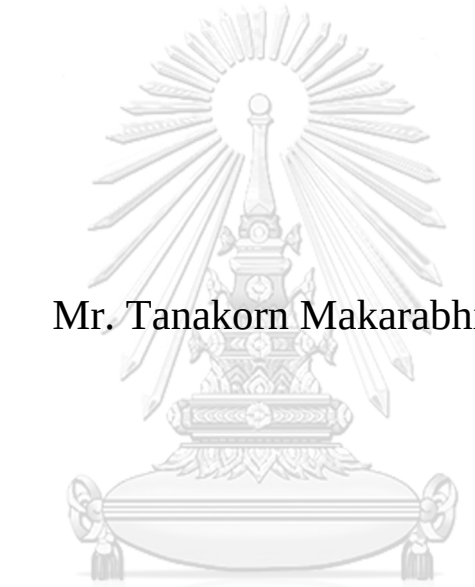
The Effect of Sustainability Index Inclusion on Equity Fund Allocation
Evidence from Thailand

Mr. Tanakorn Makarabhiromya



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The concept of sustainability index has been accepted widely in the global investment context. However, sustainable investments are relatively underexplored in an emerging market as in Thailand. This study analyzes the relationship between corporate sustainability performance (proxy by announcement events of the Stock Exchange of Thailand Sustainability Index SETTHSI) and institutional investors' awareness toward sustainability investment. An event studies on index announcement are applied to analyze the short-term effect from investors in stock market. The results indicate that there is only weak evidence that inclusion into the sustainability index has a positive impact to cumulative abnormal returns during release-related period, but there is no evidence to support the negative impact for exclusion from the index. Then, we conduct the detailed holding-based analysis of investment decisions made by equity mutual fund managers to investigate ESG recognition and longer-term decisions. The result shows that equity fund managers increase their position in the next two quarters following the announcement of inclusion into the index. Lastly, Tax-incentive feature of Thai mutual fund industry is investigated whether it has an influence toward fund managers investment decisions in sustainability investment. Yet, the outcome implies that tax-incentive feature does not have any influence toward equity fund manager's allocation decisions.

Field of Study:	Finance	Student's Signature .....
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1. INTRODUCTION

1.1. Background and Motivation

Environmental, Social, and Governance (ESG) investments have been growing substantially in academic research, regulation, and financial market domain. In accordance with The Forum for Sustainable and Responsible Investment (US SIF), the total amount of US-domiciled sustainable investment increases from $639 billion in 1995 to $16.6 trillion at the beginning of 2020. The sustainable investment community has been expanding more than 25-fold over the past 25 years. Out of $16.6 trillion in sustainable assets, $3.1 trillion – or about 19 percent which is a significant amount– were managed by mutual funds, exchange-traded funds, and closed-end funds.

In academic research, there are various fields of studies toward the development of ESG investing. Fund portfolio analysis is one example where the risk-adjusted stock returns are compared between Socially Responsible Investment (SRI funds) and conventional mutual funds (Bauer et al., 2005). Other portfolio analysis focuses on some specific corporate sustainability performance assessment which eventually contributed to sustainability stock index construction. Another branch of the socially responsible investment studies investigates the financial performance of sustainability stock indices (Schröder, 2007).

To investigate the effect of corporate sustainability performance on financial performance in a narrow view, short-term event studies are also another methodology focusing on micro-econometric analysis. The development of short-term event study has grown particularly in financial markets and economics such as the effects of mergers and acquisitions, issuing of new bonds and equity, and earning announcements. Furthermore, such event studies are applied to analyze the investors' reaction to stock market due to new public information about the corporate sustainability activities. The relevant events can have negative information such as the impact of environmental accidents, as well as positive information such as membership in well-known sustainability indices. Therefore, there are numbers of

studies contributed to the research of an event studies to analyze the impact of inclusion in a sustainability stock index on the stock returns as in (Hayward, 2018; Nakai et al., 2013; Oberndorfer et al., 2013; Roca, 2013; Stekelenburg et al., 2015; Yilmaz et al., 2020). Additionally, (Boone & White, 2015) also suggests that firms included into the sustainable index are likely to draw institutional investors' interest. By the addition into the sustainability index, companies can send a signal to stakeholders and investors that they focus and pay attention to being a sustainability leader (Robinson et al., 2011)

Recently, the Stock Exchange of Thailand shifted focus heavily toward the trend of growth in ESG development. Initially, there are 51 listed firms included in Thai Sustainable Investment list (THSI) in 2015, however, recently 147 listed firms are in the list as of the record in 2021. This could draw the attention of institutional investors toward ESG investing theme.

In Thailand, one type of open-ended equity mutual funds that are in an outstanding amount is tax-privileged mutual funds. Referring from the Association of Investment Management Companies (AIMC), the total net asset value for tax-saving funds in Thailand has been expanding massively from 18 billion THB in 2004 to 710 billion THB at the end of 2019. This is accounted for by 27.8% compound annual growth rate (CAGR) which is a significant level of growth for total NAV of tax-saving funds. According to the recent data in 2019, the portion of tax-saving funds is representing about 47% out of the total net asset value of equity funds in Thailand at 1.5 trillion THB. Recently, there are three main types of tax-saving funds: the Long-Term Equity Funds (LTFs), which requires lockup period to at least 5 years (adjusted to 7 years in 2016), the Retirement Mutual Funds (RMFs), which requires a lockup period for at least 5 years and redeemable at the investor's age of 55, and the Super-Saving Funds (SSFs) which is a newer version of LTFs with a longer lockup period of 10 years. These types of funds are considered as long-term investment horizon funds for mutual fund investors since the investors are not allowed to sell the fund during the lockup period. If the tax-saving funds are sold during the lockup period, there is a penalty for selling and investors must return the tax benefits, therefore investors are likely to hold the funds until the end of lockup period.

The main goal of this study is to analyze the motivation, catalyst, and key driver of ESG-sensitive equity fund managers. Even though there are very few mutual funds considered as Socially Responsible Investment Funds (SRI Funds) in Thailand, the fund managers for conventional funds might consider ESG factor investing to allocate their portfolio due to the growing trend of firms participating in Thailand Sustainability Investment list and the demand for environmental, social, and governance development. It is very challenging to research factors supporting sustainable development where institutional investors, or Thai equity mutual funds, can contribute to the growth in sustainable investment. One factor that would contribute to the progression of ESG investing in Thailand is the tax incentive feature, since fund managers in a longer horizon of investment are expected to find an opportunity to invest in sustainable firms. Moreover, there are very small amount of studies in the tax incentive feature because it is available in just a few countries. Therefore, there is a strong demand for the missing piece of study in the tax incentive feature that could contribute significantly to the sustainable investing development.

Table 1: *Summary of tax-saving fund requirements*

Description	**LTFs**	**RMFs**	**SSFs**
Maximum Investment	At most 15% of taxable income, not exceeding 500,000 THB	At most 30% of taxable income, including other retirement funds, but not exceeding 500,000 THB	At most 30% of taxable income, not exceeding 200,000 THB, and combining with investment in other retirement funds not exceeding 500,000 THB
Lockup Period	7 calendar years for LTF purchased between 2016 and 2019 5 calendar years for LTF purchased prior to 2016 (LTF discontinued after 2019)	At least 5 years from the initial purchase, and selling after the age of 55 years	10 years from the initial purchase date
Continual Investment Requirement to receive tax incentive	N/A	Recurring investment at least every 2 years to receive tax incentive	N/A
Tax Benefits	Income tax credit (15% of total income, maximum 500,000 THB)	Income tax credit (30% of total income, maximum 500,000 THB)	Income tax credit (30% of total income, maximum 200,000 THB)
Investment Policy	Thai Equity	Any (Equity, Fixed-income, money market, mixed funds, and others)	Any (Equity, Fixed-income, money market, mixed funds, and others)

1.1. Research Questions

This paper has three main research questions that will contribute to the literature as follows.

Research Question 1: Does the announcement of sustainability index impact the stock performance?

Prior to the assessment of the broader view toward the ESG investment, the study in short-term effect is required to prove how the whole market reacts toward the sustainability index announcement. From the prior studies, it is still unclear whether stock markets will react positively or negatively after their own sustainability index announcement. Therefore, conducting an event study around the announcement date will allow us to analyze the short-term reaction toward the sustainability investment.

Hypothesis 1

The inclusion in the sustainability index has a positive effect on stock return in the short run.

Hypothesis 2

The exclusion from the sustainability index has a negative effect on stock return in the short run.

Research Question 2: Does the announcement of sustainability index impact fund managers' holdings position?

According to The Forum for Sustainable and Responsible Investment (US SIF), there is a substantial growth in the asset under management for institutional investors applying ESG factors as a portfolio selection. Equity fund's manager who is a part of the institutional investors tends to apply the ESG screening criteria toward portfolio allocation and stock selection process. Therefore, studying the effect of the sustainability index announcement on fund manager's holdings position would allow us to assess if the event stimulated fund managers to consider ESG criteria in their asset allocation procedure.

Hypothesis 3

The inclusion in the sustainability index increases holdings percentage in equity fund portfolio.

Hypothesis 4

The exclusion in the sustainability index decreases holdings percentage in equity fund portfolio.

Research Question 3: Do the tax-saving funds pay more attention to sustainability investment than other funds?

Apart from the investment consideration on ESG investing of institutional investors, there is a part where regulators can provoke ESG recognition. In Thai mutual fund industry, tax incentive feature is a regulation that were created to improve the stability of the financial markets and to motivate their people to saving for retirement. As a result of tax incentive feature, mutual fund investors tend to invest in longer term since there will be a penalty if fund units are sold early. Since long term investment is consistent with the purpose of ESG investment, therefore, equity fund managers where fund has the tax incentive feature are likely to pay more attention toward sustainability investment.

Hypothesis 5

The sensitivity of inclusion for tax-saving funds is higher than that of other funds.

Hypothesis 6

The sensitivity of exclusion for tax-saving funds is lower than that of other funds.

1.2.Objectives

This study focuses on investigation of the impact of the announcement of the stock exchange of Thailand sustainability index (SETTHSI) that is reviewed on semi-annually basis. The methodology used in this study is an event study methodology around the announcement date that a company is included in, remained in, or

excluded from the sustainability index (SETTHSI). By evaluating the abnormal return of its stock, the cumulative abnormal return around the announcement date is used to determine whether the addition in or removing from the index has an impact to the firms in the short run. Furthermore, the equity fund's holding is used to assess the fund manager's reaction toward the announcement of the sustainability index. Additionally, this study aims to assess the effectiveness of tax-incentive features of the Thai equity mutual funds toward the ESG investing.

1.3.Contribution

There is abundant research analyzing the impact of the announcement of sustainability indices especially in developed countries as in Dow Jones Sustainability Index. This paper as well focus on the impact of the announcement for Thailand Sustainability Index toward stock returns in short run where few studies aim attention in this index.

