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Sin stock returns on the European market:

A study on traditional sin and new sin industries

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Abstract

In this thesis, I study sin stocks on the European market over the period 2005-2020. Traditionally, sin stocks are defined as publicly traded companies involved in the sectors of alcohol, tobacco, gambling, and defense. In addition to traditional sin stocks, I examine new sin stocks, which are publicly traded stocks involved in oil and gas, metals and mining, uranium, and coal. The results suggest that traditional sin stocks have excess returns in some periods and are less held by norm-constrained investors. The new sin stocks are found to have decreasing returns over the sample period and are undervalued but to be more held by norm-constrained investors. Investors in sin stocks are mainly investment managers, corporations, and individuals. This study suggests that social norms will differ between countries and over time, which will affect what is considered sinful. The implications of these results should be considered when investing in sin stocks on the European market.

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1. Introduction

In this thesis, I study the European stock market over the period 2005-2020 with the intention of answering the research questions:

Sin stocks on the European market: How do sin stock returns differ from comparable stock returns? Who invests in sin stocks? Is a new group of sin stocks evolving?

The research questions above capture essential aspects of sin stocks. A sin stock is "a publicly-traded company involved in or associated with an activity that is considered unethical or immoral" (Investopedia, 2020). Research by, e.g., Hong and Kacperczyk (2009), Fabozzi, Ma, and Oliphant (2008), Liu, Lu, and Veenstra (2014), and Salaber (2007), show that traditional sin stocks as alcohol, tobacco, gambling, and defense, outperform the market. These sin industries are significant in Europe. The whole chain of the brewing industry employs 2.3 million people (The Brewers of Europe & Europe Economics, 2020), and the E.U. represents 63% of global wine production (Comité Européen des Enterprises Vins, 2021). As what is perceived as sinful will differ in time and between cultures, I want to investigate if results from previous research still hold for sin stocks on the European market today. I also want to explore the possible evolvement of a new branch of sin stocks, following the increased focus on climate change: oil and gas, metals and mining, uranium, and coal. These are important industries for the European economy as well, and in 2016 the EU-28 coal, oil, and gas-related extractive and processing activities employed approximately 400 000 (The Joint Research Centre, 2020). Through my thesis, I hope to provide insight into how cultural differences and changes in time will affect sin stocks´ characteristics.

To answer whether sin stocks have excess returns, I construct portfolios of traditional and new sin stocks and portfolios of comparable stocks. Using CAPM and Fama-French three-factor models, I find evidence that traditional sin stocks have excess returns over market returns. Anyways, these excess returns disappear when controlling for more explanatory variables in Fama-French five-factor model. I find proof of a negative trend for new sin stock returns, with decreasing excess returns over the sample period. I do Fama-MacBeth regressions and find that traditional sin stocks have excess returns only in earlier periods. I also investigate the valuation of sin stocks using Fama-MacBeth regressions, where I get

contradictive results for traditional sin stocks. However, I find evidence of increased undervaluation for the new sin stocks.

I analyze ownership and analyst coverage of sin stocks using Fama-MacBeth regressions. The results imply that traditional sin stocks are less held by norm-constrained investors, while new sin stocks are more held by norm-constrained investors compared to comparable stocks. Traditional sin stocks have higher analyst coverage. A closer examination of ownership in traditional and new sin stocks indicates that passive and active investment managers, individuals, and corporations are the most frequent investors in these stocks.

My thesis contributes to the literature in several ways. First, it examines the European stock market, a market that previous studies investigate to a lesser extent (compared to, e.g., the U.S. market). Second, it examines new sin stocks in addition to the traditional sin stocks, thus shedding light on how changing social norms might lead to the evolvement of new sin industries. Third, my thesis looks closer into investors in sin stocks to enlighten how social norms and sin stocks characteristics affect ownership in these stocks. Fourth, I look at how new sin stocks´ characteristics compare to renewable energy stocks, which might explain how these contrasting stocks act in relation to each other.

The rest of the thesis proceeds as follows. In section 2, I go through relevant literature for my thesis and develop the hypotheses to be tested. Section 3 describes the data collection and the methodologies I use. Section 4 provides the results of my analyzes and a discussion related to previous research. In section 5, I conclude and presents possible policy implications.

2. Literature review and hypothesis development

2.1 Social norms and market behavior

Social norms are informal rules that determine behavior in groups. People belonging to that group are sanctioned when not following the social standards, often by losing reputation or being shunned by the group to which it belongs. Several economists have explored how social norms affect market behavior.

The book of Becker (1971) presents a model of discrimination in the labor market. In this model, employers with discriminatory preferences choose not to interact with certain people and pay a financial cost from these decisions. The discriminatory preferences are a result of community norms. Akerlof (1980) examines the obedience of social norms. He concludes that norms that are not too costly to follow will prevail, as people lose both utility and reputation by not following them. He presents a model of unemployment, explaining involuntary unemployment.

In their study, Liu et al. (2014) use the traditional sin stocks alcohol, tobacco, and gaming to investigate the interaction between social norms and financial incentives. They find a strong interaction between the two, and this interaction has a significant effect in determining market participants´ behavior.

2.2 Sin stock returns and valuations

Hong and Kacperczyk (2009) analyze the effects of social norms on the U.S. stock market for the sin industries alcohol, tobacco, and gaming. They find that sin stocks outperform their comparables. Research by Fabozzi et al. (2008), Liu et al. (2014), and Fauver and McDonald (2014) support these findings. However, Blitz and Fabozzi (2017) find that the abnormal returns of sin stocks can be fully resolved by including profitability- and investment factors in Fama-French five-factor model.

Salaber (2007) looks at the determinants of sin stock returns on the European market from 1981 to 2006 and finds outperformance of sin stocks. He finds that sin stock excess return depends on country characteristics such as legislation, religion, and excise taxation. Troberg (2016) thesis looks at the European stock market from 1985 to 2015 and confirms this outperformance.

Hong and Kacperczyk (2009) also compare the valuation of sin stocks to other stocks by looking at the valuation ratios and find that sin stocks are undervalued. Fauver and McDonald (2014) find that sin stocks valuation depends on social views in the country, and sin stocks are undervalued in countries against sin firms. In countries where society is not against sin firms, the valuation of these stocks is comparable to other stocks. Troberg (2016) examined the valuation of sin stocks on the European market but got contradictive results.

As sin stocks show some desirable characteristics, research has also been done to investigate the potential cost of excluding sin stocks from the investment portfolio. Blitz and Swinkels (2020) examine the effectiveness of excluding sin stocks and find it questionable. They conclude that investors might achieve more by influencing companies as active owners instead of excluding sin stocks from their portfolios.

Geczy, Stambaugh, and Levin (2005) compare the Sharpe ratio of portfolios of funds whose objectives include socially responsible investment (SRI) with the broader fund universe portfolios. They find that the cost of SRI varies with the investor's beliefs but can be as high as 30 basis points per month. Riedl and Smeets (2017) find that intrinsic social preferences and social signaling are essential in SRI investment. Their research suggests that some investors are willing to invest in mutual funds that align with their social preferences, even though there is an increased financial cost.

2.3 Development of new sin industries

Blitz and Fabozzi (2017) mention that what is viewed as a sin stock might change over time and that companies can shift between being a sin stock and not being a sin stock because of changing social norms or changes in the companies' business. They especially mention how investors setting carbon footprint targets will reduce their investments in stocks with high CO_2 emissions. Blitz and Swinkels (2020) place firms with the worst sustainable profiles "next to the classic sin industries."

The Intergovernmental Panel on Climate Change (IPCC) states that greenhouse gas (GHG hereafter) emissions escalate climate change. Reducing GHG emissions can limit the risks connected to climate change (IPCC, 2014). At the "Leaders Summit on Climate" in April

2021, it was announced that the U.S. will work towards a 50% reduction of GHG emissions by 2030. The U.K. will embed a 78% GHG reduction in law by 2035, and the E.U. embedded in law a minimum decrease in GHG emissions of 50% by 2030 (The White House, 2021, April 23). The International Energy Agency state that no development of new oil and gas fields and no new coal mines or mine extensions are required to reach the 2050 goal of net-zero emissions (International Energy Agency, 2021). Article 2 of the Paris Agreement from 2015 says that the work towards low greenhouse gas emissions and climate-resilient development will affect financial flows (United Nations, 2015).

Ritchie and Dowlatbadi (2015) argue that divesting fossil energy companies is difficult because of the composition of financial products and the economic structure. They find that institutional investors have limited ability to isolate their assets from fossil energy through divestment, and they are subject to financial risk because of the future low carbon society.

Though new sin industries are not subject to a specific sin tax (i.e., excise duties on alcohol and tobacco), they are subject to carbon pricing through emission trading systems (ETS) and carbon taxes. Together with increased fuel taxes and withdrawn fossil fuel subsidies, they work to bring down emissions and guide investments into cleaner options (The World Bank). Carbon pricing is a part of what is known as the transitional risk of climate change: the effects and costs of policies directed at the mitigation of climate risk. Climate risk creates financial risk for all companies, but the transitional risk affects industries heavily invested in high-emission activities especially (European Central Bank, 2020).

Several ESG (environmental, social, and governance) funds divest industries with high GHG emissions. Morningstar concludes that 2020 was *"*a year of broken records heralding a new era for sustainable investing in Europe" (Morningstar, 2021). Flows into ESG went from EUR126 billion in 2019 to EUR 233 billion in 2020. Five hundred new ESG funds were launched, and funds relating to climate change were among the best sellers in 2020, and many funds divested industries with high carbon emissions (Morningstar, 2021).

Bolton and Kacperczyk (2021) test three hypotheses on how the market responds to climate risk. They conclude that that higher carbon emissions yield higher returns, i.e., there is a carbon premium in the market. They find a divestment of institutional investors from firms with the highest carbon emissions, e.g., oil and gas. In a paper by In, Park, and Monk (2019),

they find that a portfolio long stocks from firms with low carbon emissions and short stocks of firms with high carbon emissions earn abnormal returns. This implies the carbon risk is inefficiently priced, i.e., carbon risk is underpriced, and this contradicts the results of Bolton and Kacperczyk (2021).

Research provides evidence that GHG emissions from large industries contribute to global warming and climate change. There is an increased focus from governments, international organizations, and investors on sustainable investment and financial risks linked to climate change. This creates a foundation for introducing carbon-intensive industries as *new* sin industries.

2.4 Investors in sin industries

According to Hong and Kacperczyk (2009), sin stocks have lower institutional ownership than comparable stock, and they also find that sin stocks have a smaller amount of norm-constrained investors. Following this, they suggest that sin stocks also are less followed by analysts, i.e., they got lower analyst coverage, which they confirm. The results of Hong and Kacperczyk (2009) are further supported by Liu et al. (2014), who find that increasing social norm acceptance leads to increasing institutional ownership. They also find that expected financial rewards will make the institutional investors and the analysts less concerned about social norms.

Blitz and Swinkels (2021) investigate who owns tobacco stocks in different markets. They find that reported ownership in tobacco stocks tends to be lower than for comparable stocks. They also study norm-constrained investors, e.g., sovereign wealth funds and pension funds, and find that several of these funds have divested tobacco shares. In addition, they look at passive and active management and find that passive asset managers are significant owners of tobacco stocks, holding on average 27% of the tobacco stocks in the U.S. They find that 19% of the 27% is managed by what they call the Big Three passive managers: Vanguard, BlackRock, and State Street.

According to a paper by Gârelanu and Pedersen (2019), there has been an increase in delegated asset management and passive management in financial markets over the last 50 years. ETFs, passive and active mutual funds and hedge funds increase while direct holdings

are reduced. In their working paper, Bebchuk and Hirst (2019) examine the Big Three index fund managers on the U.S. stock market. They find that the average combined stake in S&P500 held by one of the Big Three was 20.5% in 2017 and that the Big Three will continue to grow.

Benz, Paulus, Scherer, Syryca, and Trück (2020), investigate how different investor types on the global market handle exposure to and management of carbon risk. They find that investment advisors and hedge funds are the largest shareholders in the entire carbon-intensive equity universe. They find that governments have a higher preference for holding shares in carbon-intensive firms, while mutual funds, investment advisors, and individuals are hesitant to hold these shares.

The European Corporate Governance Network (ECGN) (today the European Corporate Governance Institute, ECGI) studied corporate control in Western Europe, and the results of this study are presented in a book by Barca and Becht (2001). They find that for most Continental Western European firms, the control lies with one major shareholder. In his book, Goergen (2018) presents a study by Silva and Goergen (2004). The results show that holding companies and industrial companies are essential types of large shareholders in Continental Western Europe, together with families and individuals.

In his review article, Gerard (2019) concludes that higher ESG performance is related to firms´ financial performance and boosts higher valuation and lower risk. He suggests that successful engagement of institutional investors in firms´ management enhances both stakeholder and shareholder value, especially in firms performing poorly on ESG measures. Fisch, Hamdani, and Solomon (2020) find that the engagement in corporate governance decisions has increased among passive investors, including the Big Three. According to Dyck, Lins, Roth, and Wagner (2019), increasing institutional ownership is associated with better E&G scores at the firm level. The findings are also supported by Chen, Dong, and Lin (2020), who find that institutional shareholders influence CSR and can generate real social impact. Anyways, Groot, Koning, and Winkel (2021) find that the number of asset managers' presented proposals regarding E&S issues is low, and so are the votes in favor of these proposals.

One of the investors` responses to the increased climate risk is the Principles of Responsible Investment (PRI). The PRI is a set of investment principles to guide the incorporation of ESG issues into investors' investment and ownership practice (Principles for Responsible Investment). Investment managers like BlackRock, The Vanguard Group, Fidelity Investments, and Norges Banks Investment Management (NBIM) are PRI signatories. In their article, Gibson, Glossner, Krueger, Matos, and Steffen (2020) state that engagement, integration, and negative screening are the most common ESG strategies of PRI signatories.

2.5 Hypotheses

Following the previous literature, especially the article of Hong and Kacperczyk (2009) and the idea of the development of "new sin stocks," I introduce six hypotheses to be tested in my thesis.

Based on previous literature and research on *traditional* sin stocks, I would expect that sin stocks have abnormal returns over both the market portfolio and their comparable stocks:

Hypothesis 1A: Traditional sin stocks earn abnormal returns.

I would not expect the *new* sin stocks to have resilient demand like traditional sin stocks have. Instead, I would expect new sin stocks to have decreasing positive returns compared to market returns and their comparable stocks´ returns, because of increased focus on climate risk and the development of the green industry. This follows the findings of In et al. (2019):

Hypothesis 1B: New sin stocks have decreasing positive returns over time.

I would expect sin stocks to be undervalued compared to other stocks, as certain investors shy away from investing in these stocks:

Hypothesis 2: Traditional and new sin stocks are undervalued compared to comparable stocks.

I would expect sin stocks to have fewer norm-constrained investors as some people and institutions are constrained by norms and will shy away from these stocks:

Hypothesis 3A: Investors in traditional and new sin stocks are investors less constrained by norms.

Following Hypothesis 3A and the logic of Hong and Kacperczyk (2009) that analysts also serve norm-constrained investors as much as investors not so constrained by norms, I would also expect sin stocks to have lower analyst coverage:

Hypothesis 3B: Traditional and new sin stocks have lower analyst coverage than their comparable stocks.

Based on theory on who invests in stocks, I expect some investors to be the more frequent investors in sin stocks:

Hypothesis 4: Most investors in traditional and new sin stocks are passive and active investment managers and hedge funds, as well as individuals.

3. Data and methodology

3.1 Sample of stocks

I use Refinitiv Eikon equity screener to find sin stocks. I select countries in the European Economic Area (EEA), representing 27 E.U. member states and Norway, Iceland, and Liechtenstein. I also include the U.K., as they recently withdrew from the E.U. This results in a total of 31 countries, but no data are available for Liechtenstein, meaning 30 countries are included in my final data set. I choose both active and inactive stocks, so my results should be free of survivorship bias. I only include primary issues. All monetary values are retrieved in euros. I use Thomson Reuters Business Classification (Refinitiv, 2020) to sort stocks into sin stocks and comparable stocks. I use PermID to identify the TRBC activities. All PermID´s starts with 429495 followed by four unique digits and I refer to the four unique digits in the sections below. The characteristics of the sin stocks and no-sin stocks in the entire European market, which is the basis for the data collection, are presented in Appendix A.

3.1.1 Definition of sin stocks

For the traditional sin stocks, I choose stocks belonging to some of the activities in TRBC industry group "Aerospace and defense" (PermID 1858, 1861, 1863 and 1865). I also include activity "Aerospace and defense (NEC)," (PermID 1866), where I screen the stocks by looking at the business descriptions in Eikon as well as searching the internet, and only include stocks involved in the defense industry.

