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**The industry-specific and region-specific effect of ESG scores of cumulative abnormal
returns**

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Abstract

Previous research found an association between ESG scores of acquiring, and to a lesser extent targeted, firms and the cumulative abnormal return (CAR) surrounding merger announcements. This research attempted to deepen the existing knowledge on the association between acquiring firms' ESG score and CAR, as well as adding to the lack of research on the association between ESG score of targets and CAR. Additionally, the amplifying and diminishing effects of ESG scores on mergers between firms in advanced economies and unrelated mergers, respectively, were discussed. By means of linear regression, we analyzed a total of 224 mergers. Our results suggest a positive association between acquiror CAR and target ESG. Our results also suggest a significant difference in the effects of ESG on CAR in relation to the development of the economy of a region. These findings are discussed in relation to previous literature and further suggestions for future research are made.

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1. Introduction:

In recent years, there has been an increasing focus on Environmental, Social, and Governance (ESG) factors in the business world. ESG scores are used to measure a company's performance on social and environmental responsibility and are becoming increasingly important for investors. However, little research has been done on the effect of the ESG score of an acquired party on the stock price of the targeted firm.

The study of the impact of Environmental, Social, and Governance (ESG) scores on post-acquisition performance is relevant in today's business and investment world. ESG scores reflect a company's commitment to sustainable practices and socially responsible behavior, which are increasingly important factors for investors and stakeholders. It is important to determine which ESG score measure will be used to examine firms. The determination process will be discussed later on. By examining the relationship between ESG scores and post-acquisition announcement performance, researchers can gain insight into the financial benefits of sustainable business practices and help companies make informed decisions about their ESG strategies. This information can also be useful for policymakers who are seeking to encourage companies to adopt sustainable practices and for investors who are considering companies with strong ESG ratings. Ultimately, the research on the relationship between ESG scores and post-acquisition performance can contribute to a more sustainable and equitable business environment for all stakeholders.

Given the relevance of ESG scores on post-acquisition performance across a wide range of industries, it becomes challenging to identify the specific industry to be examined. However, industry characteristics are known to influence firms' financial performance (Ghelli, C., & Schröder, P., 2013). Additionally, the influence of ESG scores on firm performance is also affected by the industry. Therefore, in order to mitigate cross-industry effects, it would be beneficial to select a particular industry for this research. The energy industry is currently undergoing significant changes driven by a growing focus on sustainability and renewable energy sources. Mostly, this is happening in an attempt to reduce carbon emissions and overall environmental impact. As a result, companies in this sector are increasingly integrating ESG factors into their operations and investment decisions. This study focuses on the energy industry due to its innovative sustainability initiatives (Hughey & Sulkowski, 2012) and the growing attention it has received in scientific literature (Patari et al., 2014; Lu et al., 2014), which has been reinforced by Lungu et al. (2019). Furthermore, unlike many

firms in other sectors, energy companies are subject to intense social and environmental scrutiny due to the nature of their activities. Consequently, a significant portion of the literature linking ESG to financial outcomes has been concentrated on the energy sector (Dilling & Harris, 2018; Dong & Xu, 2016). Furthermore, the utilities sector has shown far more transparency compared to other industries (Tamimi and Sebastianelli, 2017). Given these factors, directing the research toward the energy industry presents an intriguing opportunity. To give a relevant example, M&A review (May 2023) found that in the past few years, a significant number of transactions and investments with a focus on environmental, social, and governance (ESG) have taken place. These ESG-focused deals accounted for nearly 75 percent of all Energy sector transactions between 2020 and 2022. An example of such a merger is the takeover of Spanish solar and wind developer Eolia Renovables by French utility company Engie, which took place in 2021/22.

However, it is important to notice that the theoretical basis will be aimed to build a theory for a very broad range of industries. For the aforementioned reasons, the data analysis will then be specified towards the energy industry. This research will closely align with research done by Tampakoudis et al. (2021), which aimed to analyze the effects of ESG scores on M&A performance in relation to the COVID-19 crisis. Evidently, the relation to COVID-19 is what sets the current study apart from that existing study. Moreover, this study adds to the literature by looking into the difference between related and unrelated mergers. The main reason for an extension towards relatedness of industries in connection to the existing studies is the risk of greenwashing that is involved in ESG related mergers, as will be explained in more detail.

Lastly, the current study aims to also explore the relation between target returns and acquiror ESG scores in mergers. Historically, the association between acquiror returns and target ESG score was predominantly researched. However, we aim to provide more clarity on the adverse association in order to fill that gap in the literature.

2. Theoretical basis

2.1 The effect of ESG scores of acquired companies on the post-acquisition announcement performance of acquiring firms.

The expansion of academic research in recent years has led to the emergence of numerous relevant theories. Research investigating the relationship between Environmental, Social, and Governance (ESG) scores and stock prices of acquiring firms has consistently indicated a positive correlation between these factors. This positive relationship is commonly referred to as the "ESG Alpha" (Sakib, M., 2021), representing the financial benefits that can arise from investing in companies with high ESG scores. However, given the existence of various ESG rating systems employed in academic studies, it becomes crucial to determine which rating should be utilized. For the purposes of this research, the ESG scores will be based on the ratings provided by the Refinitiv Eikon Datastream database.

One explanation for the positive ESG alpha lies in the theory that businesses with a strong focus on sustainability tend to adopt an orientation that is focused on the long-term. This long-term perspective expresses itself in significant outperformance of short-term strategies in both stock market success and accounting performance (Eccles et al., 2014).

In the context of ESG activities, it has become evident that approximately one third of the operating expenses of an office stem from energy consumption, making it a significant component of reducible costs (Eichholtz et al., 2010). Therefore, implementing green policies in offices can enhance operational efficiency. However, it is important to note that these activities, while contributing to reducing the carbon footprint of businesses, may not be as impactful as other programs specifically designed for achieving greater CO₂ emission reductions. Even though such programs are undoubtedly more effective, they are known to be more costly (Henderson, 2015). This indicates that environmental practices can have varying effects, and their positive influence on financial performance depends on the externalities to which they are exposed.

On the other hand, when it comes to "social" activities, it is evident that improved performance in these areas contributes to a firm's reputation. These activities attract capable and skilled workers while simultaneously controlling costs. Therefore, policies promoting equal opportunities for employees generally result in increased performance. Industries where reputation plays an important role in achieving profits are more likely to experience enhanced outcomes (Eccles et al., 2014).

Firms that have diverse leadership, including independent members and women, witness several positive outcomes in their governance. These include a decrease in agency problems, heightened motivation among female employees, and the eradication of gender discrimination. The majority of studies demonstrate a positive relationship between the aforementioned practices, as well as other initiatives aimed at enhancing ESG factors, and financial performance.

Enhancing internal ESG-related practices has become a crucial part of long-term strategies for many firms, driven by stakeholder pressure. Stakeholder theory argues that firms should establish strong relationships with their stakeholders to maintain and improve corporate validity (Daugaard, D. & Ding, A., 2022). According to this theory, a firm's performance in ESG activities has the potential to foster long-term business growth. Moreover, improved ESG performance can cause increased firm value by reducing explicit costs and promoting operational efficiency (Brammer, S. & Millington, A., 2005). Additionally, better performance in ESG activities can contribute to an improved corporate reputation (Dhaliwal, D.S. et al., 2012) and increased company competitiveness (Porter, M.E., & Kramer, M.R., 2002). Consequently, it is worth examining the role of mergers and acquisitions (M&A) in this process, particularly focusing on the role of M&A when the targeted firms have high ESG scores. It is expected that acquiring a target company with a strong ESG track record can significantly improve the acquiror's reputation in the marketplace and reduce corporate risk. Companies with strong sustainability practices generally have more favorable reputations and experience much lower legal risks (Gillan et al., 2021). Additionally, a research study conducted in India found that higher ESG disclosures positively influences a firm's market reputation in terms of risk, improving creditworthiness, and lowering capital costs (Bhattacharya & Sharma, 2019). Tampakoudis and Anagnostopoulou (2020) studied 100 European M&A cases and drew the conclusion that acquiring firms experience an increase in ESG scores after the merger. Additionally, market value also increases when merging with target firms exhibiting high ESG performance. However, it is important to note that ESG scores cannot individually determine the post-merger performance.

Finally, in many merger transactions, it is common for the acquiror's stock price to decline shortly after the announcement. This downward movement can be attributed to overvaluation of the target firm, leading to a lack of trust in the acquiror. Hazelkorn and Zenner (2004) provide evidence for this phenomenon, as they demonstrate that acquirors' stockholders experience losses of slightly less than one percent on a market-adjusted basis

surrounding the merger announcement. Furthermore, Bradley et al. (1988) examine the shareholder benefits of mergers for both acquirors and targets. They find that a large number of competitors is often beneficial for target shareholders, whilst reducing returns for the acquiror's shareholders. Additionally, Lindblad and Ihrelus (2013) reveal that M&A activities in the energy sector have led to a decline in the market value of mergers. Foremost, this is due to high overpayment and numerous cross-border transactions, which shows the sector's overall inefficiency in M&A activity. However, in this study, we anticipate an increase in the benefits for acquiror shareholders, reflected in increased stock prices following merger announcements. This expectation is driven by factors such as financial and operational synergy, market share growth, risk diversification, and policy implementations, all of which motivate M&A activities in the energy sector. Yoo et al. (2013) demonstrate that energy companies engaging in mergers experience a positive impact on stock returns due to operational synergy and economies of scale. Overall, the existing literature suggests that M&A activities can yield favorable outcomes for acquiror shareholders, and when coupled with high ESG scores of the target firm, these benefits may be further enhanced.

In conclusion, the growing recognition of the significance of ESG factors in investment decision-making and their potential impact on financial performance has led to an extensive body of academic research. The positive correlation between ESG scores and stock prices of acquiring firms, commonly referred to as the "ESG Alpha," indicates the potential for financial benefits by investing in companies with high ESG scores. The integration of ESG practices can lead to operational efficiency, improved reputation, and reduced agency problems. Moreover, mergers and acquisitions can play a role in enhancing ESG performance and market value, particularly when the acquired firms have strong ESG track records. However, it is important to consider other factors influencing post-merger performance and stock price movements. By examining the interplay between ESG scores, M&A activities, and stock prices in the energy industry, this research aims to contribute to the understanding of the complex relationship between ESG scores and financial outcomes in the context of mergers and acquisitions.

H1: ESG scores of target companies positively affect the post-acquisition announcement performance, measured by stock price, of the acquiring company

2.2 The effect of ESG scores of acquiring companies on the post-acquisition announcement performance of acquired firms.

In addition to influencing the performance of acquiring firms, an inverted relationship is also anticipated. Extensive research has focused on explaining the determinants underlying a company's decision to engage in mergers and acquisitions (M&A) over the years. However, limited attention has been directed towards examining the association between environmental, social, and governance (ESG) factors, stakeholder benefits, and M&A performance (Aktas et al., 2011; Cho et al., 2020). Cho et al. (2020) specifically concentrate on the target firm's corporate social responsibility (CSR) performance and provide strong evidence supporting a positive relationship between the CSR performance of the target firm and the premiums received by its shareholders. Importantly, this positive association is particularly observed when the CSR performance of the target firm exceeds that of the acquiring firm. This finding suggests that the market anticipates the acquiror to offer a fair price to the target firm based on its CSR practices. Consequently, the authors conclude that investing in CSR adds value to M&A deals for both acquiring and target firms, aligning with stakeholder theory.

Furthermore, Deng et al. (2013) uncover additional significant associations. Specifically, they find that acquirors with higher scores on ESG factors experience greater returns upon the disclosure of a merger. Moreover, acquirors with high ESG scores generally exhibit larger improvements in post-merger operating performance compared to acquirors with lower ESG scores. Deng et al. further demonstrate that acquirors with high CSR scores are more likely to complete M&A deals and generate positive long-term stock returns, compared to acquirors with low CSR scores.

Similarly, Teti and Spiga (2022) emphasize the significance of ESG factors in shaping long-term strategies for firms. Moreover, they stress that the evaluation of the feasibility of pursuing strategic initiatives, such as merger transactions, is significantly influenced by a firm's ESG practices. Teti and Spiga argue that a strong ESG profile could provide for a smoother integration of the target firm into the acquiror's operations, ultimately leading to enhanced post-merger performance.

Although the specific relationship remains unexplored in existing literature, the aforementioned theories collectively suggest that acquirors with high ESG scores are more likely to exert a positive influence on their target firms in the period surrounding the announcement of the deal. Based on these premises, we hypothesize that acquirors with high ESG scores will exhibit a greater propensity to create positive outcomes for their target firms in the context of M&A transactions. The subsequent analysis aims to empirically test this

hypothesis using a comprehensive dataset and robust econometric techniques. Therefrom we form the following hypothesis:

H2: The acquiror's ESG scores positively affect the post-acquisition stock price of the target company

2.3 The difference between the effect of ESG scores in related versus unrelated mergers

In modern day business, mergers, and acquisitions (M&A) serve as a widely adopted and effective mechanism for firms to improve their overall performance. M&A often leads to increased market share or allows firms to venture into unexplored markets (Øverby, H., 2021). Two fundamental approaches to expanding a firm's operations are horizontal and vertical growth strategies. Horizontal growth entails merging with firms operating at the same value chain level and within similar industries, leading to an increase in market share and reducing competition through gaining more market power. Furthermore, horizontal mergers can lead to cost reduction by allowing efficient production reallocation. This goes for both the acquiring and the targeted firm (Levin, 1990). Horizontal mergers not only enable firms to expand their market power but also offer potential synergies and economies of scale by combining resources and capabilities.

