



# The impact of ESG on M&A: an analysis of acquisition premia

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## **Abstract – English version**

Title: The impact of ESG on M&A: an analysis of acquisition premia

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This research paper aims to investigate and contribute to the puzzling discussion around the impact of ESG variables on the premia paid by acquiring companies in M&A transactions. To test the aforementioned relationship, different analyses have been conducted. More specifically, the empirical models developed consist in different linear regression models which were fitted by exploring all the different possible relationship combinations between the premia paid and ESG performance. The analysis led to significant results only in the case of simple bivariate analysis, while it produced insignificant results once additional control variables representing companies' size, operating performance, and capital structure were included in the analysis. Based on the study conducted, it can be concluded that there is no significant relationship between the main variables of interest regardless of the industry categories considered, namely whether the broad market industries spectrum or only capital intensive. These findings are in contrast with the initial hypotheses developed as well as with some previous research, yet they are in line with other academic studies which support the idea that ESG is not a key variable impacting M&A premia and strategic considerations behind deals execution.

**Keywords:** environmental, social & governance; delta ESG; corporate social responsibility; mergers & acquisitions; premium 1-day, 1-week, 4-week prior announcement; capital-intensive.

## **Abstract – Portuguese version**

Título: The impact of ESG on M&A: an analysis of acquisition premia

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Este trabalho de investigação tem como objetivo investigar e contribuir para a discussão em torno do impacto das variáveis ESG no premium pagos pelas empresas adquirentes em operações de Fusões & Aquisições. Para testar esta relação, foram realizadas diferentes análises. Mais especificamente, os modelos empíricos desenvolvidos consistem em diferentes modelos de regressão linear que foram ajustados explorando todas as diferentes combinações possíveis de relações entre os premia pagos e o desempenho ESG. A análise apenas conduziu a resultados significativos no caso da análise bivariada simples, mas produziu resultados insignificantes quando foram incluídas variáveis de controlo adicionais que representam a dimensão das empresas, o desempenho operacional e a estrutura de capital. Com base no estudo efectuado, pode concluir-se que não existe uma relação significativa entre as principais variáveis de interesse, independentemente das categorias de indústria consideradas, nomeadamente se o espectro das indústrias de mercado alargado ou apenas de capital intensivo. Estes resultados vão contra as hipóteses iniciais desenvolvidas, bem como com alguma investigação prévia, mas estão em linha com outros estudos académicos que suportam a ideia de que o ESG não é uma variável chave que impacta os premia de F&A e as considerações estratégicas por detrás da execução de negócios.

**Palavras-chave:** Meio-ambiente, responsabilidade social e governação; variação de ESG; responsabilidade social corporativa; fusões e aquisições; premium 1 dia, 1 semana, 4 semanas antes do anúncio; capital intensivo.

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## **1. Introduction**

The contested issue in corporate finance of how to explain a company's motivations and factors behind M&A activity served as the impetus for this study. In particular, the motivation behind writing the following research paper stems from the puzzling debate regarding the use of ESG factors in investment decisions and particularly in the world of M&A. Moreover, this research aims to contribute to previous research by examining the possible relationship between the independent variables, ESG scores, and the premia paid in the underlying M&A transactions. In particular, this research not only aims to support one of the two sides of the current debate, namely whether ESG is or not a driver of the M&A activity, but also aims to build upon former findings by presenting innovative perspectives.

Sustainable and ESG investing is the hot topic of the XXI century. The emergence of this phenomenon has a precise origin, which is the growing impact of human activity on the biosphere and its natural cycle. ESG investing, thus, started to become popular once governments and international entities recognized a pivot in the relationship between mankind and the ecosystem Earth. Mankind has always influenced the ecosystem, claims Krutzen (2012). Yet, in recent years, factors like resource depletion, climate change, and deforestation have worsened this relationship both from a size and frequency viewpoint. For this reason, governments, international bodies, and private organizations launched different initiatives to improve and standardize the measurement and tracking of the impact of climate change on corporations and vice versa. ESG scores represent one of the different initiatives thought to measure and answer this growing issue.

The popularity and momentum of ESG scores witness the growing interest and attention that companies dedicate to environmental, social, and governance topics. This fact is demonstrated by the evolution of different factors. For instance, according to a S&P Global research (S&P Global Market Intelligence, 2021), in 2011 around 20% of the 500 largest U.S. firms released a sustainability report. Since then, the volume has continuously increased, reaching 75% of these businesses in 2014 and a record 90% in 2019. This data underlines the growing attention paid by corporations towards an increasingly regulated and monitored topic, which is extremely relevant considering the fact that ESG reporting has mainly remained optional and on a voluntary basis. Further real-world evidence supports this view. According to Social Market Analytics (Social Market Analytics, 2020), since 2006, 597 various publicly listed U.S. corporations have referred to ESG in SEC filings. Although this represents only

around 16% of all publicly traded companies in the nation, there has been a steady rise in the number of firms citing ESG for the first time in their SEC filings over the years, from 9 in 2016 to 36 in 2018 and 280 in 2020. Moreover, the increasing adoption rate of the TCFD, which is an initiative launched by the FSB in 2015 with the aim of designing and developing a framework for climate-related financial risk information disclosure to investors and financial market participants, demonstrates again that companies' desire to improve their sustainable reporting activity. This framework, for instance, has received more support than anticipated; with more than 1,500 firms on board as of 2020, five times as many as in 2017. In addition, approximately 60% of the top 100 publicly traded corporations in the world support the TCFD, report in accordance with its guidelines, or do both. All these findings raise a first question. In particular, real-world evidence has shown how companies are increasingly committed to track and achieve ESG-linked goals. How, on the other hand, have financial markets moved?

The global AuM rose from \$84.9 trillion in 2016 to \$111.2 trillion in 2020, as per a recent study conducted by PwC. The study shows that emerging markets recorded the fastest growth, while established nations experienced the slowest (PwC, 2022). This pronounced growth has been driven by the global GDP per capita growth, but also by the accommodative and favorable low-interest rate environment, which significantly reduced the cost of debt and the cost of equity over the past years. Yet, the recent rising levels of inflation obliged central banks to use various measures to combat the growth in prices, especially by increasing interest rates, with a negative impact on the AuM at the global level. Nonetheless, with the reduction of interest rates expected in 2024 and 2025, the wealth management industry could still be likely to achieve the forecasted level of \$145 trillion in 2025.

In this context, ESG assets are expected to be one of the main drivers of this trend. Globally, asset managers anticipate that their ESG-related AuM, which was \$18.4 trillion in 2021, will rise to US\$33.9 trillion by 2026. In particular, ESG assets are expected to account for 21.5% of total worldwide AuM in less than 5 years, with a predicted compound annual growth rate of 12.9%. This trend symbolizes a significant and ongoing change in the asset and wealth management industry and is further supported by other research. According to a survey conducted by ETFGI, the assets held by global ESG ETFs increased from \$5 billion in 2006 to \$391 billion in 2021 (ETFGI, 2022). The growing interest around SRI is not only witnessed by the assets managed globally, but also by the percentage of NYSE-listed firms with an ESG rating, which is one of the most represented stock exchanges in the dataset used for the data

analysis of this paper. In particular, the number of firms included in the NYSE and retrievable from Refinitiv Eikon reflects the growing importance of ESG ratings. Just 469 out of 1988 enterprises, or 23.6%, received ESG ratings in 2006. However, by 2020, 1739 companies, meaning the 87.5% of the total, had an ESG score. Moreover, from 37.2 in 2006 to 46.6 in 2020, the mean ESG combined score has grown by almost 20-30%. Again, these results demonstrate how the ESG revolution is extremely affecting the financial public stock markets and will shape its future development over the upcoming years. All these findings raise a second question. In particular, real-world data have shown how companies are increasingly committed to tracking and achieving ESG linked goals for strategic purposes, including stock performance. How, on the other hand, the M&A markets moved?

The relationship between the M&A and the stock market is present and pronounced. However, it is worth understanding whether the ESG momentum which is affecting the stock market is also present in the M&A market. The value and success of a merger or acquisition can be driven by different considerations in the M&A market, namely increasing market share, improving efficiency, and gaining access to new technologies and markets among all. However, with the growing pressure on companies to achieve higher standards in terms of sustainable and social impact, new factors increased in importance, especially ESG factors. In fact, companies with strong ESG performance tend to better perform according to an analysis of the CGI (Corporate Governance Institute, 2022). Moreover, ESG is becoming a more crucial component of brand and reputation management in today's hyper-connected world which obliges companies to carefully invest their resources to not lag behind competition. For this reason, companies with strong ESG positioning may be more likely to be purchased by buyers for reputational purposes.

According to an article published on the Harvard Law School (Cannon & Kostopoulos, 2022), the authors explain how ESG factors have changed their place in M&A deals. ESG, according to the authors, is no longer simply a risk management concern but also a chance to provide value. In fact, investors are more drawn to firms with outstanding ESG performance, and that ESG may affect deal structure and due diligence. The lack of uniformity and the difficulty of measuring ESG elements, however, are two significant issues that the paper notes as barriers to integrating ESG into M&A.

The increasing effect of sustainability on M&A deals is further witnessed by the increasing popularity of new criteria used in the selection and due diligence process put in place

by acquiring companies before the closing of an M&A transaction. Different research studies conducted by Deloitte (Deloitte, 2021) and PwC (PwC, 2021) underline the importance of conducting extensive ESG due diligence to have a better picture of the target company from additional perspectives. By conducting such activity and studying factors such as inconsistent ESG reporting, ineffective corporate governance techniques, environmental laws not being followed, high energy consumption or carbon emissions, human rights violations or poor working conditions, and inadequate product or supply chain safety, companies can more promptly spot red flags and deal brakers. Moreover, these analyses further emphasize the fact that companies not properly analyzing and handling ESG risks may potentially face legal, financial, and reputational repercussions.

Real-world evidence supports this view with however some discrepancies. For instance, a study conducted by Sustainalytics (Sustainalytics, 2022) which examined 231 M&A that were completed between 2011 and 2016 to see if acquisitions involving firms with similar ESG scores fared better than deals involving companies with different ESG policies identified interesting findings. As a result, the survey found out that ESG-compatible deals achieved a cumulative performance of 64% against ESG-incompatible deals, which instead achieved only 43% over a 5 years horizon. However, not all the real-world based analyses led to similar results. In fact, a recent survey by Bain & Company (2022) suggests that ESG may only be relevant to companies operating in cyclical industries such as natural resources and energy. In particular, 40% of the survey's respondents operating in the energy and natural resources industry identify ESG as a driving motivator for the deal, while the remaining 60% identify themselves as ESG-conscious or not interested. Moreover, respondents belonging to other industries demonstrate how ESG is not always considered a key factor, with only 14% of the survey's respondents considering ESG as a real motivator. These results demonstrate how the increased interest is present and deeply affecting the industry, however with a heterogeneous impact and not crystal-clear evidence across different industries.

Overall, the increased influence of human activity on the biosphere and its natural cycle, as well as the advent of various efforts, such as ESG, to address this issue, have made sustainability and ESG investment a popular topic. The forementioned studies and analyses, prove the unprecedented growth of ESG assets, with asset managers projecting that by 2026, their ESG-related AuM will reach US\$33.9 trillion, or 21.5% of the total global AuM. This growth is affecting in different manners the financial world and its indicators, however in a

heterogeneous manner other spheres, with the M&A market being an example. Given the increasing hype yet the insufficient and opaque clarity of the relationship between ESG and the M&A market, this thesis aims to further bring evidence and clarity by studying the specific relationship between ESG scores and M&A premia.