In the literature, it is essential to better understand how fund managers screen their stocks and allocate to their portfolio in the case of ESG investing. This study also fills the gap to the literature by applying holding-based performance analysis to analyze the impact of the inclusion in or the exclusion from the sustainability index in the view equity funds' asset allocation. By applying pooled ordinary least square regression model on several announcement events, this allows us to assess the equity funds' perspectives toward the ESG performance of the individual firms.

In addition, this study is very important to academics, asset management industry and regulators as it also contributes to the literature by examining the tax-saving fund feature, especially in Thai mutual funds industry, toward the fund's allocation by applying the panel regression models to assess whether the impact of the inclusion in and the exclusion from the sustainability index is different between Thai equity tax-saving funds and Thai equity non-tax-saving funds.

2. LITERATURE REVIEW

2.1. Sustainability Index Inclusion and Exclusion Effect on Stock Performance

One important issue that has been debated for decades is about Corporate Social Responsibility (CSR) or Environmental, Social and Governance (ESG) case for the business. The main research question is that "Social performance may be good for society, but does it pay?" (Brown, 1998). A large amount of research is investigating the relationship between corporate financial performance and Corporate Social Responsibility activities. However, the conclusion is still questionable since many researchers have concluded in a different result that it can be a positive, negative, or neutral impact for CSR toward corporate financial performance (McWilliams & Siegel, 2000). On the supporters' view, numerous studies were reported a positive relationship by (Cho et al., 2019; Keszey, 2020; Li et al., 2017). On the contrary, several studies have reported negative relationship as in (Crisóstomo et al., 2011; Vance, 1975) and mixed result as in (Hillman & Keim, 2001).

From previous studies, there are several hypotheses that support and contradict the price impact on announcement event. First, the price pressure hypothesis (Harris & Gurel, 1986) believes the increase in demand is temporary and that the stock price increases from inclusion effect will be fully reversed after 2 weeks, meaning that the price impact is also temporary. Second, the downward sloping demand curve hypothesis (Shleifer, 1986) suggests that the demand increases is expected to be permanent since after stocks are included, index funds will following buy the stock and thus increases the demand, meaning that the inclusion effect supposes to be significant. Third, the information cost hypothesis (Merton, 1987) also assume that an event could carry information and then has an impact on the company fundamental values. The index announcement event would increase investor's awareness and decrease the information cost. Lastly, the signaling hypothesis (Jain, 1987) suggests that an index events are described as signals to provide information for the future of the securities.

For further investigation of the CSR and corporate financial performance, studies are divided into two groups: one including long-term analysis as (Lourenço et al., 2012) suggests that in the long run, sustainable performance will be beneficial through the improvement of relations among stakeholders and reduced cost of conflicts which makes a company more attractive to investors. On the other group, there are numerous studies focusing on the short-term analysis by applying event study methodology to identify impact caused by CSR-related announcement.

Event studies investigating the relationship between CSR and corporate financial performance consider inclusion to and exclusion from sustainability indices as an event for investor interpretation. Investors may disagree or integrate the new information into their decision. In this case, index reconstitution may induce positive (negative) reactions causing an increase (decrease) in stock's abnormal returns for the event. For instance, (Nakai et al., 2013) evaluated the inclusion and exclusion effect from the Morningstar Socially Responsible Investment Index Japan from 2003 to 2010 by applying the market model of dummy regression methodology and the result shows a positive effect on the inclusion but the exclusion did not lead to a significant result in abnormal returns. Similarly, (Hayward, 2018) studied on the event of Dow Jones Sustainability Index North America (DJSI NA) announcement and support the results of a significantly positive effect on the stock return for the inclusion announcement and conclude a negative and statistically significant impact for the exclusion announcement.

On the contrary, a study by (Oberndorfer et al., 2013) exhibits a different market reaction when the firm is included in the index. (Oberndorfer et al., 2013) analyze the inclusion effect in the Dow Jones STOXX Sustainability Index (DJSI STOXX) and the Dow Jones Sustainability World Index (DJSI World) on the stock returns using the three-factor model (Fama & French, 1993) with a t-GARCH(1,1) model. Their finding shows that there is a strong negative impact of the addition into the DJSI World but not find significant abnormal returns for the addition into the DJSI STOXX. In addition, (Roca, 2013) also shows a significant drop in the stock returns while increasing in trading volume and idiosyncratic risk for inclusion effect in Dow Jones Sustainability Index Asia Pacific.

Table 2: *Summary of previous studies on the event study of inclusion and exclusion effect from the sustainability indices*

Author	Sustainability Index	Inclusion Effect	Exclusion Effect
(Nakai et al., 2013)	Morningstar SRI Japan	Positive and significant	Not significant
(Oberndorfer et al., 2013)	DJSI STOXX / DJSI World	Negative Relationship	NA
(Roca, 2013)	DJSI Asia Pacific	Negative and significant	Mixed signals
(Stekelenburg et al., 2015)	DJSI Europe	No significant impact	No significant impact
(Hayward, 2018)	DJSI North America	Positive and significant (Temporarily)	Negative and significant (Temporarily)
(Yilmaz et al., 2020)	BIST Turkey	No strong evidence	No strong evidence

2.2. Evaluation of Mutual Fund's Allocation using Holding-Based Analysis

In the previous literature, the ESG investing among equity mutual funds have been studied from different perspectives. On one side, there are studies analyzing and comparing the financial performance of Socially Responsible Investing equity fund and the conventional equity fund that the result shows no significant difference in risk-adjusted returns among them. This means that the SRI fund managers do not show outstanding stock selection and market timing ability. (Erragragui & Lagoarde-Segot, 2016; Leite & Cortez, 2014; Muñoz et al., 2015)

On the other side, the focus has been shifted toward how firm-level ESG performance influences institutional holdings. A study of (Starks et al., 2017) shows that investors with longer-investment horizons are likely to be more patient with higher ESG-profile firms. In addition, (Nofsiger et al., 2016) also suggested that institutional investors are likely to avoid firms with CSR concerns, even though their portfolio does not tilt toward higher ESG factors. Added up to the literature, Stakeholder theory can support the rationale that firm value increases as ESG increases the shareholder wealth and it motivate other stakeholders to be partly

responsible for the success of the firm (Freeman, 2010). High ESG firms tend to have less chance to encounter lawsuit risk due to the environmental pollution concerns (Sharfman & Fernando, 2008).

In order to conduct deep assessment to mutual fund performance, many studies have used the periodically disclosure of fund holdings to investigate mutual fund investment choice and the impact of their trade on the stock market (Chen et al., 2000; Wermers et al., 2012; Yan & Zhang, 2009)

The previous literature studies in a detailed holding-based analysis of equity fund investment decisions comparing between Socially Responsible Investment funds and conventional equity funds. (Joliet & Titova, 2018) shows that SRI and conventional equity funds allocate their portfolio weight by considering firms' ESG factors. By using the portfolio holding analysis, the completely new buy and sell decision of the funds are referred as initiation and liquidation of the individual stock. Since the initiation and liquidation are identified as a dummy variable for buy and sell decision, the Logit/Probit regression model has been applied to see the effect of relative ESG factors. Moreover, the weight of an individual stock holding by SRI funds is analyzed using the panel data model of 59,037 fund-company-quarter observations. The core finding of this study is that actively managed socially responsible investment (SRI funds) and conventional funds consider both ESG factors and financial performance of individual firms for the asset allocation decisions. However, in the case of initiation and liquidation, fundamentals of firms are primarily concerned over the ESG score for both SRI and conventional funds.

2.3.Information on Tax Incentive Funds

The study of (Nathaphan & Chunhachinda, 2012) shows that the growth of equity mutual fund in Thailand is driven mainly by large fund flow from the tax incentive funds. The tax incentive funds provide immediately gain from tax savings to the mutual fund investors in an exchange of the lockup periods required by the regulators to hold the fund for a specific period. (Muthitacharoen & Burong, 2022) also support the effectiveness of price subsidy that encourage the middle-income taxpayer to invest their long-term savings into the tax-saving mutual funds. To my best knowledge, this study would be the first to analyze the mutual funds' holding to investigate the effectiveness of tax incentive feature of Thai equity mutual fund toward the ESG investing universe.

3. DATA

3.1. Thailand Sustainability Index Compositions

Thailand Sustainability Investment list (THSI) has been created since 2015 as an alternative for investors to consider the corporate assessment of high performance ESG stocks. Stock Exchange of Thailand will assess a listed company's sustainability performance in corporate governance, environmental and social dimensions and then continuously conduct an annual review to ensure that the listed companies are still align with the progression of the sustainability trend in both national and international practice.

In addition, Stock Exchange of Thailand has introduced a sustainability index "SETTHSI" in the mid of 2018 where the composition of the index is listed companies that conduct sustainable business operations continuously and pass the market capital size and liquidity criteria. To be included in the sustainability index, the listed company must comply with the following criteria:

- Included in Thailand Sustainability Investment company list in the most recent year.
- Traded on the Stock Exchange of Thailand (SET) for at least 6 months.
- Must have market capitalization of at least 5 billion THB.
- Must have free float of at least 20% of paid-up capital.
- Must have trading ratio higher than 0.5% for at least 9 out of 12 months.

According to the released documents from Stock Exchange of Thailand, I collected the Thailand Sustainability Index (SETTHSI) announcements released as the data is shown in Table3. Since the inception of the index, there are 9 semi-annual periods from the second half of 2018 to the end of 2022. Stock Exchange of Thailand set the announcement date on semi-annual basis for the sustainability index. They publish the document in the third week of December for the first half of the year list and publish in the third week of June for the second half of the year list. Currently, there are 126 times of inclusion into the index, 26 times of exclusion from the index and 499 times of stock remaining in the index for the dataset, as a result, there are 651

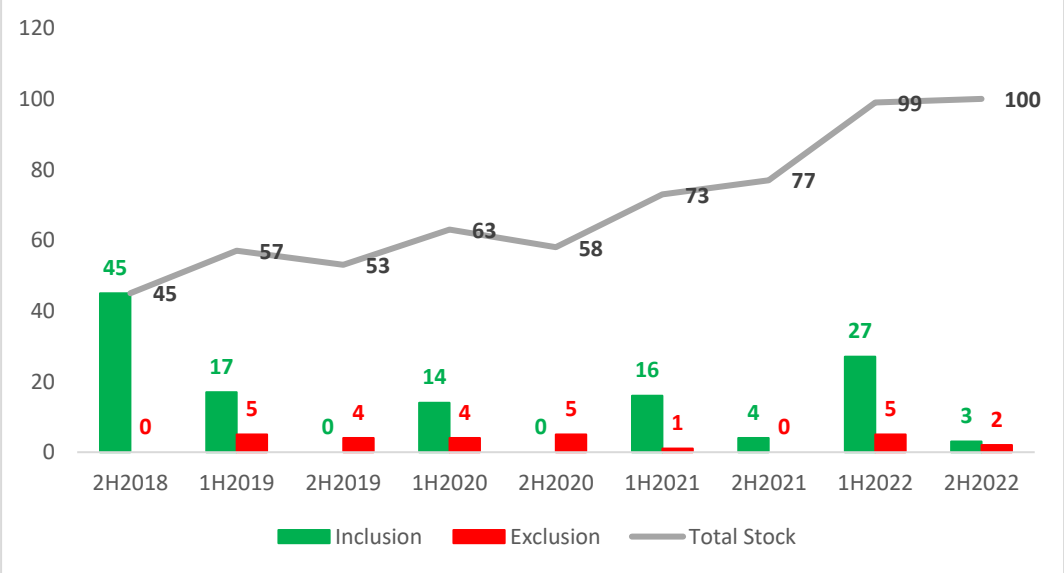
stock-period data points to be tested. As illustrated in figure1, the number of stocks included is 45 firms at the inception of the index and gradually increases to 100 firms in the second half of the year 2022.

