

Erasmus University Rotterdam

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## Master Thesis

MSc Economics and Business - Financial Economics

Effect of ESG factors on M&A outcomes and post M&A performance

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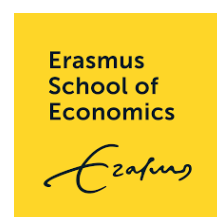
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“The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.”



## **Abstract**

This paper investigates the effect of target ESG scores on the acquirer's value, ESG performance, and cumulative abnormal returns. A sample of US companies is used in this study. Three different methods are applied. First, an OLS linear regression, then a fixed effect model for panel data, and lastly, an event study is used. Eventually, only one hypothesis was not rejected. Only the positive effect of the environmental score of targets on the post-merger acquirer's value was proved. No evidence was found for the relationship between the target aggregated ESG score and the post-merger value of the acquirer. Moreover, the effect of target ESG performance on acquirer ESG performance was not proved. Lastly, the effect of target ESG scores on the cumulative abnormal returns of the acquirer was not found.

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# 1 Introduction

Over the last two decades, ESG scores have become a significant metric of sustainability and ethical impact for many companies. ESG scores relate to the environmental, social, and governance factors of a company and reflect the impact of an investment in a company. M&A events are important strategic decisions for every company. As such, they have a significant effect on the long-term perspective of the financial landscape. Nowadays, it is essential to consider ESG factors in the context of M&A deals because they help companies manage risks more effectively and create solid long-term value.

In some cases, acquiring companies can consider an M&A deal as a tool for ESG score improvement. Hence acquisitions of a target with higher ESG can positively affect the ESG of the acquirer. However, there is inadequate coverage of this topic and no definitive conclusion on how these factors impact the post-merger ESG performance of a company. One of the most prominent existing studies about ESG improvement was made by Tampakoudis & Anagnostopoulou (2020). The authors show that a positive effect of pre-merger target ESG score on post-merger ESG value can be present if an acquirer has a lower ESG score than the target.

As was mentioned earlier, M&A deals are the methods for external value creation and important investment decisions for the maximization of shareholders' wealth. Currently, with the growing importance of the transition to sustainable economics, some managers are trying to integrate environmental, social, and governance factors in their decision-making process for value maximization. However, not everything is monosemantic and there is mixed evidence of the effect of sustainability factors on a company's performance. Some researchers found a positive correlation between CSR scores and the post-merger performance of companies. For instance, Deng, Kang, & Low (2013) found that acquiring companies with high CSR experience higher merger announcement returns and better long-term performance after the acquisition than companies with low CSR. These authors and many others use CSR metrics to establish the relationship with the firms' performances. One of the differences between CSR and ESG is that CSR does not account for the governance factor if it is not related to environmental or social terms. Whereas ESG includes the governance factor explicitly, meaning the ESG metric is more complete (Gillan, Koch, Starks, 2021). Therefore, in this master thesis, the ESG metric will be used to determine the effect of the sustainability factors on firms' performances.

Another important aspect is the effect of pre-merger ESG scores of targets on the M&A process. Indeed, there is evidence from the academic literature that M&A deals can take longer for acquirers with a low CSR score. Furthermore, target shareholders can refuse an acquisition deal if the ethical behavior and the reputation of the acquirer are not satisfactory (Deng et al., 2013). Once again, the relationship between the pre-merger ESG factors of acquirers and the M&A process is hardly analyzed. Thus, in this paper, the effect of pre-merger ESG score on merger announcement returns will be analyzed.

Considering everything discussed above, the main research question is:

*What is the influence of pre-merger ESG scores of targets on the M&A process, post-merger ESG score, and performance?*

## **1.1 Contribution**

This paper contributes to the existing literature in several ways. First, the time range is 20 years which is larger than other similar research. Thus, the sample is larger, and it brings more statistical power to this research. Furthermore, the standard methodology is not applied in this paper. Currently, there is no research that investigates the change in ESG scores before and after M&A using a fixed effect model analysis. Thus, using this approach it is possible to bring new findings to the existing literature. Lastly, some articles use samples of European companies only. This research sheds light on the M&A process and outcomes in US markets.

This study contains six parts. First, the introduction part. Then, a theoretical framework is introduced, and three sets of hypotheses are discussed. Part three is the methodology where all applied tests are presented and discussed. After the methodology part, the results from STATA are shown and analyzed. The last part consists of the conclusion and limitations, where the main findings of this paper are summarized and some limitations are considered.

## **2 Theoretical Framework & Hypotheses**

To establish a solid theoretical framework for this academic paper, it is imperative to provide precise definitions and conceptual clarity for fundamental elements that underpin the subsequent analysis. With this regard, the acronyms ESG, CSR, and M&A shall be defined. The concepts of an event study and Tobin's Q, addressed later in this paper, will also be clarified in this section.

### **2.1 Concept of ESG Score**

The ESG score is a quantitative assessment used to measure the sustainability practices of a company. It represents the extent to which the company incorporates environmental, social, and governance factors into its operations, policies, and decision-making processes (Drempetic et al., 2020). ESG is considered better than CSR because it provides a more quantitative measure of sustainability by considering environmental, social, and governance factors. While CSR is valuable for informing about the values and goals of the business, ESG provides metrics and a more comprehensive assessment of sustainability performance (Corporate Governance Institute, 2023).

However, using ESG scores can be tricky because there is one potential drawback. Studies of Berg et al., (2020), Dorfleitner et al., (2015), Gibson et al., (2019) found that there is a limited correlation between the ESG scores of different agencies. Thus, it can lead to issues in the results. Secondly, ESG scores can be not genuinely representative of the sustainability performance of the companies. Since these scores are based on publicly available information and are self-reported. However, ESG scores are used in this paper because of their simplicity and availability.

### **2.2 M&A Concept**

M&A refers to the consolidation of companies through financial transactions. M&A can include the purchase and absorption of another company, merging to create a new entity, acquiring major assets, tender offers for stocks, or hostile takeovers. M&A activity can impact shareholders through temporary drops or rises in share value, potential dilution of voting power, and long-term performance effects (Cartwright, S., & Schoenberg, R., 2006).

## 2.3 Event Study

An event study is an empirical analysis examining a significant event's impact on the value of security. It uses statistical methods to analyze how an event affects the financial performance of the security over time. The study investigates the relationship between the event and abnormal returns using different models (Binder, 1998). In this paper, an event study is used for merger and acquisition events.

One of the most prominent papers about event studies is the Fama, Fisher, Jensen, and Roll (1969) paper. In this research, the authors used an event study to test the Efficient Market Hypothesis (EMH) and a hypothesis that all publicly available information can be incorporated into stock prices. The authors found that stock prices can adjust quickly to new publicly available information. Furthermore, a weak form of EMH was found. Thus, this paper has become a classic event study literature, and the methodology of this paper is still widely used in other research. However, it is important to highlight that instead of the monthly returns used in this paper, most event studies use daily security returns, as this allows for more precise measurements.

