

Article

ESG Outcasts: Study of the ESG Performance of Sin Stocks

Gabriel Paradis ¹  and Eduardo Schiehl ^{1,2,*} 
¹ HEC Montréal, 3000, Chemin de la Côte-Sainte-Catherine, Montréal, QC H3T 2A7, Canada; gabriel.2.paradis@hec.ca

² School of Business, Aalto University, 02150 Espoo, Finland

* Correspondence: eduardo.schiehl@hec.ca

Abstract: Certain economic actors are considered by many as involved in or associated with an activity that is considered unethical or immoral, such as the producers of tobacco, alcohol and firearms (often referred to as sin stocks). In an environment in which stakeholders are increasingly interested in sustainable development and corporate social responsibility, it is important to understand how firms respond to these issues which divide public opinion. Our study compares the environmental, social and governance (ESG) performance for a targeted sample of 79 sin stocks and a control group of comparable firms. We observe that sin stocks have a lower overall ESG performance as well as for each of the three ESG pillars, and that this difference is more significant in relation to governance and some key social and environmental issues for which sin stocks could have compensated risk exposure with responsible management practices. In other words, our results demonstrate that sin stocks are exposed to more severe ESG issues and consistently lack the necessary practices to mitigate these issues. Our study provides relevant insights into the informativeness of ESG scores to distinguish firms (and sectors) investing in management practices that offset ESG risk exposure.

Keywords: key ESG performance; sin stocks; environmental; social; governance; comparative analysis



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1. Introduction

In 2018, based on sales, Phillip Morris International was the most important producer of tobacco. In that year, this company started offering services to help employees of the National Health Service, a publicly funded healthcare system in the United Kingdom, quit tobacco usage [1] while also advertising an anti-smoking campaign as a step to ultimately stop smoking cigarettes [2]. Furthermore, the firm's website emphasizes its goal to deliver a smoke-free future [3]. This approach appears quite ironic considering that Phillip Morris could simply stop producing cigarettes. This raises the question of whether such socially responsible initiatives are an alternative way of promoting its products, or is this the result of pressure from stakeholders to gyrate towards a more socially acceptable business model?

Investors have begun to display increased interest in responsible business practices. This tendency is reflected in non-financial reporting and consequently, there is now greater transparency with regard to voluntary reporting of environmental, social and governance (ESG) information [4]. A recent study [5] notes that more than 70% of investors incorporate ESG criteria in their investment decisions. A quarter (25%) of the surveyed investors systematically exclude specific business sectors, especially those of sin stocks due to high environmental and social risks, such as tobacco, alcohol and firearms production [5]. On the other hand, 39% of respondents indicated they prefer dialogue, finding the approach more efficient than disinvesting [5] with regard to fossil energy.

The typical investor considers ESG factors for three main reasons: better risk-adjusted return, coherence with own values and the potential impact on society [5]. These three motivations sometimes contradict one another. An engaged investor in a tobacco manufacturer, for instance, could pressure this company to develop products which are less harmful and addictive. However, this investment could still conflict with the investor's

values (i.e., Socially Responsible Investment (SRI)) and the new products might prove less profitable. This duality raises uncertainty about the way firms (businesses) respond to investors' pressures. Controversial firms, such as sin stocks, could waver between two distinct approaches: an impeccable ESG performance to compensate for a business sector which may be repelling to certain investors, or rather a negligence of certain ESG aspects, supposing that the investors are more concerned with financial performance than moral considerations.

Additionally, it could be that sin stocks have better practices mainly because they face more externalities and reputational risk. Thus, sin stocks' practices aimed at mitigating their ESG issues would then be expected to be superior to those of firms operating in more traditional sectors, in order to compensate for the important exposure to ESG issues (risks). Considering these two perspectives, firms flagged as sin stocks face an ambiguous response to ESG issues. This motivates our research question: Are sin stocks adopting more responsible practices than more traditional businesses?

More precisely, our study aims to compare the ESG performance of firms in certain controversial sectors, namely sin stocks, to that of a comparable group of firms in more traditional businesses. To do so, an MSCI (Morgan Stanley Capital International) database is used. The MSCI ESG Ratings are updated by a team of over 200 analysts who evaluate firms on 35 ESG key components [6].

Results of our comparative study show that sin stocks have lower ESG performance for each of the three pillars (environmental, social and governance). This underperformance, however, is not significant for the governance pillar. Further, our sample firms identified as sin stocks notably exhibit a poorer score with regard to management of water stress, chemical safety and business ethics. However, they score better for toxic emissions and waste management.

2. ESG Performance

2.1. ESG Performance Reporting Practices

While we are witnessing increased adoption of International Financial Reporting Standards (IFRS) for financial reporting, there seems to be no clear consensus on non-financial reporting standards. Since non-financial reporting is often voluntary, businesses enjoy more leeway and can consequently practice selective disclosure of ESG information. Still, the tendency to report increased ESG information is picking up. Businesses publicly disclosing ESG information were approximately 20 in the early 1990s and have grown close to 9000 in 2018 [4]. In the USA, the non-profit organization, Sustainability Accounting Standards Board (SASB), developed a series of industry-specific standards across 77 different industries that dictate the minimum disclosure for financially material sustainability issues, as well as key performance indicators (KPIs) to report on [7]. These reporting standards for ESG performance are meant to be useful for decision-making, for both investors and businesses.

Aware that it is oftentimes difficult for the user of ESG information to sort the wheat from the chaff, ref. [8] attempt to determine if the reporting on efforts against corruption is simply to maintain appearances or if it is evidence of honest efforts in that direction. Examining firms that went to trial for corruption and their anti-corruption reporting, they conclude that the reporting against corruption (a component of ESG disclosure) for these firms signals a true governance effort. This is reassuring with regard to the reliability of ESG reporting and justifies further investigation of the informativeness of ESG ratings. On the same topic, ref. [9] researched sustainable development goals reporting for controversial and environmentally sensitive industries, finding that setting such goals for controversial firms is more than symbolic. Their study suggests there is actual value enhancement for controversial firms reporting sustainable development goals.

