ESG CONTROVERSIES

The ESG Performance of Sin Stocks

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Abstract

Sin stocks are companies that engage in controversial operating activities. Traditionally, companies active in the alcohol, tobacco, and gambling industries are considered sinful. However, nowadays, under rising environmental concerns, pollution-prone or carbon-intensive industries are also often regarded as sinful. Firms active in these sin industries might respond differently to the increased investors' pressure to conduct business in a socially responsible manner, often measured by the ESG metric. Sin stocks face an ambiguous, unchartered response to ESG aspects. This research contributes to the sin stock literature by comparing the ESG performance of sin stocks, both traditional and new, to non-sin stocks by performing various GLS regressions. In addition, the incremental influence of ESG engagement on firm value under sin stocks is investigated, creating a better understanding of the motivation behind sin stocks acting in a certain manner. This study focusses on the industry-wide North American market over the years 2016 to 2020. I find that there exists a significant difference between traditional and new sin stocks. New sin stocks exhibit worse overall ESG performance relative to non-sin stocks, driven by a lower social pillar and environmental pillar score. Traditional sin stocks, in contrast, exhibit better ESG performance in comparison to non-sin stocks. Moreover, in line with the value-irrelevance hypothesis, I do not find evidence of a relationship between ESG engagement and firm value of sin stocks.

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

"Exxon is rated top ten best in the world for environment, social & governance (ESG) by S&P 500, while Tesla didn't make the list! ESG is a scam. It has been weaponized by phony social justice warriors"

Tweet of Elon Musk ~ 18 May 2022

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1. Introduction

Pornography, weapons, gambling, liquor, and tobacco are the most common examples of sin industries. Sin stocks are shares of companies active in these industries. Buying these stocks can be considered unethical, immoral, or loathsome, as the companies involved willingly provide the market with products and services that are harmful to consumers (Hong & Kacperczyk, 2009). 'Ethical' investors tend to exclude sin stocks from their portfolios as their moral standards are more important than making money.

However, there does not exist an exhaustive list, some sort of holy grail, containing all sin stocks. Environmentalists might consider Shell a sin stock, whereas vegetarians are more likely to refrain from buying shares in JBS, the world's largest meat processing company. Everyone's notion of 'sin' differs. Sin stocks are individually determined on negative screening and investors fixate on identifying the final output and categorizing it as a sin stock. Negative screening is a common sort of screening since it is the least time-consuming type of screening (Kempf & Osthoff, 2007). However, this exclusionary manner of investing is obsolete and should give way to a more holistic and inclusive investment style.

Today, more often investors are focusing on firms that have a favorable influence on three parameters – Environment, Social, and Governance ("ESG"). ESG is an increasingly recurring theme in our society and encourages investors to evaluate stocks on their ethical practices, rather than only on their final product or services. The ESG score attempts to address how a company serves all its stakeholders, including owners, employees, customers, suppliers, communities, and the environment (Freeman, 1984). It is a positive screening method.

The observant investor that is not only interested in the firms' financial reporting is a type of investor that belongs to this era. Over the past two decades, the number of investors that chose to invest in companies that fit their moral convictions significantly increased and socially responsible investing ("SRI") has become an extremely important investment trend (Adler & Kritzman, 2008). As a result of the increase in SRI, companies no longer only strive for optimal financial performance but also focus on living up to the set social targets (Barnea & Rubin, 2010). In order to attract both individual and institutional investors, firms must optimize their stakeholder relationships and focus on becoming an industry leader in both financial performance and ESG engagement. The amount of research dedicated to the ESG performance of sin stocks, however, remains very limited.

Firms active in controversial industries, such as sin stocks, can respond differently to the increased investors' pressure to conduct business in a socially responsible manner. On the one hand, they might want to compensate for being involved in an industry that may repel certain investors by reporting excellent ESG performance. On the other hand, however, they might show some sort of negligence towards certain ESG elements, assuming that investors are less bothered with moral considerations and care more about financial results (Paradis & Schiehll, 2021). Contemplating these contradicting perspectives, firms labeled as sin stocks face an ambiguous, unchartered response to ESG issues. Therefore, I have formulated the following research question:

What is the influence of being a sin stock on the ESG performance of public companies as opposed to non-sin stocks and what is the underlying reason?

This is one of the first papers that provides insight into the ESG engagement of sin stocks by performing advanced statistical analyses under more than 1500 US companies for a period of five years, from 2016 to 2020. Two different panel analyses are used to give a holistic answer to the research question. Using the first panel analysis, this research starts with examining the ESG performance of sin stocks as opposed to non-sin stocks. Moreover, not only the overall ESG scores but also the ESG pillar scores of the sin stocks are investigated in-depth. The definition of sin stocks is broad, and the industries included fluctuate over time. To tackle this broad definition this thesis examines both the traditional and the new sin industries. Traditional sin industries include the alcohol, tobacco, and gambling industries, whereas the new sin industries include pollution-prone or carbon-intensive industries, represented by the oil & gas, air travel, and meat industries. I find that new sin stocks exhibit worse overall performance relative to non-sin stocks, driven by a lower social pillar and environmental pillar score. In contrast, but in line with previous literature, traditional sin stocks exhibit better ESG performance than non-sin stocks, especially driven by a higher environmental pillar score. However, this last finding should be interpreted carefully because of the low levels of significance. Controlling for general industry effect did not return significant contradicting results. Using the second panel analysis, the reasoning behind sin stocks engaging in ESG is examined. More specifically, the incremental influence of ESG engagement on firm value under sin stocks is investigated. No existence of a relationship between ESG engagement and firm value of sin stocks has been found. This is evidence of the so-called value-irrelevance hypothesis and is in line with previous studies by Modigliani and Miller's (1958), Nelling and

Webb's (2009), and Baron et al. (2011). According to this theory, ESG-related activities of sin stock managers will not significantly affect firm valuations.

All in all, this thesis will pursue to answer whether sin stocks can offset the existing social norms. This is a compelling research topic as it sheds light on how firms active in sin industries behave under increasing pressure to conduct business in a time in which ESG is more important than ever. Moreover, by making a distinction between traditional and non-traditional sin stocks the behavior of both can be compared, giving valuable insights into the development of sin stock behavior. Lastly, by examining the relationship between ESG engagement and firm value, we learn more about the motivation behind sin stocks acting in a certain manner. This research contributes to the sparse amount of literature devoted to the ESG performance of sin stocks.

The remainder of the paper is divided into several sections, reviewing the current state of the related literature and formulating the hypotheses, describing the data sample and the applied methodology, discussing the empirical results, presenting the conclusion, and potential shortcomings, respectively.

2. Theoretical framework

2.1 Responsible investing

2.1.1 Defining Socially Responsible Investing

An increasing number of investors follow the principles of SRI during the screening process of investment opportunities (Adler & Kritzman, 2008). Cowton (1994) defines SRI as: "the exercise of ethical, social, and environmental criteria in the selection and management of investment portfolios, generally consisting of company shares". The three most commonly used forms of SRI screening are 'negative', 'positive', and 'best-in-class' screens. The negative screening policy excludes all firms from the investment opportunity pool which are involved in perceived controversial business segments, such as gambling, alcohol, and weapons, often referred to as sin stocks. To this day, the negative screening method remains a widely adopted form of screening since it is the simplest and the least time-consuming (Kempf & Osthoff, 2007). Positive screening does not lead to an exclusion of all firms involved in controversial business segments, but rates all companies based on a set of criteria, such as diversity, environment, labor conditions, and governance policies. The firms with the highest ratings are then chosen by investors. Finally, the best-in-class screening is similar to the positive screening method, but in addition, assures that the resulting portfolio is balanced across industries.

From the seventeenth through the mid-twentieth century, SRI remained a small, religiously based movement, predominantly focusing on negative screening to avoid investments in sin industries (Martini, 2021). However, this premature screening method does not follow the full scope of SRI. According to De Colle and York (2009) SRI follows two purposes: (1) "to allow investors to reflect their personal value in their choice" and (2) "encourage companies to improve their ethical, social, and environmental performance". By refraining from investing in a company whose final output is categorized as sinful, investors are only engaging in the first purpose of SRI and neglecting the second one. When investors start considering other criteria during the screening process, they follow the full purpose of SRI described by De Colle and York (2009).

Today SRI has outgrown its religious origins and evolved into one of the most important investment approaches of the century. Stimulated by both increased societal awareness and improved regulation, SRI experienced tremendous growth over the last decades (Martini, 2021). The Global Sustainable Investment Alliance (GSIA) reported that at the start of 2020

$35.3 trillion of assets globally were professionally managed under responsible investment strategies, which is a 15% increase over two years (2018-2020), and in total representing 36% of all professionally managed assets across the globe (GSIA, 2020). Today, although negative screening remains an important method, additional forms of screening, like the positive and best-in-class methods, have become more prominent and are catching up.

2.1.2 The origin of CSR

The growth of SRI and the accompanying rise of more holistic and inclusive investment screening methods can be seen as a positive development. A growing number of investors now follow the full purpose of SRI and consider both the financial and non-financial firm performance. This, together with increased government regulation, has led to increased pressure on the non-financial dimension of corporate performance, which in turn has resulted in the market-wide implementation of corporate social responsibility ("CSR") (Egbeleke, 2014). CSR has typically referred to a company's efforts to be more socially responsible or to be a better corporate citizen towards its identifiable stakeholders (Waldman et al., 2006; Gillan et al., 2021). The role of stakeholders is no longer being ignored and CSR has evolved into a strategic goal since the beginning of this century (Kakabadse, 2007). This perspective contrasts sharply with the attitude towards CSR and stakeholders fifty years ago, which was described by Friedman (1970): "There is one and only one social responsibility of business; to use its resources and engage in activities designed to increase its profits." Allocating company funds to CSR objectives was seen as implicit costs that lowered both firm's value and performance.

The impact of CSR on various aspects of business is a popular topic that is shared among academics. To this day, with few exemptions, most academics share the opinion that there are advantages tied to the implementation of CSR. Academic research concludes that CSR involvement positively influences financial performance indicators such as announcement returns (Flammer, 2015), cost of debt (Goss and Roberts, 2011), and firm valuations (El Ghoul et al., 2016). CSR engagement, however, must be genuine in order to result in better financial performance. In case stakeholders are convinced that CSR investments are only made to distract the attention from negative news, investments in CSR could also be met with stakeholder skepticism (Cai et al., 2012; Moura-Leite et al., 2014). Skeptical investors will penalize the misleading firms in the stock market, leading to a suboptimal firm valuation. Furthermore, this skeptical attitude of stakeholders could negatively affect the company's performance if management decides to withdraw from transactions (Rodrigo et al., 2016).

2.1.3 From CSR to ESG

ESG is an acronym developed in 2004 and refers to how corporations and investors deal with environmental, social, and governance in their operations (Gillan et al., 2021). One could argue that ESG is the successor of CSR. It is a more adequate and more expansive assessment of a company's actions. Environmental factors can comprise the company's utilization of natural resources, pollution, waste management, energy usage, sustainability initiatives, and other related areas. Social factors comprise employment-related issues and broader societal issues like human rights, data protection, and community engagement. Governance factors comprise the system of rules and policies used by a company for directing and controlling its operations. This includes the accuracy of reporting methods, board member selection, and compliance with regulations (Boffo & Patalano, 2020).

ESG is seen as core to the way today's responsible enterprises operate. ESG investing has been experiencing exponential growth in the past decade and has reached a point at which SRI and ESG are inseparable from each other. Reuters proclaimed 2021 as the year of the sustainable investor and Bloomberg estimated that a third of all global invested assets will be ESG proof in 2025 (FD, 2022). ESG is not commonly part of mandatory financial reporting. However, as ESG investing accelerates firms are disclosing information in their annual report or a standalone sustainability report more frequently (CFA Institute, 2015). ESG investing first found its roots in its "feel-good" aspect provided to investors that wish to be sustainable. The growth of ESG investing is predominantly driven by institutional investors that consider ESG criteria before making investments, with climate change, tobacco, and conflict risk being the top three concerns (US SIF Foundation, 2018). The reason for this might be twofold. It may be the clients that are driving institutions to become a more socially responsible investor, or it may be the strategy of the institution itself in order to attract more clients (Del Guercio, 1996). The tightening of regulation regarding the disclosure of the investment strategy of institutional investors over the past decades enables clients to control the institutional investors (Sparkes, 2001). According to several academics, the reasons to invest in ESG go beyond the behavioral spectrum and the feeling of doing good as ESG investing also seems to yield fundamental value to investors (Chen, 2018; Engle et al., 2019). For long-term investors, ESG policy is also a risk-reduction policy: shares in companies that are unable to act on ongoing ESG concerns can become worthless in the future (FD, 2022). Good ESG performance is not only beneficial for the investor, but also for the firm itself. In 2013 the first studies were published showing that good ESG performance is associated with financial growth (Clark et al., 2015). ESG remains an innovative and evolving concept, but as more investors and managers consider non-financial

responsibilities an important part of investing and conducting business, its relevance in academic literature is expanding.

As of July 2020, ninety percent of the companies in the S&P 500 have published a report indicating their ESG performance (G&A Institute, 2020). However, since non-financial reporting is often voluntary, companies enjoy more leeway and can, as a result, selectively disclose ESG-related information (Paradis & Schiehll, 2021). There is a growing awareness of the complexity of measuring ESG performance. Various ESG rating providers are engaged in scoring the ESG performance and although their methodologies are improving and becoming more transparent, ESG ratings vary depending on the provider chosen (Poh, 2019). This can occur for multiple reasons, for example as a result of different frameworks, data use, key indicators and metrics, and qualitative judgment (Boffo & Patalano, 2020). This does not only make it difficult for investors to sort the wheat from the chaff, but also for academics to perform research and draw fair, unbiased conclusions. When performing academic research, it is of relevance to understand the composition of the ESG index score and understand how the score relates to the market.

Furthermore, because companies enjoy leeway in disclosing ESG information, management might choose to report heavily on strong ESG aspects while remaining vague about the other aspects. I can elaborate on this by giving a real-life example. Due to the rising environmental concerns, an increasing number of investors refrain from investing in non-sustainable firms (Merton, 1987; Heinkel et al., 2001; Gollier & Pouget, 2009). Firm managers realizing this trend might increasingly report on their good environmental performance or might initiate actions limiting the firm's environmental impact. Moreover, companies might even pretend to be greener or more socially responsible than they actually are. This is called 'greenwashing'. The SEC stated in a report that as a result of the rising popularity of ESG and the lack of standards, greenwashing is lurking (SEC, 2021). All three options will lead to an increased ESG score, driven by an increased environmental score, and, hopefully for the managers, lead to more investments in the firm. The 'E' receives more attention than the 'S' or the 'G' in the ESG index. News articles state that the social aspect is getting overshadowed by the environmental aspect (FD, 2022). All in all, it is not only important to compare the overall ESG index score to the market but also analyzing the different pillars in depth might also help us to better understand the final index score.