## **2. Literature Review and Hypothesis Development**

### **2.1 Literature Review**

The M&A activity is a key driver of companies' growth. The potential advantage that this typology of operation brings to companies is extremely relevant in terms of competitive positioning and strategic growth. Calipha et al. (2010) suggest that this activity is a widespread occurrence that is becoming more frequent in the United States, Europe, and the rest of the world. Motives behind this activity include industry consolidation, market entry, the conquest of rare and inimitable resources, and value creation opportunities via revenue and cost synergies among all. Martynova and Renneboog (2006) further examined the characteristics and outcomes of mergers and acquisitions with a focus on the European market. Their research finds similar motives driving the M&A activity in Europe, including increasing market share, improving efficiency, and gaining access to new technologies and markets. The study however finds that most M&A deals in Europe are cross-border, with acquirers often seeking to expand into new countries and industries. The authors also find that European M&A deals tend to be smaller in size, have a higher frequency of failure, and achieve lower returns compared to M&A deals in the US for investors.

Regardless of the industry and geography, decisions made by a company's managers should always be directed toward shareholder value creation. This idea was first presented by the Friedman Doctrine (Friedman, 1970), according to which managers have no obligations other than maximizing profits for shareholders. Different externalities however may undermine the correct functioning of this relationship as the Principal Agent Theory explains (Jensen and Meckling, 1976). In this regard, literature and real-world evidence tend to conflict, showing that not always managers' decisions are directed toward augmenting shareholders' financial interests. Weston et al. (1994) and Jensen and Ruback (1984) demonstrate that a considerable number of merger and acquisition deals tend to destroy rather than create value for shareholders. In particular, the study found that the average announcement returns for acquirers in the 1980s were negative, suggesting that the market believed that the acquiring firms overpaid for the target firms. Moreover, the paper published by Jensen and Ruback (1984) found that in the sample of firms that were acquired between 1963 and 1976, the average return to the shareholders of the acquiring firm was negative in the long run. More recent studies find similar results, in particular, Hubbard and Palia (2002) found that the average abnormal returns

for acquirers were negative in the long run for the sample studied. Although the vast majority of the literature agrees that M&A deals tend to destroy rather than create value, some exceptions show the opposite. In fact, research studies conducted by Koi-Akrofi and Godfred (2016), support the view that M&A deals can also be successful. Their findings highlight that M&A transactions can have a positive impact if some considerations and precautions are taken. In particular, they found out that the likelihood of deals' failure considerably drops if human-related issues in the integration stage, namely culture, political aspects, and communication, are carefully monitored. Overall, as aforementioned, the literature identifies several challenges when companies acquire or merge with other players. These challenges severely impact the successful outcome of a transaction, leading to a high likelihood of value destruction for shareholders.

Over the last years, the global deal activity continued to grow despite the macroeconomic challenges and high failure rates. According to the Statista Research Department (Statista, 2022), the value of M&A transactions has almost doubled internationally, passing from \$2,539 billion in 2012 to \$5,857 billion in 2021, with dips observable during and after recessions. All these considerations lead to a substantial contradiction, which consists of the fact that the global M&A activity continues to grow despite the value destruction and the high failure rates of deals. As forementioned, there are different possible explanations for this phenomenon. One factor is the propensity of businesses to overestimate the value that can be generated via the creation of synergies through a merger or acquisition. For instance, a business can think that by buying another business, it might save expenses, boost earnings, or gain access to new markets or technology. Additionally, some companies engage in M&A as a means of diversifying their business, which can help to reduce risk, yet also impacting performance. Moreover, M&A can be motivated by more tactical factors like market and competitive pressures, as businesses believe they must grow swiftly to remain relevant and competitive. Finally, some companies engage in M&A as a way to boost growth or to increase their scale and market share, which can help to improve their bargaining power and increase profitability. Several scholars identified similar drivers in their research by surveying samples of finance professors and practitioners (James and Baker, 2001; Agrawal and Knoeber, 1996; Pagano et al., 2004). Overall, depending on the industry, country, and market conditions, companies tend to engage in M&A activities because of different motivations, which literature suggests having often superior importance compared to shareholders' value enhancement and performance return.

In an increasingly dynamic world, every decade novel factors materialize and acquire increasing strategic importance in line with emerging trends. In particular, there is growing scientific consensus that human activity, particularly the burning of fossil fuels, is what is driving climate change. As a result, businesses are under increased pressure to reduce their carbon emissions and take steps to mitigate their harmful environmental consequences. The Friedman Doctrine is frequently at odds with these endeavours (Friedman, 1970). The conflict between this doctrine and sustainability arises because the pursuit of profits may involve practices that harm the environment, exploit workers, or negatively impact communities. For instance, companies may put short-term financial advantages ahead of long-term environmental preservation or emphasize cost-cutting tactics that harm the environment. In this sense, the Friedman Doctrine is frequently viewed as being outdated and out of step with current business and societal concerns, where sustainability and corporate social responsibility are becoming increasingly significant factors. Different empirical studies show the growing importance of sustainable factors in financial markets, including in M&A transactions. Schaltegger et al. (2017) identified that sustainability factors are becoming increasingly significant in M&A deals as businesses become more aware of the potential advantages of incorporating sustainable practices into their operations. The literature review conducted by the authors also reveals that there are several difficulties and impediments when it comes to incorporating sustainability into M&A deals, including a lack of clear sustainability strategies, a lack of coordination, a lack of communication among the parties, and a lack of knowledge of the financial advantages of sustainability. Wicks et al. (2016) produced an additional article that further contributes to the literature. The study examines the motivations and constraints of sustainability in M&A through a survey of top managers involved in M&A transactions in the US, Canada, and the UK. The research indicates that the most frequent drivers of sustainability in M&A agreements are the possibility for cost savings and other financial benefits, as well as the improvement of reputation and brand image, the growth of customer loyalty, and the capacity to recruit and keep outstanding personnel. Similar research conducted by Högberg and Skålén (2017) with a focus on the Swedish market supports the view that corporations are increasingly taking into account sustainability in M&A strategies, with the achievement of cost savings and other financial benefits, as well as the possibility for reputation and brand image enhancements, as the most frequent drivers. Evidence from the industry is in line with scholars' findings on the increasing importance of social and green considerations in M&A deals. In a report by Deloitte (Deloitte, 2023), stakeholders such as investors, clients, employees, and

regulators are putting more pressure on companies to consider environmental, social, and governance factors when making M&A choices. Nonetheless, not all the literature supports the view that sustainability is a key factor in M&A activity. According to the study conducted by Johnson (2018), financial factors are the main drivers of M&A activity in the US, with sustainability having a limited impact. Additional research conducted by Smith (2017) discovered that while sustainability was taken into account in some M&A transactions in Europe, it was not the primary factor in the decision-making process, with financial and strategic factors still coming first. In conclusion, the literature acknowledges that different factors drive M&A decisions, not necessarily to maximize shareholders' value, yet also for strategic and vision purposes, including sustainability and social objectives. Although considerable research and studies have been produced around the topic, literature and scholars still do not have a clear position on the impact of sustainable considerations in M&A deals. This paper aims to further contribute and expand the literature's findings.

## **2.2 Hypothesis Development**

General studies and literature tend to support the notion that environmental, social, and governance aspects are increasingly understood to have a substantial influence on the long-term financial success of businesses and investment portfolios (Laux et al., 2018; Johan and Rahim, 2015; Taylor et al., 2015; Riahi-Belkaoui, 2012; Song et al., 2017; Wasiq and Al-Rajhi, 2015). Starting from the results obtained by Schaltegger et al. (2017) and Wicks et al. (2016) showing the importance of sustainability as a driver of the M&A activity, this paper aims to further expand literature findings by investigating the impact of environmental, social, and governance factors on short-term stock performance and cost of acquisition in M&A deals. Following this line of reasoning, it is expected that acquirers with a poor performance in terms of environmental, social and governance practices, are more prone to acquire high performing targets with solid ESG practices to compensate the lack of green and inclusive performance, no matter the capital required. In this regard, it is expected that acquirers pay higher premia for targets with strong orientation towards sustainability and CSR policies.

*H1: Delta between the acquirer's and the target's ESG Score lagged has a negative impact on the Acquirer's premium paid on the target's acquisition*

*H2: Acquiror's ESG Score has a positive impact on the Acquirer's premium paid on target's acquisition*

***H3:** Target's ESG Score has a positive impact on the Acquirer's premium paid on target's acquisition*

To further build on prior research, this paper also aims to examine the individual ESG scores that make up the ESG moniker: environment, social, and governance. In particular, this study concentrates only on the E score as the weight of this specific pillar accounts normally the most in the calculation of the comprehensive score. In line with previous hypotheses, it is expected a favorable and positive relationship between the forementioned score, and the premium paid by the acquirer.

***H4:** Target's E Score has a positive impact on the Acquirer's premium paid on target's acquisition*

### 3. Data

#### 3.1 Data collection

The goal of this study is to comprehend whether sustainability and ESG metrics have an impact on the premium paid of acquiring a target company in a M&A transaction. For this reason, the sample selected from the population of interest consists of a pool of M&A transactions completed over the last 10 years from January 1, 2013, to December 31, 2022. The data were retrieved from Refinitiv (formerly, Thomson Reuters) Eikon Deal Screener. This source can be considered one of the most reputable and accurate providers of M&A data and information. Additionally, company specific as well financial and accounting data were retrieved from Refinitiv DataStream on a yearly basis, FY. Transactions were filtered according to the following criteria:

- Time period announcement dates: from January 1, 2013, to December 31, 2022
- Form of the deal: Merger
- Deal value: \$1+ Million
- Payment method: cash, equity, or cash-equity combination
- Acquirer status: Public company
- Target status: Public company
- Deal status: Completed
- Acquirer region: Americas, Africa/ Middle East/ Central Asia, Asia Pacific, Europe
- Target region: Americas, Africa/ Middle East/ Central Asia, Asia Pacific, Europe
- Acquirer industry: all except financial, real estate, rental, leasing, banking, and insurance industry
- Target industry: all except financial, real estate, rental, leasing, banking, and insurance industry
- Currency: USD

The application of the forementioned filtering conditions led to a sample of 2,251 observations. Starting from this initial dataset, additional selection criteria were applied. In particular, for each transaction, supplementary accounting, financial and ESG variables were retrieved from Refinitiv DataStream. This treatment led to a reduction in the number of observations equal to the number of transactions where at least one acquirers' or targets' value

was missing. Moreover, years and industries with a single observation were omitted in order to ensure variation within each year and industry of the dataset. This process led to a final dataset composed of 204 public companies' transactions from January 1, 2013, to December 31, 2022. A brief summary of the acquirers and targets information and distribution are provided in Table 1, Table 2, and Table 3.

**Table 1** – Acquirers and targets headquarter countries distribution

<b>Regions</b>	<b>Target #</b>	<b>Target %</b>	<b>Acquirer #</b>	<b>Acquirer %</b>
Africa/ Middle East/ Central Asia	3	1.47%	1	0.49%
Europe	38	18.63%	51	25.00%
Americas	129	63.24%	122	59.80%
Asia-Pacific	34	16.67%	30	14.71%
Total	204	100%	204	100%

**Table 2** – Cross-border and cross-industry distribution

Note: Cross border binary variable equals 0 if the target's and acquirer's headquarters are in the same geography, otherwise 1. Cross industry binary variable equals 0 if the target and acquirer operate in the same industry, otherwise 1.

<b>Binary</b>	<b>Cross-border #</b>	<b>Cross-border %</b>	<b>Cross-industry #</b>	<b>Cross-industry %</b>
0	155	75.98%	112	54.90%
1	49	24.02%	92	45.10%
Total	204	100%	204	100%

**Table 3** – Acquirer Industry NAICS and deals by year distribution

Note: The following table represents the sample distribution of deals by year and acquirer industry NAICS code. Specifically, Code N°31 represents animal, food, beverage, tobacco, textile manufacturing. Code N°32 represents wood, paper, pharmaceutical and metal manufacturing. Code N°33 represents hardware, industrial machinery, semiconductor, electrical, and automotive manufacturing.

