ERASMUS UNIVERSITY ROTTERDAM

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Bachelor Thesis Corporate Finance

"How do ESG disclosure and scores at flotation influence IPO underpricing in the US?"

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Abstract

This research study investigates the relationship between Environmental, Social, and Governance (ESG) factors and Initial Public Offering (IPO) underpricing in the US market from January 2015 to December 2021. The study aims to understand the impact of ESG reporting and ratings on IPO pricing outcomes, with a specific focus on the Environmental pillar within ESG. Utilizing a unique dataset compiled by the author, incorporating IPO underpricing data from the Refinitiv Eikon database and ESG metrics from the Thomson Reuters Asset4 database, the study employs multiple regression models to analyze the relationship between ESG factors and IPO underpricing. Controlling for various firm-level, market-level, and IPO characteristics, the study finds that neither the presence of an ESG report in the year of IPO nor higher ESG ratings significantly explain variations in IPO underpricing levels. However, within the subset of ESG-rated firms, higher ESG ratings exhibit the expected negative relationship with underpricing, indicating that firms with better ESG scores tend to experience lower levels of underpricing, supporting previous research. Notably, the lack of statistical significance calls for caution in interpreting these findings. Additionally, the Environmental pillar within ESG demonstrates a significant negative relationship with underpricing, suggesting that firms emphasizing environmental sustainability experience reduced underpricing. These findings contribute to the understanding of how ESG factors influence IPO underpricing and provide insights into the integration of sustainability and ethical considerations in business practices.

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1. Introduction

ESG reporting is a popular topic in the corporate world since recent years. ESG factors evaluate a company's sustainability and ethical impact and are associated with long-term value creation. It is introduced by the United Nations in 2004 and has since been adopted by major financial firms such as Goldman Sachs, Morgan Stanley, and UBS. However, the rise of "woke capitalism" has led to political controversy in the United States (US). "Woke capitalism" refers to the practice of corporations using social and political activism as a marketing tool to appeal to consumers who are concerned about social and environmental issues. Critics argue that this approach can be shallow and insincere, and that companies may use social and political issues to distract from other problems, such as poor working conditions or unethical business practices (Corporate Governance Institute, 2022). Congress recently voted to overturn a Department of Labor rule that allows retirement funds to base their investment strategies on ESG related reasons, but President Biden is expected to veto the resolution (Gelles, 2023). Former Vice President Mike Pence has taken to Twitter to criticize Biden's prioritization of "E.S.G. and woke policies" over the interests of hard-working Americans (Gelles, 2023). With over $18 trillion in the US market held in investment funds that follow ESG principles, it is crucial to investigate the impact of ESG investing on the initial public offering (IPO) market in the US. The importance of studying the IPO market in relation to ESG variables lies in the potential to gain valuable insights into the integration of sustainability and ethical considerations into business practices, the evaluation of long-term value creation potential, and the identification of risks and opportunities associated with investments. This is especially interesting because of the growing political backlash against ESG investing (Gelles, 2023).

There has been some prior research concerning ESG and IPO's such as the paper "How does the market perceive ESG in IPOs" (Bui & Frongillo, 2020), in which the authors consider the U.S. capital market as well. They wanted to find whether the market cares about ESG when choosing to invest and came to the conclusion after empirical research that ESG reporting by firms does affect its IPO underpricing. In the paper "IPO Underpricing and ESG firms: An empirical study" (Ok & Chethan, 2022) the authors looked at two regions: the US and the Nordics in the period 2014 to 2020. Their results did not show a significant relation between ESG classifications and IPO underpricing. However, the authors proposed as possible explanation that growing awareness in financial markets with respect to ESG is relatively new. They recommend future research to focus on specific regions or more compact timeframes. They expect future research on ESG to have significant relevance in the underpricing theory, as ESG will likely become more widely incorporated and transparent in the coming years. Therefore it will be insightful to examine a shorter time frame with the most recent data available. That is why this thesis is focused on a shorter timeframe and uses the most recent data available. Lastly, the study "Sustainability Disclosure and IPO

Performance: Exploring the Impact of ESG Reporting" (Ferri et al., 2023) explores the impact of ESG disclosing on IPO underpricing in Europe by looking at a sample of 100 IPOs from 2017 to 2021. They found that ex-ante publication of an ESG report reduces IPO underpricing. The authors acknowledge their shortcomings and therefore recommend future studies to consider companies from other parts of the world, and with more IPO data. The US market because it has more IPO's than Europe and therefore provides a bigger sample (Ritter, 2015). This paper will try to measure the effect of ESG reporting in the US market on underpricing based on empirical research from January 2015 to December 2021. The main research question of the paper is as follows:

"What is the relationship between ESG reporting and IPO underpricing?"

This research will provide a different insight with respect to the relation between ESG reporting and underpricing in IPO's from prior research by focusing on Environmental, Social and Governance metrics separately. An unique dataset is compiled and the differences between the E, the S and the G of ESG reporting are examined. Next to that, control variables are divided into three groups: firm-level, market-level and IPO characteristics and observe their effects on underpricing in combination with the dependent variable. Studying the IPO market in relation to ESG variables is essential because it can add to the understanding of how sustainability and ethical considerations are incorporated into business operations and its prospectuses. By examining the ESG-related disclosures and practices of IPO companies, investors and stakeholders can better evaluate a company's long-term value creation potential and assess the risks and opportunities associated with their investments (Ferri et al., 2023). Moreover, this research can provide insights into broader trends in the corporate world, such as how companies are adapting to the changing expectations of investors and stakeholders with respect to ESG disclosure and each of the ESG considerations separately. This will provide more detailed information on what aspects within companies investors focus on most, which in turn can help companies to specifically integrate the relevant ESG metrics in their business activities. The relevant sample consists of companies that are publicly listed on the US stock market from January 2015 to December 2021. This time range is specifically chosen to focus only on recent years because sustainability issues have recently become more prominent. The U.S market has been chosen for this study because of the quality and reliability of the data available for this country as well as because of the interesting developments happening in the US with respect to ESG investing. The dataset of IPOs will be build based on IPO underpricing data from the Refinitiv Eikon database. The data for ESG metrics will be obtained from Thomas Reuters Asset4 database which can be retrieved from the Refinitiv Eikon database as well. Underpricing is defined as the percentage difference between the offer price and the first-day closing price of the firm during its IPO (Loughran & Ritter, 2004). The underpricing for firms will be observed regardless of their ESG alignment.

A general dummy variable will be used to capture whether a given firm undertakes ESG initiatives or not. A multiple linear regression model will be used, controlling for firm-level underpricing factors, and the Ordinary Least Squares (OLS) method is chosen to estimate the model. This approach is adopted in almost every underpricing study (Loughran & Ritter, 2004). A set of control factors for underpricing is determined based on commonalities in the literature. The control variables that will be used in this research are: firm age, firm size, offer size, offer size relative to firm size, year of IPO, underwriter rank, whether a company is venture capital backed, whether a company is high-tech and whether the company is listed on the Nasdaq. The data for these variables will be obtained from the Refinitiv Eikon and Orbis database. Finally, appropriate tests for assumption violations will be conducted to check the suitability and robustness of the methodology, with special attention to the assumptions relating to the OLS method. Regarding the hypotheses, H1 proposes that ESG reporting reduces IPO underpricing:

H1 "ESG reporting reduces IPO underpricing"

This hypothesis is grounded in the growing importance of ESG considerations in investment decision-making. Stakeholders are increasingly aware of the societal and environmental impact of businesses, leading to the integration of ESG factors into investment practices. Companies voluntarily disclose their ESG practices, aligning with the expectations of socially responsible investors (Cheng et al., 2014; Johnson, 2021). However, recent discussions in the United States may have influenced the interpretation of ESG reporting practices. Moving on to H2, the hypothesis examines the association between higher ESG ratings and reduced IPO underpricing:

H2 "Higher ESG rating corresponds to lower IPO underpricing"

Existing research supports the notion that firms with higher ESG ratings experience lower levels of underpricing in IPOs. Sustainable business models attract socially responsible investors, recognizing the long-term value creation potential (Bui & Frongillo, 2020; File, 2022). By aligning with ESG principles, companies cultivate a positive reputation and reduce information asymmetry, leading to reduced underpricing in IPOs. Lastly, H3 explores the influence of the Environmental pillar within ESG on IPO underpricing:

H3 "The Environmental pillar within ESG has the most positive effect on IPO underpricing"

This hypothesis suggests that companies emphasizing environmental sustainability and addressing environmental challenges will experience lower levels of underpricing. Firms committed to

environmental responsibility are perceived favorably by investors, particularly as the demand for sustainable investments grows (Amel-Zadeh & Serafeim, 2018; Ok & Chethan, 2022). By investigating these hypotheses, this research contributes to understanding the relationship between ESG factors and IPO underpricing. It sheds light on the effects of ESG reporting, ESG ratings, and the Environmental pillar on IPO pricing outcomes, enhancing knowledge in sustainable investing and capital market dynamics.

2. Literature review

2.1. Initial Public Offerings

An Initial Public Offering (IPO) is the process of a private company issuing their shares to the public market for the first time to raise capital (Loughran & Ritter, 2004). IPO procedures include a number of stages and steps. The company assesses its preparation for an IPO during the pre-IPO phase and chooses investment banks and consultants (Ritter, 2015). To ensure accurate financial reporting and regulatory compliance, due diligence efforts are carried out (Ritter & Welch, 2002). A prospectus that contains comprehensive information about the firm is prepared by the company and included in a registration statement (SEC, 2019). In order to be reviewed, the registration statement is then submitted to the Securities and Exchange Commission (SEC) (SEC, 2023). The company drafts the prospectus while taking into account changes and advice from the SEC and legal counsel (SEC, 2023). The prospectus is the main document used by prospective investors to decide which investments to make. The company chooses investment banks to support the IPO and performs due diligence on its operations and financials (Kim & Weisbach, 2008). The roles, responsibilities, and compensation of the underwriters are outlined in an underwriting agreement that is written and signed (Ljungqvist & Wilhelm, 2003). Based on market conditions, investor demand, and company value, the underwriters choose the offer price and distribute shares to investors (Allen & Faulhaber, 1989). To entice potential investors, the company creates marketing materials and launches a roadshow (Baker & Wurgler, 2013). To stimulate interest and determine demand, presentations and meetings are held (Ljungqvist, 2007). The final offer price and the allocation method are improved with the use of investor feedback (Rock, 1986). The company completes the IPO terms and enters the underwriting agreement with the selected underwriters once the offer price has been decided (Gao, 2009). The money from investors is collected on the IPO's effective date, and the shares are then transferred to each investor's account (Loughran and Ritter, 2002). The chosen stock market lists the company's shares, allowing for public trade (Chemmanur & Fulghieri, 1999).The company gets involved in post-IPO operations after the IPO. Once the shares begin trading on the secondary market, the company undertakes investor relations initiatives to stay in continual communication with shareholders. The corporation responds to queries and provides financial updates (Buchanan et al., 2014). Maintaining compliance with legal obligations and corporate governance guidelines is crucial. The