2.2 Irresponsible investing

In contrast to the numerous papers written about responsible investing and business ethics, the research on irresponsible investing remains scarce. The literature dedicated to 'sin investing' falls short in both quantity and theoretical relevance. While investors in vice state that the defensive nature of sin stocks generates risk-adjusted abnormal returns, the lack of mutual funds financially involved in sinful companies makes it more difficult to exploit the opportunity and achieve abnormal returns (Richey, 2014)

2.2.1 Traditional versus non-traditional sin industries

Not only does everyone's notion of a sin stock differ, but society's perception of what constates sinful behavior also changes over the years. Whether a firm is considered a sin stock depends on the definition used in research. The most frequently used definition of sin stocks is the 'Triumvirate of sin'. This term includes the alcohol, tobacco, and gambling industries (Blitz & Fabozzi, 2017; Hong & Kacperzyck, 2009).

The alcohol industry was long seen as sinful as it has negative implications on health conditions when consumed heavily (Room et al., 2005; Hong & Kacperzyck, 2009; Marshall, 2014). Similar to the alcohol industry, gambling is known for its addictiveness and negative impact on mental health (Shaffer & Korn, 2002). Especially in the last years, we observe a rapid expansion of online gambling, leading to increased public health costs. Whereas the negative consequences of alcohol and gambling were long known to society, tobacco has only been associated with negative health consequences for the past fifty years. As a result, also the tobacco industry is seen as sinful since the 1960s (Hong & Kacperzyck, 2009; Alberg et al., 2014; CNN, 2020).

According to Hong and Kacperzyck (2009), incorporating industries other than the alcohol, tobacco, and gambling industries is arbitrary. Lobe and Walkshausl (2016), however, incorporate the nuclear power industry in their sin stock research, indicating that the public's perception of sinful activity is still unclear. What is seen as a sinful industry could also differ per country. Take the weapon industry for example. In the United States weapons are legal and most of the people living and investing in the US do not regard this industry as sinful. Conversely, in Europe, this industry is indeed regarded as sinful as the majority of the society relates the industry to violent, uncivilized wars. Interestingly, however, this perception is altering after the invasion of Ukraine. People start to realize how important it is for a country

to be able to defend itself or credibly enforce peace. The production of defense mechanisms is likely to be increasingly seen as a necessity that facilitates peace and stability (Sommerset Webb, 2022). Other industries falling into a grey area are for example the adult entertainment industry, but also industries associated with negative environmental impact, like the aviation industry and the oil & gas industry (Fabozzi & Oliphant, 2008).

2.2.2 The ESG of sin stocks

As mentioned before, a growing number of businesses throughout the world are making a concerted effort to conduct business in a socially responsible manner and have the non-financial goal to boost ESG performance. However, can a company active in a controversial industry be socially responsible while creating goods and services detrimental to society or the environment?

According to Paradis and Schiehll (2021), sin stocks can respond differently to the rising investor pressure to conduct business responsibly. Sin stocks could waver between two distinct approaches. On the one hand, sin stocks might be striving to report excellent ESG performance because they want to compensate for being active in an industry that may repel certain investors. Furthermore, as sin stocks are exposed to more externalities and reputational risks, they might have better ESG practices in place. As a result, sin stocks practices aimed at the mitigation of ESG issues would be expected to be superior to those of companies operating in more traditional industries, to compensate for the significant exposure to ESG issues (Sharma & Song, 2018). On the other hand, sin stocks may show negligence towards certain ESG factors, assuming that investors are less bothered with moral considerations and more interested in the financial results. Previous studies find that sin stocks pay higher dividends and outperform the market across all economic cycles, even in downturns (Ahrens, 2004; Hong & Kacperczyk, 2009; Salaber 2007). The financial performance might be the primary reason for sin investors to invest and they might be indifferent when it comes down to the ESG scores of sin stocks.

Besides the above-mentioned contradicting theories, there is a rising concern that, as touched upon earlier, ESG rating methods are divergent and therefore are too easy to ‘game’. Greenwashing is a real-life example of this phenomenon. This is in line with the beliefs of Elon Musk, whose tweet can be read on the third page of this paper. However, not only Musk but also multiple other important individuals in the industry have expressed their concerns about the ESG ratings. It cannot be denied that the acronym attracts more and more backlash in society (Responsible Investor, 2021). Moving forward in this research, this development should be kept

in mind. Sin stocks might want to try to distract the market from their core activities and frame information in such a way that they score well when it comes down to ESG performance.

The question of whether firms flagged as sin stock can be socially responsible and exhibit optimal ESG performance, however, largely remains unanswered. Individual examples can be found of sin stocks showing excellent ESG performance as well as sin stocks showing appalling ESG performance. There is, however, a sparse amount of literature devoted to the engagement in CSR of sin stocks, the precursor of ESG. A relevant paper by Oh et al. (2016) describes that CSR can provide controversial firms with an opportunity to counter-set their bad reputation. They find that sinful firms advertise their CSR engagements more actively compared to non-sinful firms. Kotchen and Moon (2012) even go one step further and state that companies that do more "harm" do more "good", indicating that the more irresponsible the firm is the better its CSR performance will be. Additionally, Yoon et al. (2006) emphasize that CSR activities only improve a firm's image when consumers attribute sincere motives. Finally, Frynas (2005), Palazzo and Richter (2005), and Byrne (2010) examine the CSR performance of specific sin industries, respectively the oil, tobacco, and defense industry.

2.2.3 Why engage in ESG as a sin stock?

In addition to empirically comparing ESG performance of sin stocks and non-sin stocks, the motivation behind ESG engagement of sin stocks is an unexplored area as well. However, a relevant paper by Cai et al. (2012) aims to explore the underlying reason for sinful firm managers engaging in CSR. More specifically, the article examines the empirical relationship between firm value and CSR engagement for firms in sinful industries.

In the paper, it is described how Carroll (2001) distinguished three different management forms in the literature: moral, immoral, and amoral management. Moral managers strive for good results, but only within the boundaries of sound legal and ethical principles. These executives commonly demonstrate leadership on ethical issues. In contrast, immoral managers lack ethical standards and make judgments, acts, and behaviors that appear to go against what is considered right or ethical. Lastly, amoral executives are unconcerned with the assumption that their decisions might have negative consequences for third parties. These executives simply show a shortage of ethical knowledge and perception. Consequently, the type of management active at sin stocks influences the CSR engagement of these stocks. Depending on the management form, three contradicting hypotheses regarding CSR engagement in sinful industries and firm value can be distinguished (Cai et al., 2012).

Window-dressing hypothesis

The first theory is that executives of companies in contentious industries are immoral and use CSR to enhance their personal advantages of image building as responsible civilians at the expense of shareholder wealth (Barnea & Rubin, 2010). According to this theory, these managers do not have the true intention of (i) "using CSR as long-term strategies to modify their core business"; (ii) "using CSR to reduce their negative impact"; or (iii) "using CSR to improve transparency for their products and impacts". This theory is in line with the findings of Scalet and Kelly (2010), indicating that firms active in sin industries publicly announce the positive CSR activities while rarely addressing unfavorable CSR activities. The first theory is named the window-dressing hypothesis. Cai et al. (2012) predict that, according to this theory, investors will eventually discover the manager's true motives of individual image building and will punish those firms in the stock market, causing their CSR activity to negatively affect firm valuation.

The value-enhancement hypothesis

An alternative theory suggests that executives within sin industries are moral and use CSR as a tool to promote transparency, strategies, philanthropy, and improve firm valuation in the long term (Jensen & Meckling, 1976; Jensen, 2002). Wood (1991) describes managers as moral agents who must direct their behavior towards socially responsible results. In order to boost both firm and social value, moral managers can utilize CSR as a business strategy that is part of the firm's core business targets (McElhaney, 2007). In line with McElhaney, Porter and Kramer (2006) describe that firms in controversial industries can enhance firm value by utilizing certain CSR activities. Cai et al. (2012) label this view as the value-enhancement hypothesis and predict that under this hypothesis there will exist a positive relationship between CSR engagement and firm values of sin stocks.

The value-irrelevance hypothesis

According to the third and final view, managers of sin companies are amoral, meaning that they attach little value to both personal reputation and firm valuation enhancement. Instead, they merely adhere to the current CSR involvement trend set by the industry leaders. Although CSR engagement of sin stocks may have a favorable connotation for investors, the overall effect on financial firm performance is negligible due to investors' negative connotation of the company's controversial products or activities in sin industries. As a result, investors regard CSR involvement of sin stocks as neither damaging nor beneficial, but rather as a value-irrelevant activity. The theory that CSR engagement does not affect firm value aligns with

Modigliani and Miller's (1958) value-irrelevance theorem, Nelling and Webb's (2009) finding of negligible influence of CSR on financial performance, and the study of Baron et al. (2011) indicating no existence of a relationship between CSR activity and firm value for specific companies. This last view is named the value-irrelevance hypothesis. Under this theory, investors comprehend their social-responsibility neutral intention, and as a result, the CSR activity of amoral managers will not significantly influence the firm value of sin stocks (Cai et al., 2012).

Following previous literature examining CSR engagement in relationship with firm values of sin stocks should give us a good indication of the reason why sin stocks engage in CSR.

3. Hypotheses development

To the best of my knowledge, a statistical analysis comparing the ESG performance of both sin stocks and non-sin stocks has not yet been performed. Paradis and Schiehll (2021) describe the contrary responses of sin stocks to rising investor pressure to conduct business responsibly. Individual examples of both responses can be found in the market. Indeed, I think that several sinful firms exhibit excellent ESG performance to compensate for their activities and their exposure to ESG issues (Sharma & Song, 2018). However, this group might be overshadowed by the group of sinful companies that attach less value to ESG performance. Following this view, sin investors are less bothered with moral considerations and more interested in superior financial performance (Ahrens, 2004; Hong & Kacperczyk, 2009; Salaber 2007). This might show in the ESG performance of sin stocks when making a comparison with the performance of non-sin stocks, leading to hypothesis one.

> **Hypothesis 1:** Firms flagged as a sin stock exhibit sub-optimal ESG performance in comparison to non-sin stocks

By answering the first hypothesis we get an idea of the ESG performance in general. However, ESG is an acronym consisting of three pillars quantifying the environmental, social, and governance performance of corporations (Gillan et al., 2021). This research will be examining the various pillars in depth in order to better understand the potential difference between ESG scores of sin and non-sin stocks. This can be of added value considering that reporting on ESG performance is unregulated and management might promote certain ESG aspects while underexposing others. Before the rise of ESG, CSR was also used as a tool for promotion and as a counterweight to the bad reputation of sin stocks (Yoon et al., 2006; Kotchen and Moon, 2012; Oh et al., 2016). A comparison between the different ESG pillars of sin stocks and non-sin stocks will be made. No paper has yet examined the individual ESG pillar scores of sin stocks in comparison to non-sin stocks. However, logically, one would expect that the overall sub-optimal ESG score is driven by the lower pillar scores, leading to the following hypotheses.

> **Hypothesis 2:** Firms flagged as a sin stock exhibit sub-optimal environmental performance in comparison to non-sin stocks

> **Hypothesis 3:** Firms flagged as a sin stock exhibit sub-optimal social performance in comparison to non-sin stocks

> **Hypothesis 4:** Firms flagged as a sin stock exhibit sub-optimal governance performance in comparison to non-sin stocks

As described in the theoretical framework, there is a difference between traditional and non-traditional sin industries. However, both types fall under the heading of 'sin stocks'. With the intention of giving a complete answer to the research question, this research will test the above standing hypotheses for both traditional and non-traditional sin stocks. The results of the different analyses will be compared and discussed.

After having compared the ESG scores of different sin and non-sin stocks in depth, this research will go one step further and examine what the motive is behind the ESG performance of sin stocks. More specifically, following the paper of Cai et al. (2011) about the CSR performance of sin stocks, this will be done by analyzing the empirical relation between firm value and ESG engagement of sin stocks. Three different hypotheses are described in the theoretical framework: the window-dressing hypothesis, the value-enhancement hypothesis, and the value-irrelevance hypothesis. Cai et al. found evidence of the value-enhancement hypothesis. Although their research examined the relation between CSR performance and firm value, I expect a similar relationship between ESG performance and firm value. Therefore, I have formulated the following hypothesis.

> **Hypothesis 5:** There exists a positive relationship between ESG engagement and firm value under sin stocks, showing evidence for the value-enhancement hypothesis

By testing this hypothesis, this research will shed light on the reasoning behind sin stocks engaging in ESG.

4. Data

This research focuses on the North American market over the years 2016 to 2020, a period in which ESG evolved into a hot topic amongst academics, investors, consumers, and company managers. For this research, four different databases are consulted and merged into one sample. The Thomson Reuters ESG database offers overall ESG scores and ESG pillar scores. Most firm characteristics are gathered from the Wordscope database. Both databases are accessible via DataStream and form the base of the sample. Thereafter, the sample is extended with data on industry classification, gathered from the Compustat database. Finally, institutional ownership information is collected from the Thomson Reuters Institutional Ownership database, accessible through WRDS. In the end, annual data of over 1500 US-listed companies is collected over a sample period of five years.

4.1 Collecting ESG data

Since there is no disclosure regulation for ESG data, this data is not available for all publicly traded firms and the coverage varies depending on the database consulted. For this research, I have used the Thomson Reuters ESG database, an enhancement and replacement of the Asset4 database. Thomson Reuters offers one of the most comprehensive databases in the industry containing ESG scores of over 6,000 public companies globally, across more than 400 ESG metrics.

The Thomson Reuters ESG scores were created to transparently and objectively quantify the firm's relative ESG performance across ten themes based on company disclosed data. The different themes per pillar are displayed in Table 1. Data is collected from annual reports, company websites, CSR reports, NGO websites, stock exchange filings, and news sources and translated into various ESG scores by a team of over 150 trained analysts (Thomson Reuters, 2017).

Table 1: Thomson Reuters ESG score design

Pillar	Category
Environmental	Resource Use, Emissions, Innovation
Social	Workforce, Human Rights, Community, Product Responsibility
Governance	Management, Shareholders, CSR strategy

The category score of a firm is determined by the number of firms with a worse, equal, or better category score within an industry group for environmental and social factors and within a country for governance factors. This implies that scores are relative. The quantity of relevant data points within a category determines the category weight used to calculate the overall ESG score. Thus, the overall ESG score is derived using the category scores and category weights. The scores can range from 0 to 100. Companies with an ESG score between 0-25 can be considered bad ESG performers, whereas companies with a score between 75-100 are deemed to be ESG leaders.