2.2. Incentives to Reporting ESG Information

Since ESG disclosure is voluntary, firms have considerable latitude for this type of disclosure, whereas they have less flexibility when it relates to disclosure of financial information. Ref. [4] found that lack of comparability and consistency in disclosure are seen as the main barriers surrounding the use of ESG information by investors. Additionally, not all ESG rating agencies use the same materiality criteria, making comparisons of ESG ratings between different data sources almost impossible [10].

For example, ref. [11] argue that firms with better ESG performance face lower capital constraints. The explanation is that they have more responsible practices and have more interest in promoting them to assert their difference and their long-term approach. This increased transparency is beneficial since it reduces information asymmetry between the firm and its stakeholders. Lenders are less reluctant to grant funds as they have access to more ESG information that allows them to better assess risk exposure and agency costs that arise from the misalignment between the interests of management and investors. This greater accessibility to financing also allows firms to create more value by undertaking more projects with positive net present value. In short, this process reduces information asymmetry and facilitates access to capital while lowering the cost of capital, all of which reduce financial constraints to invest in value creation projects. Another incentive for sin stocks might be risk reduction. This was evidenced by [12], who find that better environmental and social engagement inversely affect firm risk after controlling for various firm characteristics. Furthermore, the effect of risk reduction through such engagement is more economically and statistically significant for sin stocks than in non-controversial industry firms.

According to [13], who examined the value relevance of voluntary disclosure of ESG information established according to the SASB framework. Their results suggest that firms that disclose this information voluntarily have stock prices that show less synchronicity with the market, that is, prices move more independently of the broader market performance. This is also observable for firms that begin new voluntary ESG disclosures, which then exhibit less price synchronicity with the market than they previously had. According to the authors, this lower synchronicity is explained by the fact that prices reflect more firm-specific information (referred to as increased stock price informativeness), rather than evolving according to the vagaries of the stock market. This study, therefore, supports the idea that financial materiality in ESG disclosure increases the informativeness of such information for investor decision-making [14].

Another study by [15] provides similar evidence suggesting positive market reaction in the case of a transition from voluntary to mandatory disclosure regimes; in other words, when firms face and comply with new ESG disclosures obligations. More precisely, in October 2014, the European Union's Directive 2014/95 required the disclosure of certain non-financial information regarding employees' diversity in terms of age, sex, education and professional background. These authors show that mandatory disclosure requirements led to on average, an impact of -0.79% on share price. Further, their results show that the impact was greater for firms that disclosed less ESG information and had poorer ESG performance before this mandatory ESG disclosure was enacted. The authors conclude that firms' non-financial disclosure targeting material ESG issues allows shareholders to better identify anticipated wealth transfers away from equity holders (e.g., from employees, government or possible lawsuits) arising from poor corporate social responsibility.

In the same line of reasoning, ref. [16] investigate the link between the quantity and readability of the ESG disclosure and ESG performance. Using computational linguistics methods, they established that longer ESG disclosure increases transparency. Their research also provides tools to validate the relevance of ESG disclosure. Finally, and closely related to the focus of our study, the study by [17] provides evidence that sin stocks disclose more ESG information and invest more in environmentally and socially responsible practices than firms operating in non-controversial sectors. More important, ref. [17] findings show that the environmentally and socially responsible practices of sin stocks are value-relevant

only when these firms are performing below their peers, which suggests that sin stocks pursue ESG investments because of competitive advantage, rather than moral rebalancing.

2.3. Use of ESG Information

Two recent studies help delineate how investors use ESG information. Ref. [4] surveyed more than 600 investors and 63.1% of respondents claimed that ESG performance impacts investment returns, and this proportion was higher in Europe than in the United States (USA). In addition, the use of ESG information is carried out at a higher rate for financial (i.e., returns) reasons rather than ethical reasons. More important, 54.3% of respondents with more than USD 5 billion in assets under management stated that they integrate ESG information due to client demand. The study also found that European managers are more likely to consider integrating ESG information in their decision-making as an ethical responsibility in comparison to their US counterparts (40.7% in Europe versus 18.6% in the USA).

In the same vein, a survey conducted by [5] provides similar conclusions. A majority of respondents (58.7%) believe that a portfolio incorporating ESG criteria would perform as well as a portfolio ignoring these factors. However, more than two-thirds (67.3%) believe that the integration of ESG criteria helps mitigate portfolio risk. It appears, therefore, that an ESG-tilted investor does not necessarily expect a higher return, but rather aims to reduce risk.

Negative screening is an investment practice which consists of excluding certain sectors deemed immoral. While some perceive this as a clear investment criterion, one important criticism is that the exclusion of sin stocks could limit the investment universe to the point of limiting returns and hampering portfolio diversification [18]. A less diversified portfolio will typically be more volatile, especially if it excludes certain stable and profitable sectors of the economy.

Additionally, the [5] asked respondents about their filter preferences. In North America and the United Kingdom, 20% of respondents apply filters to exclude certain companies, a proportion much higher in Europe, where it reaches almost 50% of respondents. Investors were also asked whether they considered divestment (i.e., exclusion) or engagement to be more effective: 45.1% of investors favor engagement comparing to only 8.1% favoring divestment. The remainder of respondents are ambivalent about whether the two approaches are as effective or whether neither is.

Regarding the use of negative filters in an investment context, ref. [19] see problems of both a theoretical and practical nature. They believe that these filters essentially prevent investors from putting forward the values they embrace, which deprives these funds of influence over firms to change their business practices and improve their ESG performance. Consequently, they suggest completely revisiting the framework in which the use of negative screening fits. The authors point out the contradiction between the assertions that no company is without fault (as the Social Investing Forum argues) and the accepted practice of negative screening, according to which certain sin stocks should be excluded from the investment universe. The authors call on investors to stop exclusionary practices, as all investors must become engaged stakeholders in firms they consider harmful in order to influence their practices. For instance, as ESG risks and opportunities tend to be industry-specific, these authors recall that the focus of investors should be on the way business is conducted, and not on the product sold as such. In an investment context, the preferred approach should be to consider the impact of the products, the relationships with stakeholders and the contingent environment in which the firm operates.

