic and environmental criteria (Escrig-Olmedo et al., 2013) as well as financial factors when investing. In addition, investors believe the non-financial dimension of business performance and policies in socially responsible investing of listed companies (Scholtens, 2009) and consider corporate responsibility activities, especially those related to environmental, social, and governance practices, when making investment decisions (Young & Gates, 2013). Companies that aim to increase the welfare of their partners and maximise the company's value pay attention to the effective use of environmental resources in their business processes within the sustainability framework, carry out activities to minimise their adverse effects, and use natural resources effectively. With the development and importance of the concept of sustainability, the relationship between sustainability and financial performance has become very popular in the field of finance (Oberndorfer et al., 2013; Stekelenburg et al., 2015; Santis et al., 2016; Abughniem & Hamdan, 2019; Ohaka & Obi, 2021). Therefore, this study aims to reveal the effect of being included in the sustainability

index on firm performance, which is expressed as the ability of an enterprise to take risks and compete for profitability and investment purposes (Karatepe, 2008) and on firm value, which is described as the total value of the firm, including market assets. The effect of being included in the sustainability index on firm performance, which is expressed as the ability of an enterprise to take risks and compete for profitability and investment purposes (Karatepe, 2008), and on firm value, which is expressed as the total value of the firm, including market assets. Because the last quarter data of companies for the last quarter of 2023 could not be announced, the study covers the period 2018Q1-2023Q3, and this situation is the limitation of the study. In addition, the study of the effect of being included in the sustainability index on the firm value shows the originality of this study. There are several existing studies on the sustainability index in the literature. However, it is observed that the number of studies examining the effect of inclusion in the sustainability index on firm value is very limited. Therefore, this study is expected to fill this gap in the literature. This study is critical because it provides information to investors interested in or concerned about sustainability. The body of the study is structured as follows: literature review and hypotheses in the first section, data set and methodology in the third section, results in the fourth section, and conclusions and recommendations in the final section.

2. Literature Review and Developing Hypotheses

In the literature, it has been shown that being included in the sustainability index increases stock returns (Oberndorfer et al., 2013; Stekelenburg et al., 2015); Santis et al. (2016), Unal & Yuksel (2017), Gok & Özdemir (2017), Gündüz (2018) examined its effect on financial performance. This study examined studies investigating the effect of being included in the sustainability index on financial performance.

In the study by Ziegler (2012), they investigated the effect of being included in the Dow Jones Sustainability World index on financial performance. The study found that being included in the sustainability index positively affected the financial performance of companies in the European continent. In contrast, no significant effect was found for Anglo-Saxon European countries. In his study, Gurunlu (2019) investigated the effect of being included in the Borsa Istanbul sustainability index on long-term financial performance. The study found a weak relationship between high sustainability performance and financial success. In this study, Sevim (2021) examined the effect of environmental investment expenditures on financial performance by considering the companies included in the sustainability index and found that environmental investment expenditures have a negative effect on financial performance. In their study, Abugniem et al. (2019) examined the relationship between the financial performance and sustainability performance of the companies listed on the Amman Stock Exchange, and no significant relationship was found. On the other hand, Dogukanli & Borak (2020) investigated the effect of being included in the Borsa Istanbul Sustainability Index on firm performance and found no significant relationship. In addition, Dagistanli & Dagistanli (2023) in their studies investigated the positive or negative impact of financial performance indicators on the publication of sustainability reports. It was found that there is no relationship between the financial

performance of companies and the publication of a sustainability report. However, companies tend to publish sustainability reports as the company's size increases. In the study of Korga & Aslanoglu (2022), no significant relationship was found between sustainability and financial performance, but a significant relationship was found with company size. Gonzalez-Benito & Gonzalez-Benito (2005), Makni et al. (2009), and Önder (2017) also found no relationship between sustainability performance and financial performance.