4.2 Selection of sin stocks

After collecting the ESG and ESG pillar scores, the companies are divided into different industries. This has been done following a method described in the paper of Hong and Kacperczyck (2009) who segmented the market into 48 different sectors using the Standard Classification codes ("SIC codes"), an industry classification method developed by Fama and French (1997). An overview of the different industries and the associated SIC codes is given in appendix A. Worldscope, accessible via DataStream, gives up to eight SIC codes per company, as multiple business segments can make up the company's revenue. SIC code 1 represents the business segment that provides the most revenue for the company, whereas SIC code 8 represents the segment that provides the least revenue. All SIC codes are matched to one of the 48 industry groups.

Important is to distinguish between the different sin industries in order to draw a comparison between ESG performance of sin and non-sin industries. Moreover, it is important to form the sin stock selection in order to examine the relation between ESG engagement and firm value under sin stocks. In this research, the starting point of the sin stock selection will be the Triumvirate of sin, including the alcohol, tobacco, and gambling industries. Following the classification method, alcohol stocks can be identified with SIC codes 2080-2085 and are subject to group 4. Tobacco stocks are subject to group 5 and are identified with SIC codes 2100-2199. More difficult is to identify the companies active in the gambling industry as Fama and French did not distinguish these stocks from other entertainment stocks. Following Hong and Kacperczyck, however, this research assembles a new industry group, group 48, using the North American Industry Classification System codes ("NAICS codes"). The gambling stocks can be recognized by the NAICS codes 7132, 71312, 713210, 71329, 713290, 72112, and 721120. These codes have been collected via the Compustat database, accessible via WRDS,

and are manually matched with the sample using the company name, Ticker symbol, and Cusip code.

In the coming analyses, a comparable industry group is matched for each sin industry, functioning as an additional variable that controls for general industry effects. Moreover, adding this control variable to the analysis allows for a comparison between the ESG performance of the sin stocks and the comparable non-sin stocks. Also now, the various industries are identified and categorized using the Fama and French (1997) method. The comparable industry group for alcohol is soda (group 3), the comparable industry group for tobacco is food (group 2), and the comparable industry group for gambling is the combined group of the fun (group 7) & meals (group 43) industries.

All in all, alcohol, tobacco, and gambling are seen as the more traditional sin industries. However, as mentioned in the literature review, several articles define the concept of 'sin' and what it includes somewhat differently. Some papers expand on the original sin stocks with stocks of firms active in the weapon, nuclear power, and adult industries. However, as weapons are legal in the US and the country's army is deeply rooted in society, not all Americans consider this industry sinful. Furthermore, in contrast to the Triumvirate of sin, the weapon industry does not have an addictive tendency or causes health issues. Moreover, due to identification problems the nuclear power and adult industries are not included as sin companies in this study either. These days, under rising environmental concerns, people thinking of sin stocks, start to think of companies active in pollution-prone or carbon-intensive industries, also called 'brown companies' (Masters, 2021). This development has also been described by Chava (2014). The exclusion movement, or the type of investor that applies negative screens, turns its back to companies that fall foul of environmental standards. A new, less traditional sin stock class has emerged in response to growing environmental awareness (Barr et al., 2010). In order to include this class in the research, the oil & gas, air travel and meat industries will be considered as sinful as well. Following Fama and French (1997), the oil & gas stocks are subject to group 30 and are identified with SIC codes 1300, 1310-1389, 2900-2911, and 2990-2999. The comparable industry group is the utilities industry (group 31). The air travel industry is subject to the newly created group 49, consisting of SIC codes 3720-3721, 3723-3725, 3728-3729, and the SIC codes 4500-4599 of the transportation industry. The transportation industry (group 40), excluding SIC codes 4500-4599 will serve as the matched comparable industry group. Finally, the last sinful industry is the meat industry (group 50), recognized by SIC codes 2011-2015 within the food group. These SIC codes represent meat production companies. The

food industry group will function as the comparable industry group (group 2). The SIC codes 2011-2015, representing the meat production companies, are excluded.

If the first out of eight extracted SIC codes can be matched to a sinful industry, the company is considered a sin stock in this study. The second to eighth SIC codes, if available, are not considered as they very likely represent the less relevant business segments of the examined firms. The same applies to the industry classification process of the other stocks included in the sample. In the research, I will make a distinction between the Triumvirate of sin industries and the new sin industries. Following Hong and Kacperzyck, the SIC codes 4900-4999 and 6000-6999 are omitted in the overall sample, because they constitute the service industry. Moreover, the banking, insurance, real estate, and trading industries are also excluded from the sample as accounting practices in these industries often differ from the other industries. Lastly, all industries assigned to the companies in the sample as a result of the Hong and Kacperczyck method are compared with the Worldscope industry classification. This extra test only resulted in one adoption in the data sample.

In the end, the sample contains 1583 unique US-listed firms active in 46 different industries. 140 firms are active in sin industries. The industry distribution for the entire sample used in this research is shown in Table 2, presented below. In the end, annual data of the unique companies is collected over a sample period of five years, from 2016 to 2020, resulting in 7915 observations.

Table 2: Industry distribution

This table exhibits the industry distribution for the entire sample. The overall sample is divided into 46 industry groups. All sin stocks are matched with a comparable industry.

Industry	Count				
Alcoholic Beverages	**9**	Clothes	15	Defense	6
Tobacco	**6**	Healthcare	27	Precious Metals	5
Gambling	**15**	Medical Equipment	67	Nonmetallic Mining	10
Oil & Gas	**74**	Drugs	108	Coal	4
Air Travel	**31**	Chemicals	43	Telecom	23
Meat	**5**	Rubber and Plastics	12	Personal Services	20
Soda	10	Textiles	5	Business Services	262
Food	25	Building Materials	38	Computers	39
Fun	12	Construction	35	Chips	89
Meals	41	Steel Works	26	Laboratory Equipment	39
Utilities	85	Fabricated Products	2	Business Supplies	11
Transportation	49	Machinery	59	Shipping Containers	11
Agriculture	4	Electrical Equipment	17	Wholesale	51
Toys	11	Miscellaneous	1	Retail	93
Books	10	Automobiles and Trucks	43		
Consumer Goods	31	Ships	4		

4.3 Firm value

In order to examine the last hypothesis (5), it is of importance to gather the yearly firm values of the included sinful companies. Following previous accounting, economics, and finance literature, and the paper of Cai et al. (2011), firm value is measured with Tobin's Q. Tobin's Q indicates the ratio between the market value of a company and the total value of its assets. The simplified formula of Sturgess (2012) is used:

$$Tobin's\ Q = \frac{Market\ Value\ of\ Firm}{Replacement\ value\ of\ Assets}$$

4.4 Selection of control variables

In addition to the independent variables and dependent variables as described above, different variables are used as control variables in the various analyses. The gathered variables are explained below. Although the control variables in both panel analyses, which will be explained in the methodology section, will be mostly identical, there are some differences.

In the first panel analysis, the percentage of institutional ownership will be controlled for. I have chosen to do this because, as described in the literature review, the growth of ESG investing is predominantly driven by institutional investors. As a result, one could expect that the more voting power an institutional investor has in a firm, the better its ESG performance. Previous studies examining the relationship between institutional ownership and CSR performance also find a positive relationship (Dyck et al., 2019; De Colle & York, 2009). The variable is retrieved from the Thomson Reuters Institutional Ownership database, via WRDS, and indicates the percentage of total stocks outstanding that is owned by institutional investors. The retrieved data is matched to the original sample. This is done by using both the Ticker and the Cusip code, as matching the data using only one identification variable gave incomplete results. In order to be able to match the Cusip codes I first deleted the digits "00", if applicable, at the beginning of the codes in both databases. Thereafter I deleted the last digit of the Cusip codes retrieved from the Worldscope database to create codes of the same length. At last, all matches are checked manually.

Furthermore, several financial firm characteristics are included in the first panel analysis, being size, leverage, firm investments, profitability, the market value of the company, but also advertising intensity (Oh et al., 2016). To control for the effect of size, the log function of the

book value of assets is used. Leverage is controlled for by taking the book value of debt over the book value of assets. Firm investments are accounted for by including the capital expenditures scaled by the firm's book value of assets. I control for profitability by including both the return on assets ("ROA") and the return on equity ("ROE"). The market value of the company is controlled for by including Tobin's Q in the various regressions. Advertising intensity is defined as the firm's selling, general, and administrative ("SG&A") expenses scaled by the firm's total assets. Although SG&A expenditures include other costs as well besides the pure advertising expenses, it is available more often than solely advertising expenses. All mentioned financial firm characteristics are retrieved from the Worldscope database. Moreover, I control for the number of years that the company is incorporated. Finally, the year of ESG scoring is also controlled for as methods could have evolved over the years.

In the second panel analysis, this paper will control for variables shown to affect firm valuation. Identical to the first analysis, there will be controlled for institutional ownership, size, leverage, firm investments, profitability, and advertising expenditures (Cai et al., 2011). Furthermore, in this part of the analysis, there are six different industries, determined using the Fama and French (1997) method, that will be controlled for. These are the traditional and new sinful industries. This is in line with Chen and Steiner (2000). Lastly, I will control for the number of years that the company is incorporated and the year of valuation.

A complete overview of the different variables, descriptions, and origins is given in appendix B.

4.4 Summary statistics

In total, the sample consists of 7915 observations. After observing the variables in Stata using box plots, it becomes clear that some variables suffer from extreme outliers, resulting in high levels of skewness and potentially biased results. Therefore, the variables *ScaledDebt*, *ScaledCapex*, *ROA*, *ROE*, *TobinsQ*, and *ScaledSGA* are winsorized. Consequently, in the remainder of this paper, any references to these variables will be equal to the winsorized values of these variables.

Below, not only the summary statistics of the whole sample are presented, but also of the categorized sample. Panel B distinguishes the three different stock types in the sample: Triumvirate of sin, new-sin, and non-sin stocks. Remarkable is that the Triumvirate of sin stocks

have higher ESG scores than the new-sin and non-sin stocks, indicating that firms flagged as sin stocks exhibit better ESG performance in comparison to other stock types. However, no conclusions should be drawn based on these statistics.

Table 3: Summary statistics

This table exhibits the summary statistics of the different variables included in the analyses. In order to deal with heavy outliers and resulting high levels of skewness, the variables *TobinsQ*, *ScaledDebt*, *ScaledCapex*, *ROA*, *ROE*, and *ScaledSGA* have been winsorized. Panel A presents the summary statistics for the whole sample, consisting of the number of observations, the mean, the standard deviation, and the minimum and maximum variable values. Panel B shows the summary statistics per stock type, being Triumvirate of sin, new-sin, and non-sin stock types.

Panel A: Summary statistics overall sample

Variables	N	Mean	Std. Dev.	Min.	Max
ESG score	7915	39.92	19.71	0.45	93.62
Environmental score	7915	25.15	27.53	0.00	98.00
Social score	7915	42.11	21.97	0.00	97.96
Governance score	7915	49.13	22.29	0.19	99.56
TobinsQ	7915	1.65	1.26	0.00	4.25
Institutional ownership (%)	7915	0.76	0.23	0.00	1.00
LogAssets ('000)	7915	6.28	0.81	2.94	8.57
ScaledDebt (%)	7915	26.10	20.27	0.00	75.46
ScaledCapex (%)	7915	3.56	2.73	0.00	8.90
ROA	7915	1.68	9.55	-18.57	16.93
ROE	7915	5.28	23.15	-40.42	49.21
ScaledSGA (%)	7915	24.17	20.03	0.00	72.78
Age	7915	31.57	28.24	0.00	204.00

Panel B: Summary statistics categorized sample

Variables	Triumvirate of Sin stocks			New-Sin stocks			Non-Sin stocks		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
ESG score	150	45.15	23.01	550	38.24	22.24	7215	39.94	19.42
Environmental score	150	35.33	34.19	550	27.81	27.23	7215	24.74	27.35
Social score	150	47.18	22.72	550	37.50	24.40	7215	42.35	21.71
Governance score	150	51.80	22.19	550	51.97	23.53	7215	48.86	22.18
TobinsQ	150	1.56	1.18	550	0.87	0.80	7215	1.71	1.27
Institutional ownership (%)	150	0.68	0.24	550	0.74	0.26	7215	0.77	0.22
LogAssets ('000)	150	6.63	0.85	550	6.65	0.82	7215	6.24	0.80
ScaledDebt (%)	150	48.05	21.91	550	30.15	19.05	7215	25.34	20.03
ScaledCapex (%)	150	4.03	2.86	550	5.99	2.97	7215	3.37	2.62
ROA	150	4.56	6.96	550	-0.87	9.77	7215	1.81	9.55
ROE	150	12.97	24.08	550	0.35	24.46	7215	5.49	22.96
ScaledSGA (%)	150	15.74	13.42	550	9.09	10.57	7215	25.50	20.18
Age	150	35.40	30.37	550	36.44	30.80	7215	31.11	27.95

5. Methodology

The methodology of this thesis will consist of multiple components. The analyses will be done using two different panel analyses, the second of which with somewhat different control variables. To extract the intended unbiased results in the different regressions, I will pursue stepwise model building. Introducing possible omitted variables one at a time, with the intention of composing a model with optimal fit.

First, the overall ESG scores of sin stocks, both traditional and newcomers, will be examined and compared with the scores of non-sin stocks. As the summary statistics indicate, it is expected that, in contrary to formed hypothesis, the traditional sin stocks will exhibit higher ESG scores than the other stock types. However, the performance of new sin stocks will, in line with the hypothesis, be sub-optimal in comparison to the performance of non-sin stocks. Thereafter, this research will dive deeper and examine the ESG pillars separately in order to establish what drives the difference between the overall ESG scores of the different stock types. Finally, this research will analyze the motive behind the ESG performance of sin stocks by examining the relationship between the ESG scores and the firm valuations. I suspect to find evidence of the value-enhancement hypothesis, as seen in previous sin stock literature (Cai et al., 2011).

5.1 Panel 1 Analysis

5.1.1 Panel 1.A Analysis

Different regressions are utilized to accept or reject the first hypothesis in this first panel analysis. I will perform a general least squares ("GLS") regression approach in order to estimate the relationship between the stock type and ESG performance. The first regression examines whether the ESG scores of sin stocks out- or underperform the scores of non-sin stocks:

$$ESG_{it} = a_0 + \beta_1 Sin_i + \beta_2 x_{it-1} + \mu_t + v_{it} \quad (1)$$

In this panel regression, the dependent variable ESG_{it} denotes the ESG index score based on the performance indicators of a certain company (i) in a certain year (t). The constant a_0 remains stable over time and is the same for all cross-sectional units. Sin_i is a dummy variable equalling one if a firm is considered a traditional sin stock or a new sin stock, and zero if this is not the case. Additionally, I include a vector x_{it-1} of lagged variables controlling for various firm characteristics. The reason for using lagged control variables is that the coefficient

estimates are calculated for time (t) making use of the available information, which is the information at the time $(t-1)$. An extensive formula, showing all control variables, is presented in appendix C. Furthermore, μ_t captures the yearly fixed effects. Lastly, v_{it} is the clustered individual error term per entity (Brooks, 2019). The coefficient of interest is β_1, measuring the abnormal ESG performance of the examined sin stock. A negative and significant value of this coefficient indicates that the sin stocks underperform in comparison to non-sin stocks. By performing the Hausman test it will be determined whether a fixed or random effects model will be adopted.