2.4. Sin Stocks

While methods abound for assessing ESG performance, there are far fewer consensual ways to flag companies with immoral activities (i.e., sin stocks). Ref. [19] illustrate ably how difficult it is to segregate companies between virtuous and sinful. The authors show that such exercise can be considered futile since even trivial products can cause significant

damage. The authors tell the story of the Resistoleros, the Honduran children addicted to inhaling glue. Producer H.B. Fuller was applauded after the public announcement of the end of production and marketing of Resistol glue in Honduras. Conversely, alcohol causes more than 60 different diseases and is identified as a significant risk for domestic violence, but its moderate use has been associated with health benefits, especially for heart condition and cholesterol levels. Additionally, they provide the example of the hotel industry (a respectable one at first glance) which derives up to 10% of its income from the sale of pornography. All these examples support the argument that no industry is inherently virtuous or sinful and that it is fairer to judge ESG issues in their particular context, rather than simply by the commercial activity of said industry.

Along the same line, ref. [20] argue that even within sin stocks, there are many shades of grey and these firms are avoided to varying degrees depending on the social norms of investors. Classification of a specific firm as sin stock or not is very specific to the investors and their values, but certain sectors are traditionally identified as the vice industries, such as adult entertainment, casinos, tobacco, alcohol, nuclear power and weapons [17]. For the purposes of our study, the selection of sin stocks was limited to three sectors: gambling, alcohol and tobacco. These sectors and respective firms are relatively easy to identify, their number is sufficient to draw statistical conclusions, and these three sectors are the subject of a broad consensus in terms of their classification as sin stocks.

Ref. [21] examined the stock price performance of sin stocks to determine whether they outperform benchmark indices. They target the following areas: adult entertainment, alcohol, gambling (casinos), nuclear energy, tobacco and weapons. In their study, both the US and international markets are in scope. Their results show that a portfolio biased in favor of sin stocks does not outperform or underperform its benchmark index. The study also looks at the performance of 32 responsible investment indices covering a multitude of international markets. The authors find that 26 of the indices (81%) adopt a negative screening approach. Further, the authors break down the performance of stocks by factors: (1) beta (market sensitivity), (2) size (capitalization), (3) value, (4) momentum and (5) alpha, or the unexplained residual return. This method ensures that the sin stocks portfolio's performance is attributable to idiosyncratic risk specific to sin stocks, rather than to known factors influencing stock returns. The authors observe that sin stocks exhibit a beta of less than 1 (relatively low covariance with the market), a value tilt (low price-to-book ratio), a momentum exposure, as well as an alpha component which is not statistically significant. Therefore, they conclude that the portfolio's performance is explained by the four factors of the Carhart model. Additionally, they also test a hypothetical portfolio which short sells responsible indices to buy sin stocks. If they control for the same factors identified previously, no significant performance difference can be observed. These findings are consistent with [22] who studied sin stocks in many different stock markets over time and found that their financial returns can be fully explained by the Fama–French five-factor model. Along the same line, the evidence provided by [17] suggests that sin stocks benefit from improved ESG performance through an increase in firm value and higher analyst following.

However, in an equally detailed study, ref. [20] observe that the exclusion of sin stocks leads to portfolio underperformance. This finding is credited to a societal norm against vice activities, which leads to higher expected returns for sin stocks than for otherwise comparable securities. Moreover, to support their argument that non-compliance with social norms increases expected returns, they point out that the perception of smoking changed in the 1960s and this was pivotal moment where tobacco producers started to outperform comparable companies. These results are entirely in line with a study conducted by [23], who examined the performance of responsible funds. These authors find that only the practice of negative screening, for example the exclusion of sin stocks, reduces the performance of funds. In addition, the study by [20] suggests that social norms lead to an undervaluation of stocks. With their equity securities being undervalued, sin stocks have increased incentives to either find financing through debt or stay private. Debt

financing (requiring less transparency) has helped sin stocks have on average significantly more leverage. This market microstructure would therefore encourage sin stocks to limit their voluntary disclosure as much as possible.

Even so, ref. [24] observe that sin stocks show better financial disclosure than a control group. The quality of the disclosure is estimated by the predictability of profits and the speed in recognizing accounting depreciations. If investors are moving away from sin stocks, the authors believe it is due to social norms, despite the higher expected return and superior financial disclosure.

Overall, the literature discussed above shows that sin stocks face ambiguous incentives, both in terms of ESG performance and ESG disclosure. Superior ESG performance entails costs for a firm, whether for the evaluation of externalities, for the internal controls or for the social and environmentally responsible practices to be implemented. Consequently, if a more controversial firm (i.e., sin stock) conjectures that investors are not interested in, or do not value enough its ESG performance, it could conclude that the increased expenses are not justified. As follows, our study aims to bring a new perspective to this question: Are sin stocks incentivized by the market to adopt more responsible practices than firms in more traditional sectors? More specifically, we seek to shed light on the differences and similarities between the ESG performance of sin stocks and more conventional firms.

3. Empirical Design

3.1. Data Source

In this study, we use ESG performance scores from the MSCI ESG Ratings database, the largest provider of ESG data to investors. MSCI data are reliable insofar as they incorporate several sources: both the disclosures by firms analyzed and the information disclosed by external sources (in particular, governments, non-governmental organizations and the media) [6].

The distinction needs to be made between exposure to ESG risks and management of ESG risks. MSCI considers exposure to risk to come from the specific industry, location of assets and income, and other measures such as raw material outsourcing. Risk management, on the other hand, represents the strategies and measures used by the firm to manage its risk level and opportunities. More important, MSCI ESG Ratings assess ESG performance through continuous measures (scores) of 37 ESG Key Issues capturing firms' risk exposure and respective risk management practices. These issues then feed into the scores of the three pillars (environmental, social and governance) which make up the overall performance score. Therefore, contrasting with previous studies, such as [17], we use a measure of ESG performance that contrasts firms' ESG risk exposure to their ESG management practices. This is important because controversial firms (or sectors) with higher risk exposure need to compensate with more responsible practices to mitigate those risks. This approach has been recommended in more recent studies about ESG performance, see for example the study by [25]. For instance, the results by [22] also corroborate the idea that assessment and comparison of sin stocks' ESG performance to less controversial sectors, should consider the level of risk exposure (concerns, not only the strengths). It should be noted that the following analysis relies on the scores before the adjustment for industry, since it is carried out only once, i.e., on the final score.