Moreover, there are two types of event studies. First, there are short-term event studies, which include an event window with a short horizon, and which are considered as a not complicated and trouble-free statistical method compared to the long-term event study method. Short-term event studies present the “cleanest evidence we have on efficiency” (Fama, 1991, p.1602). Second, there are long-term event studies, which have an event window of more than one year. This method is considered sophisticated and sometimes problematic (Kothari and Warner, 1997) because it has many limitations, low power, and is prone to the joint-test problem (Lyon, Barber, and Tsai, 1999). Therefore, in this paper, a short-term event study is used.

## 2.4 Tobin's Q

Tobin's Q is a measure that compares the market value of a company to the replacement cost of its assets. It is calculated by dividing the market value of a company by the replacement value of its assets. Tobin's Q determines whether a business or market is overvalued or undervalued. A ratio greater than 1 means that a company's stock is more expensive than the replacement cost of its assets, indicating overvaluation. Conversely, a ratio lower than 1 implies that a company's stock is undervalued. Tobin's Q is considered a good proxy for a company's value because it captures the relationship between market valuation and intrinsic value, helping

to determine if a business or market is over- or undervalued based on the replacement cost of assets rather than just market value.

## **2.5 ESG and Financial Performance**

Some studies examined the relationship between ESG scores and post-merger financial performance. For instance, Caiazza et al. (2021) did research on the ESG effect before an acquisition on the post-merger financial performance of companies. This research included takeover data from several countries over 20 years. The findings suggest that the relationship between ESG score and post-merger financial performance was not significant, so it was not proved.

At the same time, Yen & André (2019) conducted similar research on ESG pre-merger performance and post-merger financial performance. They found that in the short run, the effect of ESG is negligible. Whereas in the long run, robust evidence of a positive impact on ESG on the post-merger financial performance was found.

Some empirical findings and existing literature suggest that the ESG score of the target can affect the post-merger market value of the company. Recent studies show that some companies consider the acquisition of an ESG-oriented company as a value-enhancing strategy. Therefore, the premiums paid for the acquisitions are higher for such companies (Gomes & Marsat, 2018). However, there is a lack of studies investigating whether a post-merger market value can be enhanced by highly ESG-oriented target acquisition. One of the most prominent papers investigating this relationship is the research by Deng, Kang, & Low (2013). The authors found partial evidence of the target's ESG effect on the market value of the acquirer after the deal. Another paper by Aktas et al. (2011) investigates whether acquiring a target with CSR awareness leads to an improvement in the financial performance of a company. However, these papers can only partially confirm this argument. Furthermore, there is no analysis that compares the outcome of the acquisition of highly sustainable targets between different companies' size groups and an effect on the financial post-merger performance. Thus, the following set of hypotheses is tested in this research:

*Hypothesis 1A: The post-merger value of an acquirer increases following the takeover of a target with a higher ESG score.*



*Hypothesis 1B: The value of smaller acquirers tends to increase significantly more compared to larger acquirers following the acquisition of a target with a higher ESG score.*

*Hypothesis 1C: The environmental pillar factor of a target has a positive effect on the post-merger value of the acquirer.*

*Hypothesis 1D: The social pillar factor of a target has a positive effect on the post-merger value of the acquirer.*

*Hypothesis 1E: The governance pillar factor of a target has a positive effect on the post-merger value of the acquirer.*

## **2.6 ESG Score Improvement**

Furthermore, some companies consider the acquisition of ESG-oriented targets as a method for ESG score improvement. Eccles et al. (2014) found that there is a significant positive relationship between corporate performance and the voluntary adoption of sustainability policies. Other studies such as Weber (2014) made similar conclusions and found a strong relationship between ESG performance in the pre-merger stage and ESG performance in the post-merger stage. Based on the discussion, the second hypothesis is:

*Hypothesis 2: The post-merger ESG performance of an acquirer increases following the acquisition of a target with a higher ESG score.*

## **2.7 ESG and Abnormal Returns**

As was discussed earlier, there is some evidence that abnormal returns of the acquirer can be positively associated with the target's ESG score (Aktas et al., 2011). The authors assume that this positive relationship can be caused by learning from the target's experience by the acquirer. However, in the study of Aktas (2011), Intangible Value Assessment (IVA) is used as a proxy for the social and environmental performance of the target and accounts for 120 performance factors. In this paper, we are interested only in environmental, social, and governance factors. Thus, the ESG score will be used instead. Considering everything mentioned above, the following set of hypotheses is formulated:

*Hypothesis 3A: The acquisition of companies with a high ESG score have significantly higher merger announcement returns than companies with a low ESG score.*

*Hypothesis 3B: The acquisition of companies with high environment factor scores have significantly higher merger announcement returns than companies with low ESG scores.*

*Hypothesis 3C: The acquisition of companies with high social factor scores have significantly higher merger announcement returns than companies with low ESG scores.*

*Hypothesis 3D: The acquisition of companies with high governance factor scores have significantly higher merger announcement returns than companies with low ESG scores.*

### 3 Data

In this paper, a few databases are used. First, data on mergers and acquisitions is collected from the Refinitiv Eikon database. This dataset includes the announcement date. It also includes the industry, the PermID, the CUSIP code, the country of headquarters, the deal value, and the ISIN code of both the acquirer and the target. Several criteria are applied for a merger to be included in the data set. First, the target and acquirer must be listed companies and the deal must be completed. Second, the percentage of share ownership must be lower than 50 before the takeover and must be higher than 50 after the takeover. Furthermore, some deals were excluded since there were restructurings. Companies must be from the USA. Finally, the announcement date of a deal must be between 2000 and 2020. In total, there are 4686 deals.

Then, Capital IQ and the Wharton database are used for the collection of cumulative abnormal returns and financial data for each company. The CUSIP-8 codes and event dates were used for exporting the data of abnormal returns. The chosen model is a market model. The estimation window is 100 days and the event window is  $[0;1]$  days.

For ESG scores, the Thomson Reuters Assets and Datastream databases are used. The dataset includes the total ESG score annually together with each factor's score for every company from 2000 to 2021.

To determine the right annual values of the used variables for each company, the date of publishing of the ESG scores was found. Since different companies have different end of fiscal years and sometimes the ESG scores are reported on different dates, it is essential to measure and to adjust the financial information of the companies at the exact time in order to keep the variables consistent.

