



The Impact of ESG Scores on Short-term Shareholder Value at M&A Announcement – Evidence from Acquirer and Target Firms

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Abstract: <p>This thesis investigates the impact of Environmental, Social, and Governance (ESG) scores of both target and acquirer firms on the cumulative abnormal returns (CARs) of acquirers at M&A announcement.</p> <p>Utilizing a comprehensive methodology that includes an event study and a Heckman two-step selection model, this study examines 343 international M&A deals spanning from 2009 to 2023. Despite consistent negative CARs across various event windows, the findings reveal a positive and significant relationship between the acquirer's ESG score and its CARs at M&A announcements, while the target's ESG score shows no significant impact.</p> <p>These findings highlight that 1) ESG factors act as value destroyers in terms of short-term shareholder value creation in the context of M&As. 2) Investors prioritize acquirer's ESG performance and may prioritize the acquirer's own ESG credentials over those of the target. 3) The insignificant relationship between target ESG score and acquirer's CARs reflects the concerns of overpaid risk to high ESG score target and integration challenge which may not immediately translate into value for acquirers in short-term.</p> <p>The study contributes to the literature by examining the impact from both acquirer and target ESG scores and providing insights into the differential impact of ESG scores in cross-border deals. This dual approach enriches the understanding of how ESG considerations influence shareholder value, offering valuable insights for corporate managers and investors in strategic decision-making in M&A.</p>	
Keywords: Environmental, Social, and Governance (ESG), Cumulative Abnormal Returns (CARs), Mergers and Acquisitions (M&A), Short-term Shareholder Value.	

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1 INTRODUCTION

1.1 Background

Environment, social and governance (ESG) has been extensively studied by scholars in the last two decades and it becomes more and more essential in operating business successfully under current shifting market conditions. Environment, social and governance respectively present three core pillars which are seen as important value drivers for corporate dealmakers and shareholder value creation in capital markets.

The Principles for Responsible Investment (PRI 2020), an initiative supported by the United Nations, underscores the importance of incorporating ESG factors into investment analysis and corporate decision making. This trend reflects a broader shift in investor attitudes, with increasing recognition that ESG factors can significantly influence corporate financial performance and risk management. Not only investors are seeking reliable sustainable investment criteria to help them to identify investment objects, but corporates also rely even more on ESG scores to make the right investment decisions.

Companies with stronger ESG performance are often better positioned to create long-term value. ESG scores reflect a company's commitment and capability in implementing sustainable practices, innovation and governance. These aspects could intrinsically enhance the firm's competitive advantage and eventually firm value. Previous research indicates that companies with high ESG ratings tend to have more engaged employees, stronger customer loyalty, and better stakeholder relationships, which could contribute to value creation, especially advance the synergies in post-mergers (Friede et al., 2015). During M&A, aligning with companies that have robust ESG performance can help acquirers achieve greater synergies and operational efficiencies (Friede et al., 2015).

Despite substantial previous academic research proved positive correlation existence between companies excelling on ESG performance and companies generating higher shareholder value than their peers (Tensie.W, 2021), there are many controversial debates on the impact of ESG performance on shareholder value creation, especially at the event of mergers and acquisitions (M&A). For instance, McWilliams and Siegel (2000) contend that while ESG initiatives can lead to positive outcomes, they also require substantial investments that may not immediately translate into financial returns. This view suggests that the impact of ESG performance on M&A outcomes may vary depending on the specific context and industry dynamics in which the transaction occurs.

M&A activities have been considered as essential growth strategy in creating value for firms stemming from its natural in synergizing the acquirer and acquirees' technology and resources advances, hence optimize economic value in industry. It is noteworthy that ESG performance

is shaping shareholder value creation perspectives, with both acquirors and acquirees looking to capitalize on synergies arising from corporations with aligned ESG ratings. Because the shareholders make a significant impact on the M&A eventual outcome due to their vital role in its pre-merger decision making as well as post-merger integration process, M&A creates a perfect framework for shareholder value creation study. Therefore, M&A has been considered as a critical event in examining the impact of ESG performance on the shareholder value (Deng et al., 2013).

1.2 Motivation

Currently, we are experiencing a major transformation toward more socially conscious capitalism and transparent organizations. Both corporate social responsibility (CSR) and environmental, society and governance (ESG) have been considered as important framework in leading to a sustainable and ecological business environment. Comparing with CSR, ESG provides a more quantifiable and integrated approach to assessing the corporates ethical impact and sustainability practices, hence, ESG factors have been utilized extensively in company performance evaluation and investment decisions. Research shows that companies with high ESG ratings tend to perform better financially in the long term, as they are better at managing risks and seizing opportunities related to sustainability (Clark, Feiner, & Viehs, 2015).

The rapid development of ESG framework and its growing importance in making investment and corporate management decisions has attracted significant interest from the academic regime. However, extant literature focus on the rational of ESG and its impact on firm performance and valuation, while the impact of ESG performance on shareholder wealth creation remain as an ongoing debate. Notably, there are two contrasting perspectives in the literature regarding the impact of ESG activities in M&A (Deng et al., 2013). One perspective aligns with stakeholder theory, arguing that ESG initiatives positively affect shareholder wealth. It asserts that by acting in the best interest of stakeholders, ESG initiatives actively improve corporate reputation, increase customers and suppliers' satisfaction, enhance employees' engagement and productivity, which eventually increase shareholders' value (Gelb and Strawser 2001; Baron, 2001). In contrast, the other view of literature advocates the shareholder expense perspective, asserting that managers may motivated to engage in CSR activities only to enhance their own reputations, which can result in a decrease in shareholder wealth (Pagono and Volpin 2005). It also highlights that the costs associated with implementing ESG activities can outweigh the financial benefits, thereby transferring wealth from shareholders to other stakeholders (Renneboog et al., 2008).

In light of prior empirical studies, the debate continues as the previous literature present mixed empirical findings. For instance, Aktas et al., (2011) find empirical evidence that higher ESG targets positively impact on acquirer's abnormal returns at the M&A announcement. In like manner, Deng et al., (2013) investigates the impact of CSR on shareholder value creation by examining the acquirers' announcement return at the event of M&A. Both findings support the stakeholder theory by validating the positive impact of high CSR ratings both from acquirer and target perspectives.

Contrarily, Fatemi et al., (2018) argues that the impact of ESG considerations on the financial outcomes of M&A event is negligible, indicating that ESG performance does not generate substantial influence on the immediate market reaction on M&A announcements. Accordingly, Karen et al., (2011) reveal a negative corporate stock performance from CSR environmental initiatives from a sample of 58 US companies and further confirm a significantly negative abnormal returns around the date of M&A announcement. In view of these contradictory findings, the controversial debate on whether the ESG factor works as the creator or destroyer of shareholder value remains open. Therefore, this thesis contributes to the open debate by further examining the impact of ESG factors on shareholder value creation adjacent to the announcement of M&A event.

1.3 Objective and research scope

The primary objective of this study is to investigate the impact of the ESG performance from both acquirer and target on the announcement returns of acquirers at the event of M&A. By focusing on the paramount relationship between ESG ratings and abnormal announcement returns, this thesis aims to provide a profound understanding of how ESG scores influence short-term shareholder value creation in the context of M&A transactions. In addition to finding out whether the value driver is from ESG factor of acquirer or target, this research will consider deal, industry, financial characteristics to assess their interactive impact on the relationship between ESG performance and shareholder value creation.

Research questions of this study:

1. Does ESG factor act as a value creator or destroyer in terms of short-term shareholder value creation in the context of M&A?
2. Which has an impact on the abnormal return of the acquirer at the M&A announcement: the acquirer's ESG performance or the target's ESG performance?

By addressing these research questions, this study intends to shed light on the ongoing debate about the role of ESG factors in M&A outcomes: shareholder value creator or value destroyer? Specifically, this thesis examines both the acquirer and target ESG ratings perspectives, to determine the key driver of significant impact on the acquirer's shareholder value.

The scope of the study will cover international contexts, specifically examining 337 international deals covering 30 countries spanning from 2009 to 2023. By employing the worldwide data with cross-border deals and other firm and industry specific characteristics, this research aims to seek to uncover how ESG considerations influence shareholder value across different geographical regions and regulatory regimes.

Cross-border deals involve the integration of firms with potentially divergent ESG practices and standards, making it essential to understand how these factors play out in different contexts. Moreover, together with country effect, it allows for a further analysis that can identify patterns and insights applicable across various regulatory and cultural landscapes.

1.4 Contribution

This thesis contributes to exist body of ESG considerations in M&A literature in several ways. First, it fills a gap by conducting large-scale study with up-to-date worldwide data spanning from 2009 to 2023 in examining the impact of ESG ratings on acquirer announcement return.

Despite extensive studies on acquirer's announcement return in response to ESG performance, the impact from both acquirer and target ESG ratings on announcement returns is underexplored in M&A context. This thesis contributes to this perspective by applying a dual approach to address the ESG factors impact from both parties.

Furthermore, a dual approach allows for comparative study between the ESG factors from acquirer and target. By addressing who plays stronger impact on acquirer announcement returns, this study adds depth to the understanding of ESG dynamics in M&A.

Second, this study conducts a further analysis of cross-border samples in international settings, which presents a potential research avenue requiring further studies. For instance, Aktas et al., (2011) examined the impact of target CSR on shareholder wealth at the M&A announcement, but with a small sample covering merely 106 international M&A deals. Instead, Deng et al., (2013) validated the positive impact from acquirer CSR on both abnormal returns and long-term operational performance but using a regional sample only locating in US.

In addition, Ahmad et al. (2023) argues that the greater differences of environmental sustainability between the acquirer and acquiree countries, the higher announcement returns

are generated from M&A. Hence, by examining industry, cross-border and deal-specific characteristics, this thesis provides a comprehensive understanding of the wealth impact from ESG considerations.

Finally, the study contributes to the open debate of shareholder value creation in M&A incorporating ESG considerations in the following aspects: Primarily, by incorporating both acquirer and target ESG scores, this research can contribute to stakeholder theory by examining how different stakeholders (acquirer vs. target) influence market perceptions and M&A outcomes. Chiefly, the final findings validate and support one of the two opposing point of views: the shareholder value maximization view and the stakeholder expense view, offering practical insights for corporate managers and investors in decision-making at the event of M&A.

1.5 Thesis structure

This thesis is structured as follows. Chapter 2 explores the research topic within the theoretical framework, while chapter 3 will be dedicated to literature review and hypothesis development. In addition, to a propound understanding of ESG, the nuanced conceptual distinctions between ESG and CSR will be examined in this chapter. Chapter 4 specifies the data collection process, focusing on clarifying ESG data sources and measurements. Chapter 5 delves into the methodology, clarifying the methodology design, model, and variables specifications. Moreover, the econometric method will be employed to address the endogeneity problem and selection bias. Chapter 6 will conclude the results with granular analysis on significant parameters. Chapter 7 unfolds with a further discussion of the empirical findings and implications in both academic and business contexts. Chapter 8 concludes the thesis with a comprehensive conclusion.

2 THEORETICAL FRAMEWORK

This chapter presents the financial theoretical framework applied in this study to provide a fundamental understanding of the research question and methodology.

2.1 Shareholder theory and stakeholder theory

The shareholder theory stems from shareholder primacy approach, which shareholders are considered as the primary group who steers the engine of company. The firm has its primary responsibility to its shareholders and the goal of the firm is to grow the profits and maximize shareholders' returns (Smith, 2003). It firmly alleged that shareholder theory addressed the corporate goal as to maximize profit and seek for long-term growth in shareholders' wealth. (Friedman, 1970). Therefore, from the traditional view of shareholder theory, the company has a binding primary duty to put the owners and shareholders' benefit in the frontline of the firm's objectives, to create value for them.

Stakeholder theory asserts that the primary purpose of corporation is to benefit not just investors but also all its major stakeholders (both internal and external) such as its employees, clients, suppliers, contractors, the competitors, the partners, the government, the local community as well as shareholders etc. Even though the competitors are mostly on a rivalry position to the peer companies, they are considered as stakeholders as their position in affecting the opponent companies and their stakeholders (Miles, 2012). Based on stakeholder theory, ESG activities create value through promoting or synergies a firm's operational performance. Firm's stakeholders constitute an interconnected ecosystem of contracts and relations which help the firm to support its employees, enhance reputations, advance collaborations with suppliers and partners, and eventually improve profit performance (Parmar et al., 2010). For instance, a company with happy employees, satisfied customers and suppliers will be able to enhance its reputation, maintain customer loyalty, and lead to better financial performance.

In recent decades, shareholder theory and stakeholder theory have been aligned in the context of ESG activities regarding firm value and performance (Donaldson & Preston, 1995). Stakeholders in firms with high ESG performance tend to have stronger incentives to keep corporate commitments and make better effort on enhancing firm performance (Clark, Feiner, & Viehs, 2015). Therefore, the shareholder theory and stakeholder theory converge in the way that acting in the best interests of all stakeholders ultimately serves the best interests of shareholders (Tampakoudis et al, 2020).

2.2 Agency theory and shareholder expense view

Based on agency theory, ESG considerations are not aligned with shareholders' best interests, as they can lead to potential outflows of funds, thereby reducing profits and shareholders' wealth (Jensen and Meckling, 1976). In general, agency problems manifest in ESG activities mainly from three opinions.

Firstly, it is contended that ESG engagement can lead to the inefficient use of firm resources and reduction of overall firm performance. Managers may be motivated to undertake ESG activities for personal reasons rather than focusing on maximizing shareholder value. This misalignment can occur when managers or block shareholders prioritize ESG initiatives to enhance their own reputations as responsible global citizens, resulting in a "warm-glow" effect (Brown et al., 2006; Barnea & Rubin, 2010). These actions can divert attention and resources away from core business activities that directly contribute to financial performance.

Secondly, given the finite financial resources available to a firm, the costs associated with ESG activities can limit the funding available for more profitable projects which would directly contribute to financial performance. This trade-off can constrain the firm's ability to invest in initiatives that have higher potential returns, thereby potentially impairing overall financial performance (Schuler & Cording, 2006). Consequently, while ESG activities may generate long-term benefits, the immediate financial burden they impose could hinder the firm's capacity to pursue more lucrative opportunities.

Third, based on agency theory and information asymmetry, managers may use firm's resources to generate ESG activities for their own benefits such as avoid negative attention on inferior management performance and offset the poor financial performance under their purview. This is often known as "window dressing", which means that ESG activities are carried out with the aim of getting good image or public exposure as an effort to cover weak performance.

All the three opinions support the shareholder expense view, which suggests that ESG activities may be carried out at the expense of shareholders in certain circumstance. Under the shareholder expense view, the low ESG acquirer realizes lower announcement abnormal returns as well as lead to larger decreases in long-term operational performance in post-merger (Deng et al., 2013).

2.3 Stakeholder value maximization

Stakeholder value maximization view advocates the positive effects of ESG activities on shareholder wealth. It is aligned with contract theory which states corporation itself is viewed as a “nexus of contracts” in which all participants other than shareholders are in the contractual relation which can be specified with the terms of implicit contracts or explicit contracts with the firm (Coase 1937; Jensen and Meckling 1976). Implicit contracts refer to the promise of providing continuous services to customers or job security to its employees, while explicit contacts pertaining to wage contracts and product warranties are distinct on the nature from the shareholders’ perspective (Cornell and Shapiro, 1987).