In contrast, vertical growth strategies involve mergers between companies operating at different levels of the value chain, including both upstream and downstream linkages. These linkages are not necessarily restricted to the same industry. Firms pursuing vertical growth often aim to increase control over production processes, hence lowering production costs and improving overall efficiency. By integrating activities along the value chain, firms can achieve a more streamlined and better coordinated production process. Streamlining processes should lead to reduced transaction costs and could optimize value creation (McCarthy et al., 2019). The vertical integration of activities can also provide firms with a competitive advantage by ensuring a stable and reliable supply stream. Furthermore, vertical mergers can stimulate sharing specialized knowledge and technology, allowing firms to innovate together and adapt rapidly to changes in the marketplace (Singh, 2021). Empirical evidence suggests that vertical mergers lead to significant gains for the target firms, in the period leading up to the merger. This period is often defined as seven to ten months. Additionally, acquiring firms also tend to experience larger gains than they would normally, during the period leading up to a merger (Spiller, 1985). These gains are connected to several of the previously mentioned

factors. Economies of scale, improved coordination within the value chain and higher efficiency, caused by mergers, all lead to larger market power and increased performance.

Both horizontal and vertical expansion strategies are frequently associated with related mergers, which are considered more effective than unrelated mergers according to numerous scholars. Related mergers can have an advantage as the acquiring firm typically continues to operate within the same industry, facilitating a smoother adaptation to new circumstances due to existing knowledge. Additionally, Berger and Ofek (1995) highlight the ability to use existing resources and capabilities to the firm's advantage in related markets as another factor contributing to the potential benefits of related M&A. By capitalizing on their existing expertise and assets, firms can exploit the new cooperation and enhance operational efficiency. The transfer of knowledge and capabilities across related business activities can improve the level of innovation, leading to improved product development. In turn, this could cause more effective market positioning (Capron & Mitchell, 2010). Moreover, related mergers can generate economies of scope by combining complementary resources and capabilities. This could result in cost savings by means of increased efficiency, leading to value creation (Kitching & Hughes, 2020). By integrating related businesses, firms can use their combined strengths to better respond to pressure, generated by competition. Moreover, they should be able to capitalize more on new growth opportunities.

Reputation and economies of scale are also emphasized by other researchers as more effective mechanisms in related markets compared to unrelated markets. For instance, Nayyar (1993) stresses that related mergers offer advantages through economies of scope and makes it easier to benefit from the acquiror's established reputation in the industry. Economies of scope can arise from the sharing of resources, technological advances, and distribution channels across related business activities. A combination of these factors could lead to cost savings and increased operational efficiency (Montgomery & Wernerfelt, 2018). Furthermore, a good reputation can provide a competitive advantage by attracting customers, suppliers, and other stakeholders, again, allowing for business growth and value creation (Dierickx & Cool, 1989). Reputation is particularly important in industries characterized by high levels of customer loyalty and repeat purchases, where a strong brand image can translate into higher market share and profitability (Fombrun & Shanley, 1990). All that has been discussed previously, can be seen as the direct effect of a merger of firms that are active in unrelated industries compared to firms that act in related industries. This direct effect is expected to be negative, meaning that we expect merger results to be lower for firms that are active in unrelated industries.

However, while related mergers have generally been found to outperform unrelated mergers, the possibility that an announcement of a merger with a high-ESG score target could even out the performance disparity between related and unrelated mergers has not been thoroughly examined. It is expected that the incorporation of ESG scores could partially bridge the existing gap, primarily due to the potential for greenwashing. Unrelated mergers involving targets with high ESG scores may be driven by the acquiror's desire to enhance its own ESG reputation or mitigate potential negative spillover effects. By acquiring a target with a strong ESG track record, firms can signal their commitment to sustainable and responsible business practices, thereby enhancing their reputation among stakeholders (Chatterji et al., 2009). Moreover, targets with high ESG scores may hold valuable intangible assets, such as strong relationships with socially responsible investors, access to green technologies, or a positive corporate culture. Altogether, this could contribute to the acquiror's long-term value creation potential (Hitt et al., 2021). The integration of a target's ESG practices and expertise into the acquiror's operations can lead to better risk management and increased efficiency in operations (Hansen et al., 2020). However, it is important to remain cautious of greenwashing practices, where firms may strategically manipulate their ESG image without making substantive changes to their actual practices (Nguyen et al., 2022). Scrutinizing targets' ESG practices and conducting thorough due diligence is therefore crucial to ensure the potential benefits of the merger are genuine and aligned with the acquiror's sustainability objectives.

In general, this last section has discussed the indirect effect that ESG scores might have on merger results. As mentioned before, the direct effect of acting in unrelated industries is expected to be negative. However, the indirect effect, found by an interaction term in the regression model, is expected to be positive. Specifically aiming to improve ESG scores through mergers could improve the results of mergers between firms that act in unrelated industries.

In conclusion, mergers and acquisitions offer firms opportunities for market expansion, increased market share, and enhanced value creation. Horizontal and vertical growth strategies allow firms to tap into new market segments or consolidate their positions within existing industries. Related mergers in particular, have been found to yield greater value creation potential compared to unrelated mergers, driven by synergies, knowledge transfer, economies of scope, and enhanced market power. Additionally, incorporating targets with high ESG scores in unrelated mergers holds the potential to decrease this gap between related and unrelated mergers, as it provides opportunities for reputation enhancement. Moreover, focusing on ESG scores in such mergers allows for access to valuable assets and

alignment with sustainable business practices. However, it is essential to carefully assess the authenticity of ESG practices and guard against greenwashing to ensure that the potential benefits of the merger are realized and sustainable in the long run. Overall, a distinction must be made between the individual effect that pursuing a merging between firms of unrelated industries has on the merger performance and the indirect that this process has on the association between ESG scores and merger performance. Based on the last association, hypothesis 3 is formed.

H3: ESG scores reduce the difference in post-announcement performance between related and unrelated mergers

2.4 The influence of the level of development of a region on effect of ESG scores on the post-acquisition announcement stock-price change

Lastly, it is important to note that ESG-related efforts are not universally appreciated to the same extent. The level of appreciation varies depending on several factors, including the emphasis placed on different aspects of ESG - environmental, social, and governance - which show significant variations across specific regions and countries (Miralles-Quíros & Hernández, 2019). Pineau and Estran (2022) find that a group of countries from North America, Europe, and Central Asia, where most advanced economies are concentrated, consider governance as the most important factor. On the other hand, variables that are outside of the ESG range have a more significant impact on groups comprised of emerging markets and developing economies. Notably, the environmental factor (E) holds the greatest significance in Sub-Saharan Africa, likely due to the heavy reliance of a significant portion of its population on agriculture. However, the most significant finding is that non-ESG variables have a more dominant influence on groups comprised primarily of emerging market and developing economies (EMDEs), as can be seen in Figure 1.

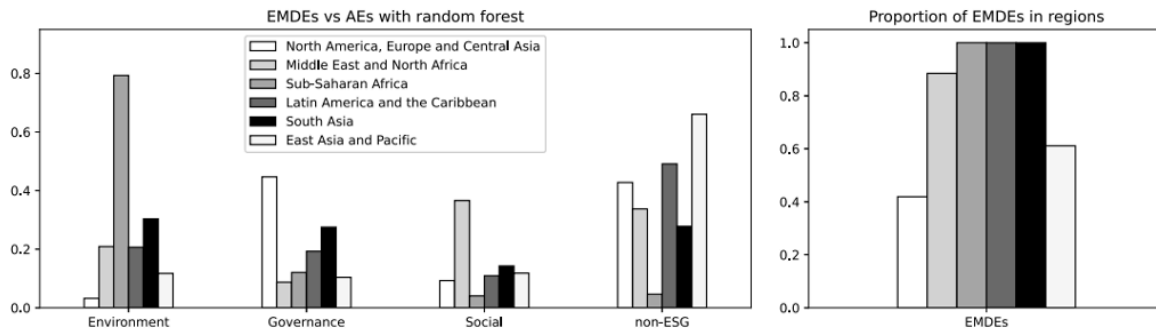


Fig. 1; Variable importance for geographical regions. Left: VI. Right: proportion of EMDEs in each group. Governance is the most important factor in North America, Europe, and Central Asia group which has most AEs. While non-ESG variables are the more dominant drivers in the rest.

Additionally, Arun et al. (2022) highlight the need for the BRICS countries to strengthen their ESG processes and investments in order to catch up with developed countries.

Furthermore, besides the difference in the importance of individual components of the ESG score, it makes sense to analyze the overall differences in the importance and relevance of ESG scores between developed and emerging economies. Most academic research thus far has been concentrated on specific geographical areas, predominantly focused on developed economies (Kalia & Aggerwal, 2023). There is a lack of research on this relationship in emerging markets (Ruan and Liu, 2021; Ting et al., 2019) and no existing studies have been able to make comparisons between the two. Consequently, the understanding of the correlation between ESG initiatives and firm performance remains limited to individual nations in such research.

However, Kalia and Aggerwal (2023) conducted research on the association between ESG scores and the financial performance of healthcare. They expanded their research to include multiple regions. They looked in to underdeveloped, emerging, and developed economies. Their findings suggest that the impact of ESG activities on firm performance is likely to differ across economies due to several factors.

Firstly, the concept of ESG is at different stages of development in various markets. ESG activities and the availability of information related to ESG matters are the most obvious concern in most developed countries. However, in emerging markets, ESG is a concept in its early stages. Previous research suggests that markets can reduce negative externalities by increasing the duration of knowledge. Since developed countries have significantly better disclosure practices, it is expected that engaging in ESG activities will have a positive impact on firms in developed nations but may not be as effective in developing economies.

Secondly, according to Kalia and Aggerwal, access to financing is challenging for businesses in developing countries due to underdeveloped regulatory institutions. Although

firms in emerging markets may undertake ESG activities to gain investor confidence, such practices are perceived as extraordinary and relatively high expenditures. ESG operations are viewed as high-cost activities that could hinder businesses, further constraining capital markets in emerging economies. Consequently, engaging in ESG activities may have a negative effect on firm performance in developing countries.

Additionally, the cultural and societal context of each region plays a significant role in shaping the relationship between ESG scores and firm performance. Advanced economies typically place greater emphasis on corporate governance and ethical conduct, in line with stakeholder expectations. In contrast, emerging economies may prioritize other factors such as economic growth and job creation, leading to a relatively low focus on ESG initiatives. This disparity in priorities can influence the perceived significance and impact of ESG scores on firm performance.

Furthermore, it is important to consider the overall ESG development within each country. Examining global ESG performance stresses the significance of geographical location in relation to ESG scores, as highlighted by Daugaard and Ding (2022). These scores fluctuate significantly across different areas and develop over time. To illustrate this point, they present a figure comparing Sustainalytics ESG Risk Ratings from 2009 to 2018 across various geographic regions. These ratings are based on the ESG policies implemented by businesses in each country, the level of transparency in ESG reporting, and the response to ESG-related events. Generally, an increase in interest for ESG worldwide is observed, which is shown by the increasing number of companies that are subject to ESG rating investigations. Furthermore, the data indicates an overall improvement in ESG performance over the years. Additionally, the data coverage has expanded, suggesting an improvement in transparency on the subject and an increased motivation to communicate the efforts made by countries. Moreover, a significant disparity in ESG ratings between geographic regions becomes evident.

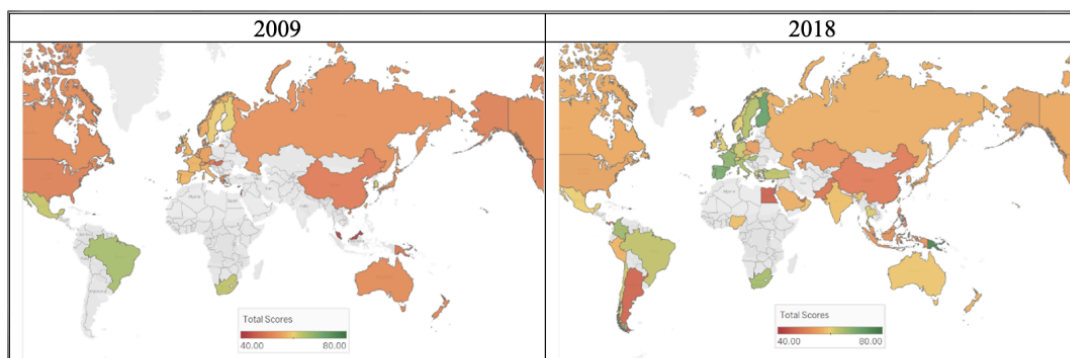


Figure 2. Geographic heat map of ESG performance. These heat maps show the average firm-level ESG scores across countries in 2009 and 2018.