<b>NAICS Code</b>	<b>Acquirer NAICS #</b>	<b>Acquirer NAICS %</b>	<b>Year</b>	<b>Deals # per year</b>	<b>Deals % per year</b>
Mining and utilities (Code N° 21/2)	33	16.18%	2013	4	1.96%
Construction (Code N° 23)	9	4.41%	2014	14	6.86%

Manufacturing (Code N° 31)	6	2.94%	2015	19	9.31%
Manufacturing (Code N° 32)	22	10.78%	2016	22	10.78%
Manufacturing (Code N° 33)	47	23.04%	2017	25	12.25%
Wholesale trade (Code N° 42)	4	1.96%	2018	33	16.18%
Retail trade (Code N° 44)	15	7.35%	2019	31	15.20%
Transportation and warehousing (Code N° 49)	5	2.45%	2020	23	11.27%
Information (Code N° 51)	17	8.33%	2021	27	13.24%
Professional services (Code N° 54)	23	11.27%	2022	6	2.94%
Administrative management (Code N° 56)	12	5.88%			
Health care and assistance (Code N° 62)	2	0.98%			
Arts and entertainment (N° 71)	3	1.47%			
Accommodation and food (N° 72)	3	1.47%			
Other services (N° 81)	3	1.47%			
Total	204	100%		204	100%

### 3.2 Variables overview and methodology

In this section, it is presented an overview of the different variables that were examined to conduct the study. The dependent variables are the first to be presented and consist in the M&A result measurement that this research is interested in explaining. Second, the independent

variables used to test the different research hypotheses are presented. Finally, different control variables are provided to ensure the relationship between the dependent and independent variables is authentic and not affected by external factors.

### 3.2.1 Dependent variables

This study's major goal is to determine whether sustainability and other social and environmental factors have an effect on the premium that the acquirer must pay in an M&A transaction. Acquirers frequently pay various premia based on the amount of time before the announcement date, as demonstrated by Taha and Raju (2019). For this reason, this paper utilizes as dependent variable three different premia, respectively 1 day, 1 week, and 4 weeks premia prior to the announcement date of the transaction. The insightful findings that can be derived from the application of different market premia are multiples, but most importantly it anticipates a market perception of deal and its possibility to be accretive or dilutive. Following the forementioned considerations, the data of interest were retrieved from Refinitiv Eikon Deal Screener, which is used by different market participants, namely investment banks and institutional investors, and considered are reputable source for deal data. The variables are calculated according to the following equations:

$$\text{Prem}_{1D} = \frac{(\text{Target's stock price} - \text{Target's stock price 1 day before})}{\text{Target's stock price 1 day before}} * 100$$

$$\text{Prem}_{1W} = \frac{(\text{Target's stock price} - \text{Target's stock price 1 week before})}{\text{Target's stock price 1 week before}} * 100$$

$$\text{Prem}_{4W} = \frac{(\text{Target's stock price} - \text{Target's stock price 4 weeks before})}{\text{Target's stock price 4 weeks before}} * 100$$

**Table 4** – Dependent variables summary

<b>Variable</b>	<b>Symbol</b>	<b>Description</b>
1 day premium prior to the transaction announcement	Prem_1D	Continuous variable expressed as percentage representing the premium on top of target stock price 1 day prior to the announcement
1 week premium prior to the transaction announcement	Prem_1W	Continuous variable expressed as percentage representing the premium on top of target stock price 1 week prior to the announcement
4 week premium prior to the transaction announcement	Prem_4W	Continuous variable expressed as percentage representing the premium on top of target stock price 4 weeks prior to the announcement

### 3.2.2 Independent variables

Several reasons have contributed to the huge rise in popularity of ESG indicators over the past few years, namely increasing awareness of carbon footprint impact and reputation concerns. This trend is witnessed by the increasing availability of ESG data published by different data providers. Among the wide spectrum of the data providers, this study bases its analysis on the information supplied by the Refinitiv ASSET4 database, which is widely used in the academic world. Environmental, Social, and Governance are the three criteria that make up the Refinitiv ESG moniker. Ten distinct measures, such as emissions, human rights, or CSR strategy, make up each of the categories and have a different impact on the comprehensive score based on a materiality matrix. In this way, Refinitiv calculates an ESG score between 0 and 100 using the values of these data items and a percentile rank scoring technique, with 100 representing the highest possible ESG score. Moreover, the data provider supplies individual scores for each pillar, namely Environmental, Social, and Governance scores. To exploit the different advantages and perspectives these scores provide, different independent variables have been used to conduct the analysis. In particular, to assess the impact of the sustainable position of the target, data about targets' E, S, G, and ESG scores have been retrieved. Moreover, in order to account for the positioning of the acquirer in terms of sustainable practices, the ESG score was retrieved as well. Finally, to study the influence of an acquisition with the ultimate goal of compensating a poor acquirer's ESG score with a high target's ESG score, the independent variable `Delta_ACQTAR_ESG_lag` has been calculated with the following equation:

$$\text{Delta ACQTAR ESG}_{1y \text{ lag}} = \text{Acquiror's ESG Score}_{1y \text{ lag}} - \text{Target's ESG Score}_{1y \text{ lag}}$$

To incorporate the effect of the difference in time between the intention to acquire a target, and the effective execution of the operation, all the independent variables presented in this section are lagged by one year. This means that the score considered represents a company's sustainability performance one year prior to the announcement date of the deal.

**Table 5** – Independent variables summary

<b>Variable</b>	<b>Symbol</b>	<b>Description</b>
Delta between acquiror's Refinitiv ESG score and target's Refinitiv ESG score, 1 year lagged	Delta_ACQTAR_ESG_lag	Continuous variable representing the difference between acquiror's Refinitiv ESG score and target's Refinitiv ESG score, 1 year lagged
Acquiror Refinitiv ESG score, 1 year lagged	ACQ_ESG_lag	Continuous variable on a scale 0-100 measuring acquiror's performance in Refinitiv environmental, social, and governance areas, 1 year lagged
Target Refinitiv ESG score, 1 year lagged	TAR_ESG_lag	Continuous variable on a scale 0-100 measuring target's performance in Refinitiv environmental, social, and governance areas, 1 year lagged
Target Refinitiv E score, 1 year lagged	TAR_E_Score_lag	Continuous variable on a scale 0-100 measuring target's performance in Refinitiv environmental area, 1 year lagged
Target Refinitiv S score, 1 year lagged <sup>1</sup>	TAR_S_Score_lag	Continuous variable on a scale 0-100 measuring target's performance in Refinitiv social area, 1 year lagged
Target Refinitiv G score, 1 year lagged <sup>2</sup>	TAR_G_Score_lag	Continuous variable on a scale 0-100 measuring target's performance in Refinitiv governance area, 1 year lagged

<sup>1</sup> Social score variable not used in the analysis, but with potential applications for future research

<sup>2</sup> Governance score variable not used in the analysis, but with potential applications for future research

### 3.2.3 Control variables

As underlined by different research papers (Calipha et al., 2010), several variables can impact on the decision whether to acquire or not a target. For this reason, different control variables have been included in the model to decrease the possibility of receiving skewed estimations and boost the model's prediction accuracy. To control for size effects, the natural logarithm of the deal value, as well of the target's and acquiror's total assets were considered. Moreover, to capture for capital expenses for maintenance and innovation, the target's and acquiror's capital expenditures and R&D expenses were included. In addition, to control for the financial position and profitability metrics, the target's and acquiror's debt-to-equity and gross margin ratios were included in the control variables set. Lastly, cross border and cross industry dummies were calculated and included in the analysis to further control for differences in deals involving two different geographies or industries, as these types of deals tend to follow more complex transactions, and thus treated differently.

**Table 6** – Control variables summary

<b>Variable</b>	<b>Symbol</b>	<b>Description</b>
Natural logarithm of deal value	log_Deal_Value	Continuous variable representing the natural logarithm of the total amount paid by the acquiror excluding the additional charges and fees
Natural logarithm of FY-1 target's total assets	TAR_log_TA_lag	Continuous variable representing the natural logarithm of the target's FY-1 total assets prior to deal announcement date
Natural logarithm of FY-1 acquiror's total assets	ACQ_log_TA_lag	Continuous variable representing the natural logarithm of the acquiror's FY-1 total assets prior to deal announcement date
FY-1 target's capex to total assets ratio	TAR_Cap_to_TA_lag	Continuous variable representing the target's FY-1 capex prior to deal announcement date expressed in USD divided by total assets
FY-1 acquiror's capex to total assets ratio	ACQ_Cap_to_TA_lag	Continuous variable representing the acquiror's FY-1 capex prior to deal announcement date expressed in USD divided by total assets expressed as percentage

FY-1 target's debt-to-equity ratio	TAR_D/E%_lag	Continuous variable representing the target's FY-1 debt-to-equity ratio prior to deal announcement date expressed as percentage
FY-1 acquiror's debt-to-equity ratio	ACQ_D/E%_lag	Continuous variable representing the acquiror's FY-1 debt-to-equity ratio prior to deal announcement date expressed as percentage
FY-1 target's gross margin ratio	TAR_Margin%_lag	Continuous variable representing the target's FY-1 gross margin ratio prior to deal announcement date expressed as percentage
FY-1 acquiror's gross margin ratio	ACQ_Margin%_lag	Continuous variable representing the acquiror's FY-1 gross margin ratio prior to deal announcement date expressed as percentage
FY-1 target's research and development expenditure to total assets ratio	TAR_R&D_to_TA_lag	Continuous variable representing the target's FY-1 research and development expenditure prior to deal announcement date divided by total assets expressed as percentage
FY-1 acquiror's research and development expenditure to total assets ratio	ACQ_R&D_to_TA_lag	Continuous variable representing the acquiror's FY-1 research and development expenditure prior to deal announcement date divided by total assets expressed as percentage
Cross border dummy	Dum_Cross_Border	Dummy variable with 0 representing the target's and acquiror's headquarters are in the same geography, otherwise 1
Cross industry dummy	Dum_Cross_Industry	Dummy variable with 0 representing the target and acquiror operate in the same industry, otherwise 1

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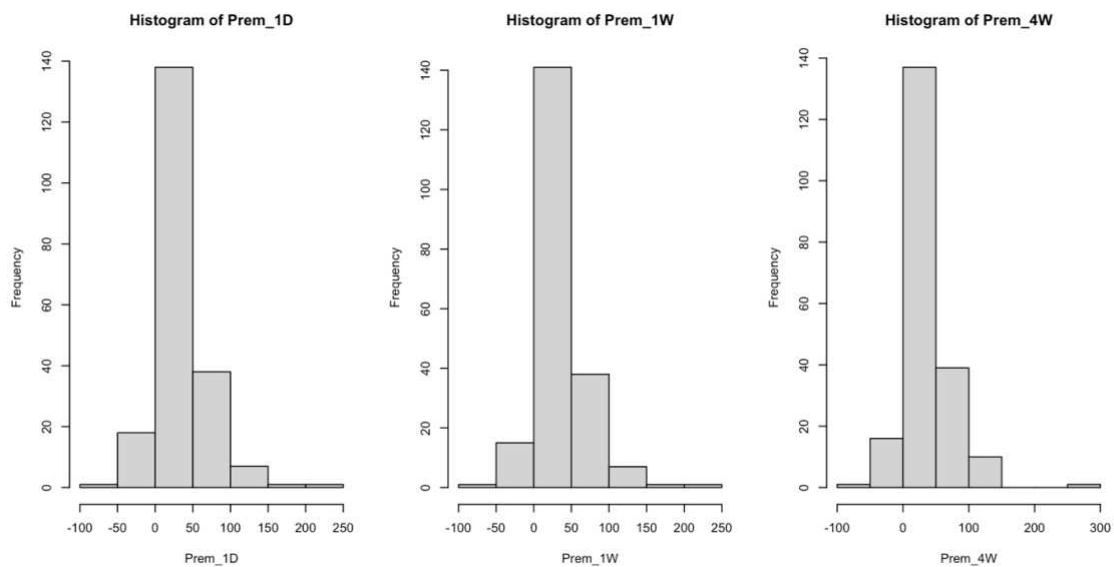
### 3.3 Summary statistics and variables distribution

Before testing whether ESG metrics and considerations have an impact on cost of acquisition paid by acquirors, it is worth briefly analyzing the distribution of the different variables within the dataset. The descriptive analysis will mostly concentrate on the key variables of interest, meaning the dependent and independent variables. Nonetheless, further

information for the full range of variables, namely central tendency measures, skewness, and kurtosis, are provided in Table 7 to give a broader and more comprehensive picture of the dataset. Starting with the dependent variables, Figure 1 shows that premia paid by the acquirors respectively 1 day, 1 week, and 4 weeks prior to the original announcement date. This data shows that premia are highly concentrated between 0-50 (%) range, following a right-skewed distribution. Moreover, Figure 1 further displays that this data tends to approximately follow a normal distribution with thin and relatively asymptotic tails.