Firms with high ESG engagement have stronger incentives to honor their promise to implicit contracts, so these firms usually endeavor more in long-term firm performance than low ESG engagement firms (Clark, Feiner, & Viehs, 2015). In addition, Jensen (2001) theory supports that interests of shareholders and stakeholders are better aligned than those in low ESG engagement firms, therefore, they are more likely to lead to firm’s long-term profitability and performance. Jensen (2001) also argues that firms who integrate stakeholder interests rather than those solely focus on shareholder value realize better corporate governance and long-term performance.

In all, firms with high ESG engagement not only fulfil their implicit and explicit contractual obligations more effectively but also align the best interests of shareholders and stakeholders, leading to improved long-term profitability and performance.

2.4 Signaling theory and information asymmetries

Signaling theory is a fundamental concept which can reduce information asymmetries between two parties (Spence, 2002). Spence, who was the first scholar to put forth the theory, applied this theory for the first time in the labor market to model the signaling function of education (Spence, 1973). Consequently, the signaling theory has been applied in the relationship research between sustainability and M&A, suggesting that firms send signal to stakeholders indicating their commitment towards ESG engagement. These signals alleviate the information asymmetries and adverse selection risk. Flammer (2021) also argues that corporates signal their commitment on sustainability engagement by means of issuing green securities, hence building up a positive corporate reputation. In like manner, Zerbini (2017) suggestS that firms may conduct ESG initiatives as its signaling to enhance corporate reputations among its stakeholders.

2.5 Efficient Market Theory

The Efficient Market Hypothesis (EMH) served as the foundational theory underpinning the event study methodology, is employed to assess the impact of ESG performance on M&A announcement returns. Based on Fama (1991), EMF demonstrates that all the information about stocks and the market has already been factored into the stock prices. This hypothesis supports the argument that it is impossible to consistently realize abnormal returns through market timing or stock selection solely based on publicly available information.

Event studies leverage the EMH by examining the stock price reaction to specific events, such as M&A announcements, to determine whether these events create value. The primary goal is to measure abnormal returns—returns that deviate from what is expected based on the market's normal movement. Despite its theoretical appeal, the EMH remains a subject of debate within financial literature. Some research finds that stock prices often exhibit delayed reactions to new information, suggesting that markets are not perfectly efficient (Malkiel, 2003; Shiller, 2003).

Contrarily, the weak form of the EMH posits that past price movements and volumes do not predict future price movements, arguing that observed abnormal returns are largely due to random chance rather than market inefficiencies. Alexandra (2015) provides support for the weak form EMH by showing that stock prices tend to adjust quickly to new information during the initial days following various announcements. This finding aligns with the notion that financial asset prices swiftly reflect new information, validating the efficiency of capital markets in the short term.

3 LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

3.1 CSR and ESG- framework

The concept of corporate social responsibility (CSR) originally stemmed from the publication of the landmark book *Social Responsibility of the Businessman* (Bowen, 1953, p.6) is defined as follows:

“...[CSR] refers to the obligation of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of objectives and values of our society.”

In the following decade, CSR has been intensively studied in the realm of responsibilities of companies towards to its shareholders and stakeholders. The foremost well-developed argument from Friedman (1962) states that CSR is consisted of utilizing corporate resources to undertake specific activities that are intended to create long-term benefit within free competition.

United nationals' industrial development organization states the CSR definition as follows:

“Corporate Social Responsibility is a management concept whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders. CSR is generally understood as being the way through which a company achieves a balance of economic, environmental and social imperatives (“Triple-Bottom-Line- Approach”), while at the same time addressing the expectations of shareholders and stakeholders.”

The definition of CSR has long been a subject of debate among scholars, making it challenging to pin down its unique composition. The complexity arises from the multifaceted nature of CSR, which encompasses various dimensions and interpretations.

Initially, Ramanathan (1976) highlighted that CSR involves a complex interplay of economic, legal, ethical, and philanthropic responsibilities. Later, Wiseman (1982) expanded on this by examining how corporations report their CSR activities, revealing inconsistencies in how CSR is understood and communicated. Thereafter, Ilinitch et al., (1998) further explored the ambiguity in CSR definitions, emphasizing the need for a more structured approach to understanding its components. In due course, McWilliams et al. (2006) and Barnett (2007) contributed to the discourse by examining the strategic significance and impact of CSR on firm performance. They argued that the firm should incorporate CSR into its core business strategy, creating long-term sustainable value for both the firm and its stakeholders. Eventually, Dahlsrud (2008) synthesized these perspectives and identified the five dimensions of CSR, which are stakeholder, social, economic, voluntariness, and environmental. To conclude, all these diversified components underscore the broad scope and evolving nature of CSR as a concept.

As the successor of CSR, ESG has gained skyrocketed attention from investors and corporate players in recent years. While the concept of CSR broadly focuses on a large set of factors in the business environment, ESG provides a framework to assess the risk and opportunity elements through the lens of sustainability and social responsibility. Meanwhile, the growing number of ESG related regulations, such as the EU taxonomy and the SFDR, is gradually reshaping the entire corporate world and academic research trends. ESG declares a concise specification on environment, social and governance dimensions, which can be easily used to measure a company's overall sustainability performance. Thus, ESG has evolved into a broader and inclusive terminology than CSR.

ESG scores and ESG ratings, used interchangeably, are comprised of three independent pillars, which are environmental, social, and governance. ESG scores serve as a metric for assessing a company's overall sustainability performance, although the methodologies for assigning these metrics vary among different rating agencies.

In view of the influence of CSR and ESG in the context of M&A, both concepts play a pivotal role in influencing shareholder value and corporate strategy. Specifically, CSR has traditionally been considered as an approach to enhance corporate reputation and build stakeholder trust, which can be crucial during the M&A process. ESG, however, provides a more structured, quantifiable and comparable approach to assess a firm's sustainability practices. In M&A research, ESG metrics have increasingly applied to evaluate potential synergies, risks, and long-term value creation. Both the investors and acquirers often consider target ESG rating as an important signal which generate positive market reactions and long-term financial benefits. The alignment of ESG practices between the acquirer and the target could influence organizational processes and performance, leading to smoother post-merger integration and enhanced value creation (Eccles et al., 2014).

In summary, while CSR provides the foundational principles of corporate responsibility, ESG offers a more rigorous and measurable framework that is particularly useful in the context of M&A. By integrating ESG considerations into M&A strategies, companies posit for a better strategic alignment with their stakeholders and shareholders, comprehensive risk management framework, and long-term sustainability value creation.

3.2 ESG, firm value, and corporate finance performance

One of the most debated areas in ESG-related financial studies is the relationship between ESG performance and firm value or corporate financial performance. A large set of literatures

in this field have found mixed findings. Some studies suggest that ESG scores positively influence firm value, while others indicate a negative or negligible impact.

On one hand, ESG engagements are argued to create value for corporates by enhancing shareholder value. This enhancement is primarily achieved through increased cash flows, which can result from improved customer loyalty, sales, and market share growth. For instance, Weber (2008) and Xie et al. (2015) highlight that sustainable business practices can attract and retain customers, thereby boosting sales and market share. Additionally, ESG engagement can enhance employee satisfaction and engagement, which further contributes to organizational performance (In et al., 2019).

Another significant way ESG activities could enhance shareholder value is by reducing the cost of capital and associated risks. Graham et al. (2005) argued that firms with robust ESG practices often benefit from lower capital costs due to their perceived lower risk. Similarly, Martínez-Ferrero et al. (2016) found a positive correlation between CSR activities, firm reputation, and a reduction in the cost of capital, confirming that ESG initiatives can lead to financial benefits by enhancing the firm's reputation and reducing financing costs. Moreover, Both Cheng et al. (2014) and El Ghouli et al. (2011) asserted that firms with superior ESG performance could access cheaper capital financing, reducing agency cost and information asymmetry problems, hence achieve better financial performance.

Conversely, some scholars present different findings regarding the impact of ESG performance. Aouadi and Marsat (2018) concluded that higher ESG scores positively impact market value primarily for firms that receive significant attention, such as larger firms with better performance and greater press freedom, which enhances their corporate social reputation. Additionally, Mervelskemper and Streit (2017) supported the notion that high CSR activity is positively related to firm value. Their findings emphasized that this positive relationship is pronounced when capital market investors highly regard CSR efforts. Accordingly, Awaysheh et al. (2020) concluded that investors reward companies with strong CSR performance, as these engagements are perceived as indicators of better management practices and long-term sustainability. Similarly, Fride & Bassen (2015) conducted a meta-analysis of over 2200 ESG literature regarding the relationship with corporate financial performance. They found that more than 90% of the studies proved empirical evidence on a non-negative relationship between ESG performance and corporate financial performance. Notably, most of the research has proved the positive impact of ESG, and shareholder returns.

In conclusion, despite the mixed results, most research validates a positive relationship between ESG engagements and a firm's financial performance. This consensus underscores the growing recognition of ESG factors as integral to sustainable corporate success and value creation.

3.3 ESG considerations in M&A context

Despite the ESG engagement and corporate financial performance having been extensively studied in academic literature, the impact of ESG considerations on M&A has remained relatively underexplored (Gomes & Marsat, 2018).

Extant studies suggest that the predominant motive to conduct merger & acquisition transactions is to maximize firm value, where the firm value has been reflected as its equity market value, namely, shareholder value (Jense, 2001). In the context of M&A, value creation can be achieved through two primary paths: growth and synergies.

In recent years, firms engaged in M&A deals have shown a growing interest in improving their ESG ratings as both investors and management have shifted the focus to sustainability and social responsibility in corporate strategy. Meantime, a rapidly growing body of research strongly suggests that ESG scores play a crucial role in determining how investors perceive M&A motivations, process, outcomes, the short-term shareholder value creation, and the long-term financial performance in post-mergers. For instance, Deng et al., (2013) emphasizes the ESG factors are considered by investors as a positive endorsement which generate high abnormal returns and ensure the long-term shareholder value creation and operational efficiency.

Furthermore, Ferrell et al. (2016) finds that strong ESG performance can enhance firm value and mitigate the adverse effects of managerial entrenchment. This finding underscores the potential for ESG considerations to align managerial actions with shareholder interests, thereby promoting long-term value creation. Additionally, higher ESG scores may signal management's better risk management practices and greater transparency in corporate governance, which can reduce the potential risk of M&A transactions and increase investor confidence (Eccles, Ioannou, & Serafeim, 2014).

3.4 ESG and short-term shareholder return in M&A

The studies of the impact of ESG on short-term shareholder value creation in M&A events have not been addressed until recent decade. Most studies have found acquirer abnormal returns at the M&A announcements are positively associated with ESG performance.

Abnormal return is the first signal from market reaction to the M&A, it implies the impact of ESG on the acquirer's shareholder value. To date, there is few literatures studying the specific value effect from ESG to acquirer. Being the first few scholars who examine the shareholder value from target ESG perspective in an M&A setting, Aktas et al., (2011) asserts that the target

ESG performance is positively correlated with the shareholder wealth effect of acquirer in M&A. He has empirically proved that one unit increase of target rating could lead to 0.9 percent increase of abnormal return for acquirers at the M&A announcement. Furthermore, Aktas et al., (2011) also concludes that acquiring a target of better ESG performance signals the stakeholders of acquirer that the firm is committed in improving its sustainability practice and mitigating associated risks.

In a similar manner, Tampakoudis et al., (2020) evidence that the target with higher ESG ratings than its acquirer's is more likely to positively impact on the firm value after M&A. Moreover, the acquirer's own ESG score tends to improve after acquiring a high ESG target. Deng et al., (2013) declares a similar finding which suggests a positive value creation relationship between high CRS acquirers and its short-term abnormal returns at the M&A announcement.

Nonetheless, scholars present mixed findings on abnormal returns' reaction to ESG considerations. Yen & Andre (2019) share a controversial point of view. They have studied the sample of firms from emerging markets and indicated an insignificant relationship between the ESG factors and shareholder value effect. The argument is that the market investors perceive the ESG creating cost instead of producing benefit to firms, which negatively affects the market reactions at the announcement of M&A. Yen & Andre (2019) also brought forward the agency problem in affecting the relationship of ESG factors and acquirer's abnormal returns, arguing agency problems of acquirer lead to negative market reaction at M&A announcement.

In the context of short-term abnormal returns at M&A announcement, my thesis focusses on investigating the immediate market reaction of acquirer's shareholder value. To provide an understanding of previous literature within this scope, I have summarized the short-term shareholder value creation literature in table 1, table 2 and table 3 as follows. Table 1 focuses on the extant literature investigating the impact of acquirer ESG rating on acquirer's shareholder value. Table 2 summarizes the few literatures that investigate the impact of target ESG rating on acquirer's shareholder value. Table 3 includes the research that investigates relative impact from both target and acquirer ESG performance.

Table 1: The summary of the literature - impact of acquirer ESG performance on CARs

Impact from acquirer ESG performance				
Author	Scope	Sample	ESG and CARs relationship	Findings
Deng, X; Kang, JK; Low, BS, 2013	Regional	US, 1992–2007	Positive	Higher CARs realization by higher ESG acquirers
Shi, JY; Yu, CH; Li, YX, 2022	Regional cross-border	China, 2010–2018	Non-unitary	Higher CARs realization by extremely high ESG or low ESG acquirers
Hussain, T; Shams, S, 2022	International	International, 2003–2016	Positive	Acquirers with higher CSR scores than their targets experience positive CARs
Arouri, M; Gomes, M; P, K, 2019	International	International, 2004–2016	Positive	High ESG acquirers enhance shareholder value by reducing risk and improving M&A outcomes
Li, JJ; Wu, XM, 2022	Regional cross-border	China, 2010–2019	Non-unitary	higher ESG scores of acquirers are associated with positive CARs around M&A announcements
Li, MH; Lan, FQ; Zhang, F, 2019	Regional	China, 2010–2017	Irrelevant	Acquirer ESG has no significant impact on CARs and M&A premia are not reduced by higher ESG acquirer
Yen, T.; André, P., 2019	Regional	23 Emerging markets, 2008–2014	Irrelevant	Higher ESG acquirer's pre-merger can be beneficial for cross-border deals but not significant on CARs
Zhang, F; Li, MH; Zhang, ML, 2019	Regional	China, 2010–2017	Negative	Lower ESG acquirers generate higher CARs as the investors are short-term profit-oriented
Tampakoudis, I; et al., 2021	Regional	US, 2018–2020	Negative	Acquirer ESG negatively associated with CARs reflected the outweighing cost of ESG impact on economic downturn
Caiazza, S; et al., 2021	International	Hospitality sector for targets, 2000–2019	Irrelevant	Higher ESG acquirers realize long-term financial returns but are irrelevant to short-term gain.
Huang, CJ; et al., 2023	International	American acquirer, 2003–2020	Irrelevant	ESG considerations of acquirer are irrelevant to CARs generation
Zhang, TT; et al., 2022	Regional	23 developed economies, 2002–2012	Positive	Higher acquirer CARs are related to higher ESG scores of acquirers' pre-announcement

Table 2: The summary of the literature - impact of target ESG performance on CARs

Impact from target ESG performance				
Author	Scope	Sample	ESG and CARs relationship	Findings
Aktas N; de Bodt E; Cousin J; 2011	International	International, 1997–2007	Positive	Target's ESG performance is positively related to CARs of acquirers
Tong, L; Wang, HL; Xia, J, 2020	Regional	US, 2000–2012	Positive	Positive relation between the target ESG and acquirers' CARs
Wang, ZK; Lu, WJ; Liu, M, 2021	Regional	US, 1996–2007	Negative	Overinvesting of Target ESG is negatively related to CARs of acquirers

Table 3: The summary of literature - relative sustainability impact on CARs

Impact from both acquirer and target (relative sustainability)				
Author	Scope	Sample	Findings	
Hussain, T; Shams, S, 2022	International	International, 2003–2016	Acquirers with higher CSR scores than their targets experience positive CARs	
Teti, E; Dell'Acqua, A; Bonsi, P, 2022	International	International	Higher ESG score of targets than its of acquirers generate more benefit for acquirers	
Chen, C; Lu, WJ; Liu, M, 2022	Regional	US, 1995–2014	Higher ESG targets generate more shareholder gains for acquirers	
Bose, S; Minnick, K; Shams, S, 2021	International	Across 31 countries, 2006–2018	High emission targets increase cross-border CARs but acquirers with higher carbon emissions realize low CARs	
Ahmad, MF, et.al., 2023	International	Cross-border, 2011–2020	The bigger country sustainability difference between acquirer and target the greater CARs	
Doukas, JA; Zhang, RY, 2021	International	US, 1992–2017	Similarity of corporate culture between acquirer and target generate higher CARs	
Alexandridis, et al., 2022	International	23 international markets, 2004–2012	Wider divergence of ESG performance between acquirer and target generate lower CARs	

3.5 Hypothesis development

The rationale of examine ESG's shareholder wealth impact in the framework of M&A is reflected in the following aspects: Firstly, M&A is primarily unanticipated event which can potentially mitigate the reverse causality problem by using abnormal announcement returns (Deng et al.,2013). Secondly, as the predominant motive to conduct merger & acquisition transactions is to maximize firm value (Jense, 2001), the M&A creates a perfect timing which shareholder value experience dramatic change in both at the announcement and in post-merger. Hence, it creates an excellent opportunity to examine the relationship between ESG score and shareholder wealth. Third, Environment, Social and Governance, as three key elements of ESG are fundamentally intangible value of the firms, ESG score by combining all these perspectives provides a structured and measurable approach in understanding the intrinsic value of ESG target while the investors or corporates making acquisition offers.