two key factors that influence a company's decision to go public are increased liquidity and better access to capital (Amihud et al., 1988). By issuing shares on the open market, public firms can engage in a variety of transactions and have access to more funding (Berk & DeMarzo, 2014). Another advantage of going public for private equity investors is the capacity to diversify one's holdings (Ibbotson et al., 1988). Additionally, the public trading of shares may cause the market price to reflect important information, providing management and shareholders with meaningful knowledge about the firm's worth which can add to the value of the firm (Holmström & Tirole, 1993). Going public further provides companies with the opportunity to obtain funding from public investors, boosting future expansion and maybe attracting in new talent (Holmström & Tirole, 1993).The enhanced transparency and liquidity of an IPO may be advantageous to stakeholders. Several financial and non-financial considerations, such as the capacity to attract potential acquirers and increased public interest, have an influence on the decision to go public (Ritter & Welch, 2002). In order to change the ideal ownership structure as the firm enters the next stage of its life cycle, companies can go public (Chemmanur & Fulghieri, 1999). Ritter Welch (2002) explored complex theories explaining why companies go public. Financial motivations, non-financial motivations (e.g., increased publicity), life-cycle theories, and market-timing theories have been developed to understand firms' IPO decisions. Life-cycle theories highlight the need to change the ownership structure as a firm approaches its next life cycle stage, while market-timing theories consider factors like undervaluation and business cycle expansions (Ritter & Welch, 2002). The IPO process is not without risks or problems. Going public involves additional obligations, such as disclosure requirements, transparency, and responsibilities toward a larger and more diverse pool of shareholders (Ljungqvist, 2007). Market volatility and share price variations also pose challenges (Economidou et al., 2023). Careful planning is crucial, considering lock-up periods that restrict insiders from selling their shares for a specific duration (Ljungqvist, 2007). Valuing a company before an IPO can be complex, as different stakeholders may have conflicting interests regarding the company's valuation. Information asymmetry between issuers, underwriters, and investors can create disparities and uncertainties during the process of going public (Baron & Holmström, 1980; Rock, 1986; Welch, 1989).

2.2. Underpricing in initial public offerings

IPO underpricing is a well-documented phenomenon in the literature on IPOs (Ritter & Welch, 2002). IPO underpricing is a central measure of the efficiency of the Initial Public Offering markets (Hensler et al., 1997). It refers to the situation where a company's shares are listed at a price below their market value, leading to a positive difference between the offer price and the first-day closing price (Lee et al., 1996). On the other hand, overpricing occurs when the stock price is lower than the offer price, indicating weak demand for the stock. The underpricing of IPOs has been the subject of extensive research since the 1970s and two of the earliest studies on IPO underpricing by Logue (1973) and Ibbotson (1975) find that

shares are intentionally underpriced, in order to give investors a premium or a discount. Various other theories have been proposed over the years to explain this phenomenon as well (Ritter & Welch, 2002). These theories can be broadly categorized into four groups: asymmetric information, institutional reasons, control considerations, and behavioral approaches. The asymmetric information model is one of the most widely accepted explanations for IPO underpricing (Beatty & Ritter, 1986). It assumes that there is a disparity in information among different participants in the IPO process, such as the issuer, underwriters, and investors. This information asymmetry leads to mispricing of the IPO shares, with uninformed investors requiring compensation for participating in the offering. Underpricing as a compensation for uninformed investors is an early and leading founding of Rock's (1986) Winner's Curse hypothesis which suggests that underpricing serves as a compensation for uninformed investors in the presence of superior information held by underwriters. The winner's curse hypothesis, information revelation theories, and principal-agent models are sub-models within the asymmetric information framework that provide further insights into the mechanisms behind underpricing (Ljungqvist, 2007). In contrast to the winner's curse, the signaling theory revolves around the idea that the issuing company possesses privileged information. Well-performing firms often communicate their promising prospects to investors through a modest IPO price. The objective of setting a lower price is to generate excitement and attract investors (Allen & Faulhaber 1989). Ibotsson and Jaffe describe this as leaving 'a good taste'. Moreover, purposely underpricing an IPO is an immediate cost for the company, and therefore serves as a signal to the market of its quality because only reputable companies are expected to recover from the loss incurred by IPO underpricing (Allen & Faulhaber, 1989; Barry et al., 1990). Information revelation theories posit that underwriters collect valuable information from informed investors, and underpricing is a means of compensating them for their contributions during the book-building process (Benveniste & Spindt, 1989; Sherman, 2005). Principal-agent theories explain that during the IPO book-building process agency costs arise between the issuers of the IPO and the underwriters (Loughran & Ritter, 2004). The main takeaway of this theory is that more ex-ante uncertainty about firm value, the will result in higher levels of underpricing. Institutional explanations focus on factors related to the institutional environment surrounding IPOs (Lee et al., 1996). The presence of conflicts of interest and limited competition among underwriters can create incentives for underpricing (Ritter, 2011). Underwriters may have a conflict of interest as they strive to please both issuers and investors, who often prefer underpriced shares (Ritter & Welch, 2002). However, a study by Michaely and Shaw (1994) shows that reputable underwriters lower uncertainty, which decreases underpricing. Lawsuit avoidance from disappointed investors, underwriters manipulating prices to generate demand, and the potential tax advantages associated with underpricing are additional institutional factors that can influence underpricing levels (Lee et al., 1996). Control considerations theories emphasize the agency relationship between issuers and underwriters. The book-building process used to value IPOs can create agency costs and lead to underpricing (Beatty & Ritter,

1986). Factors such as an IPO's offer size, rank of the underwriter and choice of stock exchange for listing have been identified as relevant control factors for underpricing (Baker et al., 2021). These factors reflect the influence of the underwriter's reputation and the level of competition in the IPO market. Behavioral approaches draw on concepts from behavioral finance to explain IPO underpricing (Ljungqvist, 2007). These theories suggest that investor sentiment, market momentum, and herding behavior can contribute to the mispricing of IPOs. The cascade effect, where the demand for an IPO increases based on the decisions of other investors, is an example of a behavioral explanation for underpricing (Welch, 1992). Additionally, news media sentiment has been explored as a potential driver of IPO underpricing. While some studies have found a positive relationship between news media sentiment and initial returns, others have observed a negative relationship, indicating mixed findings in this area (Zou et al., 2020). Regulation and disclosure standards have also been examined as factors influencing IPO underpricing. The Securities Act of 1933 in the US, particularly Section 11, has been suggested as a reason for underpricing, as it serves as a hedge against potential lawsuits (Hanley & Hoberg, 2012). The introduction of International Financial Reporting Standards (IFRS) has been associated with decreasing underpricing, suggesting that changes in regulations can impact underpricing levels. However, the impact of government regulation, disclosure policies, and the prestige of IPO underwriters on underpricing has shown mixed results in different studies (Chambers & Dimson, 2009). Another perspective in understanding IPO underpricing is the consideration of factors related to favoritism, spinning, and corruption. Underpricing can be seen as a tool to facilitate certain practices, such as enriching executives of prospective investment bank clients or allowing flipping by favored investors (Friedman, 1970; Aggarwal et al., 2002; File, 2022). Furthermore, the literature has highlighted the potential influence of personal wealth and prospect theory, suggesting that managers and founders may be less concerned about underpricing if they are satisfied with the amount raised in the IPO (Loughran & Ritter, 2002). Loughran & Ritter (2002) see underpricing as an opportunity cost of going public. They call it 'money left at the table', which they describe in their identically named research paper, since the issuing firm could have issued the stock at a higher price collecting more proceeds. In conclusion, IPO underpricing is a multifaceted phenomenon influenced by factors such as asymmetric information, institutional considerations, control issues, behavioral biases, regulation, and favoritism. The literature on IPO underpricing has shed light on the significance of information disclosure, transparency, and regulatory frameworks in mitigating underpricing. However, the understanding of underpricing remains an ongoing area of research, necessitating further investigation into the complex interactions among these factors and their impact on the efficiency of the IPO market.

2.3. Environmental, Social and Governance measures

ESG stands for Environmental, Social, and Governance. Environmental factors refer to an organization's impact on the natural environment (Boffo & Patalano, 2020), This includes considerations such as climate change, carbon emissions, waste management, resource conservation, and pollution control. Assessing environmental factors involves analyzing an organization's efforts to reduce its ecological footprint, mitigate climate risks, adopt sustainable practices, and comply with environmental regulations. Social factors focus on an organization's impact on society, including its employees, customers, communities, and other stakeholders (Boffo & Patalano, 2020). It involves evaluating aspects such as labor practices, human rights, diversity and inclusion, community engagement, product safety, and customer satisfaction. Assessing social factors helps understand an organization's commitment to ethical business practices, fair treatment of employees, and contribution to the welfare of communities. Governance factors refer to the systems and processes through which an organization is directed and controlled (Boffo & Patalano, 2020). This includes evaluating board composition, executive compensation, transparency, accountability, and adherence to legal and regulatory frameworks. Governance factors assess the organization's management structure, decision-making processes, and integrity in conducting business.

2.4. ESG and investing

ESG metrics provide a formal framework to evaluate the sustainability and ethical impact of an organization's activities. To facilitate the evaluation of sustainability for investors, rating institutions have established ESG scores based on a scale from 0 to 100, where 100 represents the highest score and zero represents the lowest (Boffo & Patalano, 2020). These scores provide a standardized metric for comparing the ESG performance of different organizations and assist investors in making informed decisions based on sustainability considerations. Paying attention to the ESG score and integrating ESG considerations into the business strategy should be a top priority for boards and management. Przychodzen and Przychodzen (2012) found that CEOs believe that implementing ESG in the business strategy can improve the brand, financial performance, and create long-term value for shareholders. Ten years after Przychodzen and Przychodzen's (2012) research, companies are indeed increasingly incorporating sustainable strategies into their business models. This concept has gained significant importance in recent years as investors and stakeholders increasingly consider non-financial factors when making investment decisions. Bernow et al. (2017) found ESG investing having a consistent annual growth of over 17%. Investors today see, to value positive ESG reports also beyond mandatory disclosure (PricewaterhouseCoopers, 2020). Up to 80% of participants in "PwC's 2021 Global Investor Survey" acknowledge ESG risks in their investment strategies (PricewaterhouseCoopers, 2022). This corresponds to the substantial increase in global sustainable investments and the record-high levels of investment in

ESG-focused funds (Reuters, 2021). Even though there has been a tendency towards sustainable investing in recent years, there is still a significant amount of investors who invest in companies that harm the environment (Beri, 2019). Beri's study found that approximately one-fifth of global industrial greenhouse gas emissions are financed by public investments. This indicates that a considerable number of investors are not prioritizing environmental sustainability in their investment decisions. Additionally, "greenwashing" is a problem in the industry, where companies make unsubstantiated or misleading claims about their environmental and social attributes (Parguel et al., 2011). This practice allows companies to create a false perception of being environmentally friendly without actually minimizing their adverse impact on the environment. However, regulatory bodies and securities commissions play a role in monitoring and addressing instances of greenwashing in IPOs (Global Reporting Initiative). They aim to ensure that companies provide accurate and transparent information to investors during the IPO process, including the disclosure of their environmental practices and impacts. By scrutinizing companies' claims, regulatory bodies aim to protect investors from potential greenwashing and promote transparency and accountability in IPOs. The reduced concern about greenwashing has also contributed to the momentum of ESG investing, as investors have gained more trust and confidence in sustainable investment practices (Boffo & Patalano, 2020). This is also revealed by a study by Harvard which shows a decrease of perceived prevalence of greenwashing in the North America from 63% in 2021 to 57% in 2022 (ESG global study, 2022). This shift in investor perceptions suggests that efforts to address greenwashing and promote transparency in sustainable investment practices are having a positive impact on investor confidence.