I include stocks in the TRBC industry "Casinos and gaming," (PermID 1583 to 1588) "Brewers," (PermID 1475 and 1476) "Distillers and wineries," (PermID 1471 to 1474) and "Tobacco" (PermID 1419 to 1423). As my focus is on the *production* of sinful products and services, I leave out stocks belonging to TRBC activities "Beer, wine and liquor stores" (PermID 1390) and "Tobacco stores" (PermID 1388). Only one stock belongs to TRBC activities "Adult entertainment production and broadcasting" (PermID 1545) and "Adult publishing" (PermID 1538) so this is not included in the data sample.

For the new sin stocks, I choose stocks belonging to TRBC industry groups "Coal," (PermID 1999 to 2001) "Oil and gas," (PermID 1988 to 1998) and "Oil and gas-related equipment and services" (PermID 1972 to 1987). I remove stocks belonging to TRBC activity "Gasoline stations," (PermID 1989) as my focus will be on the extractive industries. I also include

stocks from the TRBC industry groups “Uranium” (PermID 1952 to 1954) and “Metals and mining” (PermID 1916 to 1930). From the latter, I remove stocks belonging to the TRBC industry “Aluminium” (PermID 1902 to 1908) as my focus is on mining (extractive industry). For the same reasons, I added TRBC activity “Rock mining” (PermID 1889) to the data sample.

3.1.2 Definition of comparable stocks

When selecting comparable stocks, I follow the same approach as in Hong and Kacperczyk (2009) and Troberg (2016). For tobacco production, I choose comparable stocks belonging to some of the activities in TRBC industry “Food processing” (PermID 1429, 1435, 1439, 1441, 1443, and 1444). For military and defense, I choose comparable stocks belonging to some of the activities in TRBC industries “Industrial machinery and equipment,” “Heavy machinery and vehicles”, and “Electrical components and equipment” (PermID 1823, 1830, 1834, 1839, 1841, 1842, 1843, 1844, 1847, 1854, and 1855). As comparables for wine and beer production, I choose all stocks in the TRBC industry “Non-alcoholic beverages” (PermID 1466 to 1470). I choose comparables in the TRBC industry “Leisure and recreation” (PermID 1569 to 1582) and some of the activities in the TRBC industry “Hotels, motels, and cruise lines” (PermID 1596, and 1599 to 1603) as comparable stocks for casinos and gaming.

For the new sin stocks, I choose comparable stocks belonging to the TRBC industry group “Renewable energy,” (PermID 1955 to 1971) motivated by the previously presented literature on increased climate risk and socially responsible investments, and by In et al. (2019). As the “Renewable energy” group is small (78 stocks), I also include the TRBC industry “Forest and wood products” (PermID 1881 to 1887) as a comparable to new sin industries. Forests are renewable resources, but the management of the resources is not always sustainable. The E.U. is taking measures to ensure sustainable forest management, e.g., to make use of the forest as carbon sinks and preserve the existing carbon stocks (European Commission, 2021). As they are renewable but still suffer from unsustainable exploitation, I find the stocks suitable as comparables.

The number of stocks in each of the sin- and comparable stock groups are represented in Table 1. The numbers are based on “First trade date” in Refinitiv Eikon, which usually represents an IPO date for issues that have come to market since 1999. Note that not all stocks

got data on "First trade date," so 9 sin stocks and 12 comparable stocks are left out from the table below.

Table 1.
The number of sin stocks and comparable stocks.
The table shows the number of stocks in the subgroups of the new and traditional sin stocks and their comparable stocks in the period December 2005 to December 2020. Note that the new sin stocks got only one group of comparables.

	2005		2010		2015		2020	
	Sin	**Comp.**	**Sin**	**Comp.**	**Sin**	**Comp.**	**Sin**	**Comp.**
Beer and wine production	49	9	55	9	68	9	73	13
Casinos and gaming	18	111	23	139	29	155	35	179
Military and defense	16	65	17	79	18	97	19	118
Tobacco production	10	37	12	47	12	52	13	57
Coal	5		10		23		24	
Metals and mining incl. uranium	104	29	162	56	203	81	231	107
Oil and gas	126		179		223		266	

As seen from Table 1, the traditional sin stocks and their comparable stocks are relatively few. Anyways, I analyze the total traditional sin portfolio and the total comparable portfolio, so the number of stocks seems sufficient. Note also that the new sin stocks are a large group of stocks compared to their comparables, even after adding forestry stocks to the renewable stocks.

I also calculate the betas of the different groups. I do this by retrieving the historic beta for all stocks in Refinitiv Datastream at 31st of December in 2005, 2010, 2015, and 2020. I value-weight the betas using market capitalization at the same date. The results are presented in Table 2.

Table 2.
The beta of sin stocks and comparable stocks.

The table shows the historical beta of the sin stocks and comparable stocks, 31st of December in 2005, 2010, 2015, and 2020. The betas are value-weighted for each group, using market capitalization for the stocks at the same dates.

	2005		2010		2015		2020	
	Sin	**Comp.**	**Sin**	**Comp.**	**Sin**	**Comp.**	**Sin**	**Comp.**
Beer and wine production	0.36	0.15	0.83	0.57	0.81	0.34	0.84	1.10
Casinos and gaming	0.82	1.06	0.78	1.15	0.35	0.83	0.89	1.54
Military and defense	1.48	0.91	0.87	1.56	0.92	1.05	1.24	1.18
Tobacco production	0.39	0.61	0.45	0.54	0.84	0.41	0.98	0.43
Coal	1.86		0.84		1.49		1.95	
Metals and mining incl. uranium	1.02	2.20	1.59	1.44	1.37	0.90	1.13	1.22
Oil and gas	0.70		0.88		0.97		1.14	

As seen from the table above, the traditional sin stocks have betas less than one. This is as expected, given their resilient characteristics. The exception is “Military and defense” in 2005 and 2020. “Coal” and “Metals and mining incl. uranium” got betas higher than one almost all years. “Oil and gas” got an increasing beta over the four years. This is as expected, given the increased carbon risk. The comparable stocks for the new sin stocks have a decreasing beta, which aligns with the theory on increased green investments.

3.2 Methodology

For all the regressions, I work with data from January 2006 – December 2020. I work with euro rates of return. The data sample is as described in section 3.1.

3.2.1 Return regressions

Following Hong and Kacperczyk (2009) closely, I make four portfolios: traditional sin stocks, new sin stocks, and their comparables. I calculate the monthly return using the return index, which aligns with Salaber (2007). The return index in Refinitiv Datastream is defined as *"a theoretical growth in value of a shareholding over a specified period, assuming that dividends are reinvested to purchase additional units of an equity or unit trust at the closing price applicable on the ex-dividend date."* I value-weight the returns using the market capitalization on the last trading day of the month.

I follow Blitz and Fabozzi (2017) and do time-series regressions of the two sin stock portfolios´ monthly returns net risk-free rate. I also choose to follow Hong and Kacperczyk (2009) and do time-series return regressions of sin stocks portfolios´ return net their comparable stock portfolios´ return. I do the regressions on rolling three-year periods (36 months) and choose to present the alpha graphically over time, with 95% confidence intervals.

I do the return regressions using three models: CAPM, Fama-French three-factor, and Fama-French five-factor (see equations 1, 2, and 3 below). The models follows Hong and Kacperczyk (2009), Salaber (2007), and Blitz and Fabozzi (2017). I use regression variables calculated for the European market, extracted from the web page of Kenneth R. French (2021a, 2021b).

Capital Asset Pricing Model

The capital asset pricing model (CAPM) is presented as follows:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_{it} MrktRF_t + e_{it} \quad (1)$$

Where R_{it} is the return of the portfolio *i* at time *t*, R_{ft} is the risk-free rate at time *t*, β_{it} is the beta of a portfolio *i* at time *t*, $MrktRF_t$ is the market risk premium ($market\ return\ R_{mt} - risk\ free\ return\ R_{ft}$) at time *t*, and e_{it} is the error term for a portfolio *i* at time *t*. The market return is the value-weighted return of a European portfolio, and the risk-free rate is the U.S. one-month T-bill rate (French, 2021a).

Fama-French three-factor model

The Fama-French three-factor model is represented as follows:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1 MrktRF_t + \beta_2 SMB_t + \beta_3 HML_t + e_{it} \quad (2)$$

Where R_{it}, R_{ft}, α_{it}, and e_{it} are the same factors as mentioned above. SMB_t is the size premium at time *t*, calculated as the equal-weight average of the returns on the three small stock portfolios for Europe minus the average of the returns on the three big stock portfolios, HML_t is the value premium at time *t*, which is calculated as the equal weight average of the returns for the two high B/M portfolios for Europe minus the average of the returns for the two low B/M portfolios (French, 2021a). β_1, β_2 and β_3 are factor coefficients.

Fama-French five-factor model

The Fama-French five-factor model is represented as follows:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1 MrktRF_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + e_{it} \quad (3)$$

Where R_{it}, R_{ft}, α_{it} $MrktRF_t$ and e_{it} are the same factors as before. SMB_t is still size premium but now calculated as the average return on nine small stock portfolios minus the average return on nine big stock portfolios. HML_t is still the value premium, calculated as before. RMW_t is the average return on the two robust operating profitability portfolios minus the average return on the two weak operating profitability portfolios for Europe. CMA_t is the

average return on the two conservative investment portfolios minus the average return on the two aggressive investment portfolios for Europe (French, 2021b). β_1, β_2, β_3, β_4 and β_5 are factor coefficients.

3.2.2 Fama-MacBeth regressions

I follow the same model used by Hong and Kacperczyk (2009) and use the method of Fama and MacBeth (1973). In this method, each asset is first regressed on proposed risk factors to determine beta for the asset. The returns are regressed over a fixed time period against the betas, to determine each asset´s risk factor. I use Newey and West (1987) standard errors to make up for cross-sectional and time-series dependence. The stocks are equally weighted.

I specify the return forecasting regression as follows:

$$R_{it} - R_{ft} = a_0 + a_1 sinstock_{it-1} + aX_{it-1} + e_{it}, i = 1, \dots, N \quad (4)$$

Where R_{it} and R_{ft} are the same as for the time-series regressions. *Sinstock* is a dummy variable, which has the value one if the stock is a sin stock and zero otherwise. X_{it-1} includes several explanatory variables: $lnMrktCap1_{it-1}$ is the natural logarithm of the monthly market capitalization (in million euros) of stock *i* in month *t-1*. $lnMrktBook1_{it-1}$ is the natural logarithm of the monthly market-to-book value for stock *i* in month *t-1*. $Return1_{it-1}$ is the average return for stock *i* in month *t-1* and it is calculated in the same way as for time series regressions, using the *return index*. $Beta1_{it}$ is historical beta for each stock *i,* at the end of month *t-1*. $Turnover1_{it}$ is the share´s average turnover in 10^9 euros, for stock *i* in month *t-1*.

To test whether sin stocks are undervalued, I run Fama-MacBeth regressions using this valuation regression (inspired by Troberg (2016)) :

$$Valuation_{it} = b_0 + b_1 sinstock_{it} + bX_{it} + e_{it}, i = 1, \dots, N \quad (5)$$

Where $Valuation_{it}$ is the value of stock i at time t, either as $lnPriceEarn_{it}$ or as $lnMrktBook_{it}$. *lnPriceEarn* is the natural logarithm of the average monthly price-to-earnings ratio of stock *i* in year *t*. $lnMrktBook_{it}$, is the natural logarithm of the average monthly market-to-book value for stock *i* in year *t*. *Sinstock* is the same as before. X_{it} includes two explanatory variables: $lnMrktCap_{it}$ is the natural logarithm of the average monthly market capitalization (in million

euros) of stock *i* in year *t*. ROE_{it} is the return on equity in % for stock *i* at time *t* each year, *t* is 31st of December.

For the regressions with *lnPriceEarn, the* top 5% and lowest 5% of the data points were removed. This was based on an analysis of the data, showing large differences in the numbers. This is in line with expectations, as price-earnings ratios can vary significantly among, e.g., different sectors.

I choose to do return- and valuation regressions for different periods: 2006-2020 and 2006-2019. I leave 2020 out to see if there is any effect of 2020 being a good year for ESG. I also analyze shorter periods: 2006-2012; 2013-2020; and 2013-2019, to see the development of the results over time.

To analyze ownership in sin stocks, I run Fama-MacBeth regressions using the following specification:

$$NormConstr_{it} = c_0 + c_1 sinstock_{it} + c_2 X_{it} + e_{it}, i = 1, \dots, N \quad (6)$$

Where $NormConstr_{it}$ is the fraction of norm-constrained investors, represented as the fraction of investors belonging to Investor group 1. The variable *Sinstock* is the same as in the valuation regressions. X_{it} includes several explanatory variables: $lnMrktCap_{it}$ and $lnMrktBook_{it}$ are the same as in the valuation regressions. $Beta_{it}$ is the historical beta for each stock *i,* 31st of December each year. STD_{it} is the standard deviation of the average yearly prices. $Return_{it}$ is the average return for stock *i* in year *t* calculated in the same way as for time series regressions, using the *return index.*

To find the share of norm-constrained ownership, I get data on "Investor type description," as well as "Holdings percentage of traded shares held" for the sin stocks and comparable stocks from 31st of December 2005 to 2020. I divide the investor types into two groups: Investor group 1 – investors less willing to hold sin stocks (more norm-constrained), and Investor group 2 – investors indifferent to holding sin stocks. This follows the logic of Hong and Kacperczyk (2009) and Blitz and Swinkels (2021). The two groups of investors are presented in Table 3.

Table 3.
Investor groups.
The table shows the two main types of investors. Group 1 includes investors less willing to hold sin stocks, i.e., they are more norm-constrained. Group 2 includes investors indifferent to holding sin stocks.

Group 1 - Less willing	**Group 2 - Indifferent**
Bank and trust	Brokerage firms
Corporation	Closed-End fund
Endowment fund	Exchange-Traded Fund
Foundation	Hedge fund
Government agency	Hedge fund portfolio
Institutions	Holding company
Insurance company	Independent research firm
Pension fund	Individual Investor
Pension fund portfolio	Investment advisor
Sovereign wealth fund	Investment advisor/hedge fund
	Mutual fund
	Other insider investor
	Private equity
	Research firm
	Venture Capital

I analyze analyst coverage of sin stocks using Fama-MacBeth regressions with the following regression specification:

$$lnAC_{it} = d_0 + d_1\, sinstock + d_2 X_{it} + e_{it}, i = 1, \dots, N \quad (7)$$

$lnAC_{it}$ is defined as the natural logarithm of 1+number of analysts covering the stock i at time t (31st of December) that year. The rest of the variables, including the components of X_{it} are the same as described for the norm-constrained investor regressions. I retrieve data on "Analyst coverage" for the sin stocks and their comparable stocks from 31st of December 2005 to 2020.

3.3 Descriptive analysis of ownership in sin stocks

I do a descriptive analysis of who invests in sin stocks. When selecting sin stocks, I choose all stocks belonging to Europe in Refinitiv Eikon, including Russia and Bulgaria. This data sample will therefore contain more stocks than the data sample for the regression analysis. The simple explanation for this is that the descriptive analysis was done before starting the regression analysis, and the view on what is suitable countries changed between the two analyses. I chose both active and inactive stocks, so my results should be free of survivorship bias. I only include primary issues, and all data is collected in February 2021. I use Thomson Reuters Business Classification (Refinitiv, 2020) to choose sin stocks in the same way as described for the regression data sample. For "Aerospace and defense (NEC)," 40 stocks were included, most of which belonging to Russia.

I further analyze the investors in the stocks by looking at the most frequent investors. I sort investors by using the Excel count, thus finding the investors repeated most times. "Uranium" is left out of this part of the descriptive analysis, as "Uranium" only has unique investors, and no investors occurring several times. I then choose the investors repeated most times and sort these on "total value of holdings." This way, I find the most frequent investors and those with significant amounts of holdings in euros.

3.4 Summary of variables

A summary of the variables used in my analyzes is presented in Table 4. The summary statistics of the variables are presented in Appendix B.

Table 4.
Summary of variables.

The table presents different variables used in regression analysis, a short explanation of them, and the source of the data (Refintiv Eikon Formula builder, Refinitiv Datastream, or the web page of French (2021a, 2021b)). **Panel A** presents the variables used in the regressions of returns, valuations, norm-constrained investors, and analyst coverage. **Panel B** shows the variables used in the descriptive analysis of sin stock ownership.