All these datasets were merged in Excel into two datasets. The first dataset is used for the first and third sets of hypotheses since only cross-sectional data are required. Another dataset is made with panel data and is used for the second hypothesis. The reason for creating two datasets is that the second hypothesis requires time series and cross-sectional data for the analysis. The data was merged on companies' identifiers such as CUSIP-8 and ISIN. Below, a description of every variable is presented.

### 3.1 Dependent Variables

#### *Tobin's Q*

For the first set of hypotheses, the closest pre-merger and post-merger observations were used in order to generate the acquirer's value variable, namely Tobin's Q. This variable was generated from the Wharton database and it includes a few financial characteristics: total assets, common shares outstanding, price close annual and common equity. The following formula was used for Tobin's Q generation:

$$Tobin's\ Q = \frac{AT + (CSHO * PRCC_F) - CEQ}{AT}$$

Where *AT* is total assets, *CSHO* is common shares outstanding, *PRCC<sub>F</sub>* is price close, *CEQ* is common equity.

#### *ESG Score*

For the second hypothesis, the ESG Score of the acquirer was taken from the Datastream database. For this, a relative time variable from -5 to 5 was generated based on the announcement date, such that 0 is the year when the takeover happened. Thus, five years before and five years after the acquisition were considered in the analysis. Hence, M&A data from Eikon and ESG data from Datastream were merged.

#### *CAR*

Cumulative abnormal returns were extracted from the Capital IQ, Wharton database. For this, the CUSIP-8 code and announcement date were used.

### 3.2 Firm Characteristics' Variables

#### *Leverage of Acquirer*

The leverage of the acquirer is also added in the analyses since there is a direct correlation between ESG scores and the leverage of a company. This is due to the fact that companies with lower leverage have higher financial flexibility and can focus more on ESG investments and projects. Furthermore, the leverage of a company has a direct effect on the value of the company. Thus, it is an important variable for this research.

### *Market Capitalization*

The market capitalization of the acquirer is a proxy for the company's size. Some well-established and old companies can have a greater size and therefore a larger value. Larger companies tend to have more capabilities to invest in ESG initiatives, thus there can be a positive correlation between size and ESG performance (Wang, J., Zhang, Y., & Goh, M., 2018).

### *Market-to-book ratio*

This ratio shows the market capitalization of the company compared to its book value. If the market-to-book ratio is high then the company has the potential to grow, thus it is a positive sign. In this analysis, the market-to-book ratio is used to control for the financial performance of the acquirer.

## **3.3 Control Variables**

### *Fama-French 12 Industry Classification*

For my hypotheses a Fama-French 12 industries variable is used to control for changes in the industries, the so-called industry effect. This categorical variable includes Consumer non-durables, Consumer durables, Manufacturing, Energy (oil, gas, and coal), Chemicals, Business equipment, Telephone and television transmission, Utilities, Wholesale, Healthcare, Money finance, and Others. This variable was generated from the SIC code of each company.

### *Year and Month variables*

These variables help to control for the period in which the acquisition happened. It is expected that the financial crisis of 2007-2008 could affect the cumulative abnormal returns and the value of the companies. Thus, this variable is included as a control. Moreover, the month of acquisition can also play a role in the analysis since it can capture a systematic monthly effect and therefore a fluctuation in stock prices.

### *Tender, Hostile, Completed Offer*

These variables control for the acquisition characteristics. Particularly, complete or not complete, hostile or not, and tender offer or not. All these variables are dummies which equal 1 in the former case and 0 in the latter.

### 3.4 Descriptive Statistics

Table 1A shows the descriptive statistics of the variables. For each variable, the number of observations, the mean, the standard deviation, the minimum values, and the maximum values are presented. To avoid outliers and their potential effect on the results, all variables are winsorized at 1% and 99% levels. Interestingly, on average Tobin's Q one year before the acquisition is larger than Tobin's Q one year after the acquisition. Furthermore, the mean of the acquirer's ESG score is larger than the mean of the target ESG score by more than 10 points. Also, we can see that on average cumulative abnormal returns of acquirers are negative. Lastly, to solve the problem of skewness, the market value of the acquirer is split into four quartiles, where 1 is the quartile with the smallest market values and 4 is the quartile with the largest market values.

**Table 1A** Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Acquirer Tobin's Q Before	213	2.028729	1.240285	.6266607	8.64476
Acquirer Tobin's Q After	213	1.954841	1.093457	.5607227	6.795619
Acquirer Market Value	213	68228.79	116417.3	0	920224.3
Acquirer Market-to-Book ratio	213	3.825779	6.296208	-14.52722	42.49993
Acquirer Leverage	213	1.194058	2.547907	-6.423921	18.26294
CAR	153	-.0104589	.0561611	-.2152836	.1911284
Target ESG Score	213	38.48268	18.63925	7.63	85.66
Target Environmental Score	212	26.5109	24.99339	0	89.48
Target Social Score	212	40.9216	19.96048	6.65	95.76
Target Governance Score	213	44.28756	23.25459	2.33	97.32
Acquirer ESG Score	193	54.18415	21.43281	5.46	92.6
Acquirer Environmental Score	193	48.3029	29.19507	0	92.8
Acquirer Social Score	193	56.46166	22.54358	2.57	97.62
Acquirer Governance Score	193	56.47285	24.20314	1.6	95.32

*Note.* This table represents the descriptive statistics of the variables used. This table includes the number of observations, the mean, the standard deviation, and the minimum and maximum values.

Table 1B presents the descriptive statistics of the panel data for the second set of hypotheses. There are seven variables used in this analysis. It is shown that there is a large discrepancy in the number of observations for the acquirer’s ESG scores and target ESG scores. This happens because many target companies do not self-report their sustainability performance. Furthermore, the mean is similar for targets and acquirers which is equal to 43.42. Considering the ESG difference variable, most of the non-missing observations have higher target ESG scores compared to the acquirer’s one.

**Table 1B** Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-Merger	49,566	.4545455	.4979346	0	1
Acquirer ESG Score	16,321	43.42289	20.62618	.44	95.16
Target ESG Score	1,314	42.70801	20.45133	4.99	88.53
ESG Difference	16,412	.9495491	.2188801	0	1
ROA	37,160	-.9622334	96.35761	-17703	400.5352
Market/Book ratio	37,181	7.070911	410.7611	-6821.5	44843.56
Ln (Market Value)	36,212	7.402883	2.473767	-7.998995	14.49155

*Note.* This table represents the descriptive statistics of used variables of panel data. This table includes number of observations, mean, standard deviation, minimum and maximum values.