Similar considerations apply to ESG-related variables distribution. In particular, Figure 2 shows how the variable `Delta_ACQTAR_ESG_lag` follows a normal distribution pattern, with relatively thin tails. This result, however, is due to the fact that by construction this variable tends to attenuate extreme results. On the other hand, the `TAR_ESG_lag` and `ACQ_ESG_lag` variables present some degrees of skewness, with distribution right and left skewed respectively for `TAR_ESG_lag` and `ACQ_ESG_lag`. These results do not contradict general expectations. In fact, it is not questionable that companies with more mature and established operations, have the ability to deploy more resources in terms of ESG and sustainable practices. Moreover, the interest that bigger companies have in maintaining high reputation standards is presumably higher due to the global reach of the operations.

**Figure 1** – Prem\_1D, Prem\_1W, Prem\_4W histograms



**Figure 2** – Delta\_ACQTAR\_ESG\_lag, TAR\_ESG\_lag, ACQ\_ESG\_lag histograms

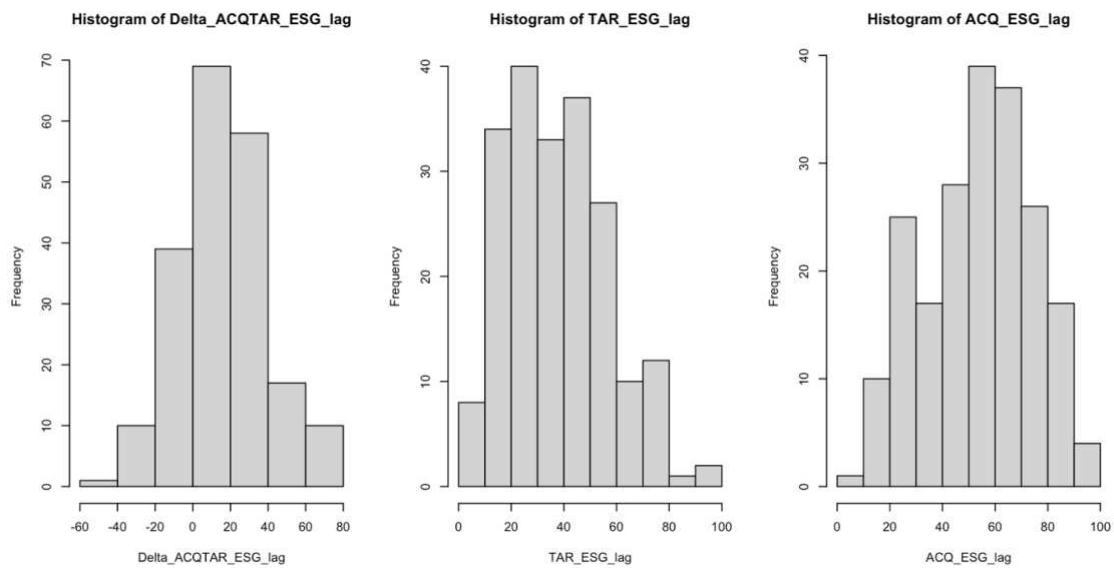


Table 7, on the other hand, provide a general overview of the variables distribution. First, by taking into consideration the dependent variables, meaning Prem\_1D, Prem\_1W and Prem\_4W, it can be noticed that Prem\_4W is the variable with the highest values. This fact can be explained by the reason that premia tend to become larger the bigger the time lag with respect to the announcement date. This because rumors and market sentiment can discount in advance the possibility of a merger, ultimately influencing stock prices and thus premia paid, yet with some exceptions.

Regarding the ESG variables, it can be generally assumed that not all the companies feel the same level of urgency to invest considerable amount of resources in ESG practices. In particular, it is expected that the size of the company has, on average, a strong influence on the resources deployed and consequently the ESG performance. Following this reasoning, it can be noticed how also the data analyzed in this thesis support this view. In fact, acquirer's E, S, G, and combined scores are consistently higher with respect to targets' scores, again reflecting the substantial difference in terms of resources available. However, there can be further considerations that contribute to this difference, namely the fact that larger companies are keener on maintaining high ESG standards to improve their reputation.

Concerning instead the variables that encompass the size of the companies involved and the deal value, namely ln\_Deal\_Value, TAR\_log\_TA\_lag and ACQ\_log\_TA\_lag, in this case, it is possible to notice how acquirers on average pay a deal value amount which is less

than the total assets possessed by the target. In addition, Table 7 further highlights that, on average, the amount of total assets held by the acquiring company is consistently greater than the targets' ones. This result is in line with common expectations, as companies with greater amounts of resources are more willing to engage in a M&A deal, which is a long and expensive process that can provide the companies involved with benefits only if the strategic plan and the resources available are sufficiently supportive.

Table 7 presents in addition interesting characteristics about target and acquiring companies. In particular, on average, it can be noticed that smaller companies tend to display higher operating metrics, for instance gross margin, compared to larger acquiring companies. This result is in line with previous research findings (Fama & French, 1993), where the authors claim that smaller companies tend to outperform bigger companies over a long-term horizon. Moreover, the table shows how, on average, smaller companies tend to have higher D/E ratios compared to larger companies. This result, however, is highly dependent on the industry of reference, as companies tend to have different capital structures depending on the industry dynamics in which they operate.

Finally, regarding companies' expenditures in terms of R&D and Capex, it can be noticed how, on average, target companies tend to have higher R&D-to-Total Assets and Capex-to-Total Assets ratios. As forementioned, target companies tend to have on average smaller amounts of assets. This means, that in the calculation of these ratios, the denominator is significantly smaller than the one of acquirers, leading to higher ratios. Moreover, acquiring companies are expected to be more mature companies, meaning with lower investments in innovation as well in growth and maintenance capex relative to their size, as companies reach a maturity stage.

Further information about variance-covariance and correlation among the main dependent and independent variables is displayed in Table 8 and Table 9. For the sake of conciseness, the analysis will mostly concentrate on the correlation coefficients, which can provide interesting insights on the relationship between the main dependent and independent variables used, however further information about variance-covariance is displayed as well in Table 8.

Starting from the three main dependent variables - Prem\_1D, Prem\_1W, and Prem\_4W - it can be noticed from Table 9 that these variables display positive and high correlation

coefficients, which are greater than 0.895 in all the different cases. These coefficients show a strong and tight positive relationship, as the three dependent variables are tightly correlated by construction and reflect the premia paid on the underlying stock of the target. In fact, despite the fluctuations in the underlying stock, it can be assumed that drivers such as market conditions, deal size, industry dynamics, and bidder characteristics similarly impact premia paid on a short-term horizon.

Regarding instead the E, S, G, and combined score, the correlation matrix found a strong correlation between the ESG score and the specific factors related to environmental, social, and governance issues for the same company, with the only exception being the `Delta.ACQTAR_ESG_lag` variable. This result is reasonable since companies often adopt policies that address multiple factors at once, namely carbon emission reductions, waste reduction, employee training and development programs, diversity inclusion programs, transparency in financial reporting, board of directors' diversity, etc. On the other hand, it can be noticed how the different E, S, G, and combined scores between the target and acquirer do not display strong correlation coefficients. A similar reasoning applies to E, S, G, and combined scores and the premia paid. This result is not surprising as the policies pursued by different companies, although they might share some similarities, should not have a relationship among each other, meaning a low correlation coefficient.

Overall, apart from the strong positive correlation among the different premia, and the one between the E, S, G, and combined scores belonging to the same company, no further significant coefficients are displayed in Table 9.

**Table 7** – Dependent, independent and control variables summary statistics

<b>Variable</b>	<b>Mean</b>	<b>St. dev</b>	<b>Min</b>	<b>Pctl(25)</b>	<b>Median</b>	<b>Pctl(75)</b>	<b>Max</b>	<b>Skewness</b>	<b>Kurtosis</b>
Prem_1D	32.0	33.7	-66.1	13.7	24.6	46.0	227.5	1.8	9.91
Prem_1W	33.8	34.1	-66.1	13.9	27.5	46.3	225.6	1.6	9.2
Prem_4W	36.4	37.2	-66.1	14.1	30.0	49.6	262.5	1.7	10.2
Delta_ACQTAR_ESG_lag	16.0	23.0	-52.6	0.6	15.2	29.9	74.0	0.2	3.1
TAR_ESG_lag	37.5	19.1	0.6	22.4	35.3	50.9	92.3	0.5	2.6
ACQ_ESG_lag	53.5	20.3	7.4	39.2	55.8	67.9	93.5	-0.2	2.2
TAR_E_Score_lag	25.7	25.3	0.0	1.9	19.0	43.9	98.7	0.8	2.6
TAR_G_Score_lag	45.1	22.5	0.6	26.0	45.5	63.9	93.7	-0.1	2.0
TAR_S_Score_lag	39.6	21.1	1.0	23.4	37.8	52.9	96.1	0.5	2.6
ACQ_E_Score_lag	48.5	28.4	0.0	26.9	52.4	73.1	96.6	-0.3	1.9
ACQ_G_Score_lag	53.9	23.1	5.6	33.9	56.5	72.2	94.7	-0.2	2.0
ACQ_S_Score_lag	56.6	22.5	10.5	39.9	59.1	73.5	99.6	-0.1	2.0
Dum_Cross_Border	0.2	0.4	0.0	0.0	0.0	0.0	1.0	1.2	2.5
Dum_Cross_Industry	0.5	0.5	0.0	0.0	0.0	1.0	1.0	0.2	1.0
ln_Deal_Value	8.0	1.4	3.2	7.2	7.9	8.9	11.4	-0.1	3.4

TAR_log_TA_lag	19.3	6.1	3.4	19.9	21.2	22.4	25.4	-2.0	5.3
ACQ_log_TA_lag	23.5	4.1	18.4	21.4	22.7	23.9	38.2	2.6	9.6
TAR_Cap_to_TA_lag	5.1	6.0	0.1	1.6	3.0	6.1	35.9	2.7	5.6
ACQ_Cap_to_TA_lag	4.3	4.6	0.0	1.4	2.9	5.6	26.5	2.2	2.9
TAR_D/E%_lag	163.1	500.6	0.0	24.4	74.7	151.5	653.8	2.7	11.7
ACQ_D/E%_lag	163.8	1003.3	0.0	33.5	62.3	105.2	436.2	3.9	27.5
TAR_Margin%_lag	56.4	59.6	0.1	27.9	43.5	68.5	592.8	5.3	4.6
ACQ_Margin%_lag	42.8	22.1	-17.0	26.4	41.2	57.4	98.1	0.2	2.6
TAR_R&D_to_TA_lag	5.7	10.7	0.0	0.0	0.1	7.9	62.5	2.8	6.2
ACQ_R&D_to_TA_lag	2.7	5.7	0.0	0.0	0.0	2.6	40.2	3.3	11.4

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**Table 8** – Variance-covariance matrix – dependent, independent variables and S and G scores