Some studies have found a positive relationship between sustainability and financial performance. Wagner's (2010) study examined the relationship between sustainability and financial performance of companies in the Standard & Poor's 500 Index and concluded that there is a significant and positive relationship. Soytas et al. (2017) showed that sustainability positively affects financial performance. In their study, Akyuz and Yeşil (2017) investigated the financial performance of manufacturing companies in the Borsa Istanbul Sustainability Index using the ranking method. According to the ranking analysis, Aksa Acrylic Chemical Industry Inc. scored the highest. Aytekin & Erol (2018), who investigated whether financial performance is a sufficient indicator for inclusion in the sustainability index, determined that financial performance is an essential indicator for inclusion in the index. In their study, Ozkan et al. (2018) investigated the impact of corporate social responsibility disclosures of companies on financial performance within the scope of sustainability reports. They found that these disclosures have a positive effect on profitability. In their study, Ohaka & Obi (2021) found that sustainability reporting of companies listed on the Nigerian Stock Exchange positively affects financial performance. In addition, Konar & Cohen (2001), King & Lenox (2001, 2002), Lopez et al. (2007), Callan & Thomas (2009), Reddy & Gordon (2010), Burhan & Rahmanti (2012), Wang & Choi (2013), and Sak & Dalgar (2020) observed a positive relationship between sustainability performance and financial performance in their studies. The following hypotheses were established in line with the studies in the literature.

H_0: Inclusion in the sustainability index increases financial performance.

H_1: Inclusion in the sustainability index increases firm value.

3. Methodology and Data

This part of the study includes data introduction, analysis, and findings obtained to determine the effect of financial performance and firm value on the sustainability index.

3.1. Methodology

Financial data for the period of 2018Q1-2023Q3 were used in the study, which investigated the effect of being included in the BIST sustainability index on financial performance and firm value. In this context, the panel data analysis method was used in the study. Panel data analysis covers two dimensions, both cross-sectional and time series. This situation can also be explained as there are N units/companies and T time. Combining the two dimensions in panel data analysis offers the opportunity to use more information and

increase freedom (Ari & Zeren, 2011: 41). In panel data analysis, the spurious regression relationship prevents accurate and consistent results. To prevent this situation, some assumptions need to be tested. The problems of multiple linear linkages are cross-sectional dependence, stationarity, autocorrelation, and varying variance. This study used Spearman correlation analysis and the Variance Inflation Factor (VIF) test under the assumption of normal distribution for the multiple linear linkage problem. Considering the time and cross-sectional dimension of the panel data, the cross-sectional dependence was tested with the Peseran CD test on both model and variable basis. The formulation of the calculation of the test is shown in Eq. 1 (Celik & Memis, 2023: 198):

$$CD_{LM} = \sqrt{\frac{1}{N(N-1)} \sum_{i=1}^{N-1} \sum_{J=i+1}^{N} (T\, \hat{\rho}_{ij}^{2} - 1)} \tag{1}$$

CD_{LM} the basic hypothesis of the test is: "There is no cross-sectional dependence". The alternative hypothesis is: "There is a cross-sectional dependence." (Pesaran, 2004).

According to the results of the horizontal cross-section dependence test, Bai and Ng (2004) PANIC unit root test, one of the second-generation unit root tests, was used in the study. This test allows for the separate testing of common factors and error terms (Bai & Ng, 2010). The deterministic component, $D_{it} = \sum_{j=0}^{p} \delta_i\, t^j$, is an individual-specific fixed effect of the form $D_{it} = \delta_i$ when $p = 0$ and also an individual specific time trend when $p = 1$. When there is no deterministic term, $p = -1$. From this point of view, the data creation process can be expressed as follows (Bai & Ng, 2010: 1089):

$$X_{it} = D_{it} + \lambda_i' F_t + e_{it} \tag{2}$$

$$(1 - L)F_t = C(L)\eta_t \tag{3}$$

$$e_{it} = \rho_{it} e_{it-1} + \varepsilon_{it} \tag{4}$$

In equations (2), (3), and (4), F_t is the vector of common factors in dimension rx1 that trigger correlation between cross-sectional units. λ_i is the vector of factor loadings in the rx1 dimension. e_{it} is the error term and $C(L)$is the r×r matrix containing the polynomials of the lag operator, which can be expressed as C(L) = $C(L) = \sum_{j=0}^{\infty} C_j L^j$. In obtaining Panic tests, the first difference of equation (2), (3), and (4) is taken and expressed as follows (Bai & Ng, 2010: 1092):

$$\Delta X_{it} = \lambda_i' \Delta F_t + \Delta e_{it} \tag{5}$$

According to these test results, model estimation was performed in panel data analysis, which includes many methods such as one-way and two-way fixed effects, random effects model, pooled model, dynamic panel analysis, and generalised OLS. Some tests are required to decide on the appropriate panel data model in model estimation. F-test to decide between the pooled model and the fixed effect (one-way and two-way) model; LM and Honda tests are used to decide between pooled models and random effect (one-way-two-