These two aspects are examined in turn within the framework of this study. More precisely, we anticipate that firms identified as sin stocks will have a greater exposure to risks than the control group, as well as better management of these risks and, consequently, an ESG performance similar to that of comparable firms. We thus formulate the following forecasts.

Due to the very nature of their business, we expect that sin stocks will have much greater exposure to ESG risks than the rest of the market. More specifically, the risks of controversy, environmental damage, scandals, boycotts, etc., are much higher than for firms operating in more traditional industries.

To mitigate the increased risks specific to their business and market expectations, we believe that sin stocks will exhibit better adapted risk management practices. All firms want to avoid scandals, but those more sensitive to controversies will have to put more effort into making this risk reasonable, compared to firms operating in more traditional sectors.

The final result, the ESG letters rating assigned by MSCI (which ranges from “best” (AAA) to “worst” (CCC)) [6], is thus expected to be relatively similar between sin stocks and comparable firms operating in more traditional sectors, our control group.

3.2. Composition of the Treatment Group

In accordance with the literature discussed above and evidence documented in other studies, we selected three sectors to compose the subsample of sin stocks: casinos, alcohol and tobacco. Here are, briefly, the reasons which led us to exclude other sectors usually associated with sin stocks:

Nuclear energy: Some analysts consider that companies producing energy from nuclear sources are simply companies in the energy sector. For this reason, we prefer to exclude firms of this sector which are not unanimously seen as sin stocks.

Weaponry: It is tremendously difficult to draw the fine line between high tech companies and weaponry producers. The following three examples illustrate the difficulty of reaching a consensus: (1) Boeing, an aircraft manufacturer, derives about a third of its revenues from the military sector and the balance from the commercial sector. (2) Thales, a French multinational operating in aeronautics, derived 51% of its revenues from the military business in 2018 [26]. (3) L3Technologies is a firm that develops aircraft avionics instruments (intelligence, surveillance and reconnaissance) and two-thirds of its revenues come from the military business [27]. In short, it is very arbitrary to determine which of these firms are sin stocks, because it is indeed a continuum. This therefore led us to exclude the weapons industry from our sample of sin stocks, the treatment group.

Adult entertainment: This sector was excluded due to the very limited number of public firms. In addition, identification of firms operating in this sector is difficult since this sector is not an industry identified by MSCI dataset. This classification problem was also highlighted by [20] as well as by [21].

Therefore, our target sample for the treatment group—i.e., sin stocks—comprises all firms operating in the casinos, alcohol and tobacco sectors as identified by the MSCI ESG ratings database, regardless of the country. The most recent ESG scores available when this study was developed (December 2016) were used for the purposes of our empirical analysis.

3.3. Composition of the Control Group

In order to examine whether our sample firms of sin stocks have a significantly different ESG performance, their ESG score needs to be compared to that of a control group of similar firms operating in more traditional sectors. This pairing is a critical step, as it allows to control for several firm-level attributes that can explain firms' ESG performance. For example, the control group must comprise firms of similar size and financial performance [28]. Otherwise, the difference between sin stocks and the control group could be attributable simply to the size and financial constraints of the firms studied. More precisely, larger firms are assumed to exhibit better ESG performance since they have more resources, greater variety of stakeholders and more economies of scale for sustainable development programs. Further, this control group must represent a multitude of sectors. If a sector is over-represented in the control group, its ESG performance may not be comparable to that of sin stocks.

Therefore, following a similar approach to that of the study by [24,28], a matched sampling approach is adopted to compose the control group. In this sense, each firm designated as a sin stock was paired with a firm from a more traditional sector whose characteristics are as similar as possible, considering the following five attributes:

Location: The country where firms operate can greatly influence their exposure to ESG risks as well as their response (risk management). For instance, some countries adopt

policies in terms of diversity, environmental protection or the fight against corruption that reduce the exposure of firms to these issues.

Size: Firm market capitalization is used insofar as larger firms are expected to have more stakeholders creating an incentive to adopt more responsible practices. In addition, they have more resources that allow for a more complete and fleshed out disclosure of sustainable practices.

Financial leverage: The valuation by the ratio of Total Assets/Equity aims to control the capital structure of the firm. We believe that the source of funds (debt or equity) can impact business incentives. For example, debt financing creates fewer expectations of responsible practices than equity financing. The Total Assets/Equity ratio of the firms was compared.

Return on Assets: We believe that a firm's financial performance creates different incentives for adopting responsible practices. Among other things, a firm generating losses will have more pressing concerns than sustainable development. The average return for the past five years was compared, computed as Net Income/Total Assets.

Sector exclusions: In the control group, the financial sector has been excluded. As documented in previous studies, financial institutions face very different regulation and incentives and it is therefore preferable to exclude them in a context of matched sampling.

3.4. Sampling Strategy

In order to build the two subsamples described above (treatment and control groups), the starting point of our sampling strategy was all firms to which MSCI had assigned an ESG score on 1 December 2016; 11,289 firms met this criterion. A second database (WRDS, Wharton Research Data Services) was combined with the MSCI database in order to generate the firms' NAICS and SIC codes. A criterion was then applied to retain the firms whose industry is either Casinos and Gaming, Tobacco or Alcohol. For the Alcohol sector, firms were retained if their NAICS code was 312120 (Breweries), or if their SIC code was 2084 (Wines, Brandy and Brandy Spirits) or 2085 (Distilled and Blended Liquors). The following firms and their subsidiaries were added manually to the sin stocks subsample, since they are well-known brewers: Anheuser-Busch, Diageo, SABMiller and Molson Coors. As a result, 123 sin stocks were identified with ESG scores for the year of 2016 in the MSCI database.

We then paired each sin stock with a comparable firm operating in a more traditional business sector. The paired control group needed to present similarity for the four attributes explained above that are as close as possible to that of the sin stocks: the firm's country, market capitalization (size), financial leverage and average return on assets over the past five years. This approach is similar to the pairing methodology used in previous literature [28,29].