2.5. Relation between ESG and IPO underpricing

Examining the relation between ESG and IPO underpricing reveals the impact of integrating ESG principles into the initial public offering (IPO) process in reducing information asymmetry. Private firms often have higher information asymmetry between insiders and outside investors regarding future prospects Brealey et al. (1977). Integrating ESG principles into the IPO process helps reduce information asymmetry between companies and investors. ESG-oriented companies tend to be more transparent in disclosing information, leading investors to perceive them as less risky. Consequently, these companies experience lower underpricing during IPOs since investors do not require additional compensation for risk and uncertainty (Kumar et al., 2016; Reber et al., 2021). Expanding the focus beyond ESG disclosures, Avramov et al. (2022) examined the visibility and accountability of firms' ESG quality through rating procedures. They argued that firms with ESG ratings face constant scrutiny, which holds them accountable to investors and other stakeholders. The study suggested that ESG-rated firms are compelled to maintain high standards, and even firms with poor ESG risk management are motivated to improve their practices to obtain a social license to operate. The voluntary disclosure of ESG information during

the IPO process plays a crucial role in reducing information asymmetry and exerting a significant signaling effect (Beatty & Ritter, 1986; Beatty & Welch, 1996; Eccles et al., 2011). By disclosing ESG information, companies can mitigate information asymmetry and increase investor confidence in their compliance with societal norms (Verheyden et al., 2016; Rothenberg et al., 2021). The existing research supports the idea that integrating ESG considerations in IPOs can contribute to reduced information asymmetry, enhanced investor confidence, and potentially lower underpricing. A study by Fenili and Raimondo (2021) investigated the impact of ESG disclosures on IPO underpricing and found that greater disclosure of ESG information was associated with lower levels of underpricing, indicating that increased transparency and information sharing regarding ESG practices can mitigate information asymmetry (Fenili & Raimondo 2021). Additionally, Bollazzi et al. (2017) examined the relationship between ESG policies and IPO performance in the Italian stock market and found that companies publishing a sustainability report had a higher average underpricing. However, these results were not statistically significant in multivariate analysis, likely due to the small dataset of only 48 companies (Bollazi et al., 2017). Numerous studies have examined the link between ESG disclosure and accounting-based or market-based returns, with most findings indicating a positive relationship (Platonova et al., 2018). Research has also demonstrated that ESG companies exhibit lower volatility and higher risk-adjusted returns compared to non-ESG companies across various industries (Baker et al., 2021). Companies with higher ESG ratings have shown stronger historical dividend growth and better risk management practices, attracting investors seeking long-term value creation and positive societal impact (Bollazi et al., 2017; Fenili & Raimondo 2021). Kumar et al. (2016) analyzed the returns and volatility of sustainable companies from the Dow Jones Sustainability Index (DJSI) and found that ESG companies outperformed non-ESG companies by an average of 6.12% across 12 industries. However, because these investors value ESG policies in companies, stock demand increases which can result in underpricing. Transparency and a commitment to ESG practices signal a company's long-term value creation and risk management capabilities, attracting investors seeking sustainable investments (Durán-Santomil et al., 2019). Institutional investors and portfolio managers increasingly recognize the importance of ESG analysis in driving long-term value creation and risk mitigation. Evidence also suggests that IPO firms with higher ESG ratings tend to experience lower underpricing, indicating investor preference for environmentally and socially responsible companies. Sustainable businesses have demonstrated better stock performance to stock volatility ratios and higher historical dividend growth, with companies having an "A" rate for sustainability generating the highest average dividend growth. Excellent management of social and environmental risks reduces litigation, regulatory costs, and brand erosion, while strong governance mitigates risks associated with over-leveraged balance sheets (Rothenberg et al., 2021). These factors attract investors who seek both better performance and a positive societal impact (Fenili & Raimondo, 2021). Additionally, ESG conscious companies exhibit control processes and risk management with above average quality, reducing the

occurrence of industrial accidents, corruption cases, and frauds, which enhances the company's legitimacy and reduces underpricing (Galbreath, 2013; Reber et al., 2021). Baker et al. (2021) also found a negative relationship between ESG Government Rating and IPO underpricing, with stronger risk management practices in the environmental domain associated with lower underpricing. These findings indicate that ESG considerations can mitigate underpricing in IPOs and improve long-term value creation, risk management, and investor confidence (Cheng et al., 2014; Baker et al., 2021). However, further empirical studies are needed to explore the specific mechanisms and dynamics through which ESG factors influence IPO underpricing, particularly in different market contexts and industries (Reber et al., 2021; Yu & Van Luu, 2021).

3. Data and methodology

3.1. Data collection

I built a cross-sectional dataset to test the hypotheses as discussed in the introduction. This data is retrieved from the Refinitiv Eikon database and is limited to live (i.e. not planned, ongoing, etc.) IPO's between 2015 and 2021 in the US. Including earlier years would not be beneficial because the number of companies with ESG ratings drastically drops in the year 2014 and prior, relative to 2015 and onwards. The ESG reports of the years 2022 and 2023 are not published yet and those years are therefore excluded as well. The US is the country of incorporation of the companies who performed an IPO. This concluded an initial dataset of 1352 IPO's. Market-level, firm-level and IPO characteristics are also selected in Refenitiv Eikon and included in the dataset. Firm's founding dates are retrieved from Orbis due to incomplete information thereof in Refinitiv Eikon. The respective underwriter ranks are based on information of the Carter-Manastersystem (Cooney et al., 2004). Comprehensive ESG information is retrieved from the Asset4 Thomas Reuters database and matched on the bases of the company indicator (ISIN) to the relevant IPOs and control variables.

3.2. Rationale for choosing US market

The US market has been chosen as country of interest because of two reasons. Firstly, the US has a track record of high number of IPOs relative to for instance Scandinavia, Benelux, other countries in Europe and Europe itself. The US is actually one of the countries with the most IPOs yearly worldwide (Ritter, 2015). China, Southeast Asia, India, and Australia historically have a significant number of IPOs as well. IPOs in emerging markets such as South Africa and Brazil are also on the rise (Procianoy & Cigerza, 2007). However, the needed information for these countries is harder to obtain, particularly for ESG which is often not incorporated completely yet or just by a small portion of companies. Next to this would it be hard to interpret because ESG is not globally standardized and open to mistakes and sabotage. Secondly,

it will be insightful for future researchers to compare the results which reflect investor preferences just prior to the ESG debate and controversy around sustainable investing in the US, as a benchmark as to which they can compare future research based on years during or after the controversy.

3.3. Data sampling

3.3.1. Missing and removed data

After obtaining all the information, necessary changes to the dataset are made. Firstly, dual listed companies are removed. The price of a dual listed company is already set in the market and thus no underpricing will be observed on the first day of trading on the new exchange (Smart & Zutter, 2008). A total of 31 dual listed companies is removed from the sample. Consequently, missing values are removed or found elsewhere. Missing information for 'founding date' in the Refinitiv Eikon database is retrieved from the Orbis database. This concludes a dataset containing 951 companies with an underpriced IPO of which 319 companies had an ESG rating in the year of IPO.

3.3.2. Outliers

Outliers distort the distribution and can influence OLS results (Wooldridge, 2013). To see if the data is subject to outliers this papers looks at histograms of the variables in Stata. The regression variables are not normally distributed and show some outliers. Therefore all continuous variables are winsorized at a 1% level, which is comparable to related research (Liu & Ritter, 2010). This means 1% (i.e. 10 observations) of the top of the distribution will be replaced with the 99th percentile observation and 1% (i.e. 10 observations) of the bottom observations will be replaced with the 1st percentile at the bottom. Winsorizing is an effective method of removing outliers as the sample size does not change and the power of the regression also remains the same (Lusk et al., 2011). See Appendix A for the histogram of underpricing before and after winsorizing. The winsorized variables will be included in the regressions.

3.4. Descriptive statistics

3.4.1. The dependent variable and control variables

In order to get a better understanding of the relevant variables, descriptive statistics are shown in Table 1. These variables are not winsorized. Table 1 shows that the observed IPOs are mostly underpriced with an average underpricing of approximately 14 percent and a standard deviation of 36 percent, which is

relatively high and implies substantial variability in underpricing. These findings are however comparable to research by Ritter et al. (2002). The maximum indicates that some IPOs are severely underpriced, and have a closing price of over 4 times the initial offer price. Indicating a relatively large amount of 'money left at the table' (Loughran & Ritter, 2002). The minimum is negative and reflects that some IPOs in the sample are overpriced.

Table 1: The descriptive statistics of the dependent and continuous control variables for H1

Statistic	N	Mean	St. Dev	Min	Pctl (25)	Pctl(75)	Max
Underpricing	951	13.57	35.79	-100	-0.10	21.67	436.67
Firm age	951	6.02	9.86	1	1	8	133.00
Firm size	951	618.92	2358.30	0.10	0.50	272.80	36279.30
Offer size	951	248.67	416.34	2.50	84.00	261.00	8100
Offer size / firm size	951	296.64	714.30	0.01	0.67	300.00	9000

The continuous variables show large standard deviations and very high maximums compared to their minimum values. The difference in magnitude of some variables, such as firm size and offer size which are in million, can make the interpretation of these variables compared to the other variables hard. Each respective boxplot has been looked at and spreads severely affected by outliers were detected. To account for this, firm age, firm size, offer size and offer relative to firm size are log-transformed. The winsorized and log-transformed results can be found in Table 2. The before and after log-transforming boxplots can be found in Appendix A.

Table 2: The descriptive statistics of winsorized (1%) and log-transformed dependent and continuous control variables for H1

Statistic	N	Mean	St. Dev	Min	Pctl (25)	Pctl(75)	Max
Underpricing	951	13.02	31.70	-93.38	-0.10	21.67	152.29
Log (Firm age)	951	0.55	0.42	0	0.30	0.90	1.49
Log (Firm size	951	1.35	1.46	-1	-0.30	2.44	3.95
Log (Offer size)	951	2.15	0.46	0.85	1.92	2.42	3.26
Log (Offer size / firm size)	951	0.80	1.42	-1.61	-0.17	2.48	3.48

Looking at IPOs per year in Table 3, it becomes evident that the year 2021 has the most IPOs compared to previous years. It suggests that during the Covid-19 crisis companies postponed their IPO due to bad economic environment, and simultaneously decided to go public when the market seemed to be recovering.

Table 3: Number of IPOs per year

Year of IPO	Freq.	Percent	Cum.
2015	106	11.15	11.15
2016	43	4.52	15.67
2017	65	6.83	22.50
2018	68	7.15	29.65
2019	78	8.20	37.85
2020	166	17.46	55.31

2021	425	44.69	100.00
Total	951	100.00	

As for the binary control variables, top underwriter has a mean of 48,9% indicating that almost half of the IPOs is underwritten by at least one underwriter ranked an 8 or higher. Also, 34,6% of the companies is venture capital backed and 70,9% of the companies is listed on the Nasdaq as primary stock exchange. Lastly, 39,1% of the companies has a primary business in the high-tech industry. A correlation matrix of the continuous variables is presented in Table 4 to check for multicollinearity. Most variables have a relatively low correlation with each other indicating no collinearity issues, except for offer size and firm size. The correlation of offer size and firm size is 0.563 which is relatively high. However, this paper includes them anyway because each of these factors are important control variables, and is aware of its possible implications on variable significance.