Table 3: *Historical announcement data on inclusion and exclusion of SETTHSI sustainable index*

Period	Number of stocks in index	Inclusion	Exclusion	Remaining	Published date
2H2018	45	45	0	0	18/06/2018
1H2019	57	17	5	40	17/12/2018
2H2019	53	0	4	53	18/06/2019
1H2020	63	14	4	49	18/12/2019
2H2020	58	0	5	58	15/06/2020
1H2021	73	16	1	57	16/12/2020
2H2021	77	4	0	73	16/06/2021
1H2022	99	27	5	72	17/12/2021
2H2022	100	3	2	97	20/06/2022
Total		**126**	**26**	**499**	

Source: Stock Exchange of Thailand

Figure1: *The number of inclusion and exclusion on sustainability index (SETTHSI) announcement and the number of total stocks in the index from 2018 to 2022*



3.2.Company-specific Fundamental Data

Data for the stocks on the Thailand sustainability index (SETTHSI) between 2018 and 2022 is required. There are two sets of company-specific fundamental data included in this study. First, the individual stock return is required to estimate stock-specific parameters for each event for the event study. There are 113 listed firms participating in the index at least once from 2018 to 2022. The historical stock price can be obtained from SETSMART database to calculate for the daily stock returns. Furthermore, the SET Index is selected as the market returns for the company-specific parameter estimation during normal periods. Second, the list of company fundamental data at each event period is required as control variables for the regression analysis. The main challenge in constructing the database is that the study event is based on semi-annual basis, but the fundamental data are given in quarterly basis, therefore, the trailing 12-month methodology is applied to the fundamental data to reflect the past performance of the individual firm before the event. All company-specific fundamental data can be retrieved from the Refinitiv Workspace.

For the control variable, the set of company-specific fundamental data are identified as

- Δ **Size** the difference between firm's current and 2-quarter-lagged market capitalization
- Δ **Sales growth:** the growth rate in trailing twelve-month sales
- **EPS Growth:** trailing twelve-month earnings per share growth
- **Active Return:** the difference between the stock return and market index over 1 quarter
- Δ **P/E:** the change in price-to-earnings ratio
- Δ **P/B:** the change in price-to-book ratio
- Δ **P/S:** the change in price-to-sales ratio
- Δ **Debt/Asset:** the change in sum of financial debt divided by total assets
- Δ **Dividend Yield:** the change in ratio of trailing dividend per share over the preceding 12 months over the share price

- Δ **Volatility:** the change in volatility of quarterly stock return over the preceding quarters
- **Market Return:** the SET market return for the past 6 months

3.3. Thai Equity Mutual Funds' Data

Thailand mutual fund data can be retrieved from "Morningstar Direct Database" where there are 333 unique funds classified as Thai equity funds. Out of 333 unique funds, 163 funds have tax-incentive features, and the other 170 funds are classified as non-tax incentive funds. The equity mutual fund holdings data are collected from 2018 to 2022 on a quarterly basis. In this paper, there are two sets of mutual fund-specific data (1) mutual fund quarterly holding weight of stocks participating to the sustainability index and (2) fund-level characteristics.

The fund-level characteristics can be obtained from Morningstar database that consists of

- **Fund Assets Growth:** the growth rate in the average amount of assets under management for the studied period,
- **Turnover Ratio:** percentage of a fund's holdings that have been replaced each year, and
- **Diversification Ratio:** reciprocal of the sum of weights of all companies in the portfolio at each date

4. METHODOLOGY

4.1.Event Study on the Announcement Date of Sustainability Index

To answer the 1st research question, a standard event study methodology around the announcement date is applied to evaluate hypothesis 1 and hypothesis 2. This event study is consistent with prior studies as in (Hayward, 2018; Oberndorfer et al., 2013; Roca, 2013). The standard event study is applied to detect the cumulative abnormal return (CAR) for firms included in and excluded from the Stock Exchange of Thailand Sustainability Index (SETTHSI). It is required a significant assumption that capital market is efficient enough to react on new information (an event) regarding expected future returns of target firms and the timing of the announcement is exogeneous the company cannot influence the event. Thus, the expected result would exhibit a statistically significant increase in the CAR for inclusion and decrease in the CAR for exclusion.

The market model or Capital Asset Pricing Model (CAPM) is applied to predict stock return using market portfolio as (Sharpe, 1964)

$$R_t^i - R_t^f = \alpha_E^i + \beta_E^i (R_t^m - R_t^f) + \varepsilon_{i,E} \quad (1)$$

Where R_t^i is the realized return of stock i on trading day t, and R_t^f is the risk-free rate of return, and R_m^i is the return of SET index on trading day t, α_E^i and β_E^i are stock-specific parameter for stock i for the event E, and $\varepsilon_{i,E}$ is the error term with a zero expectation and a constant variance.

For the market model parameters, the α_E^i and β_E^i are estimated for all stocks that have been a member of the sustainability index for each event period. A simple regression is applied to stock returns and SET Index returns during the normal estimated window that are between 60 days to 15 days prior to the announcement date of the Thailand Sustainability Index review results. It is essential that the normal estimation period does not overlap the abnormal period testing window to avoid the effect of the announcement event.

The expected return of the stock is

$$E(R_t^i - R_t^f) = \alpha_E^i + \beta_E^i(R_t^m - R_t^f) \quad (2)$$

Where $E(R_t^i - R_t^f)$ is the estimated expected return of stock i over the risk free-rate return on trading day t.

The abnormal return is defined as the difference between the realized return and the estimation of expected return in the normal period.

$$AR_t^i = (R_t^i - R_t^f) + E(R_t^i - R_t^f) \quad (3)$$

Where AR_t^i is the abnormal return for stock i on trading day t.

The cumulative abnormal return (CAR) between the testing window is defined as the sum of the abnormal return along the pre-defined period.

$$CAR_{i,E} = \sum_{t=T_a}^{T_b} AR_t^i \quad (4)$$

Where $CAR_{i,E}$ is the cumulative abnormal return of stock i in an event E from trading day T_a to T_b.

Following the research conducted by (Lynch & Mendenhall, 1997; Stekelenburg et al., 2015), the event window is additionally identified into five sub-window, which the intention is to assess different forms of investors behavior on and around the announcement date (AD) and the effective date of the sustainability index (ED). The announcement date (AD) is on the date where Stock Exchange of Thailand published the semi-annually review result of the sustainability index in order that investors can obtain new information on firms' sustainability performance. The study around the announcement date is to observe how quickly investors react to the new public information. In addition, the effective date (ED) where the actual date that the sustainability index applied an inclusion and exclusion of the firm's list into the index calculation is also important to study to see the usefulness of the actual sustainability index since the passive funds investing specifically in the index must adjust their portfolio according to the fund objective to control their tracking error of the index.

The five sub-windows for each event are classified as follow:

(1) Pre-announcement window (AD-14 to AD-1)

(2) Run-up window (AD to ED-1)

(3) Release-related window (ED to ED+10)

(4) Temporary price impact windows (AD-15 to ED+10)

(5) Total permanent price impact windows (AD-15 to ED+60)

To test the significance of the cumulative abnormal return over the specific event period, a regression analysis with pooled cross sections is applied as follows:

$$CAR_{i,E} = \beta_0 STAY_{i,E} + \beta_1 INC_{i,E} + \beta_2 EXC_{i,E} + \varepsilon_{i,E} \quad (5)$$

Where $STAY_{i,E}$ is a dummy variable for stock i remaining in the index at the event E, $INC_{i,E}$ is a dummy variable for inclusion into the index for stock i at the event E, $EXC_{i,E}$ is a dummy variable for exclusion out of the index for stock i at the event E, β_0 is a marginal effect on CAR if company stays in index, β_1 is a marginal effect on CAR if company is added to index, and β_2 is a marginal effect on CAR if company is deleted from index

One-sample t-test is applied to analyze the statistical inferences of the CAR for the company included and removed from the index.

4.2.Inclusion and Exclusion Effect on the Changes in Funds' Holdings

From June 2018 to June 2022 and each individual Thai equity fund, we identified the change in fund holdings' weight of the stocks in the index. By applying a panel regression analysis, we can assess the inclusion and exclusion effect on the mutual fund asset allocation by reviewing the change in fund holdings weight of the individual stock. The change in percent holding of the individual stock is analyzed in 2 scenarios as illustrated in figure 2, (1) the difference in percent holding before the announcement and in one-quarter after the announcement, and (2) the difference in

percent holding before the announcement and in two-quarter after the announcement to observe the portfolio adjustment after the event.

The change in fund holdings weight is as follows,

$$\Delta HOLD_{i,j,E} = HOLD_{i,j,E,q+1} - HOLD_{i,j,E,q} \quad (6)$$

Where $HOLD_{i,j,E,q}$ is the percent weight of holdings of stock i for fund j at the quarter-end prior to the event E announcement. And $HOLD_{i,j,E,q+1}$ is the percent weight of holdings of stock i for fund j the one-quarter-end after the event E announcement.