Therefore, regions with political systems characterized by a high degree of democracy are much more likely to influence firms to act ethically. However, the relationship between a region's relative economic wealth and corporate responsibility is complex. Economic wealth tends to have a negative impact on social performance indicators, even though economic wealth is strongly associated with strong corporate governance and is positively correlated with environmental performance. Thus, relying solely on a region's wealth is not a powerful determinant of the expected ESG rating in that region. Important to note is that the IMF list of advanced economies since 2023 (IMF, 2023) will be used to determine whether a country has an advanced economy or not.

As with the previous hypothesis, we will evaluate this hypothesis based on a direct and indirect effect. Based on the previously discussed literature, we expect the direct effect of originating from a develop economy to be positive. Therefore, the coefficient will be positive, meaning that mergers between firms from developed economies will perform better. Consequently, we expect the indirect effect of originating from an advanced economy to be even stronger. As firms and investors from advanced economies put more emphasis on ESG scores in general, we expect that higher ESG scores in mergers between firms from advanced economies enlarge the positive association that is already suggested to exist.

H4: ESG scores have a stronger association with post-acquisition stock prices of firms that originate from countries with advanced economies

3. Method

3.1 Cumulative abnormal returns

We focus on abnormal returns, which refer to the difference between the actual return and the return expected based on the company's beta, determined by the market return. This abnormal return represents the portion of the return that cannot be predicted and provides an estimation of the change in the company's value on the day of the event, namely the announcement of the merger.

The concept of cumulative abnormal return (CAR) is widely used as a measure to evaluate financial performance with regards to how the market responds to the value of mergers and acquisitions (Liu et al., 2021). CAR captures the expected performance and overcomes common accounting-based limitations. Other methods are often unable to distinguish between performance derivable from the combination of firms and regular performance that would have been achieved if the acquiring and target firms had remained independent (Fich et al., 2018).

The first step in the methodology is to establish the event window, which defines the timeframe for the study. It is crucial to determine an appropriate event window to capture the effects of the event accurately. According to the efficient market hypothesis, which assumes that market prices reflect all available information, a short event window is preferred. This is because any impact on stock prices resulting from an occurred event would be quickly observed. However, an excessively short event window may fail to capture the effect. This might happen if the information becomes available after the market closes or is leaked prior to the announcement, causing the effect to occur before the actual event day. Conversely, an extended event window might reduce the likelihood of finding meaningful empirical evidence. The first purpose of an event window should thus be to capture any pre-announcement leakage of information about the event, preceding the announcement date. Secondly, the event windows extending a few days after the announcement date incorporate the impact of investment decisions made by investors following the event. As previously done by Tampakoudis et al. (2021), we will make use of 9 different event windows. To be precise, five event windows surrounding the announcement day (-3,3, -2,2, -2,1, -1,2 and -1,1); two pre-announcement event windows (-3,0 and -1,0) and two post-announcement event windows (0,3 and 0,1) are used.

Data collection is the subsequent step in the research process. Information regarding merger announcements was obtained from the Erasmus University, and the Thomson Reuters

Eikon/Datastream database was accessed to gather the necessary data on the announcements of mergers. To ensure consistency and compatibility, we obtained the ESG ratings of the acquiring party and the stock prices of the acquiring party from the same Datastream database.

To construct the event study, we adopted the methodology proposed by Tampakoudis et al. (2021) as a guiding framework. Their research closely aligns with our objectives, making it a suitable reference. The key metric in an event study is the abnormal return, which reflects the impact of the acquisition announcement on the stock price of the firm of interest. For our study, we will adopt the mean adjusted returns model variation of CAR. This model assumes that the ex-ante expected return of a stock or firm is constant, predicted by averaging the historic return of the given stock (Brown and Warner, 1980). In the mean adjusted returns model, the abnormal return is determined by subtracting the average return over a specific period from the actual return on a given day.

Besides the expected return, we will also require the realized return of a specific period to come the abnormal return. Equation 1 will provide a formula for the realized return.

Equation 1:
$$R_{it} = a_i + \beta_i R_m + \varepsilon_{it}$$

In this equation, R_{it} is the realized return of firm i on day t , a_i represents the intercept, β_i is the regression coefficient, R_m is equal to the return of the market portfolio and ε_{it} is the error term.

The abnormal return for a specific firm at any given time will be computed by subtracting the estimated historic return from the realized return, as shown in Equation 2.

Equation 2:
$$AR_{it} = R_{it} - \hat{R}_i$$

In Equation 2, AR_{it} represents the abnormal return of firm i on day t , R_{it} is the realized return of firm i on day t which is provided by Datastream, and \hat{R}_i represents the expected return of firm i , which is based on the historic return. As \hat{R}_i is a constant and is not dependent on the time \hat{R}_i is used instead of \hat{R}_{it} .

Calculating CAR can be approached through various methods, with the choice depending on the type of benchmark used to determine the abnormality of a return on a given

day (Reddy et al., 2019). To assess the cumulative abnormal returns (CAR), we are going to aggregate the daily abnormal returns over the selected event window, as shown in Equation 3.

$$\text{Equation 3: } CAR_{i(t_1, t_2)} = \sum_{t=t_1}^{t_2} AR_{it}$$

The cumulative abnormal return is then calculated as the sum of abnormal returns over a certain period, where t_1 is the first day of this period and t_2 is the final day. In this research, t_1 and t_2 will vary depending on the event window that is used in the model.

Based on the constructed event study and obtained CARs, our analysis proceeds with a regression analysis to investigate the existence of a significant correlation between the ESG scores of the acquired party and the abnormal returns of the acquiring party. In this regression analysis, the ESG scores are treated as the independent variable, while the abnormal returns served as the dependent variable. The statistical significance of the relationship will be assessed using a t-test, which examines the magnitude of the association between the variables.

In conclusion, our research utilizes an event study methodology to explore the connection between firms' ESG scores and their post-announcement performance. By establishing multiple event windows and calculating abnormal returns and cumulative abnormal returns, we aim to capture the effects of the announcement accurately. The subsequent regression analysis allows us to investigate the relationship between ESG scores and abnormal returns, providing insights into the potential correlation between sustainability practices and financial performance.

3.2 Regression analyses

In order to determine the association between ESG scores and stock performance in M&A, we will try to analyze several hypotheses that were previously stated. By performing multiple regression analyses we can identify the coefficients that belong to parameters in the regressions, allowing for a detailed explanation of the associations. For hypothesis 1, we want to test Equation 4:

$$\text{Equation 4: } ACAR_{i(t_1, t_2)} = a + \beta 1 \cdot TargetESG + \beta 2 \cdot AcquirorAdvancedEconomy + \beta 3 \cdot TargetAdvancedEconomy + \beta 4 \cdot AcquirorEnergyIndustry + \beta 5 \cdot TargetEnergyIndustry + \beta 6 \cdot AcquirorRatioDebtToAssets + \beta 7 \cdot DealValue + \varepsilon$$

Where ACAR is the cumulative abnormal results of acquiror i between time t_1 and t_2 , the intercept a measures the excess returns after controlling for the effects of ESG performance and control variables, β_1 measures the effect of the target's ESG score on the acquiror CAR, β_2 , β_3 , β_4 and β_5 are the estimated parameters related to the control variables for industry and country. The control variables are coded in the form of dummies, to compare the most important category to all the other categories. In the case of the "country" dummies, our category of interest is grouped as advanced economies rather than actual countries, as the countries in this group have similar economic characteristics. For the "industry" dummies we compare the energy industry to other industries. Lastly, in this regression we add a control variable for the long-term debt to asset ratio of the acquiror, to account for the possible influence of the ratio of total debt to total assets on abnormal results after a merger (Gao, Z. & Bao, Y., 2022) and the deal value (Alexandridis et al., 2013). If the β_1 coefficient is not significant at the 10% level (p-value>0.10) H1 will be rejected.

For hypothesis 2, the following equation is tested:

$$\text{Equation 5: } TCAR_{i(t_1,t_2)} = a + \beta_1 \cdot AcquirorESG + \beta_2 \cdot AcquirorAdvancedEconomy + \beta_3 \cdot TargetAdvancedEconomy + \beta_4 \cdot AcquirorEnergyIndustry + \beta_5 \cdot TargetEnergyIndustry + \beta_6 \cdot TargetReturnOnAssets + \beta_7 \cdot DealValue + \varepsilon$$

Where TCAR is the cumulative abnormal results of target i between time t_1 and t_2 , the intercept a measures the excess returns after controlling for the effects of ESG performance and control variables, β_1 measures the effect of the acquiror's ESG score on the target CAR, β_2 , β_3 , β_4 and β_5 are, again, the estimated parameters related to control variables for industry and economic situation of the country. Again, we will also control for some firm and deal specific variables. In this case we will look at the target's return on assets, as this could influence the target's performance (Benson et al., 2015) and the deal value will also be included again. If the β_1 coefficient is not significant at the 10% level (p-value>0.10) H2 will be rejected.

For hypothesis 3, the following equations are tested:

$$\begin{aligned} \textbf{Equation 6: } ACAR_{i(t_1,t_2)} = & a + \beta 1 \cdot TargetESG + \beta 2 \cdot Unrelated + \\ & \beta 3 \cdot TargetESG \cdot Unrelated + \beta 4 \cdot AcquirorAdvancedEconomy + \\ & \beta 5 \cdot TargetAdvancedEconomy + \beta 6 \cdot AcquirorEnergyIndustry + \beta 7 \cdot TargetEnergyIndustry \\ & + \beta 8 \cdot AcquirorRatioDebtToAssets + \beta 9 \cdot DealValue + \varepsilon \end{aligned}$$

$$\begin{aligned} \textbf{Equation 7: } TCAR_{i(t_1,t_2)} = & a + \beta 1 \cdot AcquirorESG + \beta 2 \cdot Unrelated + \\ & \beta 3 \cdot AcquirorESG \cdot Unrelated + \beta 4 \cdot AcquirorAdvancedEconomy + \\ & \beta 5 \cdot TargetAdvancedEconomy + \beta 6 \cdot AcquirorEnergyIndustry + \beta 7 \cdot TargetEnergyIndustry \\ & + \beta 8 \cdot TargetReturnOnAssets + \beta 9 \cdot DealValue + \varepsilon \end{aligned}$$

Where ACAR/TCAR is the cumulative abnormal results of, respectively, acquiror or target i between time t_1 and t_2 , the intercept a measures the excess returns after controlling for the effects of ESG performance, control variables and the interaction term between the ESG score and the relatedness of the industries of target and acquiror, $\beta 1$ measures the effect of the acquiror's ESG score on the acquiror or target CAR. $\beta 2$ is the coefficient for the dummy variable "unrelated" which is equal to one if the main industry of the target and acquiror are not the same. $\beta 3$ is the coefficient for the interaction term between the ESG score and the relatedness of industries. $\beta 4$, $\beta 5$, $\beta 6$ and $\beta 7$ are the estimated parameters related to control variables for industry and economic situation. Lastly, $\beta 8$ is coefficient related to a control variable for the acquiror debt to asset ratio and the target return on asset ratio respectively and $\beta 9$ represents the coefficient for control variable of the deal value. In both equations the $\beta 3$ coefficient will allow us to test hypothesis 3 for both the acquirors and the targets. If we find that the coefficient is significant and negative, we cannot reject the hypothesis, in case of any other result, the hypothesis will be rejected.

In order to test H4, the following equations will be tested:

$$\begin{aligned} \textbf{Equation 8: } ACAR_{i(t_1,t_2)} = & a + \beta 1 \cdot TargetESG + \beta 2 \cdot AcquirorAdvancedEconomy \\ & + \beta 3 \cdot TargetESG \cdot AcquirorAdvancedEconomy + \beta 4 \cdot TargetAdvancedEconomy + \\ & \beta 5 \cdot AcquirorEnergyIndustry + \beta 6 \cdot TargetEnergyIndustry + \beta 7 \cdot AcquirorRatioDebtToAssets \\ & + \beta 8 \cdot DealValue + \varepsilon \end{aligned}$$

Equation 9: $TCAR_{i(t_1,t_2)} = a + \beta 1 \cdot AcquirorESG + \beta 2 \cdot TargetAdvancedEconomy + \beta 3 \cdot TargetESG \cdot TargetAdvancedEconomy + \beta 4 \cdot AcquirorAdvancedEconomy + \beta 5 \cdot AcquirorEnergyIndustry + \beta 6 \cdot TargetEnergyIndustry + \beta 7 \cdot AcquirorRatioDebtToAssets + \beta 8 \cdot DealValue + \varepsilon$

Where ACAR/TCAR is the cumulative abnormal results of, respectively, acquiror or target i between time t_1 and t_2 , the intercept a measures the excess returns after controlling for the effects of ESG performance, control variables and the interaction term between the ESG score and the relatedness of the industries of target and acquiror, $\beta 1$ measures the effect of the acquiror's or target's ESG score on the CAR. $\beta 2$ Is the coefficient for the dummy variable "AdvancedEconomy", either for the target or the acquiror, which is equal to one if the home country of the target and acquiror is an advanced economy. $\beta 3$ is the coefficient for the interaction term between the ESG score and the dummy for advanced economy. $\beta 4$, $\beta 5$ and $\beta 6$ are the estimated parameters related to control variables for industry and economic situation. Again, $\beta 7$ represents the coefficient of the control variable for the acquiror debt to asset ratio and the target return on asset ratio respectively and $\beta 8$ represents the coefficient of control variable of the deal value. In both equations the $\beta 3$ coefficient will allow us to test hypothesis 3 for both the acquirors and the targets. If we find that the coefficient is significant and positive, we cannot reject the hypothesis, in case of any other result, the hypothesis will be rejected.