	<i>Prem_1</i> <i>D</i>	<i>Prem_1</i> <i>W</i>	<i>Prem_4</i> <i>W</i>	<i>Delta_</i> <i>ACQTA</i> <i>R_ESG</i> <i>lag</i>	<i>TAR_E</i> <i>SG lag</i>	<i>ACQ_E</i> <i>SG lag</i>	<i>TAR_E</i> <i>Score_</i> <i>lag</i>	<i>TAR_G</i> <i>Score_</i> <i>lag</i>	<i>TAR_S</i> <i>Score_l</i> <i>ag</i>	<i>ACQ_E</i> <i>Score_</i> <i>lag</i>	<i>ACQ_G</i> <i>Score_</i> <i>lag</i>	<i>ACQ_S</i> <i>Score_</i> <i>lag</i>
Prem_1D	1129.64 9											
Prem_1W	1109.09 7	1158.28 2										
Prem_4W	1116.42 8	1164.19 8	1375.71 2									
Delta_ACQTA R_ESG_lag	100.723	116.304	129.476	526.017								
TAR_ESG_lag	27.058	31.570	18.496	238.526	362.176							
ACQ_ESG_lag	127.781	147.874	147.972	287.491	123.650	411.141						
TAR_E_Score_lag	38.372	38.489	-3.758	225.654	409.114	183.459	637.764					
TAR_G_Score_lag	8.901	11.129	8.735	207.290	313.986	106.696	266.615	503.509				
TAR_S_Score_lag	5.620	7.419	2.544	255.153	356.352	101.199	379.381	210.284	441.954			
ACQ_E_Score_lag	195.662	229.694	240.529	303.384	186.508	489.892	296.210	152.049	151.625	801.538		
ACQ_G_Score_lag	55.819	56.853	44.273	280.160	50.423	330.582	105.500	62.312	23.579	258.113	531.617	
ACQ_S_Score_lag	121.287	147.122	153.452	278.754	132.883	411.637	161.886	113.381	121.259	471.077	232.826	504.349

**Table 9** – Correlation matrix – dependent, independent variables and S and G scores

	<i>Prem_1</i> <i>D</i>	<i>Prem_1</i> <i>W</i>	<i>Prem_4</i> <i>W</i>	<i>Delta_A</i> <i>CQTAR</i> <i>_ESG_l</i> <i>ag</i>	<i>TAR_E</i> <i>SG lag</i>	<i>ACQ_E</i> <i>SG lag</i>	<i>TAR_E</i> <i>_Score_</i> <i>lag</i>	<i>TAR_G</i> <i>_Score_</i> <i>lag</i>	<i>TAR_S</i> <i>_Score_l</i> <i>ag</i>	<i>ACQ_E</i> <i>_Score_</i> <i>lag</i>	<i>ACQ_G</i> <i>_Score_</i> <i>lag</i>	<i>ACQ_S</i> <i>_Score_</i> <i>lag</i>
Prem_1D	1											
Prem_1W	0.970	1										
Prem_4W	0.896	0.922	1									
Delta_ACQT AR_ESG_lag	0.131	0.149	0.152	1								
TAR_ESG_la g	0.042	0.049	0.026	-0.546	1							
ACQ_ESG_l ag	0.187	0.214	0.197	0.618	0.320	1						
TAR_E_Scor e_lag	0.045	0.045	-0.004	-0.390	0.851	0.358	1					
TAR_G_Scor e_lag	0.012	0.015	0.010	-0.403	0.735	0.235	0.470	1				
TAR_S_Scor e_lag	0.008	0.010	0.003	-0.529	0.891	0.237	0.715	0.446	1			
ACQ_E_Scor e_lag	0.206	0.238	0.229	0.467	0.346	0.853	0.414	0.239	0.255	1		
ACQ_G_Sco re_lag	0.072	0.072	0.052	0.530	0.115	0.707	0.181	0.120	0.049	0.395	1	
ACQ_S_Scor e_lag	0.161	0.192	0.184	0.541	0.311	0.904	0.285	0.225	0.257	0.741	0.450	1

## 4. Data Analysis

This paper aims to study whether companies consider ESG factors while engaging in M&A transactions. More specifically, the goal of this paper is to understand whether the M&A market includes ESG factors as a strategic value driver in deals activity, meaning that the premia paid reflect the performance of companies in terms of environmental, social, and governance practices. To test this hypothesis, several multivariate regression models have been fitted. The structure of the different regression models fitted remains consistent across the whole analysis.

### 4.1 Methodology

The aim of this section is setting the basis for understanding which kind of relationship exists between the dependent and independent variables selected. Each dependent variable selected, which in this case consist of respectively Prem\_1D, Prem\_1W, and Prem\_4W, is analyzed through the application of incrementally more complex and sophisticated models. First, a simple bivariate analysis is conducted to study the one-to-one relationship between the forementioned dependent variables, and the four independent variables selected, which in our case consist respectively of Delta\_ACQTAR\_ESG\_lag, TAR\_ESG\_lag, ACQ\_ESG\_lag, TAR\_E\_Score\_lag. The mathematical model follows the general equation (Equation 1) provided below:

$$Y_{it} = \alpha + \beta_1 * X_{it} + \varepsilon_{it} \quad (1)$$

Secondly, a multivariate analysis is conducted with the aim of further studying the relationship between the dependent and the independent variables by adding different control variables which represent size (ln\_Deal\_Value, TAR\_log\_TA\_lag, ACQ\_log\_TA\_lag), capital structure (TAR\_D/E%\_lag, ACQ\_D/E%\_lag), operating metrics (TAR\_Margin%\_lag, ACQ\_Margin%\_lag) and expenditures (TAR\_R&D\_to\_TA\_lag, ACQ\_R&D\_to\_TA\_lag, TAR\_Cap\_to\_TA\_lag, ACQ\_Cap\_to\_TA\_lag). In this way, by including the forementioned control variables, the models will be able to isolate the true relationship between the dependent and independent variables. This because, in simple regression models, the coefficient of the independent variable may incorporate effects which are due to other metrics rather than the sole ESG factors, namely capital structure. In this way, the true relationship between the different variables can be better assessed and lead to more solid results.

In order to evaluate the different relationship combinations, for each dependent variable four different models were fitted with respectively each independent variable. Below are provided the different equations stemming for the models used:

$$\begin{aligned}
Prem_{1D}_{it} = & \alpha + \beta_1 * Delta\_ACQTAR\_ESG\_lag_{it} + \beta_2 * log\_Deal\_Value_{it} \\
& + \beta_3 * TAR\_log\_TA\_lag_{it} + \beta_4 * ACQ\_log\_TA\_lag_{it} + \beta_5 \\
& * TAR\_Cap\_to\_TA\_lag_{it} + \beta_6 * ACQ\_Cap\_to\_TA\_lag_{it} + \beta_7 \\
& * TAR\_D/E\%\_lag_{it} + \beta_8 * ACQ\_D/E\%\_lag_{it} + \beta_9 \\
& * TAR\_Margin\%\_lag_{it} + \beta_{10} * ACQ\_Margin\%\_lag_{it} + \beta_{11} \\
& * TAR\_R\&D\_to\_TA\_lag_{it} + \beta_{12} \\
& * ACQ\_R\&D\_to\_TA\_lag_{it} + \beta_{13} * Dum\_Cross\_Border_{it} + \beta_{14} \\
& * Dum\_Cross\_Industry_{it} + \varepsilon_{it} \quad (2)
\end{aligned}$$

$$Prem_{1D}_{it} = \alpha + \beta_1 * TAR\_ESG\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it} \quad (3)$$

$$Prem_{1D}_{it} = \alpha + \beta_1 * ACQ\_ESG\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it} \quad (4)$$

$$Prem_{1D}_{it} = \alpha + \beta_1 * TAR\_E\_Score\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it} \quad (5)$$

where  $X$  in Equation 3-5, as well in Equation 6-13, stands for the different control variables which are displayed in Equation 2. The same procedure was used and applied to the models where the dependent variable consisted of  $Prem_{1W}$  (Equation 6-9):

$$Prem_{1W}_{it} = \alpha + \beta_1 * Delta\_ACQTAR\_ESG\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it} \quad (6)$$

$$Prem_{1W}_{it} = \alpha + \beta_1 * TAR\_ESG\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it} \quad (7)$$

$$Prem_{1W}_{it} = \alpha + \beta_1 * ACQ\_ESG\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it} \quad (8)$$

$$Prem_{1W}_{it} = \alpha + \beta_1 * TAR\_ESG\_Score\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it} \quad (9)$$

as well as of  $Prem_{4W}$  (Equation 10-13):

$$Prem_{4W}_{it} = \alpha + \beta_1 * Delta\_ACQTAR\_ESG\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it} \quad (10)$$

$$Prem_{4W}_{it} = \alpha + \beta_1 * TAR\_ESG\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it} \quad (11)$$

$$Prem_{4W}_{it} = \alpha + \beta_1 * ACQ\_ESG\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it} \quad (12)$$

$$Prem_{4W}_{it} = \alpha + \beta_1 * TAR\_E\_Score\_lag_{it} + \beta_2 * X_{it} + \varepsilon_{it}. \quad (13)$$

## 4.2 Bivariate analysis

To study the one-to-one relationship between the forementioned dependent variables, and the four independent variables selected, which in our case consist respectively of Delta\_ACQTAR\_ESG\_lag, TAR\_ESG\_lag, ACQ\_ESG\_lag, TAR\_E\_Score\_lag, different simple linear regression model have been fitted as outlined in Equation 1. Columns (1), (4), (7), (10), (13), (16), (19), (22), (25), (28), (31), (34) of Table 10-15 exhibit the results obtained.

In all the 12 different cases apart from one exception – column (34) – the relationship between the dependent variable and the independent variable is positive, with significant results when either Delta\_ACQTAR\_ESG\_lag or ACQ\_ESG\_lag is considered as independent variables. These first findings lead to questionable results.

On one hand, columns (1), (13), (25) show that, as the delta between the acquiror and the target increases, the premium paid increases as well. This first result seems to go against the main hypothesis H1, as this implies that premia increase when either the acquiror ESG performance increase or the target ESG performance decrease. In other words, this result seems to suggest that companies pay higher premia in transactions where the difference in ESG performance is larger. This output may implicitly mean that the decision process of companies whether to engage in an M&A activity is driven by other factors than environmental, social, and governance scores, for instance market consolidation, competitive advantage, or higher budget allocated by larger companies in ESG. On the other hand, columns (7), (19), (31) show a positive relationship between premia paid and the acquirer's ESG score. This result can have different interpretations, including the fact that acquirors with higher ESG score engage in transactions where the premia paid is higher. These results can be explained by the fact that companies with higher ESG scores tend, on average, to be bigger in size and deploy more resources on ESG practices, which can also lead to higher interests in targets with strong ESG performance to protect and maintain their current reputation. This result is in line with H2.

Lastly, the positive yet non-significant results which are exhibited in columns (4), (10), (16), (22), (28) highlight interesting results which economically speaking are in line with H3 and H4. In fact, the premia paid increases as the target's ESG, and E performance respectively increases. Nonetheless, these results are not significant, thus not reliable.

As a result of the simple bivariate analysis, it is questionable whether there is a significant and meaningful relationship between the ESG independent variables considered and

premiums paid. Further multivariate analysis will help us better grasp how independent variables relate to the premiums paid 1 day, 1 week, and 4 weeks prior the announcement date.

### 4.3 Multivariate analysis

To build up on the findings of the simple regression models presented in the previous section, this section further investigates the relationship between the different dependent and independent variables by including additional control variables in the models. In this way, the analysis is expected to be more accurate in understanding and capturing the true relationship between the major variables of interest by increasing internal validity and reducing research bias. To evaluate this relationship, numerous regression models have been fitted as outlined in Equations 2-13, with the dependent variables being again Prem\_1D, Prem\_1W and Prem\_4W while the independent variables consisting of Delta\_ACQTAR\_ESG\_lag, TAR\_ESG\_lag, ACQ\_ESG\_lag, TAR\_E\_Score\_lag. In addition, several control variables have been included in the analysis as columns (3), (6), (9), (12), (15), (18), (21), (24), (27), (30), (33), (36) display. The final results are presented in Tables 10-15.