Most prior studies focus on either the impact from acquirer ESG rating or from target on announcement returns (Aktas et al.,2011; Tampakoudis et.al., 2021; Deng et al., 2013; Tong et al., 2020; Yen & Andre, 2019). The rationale behind is mostly based on the shareholder theory and stakeholder theory. It is explained that high CSR firms tend to have more motivation to keep the reputation and commitment associated with the implicit contracts, thus the stakeholders from high CSR firms are more likely to contribute to firms' long-term development and efficiency compared to low CSR firms (Jense 2001; Jawahar et al., 2002; Freeman et al., 2004). Especially in M&A, the high CSR acquirers with strong stakeholder alignment are more likely to create higher synergy in post-merger which indirectly contribute to the positive abnormal returns at the announcement data and long-term operating performance.

Given the acquirer's ESG score playing a key determinant factor on value creation process in M&A, the extent to how the target ESG engage in firm performance can be translated as a type of intangible assets which could impact on acquirer firms' operations and long-term performance after M&A. (Gomes, 2019). Moreover, because high ESG target firms are more likely having better governance management and good relationships with stakeholders, these attributes could alleviate firm-specific risk, hence acquiring the high ESG score targets are more likely to lead to positive market reaction and better long-term operational performance (Gomes, 2019).

Based on the previous diverse studies on acquirers' shareholder value in M&A and the impact that ESG factors play on the immediate shareholder value creation on the M&A announcement, my thesis develops further the discourse by examining the impact of ESG factors from both the acquirer and target ESG scores.

In view of the ESG and shareholder value creation in M&A literature, the impact of acquirer ESG factors on short-term shareholder value creation has been extensively studied by scholars (refer to the table 1), while both target ESG and relative sustainability impact on announcement returns have been greatly underexplored (refer to the table 2). Prior research universally presents highly mixed findings with negative, positive and irrelevant relationships between ESG factors and announcement returns. Moreover, prior research has highlighted the critical need to examine the impacts from both the acquirer and target perspectives, a dual approach that is relatively underexplored compared to studies focusing solely on either acquirer or target ESG scores.

Therefore, it is both academically essential and practically feasible to develop a research framework that investigates the impact of both the ESG ratings of acquirers and ESG ratings of target. To shed light on the impact of ESG ratings from both acquirer and target, I have the primary hypothesis as follows:

H1: The ESG score of the acquirer positively impacts the acquirer's shareholder returns at the M&A announcement.

And the secondary hypothesis as follows:

H2: The ESG score of the target positively impacts the acquirer's shareholder returns at the M&A announcement.

4 DATA

Data sample collection, ESG data source, scoring system and calculation metrics are discussed in this chapter.

4.1 Sample collection

4.1.1 Data Source

Data was collected from LSEG Refinitiv database (formerly known as Refinitiv Eikon database). Refinitiv was purchased by LSEG in 2021 for \$27bn (Financial news London, 2023). To date, LSEG Refinitiv workspace is one of the most comprehensive ESG database that provides global coverage of extensive data and analytics related to sustainability and responsible investing. So far, LSEG Refinitiv has covered 90% of the global market cap, applying more than 630 different ESG metrics, with the ESG data operation history dating back to 2002 (Refinitiv, 2022).

Refinitiv (LSEG) database has been used as the primary data source in my thesis, due to its broad coverage of global merger and acquisition deals and employing a comprehensive scoring system to precisely measure the company ESG performance.

4.1.2 Data Selection Criteria

Based on my core research question and methodology, I primarily collect the merger and acquisition data from LSEG workspace. To ensure the relevance and quality of the deals related data, the following selection criteria were applied:

- Announcement date: 1.1.2009-31.12.2023
- Type of deal: public announced merger and acquisition deals
- The transaction value starts at \$1 million.
- Target market value is at least \$10 million¹.
- Geography coverage: global deals.
- The transaction is not classified as a buyback, exchange offer, or recapitalization deal, spin-off, divestiture, self-tender, repurchase deals etc.
- Ownership: The acquirer acquires more than 50% of the target's share (the transaction must involve a transition of control).
- Deal status: Completed deals.

¹ Target value is targeted at more than \$10 million due to two reasons: 1. Large deals are more likely to have substantial impacts on financial value creation of the participated firms. 2. Big target firms are more motivated in ESG considerations, hence have ESG scores available.

- Method of payment: Cash, or stocks.
- Both acquirer and target are public companies with ESG score are publicly available.
- Inclusion of companies of various industries to capture a diverse range of cases but excluding academic and public sectors.

4.1.3 Data collection and preparation

The dataset comprises event study data and M&A deals data including both ESG scores and the three pillar scores for acquirers and targets. The data collection began with using the Refinitiv LSEG deal screener to filter major deals, yielding an initial 7,379 M&A deal data points. Subsequently, additional variables such as cash and cross-border dummies, and other financial metrics were added. Due to Refinitiv LSEG's data downloading limits of 200 rows per session and five sessions per day, further filtering with these variables was necessary, resulting in 3,624 valid data points. The final step involved integrating the separated data sheets and downloading the ESG scores of both acquirers and targets.

The final cross-sectional data sample includes firm fundamental ratios, deal characteristic variables, and industry-specific variables. For the event study, daily stock prices of acquirers and market index prices for both the event window and estimation window periods were gathered from Refinitiv LSEG workspace Datastream Excel add-in. The sampling aimed to cover worldwide M&A deals, and after excluding data points with missing ESG or firm-specific data, the final sample consisted of 343 deals spanning 15 years across 30 countries.

Log transformation has been used in data trimming for several variables. In the first step of Heckman model, the acquirer market value has been treated as a control variable and has been derived from natural logarithm due to its skewness and non-normality distribution. In the second step of Heckman model, deal size has been log-transformed to get the outcome variable (CAR) predicted as accurately as possible. In all, these considerations on variable modification can improve the fit and interpretation of the regression coefficients in the outcome equation.

In this context, outliers represent genuine phenomena as large deals that have a significant impact on outcomes, thus I deliberately use raw data despite the risk of inflated variance. However, in the Heckman probit model, there are 1744 deals used for the regression. With such a big amount of data, extreme outliers' impact on the model can be omitted. Furthermore, the outliers present are not due to errors or anomalies, so winsorization is not necessary in this case. Given the purpose of my research, I have taken the non-winsorized variables because the outliers that represent large deals are critical to understanding the overall market behavior.

4.1.4 Sample description

The country distribution of the sample is displayed as follows:

Table 4: Country distribution of the sample

Country	Deals	Country	Deals
Australia	17	Japan	13
Belgium	1	Luxemburg	2
Bermuda	4	Mexico	1
Brazil	3	Netherlands	1
Canada	25	Poland	2
China	4	Singapore	1
Colombia	1	South Africa	3
Denmark	1	South Korea	1
France	14	Sweden	2
Germany	7	Switzerland	8
Guernsey	1	Taiwan	2
Hongkong	2	Thailand	1
India	2	United Arab Meirates	1
Ireland	1	United Kingdom	19
Italy	1	United States	202
Total	30		343

Sample distribution by announcement year is shown by the following table:

Table 5: Sample distribution by announcement year

Year	Deals	Proportion
2009	4	1.2%
2010	0	0.0%
2011	1	0.3%
2012	0	0.0%
2013	2	0.6%
2014	3	0.9%
2015	2	0.6%
2016	13	3.8%
2017	61	17.8%
2018	75	21.9%
2019	53	15.5%
2020	32	9.3%
2021	46	13.4%
2022	30	8.7%
2023	21	6.1%
Total	343	100.0%

The sample includes deals from both developed and emerging markets, providing a comprehensive view of M&A activity globally. However, it is notable that the United States accounts for most deals (202 out of 343). Moreover, countries such as Canada (25 deals), the United Kingdom (19 deals), and Australia (17 deals) also contribute a notable number of transactions.

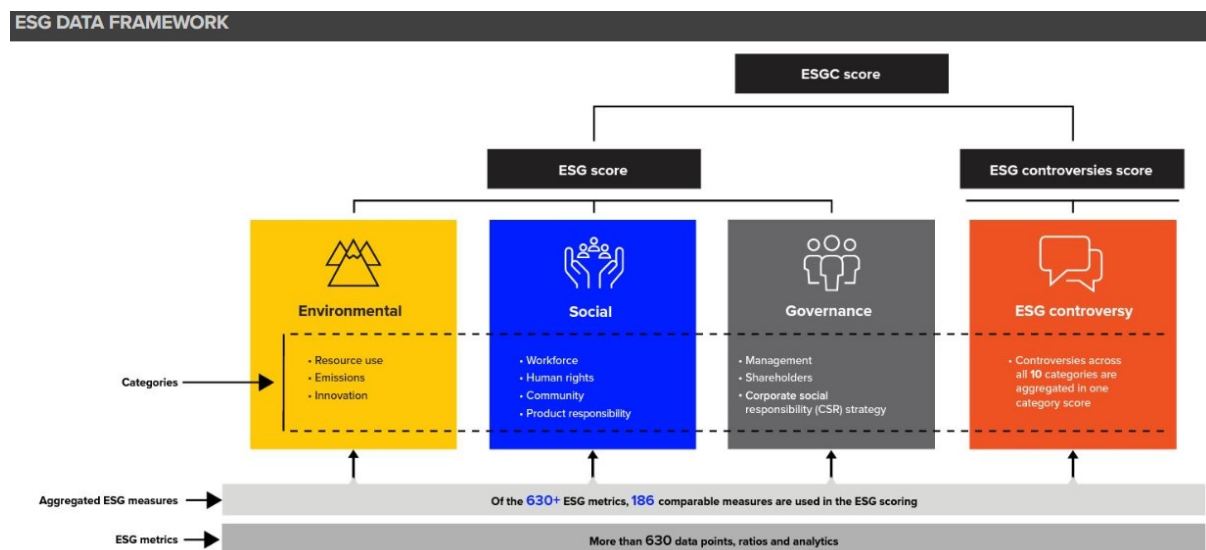
The peak M&A activity is in 2018 and 2017 (75 deals, 21.9%) and 2017 (61 deals, 17.8%). This period may reflect a boom in M&A activity, possibly driven by favorable economic conditions, regulatory changes, or strategic corporate movements. A noticeable decline in the number of deals in subsequent years, with fluctuations. For instance, there were 53 deals in 2019 (15.5%), 32 in 2020 (9.3%), 46 in 2021 (13.4%), 30 in 2022 (8.7%), and 21 in 2023 (6.1%). This decline and fluctuation could be influenced by global economic uncertainties, including the impact of the COVID-19 pandemic.

4.2 ESG measurement

4.2.1 ESG measurement and scoring method

The Refinitiv LSEG database, covers various dimensions of ESG (Environmental, Social, and Governance) measurement. While the specific details of the scoring methodology are proprietary and subject to updates, the following are commonly considered ESG dimensions, and a general description of the scoring method used in Refinitiv LSEG:

Figure 1: LSEG ESG scoring methodology



Source: Refinitiv (2022)

Environmental Dimension:

The environmental dimension focuses on assessing a company's impact on the natural environment. It includes indicators related to climate change, carbon emissions, energy usage, waste management, water consumption, pollution prevention, and resource conservation. The scoring method assigns weights to different environmental indicators based on their materiality and industry relevance. Companies are evaluated based on their environmental performance and practices, aiming to encourage sustainability and responsible resource management.

Social Dimension:

The social dimension evaluates a company's relationship with its employees, customers, stakeholders, suppliers and the whole community surrounding its business ecosystem. It includes indicators related to labor practices, diversity and inclusion, human rights, gender equality, community engagement, product safety, employee well beings, supply chain management, and customer satisfaction. The scoring method assesses social indicators based on their significance level and relevance to the company's specific industry. Companies are evaluated on their social responsibility and their ability to create positive social impacts.

Governance Dimension:

The governance dimension evaluates a company's corporate governance structures and practices, accountability, transparency and ethical standards. It includes indicators related to board composition and operation practice, executive compensation package, shareholder rights and responsibilities, anti-corruption measures, risk management, and compliance with public and industrial regulations. The scoring method considers the governance indicators' importance and relevance within its specific sector. Companies are assessed based on their governance practices, integrity, and adherence to ethical standards.

As it pertains to ESG measurement system, other than ESG, ESGC scores (ESG combined scores) belong to a separate scoring system, which provides a comprehensive and inclusive scoring metric by incorporating the ESG controversies captured from global media channels into the reported information pertaining to the ESG pillars. This scoring system aims to provide a discounted ESG performance score by incorporating the negative impact from media stories into the overall ESG score (Refinitiv 2022). Therefore, ESGC scores are out of the scope of my thesis as the research focus is to measure the impact of the company's ESG performance based on reliable and relevant data reported through the public reporting channel.

The scoring method used in Refinitiv LSEG involves assigning weights to the ESG indicators within each dimension based on their materiality and industry-specific considerations. The weights reflect the relative importance of each indicator in assessing a company's overall ESG performance. The specific algorithms and calculations for deriving the scores are proprietary

to Refinitiv, ensuring a consistent and standardized approach to measure ESG performance across companies and industries. Percentile rank score is based on the rank, and therefore is not very sensitive to outliers (Refinitiv 2022)

Equation 1: Categories score calculation methodology

$$Score = \frac{No. of companies with a worse value + \frac{No. of companies with the same value}{2}}{No. of companies with a value}$$

Source: Refinitiv. 2022

The following table indicates the ESG score range corresponding to the ESG performance level.