4. Data

4.1 General merger data

In order to conduct research on the association between ESG and the cumulative abnormal results of firms in mergers I first used the Refinitiv Dealscreen database to identify recent mergers in the energy industry. I used mergers of publicly traded companies from the past 9 years in the energy industry. To specify, either the target or the acquiring company was required to have the energy industry as their main industry. As authors of scientific journals started to appoint more significance to the sustainability initiatives in the energy industry from 2014 onwards, this seemed like an appropriate starting date. By selecting these filters in the Refinitiv Dealscreen database, a total of 10500 mergers came up as a result. However, only 625 mergers included Datastream identifiers for both target and acquirors. Accordingly, all

other mergers were deleted from the dataset. Additionally, ESG scores were obtained via the Eikon/Datastream database. Only 224 mergers included ESG scores for both acquiror and target, hence this is the number of deals used to find stock return data for the included firms.

In the end, 224 publicly completed mergers in the energy industry from January 2014 until the end of April 2023 were identified.

Figure 3 shows the distribution of mergers over the years. As can be seen there is a relatively even distribution in our sample, apart from a small increase in the number of mergers between 2018 and 2019. This should not lead to any biases based on the developments that happened over the years when it comes to ESG focus.

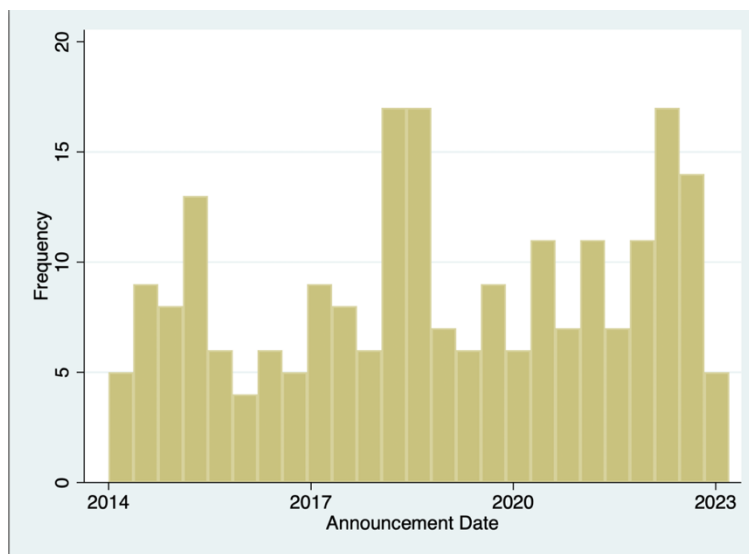


Figure 3. Frequency table of the M&A announcements and

Figures 4 and 5 show the targets' and the acquirors' distribution over the different macro industries in the overarching energy sector. The charts show that a significant amount of the firms have the Energy and Power industry as their macro focus. As this sector is the main focus of my research, this distribution is not problematic.

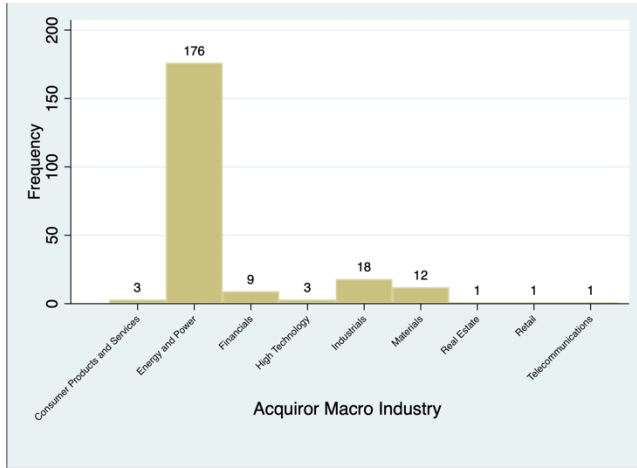


Figure 4. Distribution of acquirors' macro industries

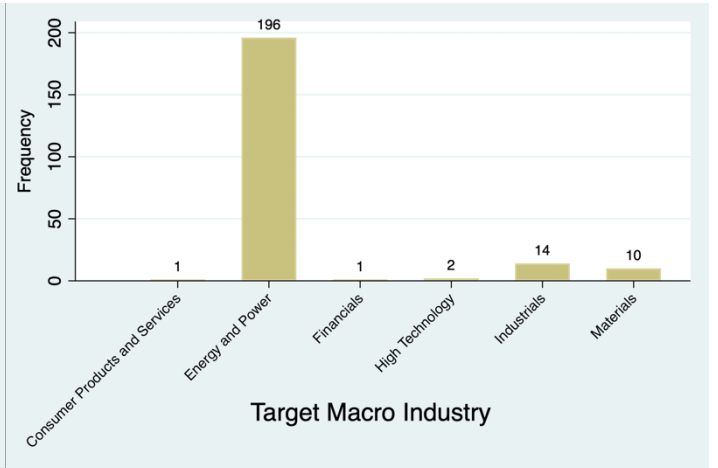


Figure 5. Distribution of targets' macro industries

Lastly, we will also look at the difference between the influence that ESG scores have on CAR for firms which find their origin in countries with an advanced economy have versus those in a developing economy. In our dataset, we find that a large percentage of the firms originate from countries in advanced economies, as can be seen from figure 6 and 7.

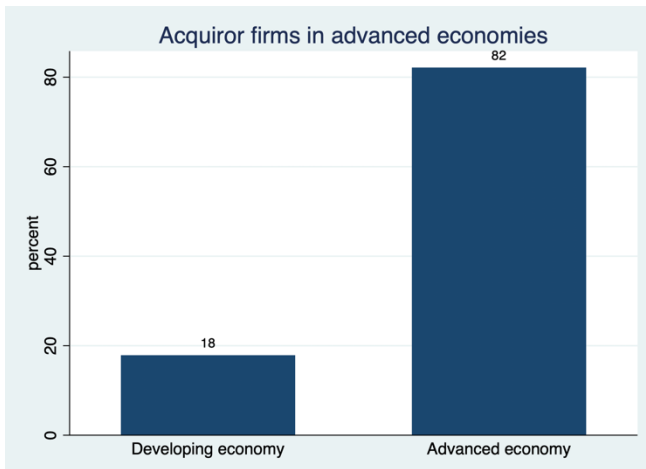


Figure 6. Percentage of acquirors in advanced economies

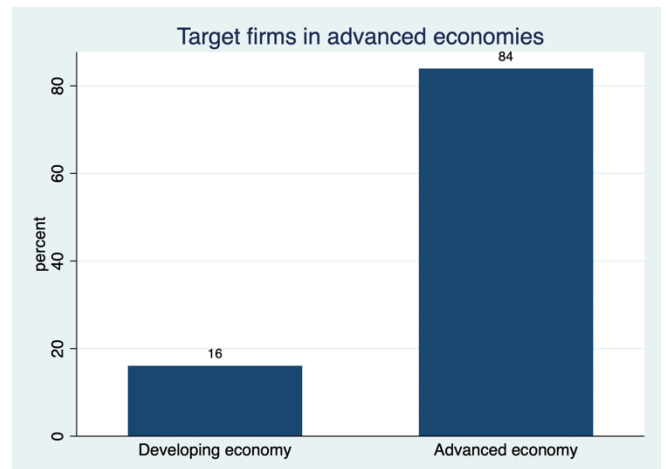


Figure 7. Percentage of acquirors in advanced economies

4.2 Stock return data

As the mergers were announced on different dates in different years and they are closed in different regions and slightly different sectors it was most appropriate to use a mean adjusted returns model. With this model, the expected 'market' returns become a constant based on a firms' performance over a period of 250 to 51 days prior to the merger announcement based on existing literature (Cichello and Lamdin, 2006). This average return is used as the constant in the CAR. The daily stock return data was retrieved from the Refinitiv Eikon/Datastream Database. Based on the stock return, calculated as the percentage change of the stock price, the average daily return was calculated as the mean of the historic returns. This mean value was used as the benchmark of a firm's performance and therefore as the expected return. As shown previously, the expected return is used to calculate an abnormal return by subtracting a daily realized return from it. As we use multiple event windows, we will have to calculate the abnormal daily return for the full range of event windows. In total, the daily abnormal return was calculated for 7 days, consisting of 3 days prior to the merger announcement, that announcement day and 3 days after the announcement.

This period is similar to the aforementioned event windows that were used in Tampakoudis et al. (2021). To compute the cumulative abnormal returns (CAR) the individual abnormal returns for the specific number of days in the event window are combined.

To make sure that the data on CAR for all different models, thus different event windows, have normal distribution, histograms were used. Figure 8 shows the histograms for all 9 event windows, before winsorizing any potential outliers. Winsorizing means that the outliers were appointed to the value at the nearest value of the 95% confidence interval. This allows us to keep observations and take their relatively small or large value into account, without them harming the robustness of the analysis. The values on the horizontal axis are the cumulative daily percentage change in stock price as presented by Eikon/Datastream. Lastly, the smooth line that runs through the bars, as presented by Stata, is an appropriately scaled normal density. The normal density line will have the same mean and standard deviation as the data.

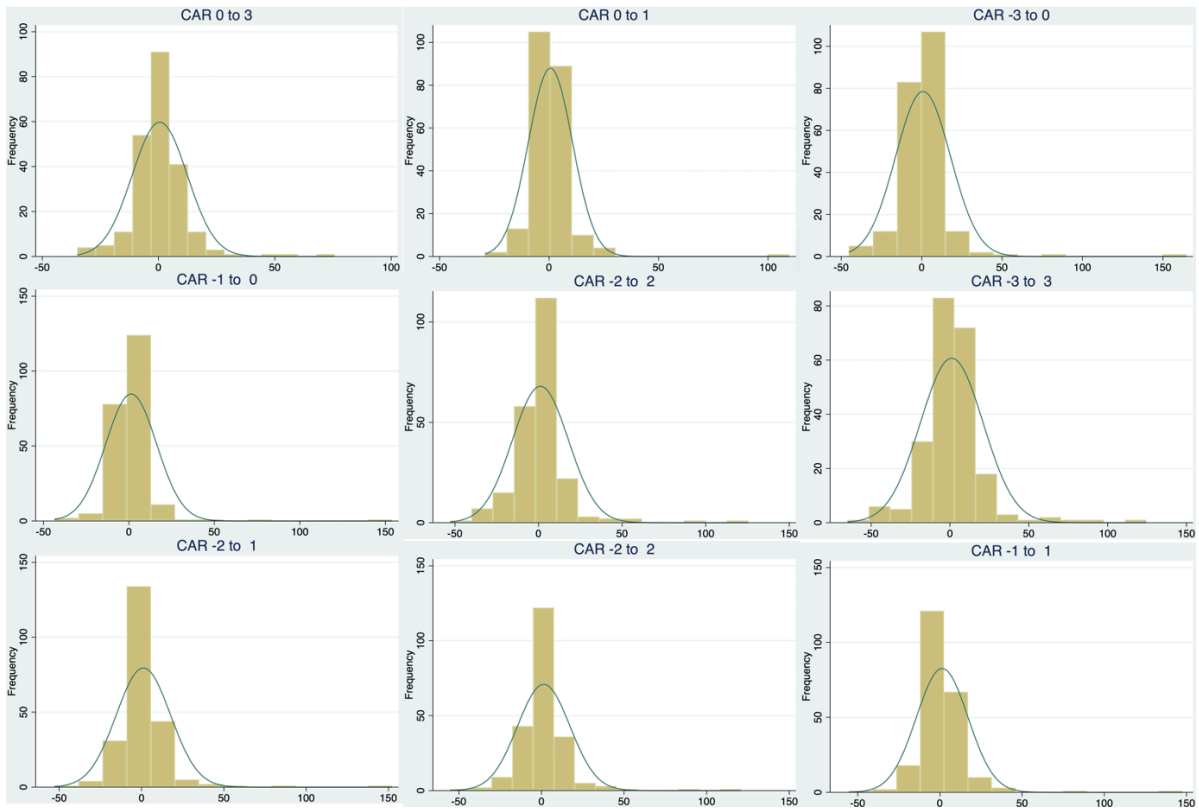


Figure 8. Acquiror CAR distribution histogram. Values are cumulative percentage change in stock price.