In the second regression, there is controlled for general industry effects by including the dummy variable $IndustryComp_i$ in the regression. This variable represents the comparable industry group matched to the sin stock examined in that regression. In addition, the introduction of the comparable industry dummy variable makes it possible to compare the ESG performance of the sin stock and the comparable non-sin stock. For example, when examining the ESG performance of an alcohol stock, the dummy variable $Alcohol_i$ constitutes the variable Sin_i and the dummy variable $AlcoholComp_i$ constitutes the matched comparable dummy variable $IndustryComp_i$. The comparable dummy variable takes the value one if the stock can be regarded as either an alcohol stock or a soda stock, as the soda industry serves as the comparable industry matched to the alcoholic industry. This leads to the following regression:

$$ESG_{it} = a_0 + \beta_1 Sin_i + \beta_2 IndustryComp_i + \beta_3 x_{it-1} + \mu_t + v_{it} \quad (2)$$

In the formula above, the coefficient β_1 measures the abnormal ESG performance of the sin stocks. The underperformance of the sin stocks in comparison to their comparable industry stocks is indicated by a negative and significant value of β_1. The coefficient β_2 indicates if the sin stocks matched with the comparable industry stocks out- or underperform the non-sin stocks.

First, using regressions (1) and (2), the ESG performance of the Triumvirate of sin stocks is examined. Thereafter, I examine the ESG performance of new sin stocks independently using the identical methodology. After determining if the ESG performance of new sin stocks is better or worse than non-sin stocks, their performance is compared to the Triumvirate of sin. So, in the second section of this analysis, I examine the ESG performance of the new sin stocks in comparison to the traditional sin stocks, leading to the following regression:

$$ESG_{it} = a_0 + \beta_1 NewSin_i + \beta_2 TriumSin_i + \beta_3 x_{it-1} + \mu_t + v_{it} \quad (3)$$

Again, ESG_{it} denotes the ESG index score. $NewSin_i$ is a dummy variable equaling one if the stock can be classified as a new sin stock. The dummy variable $TriumSin_i$ takes the value one if the stock is considered a non-traditional sin stock or is active in the alcohol, tobacco, or the gambling industry. If this is not the case, the dummy variable will take the value of zero. The coefficient β_1 indicates the ESG performance of new sin stocks in comparison to traditional sin stocks. The coefficient β_2 indicates potential out- or underperformance of the non-traditional and the traditional sin stocks combined in comparison to the non-sin stocks. A negative and significant value of the coefficient β_1 indicates the ESG underperformance of non-traditional sin stocks in comparison to the performance of the traditional sin stocks. Moreover, the regression standing below will control for a general industry effect:

$$ESG_{it} = a_0 + \beta_1 NewSin_i + \beta_2 Trium2Sin_i + \beta_3 x_{it-1} + \mu_t + v_{it} \quad (4)$$

While comparing the ESG performance between the new sin industries and the traditional sin industries, I now control for a general industry effect by including the comparable industries in the regression. The dummy variable $Trium2Sin_i$ takes the value one if the stock can be classified as the specific sin stock in that analysis, if the stock belongs to the group of Triumvirate of sin stocks, or if the stock is active in one of the comparable industries matched with the specific sin stock. For example, when examining the oil & gas stocks, the $Trium2Sin_i$ equals one if a stock can be categorized within the oil & gas industry, the alcohol, tobacco, or gambling industry, or if the stock is active in de utilities industry. Now, coefficient β_1 indicates potential out- or underperformance of new sin stocks relative to traditional sin stocks, while controlling for possible industry effects.

5.1.2 Panel 1.B Analysis

In the second part of the first panel analysis, the ESG pillars will be examined separately in order to establish what drives the difference between the overall ESG scores of the different stock types. The method, however, is very similar to the first part of the analysis. Only the dependent variable will change and can either denote the environmental, social, or governance scores. The first regression will be as follows:

$$ESGpillar_{it} = a_0 + \beta_1 Sin_i + \beta_2 x_{it-1} + \mu_t + v_{it} \quad (5)$$

Thus, the variable $ESGpillar_{it}$ will first denote the economic pillar score, thereafter the social pillar score, and lastly the governance pillar score. All other components of the regression will be similar to the first regression, including the control variables. The coefficient of interest is β_1 and is, when examining the environmental pillar, measuring the abnormal environmental

performance of the sin stock. A significant negative value indicates that sin stocks underperform in comparison to non-sin stocks.

Again, in order to control for general industry effects, I will include an extra dummy variable in the regression. This is similar to regression (2). Regression (6) is, just like regression (5), performed three consecutive times, each time with another dependent variable. Interpretation will work the same for all three regressions and will be similar as described for regression (2). The formula is as follows:

$$ESGpillar_{it} = a_0 + \beta_1 Sin_i + \beta_2 IndustryComp_i + \beta_3 x_{it-1} + \mu_t + v_{it} \quad (6)$$

First, the ESG pillar performance of the traditional sin stocks relative to non-sin stocks is examined. Thereafter, the same method is used to investigate the ESG pillar performance of new sin stocks separately. After concluding whether the ESG pillar performance of new sin stocks is better or worse than non-sin stocks, their performance is compared to the Triumvirate of sin. The same method as before applies, using the following two regressions:

$$ESGpillar_{it} = a_0 + \beta_1 NewSin_i + \beta_2 TriumSin_i + \beta_3 x_{it-1} + \mu_t + v_{it} \quad (7)$$

$$ESGpillar_{it} = a_0 + \beta_1 NewSin_i + \beta_2 Trium2Sin_i + \beta_3 x_{it-1} + \mu_t + v_{it} \quad (8)$$

Again, both above standing regressions will be executed three times. In both regressions the coefficient β_1 indicates potential environmental, social, or governance out- or underperformance of new sin stocks relative to traditional sin stocks. However, regression (8) also controls for potential industry effects. My expectation for example, being that new sin stocks have a lower environmental pillar score relative to the traditional sin stocks, can be confirmed if the value of β_1 is negative and significant when running the regressions with the environmental pillar score as the dependent variable. Running the regression with the social pillar score and the governance pillar score will also give more insight into the overall difference in ESG scores between the stock types.

5.2 Panel 2 Analysis

In the second analysis, this research will go one step further and examine the motive behind the ESG performance of sin stocks. More specifically, the empirical relationship between firm value and ESG engagement of sin stocks is examined. The value-enhancement hypothesis, described by Cai et al. (2011) will be tested. As a result, this research will shed light on the

reasoning behind sin stocks engaging in ESG. Based on the undermentioned regression, the fifth hypothesis of this research can either be accepted or rejected. Again, a GLS regression approach is performed. Regression (9) examines the incremental influence of ESG engagement on firm value under sin stocks.

$$TobinsQ_{it} = a_0 + \beta_1 ESG_{it} + \beta_2 x_{it-1} + \mu_t + \mu_i + v_{it} \quad (9)$$

This regression is somewhat similar to the first regression. However, there are some differences. First of all, $TobinsQ_{it}$ serves as the dependent variable in the regression. As explained in the data section, this variable represents the firm value. The variable ESG_{it} still represents the ESG index score based on the performance indicators of a certain company (i) in a certain year (t). However, ESG_{it} now is the independent variable. In addition, the included vector x_{it-1} of lagged control variables will be slightly different in this last part of the analysis. The extensive formulas are presented in appendix C. The other components of the formula are the same as in regression (1), however in the above-mentioned formula μ_i is included, encapsulating industry fixed effects. The Hausman test will indicate whether a fixed or random effects model will be adopted. Under the value-enhancement hypothesis, there should exist a positive relationship between ESG engagement and the firm value of sin stocks. This can be concluded if the coefficient β_1 is positive and significant. If the coefficient turns out to be significantly negative or close to zero, this is evidence for the window-dressing hypothesis or the value-irrelevance hypothesis subsequently.

I acknowledge, as implied earlier as well, that the original sin industries and the new sin industries might fundamentally differ. Therefore, I do not only control for the six different industries, but I will also run the regression for traditional and non-traditional sin industries separately and compare the results.

6. Results

This chapter is divided into several sections. In the first section, the results of the overall ESG performance of sin stocks will be presented and discussed. In the same section, I will examine the ESG pillar scores in depth. Thereafter, I repeat both steps, but now controlling for general industry effect. In the second section, I take a closer look at the ESG performance, both the overall performance and the pillar performance, of new sin stocks in comparison to traditional sin stocks. After having done this, the step is repeated while controlling for general industry effects. In the third section, the results of the last regression, examining the relationship between ESG engagement and firm value under sin stocks, are discussed. Finally, the performed two-folded robustness check is discussed.

6.1 ESG Performance of sin stocks

6.1.1 Overall ESG scores (panel 1.A)

The starting point of this research is to examine the overall ESG scores of sin stocks, both traditional and newcomers, and compare these with the scores of non-sin stocks. As described in the methodology section, several lagged variables controlling for firm characteristics have been included in the regression one at a time. Moreover, the Hausman test indicated that a fixed effects model should be adopted. Therefore, all models, except for the last (11) (22), control for year fixed effects.

First, when examining the ESG performance of traditional sin stocks, Table 4 indicates that the companies active in the traditional sin industries outperform companies active in non-sin industries. This is in line with the summary statistics. The coefficient of interest stands before the *TriumSin* dummy variable. Although all models indicate an existence of a positive relationship between the dummy variable and ESG performance, the coefficient is only significant at a 10% level in the second model. The coefficient shows that when a company can be qualified as a sin stock, the ESG score is on average 5.579 points higher on a scale ranging from 0 to 100. However, when examining the ESG performance of non-traditional sin stocks, the results indicate that these stocks show suboptimal ESG performance relative to non-sin stocks. The coefficient of interest in front of the *NewSin* dummy variable is negative and highly significant across almost all models at a 1% level. The ESG performance of a new sin stock is between 6.012 and 7.912 points lower on average in comparison to non-sin stocks.

Due to the low level of significance in the first eleven models, the results should be interpreted carefully. However, it is remarkable that traditional sin stocks show better ESG performance than non-sin stocks, whereas new sin stocks show the opposite. The ESG performance of the traditional sin stocks is more in line with the results of Oh et al. (2016), and Kotchen and Moon (2012), who find that controversial firms show relatively better CSR performance. Also, Paradis and Schiehll (2021) stated that sin stocks might be striving to report excellent ESG performance because they want to compensate for being active in a controversial industry. The newer sin stocks, however, do not seem to follow this theory. This could be because the management behind these stocks shows negligence towards ESG factors, as they might assume that investors prioritize financial results above moral consideration (Paradis & Schiehll, 2021). However, I find a more appropriate explanation that the traditional sin stocks are better at 'playing the game' of ESG reporting, as explained in the theoretical framework. They have long been recognized as controversial and are more likely to have developed certain strategies, like greenwashing, to draw away the attention from their core business and highlight other, more positive, points of interest. Companies that are seen as sinful only recently, might not have these strategies in place and are therefore punished more severely for their controversial activities by the ESG rating agencies. Although this suggestion is brought with great caution, it is not the first time it is noticed that ESG ratings differ from what one would expect. ESG ratings might not always tell the whole story.

Adding the different control variables does not seem to significantly change the coefficient of interest. Moreover, the coefficients in front of the different control variables are in line with expectations formed during an examination of previous literature. Institutional ownerschip (*InstOwn*) shows to have a positive effect on the overall ESG scores. Moreover, there is a positive relationship between the company size (*LogAssets*), firm investments (*ScaledCapex*), profitability (*ROE*), the market value (*TobinsQ*), advertising intensity (*ScaledSGA*), and age (*Age*). *ScaledDebt* indicates a negative relationship between leverage and the ESG score. The variable *ROA* is largely insignificant and should be interpreted with care.

Table 4: Panel 1.A regression results of the ESG performance of sin stocks

This table exhibits the results of the GLS panel regression of the ESG score on various firm characteristics (methodology regression 1). The variables of interest are the sin dummy variables *TriumSin* and *NewSin*. To compose a model of optimal fit, different lagged control variables have been introduced one at a time. Data over a period from 2016 to 2020 has been collected. However, because the included firm characteristics are lagged variables, the table reports the sample period 2017-2020. The Hausman test indicated that a fixed effects model should be adopted. Only in models (11) and (22) there is not controlled for yearly fixed effects.

Variables	Triumvirate of Sin											New Sin										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
TriumSin	5.044	5.579*	0.593	1.361	1.339	1.259	1.179	0.758	1.095	0.982	0.904											
	(-4.05)	(-4.10)	(-2.83)	(-2.78)	(-2.78)	(-2.78)	(-2.79)	(-2.69)	(-2.60)	(-2.64)	(-2.66)											
NewSin												-2.027	-2.014	-7.629***	-7.679***	-7.912***	-7.865***	-7.859***	-7.343***	-6.012***	-6.213***	-7.145***
												(-2.08)	(-2.05)	(-1.35)	(-1.33)	(-1.34)	(-1.34)	(-1.34)	(-1.31)	(-1.25)	(-1.25)	(-1.21)
InstOwn		5.811***	0.651	0.601	0.601	0.538	0.479	-0.18	-0.231	0.054	3.308***		5.758***	0.488	0.421	0.414	0.367	0.311	-0.306	-0.341	-0.051	3.161***
		(-1.14)	(-1.12)	(-1.13)	(-1.13)	(-1.15)	(-1.13)	(-1.12)	(-1.10)	(-1.10)	(-1.12)		(-1.14)	(-1.11)	(-1.12)	(-1.13)	(-1.14)	(-1.12)	(-1.11)	(-1.10)	(-1.09)	(-1.11)
LogAssets			12.773***	13.200***	13.202***	13.140***	13.099***	13.876***	15.778***	15.325***	17.277***			13.116***	13.558***	13.554***	13.501***	13.459***	14.175***	15.928***	15.472***	17.405***
			(-0.46)	(-0.49)	(-0.50)	(-0.50)	(-0.50)	(-0.49)	(-0.48)	(-0.49)	(-0.50)			(-0.47)	(-0.50)	(-0.50)	(-0.50)	(-0.50)	(-0.49)	(-0.49)	(-0.50)	(-0.50)
ScaledDebt				-0.042***	-0.042***	-0.040***	-0.041***	-0.030**	-0.028**	-0.027**	-0.038***				-0.042***	-0.042***	-0.041***	-0.041***	-0.031**	-0.029**	-0.028**	-0.039**
				(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)				(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)
ScaledCapex					0.035	0.031	0.032	0.023	-0.043	-0.046	-0.11					0.081	0.077	0.078	0.068	-0.002	-0.004	-0.061
					(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.07)					(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.07)
ROA						0.018	-0.027	-0.049*	-0.025	-0.03	-0.042						0.014	-0.031	-0.053*	-0.029	-0.034	-0.047
						(-0.02)	(-0.03)	(-0.03)	(-0.03)	(-0.03)	(-0.03)						(-0.02)	(-0.03)	(-0.03)	(-0.03)	(-0.03)	(-0.03)
ROE							0.023*	0.024**	0.025**	0.024**	0.019							0.023*	0.024*	0.025**	0.024**	0.019
							(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)							(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)
TobinsQ								1.199***	0.871***	0.907***	0.570***								1.151***	0.844***	0.881***	0.542***
								(-0.19)	(-0.19)	(-0.19)	(-0.2)								(-0.19)	(-0.19)	(-0.19)	(-0.19)
ScaledSGA									0.128***	0.127***	0.138***									0.122***	0.121***	0.130***
									(-0.01)	(-0.01)	(-0.01)									(-0.01)	(-0.01)	(-0.01)
Age										0.073***	0.111***										0.074***	0.112***
										(-0.01)	(-0.01)										(-0.01)	(-0.01)
Constant	37.529***	33.187***	-41.852***	-43.409***	-43.554***	-43.181***	-42.924***	-49.416***	-63.793***	-63.407***	-76.051***	37.766***	33.472***	-43.311***	-44.925***	-45.182***	-44.864***	-44.602***	-50.701***	-64.124***	-63.740***	-76.150***
	(-0.49)	(-0.98)	(-2.64)	(-2.75)	(-2.74)	(-2.78)	(-2.77)	(-2.81)	(-2.91)	(-2.87)	(-2.90)	(-0.49)	(-0.99)	(-2.65)	(-2.76)	(-2.76)	(-2.81)	(-2.80)	(-2.83)	(-2.91)	(-2.87)	(-2.89)
R-squared	0.249	0.246	0.222	0.222	0.223	0.222	0.223	0.222	0.227	0.229	0.096	0.249	0.246	0.221	0.221	0.221	0.221	0.222	0.221	0.227	0.229	0.096
Observations	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332
Number of groups	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Clustered standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6.1.2 ESG pillar scores (panel 1.B)