way) models. In the study, heteroscedasticity, which expresses the situation where the variance of the error term is different, was tested with the Breusch-Pagan-Godfrey Heteroscedasticity LM test; Autocorrelation, which is defined as the presence of a significant relationship between sequential dependency or successive error unit values was tested by the Durbin-Watson tests of Baltagi & Li (1991), Born & Bretuing (2016) and Bhargava, Franzini & Narendranathan (1982). If the random effects model yields more efficient results than the fixed effects model, then the random effects model should be used. Therefore, it is necessary to identify the more efficient model between the two, which are consistent but differ in efficiency. In the literature, this efficiency test, in other words, the selection between the fixed effects model and the random effects model, is performed using the Hausman test, which follows a chi-square distribution with *k* degrees of freedom (Bayraktutan & Demirtaş, 2011: 9). The study used the Driscoll-Kraay estimator, which considers the heteroscedasticity and autocorrelation problems that arise to make model estimation (Driscoll & Kraay, 1998).

3.2. Data Set

The study examined the effect of inclusion in the Borsa Istanbul Sustainability Index on financial performance and firm value using financial data for 2018Q1-2023Q3. The increase in the number of companies included in the BIST Sustainability Index as of 2018 marks the beginning of the sample period, while companies that have not published their fourth-quarter data for 2023 define the end of the sample period. Table 1 provides information on the 34 companies included in the study sample.

Table: 1
List of Companies Included in the Sustainability Index

No	Code	Company Title	No	Code	Company Title
1	AKCNS	Akçansa Cement Industry And Trade Co. Inc.	18	KERVT	Kerevitaş Food Industry And Trade Co. Inc.
2	AKENR	Akenerji Electricity Generation Co. Inc.	19	KORDS	Kordsa Technical Textile Co. Inc.
3	AKSA	Aksa Acrylic Chemical Industry Inc.	20	LOGO	Logo Software Industry And Trade Inc.
4	AXIS	Aksa Energy Generation Co. Inc.	21	NET	Netaş Telecommunication Inc.
5	AEFES	Anadolu Efes Brewery And Malt Sanayii A.S.	22	OTKAR	Otokar Automotive and Defense Industry Inc.
6	ARCLK	Arcelik A.S.	23	PGSUS	Pegasus Air Transport Inc.
7	ASELS	Aselsan Electronic Industry And Trade Co. Inc.	24	PETKM	Petkim Petrochemical Holding Co. Inc.
8	AYGAZ	Aygaz A.S.	25	PNSUT	Pinar Dairy Products Industry Co. Inc.
9	BREEZE	Brisa Bridgegestone Sabanci Tire Industry And Trade Inc.	26	TATGD	Tat Food Industry Co. Inc.
10	CCOLA	Coca-Cola Beverages, Inc.	27	TOSO	Tofaş Turkish Automobile Factory Inc.
11	CIMSA	Çimsa Cement Industry And Trade Co. Inc.	28	TUPRS	Tüpraş-Turkish Petroleum Refineries Inc.
12	ENJSA	Enerjisa Enerji A.Ş.	29	THYAO	Turkish Airlines A.O.
13	ENKAI	Enka Construction and Industry Co. Inc.	30	Boobs	Turkey Bottle & Glass Factories Inc.
14	EREGL	Ereğli Iron And Steel Factories T.A.S.	31	ULKER	Ülker Biscuits Industry Co. Inc.
15	FROTO	Ford Automotive Industries, Inc.	32	VESBE	Vestel White Goods Industry And Trade Co. Inc.
16	ISDMR	Iskenderun Iron And Steel Co. Inc.	33	VESTL	Vestel Electronic Industry And Trade Co. Inc.
17	KARSN	Karsan Automotive Industry and Trade Co. Inc.	34	ANGER	Zorlu Energy Electricity Generation Co. Inc.

The Sustainability Index (SI) consists of a dummy variable of 1 if the company is included in the sustainability index in the specified period and 0 if it is not included (Çelik et al., 2016; Kuzey & Uyar, 2017; Who & Who, 2018; Tanc, 2019). The index consists of the companies with the highest corporate sustainability performance to increase Borsa Istanbul enterprises' sustainability understanding, knowledge, and awareness (BIST, 2023).