Table 6: LESG ESG Score Range

Refinitiv ESG Score Range		Description
0 to 25	First Quartile	This range represents a poor performance in ESG activities, indicating nontransparency ESG reporting standards and insufficient ESG data availability.
25 to 50	Second Quartile	This range represent a satisfactory ESG performance, indicating a moderate degree of transparency in ESG data availability and reporting quality.
50 to 75	Third Quartile	This range denotes a good level of ESG performance, indicating an above average performance in ESG transparency and material ESG data disclosing.
75 to 100	Fourth Quartile	This range denotes an excellent level of ESG performance and indicates a high degree of transparency in ESG data reporting and engagement.

Source: Refinitiv website

5 METHODOLOGIES

This chapter delves into the research design and methodology applied in my research. I investigate the wealth effect of ESG performance on M&A activities using firstly event study to obtain the CARs, thereafter both univariate and multivariate analyses to identify the impact from key variables.

Firstly, I estimate the announcement abnormal returns of acquirer at the event of M&A. The acquirers will be categorized into two subsamples: high ESG score group (with the ESG score from 30-100) and low ESG group (with ESG score of 0- 29). Secondly, I compare the excess return between subsample firms according to their ranking percentile of ESG score. CARs of different intervals will be investigated from different subsamples and the discrepancies are analysed.

By means of multivariate analysis, the CARs (-1,1) of acquirers are treated as dependent variable. I conduct a cross-sectional regression with the independent variable of target's ESG score and a strand of control variables that have been proved to be significant to the acquirer's shareholder value from previous literatures. Furthermore, both the ESG score and environmental, social and governance pillars will be added into the regression model to investigate the impact of different pillars on the acquirer's excess returns.

This chapter will be structured into three parts. The first part outlines the research methodology framework. In this part, the methodology framework of event study and Heckman selection model are discussed. The second part delves deeper into the model and variables that applied in the methodology and analysis. A profound analysis on the choice of model and variables is conducted. The final part will specify data collection procedure, in addition to the merger and acquisition data, a detailed description of ESG data sources and selection are included.

5.1 Research methodology framework

The methodology employs an event study to calculate CARs of the acquirers at the announcement of M&A, followed by a cross-sectional regression model with fixed effect to estimate the relationship between targeted parameters. This research follows Aktas et al., (2011) by utilizing a two-stage Heckman (1979) correction model to address and correct potential bias on target selection.

The methodology involves an event study to calculate CARs for the acquirors, followed by a two-step Heckman selection model. The first step uses a probit model to estimate the probability of a target having an ESG score, with a dummy variable for ESG score availability as the dependent variable and several control variables. The second step involves a cross-sectional regression of CARs on target ESG scores and other control variables, with fixed effects for time, industry, and country to account for unobserved heterogeneity.

5.2 Event study

The event study methodology stems from the efficient market hypothesis (EMH) theory, which states that asset prices should fully reflect all available information in the market as well as any new information reflected in asset prices, leading to random price movements around the efficient market equilibrium. Early pioneering work by Fama (1970) argued that stock prices efficiently adjust to new information, suggesting the semi-strong form of the EMH.

The first event study application in finance is introduced by Fama et al (1969) on the study of market's reaction to stock split announcements. Estimation of abnormal returns is conceptually introduced and applied at the same time. Subsequent studies have extended the application of event studies to various financial assets and events, such as CEO appointment, IPO, share repurchasing, mergers or acquisitions as well as bond markets and international markets (Mitchell et al., 1993; Elton et al., 1970; Bekaert et al., 2002).

Previous literature has explored this relationship, shedding light on how ESG considerations affect M&A outcomes and shareholder returns. Tong et al., (2020) conducted a comprehensive event study analyzing the effect of target firms' sustainability performance on acquirer shareholder wealth in M&As. Their findings indicated that target firms with strong ESG performance positively influenced acquirer returns, suggesting that ESG considerations can create value for shareholders in M&A deals.

Market model

Capital Asset Pricing Model (CAPM) or a market model have been applied as the basis for calculating expected returns in event study. These models consider the systematic risk of an asset as well as the expected return of the overall market.

Sharpe (1964) and Lintner (1969) clarified that the CAPM is an equilibrium model that a firm's expected return is derived by its covariance with the market return. The market model asserts that the expected return of an asset is in linear relationship with the return of the representative market index (MacKinlay, 1997). The following is the market model expression:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

Where β_i represents the asset-specific beta for firm i , R_{it} and R_{mt} are the day- τ returns for asset i , and market portfolio m , respectively.

Measurement of abnormal returns

The abnormal return represents the return difference between the actual stock return and predicted (expected) return. The expected return $E(R_{it})$ is the predicted value based on the market model. The formula to calculate abnormal returns is as follows:

$$AR_{it} = R_{it} - E(R_{it})$$

As I have chosen the one-factor market model as expected normal return proxy, the formula is equally as follows:

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$$

Where AR_{it} represents the abnormal return for firm i at time t , R_{it} represents the actual return for firm i at time t , and $E(R_{it})$ signifies the expected return for firm i at time t based on the chosen benchmark model.

The cumulative abnormal returns

The cumulative abnormal return (CAR) represents the aggregated abnormal stock return over the event window for each stock of firm i .

$$CAR_i(t_1, t_2) = \sum_{t_1=1}^{t_2} AR_{it}$$

Testing for significance

Patell t-test (Patell, 1976) and t-test (Mikkelson & Parth, 1988) are employed to test the statistical significance of the mean and median CARs

$$t_{patell} = \frac{ASAR_t}{\sigma^{ASAR_t}}$$

$ASAR_t$ is the average standardized abnormal return at time t

σ^{ASAR} is the standard deviation of the average standardized abnormal return, which can be computed using the variance of the SARs

$$t\text{-statistic} = \frac{\overline{CAR}}{\sigma_{CAR} / \sqrt{N}}$$

\overline{CAR} is the mean of cumulative abnormal return; σ is the standard deviation of the CARs; N is the number of securities

Event window

Following Deng et al., (2013) and Aktas et al., (2011) event study approach, I applied 11 days event windows ranging from (-5,5) to capture the information factored into the stock prices. More specifically, I apply three different event windows ranging from (-5,5), (-2,2) and (-1,1) to measure the dynamic value effect of M&A announcements.

Despite event study has been proved and widely applied in examining the market reaction on stock price at specific event, there are some limitations need to be considered.

First, the event study is based on the efficient market hypothesis (EMH) with the assumption that investors are rational and the absence of restrictions on arbitrage.

Second, the precondition of obtaining accurate market reaction is that the event must be unexpected, specifically, the movement of the price can only be attributed to the event. Hence, the stand-alone value of the firm is not influenced by other factors (Deng et al., 2013). Most important, this excludes the causality problem in M&A studies, which I will discuss in detail in the endogeneity issue part.

Finally, the market reaction may be postponed because the market and investor may need time to process the new information, thus the shareholder value is measured in the long run to take the delayed effect into account. However, long-term effect brings even more challenges as the causality problem arises and more variables come into play. In conclusion, as a well-established approach in measuring market reaction to financial events, the event study approach provides a direct and forward-looking measure of value created for shareholders.

5.3 Heckman selection model

The first step of Heckman selection uses a probit model to estimate the probability of a target having an ESG score, with a dummy variable for ESG score availability as the dependent variable and several control variables. The second step employs a cross-sectional regression of CARs on target ESG scores, acquirer ESG scores and other control variables, with fixed effects for different periods, industry, and country to account for unobserved heterogeneity.

Based on Heckman (1979) approach, the typical Heckman selection model comprises two stages. The first stage, selection equation involves estimating a probit model to derive the inverse Mills ratio, which address the selection bias (Heckman, 1976). The probit model is specified as follows:

$$Pr = (Z_i = 1 | X_i) = \Phi(X_i \gamma)$$

Z_i is the indicator variable, X_i is a vector of independent variables affecting this propensity, γ is a vector of coefficients. Φ represents the cumulative distribution function of the standard normal distribution.

From Heckman (1979), the *Inverse Mills Ratio* is as follows:

$$\lambda_i = \frac{\phi(X_i \gamma)}{\Phi(X_i \gamma)}$$

Where ϕ denotes the probability density function; Φ is the cumulative distribution function of the standard normal distribution.

This equation calculates the inverse Mills ratio, which is employed in the following outcome equation to correct for selection bias.

In the second step, the inverse Mills ratio (λ_i) is included in the primary regression as an additional variable to correct for selection bias. The model is specified as follows:

$$Y_i = X_i\beta + \lambda_i\delta + \varepsilon_i$$

Where Y_i denotes the dependent variable, X_i denotes the independent variable, λ_i represents the inverse Mills ratio, δ is the coefficient of the inverse Mills ratio and ε_i represents the error term.

5.3.1 Heckman model specification and variables selection

In the context of Mergers and Acquisitions, when selecting the targets only with ESG score available, the endogenous selection bias can occur considering the selection is not based on random basis. Specifically, my data sample has been selected by excluding the acquirers and targets without ESG score, this process may entail the tendency of bias due to firms with certain unobservable attributes have been intentionally selected. Hence, it is likely to lead to biased results when conducting multivariate regressions based on these firms' data. (Aktas et al., 2011).

To take into consideration the endogenous selection bias, my research employed the Heckman two step selection model to address and correct the selection bias, thus ensuring the validity and accuracy of the estimated results.

The application of the Heckman selection model is crucial in obtaining unbiased and consistent estimates in the analysis of M&A transactions, particularly when assessing the impact of ESG factors on acquirer performance. This methodological approach strengthens the validity of our findings and contributes to the existing literature on M&A and ESG.

5.3.2 Probit Model

The first step of Heckman selection model is a selection equation, a probit model which estimates the probability of an estimated object. The results of the of the first model are included in the second step as an inverse Mill's ratio to control of the bias. λ is the coefficient of the inverse Mills ratio (IMR) (Heckman, 1979)

In this research, the first step of Heckman mode is a probit model that estimates the likelihood of a target with available ESG score being selected randomly or not randomly. The probit model is specified as following:

Equation 2. Heckman selection equation – probit model

$$TESG_i = \text{Probit}(\text{Control Variables}_i)$$

Where TESH denotes a dummy variable taking the value of 1 when the target has an ESG score available, 0 otherwise. The control variables include logarithm transformed acquirer market value, acquirer ESG score, and horizontal dummy which is denoted as 1 when both the acquirer and target are in the same industry, otherwise 0. Us dummy variable is employed to identify the deals occurred within the United States.

By applying the same selection criteria as specified in the previous data collection part, instead of utilizing the M&A deals with both ESG scores available, I take a broader data sample of 1737 deals in total which have acquirer ESG ratings available for the probit model. The target firms include both the ones with ESG ratings and the ones without ESG ratings.

In the first step of the Heckman model, I obtain the necessary estimates to calculate Heckman's Lambda, which is the coefficient of inverse Mill's ratio (IMR). Afterwards the IMR will be applied in the second step of the Heckman model to correct the bias of sample selection.

5.3.3 Cross-sectional model with fixed effect

The second step of Heckman selection model is the outcome equation, which in my research is the cross-sectional regression model with fixed effects. By incorporating the inverse Mill's ratio in the regression, the specification is as follows:

Equation 3. Heckman outcome equation – Cross-sectional regression model

$$CAR_{i,t} = \beta_0 + tar_esg_{i,t}\beta_1 + acq_esg_{i,t}\beta_2 + deal_size_log_{i,t}\beta_3 + relative_size_{i,t}\beta_4 + acq_roa_{i,t}\beta_5 + acq_lev_{i,t}\beta_6 + cross_bor_dummy_{i,t}\beta_7 + EDB_{i,t}\beta_8 + \lambda_{i,t}\delta + \mu_t + \nu_j + \xi_k + \varepsilon_{it}$$

Where $CAR_{i,t}$ is the cumulative abnormal return for acquirer i at time t ; β_0 is the intercept term for the linear regression; $tar_esg_{i,t}$ is the ESG ratings for the target i at time t ; $acq_esg_{i,t}$ is the ESG ratings for the acquirer i at time t ; $deal_size_log_{i,t}$ is the log-transformed deal value for the

deal i at time t ; $relative_size_{i,t}$ is the ratio of deal value to the acquirer's market value for the deal i at time t ; $acq_roa_{i,t}$ is the return on asset of the acquirer i at time t ; $acq_lev_{i,t}$ is the ratio of total debt to total asset for the acquirer i at time t ; $cross_bor_dummy_{i,t}$ is the dummy variable for the deal i at time t ; $EDB_{i,t}$ is the easiness of doing business index for the deal i at time t ; $\lambda_{i,t}$ is the inverse Mill's ratio for the deal i at time t ; δ is the coefficient of the inverse Mill's ratio; μ_t represents the combined period fixed effects; ν_j represents the industry fixed effects; ξ_k represents the country fixed effects; ε_{it} is the error term.

5.4 Dependent and independent variables

The dependent variable CAR is the 3-day cumulative abnormal return of acquirers in the sample, the main independent variable is target ESG score and acquirer ESG score. In addition to these major independent variables, certain control variables are taken into consideration.

Control variables

Control variables are selected based on my model specifications and the significance that has been validated from previous literature. This part includes specification on firm specific variables, deal specific variables, dummy variables and special treatment on fixed effects. (For a summary of variable definition, please refer to Appendix A):

Firm specific variables

Acquirer market value

Krishnamurti et al., (2019) found that acquiring firm size negatively correlated with the abnormal returns, which suggests that comparing with bigger size acquirer, smaller size acquirer generate more positive CARs. Moreover, because the managers of smaller firms tend to be more thoughtful than bigger firms as the firm's resources are limited, it leads to accurate value evaluation and careful planning in M&A. Meanwhile, it is argued that a negative correlation between target size and CARs exists, suggesting that larger targets bear more information asymmetry, which increases the shareholder risk and thus reduces the CARs. Considering the previous findings,

acquirer size is one of the key independent variables. It is represented by acquirer's market value one month prior to the M&A announcement.

Acquirers return on asset

Return on assets is the primary measure of firm profitability performance. Some findings prove the negative relationship between the acquirer's ROA and the CARs (Wang et al. 2021), while others argue the low profitability targets could generate higher shareholder value as being undervalued (Gorton et al. 2009) or will experience higher growth opportunities (Rau et al. 1998). Extant previous literature control for acquirer profitability (Yen and Andre', 2019; Tampakoudis et al. 2021; Wang et al., 2021). In this thesis, the return on assets is measured by dividing the firm's net income with the firm's book value of total assets one year prior to the M&A announcement.

Acquirer leverage

Acquirers with higher leverage ratios are expected to obtain higher CARs, resulting from reducing agency problems from better governance (Maloney et al.1993). In addition, investors and market perceive that high ESG score firms are better at risk-mitigating, which brings the firm easy access to debt financing compared with low ESG score firms (Goss & Robers 2011). This paper makes leverage ratio out of the total liabilities divided by total assets.

Deal specific variables

Deal size

According to Aktas et al., (2011), the deal size is valuable metric in understanding the impact of deal's value on the acquirer's abnormal returns in post-merger. Deal size typically negatively impact on the acquirer's abnormal return due to that bigger deals receive more regulatory scrutiny and market attention (Moeller, Schlingemann, & Stulz, 2004). Following Aktas et al., (2011)'s methodology, this paper takes the natural logarithm of deal value as a proxy for deal size.