After having looked at the overall ESG scores, the ESG pillar scores are examined separately. Also now, I made use of lagged control variables and because the Hausman test indicated that a fixed effects model should be adopted, I control for year fixed effects.

Again, the performance of traditional and new sin stocks is split. Models (1) and (4) regress the environmental score, models (2) and (5) the social score, and models (3) and (6) the governance score. From Table 5 it becomes clear that the ESG outperformance of traditional sin stocks is mainly driven by their higher environmental score. This is in line with an ongoing trend discussed in the theoretical framework of this research. Due to climate change, the environmental pillar receives more attention than the other two ESG pillars (FD, 2022). In fact, this has resulted in a whole new phenomenon called greenwashing. Firms active in traditional sin industries might go to great lengths to pump up their environmental score and draw more investments and consumers as a result. Traditional sin stocks also seem to score better on the social pillar but score worse on the governance pillar than non-sin stocks. However, unfortunately, the coefficients of interest in front of the *TriumSin* dummy variable are insignificant in all three models and no conclusions should be drawn based on these results. In contrast, examining the ESG pillar performance of new sin stocks did lead to significant results. It becomes clear that the lower overall ESG score of new sin stocks is mainly driven by lower social pillar scores, followed by lower environmental pillar scores, both significant at a 1% level. Although insignificant, the governance scores of new sin stocks do not seem to differ a lot from non-sin stocks.

The significant lagged control variables are mostly in line with expectations. Remarkable, however, is that institutional ownership has a negative, partly significant, effect on the environmental and the social pillar score, whereas it has a positive significant effect on the governance pillar score. I did not find any relevant literature explaining this observation. Also, the explanation of this observation does not fall within the scope of this research. It might, however, be an interesting avenue for future research.

Table 5: Panel 1.B regression results of the ESG pillar performance of sin stocks

This table exhibits the results of the GLS panel regression of the ESG pillar score on various firm characteristics (methodology regression 5). In models (1) and (4) the environmental score is regressed, in models (2) and (5) the social score, and in models (3) and (6) the governance score. The variables of interest are the sin dummy variables *TriumSin* and *NewSin*. Again, there is controlled for yearly fixed effects and the table reports the sample period 2017-2020.

Variables	Triumvirate of Sin			New Sin		
	1	2	3	4	5	6
TriumSin	3.22	1.279	-0.416			
	(-4.09)	(-2.55)	(-3.50)			
NewSin				-5.197***	-8.162***	-0.893
				(-1.62)	(-1.53)	(-1.78)
InstOwn	-5.702***	-0.654	6.614***	-5.855***	-0.793	6.610***
	(-1.49)	(-1.18)	(-1.78)	(-1.49)	(-1.17)	(-1.78)
LogAssets	20.402***	15.874***	9.300***	20.548***	16.071***	9.313***
	(-0.77)	(-0.59)	(-0.65)	(-0.77)	(-0.59)	(-0.65)
ScaledDebt	-0.018	-0.038**	-0.015	-0.018	-0.039***	-0.015
	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)
ScaledCapex	0.133	-0.150*	0.124	0.167*	-0.093	0.132
	(-0.09)	(-0.08)	(-0.10)	(-0.09)	(-0.08)	(-0.10)
ROA	-0.023	-0.037	-0.011	-0.026	-0.043	-0.012
	(-0.04)	(-0.03)	(-0.05)	(-0.04)	(-0.03)	(-0.05)
ROE	0.020	0.018	0.036	0.021	0.018	0.036
	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)
TobinsQ	0.632*	1.699***	-0.065	0.615**	1.666***	-0.072
	(-0.26)	(-0.25)	(-0.29)	(-0.26)	(-0.25)	(-0.29)
ScaledSGA	0.103***	0.148***	0.062***	0.098***	0.140***	0.061***
	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)
Age	0.126***	0.043**	0.085***	0.127***	0.044**	0.085***
	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)
Constant	-107.880***	-64.398***	-18.701***	-108.241***	-64.864***	-18.706***
	(-4.36)	(-3.59)	(-3.99)	(-4.36)	(-3.58)	(-3.9)
R-squared	0.206	0.183	0.041	0.205	0.183	0.041
Observations	6332	6332	6332	6332	6332	6332
Number of groups	1583	1583	1583	1583	1583	1583
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6.1.3 Control for general industry effect

Now, I control for a general industry effect. As explained in the methodology section, the dummy variable *IndustryComp* is added to the regressions, representing the comparable industry group matched to the examined sin stock. Again, lagged control variables are included and there is controlled for year fixed effects.

In Table 6 (panel 1.A) the overall ESG score is examined while controlling for general industry effect. The coefficient of interest stands before the *Sin* dummy variable and is represented by the *Alcohol* dummy variable in model (1), the *Tobacco* dummy variable in model (2), the *Gambling* dummy variable in model (3), et cetera. The coefficient indicates the ESG performance of the sin stocks in comparison to the matched industry stocks. Unfortunately, the only coefficient of interest in Table 6 that is significant at a 1% level is found in model (4), indicating that when a company is active in the oil & gas industry, the ESG score is on average 6.169 points lower than the score of companies active in the utility industry. This is in line with the results presented in Table 4 from which it could be concluded that new sin stocks have lower ESG scores than non-sin stocks. Also, in line with previous results, the meat stocks seem to underperform relative to the matched food industry stocks when looking at ESG scores. However, this coefficient is not significant. In contrast, the air travel stocks seem to insignificantly score better on ESG level than the matched transport industry stocks. Another remarkable observation is that only alcohol stocks show evidence of ESG outperformance in comparison to the matched industry group. However, earlier, from Table 4 it could carefully be concluded that traditional sin stocks outperform non-sin stocks when examining ESG performance. But because both tables show few significant coefficients of interest, it is impossible to draw any hard conclusions based on this observation. Finally, significant control variables do not seem to significantly change after including the matched industry as control variable in the regression. All in all, Table 6 cannot be used to form new insights due to low levels of significance. Nevertheless, the results do not seem to contradict the results found in the previously discussed tables.

In Table 7 (panel 1.B) the ESG pillar scores are regressed while controlling for general industry effect. For every sin industry, three models are presented: one with the environmental score as dependent variable, the other with the social score, and the last with the governance score. Again, the coefficient of interest stands before the *Sin* dummy variable. Unfortunately, as expected after examining Table 6, most coefficients of interest are not significant. What can, however, be concluded from Table 6 is that the ESG underperformance of oil & gas stocks in

comparison to their matched industry is largely driven by a lower environmental score, significant at a 1% level. Also, the low ESG score of meat stocks relative to food stocks is driven by a relatively lower environmental score, significant at a 5% level. The remaining results should be interpreted carefully.

Table 6: Panel 1.A regression results of the ESG pillar performance of sin stocks while controlling for general industry effect

This table exhibits the results of the GLS panel regression of the ESG pillar score on various firm characteristics while controlling for general industry effect (methodology regression 2). The variable of interest is the sin dummy variable *Sin*. Including the comparable dummy variable *IndustryComp* in the analysis gives the possibility to test the difference between the six different sin industries and the comparable non-sin industries. Again, there is controlled for yearly fixed effects and the table reports the sample period 2017-2020.

Variables	Alcohol	Tobacco	Gambling	Oil & Gas	Air Travel	Meat
	1	2	3	4	5	6
Sin	11.158	-1.515	-4.080	-6.169***	0.949	-6.125
	(-7.28)	(-6.82)	(-4.26)	(-2.09)	(-2.68)	(-6.46)
IndustryComp	-8.680	7.961***	2.022	-1.033	-5.680***	7.937**
	(-6.11)	(-3.08)	(-2.01)	(-1.58)	(-1.75)	(-3.08)
InstOwn	-0.063	0.145	-0.005	-0.088	-0.013	0.115
	(-1.10)	(-1.09)	(-1.10)	(-1.10)	(-1.10)	(-1.09)
LogAssets	15.314***	15.299***	15.336***	15.401***	15.464***	15.297***
	(-0.50)	(-0.49)	(-0.49)	(-0.50)	(-0.50)	(-0.49)
ScaledDebt	-0.026**	-0.027**	-0.027**	-0.027**	-0.026**	-0.026**
	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)
ScaledCapex	-0.047	-0.041	-0.049	0.000	-0.029	-0.044
	(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.06)
ROA	-0.030	-0.030	-0.031	-0.034	-0.031	-0.030
	(-0.03)	(-0.03)	(-0.03)	(-0.03)	(-0.03)	(-0.03)
ROE	0.024**	0.024**	0.025**	0.023*	0.025**	0.024**
	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)
TobinsQ	0.919***	0.904***	0.902***	0.881***	0.887***	0.909***
	(-0.19)	(-0.19)	(-0.19)	(-0.19)	(-0.19)	(-0.19)
ScaledSGA	0.127***	0.128***	0.127***	0.119***	0.128***	0.128***
	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)
Age	0.074***	0.071***	0.074***	0.073***	0.072***	0.071***
	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)
Constant		-63.380***	-63.457***	-63.257***	-63.957***	-63.346***
	(-2.89)	(-2.88)	(-2.88)	(-2.88)	(-2.89)	(-2.88)
R-squared	0.229	0.229	0.229	0.229	0.229	0.229
Observations	6332	6332	6332	6332	6332	6332
Number of groups	1583	1583	1583	1583	1583	1583
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Panel 1.B regression results of the ESG pillar performance of sin stocks while controlling for general industry effect

This table exhibits the results of the GLS panel regression of the ESG pillar score on various firm characteristics while controlling for general industry effect (methodology regression 6). In models (1), (4), (7), (10), (13), and (16), the environmental score is regressed, in models (2), (5), (8), (11), (14), and (17) the social score, and in models (3), (6), (9), (12), (15), and (18) the governance score. The variable of interest is the sin dummy variable *Sin*. Again, the comparable dummy variable *IndustryComp* is included in the analysis. There is controlled for yearly fixed effects and the table reports the sample period 2017-2020.