Panel A: Statistical analysis in Stata

Variable	Description	Source
TradSinRF	A value-weighted traditional sin stock portfolio´s monthly return net risk-free rate. Return calculated using *return index*	Refinitiv Datastream/ French (2021a, 2021b)
NewSinRF	A value-weighted new sin stock portfolio´s monthly return net risk-free rate. Return calculated using *return index*	Refinitiv Datastream/ French (2021a, 2021b)
TradSinComp	A value-weighted traditional sin stock portfolio´s monthly return net comparable stock portfolio´s monthly return. Return calculated using *return index*	Refinitiv Datastream
NewSinComp	A value-weighted traditional sin stock portfolio´s monthly return net comparable stock portfolio´s monthly return. Return calculated using *return index*	Refinitiv Datastream
TotSinComp	Total sin portfolio´s monthly return (equally weighted traditional and new), net total comparable stock portfolio´s monthly return (equally weighted traditional and new). Return calculated using *return index*	Refinitiv Datastream
MrktRF	Market return over risk-free rate; excess market return	French (2021a, 2021b)
RF	U.S. one month T-bill rate	French (2021a, 2021b)
ReturnRF	Monthly return of stock net risk-free rate. Return calculated using *return index*	Refinitiv Datastream/ French (2021a, 2021b)
SMB	"Small minus big"; size premium	French (2021a, 2021b)
HML	**"**High minus low"; value premium	French (2021a, 2021b)
RMW	"Robust minus weak"; profitability premium	French (2021a, 2021b)
CMA	"Conservative minus aggressive"; investment premium	French (2021a, 2021b)
Sinstock	A dummy variable. Equals one if stock is sin stock, and zero if stock is comparable stock	
$\ln MrktCap1_{it-1}$	Natural logarithm of the monthly market capitalization (in million euros) of stock *i* in month *t-1*	Refinitiv Datastream
$\ln MrktBook1_{it-1}$,	Natural logarithm of the monthly market-to-book value for stock *i* in month *t*	Refinitiv Datastream
$Return1_{it}$	$Return1_{it-1}$ is the average return for stock *i* in month *t-1* calculated using *return index*	Refinitiv Datastream
$Beta1_{it}$	Historical beta for each stock *i,* at the end of month *t-1*	Refinitiv Datastream

$Turnover1_{it}$	Share average turnover in 10^9 euros, for stock *i* in month *t-1*	Refinitiv Datastream
$lnMrktBook_{it}$	Natural logarithm of the average monthly market-to-book value for stock *i* in year *t*	Refinitiv Datastream
$lnPriceEarn_{it}$	Natural logarithm of the average monthly price-to-earnings ratio of stock *i* in year *t*.	Refinitiv Datastream
$lnMrktCap_{it}$	Natural logarithm of the average monthly market capitalization (in million euros) of stock *i* in year *t*	Refinitiv Datastream
ROE_{it}	Return on equity in % for stock *i* at time *t* each year, *t* is 31st of December	Refinitiv Datastream
$Beta_{it}$	Historical beta for each stock i, at 31st of December in year t	Refinitiv Datastream
$Return_{it}$	$Return1_{it}$ is the average return for stock *i* in month *t* calculated using *return index*	Refinitiv Datastream
STD_{it}	The standard deviation of the average yearly prices in year *t*, for stock *i*	Refinitiv Datastream
$NormConstr_{it}$	Share of norm-constrained investors represented as the fraction of investors belonging to Investor group 1, at 31st of December in year *t*	Refinitiv Eikon Formula Builder
$lnAC_{it}$	Natural logarithm of 1+number of analysts covering the stock *i* at 31st of December in year *t*	Refinitiv Eikon Formula Builder

Panel B: Descriptive analysis

Variable	Description	Source
Investor full name	Full name of the investor	Refinitiv Eikon Formula Builder
Holdings pct of traded shares held	Percentage of traded shares held by an investor	Refinitiv Eikon Formula Builder
Shares held value	Value of the shares held by an investor, in euros	Refinitiv Eikon Formula Builder
Investor type description	Indicates what type of investor it is, e.g., corporation, pension fund, hedge fund, individual investor, and so on	Refinitiv Eikon Formula Builder
Investor investment orientation	Indicates whether an investor is active or passive	Refinitiv Eikon Formula Builder
Investor investment style code	Indicates the investor's investment style, e.g., core growth, core value, index, etc.	Refinitiv Eikon Formula Builder

4. Results and discussion

4.1 Return performance of sin stocks

4.1.1 Time-series return regressions

Regressions are done with monthly returns of a traditional sin stock portfolio and a new sin stock portfolio, net the risk-free rate, to see if they yield excess returns. The hypothesis is that traditional sin stocks will generate excess returns (Hypothesis 1A), while new sin stocks will yield decreasing results (Hypothesis 1B). The results of the time-series regressions are presented in Table 5. The coefficient of interest is the alpha, which expresses the excess return of the sin portfolios.

Table 5.
Return performance of sin stocks.

The table reports coefficients obtained from time-series return regressions of a value-weighted portfolio of sin stocks net risk-free rate on a set of factors, over the period 2006-2020. **Panel A** reports the results from the regressions of the returns of a value-weighted portfolio of traditional sin stocks net risk-free rate. **Panel B** reports the results from the regressions of the returns of a value-weighted portfolio of new sin stocks net risk-free rate. All variables are as described in Panel A of Table 4 in the data and methodology section. Standard errors shown in parentheses. ***1%, **5% and *10% significance.

Panel A: Traditional sin stocks

	(1)	(2)	(3)	(4)	(5)
Alpha	0.0070**	0.0071**	0.0056**	0.0032	0.0033
	(0.0028)	(0.0028)	(0.0027)	(0.0028)	(0.0030)
MrktRF	0.4536***	0.4556***	0,5585***	0.5486***	0.5465***
	(0.0631)	(0.0656)	(0.0639)	(0.0617)	(0.0765)
SMB*		-0.1158	-0.1648	-0.0977	-0.1002
		(0.1918)	(0.1983)	(0.1952)	(0.1985)
HML			-0.4318**	-0.0095	-0.0035
			(0.1731)	(0.2452)	(0.2593)
RMW				0.8555***	0.8550***
				(0.3214)	(0.3234)
CMA					-0.0160
					(0.3013)
R-squared	0.32	0.3186	0.3605	0.3900	0.3865
N observations	180	180	180	180	180

Panel B: New sin stocks

	(1)	(2)	(3)	(4)	(5)
Alpha	0.0030	0.0032	0.0038	0.0007	0.0012
	(0.0030)	(0.0030)	(0.0032)	(0.0032)	(0.0031)
MrktRF	0.7869***	0.7885***	0.7462***	0.7357***	0.6899***
	(0.0726)	(0.0731)	(0.0766)	(0.0720)	(0.0855)
SMB*		-0.0910	-0.0709	-0.0194	-0.0728
		(0.1780)	(0.1799)	(0.1789)	(0.1661)
HML			0.1772	0.7067***	0.8315***
			(0.1566)	(0.2149)	(0.2460)
RMW				1.0923***	1.0830***
				(0.3007)	(0.3006)
CMA					-0.3332
					(0.3397)
R-squared	0.5506	0.5489	0.5507	0.5803	0.5817
N observations	180	180	180	180	180

*SMB calculated as described for Fama-French five-factor model in the methodology section.

In Table 5 Panel A, the alpha is statistically significant on a 5% significance level for regression specifications 1, 2, and 3. It is positive, implying an excess return of traditional sin stocks over market returns. The excess return is 0.70% in the CAPM model, which is higher than the 0.44% found by Blitz and Fabozzi (2017) and the 0.33% found by Salaber (2007). The alpha decreases over the specifications, and regression specifications 4 and 5 do not have statistically significant alpha, which implicates no excess returns of traditional sin stocks. This is in line with Blitz and Fabozzi (2017) and the resolving of sin stock anomaly. The results

suggest that the excess returns of traditional sin stocks are driven by profitability- and investment factors, and not by the fact that they are sinful (e.g., they are more risky). This suggests that investors can compensate for losses following the exclusion of sin stocks by investing in non-sin stocks exposed to the same factors driving the excess returns, as stated by Blitz and Fabozzi (2017). The results support Hypothesis 1A to some extent but contradicts the notion of sin stocks having excess returns simply because they are sinful. The results in Table 5 Panel B are not statistically significant, and Hypothesis 1B is neither contradicted nor supported.

I do rolling regressions of sin stocks portfolios´ monthly returns net their comparable stock portfolios´ monthly returns to see if sin stocks outperform their comparable stocks (Hypothesis 1A and Hypothesis 1B). The results of the regressions are shown in Figure 1. The alpha´s development over time is shown in graphs with 95% confidence intervals. I choose to show the alpha´s time trend as this gives a good indication of how the alpha is evolving (e.g., if it is decreasing for the new sin stocks), or how it acts when including more explanatory variables (as in Blitz and Fabozzi (2017)). The figure shows the results using the Fama-French three-factor model, while the results from CAPM and Fama-French five-factor model are presented in Appendix C.

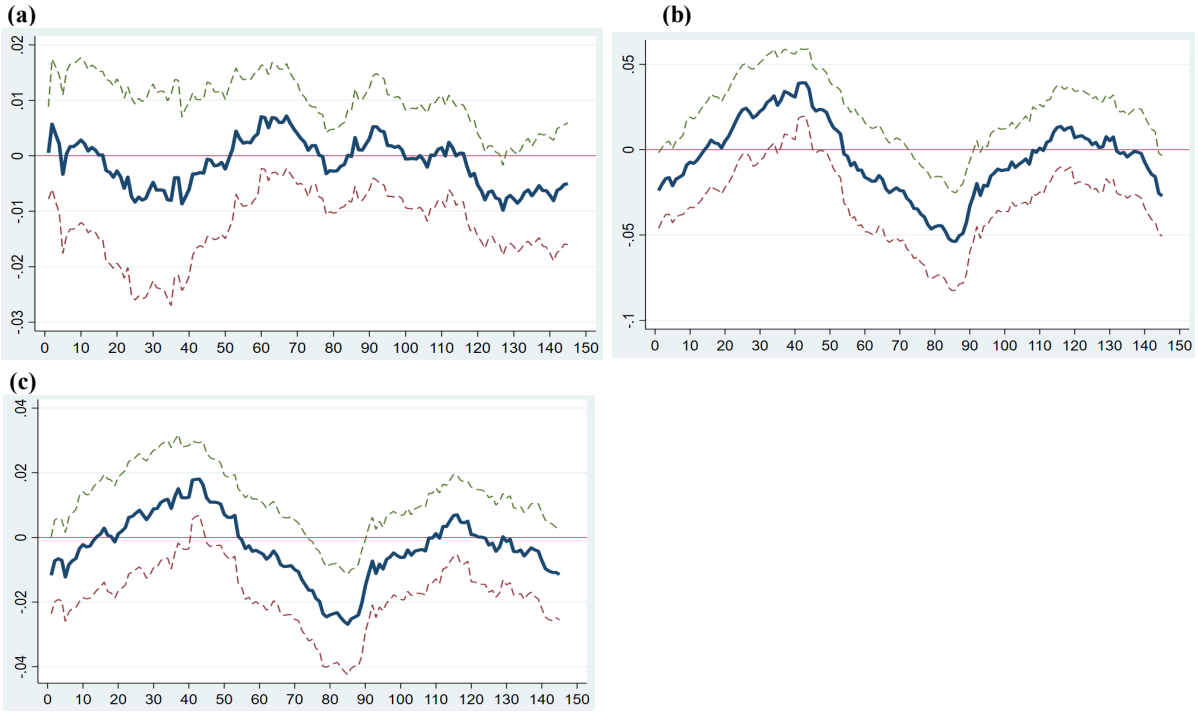

Figure 1. Return performance of sin stocks (rolling regressions) using Fama-French three-factor. The figure shows the alpha (blue line) obtained from time-series regressions of returns of value-weighted portfolios, for January 2006- December 2020. The regressions are done on rolling 3 years (36 months) periods which yields 145 rolling periods. The X-axis represents the rolling periods and the Y-axis the value of alpha and confidence intervals. The 95% confidence intervals are presented as green and red lines. In **Plot a**, the dependent variable is *TradSinComp,* which is the returns of a value-weighted portfolio long traditional sin stock and short comparable stock. In **Plot b**, the dependent variable is *NewSinComp,* which is the returns of a value-weighted portfolio long new sin stock and short comparable stock. In **Plot c** the dependent variable is *TotSinComp,* which is the returns of a portfolio long total (equal weight traditional and new) sin stocks and short total (equal weight traditional and new) comparable stock.

In Plot (a), the zero-line is in the confidence interval for nearly all rolling periods, implying no excess return of the traditional sin stock portfolio over the comparable stock portfolio. This is also supported by Figures C1 and C2 in Appendix C. This is not in line with what is expected from previous research. Hong and Kacperczyk (2009) found outperformance of around 0.30 % a month, and Troberg (2016) found 0.74%. There could be several explanations for the difference. Hong and Kacperczyk's research were done on U.S. stocks for periods 1965-2006 and 1926-2006, and Troberg (2016) uses data until 2015. I also have a more extensive selection of sin stocks than Troberg (2016). As suggested by Salaber (2007), religion and other country characteristics matter for sin stocks, as what is sinful will differ between countries. What is considered sin will also change with time, and this could also affect the results.

Plot (b) implies new sin stocks outperformed their comparables in November 2008 to January 2013 (rolling periods 35-50) but underperformed from March 2012 to May 2016 (rolling periods 75-90). This is supported by figures in Appendix C. The overperformance is in line with new sin industries being essential industries in Europe, employing many people. People dependent on these industries might not consider these industries sinful. The decreasing returns align with theory on increased carbon taxes and climate risk in later years, e.g., the reports by International Energy Agency (2021) and IPCC (2014). There have also been increased "green investments" in the same period, as stated by Morningstar (2021), implying more investments in comparable stocks (renewables). The results and arguments align with what was found by In et al. (2019) where a portfolio long carbon-effective stocks and short carbon-ineffective stocks yielded abnormal returns, which suggests an underpricing of the carbon risk.

Plot (c) implies a short period of overperformance of the total sin stock portfolio from September 2009 to August 2012 (rolling period 45). It implicates an underperformance of the sin stocks around March 2012 to May 2016 (rolling periods 75-90). In sum, the rolling regressions give no support to Hypothesis 1A but do support Hypothesis 1B about decreasing returns for new sin stocks.

4.1.2 Fama-MacBeth return regressions

Fama-MacBeth regressions were done with traditional sin stocks and new sin stocks to test Hypothesis 1A and Hypothesis 1B. The coefficient of interest is the coefficient in front of the variable *Sinstock*, which expresses the monthly excess return of the sin portfolios over its comparable stocks´ monthly returns. The results from the regression for periods 2006-2020 and 2006-2019 are shown in Table 6.

Table 6.
Return performance of sin stocks in two periods.

The table shows results of a cross-section regression of returns of sin stocks over two periods: 2006-2020 and 2006-2019. The regression analysis is done using the methodology of Fama and MacBeth (1973). **Panel A** shows the results for traditional stocks. **Panel B** shows the results for the new stocks. The dependent variable is *ReturnRF,* which is the monthly return of the stock, using the return index, net risk-free rate. All explanatory variables are lagged (month *t-1*) and are as described in Panel A of Table 4 in the data and methodology section. Newey and West (1987) standard errors reported in parentheses. ***1%, **5% and *10% significance.

	Panel A: Traditional sin stocks		**Panel B: New sin stocks**	
	2006-2020	**2006-2019**	**2006-2020**	**2006-2019**
Sinstock	0.0039	0.0029	0.0424	0.0017
	(0.0036)	(0.0038)	(0.0446)	(0.0044)
lnMrktCap1	-0.0051**	-0.0050**	-0.0098	-0.0022**
	(0.0023)	(0.0025)	(0.0068)	(0.0010)
lnMrktBook1	-0.009**	-0.0103**	-0.0218*	-0.0100***
	(0.0041)	(0.0043)	(0.0119)	(0.0015)
Return1	-0.2153*	-0.2260*	0.0258**	-0.0309***
	(0.1267)	(0.1357)	(0.0114)	(0.0098)
Beta1	0.0050	-0.0044	-0.0589	0.0008
	(0.0062)	(0.0065)	(0.0615)	(0.0021)
Turnover1	0.3980*	0.4170*	0.2550	0.0797***
	(0.2050)	(0.2190)	(0.1550)	(0.0271)
Constant1	0.0389***	0.0400**	0.0982	0.0156**
	(0.0149)	(0.0159)	(0.0769)	(0.0071)
Avg. R-squared	0.0813	0.0806	0.0500	0.0495
N observations	42 511	38 648	59 282	53 901

The coefficient in front of *Sinstock* is not statistically significant for any regressions, thus implying no difference in returns between sin stocks and their comparable stocks over the sample periods. Neither Hypothesis 1A nor Hypothesis 1B are supported or contradicted.