The Worldscope dataset was used to collect information on the financial fundamentals used to measure the four criteria applied in the paired matching sample procedure. Of the 123 stocks identified in the MSCI dataset, only one did not have the identifier code (the ISIN code) and could not be matched in the Worldscope. For the 122 remaining sin stocks, 115 entries contained financial information. Worldscope was able to identify the home country of all of these 115 firms, but was unable to provide market capitalization, leverage or return on assets for some firms. It was deemed necessary for firms in the control group to have at least the firm's country and two of the financial attributes. Therefore, the final subsample of sin stocks is made up of 81 firms.

The list of firms that can be included in the control group has been established according to the following criteria: (1) the firm must have an ESG score in the MSCI database, (2) it must not be included in the 123 sin stocks identified previously and (3) it must not belong to the financial sector. More precisely, eight industries were excluded according to MSCI industry classification: Banks, Life & Health Insurance, Asset Management & Custody Banks, Consumer Finance, Property & Casualty Insurance, Diversified Financials, Multi-Line Insurance & Brokerage, and Investment Banking & Brokerage). There was

a total of 5295 firms meeting these criteria. The next step was to match each of the 81 sin stocks with a comparable firm (control group). As much as possible, the paired firm came from the same country and had the three closest attributes (according to a Z-score calculation, allowing us to calculate which firm is most similar to the sin stock in terms of standard deviation from the average of the attribute). Two of the 81 sin stocks had to be excluded as they had very specific attributes that prevented them from being matched with any firm in the control group. These firms are Multi Soft II, Inc. with an unknown market capitalization, leverage of -0.07 and return on assets of -956.76% ; and Multi Solutions II, Inc. whose market capitalization was 379,915 US\$, leverage of -0.08 and return on assets of -913.23% .

The final sample is therefore made up of 158 firms, that is 79 sin stocks individually matched with 79 comparable firms belonging to more traditional sectors. Table 1 presents the distribution of the industries of the two subsamples. As expected, the control group is very diversified in terms of industries and not overweighted towards any single industry. In fact, a total of 36 different industries are represented in our control group. For reasons of space, in Table 1 we grouped 31 industries in “Other Industries” because they have three and less firms included in our control group. In Table 1, details are omitted to conserve space but, “Other Industries” comprises 50 firms belonging to 31 different industries as follows: Utilities (3), Wireless Telecommunication Services (3), Food Products (3), Paper & Forest Products (3), Professional Services (3), Steel (3), Oil & Gas Refining & Marketing (2), Commodity Chemicals (2), Energy Equipment & Services (2), Integrated Telecommunication Services (2), Metals and Mining—Precious Metals (2), Retail—Food & Staples (2), Road & Rail Transport (2), Aerospace & Defense (1), Air Freight & Logistics (1), Broadcasting, Cable & Satellite (1), Building Products (1), Commercial Services & Supplies (1), Construction & Engineering (1), Construction Materials (1), Containers & Packaging (1), Electrical Equipment (1), Electronic Equipment, Instruments & Components (1), Hotels & Travel (1), Marine Transport (1), Media (1), Metals and Mining (1), Specialty Chemicals (1), Technology Hardware, Storage & Peripherals (1), Textiles, Apparel & Luxury Goods (1), and Trading Companies & Distributors (1). As expected, Table 2 (high p -values) shows that the two subsamples are statistically similar.

Table 1. Composition of the two subsamples’ industries.

Sin Stock Industries	Percentage	Control Group Industries	Percentage
Casinos and Gaming	61%	Retail—Consumer Discretionary	10%
Tobacco	26%	Software and Services	9%
Beverages	13%	Household and Personal Products	8%
		Health Care Equipment and Services	5%
		Pharmaceuticals	5%
		Other Industries (composed of 31 different industries with 3 firms and under per industry)	55%
Total	100%	Total	100%

Table 2. Descriptive statistics of the two subsamples.

	Market Capitalization (USD)	Financial Leverage	5-Year Average Asset Return
Average			
Sin stocks	18,075 M	2.8	12.3%
Control group	17,255 M	2.9	11.2%
Standard deviation			
Sin stocks	36,870 M	9.2	14.2%
Control group	37,060M	8.6	11.5%
<i>p</i> -value	0.891	0.912	0.630

4. Data Analysis

In connection with our research question, the statistical tests aim to determine whether, for each of the ESG aspects assessed by MSCI, the two subsamples present similar performance. Hence, we compare the subsamples using a paired samples *t*-test of mean difference between two subsamples. The null hypothesis (H_0), which is the absence of statistically significant differences, entails that the two subsamples—sin stocks and control group—have similar mean ESG scores. If the means of the two subsamples are different, this would lead us to reject H_0 and conclude that the ESG performance of sin stocks differs from that of comparable firms from more traditional sectors. Both the *z*- and *t*-tests are used to test whether two subsamples have different means, but the *z*-test requires knowing the population's standard deviation [30], which is unknown in our case. Consequently, the *t*-test was retained for the purposes of our analysis.

Another important consideration is the choice between a two-sample *t*-test or a paired *t*-test. According to [31], this choice should consider whether the two subsamples are independent of each other, or whether the observations of the first sample are associated with particular observations of the other sample, which means that the samples are considered as paired. Our methodology clearly indicates that the samples are paired because each sin stock has been matched with a comparable firm from a more traditional industry.

Finally, all the statistical tests carried out are bilateral (two-tailed tests) in order to test whether the subsample of the control group has an ESG score higher or lower than that of the sin stocks subsample, assuming a 10% level of confidence. In all cases, *p*-values are provided to indicate the statistical power of the various statistical tests performed.

As indicated previously, the two subsamples are 79 sin stocks and 79 firms in the control group. It is worth noting that some firms were not evaluated for some ESG key issues. For example, MSCI does not rate software developers for health and safety. This implies that some of the statistical tests that follow have been performed on fewer than 79 pairs of firms. Regardless, the pairing of firms has been respected to ensure that the differences observed between the ESG scores of sin stocks and the control group are not due to aspects which have previously been controlled for.