Variables	Alcohol			Tobacco			Gambling			Oil & Gas			Air Travel			Meat		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Sin	6.911	10.382	15.025	-3.422	-1.114	0.043	-6.499	-3.079	-2.426	-9.066***	-3.698	-4.594	-2.847	0.211	2.102	-13.950**	3.001	-13.812
	(-8.40)	(-7.49)	(-10.68)	(-9.41)	(-7.56)	(-6.23)	(-7.41)	(-4.24)	(-4.94)	(-2.57)	(-2.37)	(-2.93)	(-4.01)	(-2.91)	(-4.09)	(-6.30)	(-8.92)	(-8.97)
IndustryComp	-0.684	-8.053	-14.491**	14.529***	6.656**	5.446	4.959	2.062	-1.05	5.188**	-6.580***	4.173*	-4.308*	-7.091***	-1.544	14.477***	6.670**	5.379
	(-7.46)	(-6.77)	(-6.94)	(-4.18)	(-3.29)	(-3.96)	(-3.05)	(-2.24)	(-2.58)	(-2.12)	(-1.72)	(-2.18)	(-2.46)	(-1.85)	(-2.85)	(-4.18)	(-3.29)	(-3.96)
InstOwn	-5.736***	-0.774	6.384***	-5.599***	-0.585	6.737***	-5.827***	-0.713	6.607***	-5.535***	-1.149	6.934***	6.934***	-5.807***	6.601***	-5.662***	-0.55	6.608***
	(-1.49)	(-1.18)	(-1.78)	(-1.49)	(-1.18)	(-1.78)	(-1.49)	(-1.18)	(-1.78)	(-1.49)	(-1.18)	(-1.78)	(-1.78)	(-1.49)	(-1.78)	(-1.49)	(-1.18)	(-1.78)
LogAssets	20.385***	15.863***	9.284***	20.376***	15.850***	9.266***	20.436***	15.887***	9.289***	20.275***	16.186***	9.153***	9.153***	20.587***	9.302***	20.374***	15.845***	9.278***
	(-0.77)	(-0.59)	(-0.65)	(-0.76)	(-0.59)	(-0.65)	(-0.77)	(-0.59)	(-0.65)	(-0.77)	(-0.59)	(-0.65)	(-0.65)	(-0.77)	(-0.65)	(-0.77)	(-0.59)	(-0.65)
ScaledDebt	-0.017	-0.037**	-0.015	-0.018	-0.038***	-0.016	-0.018	-0.038**	-0.013	-0.018	-0.038***	-0.015	-0.015	-0.017	-0.015	-0.017	-0.037**	-0.015
	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.01)	(-0.02)
ScaledCapex	0.133	-0.150*	0.122	0.141	-0.145*	0.129	0.125	-0.153*	0.13	0.129	-0.055	0.098	0.098	0.149*	0.128	0.138	-0.150*	0.13
	(-0.09)	(-0.08)	(-0.10)	(-0.09)	(-0.08)	(-0.10)	(-0.09)	(-0.08)	(-0.10)	(-0.09)	(-0.08)	(-0.10)	(-0.10)	(-0.09)	(-0.10)	(-0.09)	(-0.08)	(-0.10)
ROA	-0.023	-0.037	-0.01	-0.023	-0.037	-0.011	-0.025	-0.038	-0.01	-0.022	-0.046	-0.008	-0.008	-0.024	-0.011	-0.022	-0.037	-0.01
	(-0.04)	(-0.03)	(-0.05)	(-0.04)	(-0.03)	(-0.05)	(-0.04)	(-0.03)	(-0.05)	(-0.04)	(-0.03)	(-0.05)	(-0.05)	(-0.04)	(-0.05)	(-0.04)	(-0.03)	(-0.05)
ROE	0.02	0.018	0.036*	0.021	0.018	0.036*	0.021	0.019	0.036*	0.020	0.017	0.036*	0.036*	0.022	0.036*	0.02	0.018	0.036*
	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.01)	(-0.02)
TobinsQ	0.630**	1.711***	-0.038	0.629**	1.697***	-0.074	0.625**	1.696***	-0.063	0.640**	1.653***	-0.051	-0.051	0.618**	-0.071	0.637**	1.701***	-0.067
	(-0.26)	(-0.25)	(-0.29)	(-0.26)	(-0.25)	(-0.29)	(-0.26)	(-0.25)	(-0.29)	(-0.26)	(-0.25)	(-0.29)	(-0.29)	(-0.26)	(-0.29)	(-0.26)	(-0.25)	(-0.29)
ScaledSGA	0.102***	0.148***	0.062***	0.103***	0.149***	0.062***	0.102***	0.148***	0.061***	0.102***	0.133***	0.065***	0.065***	0.103***	0.062***	0.103***	0.149***	0.062***
	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)
Age	0.125***	0.044***	0.087***	0.121***	0.041***	0.083***	0.128***	0.044***	0.084***	0.123***	0.045***	0.083***	0.083***	0.126***	0.084***	0.121***	0.041***	0.083***
	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.01)	(-0.02)
Constant	-107.720***	-64.234***	-18.447***	-107.892***	-64.354***	-18.629***	-108.094***	-64.472***	-18.597***	-107.160***	-65.023***	-18.173***	-18.173***	-108.688***	-18.658***	-107.828***	-64.374***	-18.588***
	(-4.38)	(-3.61)	(-4.00)	(-4.36)	(-3.59)	(-4.00)	(-4.38)	(-3.60)	(-3.99)	(-4.38)	(-3.59)	(-4.00)	(-4.00)	(-4.39)	(-4.00)	(-4.36)	(-3.59)	(-4.00)
R-squared	0.206	0.183	0.041	0.206	0.183	0.041	0.206	0.183	0.041	0.207	0.182	0.041	0.206	0.183	0.041	0.206	0.183	0.041
Observations	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332
Number of groups	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6.2 Comparison of ESG Performance between new sin stocks and traditional sin stocks

In the second section, the ESG performance of new sin stocks, being stocks of companies active in the oil & gas, air travel, and meat industries, is empirically compared to the Triumvirate of sin stocks. Also in these regressions, I made use of lagged control variables, included one at a time, and control for year fixed effects.

Table 8 (panel 1.A) shows the results of the overall ESG scores of non-traditional sin stocks in comparison to the traditional sin stocks. The coefficient of interest stands before the *NewSin* dummy variable. Most importantly, the coefficients show that companies qualified as new sin stocks exhibit a lower overall ESG score relative to traditional sin stocks, significant across almost all models. Model (10), with all control variables included, shows that new sin stocks score on average 6.637 ESG points lower than traditional sin stocks, significant at a 5% level. It can be concluded that new sin stocks show different overall ESG scores than the Triumvirate of sin stocks. The coefficient in front of the *TriumSin* dummy variable specifies if the group of non-traditional and traditional sin stocks combined outperforms the market when examining ESG performance. Model (10) of Table 8 exhibits that they do outperform non-sin stocks. Whether this is only because of more general industry effects becomes clear after the comparable industry group is added to the regression (*see Table 10*). However, notice that the coefficient indicating the outperformance is not significant.

Table 9 (panel 1.B) shows the result of the ESG pillar scores of non-traditional sin stocks relative to the Triumvirate of sin stocks. The coefficient of interest indicates that companies qualified as new sin stocks on average receive an environmental score of 7.888 points lower than traditional sin stocks, significant at a 10% level. Moreover, when regressing the social pillar score, new sin stocks on average receive a score of 8.712 points lower than traditional sin stocks, significant at a 1% level. The governance score of new sin stocks, although insignificant, does not seem to differ from the score of traditional sin stocks. Again, the coefficients in front of the combined *TriumSin* dummy variable are not significant.

These results are in line with what could already be concluded from Tables 5 and 6. The management behind traditional sin stocks is either more willing to compensate for being active in a controversial industry than the management behind new sin stocks, or the management of

traditional sin stocks is better at 'playing the game'. The difference between overall ESG performance of traditional and non-traditional is mainly driven by a difference in the environmental and social pillar scores. The included control variables in both regressions do not exhibit any surprising new observations.

In Tables 10 and 11, there is also controlled for general industry effects by adding the dummy variable *Trium2Sin* to the regressions. Also now, the results presented in Table 10 (panel 1.A) indicate that all three new sin industries exhibit worse ESG performance than the traditional sin industries while controlling for possible industry effect. However, only when regressing the ESG performance of sin stocks active in the oil & gas industry returns significant results. The combined outperformance of new sin and traditional sin stocks, indicated by the coefficient in front of the *TriumSin* dummy variable in Table 8, is not observed after the comparable industry group has been included via the dummy variable *Trium2Sin*. The coefficient in front of the *Trium2Sin* is now negative instead of positive, significant at a 5% level for the air travel and meat industry. This indicates that the outperformance of the combined sin industries is not a result of general industry effects. The results in Table 11 (panel 1.B) show that companies active in the oil & gas industry score lower on average on the environmental and social pillar performance, significant at a 1% and 5% level respectively while controlling for general industry effects. Unfortunately, as the other coefficients of interest in models (3) to (9) are insignificant, interpreting should be done with caution. However, the signs in front of the coefficients are in line with the signs in front of the coefficients in Table 9, indicating that the lower environmental and governance pillar scores are the main driver of the difference between ESG scores of traditional and non-traditional stocks.

Table 8: Panel 1.A regression results of the ESG performance of new sin stocks in comparison to the Triumvirate of sin stocks

This table exhibits the results of the GLS panel regression regarding the ESG performance of the new sin stocks in comparison to the traditional sin stocks (methodology regression 3). Including the dummy variable *TriumSin* in the analysis gives the possibility to test the difference in ESG performance between the combined sin stocks (traditional and non-traditional) and non-sin stocks. To compose a model of optimal fit, different lagged control variables have been introduced one at a time. Again, there is controlled for yearly fixed effects and the table reports the sample period 2017-2020.

Variables	1	2	3	4	5	6	7	8	9	10	11
NewSin	-6.835	-7.347	-7.548**	-8.352***	-8.519***	-8.418***	-8.336***	-7.470**	-6.565**	-6.637**	-7.422***
	(-4.50)	(-4.53)	(-3.06)	(-3.01)	(-3.02)	(-3.02)	(-3.03)	(-2.93)	(-2.83)	(-2.87)	(-2.88)
TriumSin	4.908	5.444	-0.083	0.691	0.625	0.569	0.49	0.131	0.568	0.436	0.285
	(-4.05)	(-4.10)	(-2.81)	(-2.76)	(-2.76)	(-2.76)	(-2.77)	(-2.68)	(-2.60)	(-2.63)	(-2.66)
InstOwn		5.809***	0.487	0.434	0.426	0.377	0.32	-0.303	-0.33	-0.042	3.167***
		(-1.14)	(-1.11)	(-1.12)	(-1.13)	(-1.14)	(-1.12)	(-1.11)	(-1.10)	(-1.09)	(-1.11)
LogAssets			13.115***	13.552***	13.548***	13.496***	13.454***	14.173***	15.923***	15.468***	17.403***
			(-0.47)	(-0.50)	(-0.50)	(-0.51)	(-0.51)	(-0.49)	(-0.49)	(-0.50)	(-0.50)
ScaledDebt				-0.042***	-0.042***	-0.041***	-0.041***	-0.031**	-0.029**	-0.028**	-0.039***
				(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)
ScaledCapex					0.081	0.077	0.078	0.068	-0.002	-0.004	-0.061
					(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.07)
ROA						0.014	-0.031	-0.053*	-0.029	-0.034	-0.047
						(-0.02)	(-0.03)	(-0.03)	(-0.03)	(-0.03)	(-0.03)
ROE							0.023*	0.024*	0.025**	0.024**	0.019
							(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)
TobinsQ								1.150***	0.843***	0.880***	0.541***
								(-0.19)	(-0.19)	(-0.19)	(-0.19)
ScaledSGA									0.122***	0.121***	0.130***
									(-0.01)	(-0.01)	(-0.01)
Age										0.074***	0.112***
										(-0.01)	(-0.01)
Constant	37.666***	33.323***	-43.306***	-44.901***	-45.160***	-44.845***	-44.585***	-50.687***	-64.108***	-63.726***	-76.145***
	(-0.50)	(-0.99)	(-2.66)	(-2.77)	(-2.77)	(-2.81)	(-2.80)	(-2.83)	(-2.91)	(-2.87)	(-2.89)
R-squared	0.249	0.246	0.221	0.221	0.222	0.222	0.222	0.222	0.227	0.229	0.096
Observations	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332	6332
Number of groups	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583	1583
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Clustered standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9: Panel 1.B regression results of the ESG pillar performance of new sin stocks in comparison to the Triumvirate of sin stocks

This table exhibits the results of the GLS panel regression regarding the ESG pillar performance of the new sin stocks in comparison to the traditional sin stocks (methodology regression 7). In model (1) the environmental score is regressed, in model (2) the social score, and in models (3) the governance score. The variable of interest is the dummy variable *NewSin*. Again, the variable *TriumSin* is included in the regression. There is controlled for yearly fixed effects and the table reports the sample period 2017-2020.

Variables	1	2	3
NewSin	-7.888*	-8.712***	-0.41
	(-4.33)	(-2.90)	(-3.86)
TriumSin	2.763	0.565	-0.496
	(-4.09)	(-2.54)	(-3.50)
InstOwn	-5.802***	-0.782	6.595***
	(-1.49)	(-1.18)	(-1.78)
LogAssets	20.530***	16.066***	9.316***
	(-0.77)	(-0.59)	(-0.65)
ScaledDebt	-0.019	-0.039***	-0.015
	(-0.02)	(-0.01)	(-0.02)
ScaledCapex	0.165*	-0.094	0.133
	(-0.09)	(-0.08)	(-0.10)
ROA	-0.026	-0.043	-0.012
	(-0.04)	(-0.03)	(-0.05)
ROE	0.02	0.018	0.036*
	(-0.02)	(-0.01)	(-0.02)
TobinsQ	0.610**	1.665***	-0.071
	(-0.26)	(-0.25)	(-0.29)
ScaledSGA	0.098***	0.140***	0.060***
	(-0.02)	(-0.02)	(-0.02)
Age	0.127***	0.044***	0.085***
	(-0.02)	(-0.01)	(-0.02)
Constant	-108.194***	-64.846***	-18.711***
	(-4.36)	(-3.58)	(-3.99)
R-squared	0.206	0.183	0.041
Observations	6332	6332	6332
Number of groups	1583	1583	1583
Year fixed effects	Yes	Yes	Yes

Clustered standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10: Panel 1.A regression results of the ESG performance of new sin stocks in comparison to the Triumvirate of sin stocks while controlling for general industry effect

This table exhibits the results of the GLS panel regression regarding the comparison in ESG performance between the non-traditional sin stocks and the traditional sin stocks while controlling for general industry effect (methodology regression 4). The variable of interest is the dummy variable *NewSin*. Including the dummy variable *Trium2Sin* in the analysis gives the possibility to test the difference in ESG performance between the combined sin stocks (traditional and non-traditional) and non-sin stocks while controlling for general industry effect. Again, there is controlled for yearly fixed effects and the table reports the sample period 2017-2020.

Variables	Oil & Gas	Air Travel	Meat
	1	2	3
NewSin	-6.558***	-1,443	-2,423
	(-1.96)	(-2.54)	(-6.05)
Trium2Sin	-0,613	-3.276**	-4.260**
	(-1.39)	(-1.53)	(-2.08)
InstOwn	-0,077	-0,054	0,169
	(-1.10)	(-1.10)	(-1.09)
LogAssets	15.390***	15.457***	15.289***
	(-0.50)	(-0.50)	(-0.49)
ScaledDebt	-0.027**	-0.025**	-0.028**
	(-0.01)	(-0.01)	(-0.01)
ScaledCapex	-0,002	-0.033*	-0.046*
	(-0.06)	(-0.06)	(-0.06)
ROA	-0,034	-0,031	-0,030
	(-0.03)	(-0.03)	(-0.03)
ROE	0.023*	0.025**	0.024**
	(-0.01)	(-0.01)	(-0.01)
TobinsQ	0.883***	0.900***	0.901***
	(-0.19)	(-0.19)	(-0.19)
ScaledSGA	0.119***	0.127***	0.128***
	(-0.01)	(-0.01)	(-0.01)
Age	0.073***	0.073***	0.072***
	(-0.01)	(-0.01)	(-0.01)
Constant	-63.211***	-63.946***	-63.330***
	(-2.88)	(-2.90)	(-2.87)
R-squared	0,229	0,229	0,229
Observations	6332	6332	6332
Number of groups	1583	1583	1583
Year fixed effects	Yes	Yes	Yes

Clustered standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 11: Panel 1.B regression results of the ESG pillar performance of new sin stocks in comparison to the Triumvirate of sin stocks while controlling for general industry effect

This table exhibits the results of the GLS panel regression regarding the comparison in ESG pillar performance between the non-traditional sin stocks and the traditional sin stocks while controlling for general industry effect (methodology regression 8). In models (1), (4), and (7) the environmental score is regressed, in models (2), (5), and (8) the social score, and in models (3), (6), and (9) the governance score. The variable of interest is the dummy variable *NewSin*. Again, the dummy variable *Trium2Sin* is included in the regression. There is controlled for yearly fixed effects and the table reports the sample period 2017-2020.