Starting from Table 10, column (2) shows how by including a first control variable, which in this case consists of ln\_Deal\_Value, the relationship between Prem\_1D and Delta\_ACQTAR\_ESG\_lag remains positive and significant. However, when including in the analysis the remaining control variables, further considerations are needed. As column (3) shows, once all the different control variables plus time and industry fixed effects are included in the model, the relationship between the dependent and the independent variables remains positive, yet it is no longer significant. In other words, there is no evidence to reject the null hypothesis that the coefficient is equal to zero for a 10% significance level. On the other hand, other control variables display a statistically significant relationship. First, ln\_Deal\_Value, has a positive and statistically significant relationship for a 1% significance level with Prem\_1D. This result suggests that as the total value of the deal increases, the premium paid by the acquiring company increases as well. Second, the relationship between Prem\_1D and TAR\_log\_TA\_lag is negative and statistically significant for a 10% significance level, meaning that premiums paid gets lower for deal involving target companies with larger asset bases. Finally, TAR\_D/E%\_lag displays a negative and significant relationship for a 10% significance level with the dependent variable Prem\_1D, meaning that acquiring companies pay a lower premium for highly indebted companies.

From now onwards the analysis will focus on the most complex models, thus columns (5), (8), (11), (14), (17), (20), (23), (26), (29), (32), (35) will not be further analyzed as they follow a similar reasoning to column (2) which has been already explained in the previous paragraph.

If we now consider column (6) in Table 10, it can be noticed that the main independent variable `TAR_ESG_lag` has a negative relationship with the dependent variable `Prem_1D`, meaning that as the target ESG score increases, the premium paid by the acquirer decreases. However, this economic interpretation is not meaningful since the relationship is not statistically significant. In other words, there is not enough evidence to reject the null hypothesis that the coefficient equals zero. On the other hand, other control variables display a significant relationship with the dependent variable. Apart from the ones already identified before in column (3), the new control variable that display a positive and significant relationship for a 10% significance level is the dummy variable `Dum_Cross_Border`. This means that, on average, deals involving two different geographies make acquirors to pay higher premia *ceteris paribus*.

Regarding the last two columns (9) and (12) of models with `Prem_1D` as dependent variable, it can be noticed from Table 11 that the same relationships identified in Table 10 column (3) hold, namely a positive and significant relationship between `Prem_1D` and `ln_Deal_Value`, and a negative and significant relationship between the dependent variable and `TAR_log_TA_lag` and `TAR_D/E%_lag`. These results further support the idea that the different metrics utilized to represent ESG do not have an impact on the 1-day premium paid in an M&A deal. In other words, these results lead us to reject Hypothesis 1-4 presented in Section 2.2. Nevertheless, additional regression models have been fitted to further investigate whether this result is consistent also in the case where `Prem_1W` and `Prem_4W` are considered as dependent variables.

Columns (15), (18), (21), (24) in Tables 12-13 further investigate whether there is a significant relationship between `Prem_1W` and the different independent variables used to represent ESG, namely `Delta_ACQTAR_ESG_lag`, `TAR_ESG_lag`, `ACQ_ESG_lag`, and `TAR_E_Score_lag`. In all the different cases, results show that there is no evidence to reject the null hypothesis that the independent variables' coefficient is equal to zero. This means that, also in this case, there is not a significant relationship between the main variables of interest. However, few control variables show a significant relationship with the dependent variable. In

particular, `ln_Deal_Value` show a positive and significant relationship for a 10% significance level with the dependent variable in column (15) and (18), `TAR_log_TA_lag` show a negative and significant relationship for a 10% significance level with `TAR_E_Score_lag` in column (15), and `ACQ_R&D_to_TA_lag` is positively and significantly related with the different dependent variables in columns (15), (18), (21), (24). These results further support Table 10-11 findings, as also in this case the analysis output is in opposition with Hypotheses 1-4 presented in Section 2.2.

Similar results are displayed in Tables 14-15, where the models fitted include as dependent variable `Prem_4W`. Also in this case, the models fitted and represented in columns (27), (30), (33), (36) do not show the existence of a significant relationship between the different independent variables and `Prem_4W`, meaning that the different Hypotheses 1-4 presented in Section 2.2 are not met. Again, also in this case, some control variables display a significant relationship with the dependent for different significance levels, namely `ln_Deal_Value`, `TAR_log_TA_lag`, and `ACQ_R&D_to_TA_lag`.

Overall, the different models presented in Tables 10-15 show that the different selected independent variables do not have a significant relationship with the premium paid by the acquirer in an M&A transaction regardless of the time span used to calculate the different premia. These results suggest that the premia paid by acquirors in an M&A deal is affected by other factors rather than ESG metrics, most importantly the deal value and target's assets. Further analysis presented in the following section will further clarify whether these results remain unchanged when referring to specific industries.

**Table 10** – Regression models output with Prem 1D as dependent variable

	Prem 1D				Prem 1D		
	(1)	(2)	(3)		(4)	(5)	(6)
Delta_ACQ	0.19*	0.20**	0.16	TAR_ESG	0.08	-0.04	-0.05
TAR_ESG	(.063)	(.046)	(.288)	_lag	(.548)	(.746)	(.649)
In_Deal_V		3.82**	4.08***	In_Deal_Va		3.88**	4.01**
alue		(.019)	(.007)	alue		(.031)	(.027)
TAR_log_			-0.23*	TAR_log_			-0.08*
TA_lag			(.099)	TA_lag			(.097)
ACQ_log_			0.46	ACQ_log_			0.68
TA_lag			(.626)	TA_lag			(.597)
TAR_D/E			-0.01*	TAR_D/E			-0.01*
%_lag			(.093)	%_lag			(.084)
ACQ_D/E			0.00	ACQ_D/E			0.00
%_lag			(.985)	%_lag			(.901)
TAR_Marg			-0.05	TAR_Marg			-0.05
in%_lag			(.372)	in%_lag			(.781)
ACQ_Marg			0.21	ACQ_Marg			0.22
in%_lag			(.368)	in%_lag			(.580)
TAR_R&D			0.14	TAR_R&D			0.16
to_TA_lag			(.858)	to_TA_lag			(.817)
ACQ_R&D			0.14	ACQ_R&D			0.15
to_TA_lag			(.303)	to_TA_lag			(.107)
TAR_Cap_			-0.03	TAR_Cap_			-0.10
to_TA_lag			(.611)	to_TA_lag			(.586)
ACQ_Cap_			-1.15	ACQ_Cap_			-1.08
to_TA_lag			(.323)	to_TA_lag			(.292)
Dum_Cross			7.61	Dum_Cross			8.22*
_Border			(.208)	_Border			(.096)
Dum_Cross			4.45	Dum_Cross			4.44
_Industry			(.263)	_Industry			(.121)
Intercept	28.94***	-1.77	-42.38	Intercept	29.19***	2.58	-44.49
	(.000)	(0.895)	(.534)		(.000)	(.846)	(.544)
No. Obs	204	204	204		204	204	204
Year and							
Industry FE	NO	NO	YES		NO	NO	YES
R-sq	0.017	0.043	0.336		0.00	0.02	0.335
Adj R-sq	0.012	0.034	0.188		0.00	0.02	0.187
Residual St.	33.49	33.12	30.36		33.75	33.44	30.38
Error	(df=202)	(df=201)	(df=166)		(df=202)	(df=201)	(df=166)

Note: p-values \* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

**Table 11** – Regression models output with Prem 1D as dependent variable

	Prem 1D				Prem 1D		
	(7)	(8)	(9)		(10)	(11)	(12)
ACQ_ESG	0.31***	0.25**	0.22	TAR_E_Sc	0.06	0.10	0.04
_lag	(.007)	(.036)	(.670)	ore_lag	(.521)	(.710)	(.815)
ln_Deal_Va		2.500	3.35**	ln_Deal_Va		3.95**	3.95**
lue		(.144)	(.038)	lue		(.031)	(.037)
TAR_log_			-0.80*	TAR_log_			-0.03*
TA_lag			(.073)	TA_lag			(.079)
ACQ_log_			0.31	ACQ_log_			0.67
TA_lag			(.626)	TA_lag			(.638)
TAR_D/E			0.01**	TAR_D/E			0.01**
%_lag			(.023)	%_lag			(.018)
ACQ_D/E			0.00	ACQ_D/E			0.00
%_lag			(.985)	%_lag			(.914)
TAR_Marg			-0.05	TAR_Marg			-0.05
in%_lag			(.765)	in%_lag			(.781)
ACQ_Marg			0.23	ACQ_Marg			0.23
in%_lag			(.474)	in%_lag			(.475)
TAR_R&D			0.18	TAR_R&D			0.16
to_TA_lag			(.758)	to_TA_lag			(.740)
ACQ_R&D			0.17	ACQ_R&D			0.15*
to_TA_lag			(.109)	to_TA_lag			(.092)
TAR_Cap_			0.16	TAR_Cap_			-0.09
to_TA_lag			(.616)	to_TA_lag			(.583)
ACQ_Cap_			-1.26	ACQ_Cap_			-1.08
to_TA_lag			(.291)	to_TA_lag			(.296)
Dum_Cross			5.81	Dum_Cross			8.11
_Border			(.141)	_Border			(.126)
Dum_Cross			4.97	Dum_Cross			4.54
_Industry			(.111)	_Industry			(.113)
Intercept	15.36**	-1.59	-34.07	Intercept	30.45***	1.41	-46.40
	(.020)	(0.905)	(.534)		(.000)	(.918)	(.472)
No. Obs	204	204	204		204	204	204
Year and Industry FE	NO	NO	YES		NO	NO	YES
R-sq	0.035	0.045	0.335		0.00	0.02	0.335
Adj R-sq	0.030	0.036	0.187		0.00	0.02	0.187
Residual St.	33.18	33.08	30.38		33.74	33.44	30.40
Error	(df=202)	(df=201)	(df=166)		(df=202)	(df=201)	(df=166)

Note: p-values \* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

**Table 12 – Regression models output with Prem 1W as dependent variable**

	Prem 1W				Prem 1W		
	(13)	(14)	(15)		(16)	(17)	(18)
Delta_ACQ	0.22**	0.23**	0.15	TAR_ESG	0.09	-0.02	-0.02
TAR_ESG_lag	(.033)	(.024)	(.500)	_lag	(.489)	(.875)	(.882)
ln_Deal_Value		3.66**	3.27*	ln_Deal_Value		3.58**	3.07*
		(.027)	(.073)			(.049)	(.076)
TAR_log_TA_lag			-0.12	TAR_log_TA_lag			-0.08
			(.125)				(.126)
ACQ_log_TA_lag			1.02	ACQ_log_TA_lag			1.23
			(.521)				(.496)
TAR_D/E%_lag			0.01	TAR_D/E%_lag			0.01
			(.128)				(.168)
ACQ_D/E%_lag			0.00	ACQ_D/E%_lag			0.00
			(.764)				(.876)
TAR_Margin%_lag			-0.06	TAR_Margin%_lag			-0.06
			(.593)				(.613)
ACQ_Margin%_lag			0.24	ACQ_Margin%_lag			0.27
			(.368)				(.357)
TAR_R&D to_TA_lag			0.14	TAR_R&D to_TA_lag			0.17
			(.897)				(.864)
ACQ_R&D to_TA_lag			0.20**	ACQ_R&D to_TA_lag			0.21**
			(.049)				(.042)
TAR_Cap_to_TA_lag			-0.33	TAR_Cap_to_TA_lag			-0.37
			(.841)				(.797)
ACQ_Cap_to_TA_lag			-0.83	ACQ_Cap_to_TA_lag			-0.77
			(.298)				(.306)
Dum_Cross_Border			6.13	Dum_Cross_Border			6.46
			(.156)				(.155)
Dum_Cross_Industry			4.81	Dum_Cross_Industry			4.90
			(.107)				(.108)
Intercept	30.30***	0.88	-53.91	Intercept	30.56***	5.99	-54.68
	(.000)	(0.948)	(.629)		(.000)	(.657)	(.607)
No. Obs	204	204	204		204	204	204
Year and Industry FE	NO	NO	YES		NO	NO	YES
R-sq	0.022	0.046	0.343		0.002	0.021	0.343
Adj R-sq	0.017	0.036	0.198		0.000	0.012	0.196
Residual St. Error	33.82	33.12	30.55		34.16	33.92	30.59
	(df=202)	(df=201)	(df=166)		(df=202)	(df=201)	(df=166)