4.1. Overall ESG Score and Industry Adjustment

Table 3 presents ESG scores of the two subsamples at the pillar level and the overall scores before and after the industry adjustment. This table shows that before industry adjustment, sin stocks exhibit lower ESG scores than the control group (sin stocks = 4.18; control group = 4.59; *p*-value = 0.017). This evidence suggests that sin stocks have a lower overall ESG performance than the control group, which supports the argument that sin stocks face ESG issues and incentives to adopt more responsible practices that differ from firms operating in more traditional sectors. The industry adjustment (industry-adjusted score) recoups the difference between the two subsamples, so that sin stocks have a mean adjusted ESG score slightly higher than that of the control group (sin stocks = 5.33; control group = 5.06; *p*-value = 0.397), but this difference is not statistically significant. The absence

of a significant difference is consistent with the fact that the purpose of this adjustment is to evaluate firms against other firms in the same industry, with similar ESG risk exposure or opportunities. Sin stocks, belonging to industries with on average lower overall ESG performance, therefore have their score adjusted upwards which should be interpreted as greater distance (either positive or negative) from industry peers' average ESG performance score. It is worth noting that the industry-adjusted score a firm receives is normalized based on score ranges (higher and lower percentile industry benchmark) and when defining the set of firms for peer industry, MSCI uses a global benchmark based on the MSCI ACWI Index, which includes emerging markets. Applying such global benchmark MSCI intends to reflect the impact of emerging market companies in an increasingly globalized investment landscape. It should also be noted that for sin stocks, the industry adjustment affected casinos (+1.24) and tobacco producers (+1.33) more than alcohol producers (+0.35). By way of comparison, the control group saw its score increase on average by +0.47 due to this adjustment.

Table 3. Comparison of subsamples—overall scores and score by pillar.

	Sin Stocks' Mean Score	Control Group's Mean Score
Environmental pillar	4.69	5.20
Social pillar	4.20	4.36
Governance pillar	4.30 *	5.25 *
Overall score	4.18 *	4.59 *
Industry-adjusted score	5.33	5.06

* Statistically significant difference between sin stocks and control group.

4.2. Other Factors to Control for

In this section, we also compare the two subsamples with respect to other firm-level attributes that can influence ESG performance. The aim is to ensure that ESG score differences observed between sin stocks and the control group are due to sin stocks-specific factors, rather than other confounding variables which could also influence ESG performance [10]. Similarly, ref. [32] indicates that for matched sampling, one of the main strategies for reducing bias is to ensure that the “samples are drawn from populations such that the distribution of confounders is similar in the samples”. Thus, consistent with [14], we created dummy variables to control for two confounding variables, namely the number of stock markets on which the firm is listed (i.e., cross-listing) and the presence of a controlling shareholder in firms ownership structure. We believe that a more concentrated ownership structure could impact the incentives for investments in responsible practices, and therefore ESG performance. As for cross-listed firms, they often face ESG disclosure requirements and social standards that are different, and often more stringent, than in their country of origin, which could also affect their ESG performance. These variables are, therefore, controlled in our comparative analysis.

4.2.1. Cross-Listing

To examine whether there is difference in the number of stock markets on which the sampled firms are listed, information was obtained from the Orbis—Bureau van Dijk database. Data were available for 140 sampled firms, which allowed the comparison the number of stock market listings for 64 pairs of firms (out of a possible total of 79 pairs of firms). The null hypothesis is that the two subsamples are listed on the same number of stock markets ($H_0: \mu_1 - \mu_2 = 0$) [30]. On average, sin stocks are listed on 6.0 different stock markets, compared to 6.2 for firms in the control group. The p -value is 0.352. Therefore, the difference between the two subsamples is not statistically significant in terms of cross-listing.

4.2.2. Ownership Concentration

In order to examine differences regarding the presence of a controlling shareholder (i.e., an ultimate owner of more than 50% of the outstanding shares), the relevant data were retrieved from the Orbis–Bureau van Dijk database. We used a dummy variable which indicated whether firms had a controlling shareholder. An analysis of variance (ANOVA) was carried out, which makes it possible to compare the mean of several subsamples at the same time. The two subsamples (treatment and control groups) were thus separated according to the presence (or absence) of a controlling shareholder in its ownership structure, which resulted in four distinct subsamples. These subsamples were then compared to determine if their mean ESG scores were different from each other. For the *t*-test of mean difference between two subsamples, the null hypothesis assumes that the true mean difference between the paired samples is zero, i.e., no difference. In other words, the groups are tested for whether they exhibit similar ESG scores, that is, $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$. Thus, the greater the magnitude of *t*-test, the greater the evidence corroborating our hypothesis (alternative hypothesis), which is that a performance difference exists, and it is statistically significant. The results are presented in Tables 4 and 5 below.

Table 4. Descriptive statistics of the four subsamples' ESG score.

ESG Score	Control Group		Sin Stocks	
	With Controlling Shareholder	Without Controlling Shareholder	With Controlling Shareholder	Without Controlling Shareholder
Subsample	15	49	22	42
Mean	4.307	4.602	4.236	4.118
Standard deviation	1.063	0.868	1.435	1.011
Minimum	2.500	2.400	1.400	2.300
Maximum	6.500	6.500	7.600	7.300

Table 5. Analysis of variance (ANOVA) of the four subsamples' ESG score.

	Type III Sum of Squares	Degrees of Freedom	Mean Square	F-Value	p-Value
Regression	4.481	3.000	1.494	1.350	0.261
Residual	137.194	124.000	1.106		

The *p*-value is 0.261, which allows us to conclude that the four subsamples do not have significantly different mean ESG scores, indicating that the presence or absence of a large or controlling shareholder does not seem to influence the ESG performance one way or the other.

5. Breakdown of the Overall ESG Scores into Three Pillars

The overall scores (before industry adjustment) are broken down into three pillars, namely environment (E), social (S) and governance (G). The ESG scores are then analyzed separately, through the key ESG issues that have the most weight in each pillar. The scores by pillar are presented in Table 3 above, while the underlying key ESG issues are presented in Table 6. Ten key issues were retained for comparison (out of a total of 36). Together, these ten key issues explain 78.1% of the overall ESG of firms in our subsamples.