In Table 2 we can see the correlation between the variables used in the analyses. We can see that some variables are highly correlated. Not surprisingly, Tobin’s Q before and after the acquisitions are highly correlated, but it does not create a problem for the analysis since these two variables are used to construct the dependent variable. Furthermore, we can see that environmental, social, and governance score variables are highly correlated for the acquirer and target. Thus, it is important to add them together to models with caution because the confidence intervals can be increased due to this issue. Moreover, every model must be checked for the robustness of the results.

**Table 2** Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Acquirer TQ before	1.00													
2. Acquirer TQ after	0.92	1.00												
3. Acquirer MV	0.38	0.45	1.00											
4. Acquirer MB ratio	0.43	0.44	0.32	1.00										
5. Acquirer Leverage	-0.20	-0.15	0.03	0.51	1.00									
6. CAR	0.00	0.05	0.01	-0.04	-0.08	1.00								
7. Target ESG	-0.09	-0.11	-0.08	-0.04	0.07	0.12	1.00							
8. Target Environmental Score	-0.12	-0.11	-0.02	-0.10	0.05	0.11	0.83	1.00						
9. Target Social Score	-0.02	-0.05	-0.04	-0.00	0.11	0.09	0.88	0.71	1.00					
10. Target Governance Score	-0.15	-0.18	-0.15	-0.03	0.01	0.09	0.75	0.48	0.43	1.00				
11. Acquirer ESG	0.20	0.22	0.43	0.26	0.11	0.05	0.17	0.21	0.24	0.00	1.00			
12. Acquirer Environmental Score	0.11	0.16	0.40	0.19	0.11	0.04	0.22	0.31	0.25	0.06	0.876	1.00		
13. Acquirer Social Score	0.24	0.23	0.41	0.25	0.09	0.02	0.19	0.21	0.29	-0.01	0.90	0.75	1.00	
14. Acquirer Governance Score	0.11	0.16	0.32	0.22	0.08	0.11	0.01	0.04	0.04	-0.05	0.77	0.56	0.52	1.00

*Note.* This table represents the correlation between used variables. The numbers in the first-row match with the numbers in the left most column.



## 4 Methodology

In this section the main statistical approach is discussed for each set of hypotheses. Explanation of variables and additional test for validity of classical linear regression model will be presented.

First, in order to conduct all tests, a few assumptions must be held. Regarding the first and third sets of hypotheses, the classical linear model assumptions must be respected. These assumptions are related to the error terms. First, the error terms must be homoscedastic. These cannot be correlated with other errors and independent variables. Lastly, these must be normally distributed.

Therefore, first the Breusch-Pagan test is conducted to verify heteroskedasticity check in the first and third hypotheses' sets. The P-value of this test is 0.000 in both cases. It means that the null hypothesis of homoscedastic residuals is rejected. Thus, the heteroskedasticity is presented in the analysis. In this case, clustered standard errors can be used in order to remove a potential correlation between residuals and to remove heteroskedasticity. In this research, the clustering is made based on the industry.

Moreover, the Jarque-Bera test is required for normal distribution checks. This test is conducted for each regression and it is shown that the p-value is 0.000 for each of the regressions meaning that there is not normal distribution. Thus, a winsorizing of data is required. All continuous variables were winsorized. Thus, this assumption holds.

Lastly, some control variables are added to the regressions in order to minimize omitted variable biases. However, it is impossible to eliminate omitted variable bias completely. Thus, it is expected that the bias can still be presented in this analysis.

### 4.1 HS1: Acquirer's Value and ESG Performance

The first set of hypotheses investigates the relationship between difference in target-acquirer ESG scores and post-acquisition value of the company. For this set of hypotheses, OLS linear regression will be used. Variable of interest is an ESG Difference one year before the acquisition which is equal to:

$$ESG\ Difference = Target\ ESG_{t-1} - Acquirer\ ESG_{t-1}$$

Thus, this variable is measured one year before an acquisition and it captures the difference between target and acquirer ESG scores. Furthermore, other variables such as acquirer's market capitalization, leverage, year of acquisition and industry of acquirer will be used.

Regarding the dependent variable, Tobin's Q will be used as a proxy for a company pre-, post-merger value. This formula was first used in the paper of Tampakoudis & Anagnostopoulou (2020) and was chosen for this research since it captures the essential change in value before and after the acquisition. The formula is:

$$\text{Acquirer Value} = \frac{\text{Acquirer Tobin's } Q_{t+n} - \text{Acquirer Tobin's } Q_{t-n}}{\text{Acquirer Tobin's } Q_{t-n}}$$

Hence, the change in the acquirer's value is measured considering the average value before and after the acquisition. To capture the effect of the acquisition, the closest annual value of Tobin's Q to the announcement date is taken before and after the takeover. Furthermore, in hypothesis 1B the interaction term between the ESG Difference and market capitalization is tested. This regression investigates whether larger companies benefit more from acquiring a highly sustainable target. Market capitalization is a categorical variable and is divided into four quartiles. Where 1 is the quartile of lowest market capitalization and 4 is the quartile of largest market capitalization.

The main equations for the first set of hypotheses are:

*Acquirer Value*

$$= \beta_0 + \beta_1 \text{ESG Difference}_i + \beta_2 \text{Leverage}_i + \beta_3 \text{MarketCap}_i + \delta Z_i + \theta X_i + u_i$$

*Acquirer Value*

$$= \beta_0 + \beta_1 \text{ESG Difference}_i + \beta_2 \text{ESG Difference} * \text{Market Capitalization}_i + \beta_3 \text{Leverage}_i + \beta_4 \text{Market Capitalization}_i + \theta X_i + \delta Z_i + u_i$$

*Acquirer Value*

$$= \beta_0 + \beta_1 \text{ESG Difference}_i + \beta_2 \text{Environmental Pillar Score} + \beta_3 \text{Social Pillar Score} + \beta_4 \text{Governance Pillar Score} + \beta_5 \text{Leverage} + \beta_6 \text{MarketCap}_i + \delta Z_i + \theta X_i + u_i$$

### *Acquirer Value*

$$\begin{aligned} &= \beta_0 + \beta_1 ESG\ Difference_i \\ &+ \beta_2 ESG\ Difference * Market\ Capitalization_i \\ &+ \beta_3 Environmental\ Pillar\ Score + \beta_4 Social\ Pillar\ Score \\ &+ \beta_5 Governance\ Pillar\ Score + \beta_6 Leverage_i \\ &+ \beta_7 Market\ Capitalization_i + \theta X_i + \delta Z_i + u_i \end{aligned}$$

Where  $\beta_0$  is a constant,  $\beta_{1,2,3,4,5,6,7}$  are the coefficients that represent an effect of the variables on the Acquirer Value.  $ESG\ Difference * Market\ Capitalization_i$  is an interaction term of categorical Market Capitalization variable and ESG Difference.  $\theta X_i$  is a vector of year, month and industry control variables,  $\delta Z_i$  is a vector of tender, hostile and completed offer control variables. Lastly,  $u_i$  is an error term which is presented in the regression.