Note: p-values \* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

**Table 13** – Regression models output with Prem 1W as dependent variable

	Prem 1W				Prem 1W		
	(19)	(20)	(21)		(22)	(23)	(24)
ACQ_ESG	0.36***	0.31**	0.25	TAR_E_Sc	0.06	-0.03	-0.01
_lag	(.002)	(.011)	(.474)	ore_lag	(.525)	(.757)	(.629)
ln_Deal_Va		2.05	2.50	ln_Deal_Va		3.72**	3.05
lue		(.235)	(.101)	lue		(.045)	(.103)
TAR_log_			-0.76	TAR_log_			-0.06*
TA_lag			(.102)	TA_lag			(.098)
ACQ_log_			0.83	ACQ_log_			1.22
TA_lag			(.568)	TA_lag			(.530)
TAR_D/E			0.01	TAR_D/E			0.01
%_lag			(.128)	%_lag			(.178)
ACQ_D/E			0.00	ACQ_D/E			0.00
%_lag			(.589)	%_lag			(.499)
TAR_Marg			-0.06	TAR_Marg			-0.06
in%_lag			(.587)	in%_lag			(.610)
ACQ_Marg			0.27	ACQ_Marg			0.27
in%_lag			(.296)	in%_lag			(.289)
TAR_R&D			0.19	TAR_R&D			0.17
to_TA_lag			(.835)	to_TA_lag			(.793)
ACQ_R&D			0.22**	ACQ_R&D			0.21**
to_TA_lag			(.047)	to_TA_lag			(.036)
TAR_Cap_			-0.11	TAR_Cap_			-0.36
to_TA_lag			(.852)	to_TA_lag			(.794)
ACQ_Cap_			-0.96	ACQ_Cap_			-0.78
to_TA_lag			(.230)	to_TA_lag			(.310)
Dum_Cross			4.10	Dum_Cross			6.42
_Border			(.217)	_Border			(.192)
Dum_Cross			5.37	Dum_Cross			4.93
_Industry			(.263)	_Industry			(.103)
Intercept	14.58**	0.68	-44.62	Intercept	32.28***	13.97	-55.19
	(.028)	(0.959)	(.572)		(.000)	(.725)	(.512)
No. Obs	204	204	204		204	204	204
Year and							
Industry FE	NO	NO	YES		NO	NO	YES
R-sq	0.046	0.053	0.345		0.002	0.022	0.343
Adj R-sq	0.041	0.043	0.198		0.000	0.012	0.197
Residual St.	33.41	33.37	30.55		34.17	33.44	30.57
Error	(df=202)	(df=201)	(df=166)		(df=202)	(df=201)	(df=166)

Note: p-values \* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

**Table 14 – Regression models output with Prem 4W as dependent variable**

	Prem_4W				Prem_4W		
	(25)	(26)	(27)		(28)	(29)	(30)
Delta_ACQ	0.25**	0.26**	0.15	TAR_ESG	0.05	-0.09	-0.09
TAR_ESG_lag	(.030)	(.021)	(.573)	_lag	(.710)	(.564)	(.685)
ln_Deal_Value		4.26**	4.32**	ln_Deal_Value		4.51	4.39**
		(.018)	(.017)			(.023)**	(.016)
TAR_log_TA_lag			-1.54**	TAR_log_TA_lag			-1.31**
			(.030)				(.035)
ACQ_log_TA_lag			1.72	ACQ_log_TA_lag			1.95
			(.436)				(.404)
TAR_D/E%_lag			0.01*	TAR_D/E%_lag			0.01*
			(.077)				(.067)
ACQ_D/E%_lag			0.00	ACQ_D/E%_lag			0.00
			(.817)				(.817)
TAR_Margin%_lag			-0.08	TAR_Margin%_lag			-0.08
			(.371)				(.383)
ACQ_Margin%_lag			0.20	ACQ_Margin%_lag			0.21
			(.595)				(.625)
TAR_R&D to_TA_lag			0.26	TAR_R&D to_TA_lag			0.27
			(.303)				(.308)
ACQ_R&D to_TA_lag			0.56**	ACQ_R&D to_TA_lag			0.56**
			(.027)				(.024)
TAR_Cap_to_TA_lag			-1.04	TAR_Cap_to_TA_lag			-1.13
			(.830)				(.795)
ACQ_Cap_to_TA_lag			-0.03	ACQ_Cap_to_TA_lag			-0.05
			(.252)				(.256)
Dum_Cross_Border			2.34	Dum_Cross_Border			3.20
			(.567)				(.515)
Dum_Cross_Industry			4.19	Dum_Cross_Industry			4.10
			(.180)				(.186)
Intercept	32.46***	-1.85	-45.83	Intercept	34.47***	3.54	-49.22
	(.000)	(.899)	(.629)		(.000)	(.809)	(.357)
No. Obs	204	204	204		204	204	204
Year and Industry FE	NO	NO	YES		NO	NO	YES
R-sq	0.023	0.050	0.343		0.000	0.026	0.386
Adj R-sq	0.018	0.041	0.198		0.000	0.016	0.250
Residual St. Error	36.84	36.42	30.55		37.26	36.87	32.21
	(df=202)	(df=201)	(df=166)		(df=202)	(df=201)	(df=166)

Note: p-values \* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

**Table 15** – Regression models output with Prem 4W as dependent variable

	Prem 4W				Prem 4W		
	(31)	(32)	(33)		(34)	(35)	(36)
ACQ_ESG_lag	0.36*** (.002)	0.30** (.026)	0.18 (.744)	TAR_E_Score_lag	-0.01 (.955)	-0.13 (.244)	-0.10 (.959)
ln_Deal_Value		2.70 (.152)	3.68** (.022)	ln_Deal_Value		5.08** (.012)	4.49** (.019)
TAR_log_TA_lag			-2.00** (.026)	TAR_log_TA_lag			-0.95** (.034)
ACQ_log_TA_lag			1.63 (.451)	ACQ_log_TA_lag			1.94 (.421)
TAR_D/E%_lag			0.01* (.081)	TAR_D/E%_lag			0.01* (.072)
ACQ_D/E%_lag			0.00 (.817)	ACQ_D/E%_lag			0.00 (.817)
TAR_Margin%_lag			-0.08 (.374)	TAR_Margin%_lag			-0.08 (.383)
ACQ_Margin%_lag			0.22 (.529)	ACQ_Margin%_lag			0.21 (.560)
TAR_R&D to_TA_lag			0.31 (.819)	TAR_R&D to_TA_lag			0.26 (.284)
ACQ_R&D to_TA_lag			0.59** (.024)	ACQ_R&D to_TA_lag			0.54** (.026)
TAR_Cap_to_TA_lag			-0.88 (.819)	TAR_Cap_to_TA_lag			-1.16 (.793)
ACQ_Cap_to_TA_lag			-0.11 (.255)	ACQ_Cap_to_TA_lag			0.08 (.310)
Dum_Cross_Border			0.88 (.622)	Dum_Cross_Border			3.44 (.564)
Dum_Cross_Industry			4.64 (.174)	Dum_Cross_Industry			4.21 (.178)
Intercept	17.13** (.028)	-1.19 (0.936)	-38.98 (.572)	Intercept	36.54*** (.000)	-0.82 (.957)	-57.82 (.349)
No. Obs	204	204	204		204	204	204
Year and Industry FE	NO	NO	YES		NO	NO	YES
R-sq	0.039	0.048	0.386		0.000	0.031	0.386
Adj R-sq	0.034	0.039	0.249		0.000	0.022	0.249
Residual St. Error	36.55 (df=202)	36.45 (df=201)	32.21 (df=166)		37.27 (df=202)	36.78 (df=201)	32.22 (df=166)

Note: p-values \* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

#### **4.4 Capital intensive**

The ESG revolution is likely to have an unprecedented impact on all the industries in which companies operate, yet this impact is expected to be heterogeneous given the specific priorities and characteristics of each sector. In particular, it is highly of interest studying whether industries which rely on high capital expenditures and fixed assets behave differently from the broad market spectrum. For this reason, the aim of this section is further investigating the relationship between ESG and M&A premia by focusing only on capital intensive industries, in this case those belonging to 21, 23, 31, 32, 33, 42, 44, and 49 of NAICS categories. These considerations led in practice to a new dataset comprehending 141 observations, yet the analyses conducted follow the same methodology presented in Section 4.2 and Section 4.3 as well as Equations 2, 4, 6, 8, 10, 12. The final results are presented in Tables 16-18.

##### **4.4.1 Bivariate analysis – capital intensive**

Similarly to Section 4.2, the simple linear regression analysis conducted on capital intensive industries studies the relationship between the dependent variables Prem\_1D, Prem\_1W and Prem\_4W and the independent variables Delta\_ACQTAR\_ESG\_lag and ACQ\_ESG\_lag. Among the 6 different models fitted, only columns (43), (46), (49), (52) present a significant and positive relationship between the dependent and independent variables, suggesting that the only dependent variable leading to insignificant results is Prem\_1D. These results are partially in contradiction with hypotheses developed in Section 2.2. In particular, results from columns (46) and (52) are in line with Hypothesis 2, meaning that acquirors' ESG performance has a positive impact on premia paid in M&A transactions. However, results from columns (43) and (49) are in contrast with Hypothesis 1, which is grounded on the idea that premia paid decreases for greater differences between acquirors' and targets' ESG performance. Overall, the analysis conducted identify different significant results, yet the rationale behind the output as well as the completeness of the models hinder the validity of the models and require more sophisticated analyses to draw conclusions whether the relationship between premia paid and ESG behaves differently in capital intensive industries versus the broad market.

#### 4.4.2 Multivariate analysis – capital intensive

To build up on previous findings from Section 4.4.1, models shown in columns (38), (39), (41), (42), (44), (45), (47), (48), (50), (51), (53), and (54) were fitted by including additional control variables, yet results do not show major differences with respect to the analysis conducted in Section 4.2. In fact, also in this case, the relationship between the dependent and independent variables is not significant for any model which includes all the different control variable. The only columns that display a significant relationship are the more simplistic models represented in columns (38), (44), and (50), which however are not in line with Hypothesis 1. On the other hand, different control variables from Tables 16-18 display significant relationships for different significance levels with the dependent variable, including `ln_Deal_Value`, `TAR_log_TA_lag`, `ACQ_log_TA_lag`, `TAR_R&D_to_TA_lag`, `TAR_Cap_to_TA_lag`, and `Dum_Cross_Industry`. While `ln_Deal_Value`, `ACQ_log_TA_lag`, and `TAR_Cap_to_TA_lag` display a positive relationship with the different premia, the others behave following a negative relationship.

Overall, simple linear regressions models point out that acquirors' ESG performance have a positive impact on premia in M&A transactions, suggesting that ESG affects M&A deals' performance. In contrast to this view, the difference in ESG performance between the acquiror and the target has a positive impact as well on the premia paid. These results can be driven by different reasons, for instance the higher capital budget allocated by bigger acquiring firms in the ESG practice with respect to smaller firms. The mentioned results, however, do not lead to more reliable results with respect to previous models. In fact, in the different models built, no significant relationship between the dependent and independent variable is identified, regardless the set of industries considered. This output suggests that in the dataset of transactions considered over 2013-2022, ESG is not a significant factor which affect the cost of acquiring a firm in an M&A transaction. Other variables instead consistently prove to have an impact on the premia paid and include the deal value and the target's assets among all, suggesting that the ESG revolution, which is permeating the financial stock market, struggles to affect the M&A market, which follow different and more traditional dynamics with respect to the asset management industry.