Relative size

Relative deal size, defined as the total deal value divided by acquirer's market value 4 weeks prior to announcement, appears in the first instance to be positively related to CARS. However, Moeller et al., (2004) finds that big acquiring firms making acquisition tend to negatively correlate with

CARs, especially when the target is public. These findings imply that the increased complexity and risk of integrating larger transactions relative to the size of the acquirer might lead to negative market reactions in M&A.

Dummy variables

Cash Dummy

The method of payment boils down to the financing structure of acquirers and the incentives of management towards the target firm's value. Mayers and Majluf (1984) find that full cash-funded transactions convey the management's perception that the firm is undervalued, resulting from asymmetric information. Conventionally, managers are motivated to issue shares when they believe that the shares are overpriced by the market. Therefore, all-stock fund deals send signals towards the investors leading them to react negatively. Due to adverse selection problems, the firm's share price declined (Myers and Majluf, 1984). Contrarily, the market interprets all-cash offers as a positive signal that the acquiring company is obtaining an underpriced target, thus all-cash deals generate higher returns to the acquiring shareholders (Travlos, 1987). In this study, cash is treated as a dummy variable with the value of 1 if the deal is paid entirely by cash and 0 otherwise.

Cross border deals dummy

It is argued that cross-border transactions entail an increased risk and uncertainty due to the information asymmetry in the transactions (Yen and Andre 2019). For instance, some scholars find empirical evidence that firms operating in US acquiring international targets result in lower CARs relative to domestic transactions. However, Moeller et al., (2005) argues that if the acquirer with better ESG performance relative to targets, the additional benefit is generated by positive spillovers flowing from acquirer to target's shareholder (Moeller et al. 2005). In this thesis, cross-border variable is treated as dummy variable with the value of 0 if both target and acquirer's headquarters are in the same country, and 1 otherwise.

Fixed effects

Fixed effects have been employed in my model to control unobserved heterogeneity and eliminate omitted variable bias.

Different countries have varying regulatory policies, market dynamics as well as corporate governance practices. I include country fixed effects into the model to capture these unobservable factors that might influence the abnormal returns of acquirer.

The research is situated within the time span of 15 years with the broader context of evolving ESG factors, market dynamics and economic environment in M&A decision making. To effectively capture the temporal dynamics and the varying significance of ESG factors over time, I employ the cross-sectional regression model with fixed effects, incorporating two distinct periods to represent different economic and market conditions.

The fifteen years span has been divided into two periods to facilitate regression analysis and mitigate the multicollinearity problem. From 2009 to 2015, the period captures the recovery from the financial crisis, market stabilization, and the beginning of ESG awareness. ESG considerations were emerging but not uniformly integrated into M&A decision-making processes. By grouping these years, I analyze how the initial stages of ESG integration influenced M&A returns in a recovering market.

On the contrary, the period from 2016 to 2023 captures a more mature phase of ESG integration, the pre-pandemic economic growth, the pandemic impact, and the subsequent heightened focus on ESG factors. With ESG becoming more integrated into corporate strategies and investor priorities, the impact on M&A returns is expected to be more pronounced. This grouping reflects the significant evolution in how ESG factors influence M&A activities and acquiror returns, providing a comprehensive view of the mature phase of ESG integration.

Incorporating fixed effects for these two distinct periods in the cross-sectional regression model helps control unobserved heterogeneity that may vary across different time frames. This approach ensures that the analysis accounts for the underlying economic conditions and market dynamics that differ between the two periods.

5.5 Diagnostic and robustness check

5.5.1 Diagnostic check and robustness check

A series of diagnostic checks and robustness tests have been applied to ensure the reliability and validity of the findings from my regression models. To excluding non-normality, multicollinearity and homoskedasticity, model diagnostic tests for both probit model and cross-sectional

regression including Shapiro-Wilk W test, Breusch-Pagan test, correlation matrix and variance inflation factors (VIF) will be conducted.

The robustness check includes two parts. For event study, sensitivity analysis of different event windows and estimation windows are conducted. Moreover, CARs will be tested by conducting event study with alternative market adjusted model, market proxies, and subsamples. For cross-sectional regression with fixed effects, the robustness tests include alternative regression model OLS with and without fixed effect, regression with different CARs, Bootstrapping and robust standard errors.

5.5.2 Endogeneity issue

This research has taken consideration of endogeneity problem from the following aspects:

Firstly, by employing the Heckman two step selection model, my research addresses and corrects the selection bias of non-random selection of M&A targets. Moreover, by controlling the variables that influence the likelihood of being selected as a target, this method also partially addresses the inverse causality issue.

Secondly, in the cross-sectional regression, a shorter event window CAR (-1,1) has been applied as dependent variable, mitigating endogeneity because it limits the time during which external factors can influence abnormal returns.

Thirdly, another common source of endogeneity arises from omitted variable bias, where unobserved factors that vary across industries, countries, or over time influence both the independent and dependent variables. This can lead to biased and inconsistent estimates. To address this concern, I applied fixed effects in the cross-sectional regression, controlling for industry, country, and time variables.

Finally, reverse causality has been considered as another reason that arises endogeneity concern. In my research, the inverse causality problem could arise if there are unobservable factors that influence both the likelihood of an M&A deal and the ESG scores of the firms involved. However, as mergers are mostly unanticipated events in nature and applying the announcement return as it reflects the market immediate response to M&A, this research has greatly mitigated the reverse causality problem (Deng et al., 2013).

6 RESULTS AND ANALYSIS

Results and analysis from the event study and cross-sectional regression with fixed effects are presented in this chapter. The Heckman selection model has been employed to ensure the regression is not biased as the acquirer might selectively choose the targets with ESG ratings available. Because the Heckman selection model includes one probit model and one cross-sectional regression model, the diagnostic test will be conducted separately before the regression. In the end, the chapter finalizes with robustness test separately for event study and cross-sectional regression.

6.1 Descriptive statistics

Given the presence of extreme outliers or skewed distribution to certain regressors, I have employed log transformation as the technique to mitigate their impact and ensure the validation in the later regression analysis. The variables applied for both Heckman two-step selection models are presented as follows.

Table 7: Summary statistics of Heckman two step selection model variables

Variables	Obs	Mean	Median	Std.Dev	Min	Max
CAR	343	-0.02	-0.02	0.08	-0.39	0.33
Target ESG	343	34.99	31.65	18.41	4.69	88.93
Acquiror ESG	343	52.39	53.84	22.40	4.95	92.06
Acquiror ROA	343	0.06	0.06	0.08	-0.50	0.57
Acquiror leverage	343	0.27	0.15	0.44	0	5.69
Relative size	343	0.41	0.29	0.48	0	4.51
Deal size	343	8.08	8.05	1.44	3.05	11.89
Cash dummy	343	0.38	0	0.49	0	1
Cross border dummy	343	0.29	0	0.45	0	1

Probit model (Heckman selection equation)						
Variables	Obs	Mean	Median	Std.Dev	Min	Max
Target ESG dummy	1748	0.20	0	0.40	0	1
Acquiror ESG	1748	49.48	50.01	21.70	3.47	92.06
Acquiror size	1748	8.90	8.82	1.79	2.65	19.39
Horizontal dummy	1748	0.75	1	0.43	0	1
US dummy	1748	0.45	0	0.50	0	1

CAR has a mean of -0.02 and a standard deviation of 0.08, indicating slight negative abnormal returns on average with some variability. The mean ESG score for target firms is 34.99 with a standard deviation of 18.41. Acquirer ESG scores are higher on average (mean = 52.39) with substantial variability (std.dev = 22.40). The mean ROA for acquirers is 0.06, with some firms exhibiting negative returns (min = -0.50). Based on previous studies such as Gompers et al. (2003) have shown that higher ROA is associated with better firm performance, which aligns with the mean value observed. However, this variability suggests differing operational efficiencies among acquirers. The mean of relative size is 0.41, with considerable variation (std.dev = 0.48). It is noteworthy that larger relative deal sizes often indicate higher integration challenges. Moeller et al. (2004) found that larger deals tend to destroy value for the acquiring firm, which might explain the significant variability observed.

Figure 2: Histogram of Acquiror ESG score

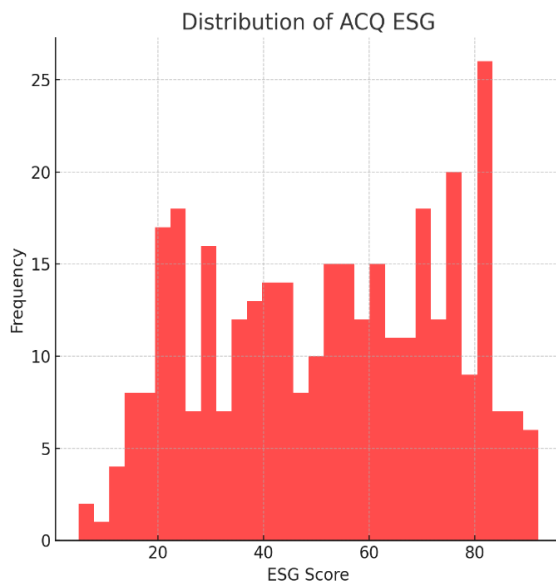
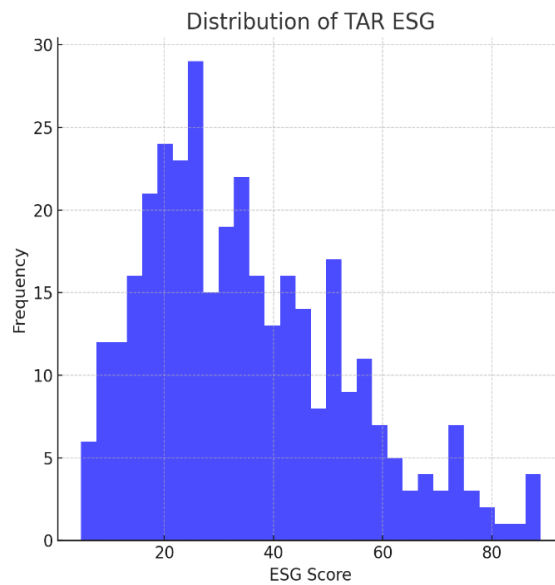


Figure 3: Histogram of Target ESG score



ACQ ESG (Acquirer's ESG Score) distribution demonstrates relatively uniform, with some peaks in both lower and higher score. A few noticeable spikes appear at the higher end around the score of 80-85. This pattern suggests that acquirers on average have diverse range of ESG scores clustering at higher values compared with target ESG score clustering at lower values. Higher ESG Acquirers tend to have higher ESG scores suggests that firms with robust ESG practices are more likely to engage in acquisitions. This finding supports the notion that high-ESG acquirers may be leveraging their strong ESG credentials as part of their growth strategy.

TAR ESG (Target's ESG Score) distribution appears skewed to the lower score. The frequency declines as the ESG score increases, with fewer firms achieving high scores above 60. This pattern indicates that many target firms have lower ESG scores, which could suggest that firms with lower ESG performance are more likely to become acquisition targets.

In view of the characteristics of acquirer and target's ESG scores, further implications can be concluded as following: Primarily, the tendency that more acquirers than targets obtain higher ESG score indicates that high-ESG acquirers may seek to acquire firms with lower ESG scores to create value through improved ESG practices. This can lead to synergy after mergers, operational efficiencies, better risk management practice, and enhanced reputations.

However, on the other hand, this market pattern could imply that investors perceive that lower ESG scores are more likely to be undervalued, indicating additional value-added opportunity for acquirers. Given industry characteristics being taken into consideration, certain industries with inherently lower ESG scores might be more prone to be taken by acquirers.

Moreover, the observed patterns suggest a market trend where ESG is becoming a critical factor in M&A activities. Firms with strong ESG credentials are not only better positioned to acquire but may also use acquisitions to drive broader ESG improvements across industries.

Industry specific perspective provides an angle in analyzing the industrial landscape of target ESG distribution. Following table presents descriptive statistics of target ESG score distribution across industries:

Table 8: Target ESG score distribution across industries

Target Industry	Obs	Mean	Std.Dev	Min	Max
Consumer Products and Services	13	37.76	23.00	10.09	86.36
Consumer Staples	14	42.45	24.06	7.7	83.98
Energy and Power	50	28.50	14.77	6.77	62.73
Financials	7	31.20	14.09	18.42	58.06
Healthcare	47	31.36	15.93	9.69	78.63
High Technology	50	34.25	14.87	6.77	71.28
Industrials	38	36.40	21.14	6.77	86.36
Materials	38	39.33	22.40	7.2	86.36
Media and Entertainment	26	37.78	19.68	8.01	86.36
Real Estate	37	37.00	15.49	14.43	74.03
Retail	12	38.03	20.18	12.78	74.16
Telecommunications	11	36.33	19.95	12.99	68.89

Crucially, there are the following pattern presented from the distribution: Consumer Staples and High Technology industries targets have high average ESG scores, suggesting that firms within these sectors may prioritize sustainability more than others. This could be due to consumer pressure and regulatory requirements.

Energy and Power industries are characterized as the targets with lower ESG scores, reflecting challenges related to environmental impact and sustainability. Acquirers in this sector may see opportunities to improve ESG performance post-acquisition.

Healthcare and Financials industries with moderate ESG scores, indicating ongoing efforts but also highlight potential areas for improvement. Acquirers in these industries may focus on integrating better ESG practices to enhance overall firm value in a long-term operational plan after M&A.

Similarly, following table presents descriptive statistics of acquirer ESG score distribution across industries:

Table 9: Acquirer ESG score distribution across industries

Acquirer Industry	Obs	Mean	Std.Dev	Min	Max
Consumer Products and Services	13	55.94	23.10	15.55	85.66
Consumer Staples	15	60.21	25.02	4.95	87.8
Energy and Power	47	48.21	20.73	15.02	82.9
Financials	8	33.16	24.33	14.62	72.19
Healthcare	49	63.59	22.69	15.29	92.06
High Technology	46	51.47	20.49	6.71	91.29
Industrials	38	50.22	19.25	19.27	82.09
Materials	42	54.62	21.64	18.71	90.22
Media and Entertainment	26	39.70	20.98	11.05	86.15
Real Estate	37	49.48	22.50	10.87	86.67
Retail	13	56.39	19.79	21.38	80.7
Telecommunications	9	58.60	26.45	10.32	83.24

Healthcare and consumer staples with the high average ESG scores of 63.59 and 60.21 respectively, suggesting that firms in these industries may be more committed to sustainable practices and investor confidence in the long-term value creation after M&A.

It is noteworthy that acquirers with high ESG scores are likely leveraging their strong sustainability practices to acquire firms with lower ESG scores, particularly in industries like Energy and Power, where ESG challenges are more pronounced. This strategy not only enhances

the acquirer's ESG profile but also contributes to broader industry-wide improvements in sustainability practices.

In general, the overall ESG score distribution shows that acquirer has on average higher ESG scores across all industries than target, suggesting that investors prioritize the acquirer's ESG performance over the target's ESG scores in most industries.

6.2 Analysis of CARs from event study

In this section, I examine the univariate analysis of the impact of ESG scores on the acquiror's cumulative abnormal returns (CARs) during mergers and acquisitions (M&A) events. The analysis is conducted over three different event windows: CAR (-1,1), CAR (-2,2), and CAR (-5,5). This analysis provides a preliminary understanding of the distribution and tendency of the CARs with the full sample and within each subsample. The results present an initial abnormal return pattern to further understand the relationship with other variables at play.