Table 6. Comparison of subsamples' scores for ten selected key aspects.

	Pillar	Sin Stocks' Score	Control Group's Score	p-Value
Carbon Emissions	Environmental	6.82	6.87	0.866
Water Stress	Environmental	4.44	5.78	0.089 *
Biodiversity and Land Use	Environmental	2.90	4.65	0.414
Toxic Emissions and Waste	Environmental	8.32	5.91	0.014 **
Product Safety and Quality	Social	3.90	4.82	0.169
Labor Management	Social	5.41	4.81	0.167
Chemical Safety	Social	0.88	3.58	0.001 ***
Privacy and Data Security	Social	5.85	3.29	0.124
Governance—Board	Governance	5.27	5.60	0.229
Business Ethics	Governance	2.96	4.02	0.073 *

Statistical significance of differences between sin stocks and control group: *** $p > 0.01$, ** $p < 0.05$; * $p < 0.10$.

As shown in Table 3, for each of the three pillars, the sin stocks have a lower mean score than the control group. For the social and environmental pillars, the differences are not statistically significant (p -values of 0.578 and 0.104). In contrast, the difference in the governance pillar is conclusive, posting a p -value of 0.0003. The analysis of the key issues composing each pillar allows to better identify the causes of the sin stocks' lower ESG scores, and also to establish whether the scores are attributable to ESG risk exposure or to a poor management practices response.

5.1. The Environmental Pillar

The first environmental key issue analyzed is carbon emissions. Here, the sin stocks and the control group show similar scores. However, casinos have a much lower score (5.41) than tobacco and alcohol producers (9.10 and 9.01, respectively). The control group has an average score of 6.87. The casinos' score is possibly related to their intensive energy use, where little natural light is used, and air conditioning and lighting are intense. Additionally, casinos use five times as much energy for the same surface as an average [33] hospital. Hence, the evidence suggests that casinos have increased exposure to this risk and less management response than other sin stocks.

A second particularly important environmental key issue is water stress, the responsible use of water. Sin stocks exhibit a lower score for this aspect (4.44 against 5.78 for the control group; p -value = 0.089). Casinos have the worst score among sin stocks at 3.08, mainly due to poor management of this issue. This score is likely linked to the drought in Nevada, where the development of Las Vegas and tourism have put considerable pressure on [34] Lake Mead. To measure this score, MSCI considers the "degree to which the activities of firms are located in geographic areas susceptible to water stress and water scarcity problems". Even though some casinos try to limit their water consumption, their location puts a huge strain on water supply.

Third, the aspect of biodiversity and land use have considerable weight in the environmental pillar. Tobacco producers are the only sin stocks that are assessed for this key issue. Their score of 2.90 compares to 4.65 for the control group. The p -value indicates that this difference is not statistically significant due to the limited sample. The study by [35] discussed several issues related to tobacco cultivation, including deforestation and soil degradation. The authors also stress that the practices and policies of multinational tobacco companies contribute to the lower performance on these two environmental key issues. This is consistent with data from MSCI, according to which tobacco producers have an increased exposure to this risk, but also an unsatisfactory response in terms of initiatives to minimize their impacts on biodiversity and land use.

Finally, Table 6 shows that toxic emissions and waste management are key ESG issues where sin stocks offer a performance significantly superior to the control group (8.32 and 5.91, respectively; p -value = 0.014). All categories in our sample of sin stocks exhibit a higher score than the control group, but tobacco producers show the highest score, 9.40. Tobacco producers have the greatest exposure to this risk, but exceptional management practices on this issue allow them to achieve a reputable score. The score may be explained by the initiatives of several firms to develop electronic cigarettes that emit fewer toxic by-products [36].

5.2. The Social Pillar

For the social pillar, the key aspect that carries the most weight is the quality and safety of production. Sin stocks exhibit a lower score than the control group (3.90 against 4.82; p -value = 0.169), but the p -value is inconclusive due to the fact that the control group is only 18 firms, as some sectors are not assessed for this key issue. Alcohol producers stand out here, with a score of 7.32 against 3.68 and 2.91 for casinos and tobacco producers, respectively. Regarding management's response to safety risk, the conclusion is similar, as sin stocks have a lower score than the control group (2.86 against 4.69; p -value = 0.099), but again alcohol producers stand out with a score of 7.16. We could only speculate on the causes, but the situation may be explained by alcohol producers' desire to avoid product recalls, which are very costly. Recalls also expose firms to lawsuits and loss of brand value, in an industry where brands and customer loyalty are of high importance.

Relative to the key issue of labor management, the sin stocks score high, but the difference is not significant (5.41 against 4.81 for the control group; p -value = 0.0167). The management of this risk is similar to the control group and therefore, the score is mainly due to the fact that sin stocks are less exposed to this risk (5.58 for sin stocks, 6.40 for the control group, p -value = 0.073). Additionally, we need to consider the fact that some firms identified as casinos have online operations and that tobacco and alcohol factories are becoming increasingly automated and require less human intervention. The manual labor involved in production, such as growing tobacco, wheat and other ingredients to produce alcohol and tobacco, is typically not performed by multinationals, but rather by independent farmers. Due to the factors listed above and industry norms, the high scores of the sin stocks were not unanticipated.

The third most important key issue in the social pillar is chemical safety. Only the tobacco producers evaluate this criterion among the sin stocks. This test is convincing, as tobacco producers have a score of 0.88 against 3.58 for the control group (p -value = 0.001). Exposure to this risk is similar, but management's response is much lower for tobacco producers, with scores of 0.45 versus 3.14 for the control group (p -value = 0.01). MSCI defines management response as "efforts to identify and eliminate substances of concern; transparency in ingredient formulas; R&D capacity in green chemistry" [37]. The score is therefore consistent with the fact that tobacco products have changed very little in recent decades and remain harmful and addictive to consumers.