The coefficient in front of *lnMrktCap1* is statistically significant and negative for three of the regressions, implying that big stocks underperform small stocks. In all regressions, the

coefficient in front of *lnMrktBook1* is statistically significant and negative, indicating higher valuation forecasts lower excess returns. The coefficient in front of *Beta1* is statistically insignificant in both panels, implying the beta does not affect excess return. These findings are in line with Hong and Kacperczyk (2009). The coefficient in front of *Return1* is statistically significant and negative for three of the periods, implying increased returns in period *t-1* yield lower excess returns in period *t*. The coefficient in front of *Turnover1* is statistically significant for Panel A and the period 2006-2019 in panel B. It is positive, implying that increased turnover in euros yields higher excess returns.

The sample period was divided into three periods, and the same Fama-MacBeth regressions as above were done to test Hypothesis 1A and Hypothesis 1B. The results are presented in Table 7.

Table 7.
Return performance of sin stocks over three periods.

The table shows results of a cross-section regression of traditional and new sin stocks´ returns over three periods: 2006-2012, 2013-2020, and 2013-2019. The regression analysis is done using the methodology of Fama and MacBeth (1973). **Panel A** shows the results for traditional stocks. **Panel B** shows the results for the new stocks. The dependent variable is *ReturnRF* which is the monthly return of the stock, using the return index, net risk-free rate. All explanatory variables are lagged (month *t-1*) and are as described in Panel A of Table 4 in the data and methodology section. Newey and West (1987) standard errors reported in parentheses. ***1%, **5% and *10% significance.

	Panel A: Traditional sin stocks			**Panel B: New sin stocks**		
	2006-2012	**2013-2020**	**2013-2019**	**2006-2012**	**2013-2020**	**2013-2019**
Sinstock	0.0047**	0.0032	0.0011	0.0150**	0.0663	-0.0114*
	(0.0023)	(0.0064)	(0.0072)	(0.0060)	(0.0831)	(0.0058)
lnMrktCap1	-0.0004	-0.0092**	-0.0010**	-0.0025	-0.0160	-0.0020*
	(0.0009)	(0.0042)	(0.0048)	(0.0016)	(0.0126)	(0.0011)
lnMrktBook1	-0.0045***	-0.0136*	-0.0159*	-0.0101***	-0.0318	-0.0089***
	(0.0016)	(0.0074)	(0.0084)	(0.0026)	(0.0221)	(0.0016)
Return1	-0.0486***	-0.3595	-0.4013	-0.0319**	-0.0206	-0.0299**
	(0.0180)	(0.2344)	(0.2673)	(0.0160)	(0.0163)	(0.0116)
Beta1	0.0004	-0.0090	0.0084	-0.0040	-0.1133	-0.0023
	(0.0037)	(0.0111)	(0.0125)	(0.0034)	(0.1142)	(0.0024)
Turnover1	0.1150**	0.6430*	0.7150*	0.0484	0.4350	0.1110***
	(0.0538)	(0.3770)	(0.4290)	(0.0351)	(0.2850)	(0.0412)
Constant	0.0067	0.0667**	0.0739**	0.0040	0.1796	0.0271***
	(0.0067)	(0.0266)	(0.0301)	(0.0120)	(0.1422)	(0.0074)
Avg. R-squared	0.0751	0.0865	0.0860	0.0659	0.0363	0.0333
N observations	16 695	25 816	21 953	21 476	37 806	32 425

As seen in Panel A of Table 7, the coefficient in front of *Sinstock* is significant at a 5% level of significance for the period 2006-2012. The coefficient is 0.0047, thus implying sin stocks got a 0.47% higher excess return than their comparable stocks in this period. The coefficient in front of *Sinstock* is not statistically significant for the other periods. The excess return in the first period is in line with previous research by Hong and Kacperczyk (2009) and the thesis of Troberg (2016). It supports Hypothesis 1A that traditional sin stocks outperform their comparable stocks. As stated by Hong and Kacperczyk (2009), the excess return can be explained by the fact that sin stocks are shunned by many investors, implicating limited risk-sharing, and therefore have higher expected returns. Furthermore, the increased litigation risk of sin stocks, boosted by stronger social norms, will increase this expected return. Note that this argument differs from the argument of Blitz and Fabozzi (2017), who suggest the excess returns of sin stocks are driven by certain asset pricing factors. The latter argument is backed by my results in Panel A of Table 5.

As seen in Panel B of Table 7, the coefficient in front of *Sinstock* is statistically significant for the two periods 2006-2012 and 2013-2019, but not for 2013-2020. In the period 2006-2012, the coefficient is 0.0150, implying that new sin stocks got a 1.5% higher excess return than their comparable stocks. For the period 2013-2019, the coefficient changes to -0.0114, implying new sin stocks got a lower excess return, about 1.14%, than their comparable stocks. This is in line with Figure 1, and is supported by In et al. (2019) who found a portfolio long carbon-efficient stocks and short carbon-inefficient stocks to earn abnormal returns of 3.5-5.4% per year. This suggests an underpricing of the carbon risk in the market. The results support Hypothesis 1B that new sin industries have decreasing positive returns, and even negative return, compared to renewable industry returns.

In Table 7, the coefficient in front of *lnMrktCap1* is statistically significant for some periods, where it is negative. *lnMrktBook1* is negative and statistically significant for all periods except Panel B 2013-2020. The coefficient in front of *Beta1* is statistically insignificant for all of the regressions. These findings are in line with Hong and Kacperczyk (2009). The coefficient in front of *Return1* is negative and statistically significant for some periods and coefficient in front of *Turnover1* is statistically significant and positive for four of the regressions.

In sum, the results from analyzing returns of sin stocks suggest that traditional sin stocks outperform the market, but this outperformance is resolved when controlling for more factors in Fama-French five-factor model. There is evidence of some overperformance of sin stocks over their comparable stocks, which would support Hypothesis 1A. The results give evidence of decreasing positive returns for new sin stocks, compared to the renewable stocks, which supports Hypothesis 1B. The results show differences in returns between sin stocks and their comparable stocks, thus answering the research question.

4.2 Valuation of sin stocks

Fama-MacBeth regressions are done with both traditional sin stocks and new sin stocks to see if there are any differences in valuations between sin stocks and their comparable stocks. The hypothesis is that sin stocks will be undervalued (Hypothesis 2). The coefficient of interest is the coefficient in front of *Sinstock*, which expresses the differences in valuation of the sin portfolios to its comparable stocks. The results of regressions of stock valuation for 2006-2020 are shown in Table 8.

Table 8.
Valuation of sin stocks over entire sample period.

The table present the results of cross-section valuation regressions for traditional and new sin stocks´ valuation over the period 2006-2020. The regression analysis is done using the methodology of Fama and MacBeth (1973). **Panel A** shows the results from regression with traditional stocks. **Panel B** presents the results from regression with new stocks. The regressions are done with two different dependent variables: regression specification 1 is done with *lnPriceEarn* and regression specification 2 is done with *lnMrktBook.* All variables are as described in Panel A of Table 4 in the data and methodology section. Newey and West (1987) standard errors reported in parentheses. ***1%, **5% and *10% significance.

	Panel A: Traditional sin stocks		**Panel B: New sin stocks**	
	(1)	(2)	(1)	(2)
Sinstock	-0.0594***	0.2691***	-0.1803***	-0.3038*
	(0.0200)	(0.0219)	(0.0569)	(0.1466)
lnMrktCap	0.0106	0.2105***	0.0248**	0.1157***
	(0.0100)	(0.0096)	(0.0086)	(0.0099)
ROE	-0.0009*	-0.0008	-0.0024***	-0.0037***
	(0.0004)	(0.0006)	(0.0007)	(0.0010)
Constant	2.9101***	-0.6930***	2.7955***	-0.0090
	(0.0423)	(0.0713)	(0.0750)	(0.1364)
Avg. R squared	0.0228	0.2789	0.0348	0.1543
N observations	3 408	4 634	2 850	5 632

In Panel A of Table 8, the two regressions yield contradictive results. In regression 1, the coefficient in front of *Sinstock* is positive and statistically significant at a 1% level of significance. It is 0.2691, thus implying that being a sin stock yields a 27% increase in market to book ratio. In regression 2, the coefficient in front of *Sinstock* is negative and statistically significant at a 1% level of significance. It is -0.0594, thus implying that being a sin stock yields about a 5.9% decrease in market-to-book ratio. The overvaluation contradicts the findings of Hong and Kacperczyk (2009). In the thesis of Troberg (2016), she also found contradictive results. The nature of the ratios used might explain the contradictive results. As stated in the methodology, the price-earnings ratio will differ between sectors, and the same goes for the market-to-book ratios. In sum, no explicit support is found for Hypothesis 2.

In Panel B of Table 8, the coefficient on *Sinstock* is statistically significant for both regressions on a 1% significance level. It is negative, implying that being a new sin stock yield a lower valuation. Regression 1 suggests an undervaluation of about 18%, and regression 2 suggests an undervaluation of about 30%. The results are in line with the expectations (Hypothesis 2), and it is in line with the previous studies on (traditional) sin stocks done by Hong and Kacperczyk (2009). A possible explanation for this undervaluation is that investors neglect sin stocks and underestimate their value, as stated by Hong and Kacperczyk (2009).

The coefficient in front of *lnMrktCap* is statistically significant for three of the regressions, and it is positive, thus implying that increasing market capitalization leads to higher valuation of the stocks. This is in line with Troberg (2016). The coefficient in front of *ROE* is significant for three of the regressions, and it is negative. This implies that increasing return on equity yields a lower valuation of the stocks.

The sample period was divided into three periods, and the same Fama-MacBeth regressions as above were done to test Hypothesis 2. The results are presented in Table 9.

Table 9.
Valuation of sin stocks over three periods.

The table present the results of cross-section valuation regressions for traditional and new sin stocks´ valuation over three periods: 2006-2012, 2013-2020, and 2013-2019. The regression analysis is done using the methodology of Fama and MacBeth (1973). **Panel A** shows the results from regression with traditional stocks. **Panel B** presents the results from regression with new stocks. The regression analysis is done with two different dependent variables: regression specification 1 is done with *lnPriceEarn* and regression specification 2 is done with *lnMrktBook.* All variables are as described in Panel A of Table 4 in the data and methodology section. Newey and West (1987) standard errors reported in parentheses. ***1%, **5% and *10% significance.

Panel A: Traditional sin stocks

	2006-2012		**2013-2020**		**2013-2019**	
	(1)	(2)	(1)	(2)	(1)	(2)
Sinstock	-0.0738*	0.3060***	-0.0468	0.2369***	-0.0555*	0.2416***
	(0.0309)	(0.0280)	(0.0265)	(0.0237)	(0.0283)	(0.0261)
lnMrktCap	-0.0113	0.1921***	0.0297***	0.2267***	0.0317**	0.2294***
	(0.0090)	(0.0125)	(0.0083)	(0.0085)	(0.0091)	(0.0088)
ROE	-0.0006	-0.0014	-0.0012	-0.0003	-0.0015*	-0.0004
	(0.0006)	(0.0010)	(0.0006)	(0.0007)	(0.0006)	(0.0009)
Constant	2.9531***	-0.6317***	2.8725***	-0.7468	2.8701***	-0.7548***
	(0.0775)	(0.1214)	(0.0421)	(0.0735)	(0.0490)	(0.0832)
Avg. R squared	0.0205	0.2470	0.0248	0.3068	0.0274	0.3134
Observations	1 467	2 007	1 941	2 627	1 762	2 405

Panel B: New sin stocks

	2006-2012		**2013-2020**		**2013-2019**	
	(1)	(2)	(1)	(2)	(1)	(2)
Sinstock	-0.1801***	0.0579	-0.1804	-0.6203***	-0.1027*	-0.4932***
	(0.0459)	(0.0343)	(0.1001)	(0.1522)	(0.0527)	(0.0759)
lnMrktCap	0.0087	0.1035***	0.0388**	0.1264***	0.0356**	0.1302***
	(0.0068)	(0.0131)	(0.0115)	(0.0126)	(0.0128)	(0.0134)
ROE	-0.0025**	-0.0040***	-0.0022*	-0.0034*	-0.0025*	-0.0037*
	(0.0010)	(0.0010)	(0.0010)	(0.0015)	(0.0011)	(0.0017)
Constant	2.8888***	-0.0851	2.7138***	0.0914	2.6788***	-0.0287
	(0.1218)	(0.1972)	(0.0737)	(0.1799)	(0.0713)	(0.1381)
Avg. R squared	0.0254	0.1460	0.0429	0.1615	0.0356	0.1508
Oservations	1 293	2 303	1 557	3 329	1 411	3 073

In Panel A of Table 9, the contradictive results from Table 8 are still evident. In the period 2006-2012, the coefficient in front of *Sinstock* in regression 1 is statistically significant at a 10% significance level. This implicates an undervaluation of traditional sin stocks of about 7%, compared to the comparable stocks. The coefficient in front of *Sinstock* in regression 2 is statistically significant at a 1% significance level and implicates an overvaluation of traditional sin stocks of about 30%. Panel A 2013-2019 shows the same contradictive results, but with less under- and overvaluation. In Panel A period 2013-2020, the coefficient in front of *Sinstock* is only statistically significant in regression 2, at a 1% significance level. It is positive, suggesting an overvaluation of traditional sin stocks in this period.

Wine- and beer production are essential industries in Europe, and in 2020 they make up about 50% of the total stock sample. How sinful these industries are perceived can depend on, e.g., religion, and be explained by factors like taxation levels, as suggested in the paper by Salaber (2007). This is supported by Fauver and McDonald (2014), who find that valuation depends on social norms in countries. They find that the undervaluation of sin stocks is 8% in countries where society is against these firms but find no such undervaluation in countries where these stocks are not considered sinful. This might explain why my results imply these stocks are overvalued, as Europe consists of many countries with different social norms. The overvaluation is reduced in later years, signifying these stocks being less overvalued in time, which would align with previous research. The undervaluation of traditional sin stocks would be explained by their sinful nature, which leads to some investors shying away from them, as stated by, e.g., Hong and Kacperczyk (2009). This argument is further supported by the regressions of norm-constrained investors (Table 11), showing fewer norm-constrained investors in traditional sin stocks than their comparable stocks.

In Panel B of Table 9, 2006-2012, the coefficient on *Sinstock* is only statistically significant in regression 1, at a 1% level of significance. It is -0.18, implying that being a new sin stock yields an 18% decrease in valuation compared to comparable stocks. In Panel B, 2013-2020, the coefficient on *Sinstock* is only statistically significant in regression 2, at a 1% significance level. It is -0.62, thus implying being a sin stock yields a 62% decrease in valuation. In Panel B, 2006-2019, the coefficient in front of *Sinstock* is statistically significant and negative for both regressions, implying an undervaluation of 10% and 49%. The findings are in line with Hong and Kacperczyk (2009) and support Hypothesis 2. The results might be evidence of the development of new sin industries, backed by theory on increasing climate risks, carbon

taxes, and green investments. The undervaluation might be evidence of decreasing demand in these industries, as investor and consumers shy away from them. The undervaluation seems to be more significant for later years, and it is largest when including 2020, which aligns with the theory on 2020 being a good year for ESG investments (Morningstar, 2021).

For all regressions where the coefficient in front of *lnMrktCap* is statistically significant, it is positive. The coefficient in front of *ROE* is statistically significant and negative for one of the traditional sin stock regressions and for all regressions with new sin stocks.

The results of the valuation regressions yield contradictive results for the traditional sin stocks, and no clear support can be found for Hypothesis 2. However, the results for the new sin stocks suggest that new sin stocks are undervalued compared to their comparable stocks. This supports Hypothesis 2 and provide evidence of the development of new sin stocks proposed in the research questions.

4.3 Norm-constrained investors and analyst coverage of sin stocks

4.3.1 Analysis of norm-constrained investors

Before doing regressions with ownership, the percentage of norm-constrained investors is calculated based on the division into Group 1 (Less willing to hold sin stocks) and Group 2 (Indifferent to hold sin stocks) presented in Table 3. The average percentage of norm-constrained investors and market capitalizations for each stock portfolio is reported in Table 10.

Table 10.
Percentage of norm-constrained investors in sin stocks and comparable stocks.
Panel A shows the average % of norm-constrained investors for sin stocks and their comparable stocks over the period 2005-2020**.** It also shows the market capitalization of the stocks included in the analysis of norm-constrained investors, in million euros, 31st of December each year**. Panel B** presents the average share of norm-constrained investors for the subgroups of stocks over the period 2005-2020.