Although the distribution is centered towards the middle, there are several extreme outliers in all CARs. Rather than completely removing those outliers, the observations outside of the 5th until the 95th percentile were winsorized. Similarly, a check for the target's CARs was done, the result of which is found in figure 9.

Again, the obvious outliers, outside of the 5th until the 95th percentile were winsorized in order to receive a more accurate result from the analysis.

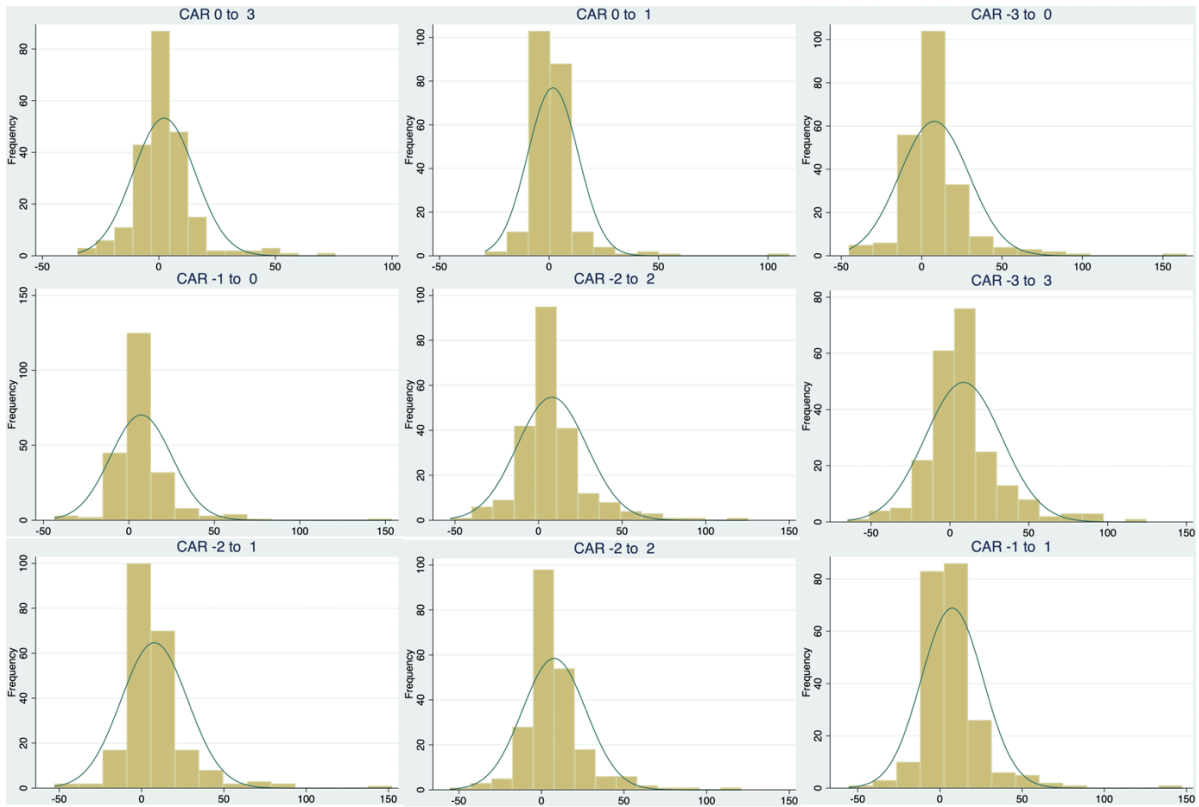


Figure 9. Target CAR distribution histogram. Values are cumulative percentage change in stock price.

To provide a clear overview of all variables that are previously discussed, as well as showing basic statistics for all other variables, a table of descriptive statistics will be provided. This table we present all minimum and maximum values, the mean values, the standard deviation, and the mean per variable. Table 1 shows that there are 224 observations for acquiror ESG scores. Although we still observe some extreme values as maximum and minimum values compared to the mean, the distribution has become a lot closer to being normal. As mentioned previously, the values for the CAR are the cumulative daily percentage change in stock price as presented by Eikon/Datastream.

Summary statistics

	N	Median	Mean	Min	Max
Acquiror ESG	224	61.32	57.872	4.62	93.17
Target ESG	224	49.05	47.587	0	93.17
Acquiror CAR Model 1	224	0	0.302	-15.51	18.97
Target CAR Model 1	224	.68	1.520	-15.43	20.317
Acquiror CAR Model 2	224	.16	0.059	-10.395	11.42
Target CAR Model 2	224	.295	0.799	-9.85	13.37
Acquiror CAR Model 3	224	.16	0.078	-18.435	19.44
Target CAR Model 3	224	4.565	6.881	-15.04	41.04
Acquiror CAR Model 4	224	.005	0.557	-12.604	16.46
Target CAR Model 4	224	4.59	6.285	-11.16	33.05
Acquiror CAR Model 5	224	.808	0.338	-20.575	22.111
Target CAR Model 5	224	5.102	7.261	-18.062	44.105
Acquiror CAR Model 6	224	1.385	0.356	-26.12	26.96
Target CAR Model 6	224	5.905	8.081	-23.255	54.11
Acquiror CAR Model 7	224	.575	0.167	-17.939	18.97
Target CAR Model 7	224	4.818	7.140	-15.22	44.92
Acquiror CAR Model 8	224	.536	0.610	-17.765	20.035
Target CAR Model 8	224	4.835	7.362	-14.26	44.78
Acquiror CAR Model 9	224	.002	0.545	-16.535	20.562
Target CAR Model 9	224	3.967	6.996	-13.454	42.705
Acquiror Advanced Economy	224	1	0.821	0	1
Target Advanced Economy	224	1	0.839	0	1
Acquiror Energy Industry	224	1	0.786	0	1
Target Energy Industry	224	1	0.875	0	1
Total Deal Value	198	6.613	6.453	.451	11.148
Acquiror Ratio Debt to Assets	224	21.57	22.608	0	80.36
Target Return on Assets	194	1.665	-1.517	-114	53.34

Table 1. Descriptive statistics of variables used in regression model.

Moreover, table 1 also shows us that the mean values of the dummies are all skewed towards either the minimum or the maximum. As shown previously, this means that the distribution between the two categories is unequal. For the unrelated industries dummy, this means that a large percentage of the mergers analyzed is between firms from the same industry. In line with this observation, we also see that most of our targets and acquirors are from the energy industry. Additionally, we observe that a large percentage of both acquiring and target firms are active in countries with an advanced economy. Lastly, we observe a small loss of observation when it comes to the total deal value and the target's return on assets.

After winsorizing the CAR variables, we observe a slight change in the distribution of the variables. Figures 10 and 11 show the new distributions of Acquiror CAR and Target CAR, respectively, after winsorizing.

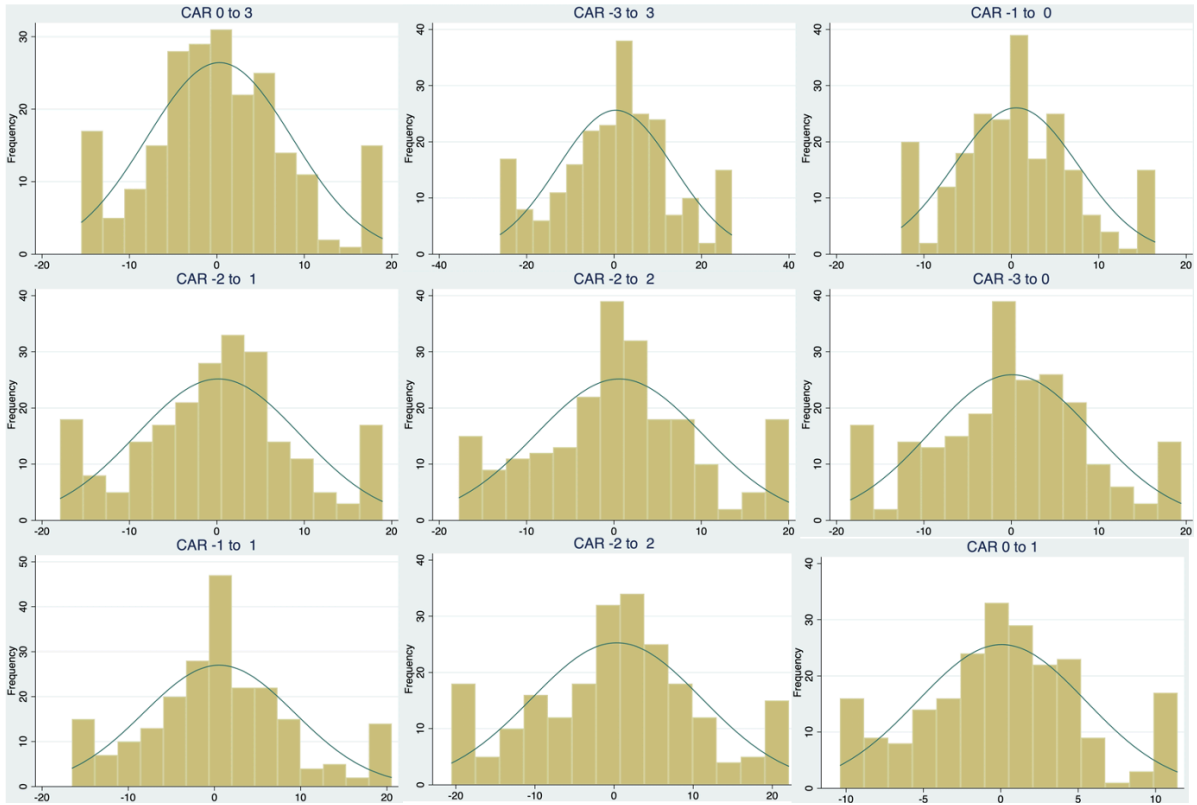


Figure 10. Acquirer CAR distribution histogram after winsorizing. Values are cumulative percentage change in stock price.

We can observe that for both acquirer and target CAR the distribution has become a lot closer to a normal distribution.

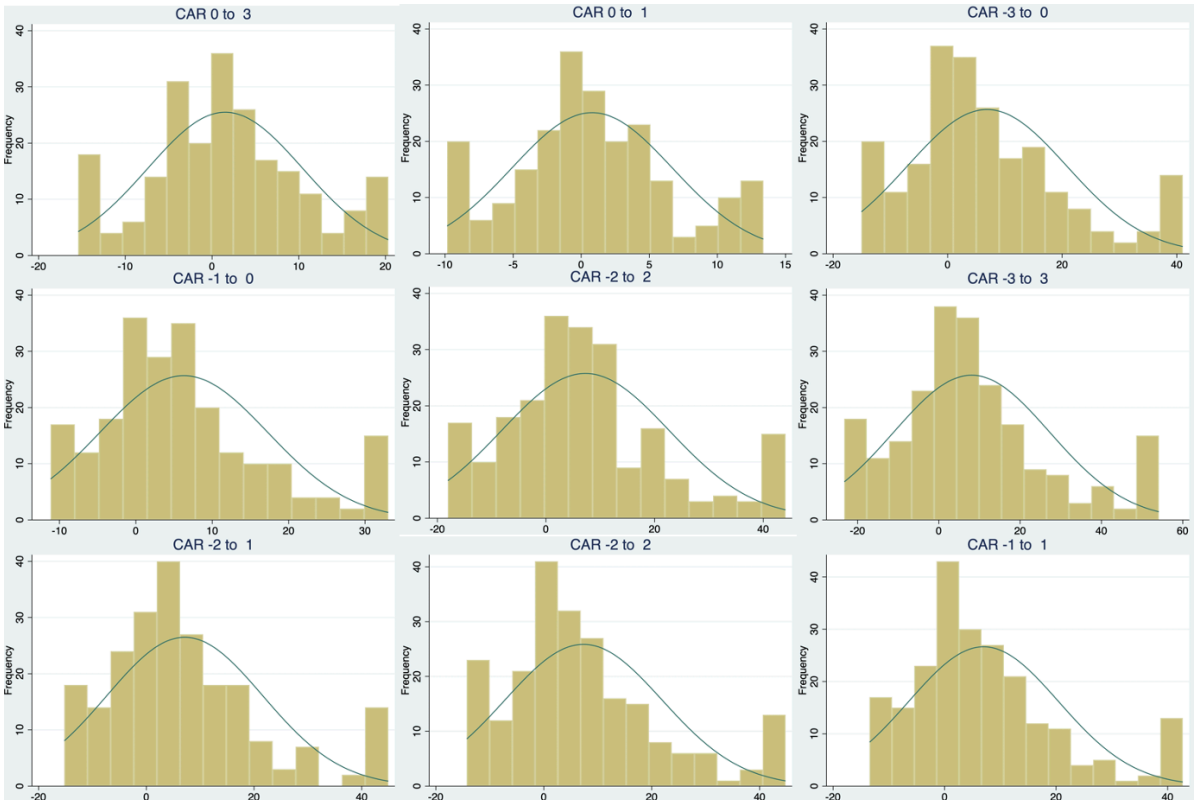


Figure 11. Target CAR distribution histogram after winsorizing. Values are cumulative percentage change in stock price.