Return on assets (ROA) was used to indicate financial performance. Although this ratio is calculated by dividing the net profit by the total assets, it expresses how profitable the enterprises are according to their total assets (Dogukanli & Borak, 2020). The Tobin Q ratio (TQ), which is used as an indicator of firm value in the study, is calculated by dividing the sum of the market capitalisation with long- and short-term liabilities by total assets (Dowell et al., 2000; King & Lenox, 2001; Maury, 2006; Ege & Nur-Topaloglu, 2018). The leverage ratio (LEV), which indicates what percentage of the assets of the company used in the study are financed by debts, is calculated by dividing the total liabilities by the total assets (King & Lenox, 2001; Ziegler, 2012; Bayraktaroglu, 2010). Capital intensity (CAP), which indicates the long-term growth opportunities of companies and the intensity of technology used in the production process, is calculated as the ratio of capital expenditures to net sales (King & Lenox, 2001; Ziegler, 2012; Gurunlu, 2019). Finally, the natural logarithm of total assets represents the company's size (FSIZE) (Ziegler, 2012).

$$ROA_{i,t} = \beta_0 + \beta_1 SI_{it} + \beta_2 LEV_{it} + \beta_3 FSIZE_{it} + \beta_4 CAP_{it} + \varepsilon_{i,t} \quad (6)$$

ROA in the above equation shows return on asset, *SI* is the sustainability report, *LEV* is leverage ratio, *FSIZE* is firm size, *CAP* is capital intensity, and the error term is given by $\varepsilon_{i,t}$.

$$TQ_{i,t} = \beta_0 + \beta_1 SI_{it} + \beta_2 LEV_{it} + \beta_3 FSIZE_{it} + \beta_4 CAP_{it} + \varepsilon_{i,t} \quad (7)$$

TQ in the above equation shows tobin Q, *SI* is the sustainability report, *LEV* is leverage ratio, *FSIZE* is firm size, *CAP* is capital intensity, and the error term is given by $\varepsilon_{i,t}$.

4. Results

Descriptive statistics, including mean, median, max., min., and standard deviation of the variables in the models created to determine the effect of being included in the Borsa Istanbul Sustainability index on financial performance and firm value, are shown in Table 2.

Table: 2
Descriptive Statistics

	ROA	SE	CAP	LEV	TQ	FSIZE
Mean	0.0387	0.8145	0.9352	0.6362	1.4059	9.7976
Median	0.0301	1.0000	0.5099	0.6529	1.2317	9.8066
Maximum	0.3071	1.0000	11.142	1.1163	3.9298	11.6828
Minimum	-0.2764	0.0000	0.0122	0.1705	0.6524	7.8285
Std. Dev.	0.0590	0.3888	1.2769	0.1826	0.5554	0.6680
Skewness	0.2681	-1.6188	3.7253	-0.3309	1.8744	-0.0326
Kurtosis	7.5102	3.6207	23.071	2.7272	6.8074	2.6247
Jarque-Bera	672.18	354.12	14935.84	16.698	930.3106	4.7260
Probability	0.0000	0.0000	0.0000	0.0002	0.0000	0.0941
Observations	782	782	782	782	782	782

When the calculated descriptive statistics in Table 2 are examined, it is determined that the average return on assets is 0.03, capital intensity is 0.93, leverage ratio is 0.63, Tobin Q value is 1.40, and business size is 9.79. In addition, it is determined that the dummy value, leverage ratio, and business size value created for the sustainability index are skewed to the left. In contrast, the other variables are skewed to the right. According to the Jarque-Bera probability value, which gives information about whether the series has a normal distribution, the hypothesis *"H_o: The series is normally distributed"* is rejected if the calculated probability value is below the critical value (0.05). Accordingly, it was concluded that the Ho hypothesis was rejected for the variables ROA, SI, CAP, and LEV; the series was not normally distributed. Due to the presence of series that do not have a normal distribution in the model, the Spearman correlation matrix was created. The high level of correlation (r>90) between the series creates a problem of multiple linear connections (Cokluk et al., 2010). The Spearman correlation matrix is shown in Table 3.