Table 4: Correlation matrix H1

		1	2	3	4	5
1.	Underpricing	1.000				
2.	Firm age	0.064	1.000			
3.	Firm size	-0.006	0.003	1.000		
4.	Offer size	0.060	-0.016	0.563	1.000	
5.	Offer size / firm size	-0.166	-0.106	-0.109	0.075	1.000

3.4.2. ESG variables

Because for the second and third hypotheses this paper only focuses on companies which have an ESG score in the year of IPO, the relevant sample and its descriptive statistics are different from Table 1. The descriptive statistics of the data used in H2 and H3 can be found in Table 5. The mean of the underpricing in the ESG reporting companies only, appears to be considerably higher than in the total sample. This later. ESG score has a mean of 23.81, which is not very high if looking at the scale of 0-100. The maximum value obtained is however 53.08, indicating that there's still a lot of room for improvement even in already ESG reporting companies. The E pillar has a very low mean compared to the other pillars, perhaps because environmental awareness is more prevailing in recent years and has not been incorporated enough yet by companies. The S pillar and the G pillar are comparable, with means 32.93 and 27.15 respectively.

Table 5: The descriptive statistics of the dependent and continuous control variables for H2 and H3

Statistic	N	Mean	St. Dev	Min	Pctl (25)	Pctl(75)	Max
Underpricing	319	22.99	34.94	-100	-28.71	36.36	201.13
Firm age	319	6.77	6.36	-3	0.48	0.95	58
Firm size	319	1014.56	2710.25	0.1	1.90	2.92	28856.5
Offer size	319	315.43	597.17	7.25	2.01	2.48	8100
Offer size / firm size	319	65.08	567.83	0.02	-1.03	0.48	9000
ESG score	319	23.81	9.15	5.35	17.91	28.98	53.08

E pillar	319	3.54	8.67	0	0	0.73	52.49
S pillar	319	32.93	13.94	4.86	21.92	40.57	80.62
G pillar	319	27.15	15.91	0.37	14.72	37.20	76.7

In Table 6 correlation coefficients for the continuous ESG measures are showed. There is no cause for multi-collinearity as the coefficients of ESG score and the control- and dependent variable are not highly correlated. This is also the case for the separate pillars. However, as can be expected, ESG score is severely correlated with each pillar score. ESG score is directly based on these three pillars in question and therefore also left out in H3. As for the pillars, they show low correlation with each other and thus can be included together in the regression model without causing issues.

Table 6: Correlation matrix H2 and H3

		1	2	3	4	5	6	7	8	9
1.	Underpricing	1.000								
2.	Firm age	0.080	1.000							
3.	Firm size	-0.089	-0.023	1.000						
4.	Offer size	0.000	-0.027	0.689	1.000					
5.	Offer size / firm size	-0.126	-0.092	-0.043	0.138	1.000				
6.	ESG score	0.051	0.099	0.128	0.192	-0.115	1.000			
7.	E pillar	-0.084	-0.010	0.271	0.357	-0.007	0.365	1.000		
8.	S pillar	0.093	-0.053	0.091	0.162	-0.138	0.682	0.253	1.000	
9.	G pillar	-0.000	0.141	-0.021	-0.012	-0.044	0.693	-0.010	0.044	1.000

3.5. Limitations of data

There are several limitations that should be acknowledged. Starting with challenges in generating ESG scores for pre-IPO firms, as ESG information is typically disclosed after the initial public offering. This limitation limited the ability to capture the ESG performance of firms during the crucial pre-IPO stage. In order to solve this issue the paper used data from Refinitiv Eikon in the year of IPO. However, these scores are publicized only after a company has become public and are therefore not available for investors pre-IPO. However, this paper suggest two reasons why this method does in fact hold. Firstly, after inspecting the ESG data within companies for multiple years and no sharp differences in ESG scores per year has been found. The incorporation of ESG standards do not happen overnight, scores change gradually, which is supported by other researchers (Amel-Zadeh & Serafeim, 2018). Therefore, the ESG score in the year of IPO will be comparable to ESG efforts, at most 12 months earlier, prior to IPO. Secondly, ESG

information is disclosed by companies voluntarily, there is no obligation for companies in the United States to report ESG scores, even if they are publicly listed. There are studies showing that there is a positive relationship between ESG performance and how firms voluntarily disclose ESG information (Hummel & Schlick, 2016). Therefore this study assumes that firms who undertake ESG efforts will express these ESG activities in their IPO prospectus. The prospectus must be truthful under the SEC laws, so "green-washing" is minimized and non-ESG firms will tend to hide the information (SEC, 2023). This means companies with an ESG score in the year of IPO will have reflected their respective score in the proposed prospectuses, which in turn can be observed and incorporated into the decision-making process by the prospective investors. So this paper's approach is based on a firm's perspective: a firm will try to make their ESG efforts clear to investors prior to IPO in their prospectus. Because this prospectus is subject to SEC laws it should in theory be very accurate and comparable to the later published ESG scores in the year of IPO. The textual analysis takes an investor's perspective and analyzes ESG related words in the prospectus. However, textual analysis is composed by hand and subject to incompleteness. Moreover, the dataset used in this study contained missing data due to the unavailability of ESG information in the year of IPO and companies with incomplete information. This limitation restricted the sample size and may have introduced bias in the analysis. Additionally, this paper carefully considers which relevant control variables to include in the regression analysis, however there will inevitably be other factors that may influence underpricing as well that are not included in the study. Lastly, the choice of regression model (OLS) may not capture potential non-linear relationships between the explanatory variables. This limitation could affect the accuracy of the results, and alternative modeling approaches could provide further insights.

3.6. Regression variables

3.6.1. IPO underpricing

The underpricing variable tries to measure the increase or decrease in the price of a stock on its first day of public trading. The price at which shares are sold in an IPO prior to their listing and subsequent trading on a public stock market is known as the "offer price." The ultimate price at which the stock traded on its first trading day is represented as the closing price ((Ibbotson & Ritter, 1995). We define the underpricing variable as a percentage using the following formula:

$$Underpricing = \frac{Closing\ Price - Offer\ Price}{Offer\ Price} * 100\ (\%)$$

3.6.2. ESG scoring

The aim of this study is to examine of companies which engage in ESG at time of IPO experience lower underpricing. Private firms do not have their ESG ratings published. It's therefore essential to estimate these ESG efforts at time of IPO correctly. There are different ways to do this. In related research textual analysis is for instance used to determine pre-IPO ESG engagement (Loughran & McDonald, 2013; Ferris et al., 2013; Bollazzi et al., 2017; Huang et al., 2019; Fenili & Raimondo, 2021) This relies on the frequency and sentiment of certain words in the S-1 prospectuses (i.e. a filing document required by the SEC prior to IPO containing detailed business information) of US IPOs. These key words are based on words commonly used in sustainability reports and Liew et al. (2014) used this approach to analyze sustainability trends. Loughran an McDonald (2011) use a weighted frequency of the obtained textual terms to predict pre-IPO ESG efforts. There's no common ESG vocabulary list, however researchers gathered ESG text mining terms over the years (Baier et al., 2020; Cochardt et al., 2022; Loughran et al., 2022; Silvola & Landau, 2021). It's widely used method, however it has also drawbacks: the list of words can be subject to incompleteness and individual words extracted can be interpreted differently than their meaning within in a sentence and therefore pose a biased result. Economidou et al. (2023) divided firms into groups based on ESG related information available prior to IPO and companies who did not have that information available. They compared a treatment group of companies with available ESG performance to a control group of companies which did not have available ESG information prior to IPO. The groups where specifically made using matching techniques to be comparable. This study bases its research on the assumption that the key operations of a company and its nature do not drastically change before and after IPO. Therefore ESG scores published in the year of IPO are assumed to be a valid proxy for pre-IPO ESG efforts. It has been checked if in the year of IPO an ESG report was published. All the companies with an ESG score published in year of IPO received the dummy value '1' and the companies who had a '0' as score or did not have an ESG score in the year of IPO received the dummy value '0'. So, this paper assumes that if in year of IPO a company has reported ESG scores, it very likely engaged in ESG activities at time IPO. However this paper is beware of the possible limitations of this assumption further discussed in section 1.5. The ESG data is retrieved from the Thomson Reuters Asset 4 ESG database which is accessible through Refinitiv Eikon and offers up-to-date and accurate ESG information. They analyze over 400 company level ESG measures to create a detailed ESG profile for each company. The underlying measures are based on considerations around comparability, data availability, and industry relevance. They are grouped into 10 categories as can be seen in Table 7.

Table 7: ESG categories

Environmental	Social	Corporate Governance
Resource use	Workforce	Management
Emissions	Human rights	Shareholders
(Product) Innovation	Community	CSR strategy
	Product responsibility	

The calculate individual scores for each metric, Refinitiv follows a specific formula:

$$Data\ point\ score = \frac{Firms\ in\ the\ industry\ that\ have\ worse\ value + 0.5}{Total\ number\ of\ valued\ firms\ in\ the\ industry}$$

The score is determined by the value of the data point in the industry and is adjusted by adding 0.5 divided by two times the total number of valued firms in the industry. The purpose of adding 0.5 is to correct any errors in the scoring process. Once the individual scores are determined, Refinitiv combines them to generate scores for each ESG pillar. These pillar scores are then weighted using a standardized weights matrix provided by Refinitiv, which takes into account industry-specific factors. A higher weight is assigned to themes that are more mature in terms of disclosure and the relative performance scores of companies is calculated with a higher degree of confidence. The final result is a combined ESG score ranging from 0 to 100 which will be used for H2. For H3 this paper will be using the continuous Environmental, Social and Governance pillars scores which also range from 0 to 100 and represent their respective weights.

3.6.3. Control variables

There exists extensive literature research on IPO underpricing with each slightly different control variables. By extensively comparing articles on the topic, commonalities are found and this paper includes 7 control variables based on prior research and 1 additional control variable generated by the author. The control variables are divided into three categories: firm-level, market-level and IPO characteristics.

3.6.3.1. Firm-level control variables

- **Firm age**

Firm age is a control variable defined as the following:

$$Firm\ age = (IPO\ issuing\ year - Founding\ year + 1)$$

The variable is log transformed because of normality issues (see boxplots in Appendix B). Carter et al. (1998) and Lowry et al. (2010) also did this. Founding year of the relevant companies are obtained from Refinitiv Eikon and Orbis database. The issue year is obtained from Refinitiv Eikon. Firm age is a widely used control variable in IPO literature for several reasons. Firstly, older firms are assumed to be less risky, younger firms face bigger ex-ante uncertainty. Hensler et al. (1997) stated: 'longevity brings stability' and therefore firm age is used as a proxy for risk. Secondly, older firms tend to have more historical information available which makes the valuation (determining the offer price) of the company pre-IPO likely more accurate and thus serves as a proxy for 'difficulty of firm valuation' as stated by Ritter (1984). Muscarella and Vetsuypens (1989) also find evidence that the age of a firm is significant and negatively related to underpricing. Economidou et al. (2023) however did not find a significant effect on firm age at IPO on underpricing. Other studies which also used firm age as control variable and measured a significant effect in their research can be seen in table 1. Firm age at IPO is expected to be negatively associated with IPO underpricing.