Again, the line that can be observed is an appropriately scaled normal density. The normal density line has the same mean and standard deviation as the data.

Summary statistics					
	N	Median	Mean	Min	Max
AcquirorESG	224	61.32	57.872	4.62	93.17
TargetESG	224	49.05	47.587	0	93.17
Acquiror CAR Model 1	224	0	0.302	-15.51	18.97
Target CAR Model 1	224	.68	1.520	-15.43	20.317
Acquiror CAR Model 2	224	.16	0.059	-10.395	11.42
Target CAR Model 2	224	.295	0.799	-9.85	13.37
Acquiror CAR Model 3	224	.16	0.078	-18.435	19.44
Target CAR Model 3	224	4.565	6.881	-15.04	41.04
Acquiror CAR Model 4	224	.005	0.557	-12.604	16.46
Target CAR Model 4	224	4.59	6.285	-11.16	33.05
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Target CAR Model 5	224	5.102	7.261	-18.062	44.105
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Target CAR Model 6	224	5.905	8.081	-23.255	54.11
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Target CAR Model 9	224	3.967	6.996	-13.454	42.705
Acquiror Advanced Economy	224	1	0.821	0	1
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Target Energy Industry	224	1	0.875	0	1
Total Deal value	198	6.613	6.453	.451	11.148
Acquiror Ratio Debt to Assets	224	21.57	22.608	0	80.36
Target Return on Assets	194	1.665	-1.517	-114	53.34

Table 2. Descriptive statistics of variables used in regression model after winsorizing.

Lastly, the descriptive statistics have also changed slightly due to winsorizing our variables. Table 2 shows the descriptive statistics of our final sample. As expected, the maximum and minimum values have all gotten closer to the mean value due to the winsorizing. However, as mentioned the outliers were appointed to the value at the nearest value of the 95% confidence interval. So, we will keep the observations and take their relatively small or large value into account, without them harming the robustness of the analysis.

4.3 ESG data

It is important to notice that the ESG scores that were used for this research are ESG scores (also known as TRESGS) as composed by Refinitiv, based on the reported information in the environmental, social, and corporate governance pillars. Figure 12 (retrieved from the Refinitiv website, 2023) provides a more detailed explanation of the factors that compose this ESG score.

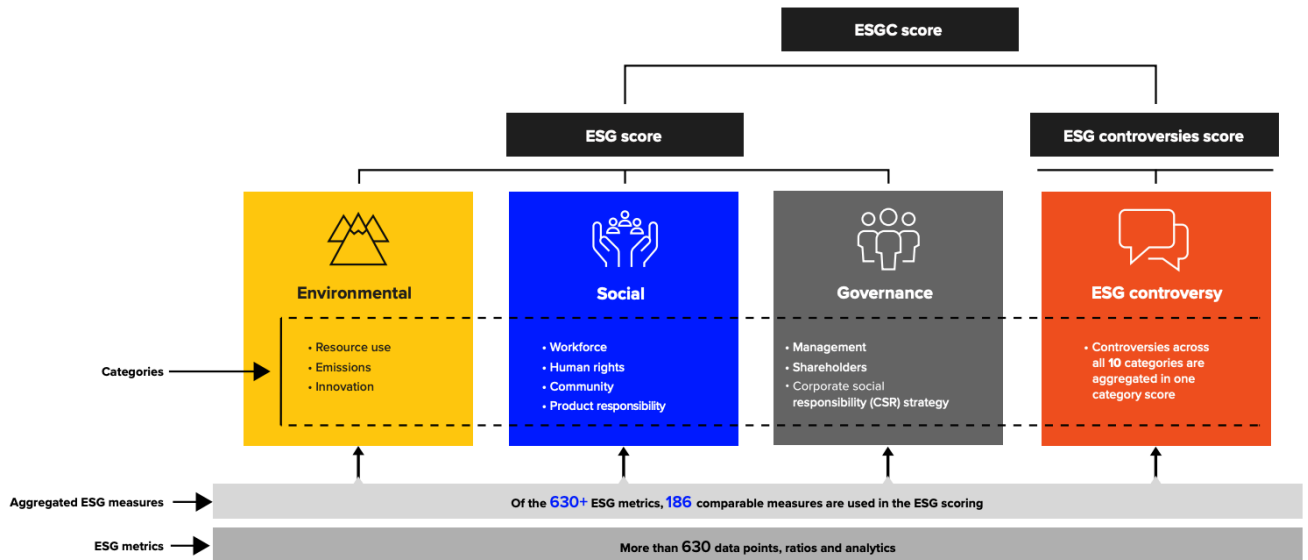


Figure 12. Buildup of the Refinitiv ESG score

The ESG score that was used in this research is based on the regular ESG score without the controversy score. The controversy score is an additional factor that increases the influence of important disputes on the overall ESG ranking, where firms' actions are compared against their stated beliefs. The scoring technique employs severity weights to address the market capitalization bias faced by large firms. This is done to ensure that controversy ratings are adjusted proportionately. This integration of severity weights aims to mitigate the influence of company size on the scoring process. Their database to conduct these scores were filled by 700+ researchers who used annual reports, company & NGO websites, stock exchange filing, CSR resources and news resources. All this information is combined into 10 categories that form the three pillar scores and the final ESG score. This final score is an assessment of the company's ESG performance, commitment, and efficacy based on publicly available data. Figure 13 provides a more detailed insight into the composition of the ESG score and the variable that was used in this research.

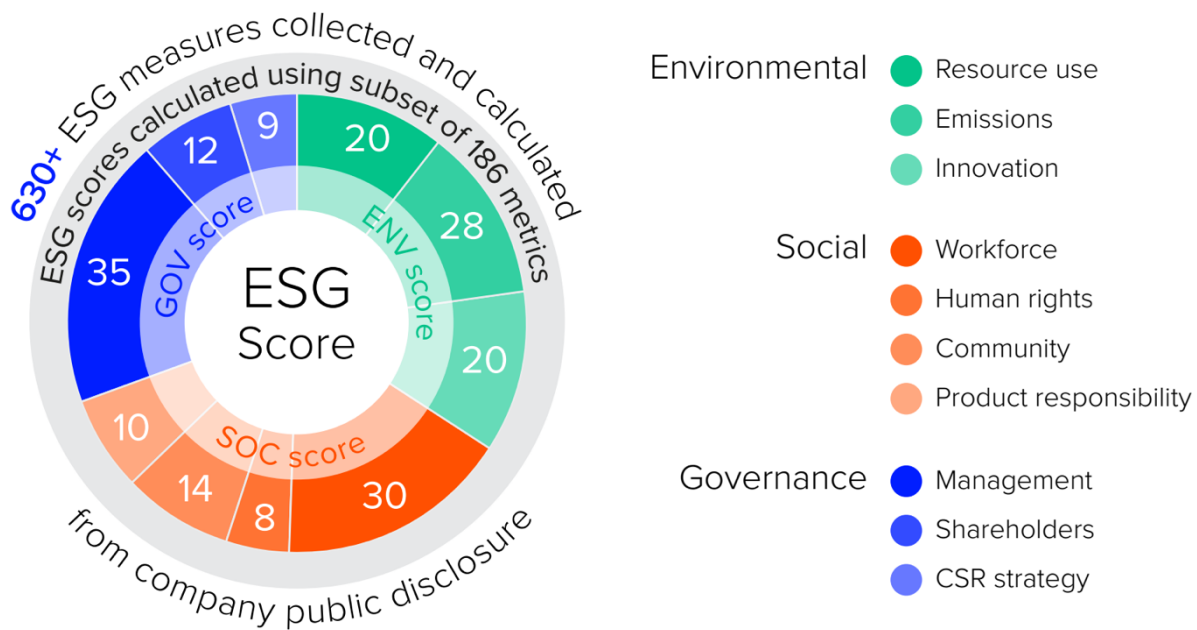


Figure 13. Composition of ESG score and weight of the different pillars.

5. Results

In order to examine the association between our dependent and independent variables, this study made use of OLS regression analysis. This analysis shows us the coefficient and the significance of the dependent variables, as well as the control variables. As mentioned previously, these coefficients will allow for an assessment of the hypotheses. Whilst considering the results, it is important to keep in mind that the different models vary based on the event window that is used for the CAR. As mentioned before, five event windows surrounding the announcement day (-3,3, -2,2, -2,1, -1,2 and -1,1); two pre-announcement event windows (-3,0 and -1,0) and two post-announcement event windows (0,3 and 0,1) are used. Model 1 represents the post-announcement event window (0,3), Model 2 relates to the other post-announcement event window (0,1). Model 3 and 4 show results on the pre-announcement event windows, -3,0 and -1,0 respectively. Models 5, 6, 7, 8 and 9 show the event windows surrounding the announcement date in the respective order; (-3,3, -2,2, -2,1, -1,2 and -1,1).

Association between Target ESG and Acquiror CAR

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Target ESG	.007 (.023)	.021 (.015)	.057** (.026)	.054*** (.019)	.071** (.03)	.042 (.036)	.065** (.026)	.062** (.026)	.057** (.024)
Acquiror Advanced Economy	-1.466 (3.179)	1.263 (2.089)	-5.795 (3.586)	-3.864 (2.723)	-5.846 (4.131)	-5.606 (5.08)	-4.356 (3.583)	-4.151 (3.658)	-2.451 (3.319)
Target Advanced Economy	2.301 (3.243)	-1.469 (2.131)	2.814 (3.659)	1.484 (2.779)	4.462 (4.215)	3.531 (5.183)	2.555 (3.656)	2.522 (3.732)	.566 (3.387)
Acquiror Energy Industry	.315 (1.763)	.199 (1.159)	2.388 (1.989)	1.485 (1.511)	2.895 (2.291)	2.406 (2.818)	2.065 (1.987)	2.447 (2.029)	1.917 (1.841)
Target Energy Industry	1.98 (2.263)	.751 (1.487)	.395 (2.553)	-.141 (1.939)	-.495 (2.941)	1.524 (3.617)	.467 (2.551)	-.481 (2.604)	-.169 (2.363)
Acquiror Ratio Debt to Assets	-.001 (.032)	.004 (.021)	-.001 (.036)	-.015 (.027)	-.01 (.041)	-.014 (.051)	-.017 (.036)	-.017 (.037)	-.025 (.033)
Total Deal Value	.414 (.3)	.29 (.197)	-.1 (.339)	-.163 (.257)	.113 (.39)	.047 (.48)	.03 (.339)	.075 (.346)	-.048 (.314)
Constant	-5.132* (2.951)	-3.3* (1.94)	-1.764 (3.33)	.158 (2.528)	-4.161 (3.835)	-3.018 (4.717)	-3.287 (3.327)	-2.511 (3.396)	-1.098 (3.082)
Observations	198	198	198	198	198	198	198	198	198
R-squared	.024	.033	.052	.066	.046	.022	.049	.045	.047
Adj R ²	-.012	-.002	.017	.032	.011	-.014	.014	.01	.012

Standard errors are in parentheses

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

Table 3. Regression results on the association between acquiror CAR and target ESG score

Our first results, as represented in Table 3, show that the association between the target’s ESG score and the acquiror’s CAR is significant at the 1% level for event window 4. Moreover, event window 3, 5, 7, 8 and 9 show significance at the 5% level. Therefore, these results suggest that there is a statistically significant association between the two variables. Interesting to notice is that the target ESG coefficient of all significant models is positive, suggesting that, when a target has a 1-point increase on the ESG score, the acquiror’s CAR increases by a minimum of 0.054% depending on the event window. Moreover, it is also interesting to notice that none of the control variables show significant results. We do see a significant coefficient of the constant in model 2, which would mean that in the second event window, the constant is statistically different from zero. Meaning that, if all explanatory variables are zero, the dependent variable would still be negative.

Our fourth table shows the results for the association between the target’s CAR and the acquiror’s ESG score, as discussed in the development of hypothesis 2. The control variables in the second regression are very similar, however, the control for the acquiror’s ratio of debt to assets is changed for the target’s return on assets, as this was proven to influence the target’s CAR.