Table: 3
Correlation Matrix

	ROA	FSIZE	SE	CAP	LEV	TQ	Error Term
ROA	1.000						
FSIZE	0.329	1.000					
SE	0.067	0.257	1.000				
CAP	-0.413	-0.219	-0.177	1.000			
LEV	-0.350	0.026	0.155	-0.160	1.000		
TQ	0.394	-0.006	0.120	-0.473	0.106	1.000	
Error Term	0.674	0.512	0.081	-0.429	-0.492	0.527	1.000

According to Table 3, a weak correlation relationship was found between the series. In addition, to determine whether there is an internality problem in the model, the correlation between the error term and the variables was examined, and it was determined that there was a weak correlation. This shows that there is no internal problem between the series. In addition, variance inflation factor (VIF) analysis was performed to solve the problem of multiple linear linkages in the study, and the results are given in Table 4.

Table: 4
VIF Test Results

Variable	1/VIF	Centred VIF
ROA	0.113650	1.420045
SE	0.002018	1.094258
CAP	0.000206	1.205560
LEV	0.009804	1.173503
FSIZE	0.000752	1.204165
C	0.070647	NA

If the critical value calculated according to the VIF is greater than 10, it indicates that multiple linear connections may be a problem (Cokluk et al., 2010). Table 4 shows that the calculated critical value of the variables in the model is not greater than 10.

Before model estimation is made, it is necessary to consider the cross-sectional dependence, which can significantly affect the results obtained (Breusch & Pagan, 1980; Pesaran, 2004). With the help of cross-sectional dependency tests, the unit root test to be

used in the study is decided. The existence of cross-sectional dependency is determined by the Breusch-Pagan (1980) Lagrange Multiplier (LM) test when the time dimension of the panel is greater than the cross-sectional size; both the time dimension is greater than the cross-sectional dimension and the cross-sectional dimension is greater than the time dimension (T>N, N>T) are tested using Peseran CD (2004) tests. This study used the Peseran CD (2004) test because there were 34 enterprises and 23 quarters.

Table: 5
Peseran CD (2004) Test Results

Variable	Statistics	p-value
ROA	36.48481***	0.0000
TQ	55.21344***	0.0000
LEV	4.298184***	0.0000
FSIZE	101.8765***	0.0000
CAP	84.43111***	0.0000
Model A	12.24039***	0.0000
Model B	46.79266***	0.0000

*Note: *** p < 0.01, ** p < 0.05, * p < 0.1.*

When Table 5, which includes the cross-sectional dependency test results on both variable and model basis, is interpreted, the hypothesis is rejected if the calculated values for both Model 1, Model 2, and variables are less than the critical value of 0.05. This situation indicates the existence of cross-sectional dependency and requires second-generation unit root tests. In the study, Bai & Ng (2004) used a PANIC unit root test to test the stationarity of the variables. The PANIC unit root test is based on the ADF test developed by Maddala & Wu (1999). This test, which also allows heterogeneity, can determine whether the stationarity in a series is variable-specific or widespread (Bai & Ng, 2004: 1127).

Table: 6
PANIC Unit Root Test Results

		Level				First Difference			
		Constant		Constant + Trend		Constant		Constant + Trend	
Variables	Test	T-Statistic	P-value	T-Statistic	P-value	T-Statistic	P-value	T-Statistic	P-value
ROA	PCe_Choi	-0.362	0.641	-1.787	0.963	11.710***	0.000	11.575***	0.000
	PCe_MW	63.777	0.622	47.157	0.974	204.568***	0.000	202.990***	0.000
TQ	PCe_Choi	-0.205	0.581	-1.452	0.926	6.817***	0.000	5.759***	0.000
	PCe_MW	65.602	0.559	51.061	0.937	147.506***	0.000	135.161***	0.000
LEV	PCe_Choi	-1.930	0.973	-1.433	0.924	10.144***	0.000	8.631***	0.000
	PCe_MW	45.484	0.983	51.287	0.934	186.307***	0.000	168.659***	0.000
FSIZE	PCe_Choi	0.134	0.446	0.276	0.390	7.972***	0.000	4.433***	0.000
	PCe_MW	69.571	0.424	71.228	0.370	160.974***	0.000	119.699***	0.000
CAP	PCe_Choi	2.362***	0.009	0.759	0.223	13.617***	0.000	12.280***	0.000
	PCe_MW	95.551***	0.015	76.852	0.216	226.809***	0.000	211.212***	0.000