Panel A: Percentage of norm-constrained investors each year

	Traditional sin stocks		**Traditional comparable stocks**		**New sin stocks**		**New comparable stocks**	
Year	Norm-constr. investors	Market cap.	Norm-constr. investors	Market cap.	Norm-constr. investors	Market cap.	Norm-constr. investors	Market cap.
2005	18.90	218 292	16.29	117 568	21.44	1 021 281	9.6	10 711
2006	16.84	257 679	16.74	128 510	20.21	1 192 084	12.50	20 373
2007	16.53	289 069	16.95	133 838	19.69	1 371 203	13.45	44 858
2008	13.24	192 688	15.44	64 824	21.43	769 434	13.96	18 233
2009	17.14	250 237	23.34	81 212	22.62	1 039 396	17.42	18 034
2010	16.21	303 323	21.43	121 591	22.59	1 174 603	16.54	10 644
2011	15.95	332 152	20.96	97 939	22.01	1 176 286	15.41	5 419
2012	15.97	408 368	21.93	116 357	21.86	1 142 441	14.45	3 831
2013	17.12	452 057	23.35	136 786	21.58	1 121 739	15.15	8 983
2014	16.68	502 345	22.14	153 681	21.85	1 061 019	15.20	11 864
2015	16.88	598 696	21.82	192 028	21.05	849 833	15.20	22 686
2016	17.40	617 182	21.74	194 978	21.28	1 119 066	13.94	24 113
2017	17.33	658 713	22.10	235 194	20.45	1 231 759	16.36	26 633
2018	18.25	513 344	26.01	213 203	21.06	1 161 278	16.73	27 117
2019	18.80	628 494	25.76	218 001	21.84	1 221 669	16.76	34 315
2020	19.22	576 935	24.05	202 364	20.83	958 298	17.25	90 491

Panel B: Percentage of norm-constrained investors over the total sample period

	Sin stock	Comparable stock
Casinos and gaming	17.62	24.49
Beer and wine production	18.58	18.57
Military and defense	20.91	16.90
Tobacco production	18.81	21.10
Coal	24.12	20.47
Metals and mining incl. uranium	18.48	
Oil and gas	23.73	

As shown in Panel A of Table 10, traditional sin stocks have a lower fraction of norm-constrained investors than their comparable stocks from 2007 and onwards. For the new stocks, the relationship is the opposite, and they have higher share of norm-constrained investors than their comparable stocks for all years. From Panel B of Table 10, one can see that "Military and defense" is the group with the highest average share of norm-constrained investors of the traditional sin stocks. "Metals and mining incl. uranium" got the lowest average share of norm-constrained investors of the new sin stocks.

Fama-MacBeth regressions are done with traditional sin stocks and new sin stocks to test Hypothesis 3A: that sin stocks will have fewer norm-constrained investors than their comparable stocks. The coefficient of interest is the coefficient in front of *Sinstock*, as it expresses the differences in ownership between the sin portfolio and its comparable stocks. The results of the regression of norm-constrained investors are presented in Table 11.

Table 11.
Regressions of norm-constrained investors in sin stocks.
The table presents the results of Fama and MacBeth (1973) regressions over the period 2006-2020. The dependent variable is *NormConstr*, which is the fraction of norm-constrained investors in each stock at 31st of December that year. **Panel A** presents the results with traditional stocks. **Panel B** presents the results with traditional stocks, Military and defense excluded. **Panel C** presents the results with new stocks. **Panel D** presents the results with new stocks, Metals and mining and Uranium excluded. All variables are as described in Panel A of Table 4 in the data and methodology section. Newey and West (1987) standard errors in parentheses. ***1%, **5% and *10% significance.

	Panel A: Traditional	**Panel B: Traditional ex. Military and Defense**	**Panel C: New**	**Panel D: New ex. Metals and mining**
Sinstock	-0.0585 (0.0054)	-0.0607*** (0.050)	0.0340*** (0.0100)	0.0531*** (0.0104)
lnMrktCap	0.0164*** (0.0029)	0.0161*** (0.0030)	0.0182*** (0.0011)	0.0204*** (0.0014)
Beta	-0.0396** (0.0184)	-0.0392* (0.0188)	-0.0076*** (0.0023)	-0.0109** (0.0044)
lnMrktBook	-0.0111** (0.0050)	-0.0080 (0.0053)	-0.0192*** (0.0028)	-0.0382*** (0.0059)
STD	-0.1161 (0.0828)	-0.1044 (0.0808)	-0.0468** (0.0171)	-0.1144*** (0.0374)
Return	0.1577 (0.1511)	1.1004 (0.1493)	0.0455 (0.0390)	0.2011** (0.0914)
Constant	0.0870*** (0.0344)	0.0903** (0.0348)	0.0009 (0.0110)	-0.0002 (0.0160)
Avg. R-squared N observations	0.0413 4 603	0.0420 4 379	0.0457 5 702	0.0763 3 426

In Panel A of Table 11, the coefficient in front of *Sinstock* is not statistically significant. When leaving Military and defense out of the regression analysis in Panel B, the coefficient is statistically significant at a 1% significance level. It is negative, implying that traditional sin stocks got a lower fraction of norm-constrained investors than their comparable stocks: about 6.1% lower. This supports Hypothesis 3A, that sin stocks got fewer norm-constrained investors. The results align with previous research of Hong and Kacperczyk (2009), who found that some institutional investors are less willing to hold sin stocks because norms constrain them. This follows the beforementioned work of Becker (1971) and Akerlof (1980), and evidence from, e.g., Riedl and Smeets (2017) that some investors are willing to invest according to their social preferences despite the financial cost. The results are not statistically significant without leaving "Military and defense" out from the analysis, as they got a very high fraction of norm-constrained owners (see Panel B of Table 10). This can be explained by the screening of stocks in the group "Military and defense," where I chose to include all

stocks that had anything to do with defense – no matter if it were the primary source of activity or not.

In Panel C of Table 11, the coefficient in front of *Sinstock* is statistically significant at 1% level of significance. It is 0.0340, implying being a new sin stock yield a 3.4% higher share of norm-constrained investors. In Panel D, the coefficient is still significant at a 1% significance level, and it has increased to 0.0531. This is not as expected and contradicts both Hypothesis 3A and previous research by Hong and Kacperczyk (2009) and Bolton and Kacperczyk (2021). The results could be evidence that new sin stocks are not yet considered sinful by norm-constrained investors in some countries. Following Fauver and McDonald (2014) and Salaber (2007), religion and social norms can affect investment in sin stocks. In addition, these industries have been essential for the European economy, and they are large (as seen by the market capitalization in Panel A of Table 10). As found by, e.g., Liu et al. (2014), institutional owners tend to hold large firms, and the regression results also support this for norm-constrained investors (as I find the coefficient in front of *lnMrktCap* to be statistically significant and positive).

It is important to note that reporting obligations between Europe and the U.S. differ, as stated in the article of Blitz and Swinkels (2021). They also mention that passive investors typically track "free float adjusted" indexes, meaning that passive investors following these indexes get lower ownership in companies with higher strategic ownership. The different disclosure rules and differences in strategic ownership among countries might explain the results of the regressions of norm-constrained investors.

It could be that new sin stocks are considered more sinful over time, and renewable energy will seem like safer investments over time, but these effects are not strong enough to affect the results of the regressions here. This idea is supported by the numbers in Panel A of Table 10. The new sin stocks have high and stable market capitalizations in 2005-2020, while the comparable stocks had very low market capitalizations in early periods, with increasing market capitalizations in the last seven years. In 2020 new sin stocks had a plunge in market capitalization, while the comparable stocks had an almost 40% increase in market capitalization relative to 2019. Anyways, comparable stocks are small (both in size and number) compared to the new sin industries (see Panel A Table 10), which could affect the results. Norm-constrained investors might find it challenging to invest in renewable because

of their novelty, small scale, and lower dividend yield, as suggested by the article of Ritchie and Dowlatbadi (2015). As found by Liu et al. (2014), institutional investors might invest contrary to their social norms if the future returns are high enough. As seen from the results of return regressions in Figure 1 and Table 7, new sin stocks have a downward trend, so this explanation does not seem to hold here. Anyways, the downward trend and the growing renewable industry might contribute to a change of these results in the future.

For all panels, the coefficient in front of *lnMrktCap* is significant at a 1% significance level and positive, implying larger companies have a higher fraction of norm-constrained investors. The coefficient in front of *lnMrktBook* is statistically significant and negative in three of the regressions, indicating that higher valuation (risk of overvaluation) leads to a lower share of norm-constrained investors. The coefficient in front of *STD* is statistically significant for new sin stocks, and it is negative, implying higher volatility leads to a lower share of norm-constrained investors. These results align with Hong and Kacperczyk (2009). The coefficient in front of *Beta* is statistically significant and negative, implying increased beta yields lower norm-constrained ownership. The coefficient in front of *Return* is only statistically significant in Panel D, and it is positive, suggesting higher returns lead to a higher fraction of norm-constrained investors.

In sum, the regressions with norm-constrained investors support Hypothesis 3A for traditional sin stocks but contradict the same hypothesis for the new sin stocks. The results shed light on the research question and show differences in ownership between sin stocks and their comparable stocks. For further research, adding regressions on institutional ownership (not only on norm-constrained investors) might give more clear answers.

4.3.2 Analysis of analyst coverage

Before doing regressions with analyst coverage, it is calculated for each of the stock portfolios. The average analyst coverages and the market capitalizations for the portfolios are presented in Table 12.

Table 12.
Average analyst coverage of sin stocks and their comparable stocks.
Panel A presents the average number of analysts per stock for sin stocks and their comparable stocks, for the time period 2005-2020. It also shows the market capitalization of the stocks included in the analysis of norm-constrained investors, in million euros, 31st of December each year. **Panel B** presents the average number of analysts per stock for the subgroups of stocks, for the period 2005-2020.

Panel A: Analyst coverage each year

	Traditional sin stocks		**Traditional comparable stocks**		**New sin stocks**		**New comparable stocks**	
Year	Norm-constr. investors	Market cap.	Norm-constr. investors	Market cap.	Norm-constr. investors	Market cap.	Norm-constr. investors	Market cap.
2005	4.44	218 292	1.73	117 568	3.88	1 021 281	0.47	10 711
2006	4.64	257 679	1.84	128 510	4.08	1 192 084	0.65	20 373
2007	4.31	289 069	1.82	133 838	4.32	1 371 203	0.94	44 858
2008	4.76	192 688	1.98	64 824	4.75	769 434	1.31	18 233
2009	4.95	250 237	1.92	81 212	5.17	1 039 396	1.53	18 034
2010	5.25	303 323	1.94	121 591	5.30	1 174 603	1.35	10 644
2011	5.34	332 152	1.94	97 939	5.41	1 176 286	1.12	5 419
2012	5.10	408 368	1.95	116 357	5.38	1 142 441	0.82	3 831
2013	4.60	452 057	1.86	136 786	5.20	1 121 739	0.62	8 983
2014	4.34	502 345	1.83	153 681	5.06	1 061 019	0.60	11 864
2015	4.26	598 696	1.83	192 028	4.78	849 833	0.68	22 686
2016	4.28	617 182	1.72	194 978	4.22	1 119 066	0.78	24 113
2017	4.19	658 713	1.76	235 194	3.69	1 231 759	0.95	26 633
2018	3.88	513 344	1.59	213 203	3.33	1 161 278	0.96	27 117
2019	3.76	628 494	1.71	218 001	3.36	1 221 669	0.99	34 315
2020	3.98	576 935	1.65	202 364	2.86	958 298	1.58	90 491

Panel B: Analyst coverage over the total sample period

	Sin stocks	**Comparable stocks**
Casinos and gaming	3.11	1.43
Beer and wine production	3.78	3.22
Military and defense	6.76	2.23
Tobacco production	4.81	2.04
Coal	1.42	0.96
Metals and mining incl. uranium	2.52	
Oil and gas	4.2	

In Panel A of Table 12, sin stocks, on average, got a higher analyst coverage than the no-sin stocks. In Panel B, one can see that "Military and defense" and "Tobacco production" got higher analyst coverage than their comparable stock: approximately 180% and 136%. The new comparable stocks (renewable) got a lower analyst coverage than the sin stocks.

Fama-MacBeth regressions are done with traditional sin stocks and new sin stocks to test Hypothesis 3B: that sin stocks got lower analyst coverage than their comparable stocks. The coefficient of interest is the coefficient in front *Sinstock*, which expresses the differences in ownership between the sin portfolio and its comparable stocks. The results of the regressions of analyst coverage are presented in Table 13.

Table 13.
Regressions of analyst coverage of sin stocks.

The table presents the results of a regression using the methodology of Fama and MacBeth (1973). The dependent variable is *lnAC,* which is the natural logarithm of 1+number of analysts covering the stock. **Panel A** presents the results from a cross-section regression with traditional stocks, over the period 2006-2020. **Panel B** shows the results from the same regression as Panel 1, where the two groups "Military and defense" and "Tobacco production" is excluded from the analysis. **Panel C** is the results from a regression of the new stocks, over the period 2006-2020. **Panel D** shows the same as Panel C, but for the period 2015-2020. All variables are as described in Panel A of Table 4 in the data and methodology section. Newey and West (1987) standard errors in parentheses. ***1%, **5% and *10% significance.

	Panel A: Traditional	**Panel B: Traditional ex. Defense and Tobacco**	**Panel C: New**	**Panel D: New 2015-2020**
Sinstock	0.1596***	0.1191***	0.0195	-0.0189
	(0.0332)	(0.0309)	(0.0267)	(0.0361)
lnMrktCap	0.3461***	0.3475***	0.1108***	0.0869***
	(0.0060)	(0.0065)	(0.0098)	(0.0046)
Beta	0.2070***	0.2042***	0.0309***	0.0162**
	(0.0509)	(0.0559)	(0.0069)	(0.0050)
lnMrktBook	-0.0582***	-0.0623***	0.0047	-0.0053
	(0.0108)	(0.0108)	(0.0069)	(0.0050)
STD	1.0983***	1.1138***	0.1451**	0.1444*
	(0.1690)	(0.1825)	(0.0530)	(0.0625)
Return	-2.3238***	-2.2033***	-0.5116***	-0.4729**
	(0.4033)	(0.4506)	(0.1659)	(0.1665)
Constant	-3.4012***	-3.3363***	-1.0048***	-0.7360***
	(0.0750)	(0.0668)	(0.1070)	(0.0564)
Avg. R-squared	0.6411	0.6170	0.2745	0.2288
N observations	4 652	4 300	4 359	2 032

As seen in Panel A and Panel B of Table 13, the coefficient in front of *Sinstock* is statistically significant at a 1% level of significance and positive. This implies that being a traditional sin stock yields a higher analyst coverage: about 16% higher in Panel A and about 12% higher in Panel B. For the new sin stocks, the coefficient is not statistically significant in either Panel C or Panel D, implying no significant difference in analyst coverage between new sin stocks and their comparable stocks. For the traditional sin stocks, the results contradict what was expected in Hypothesis 3B and Hong and Kacperczyk (2009), who found an approximately 14% lower analyst coverage for sin stocks.

The contradictive results might be explained by differences in what is considered sinful in different countries, as explained earlier. Ownership structure could also be an explanation for the results. In the U.S., ownership is more dispersed, while in Europe, there are larger shareholders, as found in the study by ECGN (Barca & Becht, 2001). Firms with large shareholders would leave fewer floating stocks, which might mean these firms are of less interest to sell-side analysts.

The coefficient in front of *lnMrktCap* is positive and statistically significant for all panels at a 1% significance level, implying that having a larger market capitalization leads to higher analyst coverage. The coefficient in front of *STD* is statistically significant in all panels, and it is positive, which implicates that having higher volatility yields a higher analyst coverage. The coefficient in front of *Return* is statistically significant for all panels, and it is negative, implying increased return leads to lower analyst coverage. These findings are in line with Hong and Kacperczyk (2009).

4.4 Who invests in sin stocks?

A descriptive analysis is done of the investors in sin stocks. Data on investment orientation, investor types, and investment style are retrieved, and most frequent investors are found. The analysis is done to investigate Hypothesis 4 if most investors in sin stocks are passive and active investment managers, hedge funds, and individuals. Detailed results tables are presented below (Table 16 to 18). I choose to work with "Top ten investors," e.g., the ten investors holding the highest percentage of the stock, for each of the stocks. The characteristics of the final data set are presented in Table 14.

Table 14.
Characteristics of sin stocks for descriptive analysis.
Panel A shows the number of stocks in each group after limiting data to only include the top ten investors for each sin stock. **Panel B** shows the number of unique investors in each group. Investor coverage is how much of a stock the investors in the final data set hold on average.

Panel A: Number of stocks

Activity	Number of stocks initially	Number of stocks after limiting data
Arms, military and defense	56	27
Beer and wine production	93	63
Casinos and gaming	42	35
Tobacco production	27	9
Coal	35	16
Metals and mining	350	251
Oil and gas	329	264
Uranium	6	4
Total	*938*	*669*

Panel B: Unique investors and investor coverage

Activity	Number of unique investors	Investor coverage (%)
Arms, military and defense	125	52.10
Beer and wine production	334	68.02
Casinos and gaming	237	60.30
Tobacco production	50	56.40
Coal	100	74.30
Metals and mining	1374	57.06
Oil and gas	1348	57.35
Uranium	31	55.74

The results from analyzing the most repeated investors in each group of sin stocks are presented in Table E1 of Appendix E. The tables show that traditional sin stocks got more active investors than new sin stocks among the most frequent investors, "Oil and gas" having the highest frequency of passive investors. Some of the largest investment managers are also

some of the most frequent investors in sin stocks, and governments are frequent investors in the oil and gas sector. NBIM, as the only sovereign wealth fund, is present in all industries except the tobacco and coal industry.