## **4.2 HS2: Acquirer's ESG score and Target ESG**

For the second hypothesis panel data is used and subsequently panel data tests are applied. In this section, three tests will be conducted and the most efficient and accurate one will be chosen. Since the dataset for the second hypothesis consists of cross-sectional and time-series observations, pooled linear regression, fixed effect, and random effect models will be compared.

### *Pooled Linear Regression*

This is the simplest panel regression model which is considered as a generalized linear regression model. One of the main drawbacks of this method is that it is not consistent when there is an unobserved heterogeneity and when there is a correlation with observed regressors. Thus, if the entity-specific effect is correlated with independent variables then omitted variable bias appears.

### *Fixed Effect Model*

This model is an adjusted pooled regression model. Every company in this model has identified entity-specific effects. Furthermore, every company has its own intercept in this model and captures unobserved firm characteristics that are constant over time. Thus, this model is robust

to any unobserved correlations and if at least one company has a fixed effect, that cannot be observed, then this model should be used instead of a pooled regression one.

### *Random Effect Model*

In the random effect model, there is also an individual-specific effect but this effect is random and it is assumed that it is not correlated with regressors. This model has higher efficiency compared to the fixed effect model. However, it assumes that estimators are consistent and normally distributed. Thus, an additional Hausman test is conducted in order to compare fixed effect and random effect models.

For this hypothesis, the annual acquirer ESG scores are the dependent variable and are used for 10 years, 5 years before the acquisition, and 5 years after the acquisition. The main regressor in this hypothesis is a dummy variable which equals 1 for the period after acquisition and equals 0 if the period is before acquisition. Thus, it is possible to determine the effect of acquisition on the ESG score of the acquirer and to see a significant change in this score within a given period.

Furthermore, some extra variables are added to check the robustness of the results. For example, a dummy variable of relative performance between the target and acquirer is added to the regressions in order to control for the possible effect of the target ESG score on the post-acquisition ESG score of acquirers. Moreover, a dummy variable of the financial crisis is added to the regressions, to control for the possible influence of the financial crisis of 2007-2008 on the results. The main equation for this hypothesis is:

*Acquirer ESG<sub>it</sub>*

$$\begin{aligned}
 &= \alpha_i + \beta_1 \text{Post} - \text{Merger}_{it} + \beta_2 \text{ESG Difference}_{it} \\
 &+ \beta_3 \text{Market to Book Ratio}_{it} + \beta_4 \text{ROA}_{it} + \beta_5 \ln(\text{Market Value})_{it} \\
 &+ \beta_6 \text{ESG Difference}_{it} * \text{Post} - \text{Merger}_{it} + v_{it}
 \end{aligned}$$

Where *Acquirer ESG<sub>it</sub>* is the ESG score of the acquirer, *Post – Merger<sub>it</sub>* is a dummy variable equals 1 for a period after acquisition and equals 0 for a period before acquisition. *ESG Difference<sub>it</sub>* is dummy which represents a difference between target and acquirer ESG scores and equals 1 if target has higher ESG score and 0 otherwise. *Market to Book Ratio<sub>it</sub>* is a market to book ratio which is calculated as market value of acquirer divided by stockholders

equity.  $ROA_{it}$  is return on assets of the acquirer and equals net income divided by total assets.  $\ln(\text{Market Value})$  is a natural logarithm of acquirer's market value. These three variables are used to control firm's characteristics.  $ESG\ Difference_{it} * Post - Merger_{it}$  is an interaction term.

First, the panel structure of the data is specified by setting company-specific and year-specific conditions. Then, the random effect model is used and after that, the Breusch-Pagan Lagrange Multiplier Test is applied in order to check for the presence of a random effect. The p-value for this test is 0.000 which means that the null hypothesis is rejected. This also means that there are significant random effects in the model.

Second, the fixed effect model is applied. However, since the assumption of homoskedastic and uncorrelated errors must hold, a modified Wald test for heteroskedasticity in a fixed effect regression model is used. The P-value of the Wald test is 0.000, meaning that the error is heteroskedastic and therefore robust errors should be used.

Lastly, a comparison of fixed and random effects models is conducted. For this, the Hausman test is applied. This test investigates whether entity-specific errors are correlated with the regressors or not. The P-value of this test is 0.000 meaning that the null hypothesis that these errors are not correlated is rejected. Therefore, a fixed effect model should be used for the analysis.

STATA automatically estimates the fixed effects which refer to the entity-specific effects, which are time-invariant and can be a driving factor in independent variable differences among companies. Thus, STATA determines fixed effects by default and includes those in the model.

### **4.3 HS3: Cumulative Abnormal Returns and Target ESG**

For the third set of hypotheses, the event study is used to find the effect of target scores on the cumulative abnormal returns (CAR) at acquisition stage. This statistical approach is known as the most appropriate and efficient to investigate the effect of a particular event on a company's value. First, the event window is determined [0;1], estimation window is [-100;100]. A comparison between target and acquirer is captured in ESG Difference variable which is a difference between target ESG score and acquirer ESG score. Furthermore, each individual factor is tested separately. These scores are regressed on CARs of acquirer which are the dependent variable at the day of acquisition. Cumulative abnormal returns equal a difference between actual returns at event period and estimated returns. The formula is

$$CAR_i = \sum_{t=t_1}^{t_2} AR_{it}$$

Where  $AR_{it}$  are abnormal returns. Moreover, for this analysis, some financial and control variables are used. The market value of the acquirer is used as a proxy for size. Leverage of the company is used as well since it has an impact on the value of the company. Plus, industry, year, tender offer, completed offer and hostile offer control variables are used in this OLS regression. The equations for the third set of hypotheses are:

$$CAR[0,1] = \beta_0 + \beta_1 ESG\ Difference_i + \beta_2 Leverage_i + \beta_3 MarketCap_i + \delta Z_i + \theta X_i + u_i$$

$$CAR[0,1] = \beta_0 + \beta_1 Environmental\ Score\ Difference_i + \beta_2 Leverage_i + \beta_3 MarketCap_i + \delta Z_i + \theta X_i + u_i$$

$$CAR[0,1] = \beta_0 + \beta_1 Social\ Score\ Difference_i + \beta_2 Leverage_i + \beta_3 MarketCap_i + \delta Z_i + \theta X_i + u_i$$

$$CAR[0,1] = \beta_0 + \beta_1 Governance\ Score\ Difference_i + \beta_2 Leverage_i + \beta_3 MarketCap_i + \delta Z_i + \theta X_i + u_i$$

Where *Environmental, Social, Governance Score Difference* is the difference between target and acquirer scores.  $\beta_0$  is a constant,  $\beta_{1,2,3}$  are the coefficients that represent an effect of the variables on cumulative abnormal returns. Same as in the first set of hypotheses,  $\theta X_i$  is a vector of year, month and industry control variables,  $\delta Z_i$  is a vector of tender, hostile and completed offer control variables,  $u_i$  is an error term which is presented in the regression.