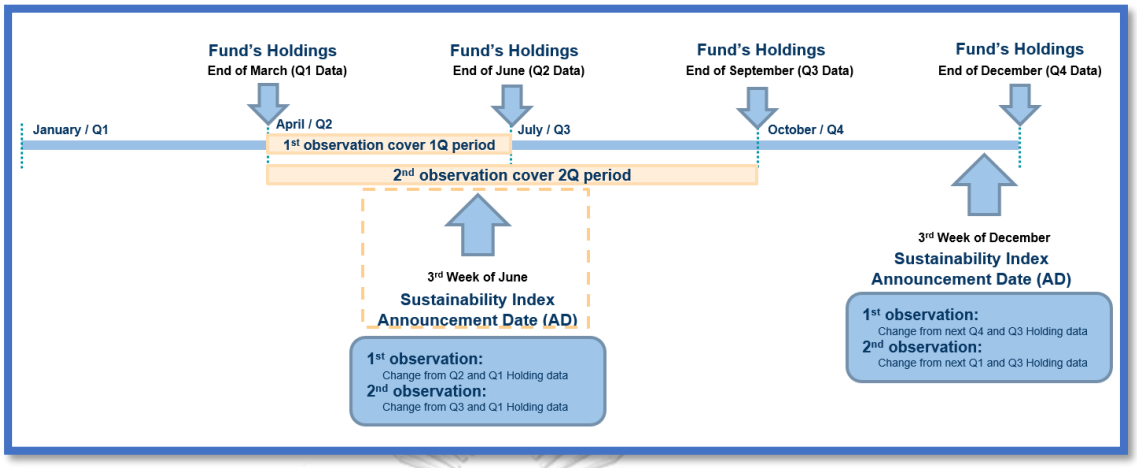
The pooled OLS regression model is estimated as

$$\Delta HOLD_{i,j,E} = \beta_0 STAY_{i,E} + \beta_1 INC_{i,E} + \beta_2 EXC_{i,E} + \sum_k \beta_k FUNDAMENTALS_{i,E}^k + \sum_n \gamma_n FUND_{j,E}^n + \varepsilon_{i,E} \quad (7)$$

Where $\Delta HOLD_{i,j,E}$ is the change in percent weight of holding in stock i of fund j from time t+1 to t, $STAY_{i,E}$ is a dummy variable for stock i remaining in the index at the event E, $\mathrm{INC}_{\mathrm{E}}^{\mathrm{i}}$ is a dummy variable for inclusion effect of stock i at an evet E, $\mathrm{EXC}_{\mathrm{E}}^{\mathrm{i}}$ is a dummy variable for exclusion effect of stock i at an event E, $\mathrm{FUNDAMENTALS}_{\mathrm{k,t}}^{\mathrm{i}}$ is the k fundamental variable for stock I at the end of time t, $\mathrm{FUND}_{\mathrm{n,t}}^{\mathrm{j}}$ is the n characteristic of fund j at the end of time t.

The interpretation of the sensitivity is that β_0 is the sensitivity of stock remaining in the index on the change in percent weight holding, β_1 is the sensitivity of inclusion effect, β_2 is the sensitivity of exclusion effect, β_{k} is the sensitivity of stock i for fundamental k, γ_{n} is the sensitivity for fund characteristic n, and ε_{ijt} is a zero-mean residual.

Figure 2: *Sustainability index announcement date timeline and observation period*



4.3.Effect of Inclusion and Exclusion on Tax-Saving Funds over Other Funds

To assess the effectiveness of the tax-saving funds over the non-tax-saving funds, a dummy variable to identify tax-saving fund is added into the previous pooled OLS regression model.

$$\Delta HOLD_{i,j,E} = \beta_0 STAY_{i,E} + \beta_1 INC_{i,E} + \beta_2 EXC_{i,E} + \gamma_0 TAX_j STAY_{i,E} + \gamma_1 TAX_j INC_{i,E}$$

$$+\gamma_2 TAX_j EXC_{i,E} + \sum_k \beta_k FUNDAMENTALS_{i,E}^k + \sum_n \gamma_n FUND_{j,E}^n + \varepsilon_{i,E} \quad (8)$$

Where $\Delta HOLD_{i,j,E}$ is the change in percent weight of holding in stock i of fund j at an event E, $STAY_{i,E}$ is a dummy variable for stock i remaining in the index at the event E, $INC_{i,E}$ is a dummy variable for inclusion effect of stock i at an event E, $EXC_{i,E}$ is a dummy variable for exclusion effect of stock i at an event E, TAX_j is a dummy variable to identify tax-saving fund feature.

As shown in Table4, the interpretation of sensitivity terms is that β_0 is the sensitivity of remaining effect for non-tax saving funds on the change in percent weight holding, $\beta_0 + \gamma_0$ is the sensitivity of remaining effect for tax-saving funds. $\beta_1$is the sensitivity of inclusion effect for non-tax saving funds, $\beta_1 + \gamma_1$ is the sensitivity of inclusion effect for tax-saving funds, β_2 is the sensitivity of exclusion

effect for non-tax saving funds, and $\beta_2 + \gamma_2$ is the sensitivity of exclusion effect for tax-saving funds.

Table 4: *Sensitivity terms in the panel regression model for tax-saving funds*

	Inclusion	**Remaining**	**Exclusion**
Tax Saving	$\beta_1 + \boldsymbol{\gamma_1}$	$\beta_0 + \boldsymbol{\gamma_0}$	$\beta_2 + \boldsymbol{\gamma_2}$
Non-Tax Saving	β_1	β_0	β_2

5. EMPIRICAL RESULTS

5.1. Event Study Results on Cumulative Abnormal Returns

Market Model Regression Analysis

An ordinary least squares regression on market model has been applied to each stock to estimate the parameters α^{i}_{E} and β^{i}_{E} at each announcement event. The data includes individual stock returns and SET Index returns between the normal period (AD-60 and AD-15 trading days). Table5 is the summary of the market model regression for the normal period. The average estimate of β^{i}_{E} is 1.0529 and the average estimate of α^{i}_{E} is 0.05%. The coefficient of β^{i}_{E} is statistically significant at a 10% significance level.

Table 5: *Market Model Regression Summary*

Description	Mean	N	Max	Min
α^{i}_{E}	0.0005	650	0.0285	-0.0157
α^{i}_{E} Std.Error	0.0035	650	0.0162	0.0011
α^{i}_{E} T-statistic	0.0177	650	3.9088	-3.8264
α^{i}_{E} P-value	0.5062	650	0.9985	0.0005
β^{i}_{E}	1.0529	650	4.0720	-1.6459
β^{i}_{E} Std.Error	0.3842	650	1.8125	0.1232
β^{i}_{E} T-statistic	3.0571	650	9.8715	-2.8049
β^{i}_{E} P-value	0.0960	650	0.9952	0.0000
R-squared	0.2569	650	0.7707	0.0000

Cumulative Abnormal Return (CAR) Regression Analysis

Initially, the result of one-sample t-test is summarized in Table A3 to A5 in the appendix to evaluate if the cumulative abnormal return (CAR) for different sub-windows is statistically significant. This methodology is aligned with the event studies of (Stekelenburg et al., 2015) and (Hayward, 2018). The sustainability index announcement will have an influence on investors if the CAR is statistically different to zero in any sub-windows.

Table 6 also shows the summary result of the cumulative abnormal return regression model. According to hypothesis 1, the inclusion effect is observed if it has any positive effect on stock return in the short run. The result for pre-announcement and run-up sub-windows indicates that the CAR is not statistically different from zero. This means that the information about the sustainability index announcement does not have any impact on the market before and around the announcement date. However, there is weak evidence that the inclusion effect has an impact on cumulative abnormal return for released-related sub-windows (from index effective date to the following ten trading days). This implies that inclusion into the sustainability index increases the CAR by approximately 1.0174% for ten trading days after the index effective date. For hypothesis 2, where the exclusion effect is monitored, the CAR regression result concludes that there is no evidence to support the cumulative abnormal return in any sub-window events. The result implies that the market does not react to the information on the exclusion out of the sustainability index. Nevertheless, the dataset for exclusion is very small so it is almost impossible to draw a conclusion of the event. In addition, the regression result also indicates the CAR of the companies that are staying in the index that is statistically different from zero. For the run-up sub-window (AD to ED-1), temporary price impact sub-window (AD to ED+10), and permanent price impact (AD to ED+30), the result shows the negative impact that the cumulative abnormal return decreases by 0.6618%, 0.9982%, and 1.2717% respectively. This could mean that Thai stock market has penalized the firms staying in the sustainability index since staying in the sustainability index as an appropriate indicator for CSR activities would require a higher cost to maintain the ESG standards that might not be financially rewarded.

Table 6: *Regression Results for Cumulative Abnormal Returns (CAR)*

	Pre-Announce (AD-14 to AD-1)	**Run Up (AD to ED-1)**	**Release Related (ED to ED+10)**	**Temporary Price (AD to ED+10)**	**Permanent Price (AD to ED+30)**
STAY	**0.6434***	**-0.6618*****	-0.3364	**-0.9982****	**-1.2717****
	(0.3480)	(0.2557)	(0.2877)	(0.4141)	(0.6196)
INC	0.1281	-0.7273	**1.0174***	0.2902	0.1644
	(0.6926)	(0.5089)	(0.5724)	(0.8241)	(1.2330)
EXC	-0.2097	0.101	1.3695	1.4704	3.102
	(1.5549)	(1.1426)	(1.2851)	(1.8501)	(2.7682)
R-squared	0.001	0.0007	0.0087	0.0051	0.0049
N	650	650	650	650	650

Standard errors in parentheses

* p<.1, ** p<.05, *** p<.01

Average Abnormal Returns (AAR) and Cumulative Average Abnormal Returns (CAAR)

Table A6 in appendix shows the summary statistic for average abnormal return (AAR) and cumulative average abnormal return (CAAR) around the Stock Exchange of Thailand sustainability index review announcement categorized by focusing group. Average abnormal return (AAR) around the announcement date is illustrated in Figure 3. The data shows that the AAR for firms included and staying in the index is less volatile relative to the firms excluded from the index because of the small amount of data available for exclusion case. Figure 4 represents the result for cumulative average abnormal return (CAAR). First, there appears to be no significant trend before the announcement date for Inclusion and Staying in the index. Second, there is a downward trend for exclusion cases but as mentioned the data for exclusion might be unreliable because of the very limited amount of data. Lastly, there is a slight decrease in the CAAR after the announcement date for Inclusion and Staying case which is consistent with the regression result. However, in the Inclusion case, there is a reversal that causes a steady increase in the CAAR which is coherent to the regression result on the release-related sub-windows.