- **Firm size**

Firm size is a proxy of total assets of a company before going public measured in millions of dollar. The information is obtained from the Refinitiv Eikon database. The logarithm of firm size is taken to normalize the data (see boxplots in Appendix B), comparable to the research of Harasheh (2022). The variable is introduced to capture the asymmetric information problem by reducing the information gap, because markets have more information on larger firms (Welch, 1989). Investors can therefore make more accurate decisions and firms are easier to valuate (Carter et al., 1998). The information asymmetry hypothesis predicts a negative relation between firm size and the level of underpricing (Lowry & Shu, 2002). Michaely and Shaw (1994) however suggest that bigger firms tend have larger issues which are harder to sell, resulting in underwriter may having the incentive to underprice them by a larger amount. Overall, studies on IPO underpricing generally do find that larger firms observe lower underpricing (Mauer & Senbet, 1992).

- **Offer size relative to firm size**

The offer size relative to the firm size is an additional control variable that should be included to capture certain characteristics of companies and their IPOs that may not be fully captured by considering offer size and firm size separately. By including the ratio between these two variables, we can account for the reasons why relatively small firms may choose to have a large offer size and vice versa. In the paragraph on offer size, it will be discussed that a larger offer size is typically associated with bigger firms (Carter et al., 1998; Boudriga et al., 2009). However, it is important to consider that small companies may also opt for a large offer size for strategic reasons, funding requirements, or to enhance market perception and

credibility. Including the offer size relative to the firm size can measure the proportion of the firm's value that is being offered to the public through the IPO. By examining this ratio, the motivations behind a small company's decision to have a large offer size can become clearer. It provides insights into whether the company aims to raise a significant amount of capital for expansion, improve liquidity, establish market presence, or enhance its perceived value. Considering the offer size relative to the firm size with respect to IPO underpricing, a larger offering relative to firm size may attract greater investor demand and create a perception of value, potentially leading to a more accurate pricing of the shares and reducing the extent of underpricing (Ritter & Welch, 2002). Additionally, a large offer size may indicate a more favorable information environment, reducing information asymmetry and contributing to more accurate pricing (Ljungqvist & Wilhelm, 2003). While the impact of the offer size relative to the firm size on underpricing has not been researched yet and can vary depending on market conditions and other factors, including this control variable in the analysis could provide a more comprehensive understanding of the dynamics at play in IPO underpricing. It can capture the nuanced relationship between offer size, firm size, and the motivations behind a company's IPO decision, shedding light on the factors influencing the level of underpricing observed.

- **High tech**

The Refinitiv Eikon database provides information on whether the primary business of companies is high tech or not. Lowry and Schwert (2004) and Lowry et al. (2010) defined high tech when primariy business is biotech, computer equipment, computer software, electronics, and general technology which coincides with the preselected data from Refinitv Eikon. Based on this data a dummy variable is made where firms categorized as high tech are assigned a value of 1, while others receive a value of 0. The literature highlights several key reasons supporting the inclusion of this variable. While there are several researchers who include industry dummies in their underpricing regressions such as Hensler et al. (1997), Ljungqvist and Wilhelm (2003) and Harasheh (2022), other researchers chose to only include a high tech dummy because it has consistently shown significantly higher levels of underpricing compared to other industries (Lowry & Schwert, 2002; Loughran & Ritter, 2004; Lowry et al., 2010). This is said to be the case because high tech companies rely mostly on growth options rather than tangible assets, which introduces higher risk when they are valued (Lowry & Shu, 2002; Lowry & Murphy, 2007; Lowry et al., 2010). This can be traced back to the information asymmetry model as well because growth options are associated with greater uncertainty, which became even more evident during the tech bubble (Loughran & Ritter, 2004). Given the consistent findings and the relevance of the high-tech sector in shaping IPO underpricing, the control variable for high-tech firms is included. Studies by Aggarwal et al. (2002), Lowry and Shu (2002), Lowry and Schwert (2004), Lowry et al. (2010) and Boulton (2023) have all incorporated this control variable in their research, further emphasizing its significance in empirical investigations.

- **Venture capital backed**

The control variable "venture capital-backed" (VC-backed) plays a crucial role in examining IPO underpricing. Bradley and Jordan (2002) observed that VC-backed firms tend to experience higher levels of underpricing compared to non-VC-backed firms. In the Refinitiv Eikon database there is information on if firms are VC-backed, this information is incorporated in the analysis by creating a binary dummy variable assigning a value of 1 to VC-backed IPOs and 0 to non-VC-backed IPOs. Venture capitalists (VCs), who invest in early-stage companies with growth potential, often seize the IPO opportunity when their invested firms achieve a high equity valuation, enabling them to exit the market and generate returns (Lerner, 1994). Research by Ang and Brau (2003) has shed light on how venture capitalists, as insiders, sometimes exploit this opportunity for personal gain. According to Megginson and Weiss (1991), venture capitalists play a significant role in certifying firms during the IPO process, enhancing transparency for external investors. Furthermore, venture capitalists may share valuable information about the firm with underwriters, facilitating a more accurate assessment of its valuation and potentially reducing the costs associated with the book-building process (Lowry et al., 2010). They expect therefore a decrease in underpricing when a company is VC-backed. However, other previous empirical studies, such as those conducted by Bradley and Jordan (2002) and Loughran and Ritter (2004), consistently indicate that venture-backed firms tend to exhibit higher levels of underpricing. Bradley and Jordan (2002) argue that venture capitalists often invest in riskier industries, which amplifies the severity of underpricing but these investments tend to experience higher initial returns following an IPO. This distinction arises from the assumption that valuing these firms accurately is challenging due to their unique characteristics at both the firm and industry levels, thereby contributing to higher levels of initial underpricing. Several studies have explored the influence of venture capital backing as a control variable in the context of IPO underpricing. Fedorova et al. (2022), Boulton (2023) and Economidou et al. (2023) reported a positive significant relationship between venture capital backing and underpricing. Other notable studies investigating this variable include Gompers (1996), Hensler et al. (1997), Lowry and Schwert (2004), Engelen and van Essen (2010). By incorporating the venture capital-backed variable into the analysis, this study aimw to provide empirical evidence on whether the certification effect of venture capitalists can offset the risks associated with the industries in which venture-backed firms specialize.

3.6.3.2. Market-level control variables

- **Nasdaq**

The stock exchange on which companies list for the first time show commonalities and has influence on the level of underpricing (Islam et al., 2011). According to Lowry et al. (2010), "small, young, high-tech

firms" tend to be listed on the Nasdaq as the Nasdaq requires less formal requirements than more traditional US stock exchanges such as NYSE. As explained before, the aforementioned firm characteristics positively influence underpricing, through difficulty in their valuation. There are no collinearity issues and thus this study includes a dummy of Nasdaq equal to 1 when the firm lists on the Nasdaq, 0 otherwise to capture the effect of a company's choice of listing on underpricing, consistent with Lowry and Schwert, (2002) , Lowry and Shu (2002) and Lowry et al. (2010). Research agrees that firms choosing to list on the Nasdaq are expected to be more underpriced. According to Smart and Zutter (2008) investing in the Nasdaq is done by more risk-taking investors compared to other stock exchanges and in return of bearing more risk to require more initial return of the stocks on the first day.

- **Year of IPO**

The control variable "year of IPO" plays a significant role in understanding the context and timing of initial public offerings and its impact on underpricing. The inclusion of year dummies controls for the effects of different time periods and explore the factors influencing decision-making preceding a firm's new issue. The year dummy also provides us with an opportunity to examine the influence of events related to ESG movements and their effect on IPO underpricing. Various global events, such as the Paris Climate agreement, have led to increased awareness and investor demand for ESG efforts (Reuters, 2022). Analyzing the impact of certain trends on underpricing is essential in understanding the dynamics of the IPO market. Factors contributing to underpricing may vary across different periods and environments (Loughran & Ritter, 2004). The concept of a "hot-issue" market, characterized by significant levels of IPO activity in a given time frame, has been widely discussed in IPO studies (Ritter, 1984). This phenomenon can be observed in periods like the "dot-com bubble" of 1999-2000, where IPO underpricing rates in the US reached exceptionally high levels (Ritter, 2022).The "hot-issue" market is driven by speculative bubbles and investor preference for IPO stocks, resulting in increased demand. However, when these bubbles burst, demand decreases, and IPO stocks become severely underpriced due to perceived risks and uncertainties (Ljungqvist et al., 2007). Issuers and underwriters may underprice the offer to maintain market stability, according to the investor sentiment theory (Ljungqvist et al., 2007). This thesis focuses on the economic period from 2015 to 2021 characterized by economic stable years but also the corona crisis, which may impact underpricing. Dummy variables for the years 2015 to 2021, except 2020 to avoid multicollinearity, are included to control for any potential effects. Comparing the underpricing levels in 2020, the year with the most IPOs, to other years will provide insights into the impact of a potentially "hotter" market. Thus, the dummy variable and the level of underpricing are expected to have an inverse relation. Including year dummies as a control variable accounts for these dynamic effects and investigate the relevance of timing in IPO underpricing, building upon previous studies (Boulton et al., 2009; Engelen & van Essen, 2010; Harasheh, 2022).

3.6.3.3. IPO characteristics

- **Offer size**

Offer size represents the gross amount in millions raised by a company by issuing new shares to the public. The information is obtained from the Refinitiv Eikon database. It is also sometimes called gross proceeds and has been incorporated by most of the studies examining IPO underpricing, shedding light on its significance and implications. Offer size is defined as the following:

$$Offer\ size\ (in\ millions) =\ Total\ shares\ offered\ at\ IPO * offer\ price$$

I take the logarithm of offer size to normalize the data (see boxplots in Appendix B), comparable to the research of Thoresen and Steira (2022) and Boulton (2023). Miller and Reilly (1987) argue that offer size reflects uncertainty on new issues. Including offer size is therefore supposed to capture ex-ante uncertainty and thereby reducing the asymmetric information problem. Larger offerings are thus expected to experience lower underpricing than smaller offerings, because smaller offers are seen as more speculative (Beatty & Ritter (1986), Carter et al., (1998), Aggarwal et al., (2002). According to Carter et al. (1998) and Boudriga et al. (2009) this is also because the difficulty of valuation and the perceived risk of investors tends to decrease as the offer size increases. Larger offerings are associated with bigger and more established firms (Carter et al., 1998; Boudriga et al., 2009). As talked about in the previous paragraph on firm size, bigger firms are easier the valuate and thereby reducing information asymmetry. Even though the rationale of including offer size and firm size seem to coincide, there's no proven connection between both control variables as no collinearity appears. This paper includes them both in the regression to account for their separate effects. Most research finds a significant negative relationship between the size of the offer and the standard deviation of IPO returns such as Carter and Manaster (1990) and Megginson and Weiss (1991). However, Michaely and Shaw (1994) show a positive relationship between offer size and underpricing. This could be because of the occurrence of underwriters underpricing the share price in order to have a better share distribution. Secondly, the signaling theory could explain that 'well-established' firms with bigger offer size are able to underprice their shares more in order to attract investors. Lastly, based on research by Lowry and Shu (2002) firms with bigger offer size face a higher litigation risk, giving underwriters and issuers the incentive to underprice the stock to prevent future lawsuits.