Table 10: Acquiror Abnormal Returns (CARs)

	Full sample F (N=343)		Subsample high ESG targets H (N=176)		Subsample low ESG targets L (N=167)				
	Mean	Median	Mean	Median	Mean	Median			
CAR (-1,1)	-2.25%	***	-1.55%	-2.76%	***	-2.43%	-1.71%	**	-1.07%
CAR (-2,2)	-1.94%	***	-1.37%	-2.77%	***	-1.95%	-1.06%		-0.21%
CAR (-5,5)	-1.87%	***	-1.81%	-3.01%	***	-3.55%	-0.67%		-0.15%

***, ** and * represent the 1%, 5% and 10% significance level respectively.

For the entire sample of 343 M&A deals, the mean CARs are consistently negative across all event windows. Specifically, the mean CARs for the windows CAR (-1,1), CAR (-2,2), and CAR (-5,5) are -2.25%, -1.94%, and -1.87%, respectively with 1% statistical significance. The result indicates a significant negative market reaction to M&A announcements overall across different samples.

Furthermore, as there are few literatures investigate from the target ESG score perspective on CARs, I purposely set up subsample based on target ESG scores. The subsample of high ESG targets (N=176) shows even more pronounced negative CARs compared to both the full sample (N= 343) and the low ESG targets (N=167). With the media CARs results being statistically significant at the 1% level, it indicates a robust negative market response to acquisitions of high ESG targets. On the contrary, with less pronounced negative CARs and less significant levels, the

low ESG target group suggests that the market reacts less negatively to M&A deals involving low ESG targets.

The results of the univariate analysis suggest that the ESG scores of target companies have a significant negative impact on the acquiror's announcement returns at the M&A events. Specifically, acquisitions of high ESG targets are associated with significantly more negative market reactions compared to acquisitions of low ESG targets. This could indicate that the market perceives higher ESG targets as potentially riskier or as involving higher integration costs, leading to more negative CARs for the acquirors. This finding highlights the importance of considering target ESG scores in the context of M&A deals and their potential impact on shareholder value. These findings set the stage for further multivariate analysis to understand the drivers behind these patterns and to control for other potential confounding factors.

6.3 Bivariate analysis

This part examines correlations between different variables. High correlations between independent variables can indicate multicollinearity, which can increase standard errors and make coefficient estimates inaccurate. Hence, I conducted the Pearson correlation test.

Table 11: Pearson correlation matrix of variables

	1)	2)	3)	4)	5)	6)	7)	8)	9)
1) CAR	1								
2) Target ESG	-0.04	1							
3) Acquiror ESG	0.08	0.25***	1						
4) Deal size	-0.06	0.33***	0.33***	1					
5) Relative size	-0.05	0.14***	-0.27***	0.20***	1				
6) Acquiror ROA	-0.08	0.09*	0.14***	0.13**	-0.10*	1			
7) Acquiror leverage	0.02	0.06	-0.27***	0.08	0.33***	-0.03	1		
8) Cash dummy	0.11*	-0.05	0.21***	-0.13**	-0.28***	0.16***	-0.22***	1	
9) Cross border dummy	-0.03	0.14***	0.12**	-0.07	-0.05	-0.01	-0.05	0.23***	1

***, ** and * denote the 1%, 5% and 10% significance level respectively.

Target ESG and acquiror's CAR (-1,1) has the coefficient of -0.04 with non-significant relationship, indicating no significant relationship. This finding is in line with some of the prior research. For instance, Goss & Roberts (2011) found that high ESG targets might entail higher costs and integration challenges, potentially leading to negative market reactions. This could be one of the reasons that target ESG, and acquirer CAR are negatively related.

Acquiror ESG and acquiror's CAR (-1,1) is positively correlated with coefficient of 0.08 with non-significant relationship, suggesting other factors may also play a crucial role.

Deal Size and CAR (-1,1) are negatively associated on non-significance level, suggesting other deal specific or market condition might at play. It is also indicated by previous findings that larger deals can be associated with higher risks and integration challenges, leading to negative market reactions (Moeller et al., 2004).

Relative Size and CAR (-1,1) are negatively associated on non-significant level. Previous literature concluded that larger relative size deals reflect positive market reactions, shown by positive abnormal returns (Alexandridis, Petmezas, and Travlos, 2010). This relationship is not reflected in this study might because that my thesis has set a high threshold of \$100 million for the target size might filter out smaller deals where the relative size effect is more pronounced. Moreover, larger size deals entail different dynamics and post-merger challenges in synergy, hence will dilute the relative size effect.

Acquiror ROA and CAR (-1,1) are negatively related with no significant relationship. Previous findings have proved that higher ROA indicates better operational efficiency, which reflects positive market reactions and creates abnormal returns (Harford, 2005). In this context, the lack of a significant correlation here might suggest that other factors mediate this relationship.

Cash Dummy is positively correlated with CAR with marginally significant level. This result is in line with previous findings that deals financed with cash are often viewed more favorably by the market due to the perceived certainty and lower risk compared to stock-financed deals (Travlos, 1987). The marginal significance supports the idea that cash-financed deals might have a slight positive impact on acquiror abnormal returns.

Cross-Border Dummy is negatively associated with CAR without significance relationship. The result is aligned with previous findings that cross-border deals bring more complexity to the study due to cultural and regulatory differences, hence the market reactions are mixed. (Conn, Cosh, Guest, & Hughes, 2005). Due to the interaction of different deal and firm specific variables, the

cross-border status alone does not significantly impact CAR in this sample, it is critical to evaluate with other factors in the model.

Importantly, a few positive and significant correlations are worth noticing. Firstly, the positive and significant correlations between acquirer ESG and deal size suggest that larger deals are associated with higher acquirer ESG scores. This finding confirms that bigger acquirers with strong ESG credentials are not only focusing on improving their own ESG ratings, but seeking to drive the ESG improvement through M&A.

Despite some significant correlations, the overall low correlation suggests that the variables are suitable for inclusion in the regression model without severe multicollinearity.

6.4 Multivariate regression Results

This section presents the results of the cross-sectional regression analysis with fixed effects, conducted as the second step of the Heckman selection model. The primary focus is on examining the impact of target ESG scores on the acquirer's CARs during M&A. The model includes various control variables and fixed effects for industry, country, and year to account for unobserved heterogeneity.

6.4.1 Diagnostic test

Diagnostic tests are conducted separately on each step of Heckman two-step selection model.

Probit regression diagnostic test

In this part, three diagnostic tests are employed to validate the assumptions underlying the probit regression model, ensuring the robustness and reliability of the estimated coefficients.

Variance Inflation Factor Test (VIF)

Following the Pearson correlation matrix in previous section, VIF test has been executed to detect multicollinearity. Even though the healthcare and materials industry have shown a slightly high tendency of multicollinearity of above 4, the mean VIF remains at 2.37, which is well below the threshold of 5, suggesting that multicollinearity is not a significant issue across the variables.

Linktest

The results show that the model is statistically significant overall, optimistically indicating that the predictors collectively explain a significant portion of the variance in the probability of a target having an ESG score. However, the pseudo R² value suggests that while significant, the model explains a modest amount (about 9.59%) of the variance in TESH.

The predicted Value (\hat{y}) has a coefficient of 0.79 with a high significant level, indicating that the model explains a significant amount of variation in the dependent variable (TESG). However, \hat{y}^2 the predicted value squared (\hat{y}^2) has a coefficient of -0.22 with significance at 5% significance level. This result suggests that the model may have some specification errors. This indicates potential non-linearity or omitted variable bias. In the probit model, as the primary goal of correcting selection bias seems to be met, minor misspecifications can be tolerated if the overall conclusions are robust and align with economic theory. Therefore, to ensure the robustness of the model and the reliability of the results, I conduct several robustness tests with robust standard errors later in this chapter.

Hosmer-Lemeshow Test

Based on the results of goodness-of-fit test, the probit model is a good fit. The high p-value (0.5422) of chi-square statistic suggests that the discrepancies between the observed and expected frequencies are not statistically significant, implying that the model adequately captures the relationship between the independent variables and the probability of a target having an ESG score. (For the details of diagnostic tests, please refer to Appendix B)

Cross-sectional regression diagnostic test

Before the final regression, model diagnostic tests on multicollinearity, normality distribution of residuals, heteroskedasticity and model specification are conducted to ensure the reliability of results.

Variance Inflation Factor Test (VIF)

Country dummy US appears a high VIF value of 6.89, indicating the potential high possibility that US dummy is overlapped with other country variables. In this case, Stata automatically omits one

dummy variable from the country to prevent perfect multicollinearity and avoid dummy variable trap.

In general, all the other variables demonstrate a VIF value below 5, indicating a low to moderate multicollinearity. Especially, with the mean VIF of 2.03, it confirms that the overall multicollinearity of my model is low.

Shapiro-Wilk Test & Histogram, Q-Q Plot

The Shapiro-Wilk test is conducted to ensure the residuals of the cross-sectional model are normally distributed. Despite that the results of Shapiro-wilk test indicate that the residuals are not normally distributed, the results of regression should be reliable due to the following justifications:

Chiefly, the normality distribution is essential in simple OLS regression. However, in my thesis, the main objective in applying Heckman two-step selection model is to address and correct the selection bias which may lead to biased estimation. Given that the selection equation (probit model) in the first stage has been correctly specified, the normal distribution of residuals in the second regression is not that critical.

Moreover, based on Heckman selection model assumptions, the errors of the selection and outcome equations are jointly normally distributed. Hence, non-normal residuals in the outcome equation can affect the efficiency of the estimators but do not necessarily bias the results. Therefore, further adjustments are not necessary.

Nonetheless, to mitigate the impact of non-normality, I have applied the robust standard errors in robustness check later in this chapter.

Breusch-Pagan Test

Breusch-Pagan test is employed to check heteroskedasticity. The result is shown that there is no strong evidence of heteroskedasticity in residuals.

Ramsey RESET test

The result of Ramsey RESET test indicates p-value of 0.6183, suggesting that there are no omitted variables in the model. This result confirms that validity and reliability of model specification, given the research context and data. (For more details of diagnostic tests results, please refer to appendix C)

6.4.2 Regression analysis

This section delves into the regression analysis by employing a two-step Heckman selection model to address potential selection bias on targets. Considering that the selection of targets with ESG scores may not be random, this approach helps to correct for any endogenous selection process, therefore providing more robust estimates of the impact of target ESG scores on acquiror's cumulative abnormal returns (CARs).

Probit model (selection equation)

Based on Aktas et al., (2011) approach, the probit model has been applied as selection equation on the first stage of Heckman selection model. The results of selection equation are as following:

Table 12: Probit model

Panel A: Probit model (Heckman's first step)			
Dependent variable TESG	Coef.		p > z
Control variables			
Acquiror size	0.21	***	0.00
Acquiror ESG	-0.003		0.13
Horizontal dummy	0.24	***	0.009
US dummy	0.31	***	0.00
Industry			
Consumer staples	0.07		0.79
Energy and power	0.05		0.81
Financials	-0.01		0.96
Healthcare	-0.39	*	0.05
High tech	-0.21		0.3
Industrials	-0.11		0.61
Materials	-0.001		1.00
Media and entertain	0.55	**	0.02
Real estate	0.47	**	0.03
Retail	-0.01		1.00
Telecommunications	-0.34		0.2
_cons	-2.92	***	0.00
Observations	1744		
Log likelihood	-794.518		
LR chi2(15)	153.14		
Prob > chi2	0		
Pseudo	0.0879		

***, ** and * represent the 1%, 5% and 10% significance level respectively.

The results of probit model highlighted the following points:

Acquiror size has the coefficient = 0.21 with a significance level of $p < 0.001$ implies that larger acquirors are significantly more likely to target firms with available ESG scores. It implies that larger acquirors may prioritize ESG transparency in their acquisition strategies as they have more motivation and strategic ambitions on ESG commitment.

Acquirer ESG score has a negative insignificant effect (-0.003, $p=0.13$) implying that the ESG score of acquirers does not significantly influence their decision in selecting targets.

Horizontal acquisitions (the acquisition of the same industry) positively influence the selection decision of target, indicating that firms prefer the acquisition within their own industry field, which potentially generates more synergy after mergers.

US deal dummy has the positive coefficient of 0.31 with high significance level of $p < 0.001$, suggesting that the US acquirors are more likely to select targets with available ESG scores. This pattern may reflect higher ESG reporting standards or investor expectation for ESG disclosure in the US market.

Some industries are noteworthy, such as Media and entertainment industry appears a high significance level, suggesting that firms in this industry are more likely to have ESG scores available. To further imply, it might be due to the high exposure to public scrutiny and nature of high visibility of the industry. Similarly, the healthcare and real estate industries indicate a high level of significance, potentially implying the increasing regulatory requirements in these sectors as well as the high standard operational priorities.

To conclude, by indicating the high significance of acquirer size, horizontal and US dummies in affecting the selection decision of targets, the results underscore the importance of considering these factors to eliminate the selection bias. Moreover, by identifying and correcting this bias, the second step of Heckman model could provide reliable and valid estimation in understanding the ESG factor contributions from both acquirer and target on the M&A outcomes.

Multivariate regression analysis (outcome equation)

The result of cross-sectional regression analysis is as following:

Table 13: Cross-sectional regression analysis results

Panel B: Cross-sectional regression (Heckman's second step)			
Dependent variable CAR			
Independent variable	Coef.		p > z
Target ESG	-0.0002		0.51
Acquiror ESG	0.001	**	0.02
Deal size	-0.01	**	0.04
Relative size	0.01		0.70
Acquiror ROA	-0.11	**	0.04
Acquiror leverage	0.02	**	0.04
Cash dummy	0.02		0.15
Cross border dummy	-0.03	**	0.01
_cons	0.13		0.14
Industry			
Consumer staples	0.03		0.31
Energy and power	0.03		0.27
Financials	0.06		0.11
Healthcare	0.04		0.18
High tech	0.05	*	0.06
Industrials	0.04		0.13
Materials	0.01		0.67
Media and entertain	0.01		0.67
Real estate	-0.01		0.68
Retail	0.06	*	0.07
Telecommunications	0.03		0.50
Country			
Brazil	0.12	**	0.02
Thailand	-0.22	**	0.01
Heckman's lambda	-0.06	*	0.05
Country fixed effects	Yes		
Industry fixed effects	Yes		
Period fixed effects	Yes		
Observations	343		
Wald chi2 (49)	69.94		
Prob > chi2	0.03		
Rho	-0.69		
sigma	0.09		

***, ** and * denote the 1%, 5% and 10% significance level respectively.

Key findings of ESG factors impact on Acquirer's CARs

The results from table 11 show that the target ESG score has the coefficient of -0.0002 with non-significant (p=0.51) impact on the acquirer's announcement return, while acquirer ESG score

instead demonstrates positive significant impact with the coefficient of 0.001, ($p=0.02$) on the acquirer abnormal return.

This finding aligns with previous literature (Deng et al., 2013; Tampakoudis and Anagnostopoulou, 2020; Gomes and Marsat, 2018) suggesting the investor's positive view and market recognition of the value of ESG scores on short-term shareholder value creation.

The log transformed deal size has a negative coefficient (-0.1) significant at the 5% level ($p = 0.04$), indicating that larger deals tend to be associated with lower announcement returns. This could be caused by the market's concern about integration risks and the ability to realize synergies in larger transactions after M&A. In contrast, relative size (the ratio of deal size and acquirer's market value) is non-significant ($p = 0.76$), suggesting no direct impact on CARs.