Figure 3: *Average Abnormal Returns (AAR) around the announcement date (AD)*

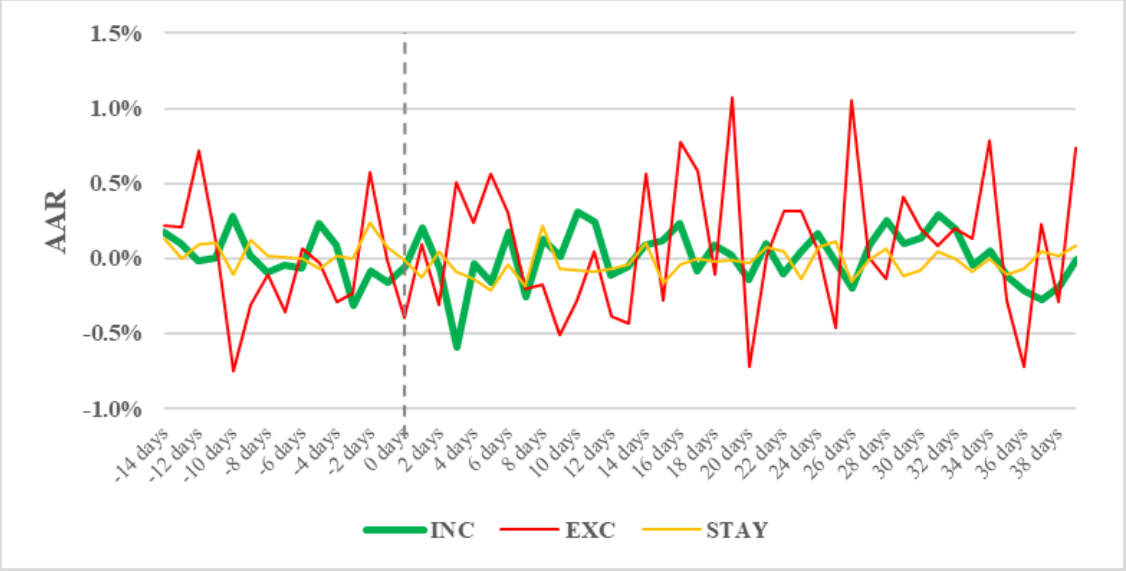
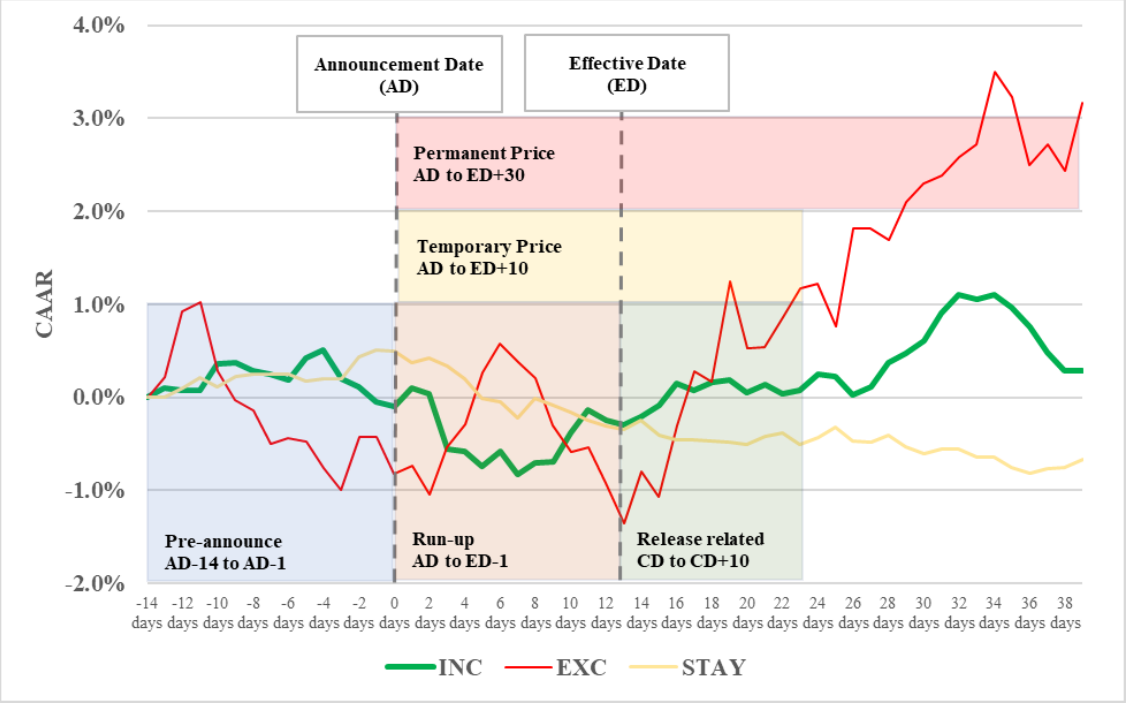


Figure 4: *Cumulative Average Abnormal Returns (CAAR) by categories*



5.2. Regression Results on the Changes in Funds' Holdings

Descriptive statistics of the main variables on the dataset for hypothesis 3 to 5 are presented in Table 7. First, the average of the changes in fund's holding weight is about 0.02% which means that during the observation period from 2018 to 2022, fund managers on average buy and sell almost equally to adjust their portfolio allocation. Second, for independent variables, the statistics show that there are 80.29% of the dataset for stocks staying in the index, 17.64% for stocks included into the index, and 2.07% of the dataset for stocks excluded out of the index cases in general. For the case of tax-incentive funds, there is about 7.90% of the dataset that are stocks included into the index. Also, there is 0.96% of the dataset for stocks excluded out of the index and 36.35% of the dataset for stock staying in the index that is held by the tax-incentive funds. The rest of the table shows the summary statistics for the control variables for both stock fundamentals and fund characteristics.

Table 7: *Descriptive Statistics*

Variables	Units	Count	Mean	Std	Min	Max
ΔHOLD	Percent	70,570	0.0238	1.6776	-11.6744	13.3203
STAY	Binary	70,570	0.8029	0.3978	0.0000	1.0000
INC	Binary	70,570	0.1764	0.3812	0.0000	1.0000
EXC	Binary	70,570	0.0207	0.1424	0.0000	1.0000
TAX_STAY	Binary	70,570	0.3635	0.4810	0.0000	1.0000
TAX_INC	Binary	70,570	0.0790	0.2697	0.0000	1.0000
TAX_EXC	Binary	70,570	0.0096	0.0976	0.0000	1.0000
Size Growth	Decimals	70,570	0.0597	0.2132	-0.4117	2.0941
Sales Growth	Decimals	70,570	0.0141	0.0892	-0.4467	2.2774
EPS Growth	Decimals	70,570	0.0199	0.8189	-1.6078	2.3333
Active Return	Decimals	70,570	0.0158	0.1768	-0.4047	1.9317
ΔP/E ratio	Ratio	70,570	1.2333	4.8132	-6.6199	13.8512
ΔP/B ratio	Ratio	70,570	0.0832	1.0136	-6.4117	10.6200
ΔP/S ratio	Ratio	70,570	0.5239	4.1486	-2.7574	67.1493
ΔD/A ratio	Ratio	70,570	0.0338	3.6522	-28.1016	24.2711
ΔDividend Yield	Percent	70,570	0.0833	0.7020	-1.4203	1.7384
ΔVolatility	Decimals	70,570	-0.0015	0.0070	-0.0378	0.0358
Fund Diversification	Ratio	70,570	110.4258	39.5256	1.5080	341.6714
Fund Turnover	Percent	70,570	312.2505	201.0572	56.5400	852.8400
Fund Asset Growth	Decimals	70,570	0.0410	0.0999	-0.1214	0.2516
Market Return	Decimals	70,570	0.0045	0.0899	-0.1524	0.1064

Equity Fund Managers' Portfolio Adjustment Decisions

This study applies a pooled OLS regression to the dataset to evaluate hypothesis 3 and 4 to answer the research question whether the sustainability index announcement has an impact to fund manager's changing the holding positions. The regression result is shown in Table 8. Result in Panel A shows the regression model where the regressor is the change in holding percentage in one quarter while the result in Panel B shows the result of the change in the next two quarters.

For hypothesis 3, it is expected that the inclusion in the sustainability index would be a booster to increase the holdings percentage in equity fund portfolio since fund manager tends to focus on a sustainable investment according to the growing trend. For a short-term portfolio adjustment, the $\beta_1$coefficient in Table 8 Column 1 is slightly negative and statistically significant at 1-percent level, showing that by including in the sustainability index, equity fund managers decrease their holding weight at the quarter ends which is normally about one to two weeks after the announcement. However, for a longer-period portfolio adjustment, the $\beta_1$coefficient in Table 8 Column 3 is significantly positive, showing that equity fund managers would raise their position in the stocks included in the sustainability index.

For hypothesis 4, the focus is shifted to exclusion effect toward fund manager position adjustment. The exclusion effect is expected to be a negative signal to fund managers since the firm will no longer be a part of the sustainability investment index. For a short run, the β_2 coefficient in Table 8 Column 1 is moderately negative and statistically significant, showing that fund managers would reduce their position if the firm were excluded for the index. Nevertheless, the β_2 coefficient in Table 8 Column 3 is slightly negative and insignificant, indicating that in long-run it has no impact to fund manager's portfolio adjustment decision. In summary, it is interesting to notice that in the short-term fund managers tend to decrease the weight following the sustainable index announcement in both inclusion and exclusion cases. Yet, in the longer term, they tend to increase their weight in the next two quarters following the announcement.

Comparison for Tax-Incentive Equity Mutual Funds over other Funds

This study also evaluates hypothesis 5 and 6 to answer the research question whether the tax-saving funds pay more attention toward sustainability investment than other funds or not. The regression model is added by the dummy variable for tax-incentive feature to get the interaction terms that could help explain the sensitivity of inclusion and exclusion for tax-saving funds over other funds. The regression result is shown in Table 8 Column 2 and Column 4.

For hypothesis 5, the expectation is that the interaction term for inclusion effect on tax-saving funds to be positive, meaning that the sensitivity is higher for non-tax-saving funds. For short-term effect in Panel A, the γ_1 coefficient is positive and statistically significant but the summation of $\beta_1 + \gamma_1$ is negative, meaning that even though the sensitivity for tax-incentive fund is higher but overall, tax-incentive fund managers are likely to decrease their position when the firm is included into the index. For a longer-term effect in Panel B, the sensitivity of inclusion effect for tax-incentive funds is slightly negative and insignificant. This suggests that having a tax-incentive feature does not impact the equity fund manager's portfolio allocation decision in the long run.

Other than that, hypothesis 6 expects the exclusion effect on tax-saving funds to be negative since tax-incentive fund managers are likely to avoid unsustainable investments. The regression result shows no evidence to support that the exclusion negatively impacts the tax-saving funds over other funds. To sum up, it cannot be concluded that tax-saving funds concern more on the sustainable investment over other equity funds.