Variables	Oil & Gas			Air Travel			Meat		
	1	2	3	4	5	6	7	8	9
NewSin	-8.608***	-5.425**	-3,51	-5,539	-2,786	1,687	-7,942	-5,853	-10,712
	(-2.46)	(-2.23)	(-2.75)	(-3.87)	(-2.75)	(-3.69)	(-5.64)	(-4.56)	(-8.47)
Trium2Sin	4.807**	-4.771***	3,025	-1,547	-4.079**	-1,142	8.553***	3.852*	2,268
	(-1.95)	(-1.50)	(-1.91)	(-2.23)	(-1.59)	(-2.24)	(-3.06)	(-2.10)	(-2.69)
InstOwn	-5.466***	-1,144	6.926***	-5.805***	-0,791	6.576***	-5.543***	-0,495	6.631***
	(-1.49)	(-1.18)	(-1.79)	(-1.49)	(-1.18)	(-1.78)	(-1.49)	(-1.18)	(-1.78)
LogAssets	20.263***	16.139***	9.178***	20.567***	16.053***	9.304***	20.346***	15.839***	9.285***
	(-0.77)	(-0.60)	(-0.65)	(-0.77)	(-0.60)	(-0.65)	(-0.77)	(-0.59)	(-0.65)
ScaledDebt	-0,019	-0.036**	-0,017	-0,016	-0.036**	-0,014	-0,020	-0.038***	-0,016
	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)
ScaledCapex	0,129	-0,064	0,106	0,143	-0.133*	0,127	0,134	-0.152*	0,127
	(-0.09)	(-0.08)	(-0.10)	(-0.09)	(-0.08)	(-0.10)	(-0.09)	(-0.08)	(-0.10)
ROA	-0,023	-0,045	-0,009	-0,024	-0,038	-0,010	-0,023	-0,037	-0,01
	(-0.04)	(-0.03)	(-0.05)	(-0.04)	(-0.03)	(-0.05)	(-0.04)	(-0.03)	(-0.05)
ROE	0,020	0,017	0.036*	0,022	0,020	0.036*	0,02	0,018	0.036*
	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)
TobinsQ	0.631**	1.666***	-0,064	0.629**	1.689***	-0,066	0.622**	1.694***	-0,071
	(-0.26)	(-0.25)	(-0.29)	(-0.26)	(-0.25)	(-0.29)	(-0.26)	(-0.25)	(-0.29)
ScaledSGA	0.102***	0.134***	0.064***	0.103***	0.148***	0.062***	0.104***	0.149***	0.062***
	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)
Age	0.123***	0.045***	0.084***	0.127***	0.043***	0.084***	0.123***	0.041***	0.084***
	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)	(-0.02)	(-0.01)	(-0.02)
Constant	-107.154***	-64.792***	-18.279***	-108.655***	-65.152***	-18.667***	-107.756***	-64.373***	-18.623***
	(-4.37)	(-3.60)	(-4.00)	(-4.39)	(-3.61)	(-4.00)	(-4.36)	(-3.59)	(-3.99)
R-squared	0,207	0,182	0,041	0,206	0,183	0,041	0,206	0,183	0,041
Observations	6332	6332	6332	6332	6332	6332	6332	6332	6332
Number of groups	1583	1583	1583	1583	1583	1583	1583	1583	1583
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6.3 Conclusion panel 1 analysis

Based on the results discussed above, the first four hypotheses can be answered. First, it has become clear that it is of importance to make a distinction between traditional and new sin stocks. New sin stocks, in line with the hypothesis, indeed exhibit sub-optimal ESG performance in comparison to non-sin stocks. When examining traditional sin stocks, it is found that this stock type, in line with previous literature, exhibits better ESG performance than non-sin stocks. However, this last finding should be interpreted carefully as most models

do not return a significant coefficient of interest. Based on these results, hypothesis (1) can be rejected for the traditional sin stocks but accepted for the new sin stocks. Controlling for general industry effect did not return significant contradicting results. Examining the ESG pillar scores of traditional sin stocks, unfortunately, did not lead to significant results and therefore it is impossible to accept or reject hypotheses (2) to (4) for this stock type. However, examining the ESG pillar scores of new sin stocks has led to significant results, and, as a result, hypotheses (2) and (3) can be accepted. Hypothesis (4) remains unanswered for non-traditional sin stocks as results turned out to be insignificant. Also now, controlling for general industry effect did not return significant contradicting results.

The results make it undeniably clear that there exists a difference between traditional and non-traditional sin stocks. Examining the ESG performance of both new and original sin stocks separately already gave a clear indication of this finding (Tables 4 - 7). However, the examination of the ESG performance of new sin stocks in comparison to the performance of traditional sin stocks confirmed this observation (Tables 8 - 11). Non-traditional sin stocks indeed score worse on ESG performance than traditional sin stocks and this difference is mainly driven by lower environmental and social scores.

6.4 Sin stock ESG engagement and firm value

In the final section, the relationship between firm value and ESG engagement of sin stocks is examined in order to shed light on the reasoning behind sin stocks engaging in ESG. In the first regression analysis, presented in Table 12, lagged control variables have been included in the regression one at a time. Moreover, the Hausman test indicated that a fixed effects model should be adopted. Therefore, there is controlled for year and industry fixed effects. The coefficient of interest stands before the *ESGscore* variable. This coefficient fluctuates between values slightly below and slightly above zero across all models. Therefore, it can be concluded that the relationship between ESG engagement and firm value is almost non-existent. Also, in model (12), in which all control variables are included and is controlled for year and industry fixed effects, the coefficient is 0.002, significant at a 5% level. Adding the different control variables does not seem to significantly change the coefficient of interest. These results form evidence for the value-irrelevance hypothesis. As described by Cai et al. (2012), under this theory, investors comprehend their social-responsibility neutral intention, and as a result, the ESG activity of amoral managers will not significantly influence the firm value of sin stocks.

Management of firms active in sin industries simply follows the recent trend of ESG involvement by copying the market leaders. Finding no relationship between ESG engagement and firm value aligns with Modigliani and Miller's (1958) value-irrelevance theorem, Nelling and Webb's (2009) results, and the study of Baron et al. (2011).

As described in the methodology section and as seen in the previous results, there exists a fundamental difference between the original and the new sin industries. Therefore, I do not only control for the six different industries in analysis 1, but I also run the regression for traditional and non-traditional sin industries separately. From analysis 2 it becomes clear that the value irrelevance hypothesis holds for both traditional and non-traditional stocks, although the coefficient of interest is only significant in model (2). Based on the results presented in this last section, hypothesis (5) can be rejected. In contrast to Cai et al. (2011), I do not find evidence of the value-enhancement hypothesis, but of the value-irrelevance hypothesis. This observation clarifies the finding, done in the first panel analysis, that new sin stocks exhibit worse ESG performance relative to non-sin stocks and seems to prove that the management behind new sin stocks is indeed less willing to compensate for being active in a controversial industry. Because, as ESG performance does not affect firm value under the value-irrelevance hypothesis, it is understandable that managers of new sin stocks are less bothered with their awarded ESG scores and therefore score worse than other non-sin stocks. This theory does not hold for the outperformance of traditional sin stocks relative to non-sin stocks. However, the coefficients indicating this relationship were hardly significant. Moreover, the coefficient indicating that the relationship between ESG engagement and firm value of traditional sin stocks is non-existent is also insignificant.

Table 12: Panel 2 regression results of the firm value of sin stocks

This table exhibits the results of the GLS panel regression of the firm value of sin stocks, measured by the variable *TobinsQ*, on the ESG engagement of sin stocks. The variable of interest is the variable *ESGscore*. To compose a model of optimal fit, different lagged control variables have been introduced one at a time in the first analysis. The Hausman test indicated that a fixed effects model should be adopted, so there is controlled for both year and industry fixed effects. In analysis 2 the regression is run for traditional and non-traditional sin industries separately, controlling for year fixed effects. Both tables report the sample period 2017-2020.

Regression analysis 1: Pooled sin stocks

Variables	1	2	3	4	5	6	7	8	9	10	11	12
ESGscore	0,001	0,002	0.004**	0.004**	0.004**	0.005***	0.004***	0.003**	0.003**	0,000	-0,001	0.002**
	(0.00)	0,00	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
InstOwn		-0.245**	-0.180*	-0.170*	-0.164*	-0.207*	-0.208**	-0,154	-0,154	-0.198*	-0,175	-0.126*
		(-0.10)	(-0.09)	(-0.10)	(-0.10)	(-0.11)	(-0.11)	(-0.10)	(-0.10)	(-0.11)	(-0.11)	(-0.10)
LogAssets			-0.195***	-0.166***	-0.173***	-0.170***	-0.169***	-0,092	-0,091	-0,092	-0,102	-0.099**
			(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.0)6	(-0.06)	(-0.06)	(-0.07)	(-0.06)	(-0.06)
ScaledDebt				-0.004**	-0.004**	-0.004**	-0.004**	-0.004**	-0.004**	-0.004**	-0.006***	-0.006***
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ScaledCapex					-0.008**	-0.009**	-0.009**	-0.009**	-0.009**	-0.014***	-0.009**	-0.004**
					(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ROA						0,00	-0,001	-0,002	-0,002	-0,006	-0.008**	-0,004
						(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ROE							0,000	0,001	0,001	0,001	0,001	0,00
							(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ScaledSGA								0.016***	0.016***	0.018***	0.006*	0,005
								(0.00)	(0.00)	(0.00)	(-0.01)	(0.00)
Age									0,00	-0,001	-0,002	-0,001
									(0.00)	(0.00)	(0.00)	(0.00)
Constant	1.041***	1.207***	2.348***	2.283***	2.396***	2.379***	2.377***	1.719***	1.717***	1.763***	2.087***	1.984***
	(-0.08)	(-0.11)	(-0.34)	(-0.33)	(-0.33)	(-0.33)	(-0.33)	(-0.37)	(-0.37)	(-0.41)	(-0.44)	(-0.40)
R-squared	0,309	0,308	0,322	0,333	0,336	0,332	0,332	0,339	0,339	0,105	0,134	0,354
Observations	560	560	560	560	560	560	560	560	560	560	560	560
Number of groups	140	140	140	140	140	140	140	140	140	140	140	140
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Industry fixed effects	No	No	No	No	No	No	No	No	No	No	Yes	Yes

Clustered standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Regression analysis 2: split sin stocks

Variables	Triumvirate of Sin	New Sin
	1	2
ESGscore	-0,006	0.003**
	(0.00)	(0.00)
InstOwn	-0,738	-0,108
	(-0.47)	(-0.09)
LogAssets	0,299	-0.112**
	(-0.22)	(-0.05)
ScaledDebt	-0.008*	-0.006***
	(0.00)	(0.00)
ScaledCapex	0,006	-0.005*
	(-0.02)	(0.00)
ROA	0.043***	0,000
	(-0.02)	(0.00)
ROE	-0,002	0,000
	(0.00)	(0.00)
ScaledSGA	0.023**	0.012**
	(-0.01)	(0.00)
Age	0,001	0,001
	(-0.01)	(0.00)
Constant	0,198	1.720***
	(-1.49)	(-0.29)
R-squared	0,256	0,406
Observations	120	440
Number of groups	30	110
Year fixed effects	Yes	Yes

Clustered standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6.5 Robustness check

In order to test if the above-presented results are robust, I have performed a robustness check. As discussed in the data section, the variables *TobinsQ*, *ScaledDebt*, *ScaledCapex*, *ROA*, *ROE*, and *ScaledSGA* have been winsorized at different levels to deal with heavy outliers and resulting high levels of skewness. However, because heavy outliers may not necessarily have to be the result of measurement errors, winsorizing the variables might not be ideal. Furthermore, as discussed in the methodology section, the variables controlling for various firm characteristics in the regression are lagged values. However, using lagged values can potentially produce negatively biased coefficient estimates. Therefore, the performed robustness check is twofold. First, I use the values of the variables before the winsorizing process in the various regression. Furthermore, the included control variables represent the present firm characteristics instead of the lagged firm characteristics.

After having made the two adaptions and having re-run all the performed regression, it can be concluded that the robustness checks confirm the previously found results. No coefficients of interest indicating the relation between the independent and the dependent variables significantly change in value, strengthening the robustness of this study.

7. Conclusion

This research compares the ESG performance of sin and non-sin stocks by performing different GLS regressions. This research focuses on the industry-wide North American market over the years 2016 to 2020, a period in which ESG evolved into a hot topic amongst academics, investors, consumers, and company managers. Originally sin stocks are considered stocks of firms active in the alcohol, tobacco, and gambling industries, also known as the Triumvirate of sin (Hong & Kacperzyck, 2009). However, the concept of 'sin' and what it includes, is altering. These days, under increasing environmental concerns, pollution-prone or carbon-intensive industries, also called 'brown companies', are often considered sinful as well (Masters, 2021; Barr et al., 2010). Considering this development and the rise of this new, less traditional, sin stock class, the oil & gas, air travel, and meat industries are categorized as sinful as well in this research. Not only does this study compare the ESG performance of sin stocks, both traditional and non-traditional, to non-sin stocks, but it also examines the ESG performance of non-traditional sin stocks in comparison to traditional sin stocks. Besides the overall ESG scores, the individual ESG pillar scores are also studied to better understand what drives the difference in ESG scores. Lastly, the reasoning behind sin stocks engaging in ESG is examined. More specifically, the incremental influence of ESG engagement on firm value under sin stocks has been investigated.

Based on the performed analyses, I can conclude that it is of great importance to make a distinction between traditional and new sin stocks. New sin stocks exhibit worse overall ESG performance in comparison to non-sin stocks. The results show that this is mainly driven by lower social pillar scores, followed by lower environmental pillar scores. Traditional sin stocks, in contrast, in line with previous studies by Oh et al. (2016), and Kotchen and Moon (2012), exhibit better ESG performance than non-sin stocks. However, as a result of the low significance in the analysis, this last finding should be interpreted with care. Also examining the separate ESG pillar scores of traditional sin stocks did not return significant results. Although the results indicate that the higher ESG score of these stocks is mainly driven by a higher environmental pillar score, in line with the expectations, it is impossible to draw hard conclusions based on these results. Controlling for general industry effects in regressing the ESG performance of both traditional and non-traditional sin stocks did not return significant contradicting results. The examination of the ESG performance of non-traditional sin stocks in

comparison to the performance of traditional sin stocks confirmed the above-described findings.

Studying the relationship between ESG engagement and firm value under the combined sin stocks led to finding evidence of the value-irrelevance hypothesis. This theory suggests that investors comprehend their social-responsibility neutral intention, and consequently, the ESG activity of amoral managers will not significantly influence the firm value of sin stocks. Sin stock managers merely adhere to the current CSR involvement trend set by the industry leaders.