I analyze the distribution of active and passive investors in each of the sin stock groups, and the results are reported in Table 15. A summary is found in Table D1 in Appendix D.

Table 15.
Distribution of active and passive investors.
The table shows the number of passive and active investors for each group of sin stocks, with % of total in parentheses. The numbers are from February 2021. The investors where no data were available, have "null".

	Military and defense	**Beer and wine production**	**Casinos and gaming**	**Tobacco production**	**Coal**	**Metals and mining**	**Oil and gas**	**Uranium**
Active	77 (61.6)	160 (47.9)	100 (42.2)	31 (62.0)	43 (38.7)	289 (21.0)	964 (44.6)	14 (45.2)
Passive	42 (33.6)	78 (23.4)	55 (23.2)	14 (28.0)	34 (30.6)	410 (29.8)	708 (32.8)	8 (25.8)
Null	6 (4.8)	96 (28.7)	82 (34.6)	5 (10.0)	34 (30.6)	675 (49.1)	490 (22.7)	9 (29.0)
Total	*125 (100)*	*334 (100)*	*237 (100)*	*50 (100)*	*111 (100)*	*1374 (100)*	*2162 (100)*	*31 (100)*

As seen from Table 15, "Military and defense" is the one group with the highest percentage of active owners, with 61.6%. "Metals and mining" is the group with the lowest percentage of active owners, with 21%, and this group also got a high percentage of investors not categorized ("Null"). All groups have passive ownership between 23% to 34%, "Military and defense" being the largest here as well. Only 4.8% of owners are categorized as "Null" in this group.

For all sin stocks, two passive asset managers are present in all groups: BlackRock Institutional Trust Company (BlackRock hereafter) and The Vanguard Group (see Appendix E). This is not surprising as they are a part of the Big Three, mentioned in the study of Bebchuk and Hirst (2019). The same study suggests a growth of index fund managers, which implies an increase in passive investors. The Big Three were also the largest passive owners in the study on tobacco stocks by Blitz and Swinkels (2021).

Most of the other investors in traditional sin stocks are active. Capital Research Global Investors (Capital Research hereafter) and Fidelity Management and Research Company LLC and Fidelity International (Fidelity Investments hereafter) are the most repeated investment

advisors of the active. Traditional sin stocks are perceived to be resilient investments, both undervalued and with excess returns. This might explain why they are part of many active investor's portfolios, e.g., growth- and value funds. This aligns with Blitz and Swinkels (2021) findings on tobacco stocks that 9 out of the top 10 active asset managers take an active bet on tobacco stocks.

When looking at new sin stocks, they have a higher frequency of passive owners than active owners. As presented earlier the new sin industries' market capitalization is large compared to the traditional sin companies (see Table 10). Thus, the new sin stocks might be a part of indexes and more invested by passive investors. This follows Blitz and Swinkels (2021) logic on tobacco stocks, suggesting that passive managers predominantly replicate broad indices. Previous literature does not imply that new sin stocks generate excess returns or are undervalued (though the latter is indicated in my results), which would attract active investors. This might explain why new sin stocks have fewer active investors than traditional sin stocks.

I analyzed the distribution of various investor types (e.g., investment managers, corporations, sovereign wealth funds) in the different groups of sin stocks, and Table 16 reports the results. A summary is found in Table D2 in Appendix D.

Table 16.
Distribution of the various investor types.
The table presents the results from analyzing the different investor types in the various groups of sin stocks. The numbers are from February 2021, and are given in number of investors, with % of total in parentheses.

	Military and defense	**Beer and wine production**	**Casinos and gaming**	**Tobacco production**	**Coal**	**Metals and mining**	**Oil and gas**	**Uranium**
Bank and trust	1 (0.80)	5 (1.50)	2 (0.84)			8 (0.58)	29 (2.15)	
Corporation	20 (24.0)	69 (20.66)	41 (17.3)	8 (16.0)	22 (22.0)	374 (27.2)	399 (29.6)	7 (22.58)
Government agency	4 (3.20)	1 (0.30)	2 (0.84)		1 (1.00)	9 (0.66)	20 (1.48)	
Hedge fund	2 (1.60)	2 (0.60)	5 (2.11)	1 (2.00)		9 (0.66)	30 (2.23)	1 (3.23)
Holding company		1 (0.30)	4 (1.69)			5 (0.36)	21 (1.56)	
Independent research firm						1 (0.07)	1 (0.07)	
Individual investor	2 (2.40)	82 (24.6)	77 (32.5)	4 (8.00)	29 (29.0)	657 (47.8)	455 (33.8)	9 (29.03)
Insurance company	1 (0.80)	2 (0.60)			1 (1.00)	3 (0.22)	3 (0.22)	
Investment advisor	37 (29.6)	91 (27.25)	54 (22.8)	16 (32.0)	25 (25.0)	169 (12.3)	217 (16.1)	7 (22.6)
Investment advisor/hedge fund	32 (25.6)	55 (16.5)	37 (15.6)	20 (40.0)	15 (15.0)	88 (6.40)	115 (8.53)	7 (22.6)
Other insider investor	3 (2.4)	14 (4.19)	5 (2.11)	1 (2.00)	2 (2.00)	18 (1.31)	9 (0.67)	
Pension fund	8 (6.40)	6 (1.80)	3 (1.27)		2 (2.00)	17 (1.24)	27 (2.00)	
Private equity	2 (1.60)	4 (1.20)	1 (0.42)			6 (0.44)	11 (0.82)	
Research firm			4 (1.69)		1 (1.00)	4 (0.29)	6 (0.45)	
Sovereign wealth found	1 (0.80)	1 (0.30)	2 (0.84)		1 (1.00)	4 (0.29)	4 (0.30)	
Venture capital	1 (0.80)	1 (0.30)			1 (1.00)	2 (0.15)	1 (0.07)	

As seen from Table 16, most investors are of types “Corporation,” “Individual investors,” “Investment advisor,” and “Investment advisor/hedge fund.” The four groups make up, on average, a total of respectively 22.4%, 25.9%, 23.5%, and 18.8%.

“Oil and gas,” “Metals and mining,” and “Military and defense” are the three groups with the highest share of corporations, “Oil and gas” having almost 23%. The new sin stocks have the highest percentage of individual investors, “Metals and mining” having a share of nearly 50%. Investment advisors and investment advisors/hedge funds make up a total share of 72% in “Tobacco production” and around 55% in “Military and defense.” All the other investor types make up relatively small shares of the investors in sin stocks, with types like “Sovereign wealth fund,” “Insurance company,” and “Bank and trust” making up less than 1% on average each. “Pension fund” makes up about 1.8% on average.

The presented investor types align with theory and earlier predictions that investment advisors and hedge funds are among the top three most repeated investor types. Investment managers are growing, as explained by three drivers in Bebchuk and Hirst (2019): First, there has been an increase in institutional owners. Second, institutional investments in index funds have increased because they have advantages (compared to active funds) as low costs and higher returns. Third, there is a concentration of the index funds sector due to, e.g., economies of scale and the natural barriers of entry. This is further supported by the findings of Gârelanu and Pedersen (2019). This might explain why investment advisors and hedge funds are generally large owners in sin stocks. The results also follow the expectations of these investors to be less norm-constrained found in the article of Hong and Kacperczyk (2009).

When looking at investor types in new sin stocks, investment managers and hedge funds are the most repeated investors, backed by Benz et al. (2020). Anyways, their study found that mutual funds, investment advisors, and individuals are more hesitant to hold carbon-intensive stocks. This might explain the difference in investor types between traditional sin stocks and new sin stocks. New sin stocks got fewer investment advisors and hedge funds than the traditional sin stocks because of the investors´ hesitance towards holding carbon-intensive stocks. Even though they are the most repeated investors, the development of today with increased climate risk and focus on GHG emissions might lead them to be more reluctant to invest in new sin stocks (compared to traditional sin stocks).

Government agencies have little ownership in my results, but the chosen methodology might explain this. My results are based on the frequency of the investors, i.e., how many times they are repeated. As Benz et al. (2020) stated, government agencies are often invested in selected firms and are not widely spread. I put government agencies in the “norm-constrained group,”

arguing that governments are publicly scrutinized and are more likely to avoid these stocks. This is in line with the arguments of Hong and Kacperczyk (2009). Anyways, possible country differences in social norms, affected by differences in, e.g., religion and the economic importance of the industry, might explain why governments are large owners in these stocks. This argument follows the results of Salaber (2007), Liu et al. (2014), and Fauver and McDonald (2014).

In my analysis, I have put "corporation" into the group of investors less willing to hold sin stocks. At first glance, this is not in line with the results of the descriptive analysis, as corporations make up around 30% of investors in sin stocks. The results could be explained by further research of investors in sin stocks: "corporation" is a mix of investment managers, holding companies, and different types of corporations. As Goergen (2018) reported, both industrial companies and holding companies are the largest shareholders in European countries. Anyways, the ambiguity of the group affects the results and must be taken into consideration. This might also explain why new sin stocks got a higher share of norm-constrained investors in the regression analysis (see Table 11).

Individual investors also make up a large part of investors in sin stocks. This is not in line with what one would expect from the general theories on social norms, and do not follow Benz et al. (2020) who found individual investors to be small investors and more reluctant to holding carbon-intensive stocks. The high share of individual investors might be explained by investing in traditional sin stocks to be relatively sound investments. In addition, sin industries are essential industries in Europe that employ many people and create economic value. This might also explain that new sin stocks have a larger share of individual owners than traditional sin stocks, e.g., as oil and gas employ many people who might feel investing in these stocks is not morally wrong (maybe even the opposite). That intrinsic social preferences affect investing is supported by Riedl and Smeets (2017). As Europe is a market with people of different cultures and religions, this might also affect the results, as suggested earlier.

Sin stocks have a small share of norm-constrained investors like banks and trust, insurance companies, and pension funds. This is supported by the research of, e.g., Hong and Kacperczyk (2009), Blitz and Swinkels (2021), and Benz et al. (2020).

Norges Bank Investment Management (NBIM) is present in all groups except tobacco production and coal, as the only sovereign wealth fund in "top 10 most repeated investors". Sovereign wealth funds are often considered more norm-constrained and expected to avoid investing in these stocks, e.g., in the study by Hong and Kacperczyk (2009). NBIM focuses on responsible investments and set expectations to the companies they invest through several expectation documents covering, e.g., climate change, and exert ownership through shareholder voting (NBIM, 2019).

Several studies support the NBIM strategy of being more active owners in sin stocks. The effectiveness of excluding sin stocks from portfolios is questionable, as presented in the article of Blitz and Swinkels (2020). In addition, shunning sin stocks can be costly, as supported by Geczy et al. (2005) and Hong and Kacperczyk (2009). Being engaged in corporate governance has proven beneficial, especially by firms with bad ESG scores, as suggested by Gerard (2019) and Chen et al. (2020). In addition, Dyck et al. (2019) conclude that only European institutional ownership leads to better E&S scores, not from other geographic regions. Following the logic that sin stocks are "bad," at least the social and environmental part of ESG, this implies that active engagement in European sin stocks might be beneficial.

NBIM, BlackRock, The Vanguard Group, and Fidelity Investments are all PRI signatories and might follow some of the same strategies mentioned above. This is supported by Fisch et al. (2020), who finds that passive investors indeed influence corporate governance. Being PRI signatories has also shown effectiveness in increasing ESG footprints, according to the article of Gibson et al. (2020). This could be an additional explanation for why these investment managers invest in sin stocks, or at least why they do not seem to shy away from these stocks. Anyways, this "active engagement" has proven to have questionable effects, as found by Groot et al. (2021), and also Dyck et al. (2019) – which find a positive link for pension plans, but not for hedge funds. Gibson et al. (2020) conclude that investors join the PRI for both societal and commercial reasons, suggesting that there is more to ESG engagement than just the aspect of doing good.

As a final analyze on investors in sin stocks, I look at the different investment styles (e.g., growth, index, and core value) of the investors in the various groups of sin stocks. The results are presented in Table 17. A summary is found in table D3 in Appendix D.

Table 17.
Distribution of the various investment style of investors.

The table presents the results from analyzing the different investor investment styles in the various groups of sin stocks. The numbers are from February 2021. The results are presented as number of investors, with % of total in parentheses. No data available is presented as null or N/A.

	Military and defense	**Beer and wine production**	**Casinos and gaming**	**Tobacco production**	**Coal**	**Metals and mining**	**Oil and gas**	**Uranium**
Aggres. Gr.		1 (0.30)	1 (0.42)	1 (2.00)	1 (1.00)	5 (0.36)	3 (0.22)	
Broker-Dealer			4 (1.69)			3 (0.22)	6 (0.45)	
Core growth	23 (18.4)	41 (12.28)	27 (11.4)	7 (14.0)	5 (5.00)	45 (3.28)	57 (4.23)	3 (9.68)
Core value	15 (12.0)	31 (9.28)	15 (6.33)	6 (12.0)	10 (10.0)	51 (3.71)	74 (5.49)	4 (12.9)
Deep value	6 (4.80)	4 (1.20)	5 (2.11)	4 (8.00)	1 (1.00)	10 (0.73)	13 (0.96)	
GARP	10 (8.00)	26 (7.78)	12 (5.06)	6 (12.0)	5 (5.00)	39 (2.84)	47 (3.49)	1 (3.23)
Global Macro					1 (1.00)			
Growth	6 (4.80)	10 (2.99)	6 (2.53)	2 (4.00)	1 (1.00)	22 (1.60)	24 (1.78)	1 (3.23)
Hedge fund	5 (4.00)	6 (1.80)	7 (2.95)	2 (4.00)		17 (1.24)	51 (3.78)	2 (6.45)
Income value		1 (0.30)	1 (0.42)	1 (2.00)		2 (0.15)	4 (0.30)	
Index	7 (5.60)	4 (1.20)	2 (0.84)	4 (8.00)	6 (6.00)	17 (1.24)	17 (1.26)	1 (3.23)
Long/short						4 (0.29)	2 (0.15)	
Market neutral						1 (0.07)		
Mixed style						1 (0.07)	1 (0.07)	
Momentum		1 (0.30)				1 (0.07)		
Sector specific		1 (0.30)	1 (0.42)			3 (0.22)	2 (0.15)	
Specialty	1 (0.80)	2 (0.60)	1 (0.42)			2 (0.15)	2 (0.15)	1 (3.23)
VC/Private equity	2 (1.60)	5 (1.50)	2 (0.84)		2 (2.00)	11 (0.80)	14 (1.04)	
Yield		1 (0.30)	1 (0.42)		1 (1.00)	4 (0.29)	5 (0.37)	
Null	50 (40.0)	200 (59.9)	152 (64.1)	17 (34.0)	66 (66.0)	1134 (82.53)	1024 (76.0)	18 (58.1)
N/A					1 (1.00)	2 (0.15)	2 (0.15)	

As seen from Table 17, the investment styles being most frequent are “Core growth” and “Core value,” making up on average 9.8% and 9%, respectively. “Deep value,” “Index,” “Growth,” and “Hedge fund” make up 2.4%, 3.6%, 2.7%, and 3% on average, respectively. “Military and defense” got the highest share of investors with style core growth (18.4%). “Uranium” and “Military and defense” got the highest share of investors with investment style core value, with about 12%. Note the large percentage of “Null,” meaning investors where the investment style is not clear.

The analysis results from investment style fit well with theory, as investment styles of core growth, core value, growth, hedge fund, and GARP all take advantage of the different aspects of sin stocks. Core growth and growth will benefit from sin stocks being resilient and provide high returns (with higher risk). Core value will benefit from the expected undervaluation of these stocks. Hedge fund uses sin stocks as part of their hedging strategies, and GARP will balance growth- and value investing. Index strategy will follow the different market indices, in which much of the sin stocks will be a part.

The results from my analysis of investors in sin stocks support Hypothesis 4 that most investors are investment managers, corporations, and individuals. It sheds some light on the research question of who invests in sin stocks and says something about the investment style of these investors.

5. Conclusions and implications

5.1 Conclusions

The results in this thesis shed light on some characteristics of sin stocks on the European market. The traditional sin stocks alcohol and tobacco production, casinos and gaming, and military and defense have excess returns over market returns in CAPM and Fama-French three-factor models, and they outperform their comparables at the beginning of the sample period. This is evidence of them being considered sinful. They are less held by norm-constrained investors, which further supports this. Decreasing returns and undervaluation in the industries of oil and gas, coal, metals and mining, and uranium are evidence of the development of new sin industries. These industries are more held by norm-constrained investors, which contradicts them being sinful.