## 5 Results

In this section the results for each set of hypotheses will be presented. First, the tables with STATA results will be shown, then the most important outcomes will be analyzed and compared with the findings of other academic papers. Lastly, the conclusion for each hypothesis will be presented.

### 5.1 HS1: Acquirer's Value and ESG Performance

In this set of hypotheses, the relationship between ESG difference of target compared to acquirer and change in the value of the acquirer after the takeover was investigated. Below Table 3 represents the results of OLS analysis. In model 1 we can see the OLS regression where ESG Difference between target and acquirer is an independent variable and acquirer's value is a dependent one. Market value, acquirer's leverage and market-to-book ratio are added as financial characteristics of the acquirer. In the first column it is shown that ESG Difference does not have any effect on acquirer's value. Only leverage coefficient of the acquirer is positive and significant at 10 percent and constant coefficient is negative and significant at 5 percent. Moreover, we can see that in the second model an interaction term between market value of the acquirer and ESG Difference is added. Once again only constant and coefficient of leverage are significant in the second model. However, in the third model by adding the environmental, social and governance pillar scores, we can see positive and significant at 10 percent effect of target environmental pillar score on the acquirer's value. Meaning that an increase in target environmental score by 1 unit increases acquirer's value by 0.000928, keeping everything else constant. Similar picture we can see in the model 4 where interaction effect between market value and ESG Difference is added together with ESG pillars scores. Target environmental score is positive and significant at 10 percent. An increase in environmental score by 1 on average leads to increase in acquirer's value by 0.00084, keeping everything else constant. Furthermore, we can see that the number of observations dropped to 193. It happened because a vast majority of target companies did not have ESG scores before the takeovers, therefore the sample is too small. Additionally, the explanatory power of these models is quite small. We can see that the adjusted R squared does not exceed 0.05.

Although ESG Difference coefficient is positive and potentially could have an effect on the acquirer's value, there is not enough evidence of this relationship in the present research.

**Table 3** OLS Regressions

	(1) Acquirer's Value	(2) Acquirer's Value	(3) Acquirer's Value	(4) Acquirer's Value
ESG Difference	0.000144 (0.000392)	-0.000593 (0.000960)	0.000662 (0.000814)	0.0000601 (0.000622)
Market Value Q2	0.0117 (0.111)	-0.0196 (0.107)	0.00471 (0.121)	-0.0228 (0.119)
Market Value Q3	-0.0925 (0.0650)	-0.0915 (0.0636)	-0.0835 (0.0623)	-0.0836 (0.0603)
Market Value Q4	-0.0134 (0.0345)	-0.0100 (0.0325)	-0.0171 (0.0301)	-0.0138 (0.0283)
Acquirer Leverage	0.0129* (0.00644)	0.0127* (0.00636)	0.00935 (0.00716)	0.00955 (0.00707)
Market-to-book ratio	-0.00399 (0.00306)	-0.00403 (0.00313)	-0.00253 (0.00283)	-0.00268 (0.00290)
Market Value Q2 # ESG Difference		-0.00503 (0.00408)		-0.00418 (0.00407)
Market Value Q3 # ESG Difference		0.000940 (0.00177)		0.00104 (0.00196)
Market Value Q4 # ESG Difference		0.000917 (0.00141)		0.000737 (0.00122)
Target Environmental Pillar Score			0.000928* (0.000422)	0.000840* (0.000423)
Target Governance Pillar Score			-0.00137 (0.00103)	-0.00128 (0.00101)
Target Social Pillar Score			-0.000874 (0.000676)	-0.000927 (0.000652)
12 industries	Yes	Yes	Yes	Yes
Completed	Yes	Yes	Yes	Yes
Tender Offer	Yes	Yes	Yes	Yes
Hostile	Yes	Yes	Yes	Yes
Month	Yes *	Yes **	Yes	Yes
Year	Yes **	Yes **	Yes *	Yes *
Constant	-18.62** (7.194)	-18.33** (7.262)	-18.77* (8.500)	-18.64* (8.499)



Observations	193	193	192	192
$R^2$	0.103	0.112	0.117	0.123
Adjusted $R^2$	0.0437	0.0369	0.0419	0.0321

*Note.* This table represents OLS linear regression analysis. The dependent variable is acquirer's value, a ratio of Tobin's Q. The main variable of interest is ESG Difference, which is the difference between target and acquirer ESG one year before the takeover. Market value is divided in four quartiles. 1 is the smallest, 4 is the largest quartile. Standard errors in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

However, the last regression that can be tested is the regression which accounts for the group of targets which consist of top 25 percent of all acquisitions in the sample. The logic is that a target with greater value can have more significant impact on acquirer's value through the ESG score. Thus, only top 25 percent of takeover's target values are considered in this regression. In Table 4 we can see the number of observations dropped considerably to 26. Furthermore, it is shown that coefficient of 4<sup>th</sup> quartile of acquirer's market value is significant and negative at 1 percent. It means that being in the 4<sup>th</sup> quartile of market value decreases on average acquirer's value by 0.373 compared to the 3<sup>rd</sup> quartile, keeping everything else constant. Once again, even for targets with high value there is no evidence that ESG Difference of target compared to acquirer has a significant effect on the value of acquirer after the acquisition.

**Table 4** OLS Regressions with top 25 percent

	(1) Acquirer's Value
ESG Difference	-0.000854 (0.000951)
Acquirer Market Value Q4	-0.373*** (0.0822)
Market-to-book ratio	-0.0322*** (0.00794)
Acquirer Leverage	0.0707*** (0.0193)
Hostile	Yes
Tender Offer	Yes***
Completed	Yes
12 Industries	Yes
Constant	0.424*

	(0.221)
Observations	26
$R^2$	0.492
Adjusted $R^2$	0.252

*Note.* This table represents OLS linear regression analysis. The dependent variable is acquirer's value, a ratio of Tobin's Q. The main variable of interest is ESG Difference, which is the difference between target and acquirer ESG one year before the takeover. Market value is divided in four quartiles. 1 is the smallest, 4 is the largest quartile. Standard errors in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

To conclude, based on the models 1-4, hypotheses 1A, 1B, 1D, 1E should be rejected since significant relationship was not found. Thus, it is possible to conclude that there is no effect of target's aggregate, social and governance pillar score on the value of acquirer. Moreover, ESG Difference of smaller acquirers does not have effect on the post-merger value. Hence, evidence of stakeholder theory and that sustainability initiatives can be determinant of value creation were not found. The same conclusion was made by Pelozo, J. (2009), the review showed that there was no evidence of sustainability impact on the financial performance of a company or this evidence was weak and the causality was not proved. Regarding hypothesis 1C, it was presented that environmental pillar score of target has a positive effect on acquirer's value. However, the relationship is weak and requires further research. Nevertheless, this hypothesis is not rejected.