*Note: PCe_MW: Maddal and Wu (1999); PCe_Choi: Represents statistics proposed by Choi (2001). The maximum number of common factors for the PANIC unit root test is 2, and the delay lengths are 4. *** p < 0.01, ** p < 0.05, * p < 0.1.*

When Table 6 is examined, it is determined that all variables in the model are both constant and constant at the level, and the value calculated in the trend is above the critical value (prob<0.05). This is the case *with "H_o: There is a unit root between the series."* It shows that his hypothesis cannot be rejected. When the first differences of all the variables in the model are taken, it is found that both constant and constant, and the value calculated in the trend is less than the critical value (prob<0.05), so that *"H_o: There is a unit root*

between the series." It is understood that his hypothesis has been rejected. This shows that the series is stationary at level I(1). F, LM, Honda, and Hausman tests were used to determine whether fixed effects, random effects, or pooled models would be applied to determine the relationship between financial performance (ROA) and being included in the sustainability index and firm value (Tobin Q) and being included in the sustainability index.

Table: 7
Model Estimation Results (Model A and Model B)

	Hypothesis	**Test**	**Statistic**	**p-value**
Model A	Fixed/Pool	F-group	16.817	0.000
		F-time	4.849	0.000
		F-two	12.561	0.000
	Random/Pool	LM-group	619.800	0.000
		LM-time	42.093	0.000
		LM-two	661.89	0.000
	Random/Pool	Honda-group	24.895	0.000
		Honda-time	6.487	0.000
		Honda-two	22.191	0.000
	Random/Fixed	Hausman	56.926	0.000
Model B	Fixed/Pool	F-group	52.988	0.000
		F-time	13.089	0.000
		F-two	41.038	0.000
	Random/Pool	LM-group	2416.664	0.000
		LM-time	224.337	0.000
		LM-two	2641.002	0.000
	Random/Pool	Honda-group	49.159	0.000
		Honda-time	14.977	0.000
		Honda-two	45.352	0.000
	Random/Fixed	Hausman	34.206	0.000

According to Table 7, for Model 1, it is understood that the bidirectional fixed effects model is valid according to the results of the F test to decide whether to use the fixed or pooled model. In addition, according to the results of the LM and Honda tests applied to choose between the pooled model and the random model, the bidirectional random effects model is valid in the model. According to the result of the Hausman test, which was performed to decide which of the bidirectional fixed effects or random effects models to use, it was determined that the bidirectional fixed effects model was valid. When the F test results for Model 2 were examined, it was determined that the bidirectional fixed effects model was valid. When the LM and Honda test results were examined, it was determined that the bidirectional random effects model was valid. According to the result of the Hausman test, which was performed to decide which of the bidirectional fixed effects or random effects models to use, it was determined that the bidirectional fixed effects model was valid. In this context, the results of the diagnostic test conducted to determine whether there are varying variance and autocorrelation problems related to the error terms of the bidirectional fixed effects models are given in Table 8.

Table: 8
Diagnostic Test Results

Test	**Heteroscedasticity**	**Statistics**	**P value**
Breusch-Pagan-Godfrey LM	Model A	306.046	0.000
	Model B	403.054	0.000
Test	**Autocorrelation**	**Statistics**	**P value**
Baltagi & Li LM	Model A	154.712	0.000
	Model B	266.031	0.000
Born & Bretuing LM	Model A	188.315	0.000
	Model B	309.993	0.000
Durbin-Watson	Model A	0.412	
	Model B	0.588	

When the results of the Breusch-Pagan-Godfrey LM heteroscedasticity Test for Model A and Model B were examined, the hypothesis *"H_0: there is no heteroscedasticity* " was rejected because the calculated probability value was below the critical value (0.05). In other words, the heteroscedasticity problem was determined for the two models. According to the values of the Baltagi & Li LM, Born, and Breitling LM Tests, which were performed to determine whether there is an autocorrelation end, the hypothesis of "*H_0: there is no autocorrelation*" was rejected because the calculated probability value was below the critical value (0.05). Therefore, the problem of autocorrelation was detected in both models. In line with the findings obtained, models were estimated using the Driscoll-Kraay estimation, which solves the problem of heteroscedasticity and autocorrelation.