In addition to the key independent variables, two firm financial characteristic variables demonstrate correlations from different directions. On the one hand, acquirer return on asset shows a negative coefficient (-0.11) with significance ($p=0.04$), suggesting that acquirors with higher return on assets might experience slightly lower announcement returns. On the other hand, acquiror leverage shows a positive coefficient (0.02) with high significant level ($p=0.04$), indicating that more leveraged acquirors tend to have higher announcement returns. These findings confirm the concern about overpaid deals due to the higher target ESG score and the market positive reactions to the leveraged firms due to its potential growth perspective.

Cash dummy appears non-significant implying no influence on announcement returns, while cross-border deals demonstrate the negative impact with a coefficient of -0.03 on a significant level of $p = 0.02$. This finding suggests that cross-border acquisitions generate negative impact on acquirer abnormal returns, which could be attributed to additional complexities, different regulations and geopolitical risks associated with international transactions.

Industry and Country Fixed Effects

The inclusion of industry, country and period fixed effects controls for unobserved heterogeneity. While the majority industry and country coefficients are not statistically significant, some notable observations provide meaningful insights:

Retail Industry is entailed with a positive coefficient (0.06) with marginally significance ($p = 0.07$), potentially reflecting market positive reactions on consolidation opportunities in the retail sector.

High-tech industry shows a positive coefficient with marginal significance just above $p = 0.05$ reflecting other factors that might influence the abnormal returns but not captured in the model. In addition, it highlights the potential concerns about the uncertainty and risks associated with market and transactions.

The country fixed effects reflect the following countries' impact on the announcement returns. Brazil has demonstrated a negative coefficient (-0.12) with significance ($p = 0.02$), indicating higher announcement returns for acquirors engaging in deals involving Brazil targets. It further implies the potential positive perceptions on operation synergies. Thailand has been captured with a significant negative impact (-0.22, $p = 0.01$) on the announcement returns, highlighting its country-related risks adversely affect acquiror returns.

Inverse Mills Ratio

A negative coefficient of -0.06 for Heckman's lambda indicates that unobserved factors affecting the selection equation are negatively correlated with the residuals of the outcome equation. It further implies that there are certain unobserved factors adversely affecting the firms in obtaining ESG scores.

With a significance level of $p = 0.05$, it confirms that the necessity in employing Heckman selection model to correct the bias. The correction will be tested and analyzed in the following robustness test.

To conclude, the results support several findings aligned with previous literature but also outlined the discrepancies to previous findings:

1. The positive impact of acquiror ESG scores on announcement returns aligns with studies highlighting the value investors place on sustainability practices, leading to positive market reactions. This suggests that firms with strong ESG credentials are viewed favorably in the context of acquisitions.
2. The lack of significant impact of target ESG scores on acquiror announcement returns cast different opinions than prior literature (Aktas et al., 2011). This discrepancy could be due to varying market perceptions of ESG value across different contexts and time periods.

3. The negative impact of deal size and cross-border transactions on announcement returns underscores the complexity and risk associated with large and international deals, this finding is consistent with existing literature on M&A performance.

6.5 Robustness check

The robustness check part is composed of two parts. The first part focuses on the robustness test of event study, while the second part is dedicated to the robustness test of Heckman two-step selection model.

In the beginning of this chapter, the diagnostic tests (linktest and Shapiro-Wilk Test) have disclosed potential risks in model misspecification (the probit regression) and non-normality distribution of residuals (the cross-sectional regression). Therefore, I conducted the following robustness tests, especially with robust standard errors to ensure the validity and reliability of results.²

6.5.1 Robustness check of event study

Robustness checks are conducted to validate the reliability and consistency of the empirical results. In this chapter, I have implemented various robustness tests to ensure that our findings are not sensitive to the choice of event window, estimation window, market index and market model choice or other methodological choices.

One of the critical aspects of event studies is the selection of the event window. In this study, in addition to the primary event window (-1,1), I examined three different event windows to test the robustness of results. The alternative windows include both short-term event windows (-2, 2), (-5,5) and relatively long-term event window (-20,20).

² Special clarification: robustness check especially the result tables are presented in the main chapter instead of in appendix due to the following reasons: 1. To address the potential risk (model misspecification and non-normality of residuals) that diagnosed in previous chapter. 2 One of the contributions of the master thesis is to provide robust empirical evidence by employing various advanced econometric techniques. Hence present the robustness check in main chapters is aligned with the objectives.

Different model and market index

In the original model, the market model has been applied by employing S&P global as market index. In robustness test, I apply the market adjusted model to calculate abnormal returns within four different event windows.

Different market indices

I employed the MSCI world index as an alternative index to estimate the CARs, as MSCI World Index captures large and mid-cap representation across 23 developed markets. Using this index allows me to examine whether our findings are sensitive to the choice of the market proxy.

Subsample analysis

The targets have been divided into high ESG score (30-100) and low ESG score targets (0-29). In order to check the robustness of CARs are consistent across different subsamples, I employed the event study separately to different groups. The results will be discussed in the discussion chapter.

The four different robustness tests are summarized together in the table 14 below:

Table 14: Robustness tests of CARs

Event window	FM model	MA model	MSCI index	Esti. window 200d	High ESG	Low ESG
CAR (-1, 1)	-2.25%***	-2.32%***	-2.21%***	-2.24%***	-2.76%***	-1.71%***
CAR (-2, 2)	-1.94%***	-2.21%***	-1.85%***	-1.92%***	-2.77%***	-1.06%***
CAR (-5, 5)	-1.87%***	-2.26%***	-1.90%***	-1.83%***	-3.01%***	-0.67%***
CAR (-20, 20)	-3.12%***	-4.78%***	-3.47%***	-2.97%***	-3.90%***	-2.29%

***, ** and * denote the 1%, 5% and 10% significance level respectively.

The results of robustness tests confirm that the negative abnormal returns are consistent and most significant across different event windows, estimation windows, subsamples with alternative market models and market proxies. These findings reinforce the validity and reliability

of our primary results, providing strong evidence of the impact of ESG factors on acquirer's short-term shareholder value evolution during M&A events.

6.5.2 Robustness check of Heckman selection model

To ensure the robustness of my findings, several robustness checks were performed. These included OLS regression with robust standard error, OLS regression without inverse Mill's ratio (IMR), bootstrapping, Heckman selection model with robust standard errors.

OLS regression with robust standard error

To further validate the robustness of our findings, I conducted two additional Ordinary Least Squares (OLS) regressions with robust standard error: one with the IMR and one without it. The inclusion of the IMR in the Heckman model is to address potential selection bias, instead, the OLS regressions with robust standard error assess and ensure the stability of the results. The results are presented in the following table 15:

Table 15: Robustness tests with different OLS regressions

Variable	Heckman two-step		OLS with IMR		OLS without IMR	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
Target ESG	-0.0002	0.51	-0.0002	0.40	-0.0002	0.43
Acquiror ESG	0.001 **	0.02	0.000	0.54	0.0006 **	0.02
Deal size	-0.01 **	0.04	0.00	0.39	-0.003	0.45
Relative size	0.01	0.70	0.01	0.45	-0.02	0.47
Acquiror ROA	-0.11 *	0.04	-0.11	0.15	-0.1	0.14
Acquiror leverage	0.02 **	0.04	0.02	0.25	0.02	0.28
Cash dummy	0.02	0.15	0.02 *	0.07	0.02 *	0.07
Cross border dummy	-0.03 **	0.01	-0.03 **	0.02	-0.03 **	0.02
Lambda (IMR)	-0.06 *	0.05	0.00	0.26		
_cons	0.13	0.13	0.30	0.28	-0.01	0.84
Country fixed effects	Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes	
Period fixed effects	Yes		Yes		Yes	
Number of Obs	1744		343		343	
Selected	336					
Wald chi2 (49)	69.94					
Prob > chi2	0.03					

R-squared	0.17	0.16
Root MSE	0.08	0.082

***, ** and * denote the 1%, 5% and 10% significance level respectively.

It has been proved consistently in all three models that target ESG scores do not significantly impact the acquiror's announcement returns, regardless of the model used. At the meantime, cross border dummy has demonstrated its negative significant impact on announcement returns across all three models, reinforcing the robustness of this finding.

In all, the Heckman two-step model provides the most comprehensive correction for selection bias, resulting in more reliable estimates. The key finding is the positive impact of acquiror ESG scores on CARs, which is robust across two of three models and the insignificance of target ESG score on CARs. Cross border dummy consistent negative impact highlights the risk concerns in cross border transactions especially associated with ESG factors.

Bootstrapping

I employed bootstrapping techniques as another robustness method to check the validity and accuracy for the cross-sectional regression model. Referring to previous diagnostic test results indicating the residuals are not normally distributed, this robustness test is to mitigate the non-normality impact. The bootstrapping method ensures the stability of the parameter estimates and test statistics by generating numerous simulated samples³ from the original data.

Two alternative bootstrapping methods have been implemented. One is Bootstrapping with fixed effect; the other is without fixed effect. The comparison of results is shown in the following table:

Table 16: Robustness test of bootstrapping

Variable	Heckman two-step		Bootstrap with FE		Bootstrap without FE	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
Target ESG	-0.0002	0.51	0.00	0.85	0.00	0.88
Acquiror ESG	0.001 **	0.02	0.001 **	0.04	0.0005 *	0.099
Deal size	-0.01 **	0.04	-0.01	0.19	-0.01	0.24
Relative size	0.01	0.70	0.002	0.91	0.01	0.85
Acquiror ROA	-0.11 *	0.04	-0.10	0.14	-0.12	0.12
Acquiror leverage	0.02 **	0.04	0.02	0.48	0.02	0.49

³ In this case, I have applied the bootstrapping with 500 iterations instead of 1000 iterations due to dealing with computationally intensive models like the Heckman two-step selection model.

Cash payment	0.02	0.15	0.01	0.14	0.02	**	0.04
Cross border	-0.03	**	0.01	-0.01	0.30	-0.01	0.31
Lambda (IMR)	-0.06	*	0.05	-0.05	0.45	-0.06	*
_cons	0.13	0.13	0.03	0.70	-0.03		0.35
Country fixed effects	Yes						
Industry fixed effects	Yes		Yes				
Period fixed effects	Yes		Yes				
Number of Obs	1744		1744		1744		
Selected	343		343		343		
Wald chi2 (8)					16.55		
Wald chi2 (20)			21.18				
Wald chi2 (49)	69.94						
Prob > chi2	0.03		0.39		0.04		
Rho			-0.3		-0.34		
Sigma			0.08		0.09		

***, ** and * denote the 1%, 5% and 10% significance level respectively.

The results confirm the non-significant impact from target ESG score on the acquirer abnormal return across three models. The acquirer ESG scores demonstrate the consistent impact on acquirer CARs across all models, reinforcing the robustness of the positive relationship.

The coefficient for acquiror ROA is negative and marginally significant in the Heckman model, however, it shows insignificant in both bootstrap models. The positive coefficient for acquiror leverage is significant in the Heckman model but not in the bootstrap models. This suggests these variables are sensitive to selection bias, which is corrected in the Heckman model.

The negative coefficient for cross-border dummy is significant in the Heckman model, but insignificant in both bootstrapping models. This result suggests cross-border deals tend to result in lower returns, although this finding is somewhat sensitive to model specification.

The significance of the inverse Mills ratio in the Heckman model and its decreased significance even non-significance in the bootstrap models suggest the presence of selection bias, which further confirms that Heckman model effectively corrects the bias.

In conclusion, the finding from bootstrap methods confirms the stability of key findings from the Heckman model. The consistent results for acquiror ESG scores across all models reinforce the robustness of this positive relationship with announcement returns, which the impact of target ESG is insignificant across all models. However, the variations in significance for deal size, acquiror ROA, acquiror leverage, and cash payment highlight the importance of addressing selection bias and the sensitivity of certain variables to model specification.

Robust standard errors

Robust standard errors have been applied in Heckman two steps selection model to mitigate concerns regarding model specification and potential biases. The results have been presented and compared with Heckman original selection model as following:

Table 17: Robustness test of Heckman with robust standard errors

Variable	Heckman two step		Heckman with Robust SE	
	Coef.	p-value	Coef.	p-value
Target ESG	-0.0002	0.51	-0.0002	0.46
Acquiror ESG	0.001 **	0.02	0.001 **	0.01
Deal size	-0.01 **	0.04	-0.007	0.17
Relative size	0.01	0.70	-0.003	0.87
Acquiror ROA	-0.11 *	0.04	-0.11 *	0.10
Acquiror leverage	0.02 **	0.04	0.02	0.20
Cash dummy	0.02	0.15	0.02 *	0.07
Cross border	-0.03 **	0.01	-0.03 **	0.01
Lambda (IMR)	-0.06 *	0.05	-0.03	
_cons	0.13	0.13	0.00	0.98
Country fixed effects		Yes		Yes
Industry fixed effects		Yes		Yes
Period fixed effects		Yes		Yes
Number of Obs		1744		1744
Selected		343		343.00
Log pseudolikelihood				-388.63
Wald chi2 (49)		69.94		
Chi2 (1)				1.03
Prob > chi2		0.03		0.31
Rho				-0.4
Sigma				-0.08

***, ** and * denote the 1%, 5% and 10% significance level respectively.

The result of Heckman model with robust standard error highlights the following noticeable patterns:

Firstly, acquirer ESG score, and cross border parameter consistently demonstrate significance reinforcing the robustness of these impact on announcement return. Moreover, the target ESG impact on CARs is consistently insignificant across two models. Last but not the least, the coefficient for the cash payment dummy is positive and significant in the robust model, indicating

that cash payments may positively impact announcement returns, particularly when heteroscedasticity is accounted for.

The significance of the inverse Mills ratio in the original Heckman model suggests the presence of selection bias, which is addressed by the Heckman model. However, the insignificance in the robust model indicates that this correction is less pronounced when accounting for heteroscedasticity.

The Heckman model with robust standard errors confirms the stability of key findings from the original Heckman model on the main variables. The consistent results support the final findings that acquirer ESG scores play a significant role in acquirer's CARs while target ESG score doesn't impact on acquirer's CARs. The robustness test with robust standard error reinforced the findings.

To conclude, the results from robustness tests further support the notion that comparing with target ESG scores, acquirors' ESG scores are positively valued by the market, enhancing short-term shareholder value creations in post-M&A.

7 DISCUSSION

With regards to my Primary Hypothesis (H1), the results show that an acquiror's own ESG score plays a crucial role on its announcement return highlighting the importance of maintaining strong ESG practices, especially for potential acquirors. In practice, this evidence proves that the acquiror's sustainability credentials play as a key driver of positive announcement returns in M&A scenarios and ultimately ensures the positive shareholder value creation in short-term at the M&A event.

The positive and significant coefficient for acquiror ESG scores ($\beta=0.001$, $p = 0.02$) suggests that higher ESG scores of the acquiror are associated with higher announcement returns even the magnitude is small. This result aligns with previous research indicating that investors positively perceive firms with strong ESG performance due to their long-term sustainability and risk management capabilities (Friede, Busch, & Bassen, 2015; Eccles, Ioannou, & Serafeim, 2014).

Like previous literatures, this finding highlights that firms with higher ESG scores might be perceived as better positioned to integrate and manage acquisitions, leading to higher investor confidence and positive shareholder value creations (Deng et al., 2013).

In parallel, with regards to my Secondary Hypothesis (H2), the target ESG scores do not show a significant impact on announcement returns and this result has been reinforced by robustness tests in all model specifications. Even this finding contrasts with some earlier studies that suggested potential benefits from acquiring firms with high ESG performance (Aktas et al., 2011), it delivers insights that while acquiror ESG performance is valued, the market does not immediately recognize the ESG characteristics of the target as a significant factor in the acquiror's short-term market performance. Moreover, the non-significance of target ESG scores further imply that investors might focus more on the acquiring firm's sustainability practices rather than the target firms.