Table 8: *Regression Results for Eq (7) & Eq (8)*

	Panel A: ΔHOLD in 1 Quarter		**Panel B: ΔHOLD in 2 Quarter**	
	(1)	(2)	(3)	(4)
STAY	-0.1178***	-0.1293***	-0.0644***	-0.0772***
	(0.0185)	(0.0197)	(0.0216)	(0.0230)
INC	**-0.0611*** **	**-0.1181*** **	**0.0745*** **	**0.0768*** **
	(0.0215)	(0.0250)	(0.0252)	(0.0291)
EXC	**-0.1554*** **	**-0.1525*** **	**-0.0345**	**-0.0278**
	(0.0411)	(0.0542)	(0.0476)	(0.0624)
TAX_STAY		0.0141		**0.0245***
		(0.0120)		(0.0143)
TAX_INC		**0.1127*** **		-0.0103
		(0.0255)		(0.0298)
TAX_EXC		-0.0174		-0.0183
		(0.0751)		(0.0867)
Size Growth	0.5744***	0.5803***	0.2198***	0.2261***
	(0.0495)	(0.0496)	(0.0578)	(0.0579)
Sales Growth	0.0223	0.0196	-0.3725***	-0.3754***
	(0.0627)	(0.0627)	(0.0756)	(0.0756)
EPS Growth	-0.0106	-0.0102	0.0636***	0.0636***
	(0.0067)	(0.0067)	(0.0080)	(0.0080)
Active Return	1.4813***	1.4768***	1.3798***	1.3740***
	(0.0588)	(0.0589)	(0.0686)	(0.0687)
ΔP/E ratio	0.0114***	0.0115***	0.0000	0.0001
	(0.0013)	(0.0013)	(0.0015)	(0.0015)
ΔP/B ratio	-0.0218***	-0.0219***	-0.0234***	-0.0234***
	(0.0067)	(0.0067)	(0.0079)	(0.0079)
ΔP/S ratio	-0.0043***	-0.0043***	(0.0007)	(0.0007)
	(0.0013)	(0.0013)	(0.0015)	(0.0015)
ΔD/A ratio	0.0061***	0.0061***	0.0010	0.0010
	(0.0015)	(0.0015)	(0.0018)	(0.0018)
ΔDividend Yield	-0.0001	-0.0001)	-0.0597***	-0.0595***
	(0.0079)	(0.0079)	(0.0093)	(0.0093)
ΔVolatility	-2.1014**	-2.1149**	4.7670***	4.7592***
	(0.8432)	(0.8431)	(1.0022)	(1.0022)
Fund Diversification	0.0009***	0.0010***	0.0005***	0.0005***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Fund Turnover	-0.0001***	-0.0001***	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000
Fund Asset Growth	-0.1182**	-0.1446**	-0.1858***	-0.2098***
	(0.0600)	(0.0615)	(0.0715)	(0.0731)
Market Return	-0.2267***	-0.2346***	-0.4674***	-0.4726***
	(0.0693)	(0.0693)	(0.0818)	(0.0819)
R-squared Adj.	0.0686	0.0689	0.0323	0.0323
N	66681	66681	70570	70570

Standard errors in parentheses

* p<.1, ** p<.05, *** p<.01

Regression Analysis by Year

To study the trend in sustainability investment that is believed to be a growing trend, regression is applied by year to observe the increasing trend of the attention toward sustainable investments. It is expected that the sensitivity for inclusion effect toward the change in fund's holding should be increased over the years. However, the regression result in Table 9 shows that the inclusion effect is insignificant in the year 2020 and is significantly negative in the year 2021 due to the fact that there is a COVID-19 pandemic that is an unusual event to all fund managers. Nevertheless, focusing on the 2019 and 2022 which are considered as a normal period, the marginal effect for inclusion shown in β_1 for 2019 and 2022 implies the increasing trend that equity fund managers pay more attention to the sustainability investment in the recent year as the global trend is growing.

Table 9: *Regression Results for Eq (7) & Eq (8)*

	ΔHOLD in 2 Quarter			
	2019	**2020**	**2021**	**2022**
STAY	**0.042**	**-0.0492**	-5.8423***	**0.1596*** **
	(0.0608)	(0.1089)	(0.8549)	(0.0470)
INC	**0.2120** **	**0.1127**	-5.7335***	**0.3198*** **
	(0.0839)	(0.1154)	(0.8503)	(0.0565)
EXC	**-0.1611**	**0.0912**	-3.7623***	0.0412
	(0.1060)	(0.2132)	(0.8950)	(0.0928)
TAX_STAY	-0.0073	0.0591*	-0.0329	0.0475
	(0.0321)	(0.0305)	(0.0233)	(0.0293)
TAX_INC	0.0368	0.0938	-0.0195	0.0254
	(0.0903)	(0.0995)	(0.0797)	(0.0557)
TAX_EXC	-0.0371	-0.0556	-0.0829	0.0105
	(0.1379)	(0.2582)	(0.3967)	(0.1150)
Size Growth	-0.8530***	1.1022***	6.8625***	0.2253
	(0.1160)	(0.1585)	(1.1171)	(0.2323)
Sales Growth	1.0113***	-0.8459***	-0.5082***	-0.2683**
	(0.2603)	(0.1796)	(0.1559)	(0.1314)
EPS Growth	0.0526**	0.0314*	0.0926***	0.0764***
	(0.0245)	(0.0179)	(0.0158)	(0.0148)
Active Return	4.0587***	0.3241**	-5.0096***	1.5602***
	(0.2147)	(0.1442)	(1.1150)	(0.2778)
ΔP/E ratio	0.0107**	0.0167***	-0.0086***	-0.0242***
	(0.0045)	(0.0038)	(0.0026)	(0.0035)
ΔP/B ratio	-0.0237	0.0412**	-0.0631***	-0.1778***
	(0.0423)	(0.0185)	(0.0107)	(0.0281)
ΔP/S ratio	0.2207***	-0.0344**	-0.0047***	0.0703***
	(0.0197)	(0.0136)	(0.0015)	(0.0121)
ΔD/A ratio	-0.0071	0.0021	0.0090***	-0.0064*
	(0.0053)	(0.0043)	(0.0032)	(0.0036)
ΔDividend Yield	-0.2179***	0.0482**	0.0423***	-0.2732***
	(0.0252)	(0.0219)	(0.0152)	(0.0237)
ΔVolatility	-5.7175	10.9521***	4.4614**	15.8265***
	(4.0840)	(2.9016)	(1.9399)	(2.6746)
Fund Diversification	0.0006	0.0015***	0.0003	-0.0012***
	(0.0004)	(0.0004)	(0.0003)	(0.0003)
Fund Turnover	-0.0001	-0.0002***	0.0002***	-0.0002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Fund Asset Growth	0.4448***	-0.2903*	-0.0274	-0.1372
	(0.1681)	(0.1751)	(0.1608)	(0.1945)
Market Return	-2.7108***	1.4744	60.8635***	0.0209***
	(0.3325)	(0.9425)	(8.9542)	(0.0063)
R-squared Adj.	0.0686	0.0257	0.0653	0.0467
N	13847	16883	21195	13150

Standard errors in parentheses

* p<.1, ** p<.05, *** p<.01

6. CONCLUSION

Extensive research has been done on the announcement of sustainability indices toward stock performance in the short run. However, little is known as to the focus on applying holding-based analysis and this study fills this gap. The contributions of this study are as follows. To our best knowledge, this is the first study providing an intensive analysis of mutual fund holdings toward the announcement of Stock Exchange of Thailand Sustainability Index (SETTHSI). This study also provides a comparison of tax-incentive features over other conventional equity mutual funds.

This study aims to investigate the impact of the sustainability announcement toward both individual stock performance and equity fund managers' allocation decisions. By conducting an event study around the announcement date, the investigation is evaluated whether the stock market rewards firms being recognized as a sustainable investment in terms of a cumulative abnormal returns. The analysis reveals that the index announcement has only weak evidence to support a positive effect to generate abnormal return after the index effective date. The result shows a significant but temporary increase in the stock abnormal return that seems to be backing by the price pressure hypothesis from (Harris & Gurel, 1986) that announcement event does not provide any information or changes in demand and supply but only a temporary effect. In addition, since there is an inadequate amount of data for the study of exclusion effect, this leads to a conclusion that there is no evidence to insist any impact for the exclusion of the sustainability index.

Furthermore, the extended analysis of equity fund holdings presents a critical result toward the investigation of ESG recognition for investment decisions. The result reveals a significant finding that equity fund managers are likely to apply ESG criteria toward their investment decision since the outcome shows that they increase their holding positions following the index inclusion announcement. On the other hand, the result does not unveil any substantial information that the index exclusion would have an impact on equity fund managers' judgement.

Lastly, this study also examines the influence of tax-incentive features on the fund managers' investment decision toward sustainability investment. In summary, it can be concluded that even though the fund manager has a tax-incentive feature that seems to support long term investment as in sustainability investment, they still act on their investment decision in the same way as the non-tax-saving fund managers.

7. APPENDIX

Table A1: *List of Companies Added to or Removed from SETTHSI (2018-2022)*

AAV	ASIA AVIATION PCL	**CPN**	CENTRAL PATTANA PCL
ADVANC	ADVANCED INFO SERVICE PCL	**CRC**	CENTRAL RETAIL CORPORATION PCL
AH	AAPICO HITECH PCL	**DELTA**	DELTA ELECTRONICS (THAILAND) PCL
AMATA	AMATA CORPORATION PCL	**DRT**	DIAMOND BUILDING PRODUCTS PCL
AMATAV	AMATA VN PCL	**DTAC**	TOTAL ACCESS COMMUNICATION PCL
AOT	AIRPORTS OF THAILAND PCL	**EA**	ENERGY ABSOLUTE PCL
ASIAN	ASIAN SEA CORPORATION PCL	**EASTW**	EASTERN WATER RESOURCES PCL.
AWC	ASSET WORLD CORP PCL	**EGCO**	ELECTRICITY GENERATING PCL
BAFS	BANGKOK AVIATION FUEL SERVICES PCL.	**EPG**	EASTERN POLYMER GROUP PCL
BANPU	BANPU PCL	**GFPT**	GFPT PCL
BBL	BANGKOK BANK PCL	**GGC**	GLOBAL GREEN CHEMICALS PCL
BCP	BANGCHAK CORPORATION PCL	**GLOBAL**	SIAM GLOBAL HOUSE PCL
BCPG	BCPG PCL	**GLOW**	GLOW ENERGY PCL
BDMS	BANGKOK DUSIT MEDICAL SERVICES PCL	**GPSC**	GLOBAL POWER SYNERGY PCL
BEM	BANGKOK EXPRESSWAY AND METRO PCL	**GULF**	GULF ENERGY DEVELOPMENT PCL
BGC	BG CONTAINER GLASS PCL	**GUNKUL**	GUNKUL ENGINEERING PCL
BGRIM	B.GRIMM POWER PCL	**HANA**	HANA MICROELECTRONICS PCL
BJC	BERLI JUCKER PCL	**HMPRO**	HOME PRODUCT CENTER PCL
BLA	BANGKOK LIFE ASSURANCE PCL	**HTC**	HAAD THIP PCL
BPP	BANPU POWER PCL	**ICHI**	ICHITAN GROUP PCL
BTS	BTS GROUP HOLDINGS PCL	**INTUCH**	INTOUCH HOLDINGS PCL
BWG	BETTER WORLD GREEN PCL	**IRPC**	IRPC PCL
CENTEL	CENTRAL PLAZA HOTEL PCL	**ITEL**	INTERLINK TELECOM PCL
CK	CH. KARNCHANG PCL	**IVL**	INDORAMA VENTURES PCL
CKP	CK POWER PCL	**JWD**	JWD INFOLOGISTICS PCL
COM7	COM7 PCL	**KBANK**	KASIKORNBANK PCL
CPALL	CP ALL PCL	**KEX**	KERRY EXPRESS (THAILAND) PCL
CPF	CHAROEN POKPHAND FOODS PCL	**KKP**	KIATNAKIN PHATRA BANK PCL