Finally, the issue of privacy and data security is vital for the social pillar. Only casinos are evaluated on this aspect and they score relatively high (5.85 against 3.29 for the control group; p -value = 0.124) but the difference is not statistically significant. This score is explained in particular by a limited exposure to this risk by casinos (3.61 against 7.37 for the control group; p -value = 0.074). Casinos rarely find themselves in situations where their information management could compromise the confidentiality of their (often anonymous) customers, while a typical firm collects large amounts of sensitive data on a multitude of customers, which increases the risk of data breaches and cyber attacks.

5.3. The Governance Pillar

This pillar determines "the extent to which corporate governance practices could pose a risk to investors". All sample firms are subject to an MSCI analysis of the governance dimension and we can observe that sin stocks have an average score in this pillar which

is similar to the control group (5.27 and 5.60, respectively; p -value = 0.229). This score stems from six elements assessed by MSCI: board of directors, executive compensation, ownership structure, reliability of accounting information, business ethics and tax transparency. For executive compensation and ownership structure, the two groups studied exhibit very similar scores. As for transparency and reliability of accounting information, sin stocks are on average at the 48th percentile, while the control group is at the 55th percentile (p -value = 0.151). This finding contrasts with evidence provided by Kim and Venkatachalam (2011), who observed that sin stocks disclose better quality financial information. It is possible that these authors and MSCI are interested in different aspects of accounting information, or that financial disclosure of sin stocks has evolved over time (2011 vs. 2016). On the board of directors' side, sin stocks also score lower than the control group (45th vs. 52nd percentile, respectively; p -value = 0.117). It is difficult to venture out with a list of possible causes, as MSCI uses 38 criteria to assess the board of directors, including independence and integrity of board members, related party transactions, audit fees and much more.

To conclude this analysis of key ESG issues, the second most important aspect assessed by MSCI for the governance pillar is business ethics. For sin stocks, only firms operating in the casinos sector present assessments on this issue and their mean score is lower than the control group (2.96 against 4.02; p -value = 0.073). Casinos and comparable firms have a similar score for exposure to this risk. It is the lower risk response from the casinos (3.07 versus 4.12 for the control group; p -value = 0.057) that explains their poor performance in this dimension. The most probable explanation is that casinos regularly come under criticism for money laundering. Some believe Macau [38] is the subject of significant investments in money laundering and similar stories have been exposed in Canada [39], Sweden [40] and Australia [41]. It seems that part of the problem is that casinos have historically been targeted for money laundering and their laxity attracts customers with less noble intentions.

6. Conclusions

This study aimed to examine whether the ESG performance of firms which the market labels as sin stocks is in fact different from that of firms in so-called more traditional sectors. Interest in the matter arises from the fact that some investors systematically shun sin stocks in their portfolios, while others invest in them with the view of engaging with management and improving business practices. This creates complex incentives, as well as uncertainty about the ESG performance of sin stocks. Using the MSCI ESG Ratings dataset, we composed two subsamples, namely sin stocks and a control group made up of firms which present similar characteristics to the sin stocks subsample but operating in more traditional sectors. These two groups were compared under a multitude of ESG key issues according to the assessment established by MSCI ESG ratings dataset. We also controlled for whether our sample firms are cross-listed and the presence of a controlling shareholder in their ownership structure.

Along with [17,20,24], our study contributes to the idea that sin stocks are in a category of their own. Indeed, we found that for the three ESG pillars and the overall score (before industry adjustment), sin stocks tend to exhibit a lower ESG performance than the control group, comprised of firms in traditional sectors. The results of this exploratory and comparative study suggest that, in comparison to similar firms from more traditional sectors, sin stocks have in fact less responsible practices according to the data compiled by MSCI. More specifically, our results suggest that these firms are exposed to more severe ESG issues and that at the same time, their practices do not seem to mitigate these issues. Our results, therefore, contrast and extend the evidence provided by [17]. Nevertheless, two aspects make our findings distinct. First, we focus on firms' ESG behavior instead of market reactions to ESG disclosure and practices. Second, we measure ESG performance of sin stocks using an improved rating method that contrasts a firm's risk exposure to its management practices. This is important because controversial sectors with higher risk

exposure need to compensate with higher responsible practices to mitigate those risks, in order to achieve higher performance. This approach has been recommended in more recent studies about ESG performance; see, for example, the studies by [22,25]. Future research can expand our findings by trying to explain why sin stocks are less interested in improving their ESG performance and whether the market reacts differently to changes in ESG ratings of sin stocks, compared to less controversial sectors

In addition, according to the results of our comparison of their ESG performance in the most critical dimensions, sin stocks have a lower performance for each of the three pillars, and the difference is even more notable for the governance pillar. This poor performance in the governance pillar is mainly explained by the issue of business ethics. Further, for most key ESG issues, the sin stock subsample performs lower than the control group. The few exceptions to this finding include toxic emissions and waste management, workforce management, and data privacy and security. In terms of the industry-adjusted results (MSCI's final score from CCC to AAA), this underperformance of sin stocks no longer appears since the industry adjustment allows sin stocks to catch up to the level of ESG performance of the control group.

Despite these interesting results, and like any empirical study, this study has certain limitations. Our findings are based on a punctual study and future research can examine sin stocks longitudinally since their ESG performance may change over time and/or depend on certain one-off events. Their ESG performance may also depend on their life cycle stage. The statistical methods used are consistent with our research objectives but are rather descriptive comparison techniques. They do not allow inferences about associations between ESG performance and the characteristics of the firms studied. Future research could continue with multivariate analyses to study other variables that could be associated with ESG performance.

Additionally, another important limitation is that the sample only includes firms assessed by MSCI. Still, their database is considered comprehensive and the uniformity of the methods used to collect information and assess ESG practices of the firms included in the database ensures the comparability of ESG scores.

Finally, even if the control group is determined based on four attributes, future research may include more criteria. For example, given that ESG issues are very sensitive to the nature of the firms' activities, future research could also consider the criterion of the materiality of ESG issues [10] in order to render even more precise comparisons. The hope is that our study will inspire further research to extend our results, improve our methods, and ultimately broaden our understanding about the comparability of ESG performance and sin stocks' practices aimed at mitigating their ESG issues.

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