## 5.2 HS2: Acquirer's ESG score and Target ESG

In this hypothesis, an influence of acquisition of target company and its ESG score on acquirer post-takeover ESG score is investigated. The dataset for this hypothesis consists of panel data. Thus, as discussed in the methodology part, the fixed effect model is chosen for the analysis. The results of this regressions are presented below.

**Table 5** Fixed Effect Models

	(1) Acquirer ESG Score	(2) Acquirer ESG Score	(3) Acquirer ESG Score
Post-Merger	9.703*** (0.314)	9.714*** (0.313)	8.464*** (1.147)
Ln (Market Value)	2.839*** (0.275)	2.816*** (0.273)	2.806*** (0.273)
Market/Book Ratio	-0.00114 (0.00254)	-0.00201 (0.00256)	-0.00180 (0.00257)
ROA	0.0274 (0.831)	-0.0151 (0.834)	0.000139 (0.834)
ESG Difference		-4.780*** (1.031)	-5.371*** (1.066)
Post-Merger # ESG Difference			1.320 (1.177)
Constant	12.39*** (2.472)	17.16*** (2.623)	17.79*** (2.639)
Observations	15311	15305	15305
R <sup>2</sup>	0.249	0.253	0.253
Adjusted R <sup>2</sup>	0.249	0.252	0.252

*Note.* The table represents fixed effect analysis. The dependent variable is acquirer's ESG score. The main variables of interest are ESG Difference, which is a dummy variable and Post-Merger which is a dummy variable equal 0 if a period is before the acquisition and 1 otherwise. Ln (Market Value) is a natural logarithm of acquirer's market value. Market/Book Ratio is a market-to-book ratio of acquirer. ROA is a return on assets of acquirer variable. Standard errors in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

In table 5 we can see that Post-Merger variable is positive and significant at 1 percent in all three models. It means that after the acquisition ESG score significantly increases on average by 9.703, 9.714 and 8.464 points in model 1, 2 and 3 respectively, keeping everything else constant. Interestingly, the ESG Difference coefficient is negative and significant at 1 percent. It means that if target firm has higher ESG score than the acquirer, the acquirer's ESG score tends to decrease by 4.780 and 5.371 points in model 2 and 3 respectively, keeping everything else constant. Additionally, this table shows that logarithm of market value is significant at 1 percent in all three models, and equals 2.839, 2.816 and 2.806 in models 1, 2 and 3 respectively.

It means that on average increase in market value by 1 percent leads to increase in acquirer's ESG score by 2.839, 2.816 and 2.806 points, keeping everything else constant.

Furthermore, we can see that the interaction term of Post-Merger dummy and ESG Difference is positive but not significant. Although the acquirer ESG score can significantly increase after the acquisition, the evidence that the difference in ESG scores between target and acquirer increases post-takeover ESG score of acquirers has not been found. Thus, Hypothesis 2 is rejected.

One of the potential explanations can be that by acquiring a company with higher ESG score, the acquirer should integrate this company effectively into the system in order to maintain and to increase a sustainability related benefits of the target. For instance, conflicting ESG priorities can be an obstacle to the full integration of effective target ESG practices. Furthermore, many companies acquire targets by following a particular strategy to enhance a company's value through creating synergies. Thus, it is possible that the ESG aspect is not prioritized when the decision for acquisition is taken.

### **5.3 HS3: Cumulative Abnormal Returns and Target ESG**

In this set of hypotheses, the relationship between firm value at the acquisition day and relative ESG performance is investigated. In the model 1 of Table 6, we can see OLS linear regression with compared target and acquirer ESG Difference variable as the variable of interest. Moreover, market value, leverage and market-to-book ratio variables of acquirer are included in the model together with few control variables. It is shown that the coefficient of the ESG Difference variable does not have any significant effect on the cumulative abnormal returns of the acquirer. However, coefficients of the acquirer's market value are significant and show that companies with market value in 2<sup>nd</sup> quartile have on average lower CAR by 0.0930 percentage points compared to the companies in the 1<sup>st</sup> market value quartile, keeping everything else constant. Companies in the 3<sup>rd</sup> market value quartile on average have lower CAR by 0.03 percentage points than the companies in the 1<sup>st</sup> quartile, keeping everything else constant. Similar interpretation applies to companies in the 4<sup>th</sup> quartile, on average these tend to have lower CAR by 0.0287 percentage points than the companies in the 1<sup>st</sup> quartile, keeping everything else constant.

Regarding model 2, we can see that three pillar scores do not have any significant effect on the cumulative abnormal returns. However, once again there is a negative significant effect of the market value coefficient on the cumulative abnormal returns. Companies in quartile 2, 3

and 4 tend to have lower CARs by 0.0946, 0.0319 and 0.0305 than the companies in 1<sup>st</sup> quartile respectively, keeping everything else constant. In both models we see that the negative magnitude of coefficient decreases with an increase of market value of the companies. Meaning that the larger a company the higher cumulative abnormal returns are for this company comparing with the companies in the 1<sup>st</sup> quartile. Once again, the number of observations dropped to 142 which is considered as a small size sample.

**Table 6** CAR Regression

	(1) CAR [0,1]	(2) CAR [0,1]
ESG Difference	0.0000661 (0.000144)	
Environment Performance		0.000137 (0.000246)
Social Performance		0.0000698 (0.000212)
Governance Performance		-0.000143 (0.000244)
Market Value Q2	-0.0930*** (0.0218)	-0.0946*** (0.0205)
Market Value Q3	-0.0300* (0.0162)	-0.0319* (0.0174)
Market Value Q4	-0.0287** (0.0126)	-0.0305** (0.0134)
Acquirer Leverage	-0.00328 (0.00462)	-0.00341 (0.00454)
Acquirer Market-to-book ratio	0.000580 (0.00108)	0.000677 (0.00109)
12 Industries	Yes	Yes
Year	Yes	Yes
Hostile	Yes	Yes
Tender Offer	Yes	Yes
Completed	Yes*	Yes*
Constant	-1.709 (3.282)	-1.642 (3.348)

Observations	142	142
$R^2$	0.118	0.124
Adjusted $R^2$	0.0429	0.0350

*Note.* The table represents event study. The dependent variable is cumulative abnormal return. The main variable of interest is the ESG difference, which is the difference between target and acquirer ESG one year before the takeover. Also, the main variables of interest are ESG pillar scores of the target. Market value is divided into four quartiles. 1 is the smallest, 4 is the largest quartile Standard errors in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

The main variables of interest in these regression models are ESG Difference and three individual factors' performances. Since these variables are a relative comparison of target and acquirer performances, absolute pre-merger values will be tested next. This analysis is conducted to examine if the relationship is changed due to independent variable variation. Thus, instead of differences, absolute environmental, social and governance pillar scores will be taken as the main independent variables.