The negative and significant impact of cross-border transactions on announcement return has been consistently in all models. This result confirms the strong notion that cross border deals are identified as more risky and more complex. It is consistent with the prior literature that identifies increased complexity, cultural differences, and regulatory challenges as potential downsides of cross-border M&A (Erel, Liao, & Weisbach, 2012). This insight underscores the importance of careful due diligence and strategic planning in cross-border deals to mitigate these risks. Firms

could benefit from developing robust integration strategies and leveraging local expertise to overcome the inherent challenges of international acquisitions.

The marginal significance of deal size and acquiror leverage highlights the nuanced effects these factors have on announcement returns. Larger deals might be perceived as riskier, leading to negative market reactions, while higher leverage indicates potential financial stability and capability to finance acquisitions, thereby positively influencing returns. These findings emphasize the need for balanced financial planning and strategic communication to investors about the rationale and expected synergies from large and leveraged acquisitions.

The lack of significance in industry fixed effects might suggest that ESG considerations are relatively homogeneous across different sectors in their impact on M&A announcement returns. However, sectors like Financials and High Technology, which showed consistent marginal significance in all the robustness test, indicating that industry-specific factors might still play a role and should not be entirely dismissed.

Country-specific fixed effects account for variations in regulatory environments, market conditions, and cultural factors. Countries with significant effects, like Brazil and Thailand, suggest that local factors could influence the outcome of M&A activities.

8 CONCLUSION

This thesis conducted a Heckman two-step selection model to assess the impact of both the target and acquirer ESG scores on the cumulative abnormal returns (CARs) of acquirors in merger and acquisitions (M&A) transactions. The first step uses a probit regression to evaluate the probability that targets with ESG scores are a random selection from acquirors. The second step employs a cross-sectional regression with fixed effects to evaluate the impact of the target's ESG score on the acquiror's CARs.

The primary objective of this study was to investigate the impact of the ESG performance of both target and acquirer firms on the acquiror's cumulative abnormal returns (CARs) at the mergers and acquisitions (M&A) announcement with the following hypothesis:

Primary Hypothesis (H1): The ESG score of the acquiror positively impacts the acquiror's shareholder returns at the M&A announcement.

Given the findings support consistent positive and significant relationship between acquirer ESG score and its abnormal returns across multiple models, I reject the null hypothesis and conclude that the ESG score of the acquirer positively impacts the acquiror's shareholder returns at the M&A announcement.

Secondary Hypothesis (H2): The ESG score of the target positively impacts the acquiror's shareholder returns at the M&A announcement.

Given the findings confirm consistent insignificant impact from target ESG score on acquirer's abnormal returns across multiple models, I fail to reject the null hypothesis and conclude that the ESG score of the target does not significantly impact on the acquirer's shareholder returns at the M&A announcement.

The results of this study provide strong support for the primary hypothesis that higher ESG scores of acquirers positively impact acquirer CARs at M&A announcements. This aligns with previous literature, such as Gomes et al. (2019) and other studies indicating that CSR and ESG performance enhance stakeholder trust and reduce perceived risks, leading to better market reactions. However, the lack of significant impact from target ESG scores suggests that investors may prioritize the ESG performance of the acquiring firm over that of the target in their immediate reactions to M&A announcements. Further research could explore the longer-term impacts of target ESG performance and its role in post-merger integration success.

Therefore, this study underscores the significant role of acquiror ESG performance in influencing M&A announcement returns, while target ESG scores do not show an immediate impact. These findings highlight the complexity of integrating ESG factors in M&A transactions.

8.1 Implications and Contributions

The finding that the acquirer's ESG score has significant impact on CARs, while target's ESG score does not significantly influence acquirer's CARs underscores the following important insights:

1. It reflects investors' preference. Investors may prioritize the acquirer's own ESG credentials over those of the target. This could be because the acquirer's ESG performance is a more direct indicator of its sustainable practices and long-term risk management. From previous literature, this view has been supported by Eccles et al., (2014), which found that companies with strong sustainability performance outperform their peers in the long run.
2. It implies integration challenges. High ESG scores of target firms may not immediately translate into value for acquirers due to integration challenges and the time required to realize synergies (Cartwright & Schoenberg, 2006). The complexities of integrating ESG practices across different corporate cultures and operational systems might delay the perceived benefits.
3. Overpaid risk: Targets with better ESG score may be perceived as a financial loss because the overpaid risk for its ESG scores. This may be perceived as risk and financial loss from investor's perspective.
4. Market perception on ESG factors. There may be a market perception that ESG factors, while important, are not the primary drivers of value in M&A transactions. Financial metrics and strategic fit might overshadow ESG considerations in the short term. This aligns with findings by Servaes and Tamayo (2013), who noted that the impact of CSR (a component of ESG) on firm value is contingent on the degree of stakeholder orientation.

Furthermore, the consistent positive impact of the acquirer's ESG score on announcement returns reinforces the value of sustainable practices for corporate management.

1. Acquirers with high ESG scores may be better positioned to integrate and leverage the ESG strengths of target firms, even if this is not immediately reflected in announcement returns. This supports the view that firms with strong ESG practices are more adept at achieving long-term synergies and value creation post-merger.
2. Firms with strong ESG performance are likely perceived as lower risk and better managed, which can enhance investor confidence during M&A announcements. This is in line with the findings of Dhaliwal et al. (2011), who observed that firms with superior CSR performance enjoy lower cost of capital.
3. From the long-term firm value management perspective, companies should integrate ESG factors into their strategic planning and decision-making processes, not just as a compliance measure but as a value-creating strategy. The positive market reaction to high ESG scores indicates that investors are increasingly valuing sustainability and responsible business practices.
4. Firms engaging in cross-border M&A should be aware of the potential negative market perceptions and prepare accordingly. Developing comprehensive integration plans and understanding the local business environment can help mitigate these risks.

From academic research perspective, my study has potentially contributed to the following aspects:

Firstly, this study adds to the growing body of literature on the role of ESG in M&A transactions. By highlighting the differential impact from both acquiror and target ESG scores, it opens up new research questions regarding the mechanisms through which ESG factors influence market reactions.

Secondly, this research provides robust empirical evidence by employing various advanced econometric techniques, including the Heckman two-steps selection model, bootstrapping with fixed effects, robust standard error etc to ensure the reliability of the results.

Chiefly, this study may fill a gap in the literature that studying the impact of ESG factor on acquirer's announcement return with worldwide data by examining the cross-border deals as well as considering country and industry effects.

Lastly, by focusing on the impact on acquirer's abnormal return both from target ESG factor and acquirer factor, this study contributes to the existing body of literature that mainly focus on investigating the impact from singular ESG score instead from both parties. The dual approach enriches the understanding of ESG impact as well as provide a new perspective to gauge the interactive impact between the target and acquirer. Most importantly, the final finding confirms that the acquirer's ESG score plays a paramount role in its announcement return, which is aligned with the extant previous research.

8.2 Limitations and Future Research

While the main findings provide insights on the major player in the announcement returns at the event of M&A, to provide a better scope and arena in applying the findings, certain limitations shall be addressed.

As clarified in the beginning, this research focuses on investigating the short-term shareholder value effect on announcement returns of acquiror at the event of M&A. Hence, the analysis provides solely the immediate market reaction in terms of stock price changes instead of long-term value evolvement. Future research could extend further from this point to examine the long-term impact of ESG factors on post-merger integration and performance.

Moreover, selection bias and unobservable variables might exist, despite the application of Heckman selection model. There may still be unobserved variables influencing the selection of targets and the subsequent market reaction. The evidence shows from some unstable significance changes of certain variables through the robustness checks. Therefore, future studies could incorporate more detailed firm-level data to capture these effects.

The detailed analysis highlights that acquiror ESG scores significantly enhance market positive performance, whereas target ESG scores do not have a significant impact. However, nonetheless the country, period and industry effect have been considered, due to the limited power of model and econometric methodology selection, the country, industry and period effects have limited significance. Further research is expected to explore this aspect in depth.

In conclusion, this research underscores the nuanced impact of ESG factors on M&A announcement returns. The finding that ESG factors act as value destroyers in terms of short-term shareholder value creation in the context of mergers and acquisitions contributes to the

debate of ESG factors being the value creator or destroyer. It suggests that integrating ESG considerations in M&A transactions may not yield immediate financial benefits for shareholders due to the negative market reactions. However, it also highlights the need for further research to explore the long-term impact of ESG factors on shareholder value creation.

While acquiror ESG performance positively influences market reactions, the target's ESG score does not appear to have a significant direct impact. The findings highlight that firms should continue to enhance their ESG practices as they are positively associated with market performance and reflect the perceptions of investors. Policymakers should promote transparent ESG reporting to facilitate better investment decisions and market efficiency.

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Appendix

Appendix A: Variables definition

Variable	Definition	Measurement
Cross-sectional regression variables		
CAR	Cumulative Abnormal Return of event window (-1,1) around the M&A announcement for the acquiring firm.	Sum of abnormal returns over a 3 days event window surrounding the announcement date.
Target ESG	ESG score of the target firm.	Numerical value ranging from 0 to 100 representing the target firm's ESG performance.
Acquiror ESG	ESG score of the acquiror firm.	Numerical value ranging from 0 to 100 representing the acquiror's ESG performance.
Deal size	Logarithm of the deal value.	Natural logarithm of the deal value.
Relative size	Ratio of the deal value to the market value of the acquiror.	Calculated as the deal value divided by the acquiror's market capitalization 4 weeks before the announcement.
Acquiror ROA	Return on Assets of the acquiror.	Calculated as the acquiror's net income divided by its total assets.
Acquiror leverage	Leverage of the acquiror.	Calculated as the acquiror's total debt divided by its total assets.
Cash dummy	Cash Payment Dummy, indicating whether the M&A deal is paid 100% in cash.	1 if the deal is 100% financed with cash, 0 otherwise.
Cross border	Cross-Border Dummy, indicating whether the M&A deal is a cross-border transaction.	1 if the target and acquiror are from different countries, 0 otherwise.
EDB	Easiness of doing business. It's an index that is used to assess the business environment across various countries.	Numerical value ranging from 0 to 124 based on its scoring from each indicator.
Probit model variables		
TESG	Target ESG Score indicator, a binary dummy variable indicating the availability of ESG score to target firms.	1 if the target has an ESG score, 0 otherwise.
Acquiror ESG	ESG score of the acquiror.	Numerical value representing the acquiror's ESG performance.
Acquiror size	Size of the acquiring firm.	Measured by the market capitalization of the acquiror 4 weeks prior of the M&A announcement.
Horizontal dummy	Dummy variable, indicating whether the M&A deal is within the same industry.	1 if the acquiror and target firms operate in the same industry, 0 otherwise.

US dummy	US Dummy, indicating whether the acquiror is based in the United States.	1 if the acquiror is from the US, 0 otherwise.
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Appendix B: Diagnostic test of probit model

Variance Inflation Factor Test (VIF)

Variable	VIF
Acquiror size	1.67
Acquiror ESG	1.55
Horizontal dummy	1.17
US dummy	1.18
Consumer Staples	1.82
Energy and Power	3.44
Financials	1.65
Healthcare	4.13
High Technology	3.79
Industrials	3.23
Materials	4.08
Media and Entertainment	1.83
Real Estate	2.36
Retail	1.84
Telecommunications	1.85
mean VIF	2.37

Linktest

Log likelihood = -794.02756

LR chi2(2) = 154.12

Prob > chi2 = 0.0000

Pseudo R2 = 0.0885

TESG	Coefficient	z	P> z
_hat	0.82	4.10	0.00
_hatsq	-0.12	-0.98	0.33
_cons	-0.42	-0.48	0.63

Goodness-of-fit test after probit model**Hosmer-Lemeshow Test**

Variable: TESHG

Number of observations = 1748

Number of covariate patterns = 1732

Pearson chi2(1716) = 1758.14

Prob > chi2 = 0.5422

Appendix C: Diagnostic test to cross-sectional regression**Variance Inflation Factor Test (VIF)**

Variable	VIF
Target ESG	1.53
Acquiror ESG	1.91
Deal size	1.84
Relative size	2
Acquiror ROA	1.2
Acquiror leverage	1.42
Cash dummy	1.56
Cross border dummy	1.77
Consumer Staples	2.32
Energy and Power	4.6
Healthcare	1.79
High tech	4.78
Industrials	4.59
Materials	3.96
Media and Entertainment	4.49
Real estate	3.12
Retail	3.95
Telecom	2.3
Financials	2.27
2.period_cond	2.13
country_id_2	1.14
country_id_3	1.44
country_id_4	1.4
country_id_5	2.49
country_id_6	1.29
country_id_7	1.11
country_id_8	1.13
country_id_9	1.96
country_id_10	1.57

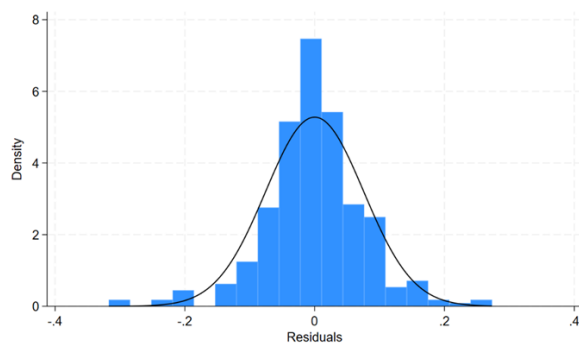
country_id_11	1.28
country_id_12	1.3
country_id_13	1.22
country_id_14	1.14
country_id_15	1.11
country_id_16	1.88
country_id_17	1.45
country_id_18	1.17
country_id_19	1.12
country_id_20	1.2
country_id_21	1.11
country_id_22	1.2
country_id_23	1.24
country_id_24	1.27
country_id_25	1.72
country_id_26	1.27
country_id_27	1.34
country_id_28	1.45
country_id_29	2.5
country_id_30	6.89
Mean VIF	2.03

Shapiro–Wilk W test for normal data

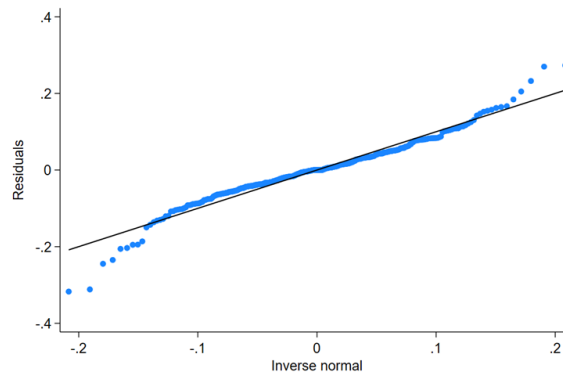
Variable	Obs	W	V	Z	Prob>z
resid	336	0.95878	9.711	5.356	0

Histogram resid, normal

(bin=18, start=-.31726459, width=.03279888)



Q-Q Plot resid



Breusch–Pagan/Cook–Weisberg test for heteroskedasticity

Assumption: Normal error terms

Variable: Fitted values of CAR

H₀: Constant variance

chi2(1) = 2.78

Prob > chi2 = 0.0954

Ramsey RESET test for omitted variables

Omitted: Powers of fitted values of CAR

H₀: Model has no omitted variables

F(3, 290) = 0.60

Prob > F = 0.6183