The investors in sin stocks are diverse, and the most frequent investors in these stocks are investment managers, corporations, and individuals. The investors have different reasons to invest in sin stocks, and characteristics such as social norms, religion, and ownership structure matter, in combination with possible financial gains. Having to assess all these factors suggests that it is hard to define what is sinful for the European market as a whole and might be evidence of Europe being a segmented market.

Further research should be done to get a more comprehensive picture of sin stocks on the European market. Analyzes with a broader or narrower definition of sin industries and variables that control for country characteristics such as religion and social norms could be considered. Investors´ motivations for investing in sin stocks (e.g., social norms vs. financial gains) and how investors affect the corporate governance in sin firms might be areas to investigate more closely.

5.2 Policy implications

My analyses suggest that the costs of divesting sin industries will differ between countries in Europe. This should be taken into account when doing research on the subject and forming policies, e.g., taxation and climate policies in the E.U. The new sin industries employ many people in Europe, and the workers in carbon-intensive industries will experience that their jobs are less safe and less desirable. Policymakers should be aware of the downward trend for the new sin industries and use the apparent change in social norms to ensure a smoother shift

in the labor market towards the renewable sector. For investors, adopting new climate policies could affect investing. It might lead to short-term losses as investors “panic” and long-term losses because changing social norms lead to decreased demand. The results of this thesis also imply investors can “do well by doing good,” i.e., investing in green stocks might be financially beneficial. In sum, the findings suggest that market participants and stakeholders should consider social norms in their decision-making.

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Appendices

Appendix A. Characteristics of sin stocks and no-sin stocks on the European market

Table A1 presents the characteristics of the sin stocks and no-sin stocks in the entire European market, which is the basis for the data collection in this thesis.

Table A1.
Characteristics of sin stocks and the European market.

Comparison of traditional and new sin stocks to no-sin stocks for the entire European market, from December 2005 to December 2020. The numbers are on an annual basis. **Panel A** shows the number of sin stocks and the number of no-sin stocks for each year, based on the first trade date (first date when Refinitiv are storing pricing data, usually the date of an Initial Public Offering). **Panel B** shows the average size of the stocks, represented as market capitalization (market price year-end times shares outstanding), in million euros. **Panel C** shows the median firm size, in million euros.

	Panel A: Number of stocks			**Panel B: Average size**			**Panel C: Median size**		
Year	Traditional sin	New sin	No sin	Traditional sin	New sin	No sin	Traditional sin	New sin	No sin
2005	93	235	3 268	3 118	5 058	1 889	114	121	98
2006	99	276	3 571	3 272	4 846	2 084	95	152	114
2007	104	307	3 941	3 777	4 836	2 008	117	127	112
2008	105	321	4 141	2 508	2 587	1 028	84	52	46
2009	107	327	4 224	3 095	3 384	1 297	81	59	54
2010	108	351	4 417	3 752	3 643	1 408	97	91	61
2011	111	382	4 657	3 887	3 370	1 184	100	78	51
2012	115	399	4 842	4 900	3 125	1 367	108	65	52
2013	119	410	5 060	5 052	2 920	1 632	107	66	63
2014	121	428	5 370	5 443	2 654	1 666	137	56	69
2015	129	449	5 752	5 687	2 114	1 749	171	42	79
2016	133	459	6 069	5 514	2 725	1 640	214	51	75
2017	135	478	6 513	5 852	2 890	1 755	268	57	87
2018	138	502	6 873	4 525	2 625	1 500	248	46	76
2019	139	512	7 151	5 351	2 777	1 761	247	48	80
2020	141	521	7 439	4 782	2 105	1 753	170	41	81

Appendix B. Summary statistics

A summary of the statistics of regression variables are presented in Table B1.

Table B1.
Summary statistics.

The table reports summary statistics for the variables used in the regressions. **Panel A** reports the summary statistics for the time series return regressions. **Panel B** reports the summary statistics for the time series return regressions with rolling windows. **Panel C** and **Panel D** present summary statistics for Fama-MacBeth return regressions for traditional and new sin stocks. **Panel E** and **Panel F** reports the summary statistics for valuation regressions for traditional and new sin stocks. **Panel G** and **Panel H** shows summary statistics for regressions with norm-constrained investors for traditional and new sin stocks. **Panel I** and **Panel J** reports the summary statistics for regressions with analyst coverage for traditional and new sin stocks. All variables are as described in Panel A of Table 4 in the data and methodology section.

Panel A: Time-series return regressions 2006-2020

Variable	Mean	Median	Standard deviation	Number of observations	10th percentile	90th percentile
TradSinRF (%)	0.94	1.08	4.43	180	-5.19	5.77
NewSinRF (%)	0.72	0.72	5.88	180	-6.43	7.02
MrktRF (%)	0.53	0.69	5.56	180	-5.35	6.41
SMB (%)	0.18	0.21	1.85	180	-2.05	2.33
HML (%)	-0.24	-0.34	2.55	180	-3.39	2.70
RMW (%)	0.39	0.50	1.54	180	-1.65	2.35
CMA (%)	-0.075	-0.085	1.42	180	-1.83	1.56

Panel B: Time-series return regressions (rolling windows) 2006-2020

Variable	Mean	Median	Standard deviation	Number of observations	10th percentile	90th percentile
TradSinComp (%)	-0.18	-0.23	4.35	180	-5.15	4.95
NewSinComp (%)	-1.39	-0.54	8.49	180	-12.6	8.19
TotSinComp (%)	-0.80	-0.75	5.22	180	-7.14	5.19
MrktRF (%)	0.53	0.69	5.56	180	-5.35	6.41
SMB (%)	0.18	0.21	1.85	180	-2.05	2.33
HML (%)	-0.24	-0.34	2.55	180	-3.39	2.70
RMW (%)	0.39	0.50	1.54	180	-1.65	2.35
CMA (%)	-0.075	-0.085	1.42	180	-1.83	1.56

Panel C: Fama-MacBeth return regressions with traditional sin stocks 2006-2020

Variable	Mean	Median	Standard deviation	Number of observations	10th percentile	90th percentile
ReturnRF (%)	1.42	-0.01	63.0	44 332	-11.3	12.8
lnMrktCap1 (10^6)	4.67	4.52	2.46	44 329	1.60	7.96
lnMrtkBook1	0.44	0.43	1.05	42 512	-0.80	1.67
Return1 (%)	2.02	0	94.5	44 332	-11.6	13.1
Beta1	0.66	0.57	7.62	44 332	0.031	1.33
Turnover1 (10^3)	5 029	31.5	19 476	44 332	0.60	8 566

Panel D: Fama-MacBeth return regressions with new sin stocks 2006-2020

Variable	Mean	Median	Standard deviation	Number of observations	10th percentile	90th percentile
ReturnRF (%)	2.81	-0.89	449	61 853	-18.9	19.0
lnMrktCap1 (10^6)	4.47	4.07	2.69	61 845	1.30	8.28
lnMrtkBook1	0.21	0.18	1.15	59 282	-1.08	1.52
Return1 (%)	2.83	-0.91	449	61 853	-19.0	19.1
Beta1	0.96	.94	7.43	61 853	0.01	1.99
Turnover1 (10^3)	9 886	77.4	46 331	61 853	2.1	15 275

Panel E: Valuation regressions with traditional sin stocks

Variable	Mean	Median	Standard deviation	Number of observations	10th percentile	90th percentile
lnMrktBook	0.38	0.40	1.02	3 713	-0.82	1.56
lnPriceEarn	2.96	2.86	1.02	3 736	1.97	4.14
lnMrktCap (10^6)	4.78	4.64	2.43	3 736	1.93	7.99
ROE (%)	12.18	8.39	75.31	3 736	-4.19	28.4

Panel F: Valuation regressions with new sin stocks

Variable	Mean	Median	Standard deviation	Number of observations	10th percentile	90th percentile
lnMrktBook	0.27	0.23	0.88	3 098	-0.73	1.31
lnPriceEarn	2.80	2.65	1.32	3 111	1.52	4.32
lnMrktCap (10^6)	5.72	5.65	2.51	3 119	2.51	8.99
ROE (%)	-11.1	2.65	1.32	3 111	1.52	4.32

Panel G: Regressions of norm-constrained investors in traditional sin stocks 2006-2020

Variable	Mean	Median	Standard deviation	Number of observations	10th percentile	90th percentile
NormConstr (%)	21.9	5.49	29.8	4 781	0	74.6
lnMrktCap	11.3	11.1	2.51	4 781	8.32	4.6
Beta	0.59	0.53	1.06	4 781	-0.016	1.30
lnMrktBook	0.32	0.35	1.14	4 603	-1.05	1.61
STD	0.14	0.085	0.81	4 781	0.039	0.20
Return (%)	1.77	0.64	28.0	4 781	-3.37	5.14

Panel H: Regressions of norm-constrained investors in new sin stocks 2006-2020

Variable	Mean	Median	Standard deviation	Number of observations	10th percentile	90th percentile
NormConstr (%)	22.1	10.8	26.5	5 966	0	66.3
lnMrktCap	11.34	10.93	2.59	5 965	8.28	15.02
Beta	0.97	.92	1.75	5 966	-0.01	1.98
lnMrktBook	0.22	0.18	1.17	5 717	-1.08	1.57
STD	0.85	0.14	46.8	5 966	0.063	0.33
Return (%)	24.2	0.29	1 652	5 966	-6.51	8.18

Panel I: Regressions of analyst coverage of traditional sin stocks 2006-2020

Variable	Mean	Median	Standard deviation	Number of observations	10th percentile	90th percentile
lnAC	0.77	0	1.04	4 831	0	2.56
lnMrktCap (10^6)	11.28	11.07	2.50	4 831	8.32	14.56
Beta	0.59	0.52	1.06	4 831	-0.016	1.30
lnMrktBook	0.33	.36	1.15	4 652	-1.05	1.63
STD	0.14	0.085	0.81	4 831	0.029	0.20
Return (%)	1.77	0.63	27.9	4 831	-3.36	5.15

Panel J: Regressions of analyst coverage of new sin stocks 2006-2020

Variable	Mean	Median	Standard deviation	Number of observations	10th percentile	90th percentile
lnAC	0.98	0.69	1.14	6 079	0	2.89
lnMrktCap (10^6)	11.32	10.91	2.60	6 078	8.25	15.02
Beta	0.97	0.92	1.75	6 079	-0.012	1.99
lnMrktBook	0.24	0.19	1.19	5 818	-1.08	1.59
STD	0.84	0.14	46.36	6 079	0.062	0.33
Return (%)	23.8	0.28	1 637	6 079	-6.52	8.20

Appendix C. Results of rolling return regressions using CAPM and Fama-French five-factor model

Figures C1 below show the alpha and 95% confidence intervals obtained using CAPM.

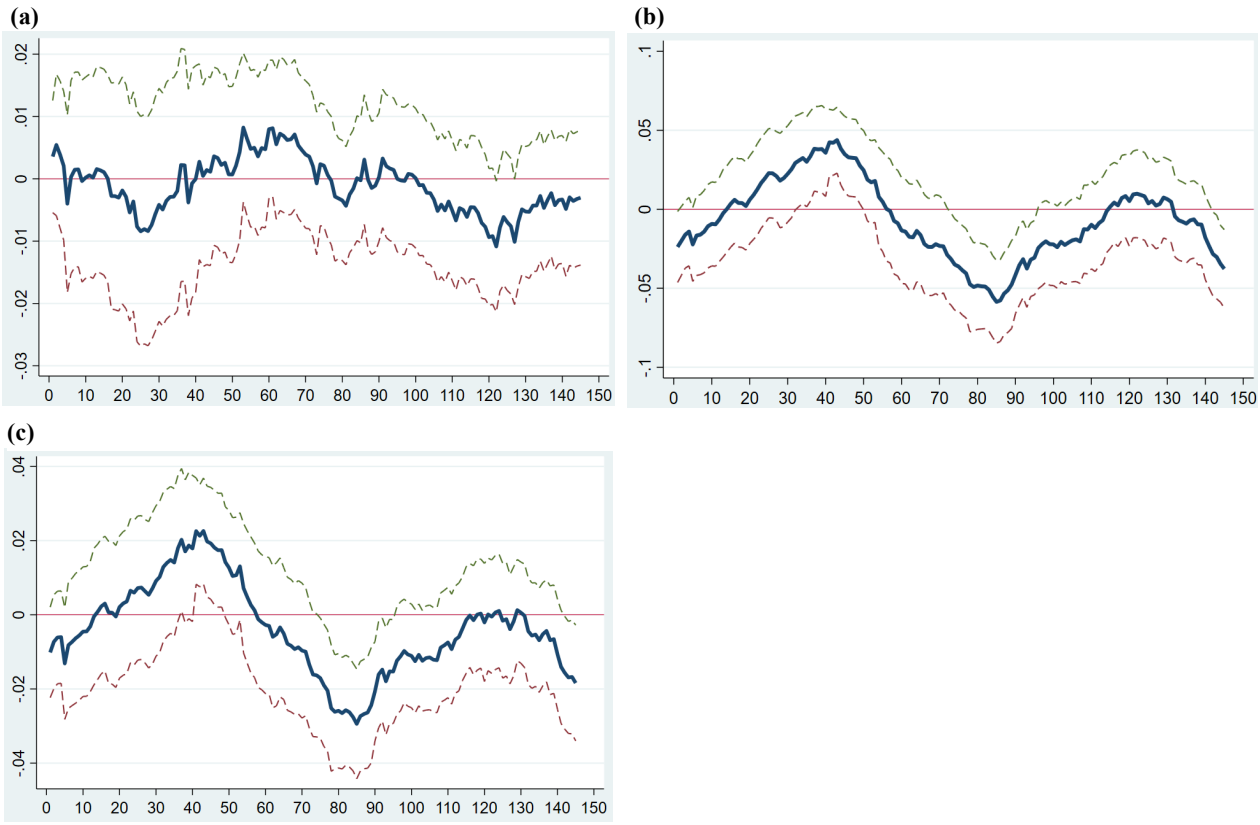

Figure C1. Return performance of sin stocks (rolling regressions) using CAPM. The figure shows the alphas (blue line) obtained from time-series regressions of returns of value-weighted portfolios, for January 2006- December 2020. The regressions are done on rolling 3 years (36 months) periods which yields 145 rolling periods. The X-axis represents the rolling periods and the Y-axis the value of alpha and confidence intervals. The 95% confidence intervals are presented as green and red lines. In Plot a, the dependent variable is *TradSinComp,* which is the returns of a an equal-weighted portfolio long traditional sin stock and short comparable stock. In Plot b, the dependent variable is *NewSinComp,* which is the returns of an equal-weighted portfolio long new sin stock and short comparable stock. In Plot c the dependent variable is *TotSinComp,* which is the returns of an equal-weighted portfolio long total (traditional and new) sin stocks and short total (traditional and new) comparable stock.

Figure C2 show alpha and 95% confidence intervals, using the Fama-French five-factor model.