Table A1: *Continued*

KTB	KRUNG THAI BANK PCL	**SCGP**	SCG PACKAGING PCL
KTC	KRUNGTHAI CARD PCL	**SIRI**	SANSIRI PCL
LPN	L.P.N. DEVELOPMENT PCL	**SNC**	SNC FORMER PCL
MAJOR	MAJOR CINEPLEX GROUP PCL	**SPALI**	SUPALAI PCL
MINT	MINOR INTERNATIONAL PCL	**STA**	SRI TRANG AGRO-INDUSTRY PCL
MTC	MUANGTHAI CAPITAL PCL	**STGT**	SRI TRANG GLOVES (THAILAND) PCL
NRF	NR INSTANT PRODUCE PCL	**SYNEX**	SYNNEX (THAILAND) PCL
NYT	NAMYONG TERMINAL PCL	**SYNTEC**	SYNTEC CONSTRUCTION PCL
ORI	ORIGIN PROPERTY PCL	**TASCO**	TIPCO ASPHALT PCL
OSP	OSOTSPA PCL	**TFG**	THAIFOODS GROUP PCL
PCSGH	P.C.S. MACHINE GROUP HOLDING PCL	**THANI**	RATCHTHANI LEASING PCL
PLANB	PLAN B MEDIA PCL	**THCOM**	THAICOM PCL
PM	PREMIER MARKETING PCL	**TISCO**	TISCO FINANCIAL GROUP PCL
PR9	PRARAM 9 HOSPITAL PCL	**TTB**	TMBTHANACHART BANK PCL
PSH	PRUKSA HOLDING PCL	**TMT**	TMT STEEL PCL
PTG	PTG ENERGY PCL	**TOA**	TOA PAINT (THAILAND) PCL
PTT	PTT PCL	**TOP**	THAI OIL PCL
PTTEP	PTT EXPLORATION AND PRODUCTION PCL	**TQM**	TQM ALPHA PCL
PTTGC	PTT GLOBAL CHEMICAL PCL	**TRUE**	TRUE CORPORATION PCL
RATCH	RATCH GROUP PCL	**TSTH**	TATA STEEL (THAILAND) PCL
RS	RS PCL	**TTCL**	TTCL PCL
S	SINGHA ESTATE PCL	**TTW**	TTW PCL
SABINA	SABINA PCL	**TU**	THAI UNION GROUP PCL
SAK	SAKSIAM LEASING PCL	**TVO**	THAI VEGETABLE OIL PCL
SAT	SOMBOON ADVANCE TECHNOLOGY PCL	**TWPC**	THAI WAH PCL
SC	SC ASSET CORPORATION PCL	**VGI**	VGI PCL
SCB	SCB X PCL	**WHA**	WHA CORPORATION PCL
SCC	THE SIAM CEMENT PCL	**WHAUP**	WHA UTILITIES AND POWER PCL
SCCC	SIAM CITY CEMENT PCL		

Table A2: *Event Period and Important Date*

Event	Period	Announcement Date (AD)	Effective Date (ED)
1	2nd half of 2018	18 June 2018	2 July 2018
2	1st half of 2019	17 December 2018	2 January 2019
3	2nd half of 2019	18 June 2019	1 July 2019
4	1st half of 2020	18 December 2019	2 January 2020
5	2nd half of 2020	15 June 2020	1 July 2020
6	1st half of 2021	16 December 2020	4 January 2021
7	2nd half of 2021	16 June 2021	1 July 2021
8	1st half of 2022	17 December 2021	4 January 2022
9	2nd half of 2022	20 June 2022	1 July 2022

Source: Stock Exchange of Thailand

Table A3: *One-sample T-Test for Companies Added to the index*

Event Sub-Window	Mean	Stdev	N	T-Stats	P-value
Pre-announce AD-14 to AD-1	0.1281	6.5605	126	0.2192	0.4134
Run-up AD to CD-1	-0.7273	7.9097	126	-1.0321	0.8480
Release related CD to CD+10	**1.0174***	7.0530	126	1.6193	0.0540
Temporary price AD to CD+10	0.2902	11.6837	126	0.2788	0.3904
Permanent price AD to CD+30	0.1644	16.7685	126	0.1100	0.4563

Notes:

(1) One-sided t-test with Ha: mean > 0

Table A4: *One-sample T-Test for Companies Removed from the index*

Event Sub-Window	Mean	Stdev	N	T-Stats	P-value
Pre-announce AD-14 to AD-1	-0.2097	8.4422	25	-0.1242	0.4511
Run-up AD to CD-1	0.1010	5.4453	25	0.0927	0.5366
Release related CD to CD+10	1.3695	8.7112	25	0.7860	0.7802
Temporary price AD to CD+10	1.4704	8.9036	25	0.8258	0.7915
Permanent price AD to CD+30	3.1020	14.3641	25	1.0798	0.8545

Notes:

(1) One-sided t-test with Ha: mean < 0

Table A5: *One-sample T-Test for Companies Remaining in the index*

Event Sub-Window	Mean	Stdev	N	T-Stats	P-value
Pre-announce AD-14 to AD-1	**0.6434***	8.0183	499	1.7924	0.0737
Run-up AD to CD-1	**-0.6618*****	5.0267	499	-2.9411	0.0034
Release related CD to CD+10	-0.3364	6.1238	499	-1.2271	0.2204
Temporary price AD to CD+10	**-0.9982*****	8.5495	499	-2.6081	0.0094
Permanent price AD to CD+30	**-1.2717****	12.9755	499	-2.1894	0.0290

Notes:

(1) Two-sided t-test

(2) ***, **, and * represent statistically significant at one percent, five percent, and ten percent levels, respectively

Table A6: *Average Abnormal Returns Around Announcement Date*

	INC (N = 126)			EXC (N = 25)			STAY (N = 499)		
t	**AAR**	**t-stat**	**CAAR**	**AAR**	**t-stat**	**CAAR**	**AAR**	**t-stat**	**CAAR**
-14	0.1729%	0.9500	0.0000%	0.2221%	0.5562	0.0000%	0.1334%	1.5030	0.0000%
-13	0.0969%	0.4671	0.0969%	0.2119%	0.4882	0.2119%	0.0025%	0.0285	0.0025%
-12	-0.0192%	(0.1144)	0.0777%	0.7157%	1.4815	0.9276%	0.0974%	1.2220	0.0999%
-11	-0.0002%	(0.0014)	0.0775%	0.1005%	0.2568	1.0281%	0.1085%	1.2264	0.2084%
-10	0.2784%	1.4685	0.3559%	-0.7507%	(2.2956)	0.2773%	-0.1022%	(1.2359)	0.1062%
-9	0.0185%	0.1073	0.3744%	-0.3127%	(1.8555)	-0.0354%	0.1188%	1.5281	0.2250%
-8	-0.0912%	(0.6011)	0.2832%	-0.1109%	(0.2908)	-0.1463%	0.0175%	0.2536	0.2425%
-7	-0.0396%	(0.3077)	0.2435%	-0.3588%	(0.8850)	-0.5051%	0.0054%	0.0546	0.2478%
-6	-0.0591%	(0.4131)	0.1845%	0.0618%	0.1766	-0.4433%	-0.0029%	(0.0403)	0.2450%
-5	0.2374%	1.7123	0.4219%	-0.0322%	(0.1252)	-0.4755%	-0.0731%	(1.0783)	0.1719%
-4	0.0891%	0.5491	0.5110%	-0.2860%	(1.2064)	-0.7615%	0.0222%	0.2430	0.1941%
-3	-0.3143%	(2.1754)	0.1966%	-0.2343%	(0.7392)	-0.9957%	0.0029%	0.0355	0.1971%
-2	-0.0803%	(0.4730)	0.1163%	0.5724%	1.1470	-0.4233%	0.2338%	2.7404	0.4309%
-1	-0.1611%	(0.9544)	-0.0447%	-0.0085%	(0.0178)	-0.4318%	0.0791%	0.8854	0.5100%
0	**-0.0551%**	**(0.3646)**	**-0.0999%**	**-0.3900%**	**(1.1934)**	**-0.8218%**	**-0.0117%**	**(0.1559)**	**0.4983%**
1	0.2008%	0.9119	0.1009%	0.0908%	0.2503	-0.7310%	-0.1223%	(1.5044)	0.3760%
2	-0.0641%	(0.3901)	0.0368%	-0.3097%	(0.8925)	-1.0407%	0.0451%	0.6304	0.4211%
3	-0.5897%	(2.8365)	-0.5529%	0.5078%	0.9063	-0.5330%	-0.0879%	(1.1005)	0.3332%
4	-0.0342%	(0.1879)	-0.5871%	0.2377%	0.4429	-0.2952%	-0.1354%	(2.0233)	0.1978%
5	-0.1608%	(0.9449)	-0.7480%	0.5621%	2.1507	0.2668%	-0.2090%	(2.9331)	-0.0112%
6	0.1728%	0.8438	-0.5752%	0.3103%	0.8795	0.5771%	-0.0356%	(0.3830)	-0.0469%
7	-0.2563%	(1.3537)	-0.8315%	-0.1979%	(0.8605)	0.3792%	-0.1808%	(2.0037)	-0.2277%
8	0.1253%	0.5267	-0.7061%	-0.1786%	(0.3461)	0.2006%	0.2149%	2.2944	-0.0128%
9	0.0162%	0.0783	-0.6900%	-0.5060%	(2.1256)	-0.3054%	-0.0721%	(0.8550)	-0.0849%
10	0.3086%	1.5989	-0.3814%	-0.2799%	(0.8436)	-0.5853%	-0.0758%	(1.0028)	-0.1607%
11	0.2456%	0.9105	-0.1358%	0.0460%	0.1315	-0.5393%	-0.0852%	(0.9233)	-0.2459%
12	-0.1091%	(0.4975)	-0.2449%	-0.3873%	(1.1993)	-0.9266%	-0.0640%	(0.6110)	-0.3099%
13	-0.0509%	(0.3337)	-0.2957%	-0.4297%	(1.4497)	-1.3563%	-0.0349%	(0.4030)	-0.3447%
14	0.0906%	0.5138	-0.2052%	0.5615%	2.2078	-0.7949%	0.1010%	1.2066	-0.2437%
15	0.1225%	0.6495	-0.0827%	-0.2811%	(0.7504)	-1.0760%	-0.1658%	(1.6430)	-0.4096%
16	0.2360%	1.2785	0.1533%	0.7738%	1.5034	-0.3022%	-0.0438%	(0.5321)	-0.4534%
17	-0.0823%	(0.5661)	0.0710%	0.5799%	1.3648	0.2777%	0.0002%	0.0030	-0.4532%
18	0.0908%	0.6524	0.1618%	-0.1100%	(0.2767)	0.1677%	-0.0184%	(0.2384)	-0.4716%
19	0.0245%	0.1365	0.1863%	1.0745%	1.5296	1.2423%	-0.0064%	(0.0746)	-0.4779%
20	-0.1408%	(0.7228)	0.0455%	-0.7160%	(1.4813)	0.5262%	-0.0256%	(0.3449)	-0.5035%
21	0.0956%	0.6501	0.1411%	0.0159%	0.0439	0.5421%	0.0777%	0.9704	-0.4258%
22	-0.1062%	(0.8014)	0.0349%	0.3144%	0.8062	0.8566%	0.0477%	0.6016	-0.3781%
23	0.0423%	0.3144	0.0772%	0.3193%	0.8136	1.1759%	-0.1327%	(1.7327)	-0.5109%
24	0.1658%	0.9369	0.2430%	0.0460%	0.1187	1.2219%	0.0784%	1.0513	-0.4324%
25	-0.0171%	(0.1112)	0.2259%	-0.4629%	(1.3799)	0.7590%	0.1168%	1.4478	-0.3156%
26	-0.1984%	(1.0703)	0.0275%	1.0532%	1.7723	1.8122%	-0.1535%	(1.7328)	-0.4691%
27	0.0890%	0.5331	0.1164%	0.0056%	0.0140	1.8178%	-0.0100%	(0.1251)	-0.4792%
28	0.2573%	1.4318	0.3737%	-0.1312%	(0.4112)	1.6866%	0.0684%	0.9178	-0.4107%
29	0.0963%	0.6019	0.4700%	0.4131%	0.9239	2.0997%	-0.1164%	(1.3190)	-0.5271%
30	0.1406%	0.9262	0.6106%	0.1979%	0.3878	2.2977%	-0.0737%	(0.8104)	-0.6009%
31	0.2946%	1.7562	0.9052%	0.0825%	0.2110	2.3802%	0.0470%	0.5760	-0.5539%
32	0.1930%	1.1079	1.0982%	0.2048%	0.5329	2.5850%	-0.0002%	(0.0033)	-0.5541%
33	-0.0483%	(0.2534)	1.0499%	0.1367%	0.3636	2.7217%	-0.0887%	(1.1984)	-0.6428%
34	0.0478%	0.2986	1.0978%	0.7802%	0.9268	3.5019%	-0.0013%	(0.0173)	-0.6440%
35	-0.1251%	(0.6893)	0.9727%	-0.2793%	(0.6040)	3.2226%	-0.1052%	(1.5429)	-0.7493%
36	-0.2145%	(1.1442)	0.7582%	-0.7241%	(2.1473)	2.4985%	-0.0676%	(0.8795)	-0.8169%
37	-0.2776%	(1.9667)	0.4806%	0.2265%	0.9648	2.7251%	0.0465%	0.5871	-0.7703%
38	-0.1910%	(0.6796)	0.2896%	-0.2934%	(0.9441)	2.4317%	0.0212%	0.2368	-0.7492%
39	-0.0015%	(0.0089)	0.2881%	0.7360%	1.4102	3.1677%	0.0811%	0.9309	-0.6680%