The results of the OLS regressions are presented in Table 7. Here we can see that the coefficients of all three variables are insignificant. It means the target scores do not affect the acquirer's cumulative abnormal return. This means that the stock market does not react to a takeover of socially and sustainably responsible companies and there is no reward for acquirers for such investments. This is an interesting finding since many academic papers argue that socially responsible targets have a positive effect on the financial performance of acquirers at M&A events. For example, Aktas (2011) in his paper found evidence of this positive impact. However, Innovest social and sustainability ratings of companies were used in his research in 2011. Thus, the difference in the results can be caused by this fact. Furthermore, in this paper many target companies do not have aggregate and individual ESG scores, therefore the sample size is quite small. Conversely, Feng, X. (2021) in his paper made the same conclusion that pre-merger target ESG scores do not have significant impact on stock returns of the acquirer.

**Table 7** Three Factors CAR Regression

	(1) CAR [0,1]
Target Environmental Pillar Score	0.000128 (0.000286)
Target Social Pillar Score	0.000135 (0.000374)

Target Governance Pillar Score	0.0000788 (0.000250)
Market Value	-0.00353 (0.00751)
Acquirer Leverage	-0.00433 (0.00317)
Acquirer Market-to-book ratio	0.000637 (0.000972)
<hr/>	
12 Industries	Yes
Year	Yes
Hostile	Yes
Tender Offer	Yes
Completed	Yes
<hr/>	
Constant	-0.260 (2.396)
<hr/>	
Observations	153
$R^2$	0.0561
Adjusted $R^2$	-0.0175

*Note.* The table represents event study. The dependent variable is cumulative abnormal return. The main variables of interest are ESG pillar scores of the target. Standard errors in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

To conclude, the hypotheses 3A, 3B, 3C and 3D are rejected since any impact of ESG factors on cumulative abnormal returns was not found in the analysis. Therefore, it is possible to conclude that the stock market does not tend to reward an acquirer for a takeover of a socially responsible target.

## 6 Conclusion & Discussion

In this paper, the potential effect of target ESG scores before a takeover on the acquirer's value, post-merger ESG performance and on cumulative abnormal returns was examined. Furthermore, some other factors were investigated that could have an effect on the previously mentioned variables. Such factors as market value, leverage and market-to-book ratio were included and studied. Moreover, to increase a validity of the models control variables were added. Such variables as industries, years, tender offer, hostile offer and completed deals were used as control variables. This section includes conclusions on the main findings based on the previous parts and potential limitations of this research.

### 6.1 Conclusion

As it was discussed in the theoretical framework part, the ESG impact on the merger and acquisition process is not widely analyzed. Many papers could not find evidence of the existence of this relationship. Furthermore, if considering some prominent academic papers, there is still no definitive conclusion about this relationship in the literature. Therefore, this paper is focused on the target ESG scores and its impact on the takeover process and post-takeover performance. After careful research of existing literature, the main research question was formulated: *“What is an influence of pre-merger ESG scores of targets on the M&A process, post-merger ESG score and performance?”*. The research question includes three sets of hypotheses. First, the relationship between pre-merger target ESG score, acquirer's size and acquirer's post-merger value was investigated. Moreover, the effect of individual ESG factors on the post-merger company's value was analyzed. Second, a dynamic relationship of target ESG and acquirer's ESG performance was tested by using data of 10 years. Lastly, event study was conducted to determine a potential effect of highly-sustainable target acquisition on the cumulative abnormal returns of the acquirer. Next part of this section consists of summaries of each set of hypotheses and after that, limitation of this paper is discussed.

Regarding the first set of hypotheses, pre-merger target ESG scores influence on the post-acquirer's value is examined. Furthermore, additional test was conducted to check a robustness of the obtained results. The conclusion is that target ESG performance before the takeover does not have any effect on the acquirer's post-acquisition value except for environmental pillar score. It was found that environmental pillar score has a significant positive effect on the acquirer's post-merger value. Considering the size of the acquirers, no evidence that smaller



acquirers tend to acquire a highly sustainable target to enhance their own value was found. Thus, hypotheses 1A, 1B, 1D and 1E are rejected. Only hypothesis 1C is not rejected.

The second set of hypotheses investigates the effect of the acquisition of target with relative higher ESG performance on the post-merger ESG performance of acquirer. For this hypothesis, a separate dataset of panel data was used. The main finding is that post-acquisition ESG score of the acquirer is significantly larger than before the takeover. However, no evidence was found that pre-acquisition ESG performance of target has a significant positive impact on the ESG value of the acquirer. Therefore, hypothesis 2 is rejected.

The third set of hypotheses investigates the impact of target ESG score of the cumulative abnormal returns of the acquirer. It was found that target aggregated ESG performance and environmental, social, governance factors do not impact the cumulative abnormal returns of the acquirer. Thus, hypotheses 3A, 3B, 3C and 3D are rejected.

## **6.2 Limitations**

It is important to highlight that this study has some limitations. Although reversed causality can be excluded since the nature of regressors and regressands makes this issue not possible in the present research.

However, some target companies do not have observations. At the beginning, a sample size counted over 4000 observations, but after variable generating, the number decreased considerably. At the end less than 200 observations were used in models. Thus, sample selection bias can be presented in this research, since all companies that reported ESG scores can be aggregated by similar characteristics. Thus, for further research it is suggested to use other databases.

Furthermore, one of the most important biases is omitted variable bias. This bias means some factors affect the dependent variable but not included in the model. If this bias is presented in the analysis, it is impossible to conclude because the coefficients are biased and can be used in the analysis for the entire population. Although control variables are included in the models to mitigate omitted variable bias, there still can be a case that this bias is presented in this analysis. Therefore, further research can be focused on adding other variables that can have effects on the dependent variables such as acquirer's value, ESG scores and cumulative abnormal returns.

Another limitation is related to the third hypothesis. The chosen event window is only one day and potentially market can be expecting the takeover, thus the acquisition can be

already priced in. However, to determine a correct event window in practice is exceedingly difficult because some information leak can happen before the event is announced. Hence, for further research it is advised to determine the event window with caution.

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