Association between Acquiror ESG and Target CAR

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Acquiror ESG	.016 (.032)	.033 (.021)	.003 (.053)	.007 (.041)	.033 (.056)	.015 (.07)	.037 (.054)	.036 (.053)	.04 (.05)
Acquiror Advanced Economy	-7.283** (3.586)	-1.871 (2.404)	-8.579 (5.931)	-.452 (4.641)	-9.902 (6.317)	-19.07** (7.838)	-6.099 (6.007)	-8.247 (5.986)	-4.622 (5.548)
Target Advanced Economy	8.247** (3.754)	2.028 (2.517)	11.428* (6.21)	2.727 (4.858)	13.363** (6.613)	22.524*** (8.206)	8.926 (6.289)	11.639* (6.267)	7.169 (5.808)
Acquiror Energy Industry	-.325 (1.947)	-.083 (1.306)	.165 (3.221)	.226 (2.52)	.576 (3.431)	-.533 (4.257)	.071 (3.263)	.254 (3.251)	-.07 (3.013)
Target Energy Industry	3.548 (2.415)	1.313 (1.619)	-2.483 (3.995)	-2.192 (3.126)	-1.691 (4.255)	.127 (5.28)	-1.054 (4.046)	-1.232 (4.032)	-.65 (3.737)
Target Return on Assets	-.056 (.038)	-.012 (.025)	-.114* (.063)	-.102** (.049)	-.144** (.067)	-.184** (.083)	-.131** (.064)	-.141** (.063)	-.127** (.059)
Total Deal Value	.295 (.355)	.157 (.238)	.8 (.587)	.679 (.46)	.915 (.626)	.995 (.776)	.784 (.595)	.827 (.593)	.702 (.549)
Constant	-5.104 (3.2)	-3.367 (2.145)	1.212 (5.294)	1.686 (4.142)	-2.28 (5.638)	-2.113 (6.996)	-1.52 (5.362)	-1.73 (5.342)	-1.119 (4.951)
Observations	171	171	171	171	171	171	171	171	171
R-squared	.06	.031	.055	.053	.071	.082	.057	.071	.059
Adj R ²	.02	-.011	.014	.012	.031	.042	.017	.031	.018

Standard errors are in parentheses

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

Table 4. Regression results on the association between target CAR and acquiror ESG score

Table 4 suggests that there is no statistically significant association between the variable of interest and the dependent variable. However, we do observe similar signs for all coefficients of the “Acquiror ESG” variable, for every model. In this analysis we see that the control variable “Target Advanced Economy” shows statistical significance for models 1, 3, 5, 6 and 8. The positive association is significant at the 1, 5 or 10% level. As the variable is a dummy variable, this means that the CAR of targets is significantly higher if the target originates from a country with an advanced economy compared to other countries, ceteris paribus. This variable has the expected sign. Moreover, we find a negative coefficient for the “Acquiror Advanced Economy” dummy, significant at the 5% level for models 1 and 6. As the variable is a dummy variable, this means that the CAR of targets is significantly lower if the acquiror originates from a country with an advanced economy compared to other countries, ceteris paribus. This result is slightly unexpected, as the influence of an acquiring firm from an advanced economy was expected to be positive on the target firm. We also find statistically significant results of our control variable “Target Return on Assets”. The coefficient for model 3 is negative and significant at the 10% level. The coefficients for models 4 until 9 are also negative, but statistically significant at the 5% level. The result implies that if the target’s return on the assets increases by 1 percentage point, the target’s CAR. This result could be expected, for the fact that a target firm with high ROA is already performing well. Chances that an upcoming takeover will have a negative effect on the

ongoing success. Lastly, the loss of observations compared to the first regression is due to the number of missing values that are in the “*Target Return on Assets*” control variable.

Advancing to the next hypothesis, we will discuss two tables to analyze the results. This is because we want to consider both the relation between the acquiror’s CAR and target’s ESG as well as association between the target’s CAR and the acquiror’s ESG. Conditional on the dependent variable in the regression, we will either use “*Acquiror Ratio Debt to Assets*” or “*Target Return on Assets*” as control variable in the regression. Both regressions include an interaction variable between the relevant ESG scores and a dummy variable that takes on a value of 1 when the acquiror and target in a merger are active in unrelated industries.

Association between Target ESG, unrelated industries and Acquiror CAR									
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Target ESG	.018 (.024)	.025 (.016)	.062** (.027)	.06*** (.02)	.08** (.031)	.051 (.038)	.07*** (.027)	.073*** (.027)	.064** (.025)
Unrelated	7.211 (4.762)	1.636 (3.143)	4.825 (5.403)	3.159 (4.1)	5.6 (6.22)	8.3 (7.646)	2.23 (5.402)	6.466 (5.496)	3.388 (4.998)
Unrelated X Target ESG	-.139* (.082)	-.054 (.054)	-.063 (.093)	-.071 (.07)	-.106 (.107)	-.114 (.131)	-.063 (.093)	-.127 (.094)	-.083 (.086)
Acquiror Advanced Economy	-1.134 (3.254)	1.074 (2.147)	-5.215 (3.691)	-3.838 (2.802)	-5.568 (4.25)	-4.672 (5.224)	-4.487 (3.691)	-3.879 (3.755)	-2.508 (3.415)
Target Advanced Economy	1.942 (3.286)	-1.363 (2.169)	2.32 (3.728)	1.411 (2.829)	4.168 (4.292)	2.727 (5.276)	2.61 (3.727)	2.218 (3.792)	.548 (3.449)
Acquiror Energy Industry	1.106 (2.628)	-.349 (1.734)	3.901 (2.982)	1.503 (2.263)	3.563 (3.433)	4.833 (4.22)	1.665 (2.981)	3.082 (3.033)	1.702 (2.758)
Target Energy Industry	1.251 (2.633)	1.052 (1.737)	-.724 (2.987)	-.25 (2.267)	-1.096 (3.439)	-.288 (4.227)	.655 (2.986)	-1.087 (3.038)	-.136 (2.763)
Acquiror Ratio Debt to Assets	.005 (.032)	-.007 (.021)	.001 (.036)	-.012 (.027)	-.006 (.042)	-.01 (.051)	-.015 (.036)	-.012 (.037)	-.022 (.033)
Total Deal Value	.449 (.301)	.307 (.198)	-.088 (.341)	-.144 (.259)	.139 (.393)	.068 (.483)	.049 (.341)	.107 (.347)	-.025 (.315)
Constant	-6.061* (3.075)	-3.328 (2.03)	-2.634 (3.489)	-.166 (2.648)	-4.896 (4.017)	-4.47 (4.938)	-3.411 (3.488)	-3.325 (3.549)	-1.386 (3.227)
Observations	198	198	198	198	198	198	198	198	198
R-squared	.039	.04	.056	.072	.051	.028	.052	.054	.052
Adj R ²	-.007	-.006	.011	.027	.005	-.018	.007	.009	.007

Standard errors are in parentheses

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

Table 5. Regression results on the association between acquiror CAR, unrelated industries, and target ESG score

In table 5 we can observe that the coefficient of target’s ESG score is positive and significant for all models except model 1, 2 and 6. Again, this means when a target has a 1-point increase on the ESG score, the acquiror’s CAR increases by a minimum of 0.06% and a maximum of 0.08% depending on the event window. This result is significant on the 5% level for models 3, 5 and 9. For models 4, 7 and 8 the significance level is 1%. Moreover, the dummy for unrelated industries is insignificant for all models. Therefore, the models suggest that there is no significant impact of this variable on the acquiror’s CAR when considered individually. The interaction term also shows insignificant effects for all models, except for model 1. Hence, the interpretation of most event windows should be done without the interaction term. The coefficient for the target’s ESG score represents the effect for related

industries. This means that we observe a positive association between target ESG scores and acquiror CAR for related industries, which is very similar to our results for hypothesis 1. However, for model 1 we find that the association between “*Target ESG*” and the acquiror’s CAR is actually negative, as the coefficient of the interaction term is negative and the magnitude is larger than the magnitude of the “*Target ESG*” coefficient. For the remaining part of hypothesis 3, we will also look at the association between the acquiror’s ESG and target’s CAR depending on the relatedness of industries. Results related to this association are found in table 6.

Association between Acquiror ESG, unrelated industries and Target CAR									
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Acquiror ESG	.008 (.034)	.022 (.023)	-.023 (.056)	0 (.044)	.013 (.06)	-.017 (.075)	.015 (.057)	.021 (.057)	.008 (.034)
Unrelated	-5.34 (6.286)	-6.309 (4.194)	-8.759 (10.349)	-.842 (8.136)	-6.688 (11.056)	-13.079 (13.7)	-6.834 (10.496)	-5.134 (10.492)	-5.34 (6.286)
Unrelated X Acquiror ESG	.067 (.099)	.094 (.066)	.214 (.163)	.061 (.128)	.169 (.174)	.271 (.215)	.184 (.165)	.129 (.165)	.067 (.099)
Acquiror Advanced Economy	-8.121** (3.738)	-2.689 (2.494)	-8.748 (6.155)	-.005 (4.839)	-9.967 (6.575)	-19.885** (8.148)	-6.033 (6.242)	-8.312 (6.24)	-8.121** (3.738)
Target Advanced Economy	9.084** (3.891)	2.902 (2.596)	11.997* (6.407)	2.472 (5.037)	13.754** (6.844)	23.749*** (8.481)	9.238 (6.497)	11.95* (6.495)	9.084** (3.891)
Acquiror Energy Industry	-1.551 (2.799)	-.956 (1.868)	2.185 (4.608)	1.972 (3.623)	2.334 (4.923)	.599 (6.1)	2.307 (4.673)	1.55 (4.672)	-1.551 (2.799)
Target Energy Industry	4.447 (2.777)	2.009 (1.853)	-3.572 (4.573)	-3.284 (3.595)	-2.66 (4.885)	-.301 (6.053)	-2.324 (4.637)	-1.941 (4.635)	4.447 (2.777)
Target Return on Assets	-.054 (.038)	-.008 (.026)	-.102 (.063)	-.098* (.05)	-.134** (.067)	-.17** (.084)	-.12* (.064)	-.133** (.064)	-.054 (.038)
Total Deal Value	.315 (.357)	.181 (.238)	.835 (.588)	.684 (.462)	.941 (.628)	1.046 (.779)	.812 (.596)	.848 (.596)	.315 (.357)
Constant	-4.386 (3.34)	-2.711 (2.229)	1.046 (5.499)	1.153 (4.323)	-2.479 (5.875)	-1.734 (7.28)	-1.87 (5.577)	-1.865 (5.575)	-4.386 (3.34)
Observations	171	171	171	171	171	171	171	171	171
R-squared	.064	.045	.068	.057	.079	.091	.068	.075	.064
Adj R ²	.012	-.009	.016	.004	.027	.041	.016	.024	.012

Standard errors are in parentheses

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

Table 6. Regression results on the association between target CAR, unrelated industries and acquiror ESG score

The coefficient for “*unrelated*” is insignificant for all models. Moreover, the “*Acquiror ESG*” variable and our interaction term also show insignificant results. This means that we do not observe an association between the variables and the target’s CAR. Hence, the relatedness of industries does not seem to have a significant effect on the target’s CAR. Similar to our second hypothesis, we find significant results for “*Target Advanced Economy*” and “*Acquiror Advanced Economy*”, for several event windows. Again “*Target Advanced Economy*” shows a positive association, and “*Acquiror Advanced Economy*” shows a negative association with the target’s CAR.

Finally, the results from the statistical analysis regarding hypothesis 4 will be discussed. Table 7 shows the results of the first part of this analysis. Like the previous hypothesis,

hypothesis 4 will also consider both the relation between the acquiror's CAR and target's ESG as well as association between the target's CAR and the acquiror's ESG. Conditional on the dependent variable in the regression, we will either use “*Acquiror Ratio Debt to Assets*” or “*Target Return on Assets*” as control variable in the regression. Both regressions include an interaction variable between the relevant ESG scores and a dummy variable that takes on a value of 1 when the subject of interest finds its origin in a country which has an advanced economy.

In table 7 we observe the results of the first association connected to hypothesis 4. The dummy for “*Acquiror Advanced Economy*” shows a significant negative association for models 3, 4, 5, 7 and 8. The significance level varies between 5 and 10 percent. The individual effect of the acquiror being in an advanced economy is thus negative on the acquiror's CAR.