Table A7: *Variable Definitions*

Variables	Definitions
Dependent Variables:	
$CAR_{i,E}$	The cumulative abnormal return of stock i in an event E
$\Delta HOLD_{i,j,E}$	The change in percent weight of holding in stock i of fund j from time t+1 to t
$HOLD_{i,j,E,q}$	The percent weight of holding of stock i for fund j at the quarter-end prior to the event E
Independent Variables:	
$INC_{i,E}$	A dummy variable for inclusion effect of stock i at an event E
$EXC_{i,E}$	A dummy variable for exclusion effect of stock i at an event E
$STAY_{i,E}$	A dummy variable for stock i remaining in the index at the event E
TAX_j	A dummy variable to identify tax-saving fund feature
Control Variables:	
Size Growth	The size difference between firm's current and 2-quarter-lagged market capitalization
Sales Growth	The change in trailing twelve-month sales growth rate
EPS Growth	The trailing twelve-month earnings per share growth
Active Return	The difference between the stock return and the market return over 1 quarter
ΔP/E ratio	The change in price-to-earnings ratio
ΔP/B ratio	The change in price-to-book ratio
ΔP/S ratio	The change in price-to-sales ratio
ΔD/A ratio	The change in sum of financial debt divided by total assets
ΔDividend Yield	The change in ratio of trailing twelve-month dividend per share over the share price
ΔVolatility	The change in standard deviation of quarterly stock return over the preceding quarters
Fund Diversification	The reciprocal of the sum of weight of all companies in the portfolio of each quarter
Fund Turnover	The percentage of a fund's holdings that have been replaced each year
Fund Asset Growth	The growth in the average amount of asset under management for the studied period
Market Return	The six-month period market return (SET index)

REFERENCES

Bauer, R., Koedijk, K., & Otten, R. (2005). International evidence on ethical mutual fund performance and investment style. *Journal of Banking & Finance*, *29*(7), 1751-1767.

Boone, A. L., & White, J. T. (2015). The effect of institutional ownership on firm transparency and information production. *Journal of Financial Economics*, *117*(3), 508-533.

Brown, B. (1998). Do stock market investors reward companies with reputations for social performance? *Corporate Reputation Review*, *1*(3), 271-280.

Chen, H.-L., Jegadeesh, N., & Wermers, R. (2000). The value of active mutual fund management: An examination of the stockholdings and trades of fund managers. *Journal of Financial and quantitative Analysis*, *35*(3), 343-368.

Cho, S. J., Chung, C. Y., & Young, J. (2019). Study on the Relationship between CSR and Financial Performance. *Sustainability*, *11*(2), 343.

Crisóstomo, V. L., de Souza Freire, F., & De Vasconcellos, F. C. (2011). Corporate social responsibility, firm value and financial performance in Brazil. *Social responsibility journal*.

Erragragui, E., & Lagoarde-Segot, T. (2016). Solving the SRI puzzle? A note on the mainstreaming of ethical investment. *Finance Research Letters*, *18*, 32-42.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, *33*(1), 3-56.

Freeman, R. E. (2010). *Strategic management: A stakeholder approach*. Cambridge university press.

Harris, L., & Gurel, E. (1986). Price and volume effects associated with changes in the S&P 500 list: New evidence for the existence of price pressures. *The journal of finance*, *41*(4), 815-829.

Hayward, L. (2018). Does the Stock Market Value Inclusion on a Sustainability Index? An Event Study Using the Dow Jones Sustainability North America Index.

Hillman, A. J., & Keim, G. D. (2001). Shareholder value, stakeholder management, and social issues: what's the bottom line? *Strategic management journal*, *22*(2), 125-139.

Jain, P. C. (1987). The effect on stock price of inclusion in or exclusion from the S&P 500. *Financial Analysts Journal*, *43*(1), 58-65.

Joliet, R., & Titova, Y. (2018). Equity SRI funds vacillate between ethics and money: An analysis of the funds' stock holding decisions. *Journal of Banking & Finance*, *97*, 70-86.

Keszey, T. (2020). Environmental orientation, sustainable behaviour at the firm-market interface and performance. *Journal of Cleaner Production*, *243*, 118524.

Leite, P., & Cortez, M. C. (2014). Style and performance of international socially responsible funds in Europe. *Research in International Business and Finance*, *30*, 248-267.

Li, D., Cao, C., Zhang, L., Chen, X., Ren, S., & Zhao, Y. (2017). Effects of corporate environmental responsibility on financial performance: The moderating role of government regulation and organizational slack. *Journal of Cleaner Production*, *166*, 1323-1334.

Lourenço, I. C., Branco, M. C., Curto, J. D., & Eugénio, T. (2012). How does the market value corporate sustainability performance? *Journal of business ethics*, *108*(4), 417-428.

Lynch, A. W., & Mendenhall, R. R. (1997). New evidence on stock price effects associated with changes in the S&P 500 index. *The Journal of Business*, *70*(3), 351-383.

McWilliams, A., & Siegel, D. (2000). Corporate social responsibility and financial performance: correlation or misspecification? *Strategic management journal*, *21*(5), 603-609.

Merton, R. C. (1987). A simple model of capital market equilibrium with incomplete information.

Muñoz, F., Vicente, R., & Ferruz, L. (2015). Stock-picking and style-timing abilities: a comparative analysis of conventional and socially responsible mutual funds in the US market. *Quantitative Finance*, *15*(2), 345-358.

Muthitacharoen, A., & Burong, T. (2022). How do taxpayers respond to tax subsidy for long-term savings? Evidence from Thailand's tax return data. *International tax and public finance*, *29*(3), 726-750.

Nakai, M., Yamaguchi, K., & Takeuchi, K. (2013). Sustainability membership and stock price: an empirical study using the Morningstar-SRI Index. *Applied Financial Economics*, *23*(1), 71-77.

Nathaphan, S., & Chunhachinda, P. (2012). Determinants of growth for Thai mutual fund industry. *International Research Journal of Finance and Economics*, *86*(12), 3.

Nofsiger, J., Sulaeman, J., & Varma, A. (2016). Institutional investors' socially responsible investments: It Just makes (economic) sense. *Unpublished working paper. University of Alaska Anchorage, National University of Singapore, and Illinois State University*.

Oberndorfer, U., Schmidt, P., Wagner, M., & Ziegler, A. (2013). Does the stock market value the inclusion in a sustainability stock index? An event study analysis for German firms. *Journal of Environmental Economics and Management*, *66*(3), 497-509.

Robinson, M., Kleffner, A., & Bertels, S. (2011). Signaling sustainability leadership: Empirical evidence of the value of DJSI membership. *Journal of business ethics*, *101*(3), 493-505.

Roca, E. (2013). The effect on price, liquidity and risk when stocks are added to and deleted from a sustainability index: Evidence from the Asia Pacific context. *Journal of Asian Economics*, *24*, 51-65.

Schröder, M. (2007). Is there a difference? The performance characteristics of SRI equity indices. *Journal of Business Finance & Accounting*, *34*(1-2), 331-348.

Sharfman, M. P., & Fernando, C. S. (2008). Environmental risk management and the cost of capital. *Strategic management journal*, *29*(6), 569-592.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The journal of finance*, *19*(3), 425-442.

Shleifer, A. (1986). Do demand curves for stocks slope down? *The journal of finance*, *41*(3), 579-590.

Starks, L. T., Venkat, P., & Zhu, Q. (2017). Corporate ESG profiles and investor horizons. *Available at SSRN 3049943*.

Stekelenburg, A., Georgakopoulos, G., Sotiropoulou, V., Vasileiou, K., & Vlachos, I. (2015). The relation between sustainability performance and stock market returns: An empirical analysis of the Dow Jones Sustainability Index Europe. *International journal of Economics and Finance*, *7*(7).

Vance, S. C. (1975). Are socially responsible corporations good investment risks. *Management review*, *64*(8), 19-24.

Wermers, R., Yao, T., & Zhao, J. (2012). Forecasting stock returns through an efficient aggregation of mutual fund holdings. *The Review of Financial Studies*, *25*(12), 3490-3529.

Yan, X., & Zhang, Z. (2009). Institutional investors and equity returns: Are short-term institutions better informed? *The Review of Financial Studies*, *22*(2), 893-924.

Yilmaz, M. K., Aksoy, M., & Tatoglu, E. (2020). Does the stock market value inclusion in a sustainability index? Evidence from Borsa Istanbul. *Sustainability*, *12*(2), 483.

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