**Table 16 – Regression models output with Prem 1D as dependent (capital intensive)**

	Prem 1D				Prem 1D		
	(37)	(38)	(39)		(40)	(41)	(42)
Delta_ACQ	0.20	0.21*	0.10	ACQ_ESG	0.22	0.12	0.10
TAR_ESG_lag	(.143)	(.089)	(.164)	_lag	(.128)	(.468)	(.589)
ln_Deal_Value		4.33**	6.18*	ln_Deal_Value		3.42	5.70**
		(.036)	(.089)			(.129)	(.063)
TAR_log_TA_lag			-4.27**	TAR_log_TA_lag			-4.65**
			(.025)				(.018)
ACQ_log_TA_lag			0.67	ACQ_log_TA_lag			0.67
			(.540)				(.566)
TAR_D/E%_lag			0.01	TAR_D/E%_lag			0.01
			(.257)				(.322)
ACQ_D/E%_lag			0.00	ACQ_D/E%_lag			0.00
			(.749)				(.601)
TAR_Margin%_lag			-0.06	TAR_Margin%_lag			-0.06
			(.582)				(.570)
ACQ_Margin%_lag			0.24	ACQ_Margin%_lag			0.26
			(.377)				(.304)
TAR_R&D to_TA_lag			0.24	TAR_R&D to_TA_lag			0.25
			(.944)				(.914)
ACQ_R&D to_TA_lag			0.29	ACQ_R&D to_TA_lag			0.30
			(.746)				(.635)
TAR_Cap_to_TA_lag			-0.15	TAR_Cap_to_TA_lag			-0.08
			(.119)				(.110)
ACQ_Cap_to_TA_lag			-1.24	ACQ_Cap_to_TA_lag			-1.28
			(.608)				(.635)
Dum_Cross_Border			9.95	Dum_Cross_Border			9.19
			(.282)				(.377)
Dum_Cross_Industry			11.03*	Dum_Cross_Industry			10.99*
			(.064)				(.056)
Intercept	30.75***	-3.57	55.95	Intercept	21.93**	0.82	62.97
	(.000)	(.777)	(.145)		(.026)	(.974)	(.115)
No. Obs	141	141	141		141	141	141
Year and Industry FE	NO	NO	YES		NO	NO	YES
R-sq	0.017	0.052	0.209		0.017	0.035	0.211
Adj R-sq	0.009	0.037	0.155		0.009	0.020	0.156
Residual St. Error	34.82	34.33	32.21		34.52	34.11	32.19
	(df=139)	(df=138)	(df=110)		(df=139)	(df=138)	(df=110)

Note: p-values \* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

**Table 17 – Regression models output with Prem 1W as dependent (capital intensive)**

	Prem 1W				Prem 1W		
	(43)	(44)	(45)		(46)	(47)	(48)
Delta_ACQ	0.24*	0.26**	0.10	ACQ_ESG	0.31**	0.22	0.16
TAR_ESG_lag	(.060)	(.026)	(.303)	_lag	(.039)	(.256)	(.450)
ln_Deal_Value		4.55**	5.54	ln_Deal_Value		3.00*	4.80
		(.044)	(.136)			(.099)	(.142)
TAR_log_TA_lag			-4.15**	TAR_log_TA_lag			-4.59*
			(.044)				(.068)
ACQ_log_TA_lag			1.55	ACQ_log_TA_lag			1.48
			(.500)				(.527)
TAR_D/E%_lag			0.01	TAR_D/E%_lag			0.01
			(.258)				(.222)
ACQ_D/E%_lag			0.01	ACQ_D/E%_lag			0.01
			(.640)				(.601)
TAR_Margin%_lag			-0.07	TAR_Margin%_lag			-0.07
			(.464)				(.449)
ACQ_Margin%_lag			0.27	ACQ_Margin%_lag			0.29
			(.380)				(.275)
TAR_R&D to_TA_lag			0.21*	TAR_R&D to_TA_lag			0.22*
			(.088)				(.064)
ACQ_R&D to_TA_lag			0.38	ACQ_R&D to_TA_lag			0.38
			(.248)				(.380)
TAR_Cap_to_TA_lag			-0.41	TAR_Cap_to_TA_lag			-0.28
			(.282)				(.257)
ACQ_Cap_to_TA_lag			-0.91	ACQ_Cap_to_TA_lag			-0.99
			(.588)				(.257)
Dum_Cross_Border			10.03	Dum_Cross_Border			8.60
			(.250)				(.369)
Dum_Cross_Industry			10.66	Dum_Cross_Industry			10.67*
			(.163)				(.092)
Intercept	32.06**	-4.07	36.14	Intercept	19.22**	0.72	45.38
	(.028)	(.936)	(.303)		(.030)	(.974)	(.230)
No. Obs	141	141	141		141	141	141
Year and Industry FE	NO	NO	YES		NO	NO	YES
R-sq	0.039	0.048	0.236		0.029	0.048	0.211
Adj R-sq	0.034	0.039	0.171		0.022	0.025	0.158
Residual St. Error	35.52	35.02	33.67		36.06	35.20	33.80
	(df=139)	(df=138)	(df=110)		(df=139)	(df=138)	(df=110)

Note: p-values \* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

**Table 18** – Regression models output with Prem 4W as dependent (capital intensive)

	Prem 4W				Prem 4W		
	(49)	(50)	(51)		(52)	(53)	(54)
Delta_ACQ	0.25*	0.27**	0.05	ACQ_ESG	0.32**	0.21	0.04
TAR_ESG_lag	(.062)	(.047)	(.655)	_lag	(.033)	(.181)	(.395)
ln_Deal_Value		5.03**	6.88*	ln_Deal_Value		3.51	6.68*
		(.031)	(.055)			(.220)	(.070)
TAR_log_TA_lag			-6.60**	TAR_log_TA_lag			-6.79*
			(.042)				(.009)
ACQ_log_TA_lag			2.38*	ACQ_log_TA_lag			2.41*
			(.456)				(.508)
TAR_D/E%_lag			0.01	TAR_D/E%_lag			0.01
			(.783)				(.858)
ACQ_D/E%_lag			0.02	ACQ_D/E%_lag			0.02
			(.390)				(.355)
TAR_Margin%_lag			-0.10	TAR_Margin%_lag			-0.10
			(.344)				(.333)
ACQ_Margin%_lag			0.21	ACQ_Margin%_lag			0.23
			(.457)				(.350)
TAR_R&D to_TA_lag			0.48	TAR_R&D to_TA_lag			0.49
			(.453)				(.426)
ACQ_R&D to_TA_lag			0.91	ACQ_R&D to_TA_lag			0.92
			(.268)				(.312)
TAR_Cap_to_TA_lag			-1.20*	TAR_Cap_to_TA_lag			-1.17
			(.074)				(.121)
ACQ_Cap_to_TA_lag			-0.01	ACQ_Cap_to_TA_lag			-0.02
			(.520)				(.553)
Dum_Cross_Border			6.75	Dum_Cross_Border			6.53
			(.592)				(.784)
Dum_Cross_Industry			11.04	Dum_Cross_Industry			11.00
			(.312)				(.288)
Intercept	33.98***	-5.96	66.54	Intercept	20.83**	-0.80	69.82
	(.000)	(.717)	(.123)		(.028)	(.957)	(.191)
No. Obs	141	141	141		141	141	141
Year and Industry FE	NO	NO	YES		NO	NO	YES
R-sq	0.028	0.048	0.270		0.036	0.048	0.274
Adj R-sq	0.020	0.039	0.189		0.028	0.032	0.188
Residual St. Error	38.02	37.84	36.23		38.18	37.97	36.26
	(df=139)	(df=138)	(df=110)		(df=139)	(df=138)	(df=110)

Note: p-values \* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

## 5. Conclusion

The objective at the core of this thesis consisted in investigating whether ESG factors affected premia in M&A transactions over 2013-2022. This topic was chosen as the impact of sustainability on companies' activities and businesses has attracted growing interests over the past years as more data became available, especially in the asset management industry. In this thesis, however, the focus was mainly directed towards studying acquiring and target companies involved in M&A deals, ESG components and premia.

To achieve this goal, first, a sound theoretical contribution was formed by a thorough examination of theory and earlier literature, which also served as the theoretical framework for contemporary M&A research. Overall, there is not a marked scholars' consensus regarding whether ESG is a factor affecting the M&A activity, with studies conducted by Martynova and Renneboog (2006) demonstrating several drivers behind the M&A activity decision making process. To build upon previous research, the sweet spot for this thesis consisted in investigating the relationship by conducting a cross-analysis of different M&A premia and ESG variables. Furthermore, additional analyses focused solely on capital intensive industries further allowed to contribute to previous research with additional new perspectives.

After the literature review, the data collection process began. Data were gathered from scratch and filtered following different conditions, which led to a final dataset of 204 observations and allowed again to build upon previous research by using a dataset which has never been tested. Moreover, a second dataset was built by including only capital-intensive industries for further analyses. Once the dataset was built, different regression models were fitted.

The first analysis consisted of a bivariate regression model analysis, where different models were fitted following a pairwise logic starting from a pool of three dependent variables – 1 day, 1 week, and 4 weeks M&A premia – and 4 independent variables stemming for ESG characteristics. Part of the first results obtained were in line with previous scholars' findings and thus the hypotheses developed, yet with some exceptions. In particular, it was demonstrated that the acquirors' ESG performance and the delta in the performances between the target and the acquiror have a positive and statistically significant impact on premia paid. This effect can be due to several reasons, but most likely is related to the fact that larger and better performing companies have more resources to be conveyed on improving ESG performance and companies' reputation.

Starting from these first findings, more sophisticated models were fitted to test whether simple linear results were sound and consistent across different studies. The empirical analyses proved the contrary, as no significant relationship was identified between the different dependent and independent variables. On the other hand, the different models seem to suggest that different factors significantly impact the premium paid in a M&A transaction, which however do not include ESG. Deal value is the variable which more frequently present a meaningful relationship with the premia, a result which is logical. In fact, as the target size or the deal size increases, premia tend to increase as the transaction have a potential disruptive impact in the industry. Nonetheless, many other explanations may lay behind this result, for instance that in specific industries auctions and offers tend to be more competitive once dealing with big caps. Deal size is not the only variable which have a significant relationship. Target total assets and target's D/E ratio among all are further variables which acquirors take into consideration before entering in an M&A transaction.

Finally, to further test the results previously obtained, the same analysis was conducted, however with focus on capital-intensive industries. In fact, it is common belief that industries relying on hard fixed assets are becoming more concerned to the ESG revolution due to a business model which might become unsustainable and obsolete in the long-term. Starting from this hypothesis, the models fitted provided new yet disappointing results. In fact, even though the relationship between some ESG variables and premia paid is significant for the simple bivariate analysis, results do not hold once different variables are considered to isolate the true relationship. This suggests that companies belonging to capital intensive industries do not follow different consideration from the broad market. On the other hand, deal size, target's assets, acquiror's assets, and cross border deals are the most common variables displaying a significant relationship.

Overall, the ESG revolution is an increasingly important trend that is affecting capital markets as well as the M&A market. Regarding the latter, over the past years the main impact happened at the due diligence level during an M&A process to identify red flags and incorporate a sustainable strategy. However, as the different analyses conducted demonstrate, the ESG performance of companies involved in a transaction is not a key factor in determining the cost of acquisition of a company. More traditional factors instead are the true drivers of this variable, especially deal value, target's assets, and target's D/E ratio among all. These results suggest that companies tend to highly focus on market position, synergies, and strategic

economic fit rather than strategic ESG fit and improvement. The possibility that the situation changes in the upcoming years, however, is present and likely, as the ESG revolution's impact will continue to affect the broad market in the future.

The results obtained are grounded on a strong basis, yet some potential limitations may affect the final output. Firstly, although the analysis considers both the broad market as well as only capital intensive industries, the source of the data considered may have omitted other observations available on other platforms. An additional limitation consists in the difficulty in accessing the latest ESG data as they are published on a yearly basis; it can be expected that more recent data reflects even more the ESG revolution due to the exponentially growing importance. Finally, the methodology used to analyze the data has produced several outputs, however the high homogeneity in the models used might reduce the ability to study the subject from different angles, namely using logistic regressions and random forest models. Although the mentioned limitations can have an impact on the results obtained, the variety of the variables, the structured approach adopted, as well as the novelty in the data considered allow this research to contribute and build upon previous research with additional new insights and perspectives.

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