Association between Target ESG, Advanced Economies and Acquiror CAR

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Target ESG	-.053 (.057)	-.045 (.037)	-.026 (.064)	-.042 (.048)	-.034 (.074)	-.033 (.091)	-.033 (.064)	-.043 (.065)	-.041 (.059)
Acquiror Advanced Economy	-4.056 (3.899)	-1.584 (2.546)	-9.384** (4.391)	-8.038** (3.311)	-10.401** (5.053)	-8.869 (6.24)	-8.584* (4.378)	-8.72* (4.466)	-6.69 (4.051)
Acquiror Advanced Economy X ESG	.071 (.062)	.078* (.041)	.098 (.07)	.115** (.053)	.125 (.08)	.09 (.099)	.116* (.07)	.125* (.071)	.116* (.064)
Target Advanced Economy	1.685 (3.285)	-2.146 (2.145)	1.96 (3.699)	.491 (2.789)	3.378 (4.257)	2.755 (5.257)	1.55 (3.688)	1.435 (3.762)	-.442 (3.413)
Acquiror Energy Industry	.307 (1.762)	.19 (1.151)	2.376 (1.984)	1.471 (1.496)	2.88 (2.283)	2.395 (2.819)	2.052 (1.978)	2.433 (2.018)	1.903 (1.83)
Target Energy Industry	2.17 (2.268)	.96 (1.481)	.659 (2.554)	.165 (1.925)	-.16 (2.938)	1.764 (3.629)	.778 (2.546)	-.145 (2.597)	.142 (2.356)
Acquiror Ratio Debt to Assets	.001 (.032)	.006 (.021)	.001 (.036)	-.013 (.027)	-.008 (.041)	-.012 (.051)	-.015 (.036)	-.015 (.036)	-.023 (.033)
Total Deal Value	.415 (.3)	.29 (.196)	-.099 (.338)	-.162 (.255)	.114 (.389)	.047 (.48)	.031 (.337)	.075 (.344)	-.047 (.312)
Constant	-2.67 (3.65)	-.595 (2.384)	1.648 (4.11)	4.126 (3.099)	.17 (4.729)	.084 (5.841)	.733 (4.098)	1.832 (4.18)	2.932 (3.792)
Observations	198	198	198	198	198	198	198	198	198
R-squared	.031	.052	.062	.089	.058	.026	.063	.061	.063
Adj R ²	-.01	.012	.022	.051	.018	-.015	.023	.021	.024

Standard errors are in parentheses

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

Table 7. Regression results on the association between acquiror CAR, advanced economies, and target ESG score

No statistically significant results were found for the “*Target ESG*” variable. The individual meaning of this coefficient would be the association between target's ESG scores and the acquiror CAR in developing economies. In this case, we find insignificant results, meaning that we do not find an individual association. As an interaction term is included, we should consider the effect of ESG scores when firms are in advanced economies as well as the effect of ESG scores when firms are in developing economies. We find positive significant results for interaction term in models 2, 4, 7, 8 and 9. The sign of this coefficient is positive with a

magnitude between 0.078% and .125% depending on the event window, ceteris paribus. Therefore, if the firms are active in advanced economies, we will observe the following effect of “*Target ESG*” on the acquiror CAR:

$$\text{Equation 10: } \textit{Target ESG} * (\beta_1 + \beta_3)$$

Hence, we observe a positive significant result for “*Target ESG*” on the acquiror’s CAR when firms are in advanced economies, for 5 of our models, as the coefficient of the interaction term is significant, and the individual effects are not found to be significant.

As mentioned, for hypothesis 4, we will also discuss the association between the target’s CAR and the acquiror’s ESG combined with the dummy for advanced economy. These results are presented in table 8.

Association between Acquiror ESG, Advanced Economies and Target CAR

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Acquiror ESG	-.085 (.072)	-.043 (.048)	-.113 (.119)	-.116 (.093)	-.125 (.127)	-.14 (.157)	-.116 (.12)	-.113 (.12)	-.104 (.111)
Target Advanced Economy	2.201 (5.37)	-2.581 (3.592)	4.513 (8.918)	-4.644 (6.956)	3.891 (9.476)	13.229 (11.784)	-.229 (9.009)	2.72 (8.979)	-1.454 (8.318)
Target Advanced Economy X ESG	.124 (.079)	.095* (.053)	.142 (.132)	.152 (.103)	.195 (.14)	.191 (.174)	.188 (.133)	.183 (.133)	.177 (.123)
Acquiror Advanced Economy	-7.438** (3.571)	-1.99 (2.389)	-8.756 (5.931)	-.642 (4.626)	-10.146 (6.301)	-19.308** (7.836)	-6.334 (5.991)	-8.476 (5.971)	-4.843 (5.531)
Acquiror Energy Industry	-.542 (1.944)	-.249 (1.3)	-.084 (3.228)	-.038 (2.518)	.236 (3.43)	-.867 (4.265)	-.257 (3.261)	-.066 (3.25)	-.38 (3.011)
Target Energy Industry	3.954 (2.418)	1.622 (1.618)	-2.018 (4.016)	-1.697 (3.133)	-1.055 (4.267)	.751 (5.307)	-.439 (4.057)	-.633 (4.044)	-.071 (3.746)
Target Return on Assets	-.058 (.038)	-.014 (.025)	-.116* (.063)	-.105** (.049)	-.147** (.067)	-.187** (.083)	-.134** (.063)	-.144** (.063)	-.13** (.059)
Total Deal Value	.299 (.354)	.16 (.237)	.805 (.587)	.684 (.458)	.921 (.624)	1.001 (.776)	.79 (.593)	.833 (.591)	.707 (.548)
Constant	-.488 (4.338)	.151 (2.902)	6.491 (7.204)	7.313 (5.619)	4.95 (7.654)	4.982 (9.519)	5.469 (7.278)	5.078 (7.253)	5.464 (6.719)
Observations	171	171	171	171	171	171	171	171	171
R-squared	.074	.05	.062	.065	.082	.088	.069	.082	.071
Adj R ²	.028	.003	.015	.019	.037	.043	.023	.036	.025

Standard errors are in parentheses

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

Table 8. Regression results on the association between target CAR, advanced economies and acquiror ESG score

In this table, we see only one significant result for the variables of interest. This result is found in the interaction term of model 2. Unlike our results in table 7, we find insignificant results for the association between the acquiror’s ESG scores and the target’s CAR. This implies that there is no meaningful interpretation of the individual effect of the acquiror’s ESG score on the target’s CAR in developing countries.

Moreover, we find a negative coefficient for the “*Acquiror Advanced Economy*” dummy, which is significant at the 5% level for models 1 and 6. As the variable is a dummy variable, this means that the CAR of targets is significantly lower if the acquiror is active in the in an advanced economy compared to other economies for these event windows, ceteris paribus. To add, we also find significant results for the control variables of the target’s ROA. Similar to our results in table 6 the sign of this control variable is negative.

Lastly, the R-squared and adjusted R-squared values of all our models are relatively low. The R-squared represent the percentage of variability in the dependent variable which is explained by the independent variables. For this research, a low R-squared was expected, as it is generally very difficult to completely predict the abnormal returns in mergers. We also added the adjusted R-squared goodness of fit measure, as, R-squared tends to increase even if the additional variables have little or no predictive power. This can lead to overfitting. The adjusted R-squared addresses this issue by penalizing the inclusion of irrelevant variables in the model. Although we find relatively low values for the R-squared and the adjusted R-squared, this does not necessarily mean our interpretations and results are meaningless. An inclusion of more control variables and an increase in the number of observations could cause a significant increase in the R-squared values. Moreover, the cumulative abnormal returns of firms that are involved in mergers are influenced by many factors. Therefore, the goodness of fit measures are expected to show relatively low scores.

6. Discussion

In the modern day and age, the environment, inclusion, equity, and social causes are considered more important than ever. In a business environment, developing a strong reputation with regards to those matters could be valuable towards firm growth and profitability. Therefore, in this research, I have tried to determine the association between a combined score for such environmental, social, and governmental causes and the cumulative abnormal results surrounding merger announcement dates gained by firms involved in such an announcement. By analyzing historical data of mergers, where at least one firm is active in the energy industry, I tried to analyze whether an ESG score could affect the CAR surrounding the merger data. For our first hypothesis, it was expected that the ESG score of a target would have a positive association with the acquiror’s CAR, based on previous literature and theories. Our statistical analysis shows the expected result, for some of our event windows. Therefore, we find that in mergers, target ESG scores positively influences the acquiror’s CAR.

Moving on to hypothesis 2, this is slightly different. We expected that the acquiror's ESG scores would positively affect the CARs of the target company surrounding the announcement dates. From our results, we found that this was the case for one model. The other models showed insignificant results. Therefore, our final conclusion on this association is not as strong as our conclusion for hypothesis 1. However, for our second event window we can say that the acquiror's ESG score has a positive effect on the target's CAR. Additionally, all models did show the expected signs for the coefficient, although being statistically insignificant.

To continue, for hypothesis 3, we have tried to identify associations between the CARs, ESG scores and the relatedness of industries in which the firms are active. Our expectation was based on the indirect effect caused by two firms acting in unrelated industries. By using an interaction term, we found that our results were not in line with our expectations for the largest part. We only found 1 significant coefficient, which was only significant at the 10% level. Therefore, with regards to the acquiror's CAR, we should stick to the analysis of our first hypothesis and remove the interaction term.

When looking at the implications for the target's abnormal return, we observe that the individual effect of acquiror ESG shows an insignificant coefficient. However, in this regression we should consider the interaction term. We also find insignificant coefficients for this interaction term. This means that we do not observe an association between the variables and the target's CAR. Again, we should therefore stick with the original hypothesis and remove the interaction term.

Our fourth hypothesis was aimed to analyze whether a regional difference in the effect of ESG scores on CAR. More specifically, we suggested that mergers between firms originating from advanced economies should perform better, reflecting in higher CARs respectively. Moreover, we expected that the indirect effect of acting from countries with an advanced economy enlarges the effect of ESG scores on CARs, as firms and investors in advanced economies are more focused on those ESG scores. With regards to the association between the target's ESG score and the acquiror's CAR, we found a positive significant coefficient for the interaction term in five of our models. This means that we see an enhanced effect of the target's ESG score on the acquiror's CAR in advanced economies for that event window. This is in line with our expectations. Similarly, we also found a positive significant effect for the interaction term in the analysis of association between the acquiror's ESG and the target's CAR. However, we only found this significant result for one event window. Yet,

we did not find any negative significant effect. Hence, the results were, to a small extent, in line with the expectations.

Moving on, some limitations of this research will be discussed. Firstly, the dependent variable in all models was based on the cumulative abnormal return. This was calculated by subtracting the actual return on a day from the average return over a historic period. However, in order to create a more detailed comparison, it would have been better to subtract an expected return in a certain period from the realized return in that same period. This would remove the potential bias of using average returns from a period in the past and provide more accurate results for the current period.

Generally, all our regressions showed relatively low values for the R-squared and the adjusted R-squared. The R-squared represent the percentage of variability in the dependent variable which is explained by the independent variables. Although this was expected, as it is generally very difficult to entirely predict the abnormal returns in mergers, additional firm characteristics and deal-based variables could have increased the R-squared. Tampakoudis et al. (2021) give some excellent examples for firm characteristics and deal variables, however, most of them were not available in the database that was used for this research. Therefore, one suggestion for further research would be to use additional databases in order to increase the number of control variables.

To continue, some more general limitations of this research should be discussed. One of them is the small number of observations used in the analysis. Winsorizing was used to keep as many observations as possible in the sample. However, the lack of observation can be redirected to the lack of ESG scores in the database that was used for this research. One suggestion to solve this, is to make use of multiple databases and match them in order to find more results for the ESG score variable. In essence, this should provide stronger results overall. Additionally, this could lead to a better distribution of the firms when it comes to our dummy variables. For our variable “*advanced economies*” the lack of observations could mean that we have a distribution which is not necessarily a true representation of the population. A larger number of mergers in our sample could give a clearer and more significant view on the association between the economic development and merger results.

Lastly, building upon this research, we want to suggest two ways of going forward. First of all, from the results based on hypothesis 3, it would be interesting to analyze what the driving factor behind the unrelated mergers is. As we currently find that ESG scores do not have a specific effect on CARs for mergers between firms in unrelated industries, and we find that such mergers are, on average, outperformed by mergers between firms from related

industries, it would be intriguing to see what drives these unrelated mergers. Moreover, it would also be interesting to broaden the perspective and look at several industries. This research focused on the energy industry specifically, however, the set-up of this research could be used to investigate several other industries.

7. Conclusion

This research discusses the findings of several linear regression models, with a main focus on the association between ESG scores and the cumulative abnormal return of firms surrounding the period of a merger announcement. Besides this main aim of the research, we also attempted to analyze the mediating or amplifying effects of the relatedness of industries of the merger subjects and the region that both firms act in. More specifically, we hypothesized that, for unrelated mergers, ESG scores have a diminishing effect on the negative association between CARs and unrelated mergers. Additionally, we also hypothesized an amplifying effect of ESG scores on merger performance in advanced economies.

As mentioned before, we did not find any meaningful results for the first hypothesis, therefore we fail to draw relevant conclusion for that specific question. Similarly, we did not find a significant association between the acquiror's ESG score and the target's CAR for our second hypothesis model. Moreover, we found results that were in line with our expectations for hypothesis 4. As predicted by theory, ESG scores from firms in advanced economies were thought to have an enhancing effect on the association that exists between CAR and ESG scores in general. We found such a result for the relation between target's ESG scores and the acquiror's CAR, which is in line with our hypothesis based on the theoretical background. We did find similar results for the association between acquiror's ESG scores and the target's CAR, however, only one of the coefficients was statistically significant.

An implication that can be considered regarding the final conclusion is that both targeted and acquiring firms should consider the ESG score of the opposing party, especially when firms are active in advanced economies. Moreover, for investors, it is also interesting to consider the ESG scores of acquirors firms when contemplating whether to invest in a firm that might be close to a take-over. However, our results are based on a short period surrounding the announcement date. With regards to further research, a final suggestion could be to analyze the effects over a longer period of time.

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