- **Top underwriter**

A ranking list of underwriters from the Jay Ritter database for the US is used to make a dummy variable which is equal to 1 if one of the underwriters involved is ranked 8 or higher, 'top underwriter', and 0 if the underwriter has a score below 8. Underwriter reputation and ranking play a crucial role in the IPO

process and may affect the level of underpricing. IPOs managed by high-quality underwriters tend to lower uncertainty, reduce information asymmetry and agency costs according to Boudriga (2009) resulting in lower underpricing (Carter and Manaster, 1990; Carter et al., 1998). These reputable underwriters can certify an IPO, reducing investors' demand for a significant discount on the offering price and allowing issuers to maximize their proceeds (Baker et al., 2021). However, the evidence regarding the relationship between underwriter reputation and IPO underpricing is mixed. Early research by Carter and Manaster (1990), Megginson and Weiss (1991), Michaely and Shaw (1994) and Carter et al. (1998) found that higher reputation underwriters is negatively associated with underpricing. More recent studies by Beatty and Welch (1996), Loughran and Ritter (2004), Baker et al. (2021), Economidou (2023) and Boulton (2023) indicate a positive correlation between underpricing and underwriter reputation. This suggests that top underwriters may intentionally set the offer price below the intrinsic valuation to maintain relationships with clients and investors (Ok & Chethan, 2022). Loughran and Ritter (2004) argue that issuers prioritize proper valuation and analyst coverage, which may lead them to compromise with underpricing to attract more analyst coverage. Since reputable underwriters have influential analysts, the relationship between underwriter ranking and underpricing may be positive.

3.6.4.   Summary of control variables

An overview of the control variables with their respective interpretation, expected effect and the literature which suggests these effects can be found in Appendix C.

3.7. Multiple linear regression

In this research a multiple linear regression will be used as analysis method. Multiple linear regression allows for the examination of the relationship between the independent variable (ESG) and the dependent variable (underpricing) while controlling for other relevant factors. This approach is widely adopted in underpricing studies, as evidenced by previous research such as Lowry and Murphy (2007) and Loughran and Ritter (2004). Including a greater number of explanatory variables enhances the ability to explain the variation in the dependent variable. Additionally, incorporating more relevant independent variables helps to address the issue of omitted variables, reducing potential bias in the results (Wooldridge, 2013). Therefore the 8 previously proposed control variables will be included. The ordinary least squares (OLS) method is the most popular technique used to estimate multiple linear regression models (Wooldridge, 2013). However, it is important to consider certain assumptions associated with the OLS. Firstly, there should be no perfect collinearity among the explanatory variables. To address this issue, Variance Inflation Factor (VIF) tests in Stata are performed to assess the level of multicollinearity. The VIF values for all the independent variables were below the threshold of 5, indicating that

multicollinearity was not a concern . Additionally, correlation matrices were examined, and no significant collinearity issues were observed (see Tables 4 and 6). Therefore, based on the VIF tests and correlation analysis, it can be concluded that multicollinearity was adequately addressed, and the assumption of no perfect collinearity among the explanatory variables is satisfied. Secondly, there should be a linear relationship between the dependent variable (underpricing) and the explanatory variables (ESG factors). The absence of studies indicating a nonlinear relationship between the control variables and underpricing further supports this assumption. Thirdly, the assumption of random residuals prevents autocorrelation and avoids biased results. To assess the randomness of residuals, a Shapiro-Wilk test is performed, which evaluates the normality of the residuals. The Shapiro-Wilk test calculates a test statistic based on the skewness, kurtosis, and correlations between the observed residuals and their expected values under normality. A non-significant result from the Shapiro-Wilk test indicates that the residuals can be considered to follow a normal distribution. The performed Shapiro-Wilk tests in Stata turned out to be significant, indicating a non-normal distribution. Fourthly, the existence of homoscedasticity. The assumption of homoscedasticity implies that the random variables in the model have the same finite variance. Departure from this assumption indicates heteroscedasticity. The Breusch-Pagan test is used to detect heteroscedasticity in the residuals (Wooldridge, 2013). The Breusch-Pagan tests indicate heteroskedasticity. Because the data is not normally distributed and subject to heteroskedasticity, robust standard errors are used in the regressions to account for the violations of the normality and homoscedasticity assumptions. Robust standard errors adjust for heteroscedasticity and provide more accurate inference regarding the coefficients and significance levels of the estimated regression model (Wooldridge, 2013). By accounting for the heteroscedasticity in the data, the robust standard errors allow for more reliable statistical analysis and interpretation of the results, reducing the potential bias caused by unequal variances. These robust standard errors provide robust estimates of the standard deviations, taking into consideration the difference in variances across observations and ensuring valid statistical inference even in the presence of non-normal and heteroskedastic residuals.

3.8. The regression formulas

I will run a total of fifteen regressions, five models per hypothesis, which are numbered as 1.1-1.5 for H1 and for the other hypotheses accordingly. The first model of every hypothesis will be the base model. The base model in H1 is different from H2 and H3, because the latter is a subsample of H1, considering ESG rated firms only. Therefore we have two base models (1.1 and 2.1/3.1). The base models include all control variables and no independent variable(s). It can be insightful to see how the significance of control variables may change with the introduction of the independent variable(s). The base model outline is the same for all the hypotheses:

$$Underpricing_i = \alpha + \beta1 * all\ control\ variables_i + \varepsilon_i$$

For H1 this paper looks at the effect of the different control variable groups and the ESG dummy together and therefore included them in separate models. Models 1.2, 1.3 and 1.4 indicate the ESG dummy and: firm-level controls, market-level controls, and IPO characteristics, respectively. Model 1. 5 is the main model, which include ESG dummy and all control variables:

$$Underpricing_i = \alpha + \beta1 * ESG_{dummy} + \beta2 * all\ control\ variables_i + \varepsilon_i$$

For H2 the independent variable ESG dummy is replaced by the continuous independent variable ESG score. Its main model, model 2.5, looks as follows:

$$Underpricing_i = \alpha + \beta1 * ESG\ Score_i + \beta2 * all\ control\ variables_i + \varepsilon_i$$

For H3 all control variables are included in every regression. However, to see the effects of the pillars on underpricing separately, regression 3.2, 3.3 and 3.4 will include only one pillar: E pillar, S pillar and G pillar, respectively. The main model, model 3.5, will include all the pillars at once:

$$Underpricing_i = \alpha + \beta1 * E\ Pillar_i + \beta2 * S\ Pillar_i + \beta3 * G\ Pillar_i$$
$$+ \beta4 * all\ control\ variables_i + \varepsilon_i$$

An overview of all the regression inputs can be found in Appendix C.

4. Empirical Results and analysis

4.1. Regression analyses

The regression results are presented in Tables 8 , 9 and 10. The coefficients of the regression variables are presented with robust standard errors. Several control variables in the base model (model 1.1) are significant in explaining underpricing looking at the base model. Firm size has a significant positive coefficient of approximately 47.15. Because this variable is log based, the interpretation is not straightforward. The coefficients of the log-transformed control variables represent the percentage change in underpricing associated with a one-unit increase in the log-transformed control variable, corresponding to an increase of factor 10. Therefore, an increase of 10 times the firm size will result in a increase of underpricing of approximately 47,15%. The explanatory power of model 1.3 and model 1.4 is

really low. The coefficients are most likely biased due to omitted variable bias and size effect. Therefore these coefficients are not interpreted. Model 1.2 has an R-squared closer to that of model 1.1 and model 1.5 and consistently shows the same significance levels in the variables as model 1.1. indicating that these control variables explain a significant amount of the variability in underpricing. ESG dummy has a positive coefficient which contradicts H1. However, the dummy is not significant. It is close to significant, with a p-value of 0.106, but it falls just out of the significance scope and may indicate only a subtle individual effect, but no real inferences can be made. The introduction of ESG dummy does improve the overall power of the regression and should therefore be included. The R-squared is comparable to related research as well. The signs of the control variables do not change comparing model 1.1 to model 1.5 (except for the insignificant 2018 dummy). The significance of firm size, offer size relative to firm size, and top underwriter went from a 5% significance level to a 10% significance level indicating that the introduction of ESG dummy potentially introduced additional factors or correlations that influenced the relationship between the control variables and the dependent variable. However, no significance is removed and the coefficients are close to the values of those in model 1.1. All but one of the significant control variables have a positive effect on underpricing and therefore increase the levels of underpricing. Top underwriter is the only significant control variable indicating a negative effect on underpricing. Companies that had their IPO underwritten by a top ranked underwriter experienced about 4.89% less underpricing.

Table 8: Regression results H1

Variables	Model 1.1	Model 1.2	Model 1.3	Model 1.4	Model 1.5
ESG dummy		3.678	15.532***	14.024***	4.404
		(2.4906)	(2.405)	(2.205)	(2.723)
Firm age	1.535	2.181			1.375
	(2.570)	(2.552)			(2.576)
Firm size	47.155**	7.436**			47.067*
	(23.589)	(2.970)			(24.095)
Offer size / firm size	18.876*	2.283*			19.051*
	(10.244)	(1.341)			(10.451)
High-tech	9.272**	9.264**			8.797**
	(3.267)	(3.326)			(3.277)
VC	10.542**	10.357**			10.141**
	(3.214)	(3.236)			(3.178)
Nasdaq	3.003		4.445**		2.700
	(2.121)		(2.062)		(2.128)
Offer size	-36.722			2.478	-37.782
	(22.797)			(3.364)	(23.256)
Top underwriter	-4.861**			-.5564	-4.889*
	(2.348)			(2.409)	(2.351)
Constant	-14.127	-10.846	3.933**	3.246	-12.513
	(8.925)	(7.310)	(1.934)	(7.071)	(8.967)

Year FE	Yes	Yes	Yes	Yes	Yes
Observations	951	951	951	951	951
R-squared	0.167	0.137	0.074	0.047	0.170

*Note: robust standard errors reported in parentheses. * p<0.10, ** p<0.05, *** p<0.*

The second hypothesis focuses on a subsample of ESG rated firms. In this subsample, the base model for H2 reveals the emergence of two new significant control variables. Specifically, firm age and the 2015 dummy variable attain statistical significance, while the variable representing the high tech sector is no longer significant. Additionally, the variables indicating VC backing and offer size relative to firm size exhibit even stronger significance in this subsample. Importantly, the R-squared value increases from 16.69 to 22.64, indicating that only looking at ESG rated firms enhances the model's ability to explain the variation in the dependent variable. Model 2.2 retains the same significant control variables as in Model 2.1, with the notable addition of offer size relative to firm size and firm size becoming even more significant. However, in Model 2.3, the introduction of the control variable Nasdaq is remarkable as it demonstrates a significant relationship with underpricing. This suggests that Nasdaq indeed contributes to explaining the variability in underpricing. It is worth noting that Nasdaq does not achieve significance in the other models. Model 2.4, due to the reasons discussed in the previous paragraph, exhibits a low R-squared, which makes it challenging to interpret its results. Consequently, the findings of Model 2.4 are not further interpreted. On the other hand, Model 2.5 shares the same significant variables as Models 2.1 and 2.2. In contrast to the first hypothesis, Model 2.5 shows the effect of ESG on underpricing is indeed as expected: negative. This suggests that a higher ESG score is associated with a lower level of underpricing. However, the lack of significance prevents drawing any conclusive conclusions regarding the effect of the ESG score. The R-squared value increases with the introduction of the ESG score in Model 2.5, indicating an improvement in the model's ability to explain the variation in underpricing compared to Model 1.5. Besides the observed negative effect of the dependent variable, the control variable high tech switched from positive to negative, but also lost significance compared to model 1.5. The control variable age has become significant in explaining underpricing and seems to increase underpricing. The year 2015 has also gained significance, and all the other variables have the same significance and sign as discussed in H1.