The finding that ESG performance does not affect firm value matches the results indicating that new sin stocks score worse on ESG performance in comparison to non-sin stocks. Managers of the companies active in new sin industries are aware that their efforts to compensate for being active in a controversial industry and elevate ESG performance do not result in a higher firm valuation. Therefore, these managers are less bothered and score worse in comparison to non-sin stocks. This theory does not hold for the found outperformance of traditional sin stocks relative to non-sin stocks. However, both the coefficient indicating the relationship between being qualified as a traditional sin stock and ESG performance, as well as the coefficient indicating the relationship between ESG engagement and firm value of traditional sin stocks were hardly significant. There are multiple potential explanations for the difference in ESG performance between traditional and non-traditional stocks. One appropriate explanation, for example, could be that traditional sin stocks are better than new sin stocks in drawing away the attention from their core business and highlighting other positive points of interest. However, more research needs to be done in order to make any conclusions.

All in all, this research especially finds significant results when examining the ESG performance of new sin stocks. Reaching conclusions concerning the ESG performance of traditional sin stocks and the reasoning behind the found difference in performance between traditional and non-traditional sin stocks is therefore difficult. Performing a robustness test, not using lagged control variables and using the non-winsorized values, did not return significantly different results.

8. Discussion

Noteworthy is that the findings are limited to certain restrictions. First and foremost, the statistical significance of the different models is quite low. Endogeneity and omitted variable bias may result from these low levels of significance. Moreover, because of these low levels, it is difficult to draw hard conclusions, especially about the performance of traditional sin stocks.

Furthermore, it could be questioned whether ESG is the ideal tool to measure a firm's socially responsible practices. ESG is often referred to as the successor of CSR. It is the result of a more adequate and more expansive scoring method. However, the acronym has attracted increasing backlash over the past years and multiple sources have expressed their concerns. First of all, rating methods are considered too divergent. For example, major ESG score providers disagree on the right way to measure sustainability (Huij, 2022). Different ESG methodologies can lead to significantly different research outcomes. Another concern regarding the ESG scoring metric is that it is too easy to 'game'. Greenwashing is a real-life example of this phenomenon. In the most extreme scenario, companies putting in a similar amount of effort in conducting business in a socially responsible manner might receive a different ESG score. Last, as a result of climate change, the environmental pillar might overshadow the social and governance pillar in the ESG acronym. Although all the ESG scores used in this research are provided by the same renowned institution, taking away some concerns, there is still a possibility of ESG performance measurement errors. For future research, it is interesting to examine other responsible business scoring metrics as well. For example, in 2015 the Sustainable Development Goals ("SDG") have been introduced. This is a universally agreed upon, objective sustainability measure. Using other scoring metrics in future studies might lead to new valuable insights.

A third limitation of this study is the scope of this research. This limitation is twofold. First, the sample only covers the United States, and therefore the results cannot be generalized on a global level without additional research. Second, this research only examines six different sin industries, three of which are traditional and three of which are non-traditional, whereas more industries can be considered sinful. For example, in many countries, the weapon industry is regarded as sinful as well. But there are more examples of industries seen as sinful that can be thought of, like industries involved in labour exploitation. For future research, it might be interesting to include more sin industries in order to examine the difference between sin and

non-sin industries regarding ESG performance, but also other aspects like stock performance, management, ownership, et cetera. Moreover, as I have found substantial evidence of differences between sin industries, it is interesting to gain a better understanding of this difference. For example, it is of importance to learn if traditional and non-traditional sin stocks only differ in terms of ESG performance or if they differ in other aspects as well. Finally, including other countries in the research might lead to valuable new learnings as the concept of sin and what it includes might differ per region. For example, the fact that the United States only ranks number 43 on the Environmental Performance Index (2022) and the top 10 consists of mostly European countries, indicates that the public perception of environmentally unfriendly, and thus possibly sinful, sectors might differ per region. Working with a larger dataset might also lead to higher levels of significance.

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Appendix A

Table 1: Fama & French industry classification

This table reports the Fama & French (1997) 47 industry classification method based on SIC codes. Groups 48 to 50 are manually constructed and do not follow the Fama & French classification method.

	Industry Group	SIC codes	NAICS codes
1	Agriculture	0100-0799,2048-2048	
2	Food	2000-2046,2050-2063,2070-2079,2090-2095,2098-2099	
3	Soda	2064-2068,2086-2087,2096-2097	
4	Alcoholic Beverages	2080-2085	
5	Tobacco	2100-2199	
6	Toys	0900-0999,3650-3652,3732-3732,3930-3949	
7	Fun	7800-7841,7900-7999	
8	Books	2700-2749,2770-2799	
9	Consumer Goods	2047-2047,2391-2392,2510-2519,2590-2599,2840-2844,3160-3199,3229-3231,3260-3260,3262-3263,3269-3269,3630-3639,3750-3751,3800-3800,3860-3879,3910-3919,3960-3961,3991-3991,3995-3995	
10	Clothes	2300-2390,3020-3021,3100-3111,3130-3159,3965-3965	
11	Healthcare	8000-8099	
12	Medical Equipment	3693-3693, 3840-3851	
13	Drugs	2830-2836	
14	Chemicals	2800-2829,2850-2899	
15	Rubber and Plastics	3000-3000, 3050-3099	
16	Textiles	2200-2295,2297-2299,2393-2395,2397-2399	
17	Building Materials	0800-0899,2400-2439,2450-2459,2490-2499, 2950-2952, 3200-3219,3240-3259,3261-3261,3264-3264,3270-3299,3420-3442,3446-3452,3490-3499, 3996-3996	
18	Construction	1500-1549, 1600-1699, 1700-1799	
19	Steel Works	3300-3369, 3390-3399	
20	Fabricated Products	3400-3400,3443-3444,3460-3479	
21	Machinery	3510-3536, 3540-3569, 3580-3599	
22	Electrical Equipment	3600-3621,3623-3629,3640-3646,3648-3649, 3660-3660,3691-3692,3699-3699	
23	Miscellaneous	3900-3900, 3990-3990, 3999-3999,9900-9999	
24	Automobiles and Trucks	2296-2296,2396-2396,3010-3011,3537-3537, 3647-3647, 3694-3694,3700-3716, 3790-3792, 3799-3799	
25	Ship Building, Railroad Eq	3730-3731, 3740-3743	
26	Defense	3480-3489, 3760-3769, 3795-3795	
27	Precious Metals	1040-1049	
28	Nonmetallic Mining	1000-1039, 1060-1099, 1400-1499	
29	Coal	1200-1299	
30	Oil & Gas	1310-1389,2900-2911,2990-2999	
31	Utilities	4900-4999	
32	Telecom	4800-4899	
33	Personal Services	7020-7021, 7030-7039, 7200-7212,7215-7299, 7395-7395,7500-7500,7520-7549, 7600-7699, 8100-8199,8200-8299, 8300-8399, 8400-8499,8600-8699, 8800-8899	
34	Business Services	2750-2759, 3993-3993, 7300-7372,7374-7394, 7397-7397,7399-7399,7510-7519,8700-8748,8900-8999	
35	Computers	3570-3579, 3680-3689, 3695-3695,7373-7373	
36	Electronic Equipment	3622-3622, 3661-3679, 3810-3810,3812-3812	
37	Laboratory Equipment	3811-3811,3820-3830	
38	Business Supplies	2520-2549,2600-2639,2670-2699,2760-2761, 3950-3955	
39	Shipping Containers	2440-2449,2640-2659,3210-3221,3410-3412	
40	Transportation	4000-4099,4100-4199,4200-4299,4400-4499,4500-4599,4600-4699,4700-4799	
41	Wholesale	5000-5099,5100-5199	
42	Retail	5200-5299, 5300-5399, 5400-5499,5500-5599, 5600-5699,5700--5736,5900-5999	
43	Meals (restaurant, hotel, motel)	5800-5813, 5890-5890, 7000-7019,7040-7049, 7213-7213	
44	Banking	6000-6099,6100-6199	
45	Insurance	6300-6399,6400-6411	
46	Real Estate	6500-6553	
47	Trading	6200-6299,6700-6799	
48	Gambling		7132,71312,713210,71329,713290, 72112,721120
49	Air Travel	3720-3729, 4500-4599	
50	Meat	2011-2015	

Appendix B

Table 2: Variable description

This table reports the various variables used in de research, a description, and the origin.

Variable	Definition	Data origin
ESG score	Measures a company's ESG performance based on reported data in the public domain. The overall ESG score is derived using the category scores and category weights.	Thomson Reuters ESG
Environmental score	Score determined by the number of firms with a worse, equal, or better category score within an industry group.	Thomson Reuters ESG
Social score	Score determined by the number of firms with a worse, equal, or better category score within an industry group.	Thomson Reuters ESG
Governance score	Score determined by the number of firms with a worse, equal, or better category score within country.	Thomson Reuters ESG
SIC code	Provides a standard industry classification that covers all the economic activities of the United States. A company may have up to eight SIC codes assigned to it or as little as one depending on the number of business segments that make up the company's revenue.	Worldscope
NAICS code	Identifies companies according to economic, subsector and industry groups.	Compustat
Market capitalization	Represents the current total market value of a company based on current price and current shares outstanding in U.S. dollars.	Worldscope
Total assets	Represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets.	Worldscope
Tobin's Q	Measures the ratio between the market value of a company and the total value of its assets.	*Manually constructed*
% of institutional ownership	Represents the percentage of shares outstanding held by institutional investors.	Thomson Reuters IO
Total debt	Represents all interest bearing and capitalized lease obligations. It is the sum of long- and short-term debt.	Worldscope
Capital expenditures	Represent the funds used to acquire fixed assets other than those associated with acquisitions. It includes but is not restricted to additions to property, plant & equipment and investments in machinery and equipment.	Worldscope
Net income	Represents income after all operating and non-operating income and expense, reserves, income taxes, minority interest and extraordinary items.	Worldscope
Return on assets	Represents profitability ratio constructed by dividing net income by the book value of total assets.	*Manually constructed*
Common equity	Represents common shareholders' investment in a company.	Worldscope
Return on equity	Represents profitability ratio constructed by dividing net income by the book value of common equity.	Worldscope
SG&A expenses	Represents expenses not directly attributable to the production process but relating to selling, general and administrative functions, including advertising expenses.	Worldscope
Date of incorporation	Represents the date the company was incorporated.	Worldscope

Appendix C

Overview of extensive regressions (including control variables)

(1) $$ESG_{it} = a_0 + \beta_1 Sin_i + \beta_2 InstOwn_{it-1} + \beta_3 LogAssets_{it-1} + \beta_4 ScaledDebt_{it-1} + \beta_5 ScaledCapex_{it-1} + \beta_6 ROA_{it-1} + \beta_7 ROE_{it-1} + \beta_8 TobinsQ_{it-1} + \beta_9 ScaledSGA_{it-1} + \beta_{10} Age_{it-1} + \mu_t + v_{it}$$

(2) $$ESG_{it} = a_0 + \beta_1 Sin_i + \beta_2 IndustryComp_i + \beta_3 InstOwn_{it-1} + \beta_4 LogAssets_{it-1} + \beta_5 ScaledDebt_{it-1} + \beta_6 ScaledCapex_{it-1} + \beta_7 ROA_{it-1} + \beta_8 ROE_{it-1} + \beta_9 TobinsQ_{it-1} + \beta_{10} ScaledSGA_{it-1} + \beta_{11} Age_{it-1} + \mu_t + v_{it}$$

(3) $$ESG_{it} = a_0 + \beta_1 NewSin_i + \beta_2 TriumSin_i + \beta_3 InstOwn_{it-1} + \beta_4 LogAssets_{it-1} + \beta_5 ScaledDebt_{it-1} + \beta_6 ScaledCapex_{it-1} + \beta_7 ROA_{it-1} + \beta_8 ROE_{it-1} + \beta_9 TobinsQ_{it-1} + \beta_{10} ScaledSGA_{it-1} + \beta_{11} Age_{it-1} + \mu_t + v_{it}$$

(4) $$ESG_{it} = a_0 + \beta_1 NewSin_i + \beta_2 Trium2Sin_i + \beta_3 InstOwn_{it-1} + \beta_4 LogAssets_{it-1} + \beta_5 ScaledDebt_{it-1} + \beta_6 ScaledCapex_{it-1} + \beta_7 ROA_{it-1} + \beta_8 ROE_{it-1} + \beta_9 TobinsQ_{it-1} + \beta_{10} ScaledSGA_{it-1} + \beta_{11} Age_{it-1} + \mu_t + v_{it}$$

(5) $$ESGpillar_{it} = a_0 + \beta_1 Sin_i + \beta_2 InstOwn_{it-1} + \beta_3 LogAssets_{it-1} + \beta_4 ScaledDebt_{it-1} + \beta_5 ScaledCapex_{it-1} + \beta_6 ROA_{it-1} + \beta_7 ROE_{it-1} + \beta_8 TobinsQ_{it-1} + \beta_9 ScaledSGA_{it-1} + \beta_{10} Age_{it-1} + \mu_t + v_{it}$$

(6) $$ESGpillar_{it} = a_0 + \beta_1 Sin_i + \beta_2 IndustryComp_i + \beta_3 InstOwn_{it-1} + \beta_4 LogAssets_{it-1} + \beta_5 ScaledDebt_{it-1} + \beta_6 ScaledCapex_{it-1} + \beta_7 ROA_{it-1} + \beta_8 ROE_{it-1} + \beta_9 TobinsQ_{it-1} + \beta_{10} ScaledSGA_{it-1} + \beta_{11} Age_{it-1} + \mu_t + v_{it}$$

(7) $$ESGpillar_{it} = a_0 + \beta_1 NewSin_i + \beta_2 TriumSin_i + \beta_3 InstOwn_{it-1} + \beta_4 LogAssets_{it-1} + \beta_5 ScaledDebt_{it-1} + \beta_6 ScaledCapex_{it-1} + \beta_7 ROA_{it-1} + \beta_8 ROE_{it-1} + \beta_9 TobinsQ_{it-1} + \beta_{10} ScaledSGA_{it-1} + \beta_{11} Age_{it-1} + \mu_t + v_{it}$$

(8) $$ESGpillar_{it} = a_0 + \beta_1 NewSin_i + \beta_2 Trium2Sin_i + \beta_3 InstOwn_{it-1} + \beta_4 LogAssets_{it-1} + \beta_5 ScaledDebt_{it-1} + \beta_6 ScaledCapex_{it-1} + \beta_7 ROA_{it-1} + \beta_8 ROE_{it-1} + \beta_9 TobinsQ_{it-1} + \beta_{10} ScaledSGA_{it-1} + \beta_{11} Age_{it-1} + \mu_t + v_{it}$$

(9) $$TobinsQ_{it} = a_0 + \beta_1 ESG_{it} + \beta_2 InstOwn_{it-1} + \beta_3 LogAssets_{it-1} + \beta_4 ScaledDebt_{it-1} + \beta_5 ScaledCapex_{it-1} + \beta_6 ROA_{it-1} + \beta_7 ROE_{it-1} + \beta_8 ScaledSGA_{it-1} + \beta_9 Age_{it-1} + \mu_t + \mu_i + v_{it}$$