Table: 9
Driscoll-Kraay Estimation Method Results

MODEL A				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
SE	-0.008	0.005	-1.534	0.139
CAP	0.008***	0.001	4.074	0.000
LEV	-0.163***	0.026	-6.110	0.000
FSIZE	0.043**	0.012	3.470	0.002
C	-0.281	0.117	-2.386	0.026
F-statistic	21.768	R-squared		0.640
Prob(F-statistic)	0.000	Adjusted R-squared		0.610
MODEL B				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
SE	0.128***	0.031	4.097	0.000
CAP	0.055**	0.024	2.243	0.035
LEV	-0.521**	0.212	-2.452	0.022
FSIZE	0.373**	0.144	2.589	0.016
C	-2.079	1.370	-1.516	0.143
F-statistic	47.876	R-squared		0.704
Prob(F-statistic)	0.000	Adjusted R-squared		0.689

*Note: *** p < 0.01, ** p < 0.05, * p < 0.1.*

When the results of the resistive estimation method in Table 9 are analysed for Model A, it is understood that the inclusion of the companies in the sustainability index does not significantly affect financial performance. A one-unit increase in business size increases financial performance by 4%. A one-unit increase in capital intensity increased financial performance by 0.8%. A one-unit increase in financial leverage reduces financial performance by 16%. In addition, it was determined that the model was significant at the 1% significance level (F-statistic=0.0000), and the independent variables in the model

explained 61% of the change in the dependent variable (adjusted R^2). When the results for Model B are examined, it is understood that the inclusion of the enterprise in the sustainability index has a positive and significant effect on the company's value. Including the sustainability index increases the company's value by 12%. In addition, a one-unit increase in capital intensity increases the firm's value by 5%; A one-unit increase in the enterprise's size increases the company's value by 37%. A one-unit increase in financial leverage reduces the firm's value by 52%. In addition, it was determined that the model was significant at the 1% significance level (F-statistic=0.0000), and the independent variables in the model explained 68.9% of the change in the dependent variable (adjusted R^2).

5. Conclusion and Recommendations

The concept of sustainability, which is becoming increasingly important nowadays, affects investment activity and share prices. Increased sustainability awareness can help companies appeal to potential investors sensitive to this issue. In the new world order, where sustainability is so crucial, implementing and developing sustainability strategies is essential for companies to survive. In doing so, companies will gain a sustainable competitive advantage.

The study examined the impact of companies' inclusion in the Sustainability Index on financial performance and firm value. Accordingly, financial data for 2018Q1-2023Q3 were analysed using the panel data analysis method. In the study, two different models were created: Model A examined the effect of inclusion in the sustainability index on financial performance. In contrast, Model B examined the effect on firm value. Firstly, both Spearman's correlation analysis and the Variance Inflation Factor (VIF) test were performed to ensure that the models give consistent and accurate results. Secondly, Peseran CD (2004) cross-sectional dependence test, second generation PANIC (2004) unit root test, and Diagnostic tests (heteroscedasticity and autocorrelation problem) were examined. Since both models have heteroscedasticity and autocorrelation problems, the Driscoll-Kraay estimator was used in model estimation. When the results of Model 1 were examined, it was found that inclusion in the sustainability index did not significantly affect financial performance. When the results of Model 2 were examined, it was concluded that inclusion in the sustainability index positively affected firm value. This can be explained by the "cost of information hypothesis," which states that the indexing event contains information and affects the stock's value. According to this hypothesis, being included in the sustainability index conveys more accessible information to investors. In addition, this increases investor awareness and reduces the costs of searching for information. Therefore, while inclusion in the index directs investors to invest in these companies, the increasing demand increases firm value.

This study is based on studies in which it was found that inclusion in the sustainability index did not have a significant effect on financial performance (Abugniem et al., 2019; Dogukanli & Borak, 2020; Dagistanli & Dagistanli, 2023; Korga & Aslanoglu, 2022; Gonzalez-Benito & Gonzalez-Benito, 2005; and Makni et al., 2009). Researchers who want

to research this issue in the future can extend the study period or contribute to the literature by examining and comparing the companies in the sustainability index by sector. Policymakers, on the other hand, can provide subsidies to companies for sustainability activities and contribute to the orientation of companies on the concept of sustainability by supporting investments made in this regard.

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