Table 9: Regression results H2

Variables	Model 2.1	Model 2.2	Model 2.3	Model 2.4	Model 2.5
ESG Score		-.271	.136	.111	-.255
		(.205)	(.202)	(.207)	(.205)
Firm age	9.983**	13.277**			10.532**
	(4.321)	(4.301)			(4.283)
Firm size	33.359**	21.883***			35.788**
	(13.302)	(4.890)			(14.079)
Offer size / firm size	14.686**	10.251***			15.536**
	(5.873)	(2.342)			(6.166)

Variables	Model 3.1	Model 3.2	Model 3.3	Model 3.4	Model 3.5
High-tech	-1.097	2.003			-.905
	(4.117)	(3.869)			(4.137)
VC	18.790***	20.783***			19.841***
	(4.403)	(4.194)			(4.537)
Nasdaq	6.433		14.099***		6.291
	(3.920)		(3.363)		(3.912)
Offer size	-13.049			12.660**	-13.538
	(13.563)			(5.471)	(14.163)
Top underwriter	-9.432**			-10.679**	-9.804**
	(4.574)			(4.675)	(4.631)
Constant	-41.970	-42.371**	7.190	-1.729	-40.250**
	(14.815)	(12.423)	(6.460)	(11.351)	(14.908)
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	319	319	319	319	319
R-squared	0.226	0.143	0.127	0.028	0.230

*Note: robust standard errors reported in parentheses. * p<0.10, ** p<0.05, *** p<0.*

The base model of H3 is identical to that of H2, and all the models reveal nearly the same significant variables. However, there are a few distinctions. In model 3.3, the coefficient for Nasdaq is significant and positive, whereas in model 3.4, the significance of the 2015 dummy is comparatively lower than in the other models. The remaining control variables maintain the same size and significance as observed in the second hypothesis. However, it is important to emphasize that the only significant finding in this thesis regarding the dependent variable is the inclusion of the E pillar in model 3.2. Among the three pillars, the E pillar is the only one that achieves significance, albeit at the lowest significance level of 10%. Notably, the E pillar has a negative coefficient, suggesting that a higher Environmental score predicts lower underpricing. It is important to be cautious when interpreting this result, given the modest significance level. However, in model 3.5, which includes all the pillars together in the regression, the significance of the E pillar diminishes. This could be attributed to omitted variable bias resulting from excluding the S pillar and the G pillar in model 3.2, which can distort the observed outcomes. As a consequence, the R-squared value of model 3.5 surpasses that of model 3.2, likely due to the presence of additional relevant factors. In conclusion, the analysis reveals the significance of the E pillar in predicting underpricing, albeit at a cautious significance level. However, when all the pillars are considered together, the significance of the E pillar diminishes, underscoring the potential influence of omitted variables.

Table 10: Regression results H3

Variables	Model 3.1	Model 3.2	Model 3.3	Model 3.4	Model 3.5
E Pillar		-.279*			-.232
		(.165)			(.180)
S Pillar			-.136		-.092
			(.147)		(.154)
G Pillar				-.128	-.120
				(.116)	(.116)

Firm age	9.983**	10.058**	9.741**	10.334**	10.212**
	(4.321)	(4.314)	(4.327)	(4.298)	(4.298)
Firm size	33.359**	33.366**	36.431**	33.526**	35.598**
	(13.302)	(13.688)	(13.905)	(14.062)	(14.976)
Offer size / firm size	14.686**	14.563**	15.833**	14.700**	15.373**
	(5.874)	(6.048)	(6.071)	(6.180)	(6.516)
High-tech	-1.097	-1.130	-.3691	-1.414	-.929
	(4.117)	(4.101)	(4.240)	(4.162)	(4.313)
VC	18.790***	18.413***	19.699***	19.534***	19.790***
	(4.403)	(4.353)	(4.568)	(4.461)	(4.591)
Nasdaq	6.433	6.132	6.760*	6.023	6.018
	(3.920)	(3.847)	(3.910)	(3.952)	(3.872)
Offer size	-13.049	-11.366	-14.263	-13.325	-12.728
	(13.563)	(14.084)	(13.683)	(14.317)	(14.908)
Top underwriter	-9.432**	-9.426**	-9.400**	-10.058**	-9.995**
	(4.574)	(4.578)	(4.567)	(4.660)	(4.658)
Constant	-41.970**	-44.525**	-42.846**	-36.894**	-39.917**
	(14.815)	(14.474)	(14.828)	(15.954)	(15.703)
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	319	319	319	319	319
R-squared	0.226	0.231	0.229	0.230	0.235

*Note: robust standard errors reported in parentheses. * $p<0.10$, ** $p<0.05$, *** p<0.*

4.2. Discussion

In contrast to the main expectation of this paper, the sign of the ESG dummy variable is positive, indicating that companies that report ESG measures have higher underpricing. However, it is important to note that this variable is not significant, so no definitive conclusions can be drawn regarding its effect on underpricing. When examining the control variables grouped by firm-level controls, market-level controls, and IPO characteristics, it appears that firm-level controls contribute the most to the variability in underpricing. However, it is challenging to directly compare these control variables to the market-level and IPO characteristics control variables since they consist of fewer variables and are subject to omitted variable bias. In H1 the regression results revealed significant associations between several control variables and underpricing. Notably, firm size was found to be significant and positively related to underpricing, contrary to the prevailing expectations put forth by Welch (1989), Mauer and Senbet (1992), and Hensler et al. (1997), who hypothesized a negative relationship. This unexpected finding suggests that larger firms experience higher levels of underpricing. Furthermore, offer size relative to firm size demonstrated a significant positive association with underpricing, indicating that larger offer sizes relative to firm size contribute to increased underpricing. Although no specific regression results were available for comparison, it is important to consider that both offer size and firm size were expected to have a negative effect. The unexpected positive effect of firm size in this regression may provide insights into the positive relationship observed between offer size relative to firm size and underpricing. The high-tech sector and VC backing variables were both found to be significant and positively related to

underpricing, aligning with the expected effects as indicated by prior research. This finding suggests that high-tech companies and those with VC backing tend to experience higher levels of underpricing. Additionally, the top underwriter variable exhibited significance and a negative association with underpricing, indicating that companies underwritten by top-ranked underwriters tend to have lower levels of underpricing. This result is consistent with the findings of Beatty and Welch (1996) but contrasts with the findings of Carter and Manaster (1990). It is worth noting that while earlier research papers tend to report positive effects, more recent studies have increasingly found a negative effect of having top underwriters involved in IPOs. Therefore, this finding aligns with the current trend among researchers in highlighting the negative impact of top underwriters on underpricing in IPOs. The regression results indicate that the year of IPO control variable plays a significant role in understanding underpricing. Specifically, the year dummies for 2020 and 2019 show significant relationships with underpricing. The positive relationship with 2020 suggests a potentially "hotter" market, while the negative relationship with 2019 indicates a contrasting trend. In H2 and H3 certain discrepancies from the findings of H1 are observed, albeit of a relatively minor nature. Of particular interest is the variable firm age, which demonstrates a significant and positive relationship with underpricing. This outcome contradicts the prevailing notion in existent literature that older firms tend to exhibit lower levels of underpricing. The loss of significance for the high-tech sector variable within the subset of ESG rated firms suggests a potentially diminished influence of this sector on underpricing. Furthermore, the persistently negative and significant constant term across both hypotheses implies a consistent baseline level of underpricing. Notably, the inclusion of the year 2015 as a significant and positively related variable in these models suggest the possibility of a "hotter" market comparable to the year 2020. The regression results of H3, which examine the impact of the pillars separately, reveal that only the environmental (E) pillar has a significant effect on underpricing. However, when considering the consolidated ESG classification, this significance diminishes.

5. Conclusion

In conclusion, this study aimed to investigate the relationship between ESG factors and IPO underpricing. Through the analysis of a comprehensive dataset and employing regression analysis, several key findings have emerged. Firstly, contrary to the initial expectation, the inclusion of ESG measures showed a positive relationship with underpricing, suggesting that companies reporting ESG measures do not necessarily experience higher levels of underpricing. However, the ESG dummy was not significant. Therefore, the overall impact of ESG measures on IPO underpricing remains inconclusive. Secondly, within the subsample of ESG-rated firms, no significant effect of high ESG ratings on underpricing was found. However, the sign of the ESG variable aligns with the expected negative effect, indicating that a

higher ESG rating is associated with lower levels of underpricing. Thirdly, when exploring the impact of individual E, S, and G pillars on underpricing separately, the analysis revealed that the environmental (E) pillar had a significant negative relationship with underpricing. This suggests that firms with higher environmental scores tend to experience lower levels of underpricing. However, this significance does not persist when considering the consolidated ESG classification. Additionally, the analysis of control variables highlighted the importance of factors such as firm size, offer size relative to firm size, high-tech sector involvement, VC backing, and top underwriter in explaining variations in underpricing levels. These findings are consistent with prior research and provide further insights into the factors influencing IPO underpricing. In summary, while the overall impact of ESG measures on IPO underpricing remains inconclusive, the findings highlight the significance of the environmental pillar in explaining variations in underpricing. These findings contribute to the existing literature on ESG and IPOs, shedding light on the complexities and nuances of the relationship between ESG factors and underpricing. Further research is encouraged to include an equal distribution of control variables from firm-level, market-level, and IPO characteristic categories. This will allow for a more comprehensive understanding of the differential impacts of these variables and their interactions on underpricing. Additionally, exploring a different time frame, preferably adding more recent years, and considering other potential factors that may influence underpricing in the context of ESG will provide further insights into this complex relationship.
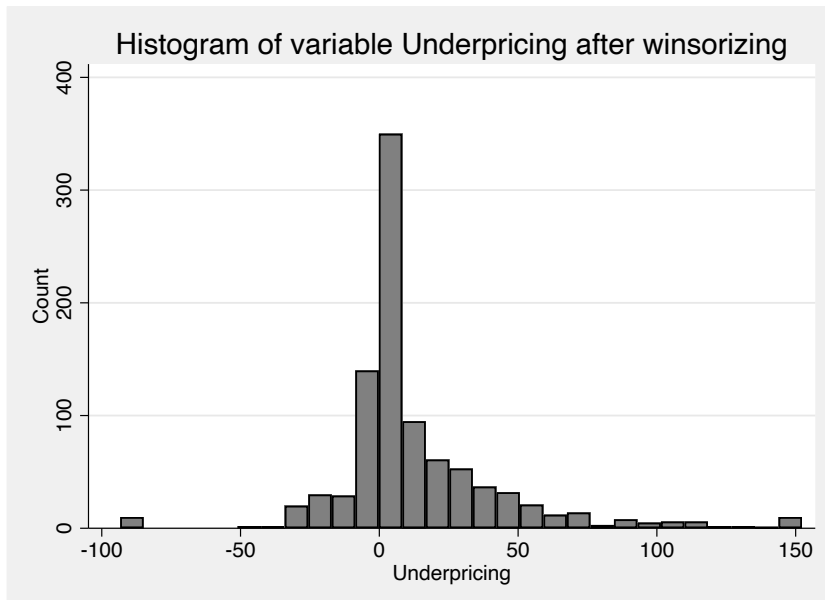
6. Appendix

Appendix A

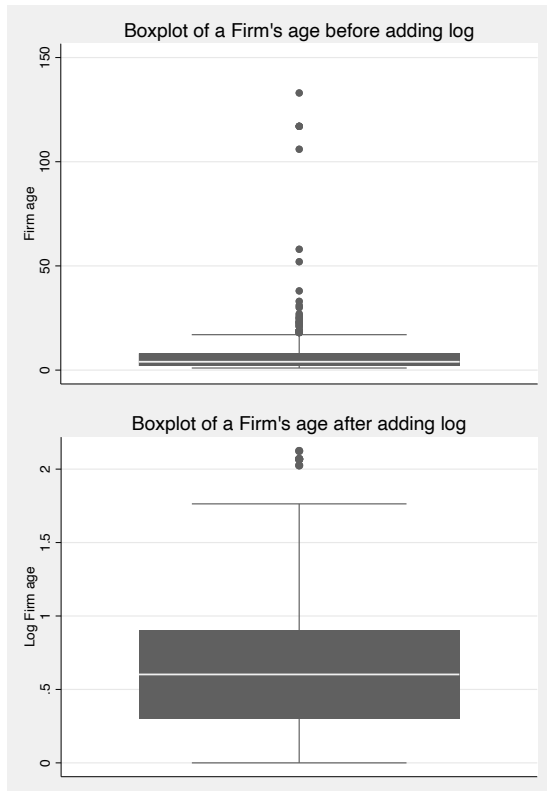*Figure 1: Histogram before winsoring at 1%*
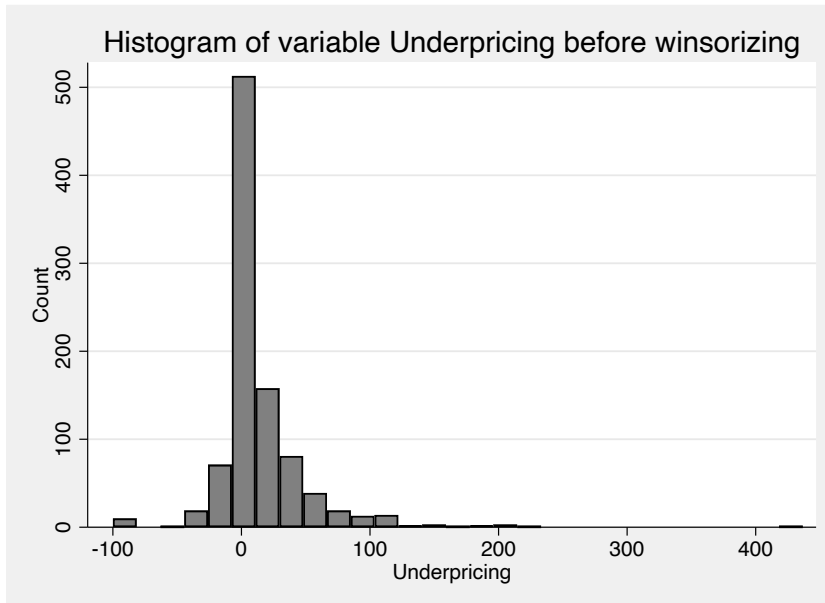
Source: Stata/MP 18.0

Figure 2: Histogram after winsoring at 1%
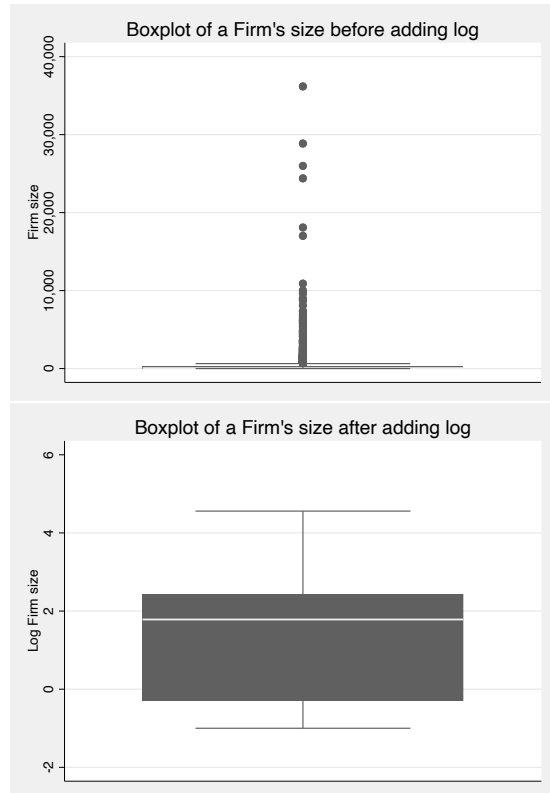

Source: Stata/MP 18.0

Appendix B

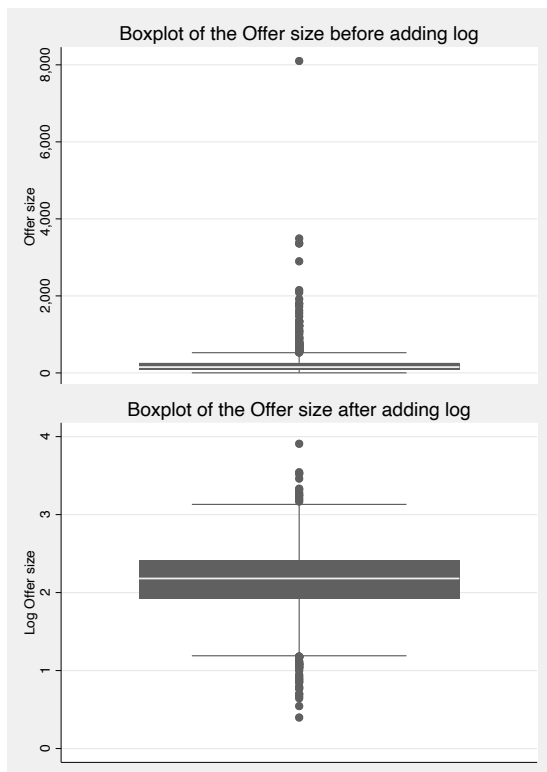*Figures 1 and 2: Boxplot Firm age*

Source: Stata/MP 18.0

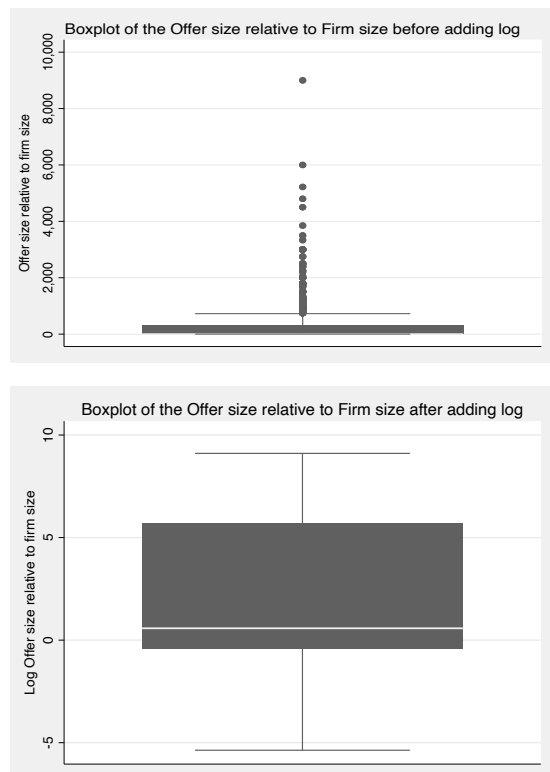*Figures 3 and 4: Boxplot Firm size*

Source: Stata/MP 18.0

Figures 5 and 6: Boxplot Offer size

Source: Stata/MP 18.0

Figures 3 and 4: Boxplot Offer size relative to Firm size age

Source: Stata/MP 18.0

Appendix C

Categories	Variable	Interpretation	Expected effect	Supported literature
Firm-level	Firm age	Log of firm's age plus one	-	Ritter (1984), Muscarella and Vetsuypens (1989), Hensler et al. (1997), Carter et al. (1998), Ljunqvist and Habib (2001), Lowry and Shu (2002), Lowry et al. (2010), Engelen and Van Essen (2010), Harasheh (2022)
	Firm size	Log of firm size	-	Welch (1989), Mauer and Senbet, (1992), Hensler et al. (1997), Lowry and Shu (2002)
	Offer size relative to firm size	Log of offer size divided by firm size	+/-	Self-generated
	High-tech	Dummy set to one if company's primary business is high-tech	+	Lowry and Shu (2002), Aggarwal et al. (2002), Schwert (2004), Loughran and Ritter (2004), Lowry and Murphy (2007), Lowry et al. (2010)
	VC backed	Dummy set to one if company is venture capital backed	+	Gompers (1996), Hensler et al. (1997), Bradley and Jordan (2002), Lowry and Schwert (2004), Loughran and Ritter (2004), Boulton (2023), Fedorova et al. (2022), Economidou et al. (2023), Engelen and van Essen (2010)
Market-level	Nasdaq	Dummy set to one if company lists on the Nasdaq	+	Lowry and Schwert (2002), Lowry and Shu (2002), Smart and Zutter (2008), Lowry et al. (2010)
	Year of IPO	Dummy variables for the years 2015, 2016, 2017, 2018, 2019 and 2021	+/-	Ritter (1984) / Ljungqvist et al. (2006)
IPO characteristics	Offer size	Log of offer size	-	Beatty and Ritter (1986), Carter et al. (1998), Boudriga et al. (2009), Carter and Manaster (1990), Megginson and Weiss (1991)
	Top underwriter	Dummy set to one if IPO is underwritten by an underwriter with rank 8+	+/-	Carter and Manaster (1990), Carter et al. (1998) Megginson and Weiss (1991), Michaely and Shaw (1994) / Beatty and Welch (1996), Loughran and Ritter (2004), Baker et al. (2021), Boulton (2023), Economidou et al. (2023)

Appendix D

	Model number	Independent variable	Control variable(s)
Hypothesis one	1.1	-	All
	1.2	ESG dummy	Firm-level
	1.3	ESG dummy	Market-level
	1.4	ESG dummy	IPO characteristics
	1.5	ESG dummy	All
Hypothesis two	2.1	-	All
	2.2	ESG Score	Firm-level
	2.3	ESG Score	Market-level
	2.4	ESG Score	IPO characteristics
	2.5	ESG Score	All
Hypothesis three	3.1	-	All
	3.2	E pillar	All
	3.3	S pillar	All
	3.4	G pillar	All
	3.5	E pillar, S pillar, G pillar	All

	Model number	Independent variable	Control variable(s)

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