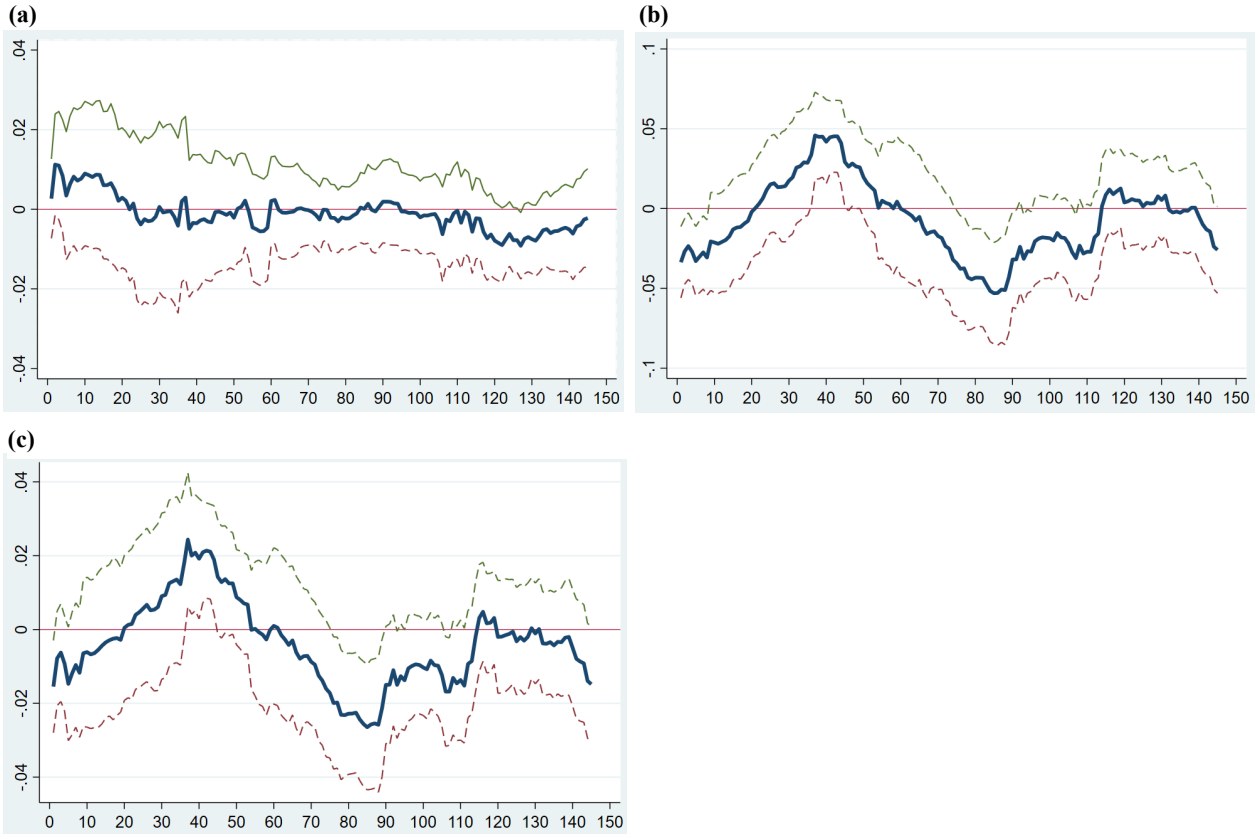

Figure C2. Return performance of sin stocks (rolling regressions) using Fama-French five-factor. The figure shows the alphas (blue line) obtained from time-series regressions of returns of value-weighted portfolios, for January 2006- December 2020. The regressions are done on rolling 3 years (36 months) periods which yields 145 rolling periods. The X-axis represents the rolling periods and the Y-axis the value of alpha and confidence intervals. The 95% confidence intervals are presented as green and red lines. In Plot a, the dependent variable is *TradSinComp,* which is the returns of a an equal-weighted portfolio long traditional sin stock and short comparable stock. In Plot b, the dependent variable is *NewSinComp,* which is the returns of an equal-weighted portfolio long new sin stock and short comparable stock. In Plot c the dependent variable is *TotSinComp,* which is the returns of an equal-weighted portfolio long total (traditional and new) sin stocks and short total (traditional and new) comparable stock.

Appendix D. Summary tables of descriptive analysis of investors in sin stocks

The results of the descriptive analysis of investor investment orientation in traditional and new sin stocks are presented in Table D1.

Table D1.
Investment orientation of investors in sin stocks.
The table presents the results from analyzing the investment orientation of investors in sin stocks. The numbers are from February 2021. The investors are either active or passive, or no data was available (null). It shows both the number of investors and their frequency (%). **Panel A** presents the traditional sin stocks, **Panel B** the new sin stocks, and **Panel C** both the traditional and new sin stocks. Total averages are calculated using unique investors in the total sample of traditional and new sin stocks.

	Panel A: Traditional		**Panel B: New**		**Panel C: Total**	
	Number of unique investors	**Frequency (%)**	**Number of unique investors**	**Frequency (%)**	**Number of unique investors**	**Frequency (%)**
Active	277	42.95	593	22.71	702	23.25
Passive	178	27.60	865	33.13	1010	33.44
Null	190	29.46	1153	44.16	1308	43.31

The results of an analysis of investor type for investors in traditional and new sin stocks are presented in Table D2.

Table D2.
Types of investors in sin stocks.

The table presents the results from analyzing the different investor types in sin stocks. The numbers are from February 2021. It shows both the number of investors and frequency (%). **Panel A** presents the traditional sin stocks, **Panel B** new sin stocks, and **Panel C** both the traditional and new sin stocks. Total averages are calculated using unique investors in the total sample of traditional and new sin stocks.

	Panel A: Traditional		**Panel B: New**		**Panel C: Total**	
Investor type	**Number of unique investors**	**Frequency (%)**	**Number of unique investors**	**Frequency (%)**	**Number of unique investors**	**Frequency (%)**
Bank and trust	8	1.24	35	1.34	37	1.23
Corporation	147	22.79	776	29.72	909	30.10
Government agency	7	1.09	25	0.96	26	0.86
Hedge fund	10	1.55	36	1.38	44	1.46
Holding company	5	0.78	26	1.00	31	1.03
Independent research firm	0	0.00	1	0.04	1	0.03
Individual Investor	167	25.89	1123	43.01	1258	41.66
Insurance company	3	0.47	6	0.23	8	0.26
Investment advisor	149	23.10	330	12.64	392	12.98
Investment advisor/hedge fund	97	15.04	152	5.82	176	5.83
Other insider investor	23	3.57	29	1.11	49	1.62
Pension fund	13	2.02	36	1.38	41	1.36
Private equity	7	1.09	17	0.65	23	0.76
Research firm	4	0.62	9	0.34	11	0.36
Sovereign wealth fund	2	0.31	7	0.27	8	0.26
Venture Capital	3	0.47	3	0.11	6	0.20

The results of an analysis of the investment style of the investors in traditional and new sin stocks are presented in Table D3.

Table D3.
Investment style of investors in sin stocks.

The table presents the results from analyzing the different investor investment styles in sin stocks. The numbers are from February 2021. It shows both the number of investors and frequency (%). No data available is presented as null or N/A. **Panel A** presents the traditional sin stocks, **Panel B** the new sin stocks and **Panel C** both the traditional and new sin stocks. Total averages calculated using unique investors in the total sample of traditional and new sin stocks.

	Panel A: Traditional		**Panel B: New**		**Panel C: Total**	
	Number of unique investors	**Frequency (%)**	**Number of unique investors**	**Frequency (%)**	**Number of unique investors**	**Frequency (%)**
Aggres. Gr.	3	0.47	7	0.27	9	0.30
Broker-Dealer	4	0.62	8	0.31	10	0.33
Core growth	60	9.30	73	2.80	94	3.11
Core value	55	8.53	100	3.83	116	3.84
Deep value	12	1.86	18	0.69	22	0.73
GARP	39	6.05	70	2.68	83	2.75
Global Macro	0	0.00	1	0.04	1	0.03
Growth	15	2.33	35	1.34	37	1.23
Hedge fund	17	2.64	61	2.34	67	2.22
Income value	2	0.31	4	0.15	6	0.20
Index	9	1.40	23	0.88	24	0.79
Long/Short	0	0.00	5	0.19	5	0.17
Market Neutral	0	0.00	1	0.04	1	0.03
Mixed Style	0	0.00	2	0.08	2	0.07
Momentum	1	0.16	1	0.04	1	0.03
Sector Specific	1	0.16	4	0.15	4	0.13
Specialty	3	0.47	3	0.11	7	0.23
VC/Private equity	10	1.55	25	0.96	33	1.09
Yield	2	0.31	7	0.27	8	0.26
Null	412	63.88	2160	82.73	2487	82.35
N/A	0	0.00	3	0.11	3	0.10

Appendix E. The most frequent investors in sin stocks

The results from analyzing the most repeated investors in each group of sin stocks are presented in Table E1 below.

Table E1.
Most repeated investors in sin stocks.

The table presents the most frequent investors, based on % holdings of traded shares, in the different groups of sin stocks. The table shows the investor type, if they are active/passive and the average % holdings per stock in the groups of sin stock, and the total holdings in each group in millions of euros. The table is sorted, placing the investors with the largest total holdings in Euro on top in the panels. The numbers are from February 2021. **Panel A** presents the most frequent investors in military and defense. **Panel B** presents the most frequent investors in beer and wine production. **Panel C** presents the most frequent investors in casinos and gaming. **Panel D** presents the most frequent investors in tobacco production. **Panel E** presents the most frequent investors in coal. **Panel F** presents the most frequent investors in metals and mining. **Panel G** presents the most frequent investors in oil and gas.

Panel A: Military and defense

Investor name	Investor Type	Investment orientation	Total holdings (million Euro)	Average holdings (%)
BlackRock Institutional Trust Company, N.A.	Investment Advisor	Passive	2 527	2.54
Capital Research Global Investors	Investment Advisor	Active	1 496	3.72
The Vanguard Group, Inc.	Investment Advisor/Hedge Fund	Passive	1 234	2.23
Schroder Investment Management Ltd. (SIM)	Investment Advisor/Hedge Fund	Active	655	2.76
Silchester International Investors, L.L.P.	Investment Advisor/Hedge Fund	Active	646	4.07
Legal & General Investment Management Ltd.	Investment Advisor/Hedge Fund	Passive	604	1.14
Baillie Gifford & Co.	Investment Advisor	Active	531	2.31
MFS Investment Management	Investment Advisor/Hedge Fund	Active	520	1.04
Norges Bank Investment Management (NBIM)	Sovereign Wealth Fund	Active	376	2.04
INVESCO Asset Management Limited	Investment Advisor/Hedge Fund	Active	355	1.87
Fidelity Management & Research Company LLC	Investment Advisor	Active	342	1.73
OJSC Concern PVO Almaz-Antey	Corporation	Passive	264	59.42
Dimensional Fund Advisors, L.P.	Investment Advisor/Hedge Fund	Active	200	0.94
Northern Trust Investments, Inc.	Investment Advisor/Hedge Fund	Passive	88	0.09
Nordea Funds Oy	Investment Advisor	Active	69	0.78
DNCA Investments	Investment Advisor	Active	22	0.42

Panel B: Beer and wine production

Investor name	Investor type	Investment orientation	Total holdings (million Euro)	Average holdings (%)
BlackRock Institutional Trust Company, N.A.	Investment Advisor	Passive	7 538	1.70
Capital Research Global Investors	Investment Advisor	Active	7 192	2.13
MFS Investment Management	Investment Advisor/Hedge Fund	Active	5 598	1.01
The Vanguard Group, Inc.	Investment Advisor/Hedge Fund	Passive	5 333	1.64
Norges Bank Investment Management (NBIM)	Sovereign Wealth Fund	Active	4 755	1.81
Lindsell Train Limited	Investment Advisor/Hedge Fund	Active	3 450	3.07
BlackRock Investment Management (UK) Ltd.	Investment Advisor/Hedge Fund	Active	1 620	2.78
Invesco Advisers, Inc.	Investment Advisor	Active	1 614	0.57
Fidelity Management & Research Company LLC	Investment Advisor	Active	1 002	1.60
Amundi Asset Management	Investment Advisor/Hedge Fund	Active	673	0.36
Dimensional Fund Advisors, L.P.	Investment Advisor/Hedge Fund	Active	277	0.55
Fidelity International	Investment Advisor	Active	206	0.53
March Asset Management, S.G.I.I.C., S.A.U.	Investment Advisor	Active	44	0.66
Dimensional Fund Advisors, Ltd.	Investment Advisor	Active	40	0.07
HMG Finance S.A.	Investment Advisor	Active	7	0.61

Panel C: Casinos and gaming

Investor name	Investor type	Investment orientation	Total holdings (millon Euro)	Average holdings (%)
Capital Research Global Investors	Investment Advisor	Active	7 388	7.61
BlackRock Institutional Trust Company, N.A.	Investment Advisor	Passive	2 832	1.92
The Vanguard Group, Inc.	Investment Advisor/Hedge Fund	Passive	1 628	1.58
Capital World Investors	Investment Advisor	Active	1 430	2.00
Norges Bank Investment Management (NBIM)	Sovereign Wealth Fund	Active	960	1.49
Aberdeen Standard Investments (Edinburgh)	Investment Advisor	Active	815	2.54
Fidelity Management & Research Company LLC	Investment Advisor	Active	560	0.99
Avanza Bank Holding AB	Corporation	Passive	338	3.50
M & G Investment Management Ltd.	Investment Advisor	Active	312	3.52
Dimensional Fund Advisors, L.P.	Investment Advisor/Hedge Fund	Active	274	0.66
JPMorgan Asset Management U.K. Limited	Investment Advisor/Hedge Fund	Active	229	0.80
Artemis Investment Management LLP	Investment Advisor/Hedge Fund	Active	166	2.05
Exchange Traded Concepts, LLC	Investment Advisor	Active	91	0.48
Aviva Investors Global Services Limited	Investment Advisor/Hedge Fund	Active	79	0.89
Callan LLC	Investment Advisor/Hedge Fund	Active	6	0.01

Panel D: Tobacco production

Investor name	Investor Type Description	Investment orientation	Total holdings (million Euro)	Average holdings (%)
Capital Research Global Investors	Investment Advisor	Active	4904	2.91
The Vanguard Group, Inc.	Investment Advisor/Hedge Fund	Passive	3002	2.34
BlackRock Institutional Trust Company, N.A.	Investment Advisor	Passive	2964	3.43
Cedar Rock Capital Ltd.	Investment Advisor/Hedge Fund	Active	1688	2.44
Fidelity International	Investment Advisor	Active	1603	3.73
Fidelity Management & Research Company LLC	Investment Advisor	Active	936	2.87
Schroder Investment Management Ltd. (SIM)	Investment Advisor/Hedge Fund	Active	668	1.14
Invesco Advisers, Inc.	Investment Advisor	Active	279	0.47
Dimensional Fund Advisors, L.P.	Investment Advisor/Hedge Fund	Active	234	0.52
Nordea Funds Oy	Investment Advisor	Active	190	0.43

Panel E: Coal

Investor name	Investor Type Description	Investment orientation	Total holdings (Euro)	Average holdings (%)
BlackRock Institutional Trust Company, N.A.	Investment Advisor	Passive	1755	1.45
The Vanguard Group, Inc.	Investment Advisor/Hedge Fund	Passive	977	1.07
Dimensional Fund Advisors, L.P.	Investment Advisor/Hedge Fund	Active	101	0.42
Grantham Mayo Van Otterloo & Co LLC	Investment Advisor/Hedge Fund	Active	23	0.13
NN Investment Partners Towarzystwo Funduszy Inwestycyjnych S.A	Investment Advisor	Active	12	0.54
AXA Towarzystwo Funduszy Inwestycyjnych S.A.	Investment Advisor	Active	9	1.20
Aviva Investors Poland Towarzystwo Funduszy Inwestycyjnych S.A.	Investment Advisor	Active	0,93	0.93

Panel F: Metals and mining

Investor name	Investor Type Description	Investment orientation	Total holdings (million Euro)	Average holdings (%)
BlackRock Institutional Trust Company, N.A.	Investment Advisor	Passive	13981	1.45
Norges Bank Investment Management (NBIM)	Sovereign Wealth Fund	Active	8113	1.51
The Vanguard Group, Inc.	Investment Advisor/Hedge Fund	Passive	7448	1.36
Capital Research Global Investors	Investment Advisor	Active	5637	2.32
BlackRock Investment Management (UK) Ltd.	Investment Advisor/Hedge Fund	Active	3821	1.30
Public Investment Corporation (SOC) Limited	Sovereign Wealth Fund	Passive	3252	4.19
Legal & General Investment Management Ltd.	Investment Advisor/Hedge Fund	Passive	2828	0.44
BlackRock Advisors (UK) Limited	Investment Advisor/Hedge Fund	Passive	2792	0.34
Schroder Investment Management Ltd. (SIM)	Investment Advisor/Hedge Fund	Active	2294	0.60
M & G Investment Management Ltd.	Investment Advisor	Active	1910	2.03
T. Rowe Price Associates, Inc.	Investment Advisor	Active	1463	0.51
DWS Investment GmbH	Investment Advisor/Hedge Fund	Active	1361	0.32
JPMorgan Asset Management U.K. Limited	Investment Advisor/Hedge Fund	Active	1132	0.34
Dimensional Fund Advisors, L.P.	Investment Advisor/Hedge Fund	Active	1056	1.04

Panel G: Oil and gas

Investor name	Investor Type Description	Investment orientation	Total holdings (million Euro)	Average holdings (%)
Federal Agency for State Property Management	Government Agency	Passive	17 687	36.9
BlackRock Institutional Trust Company, N.A.	Investment Advisor	Passive	17 685	1.0
Italian Government	Government Agency	Passive	15 672	34.8
Gazprom PAO	Corporation	Passive	14 331	48.2
The Vanguard Group, Inc.	Investment Advisor/Hedge Fund	Passive	13 452	1.2
Norges Bank Investment Management (NBIM)	Sovereign Wealth Fund	Active	8 939	1.2
State Treasury of the Republic of Poland	Government Agency	Passive	6 913	52.5
Capital Research Global Investors	Investment Advisor	Active	3 509	1.4
Romanian Government	Government Agency	Passive	3 355	52.0
BlackRock Advisors (UK) Limited	Investment Advisor/Hedge Fund	Passive	3 165	0.2
BlackRock Investment Management (UK) Ltd.	Investment Advisor/Hedge Fund	Active	2 800	0.6
Aker ASA	Corporation	Passive	2 442	26.6
Wellington Management Company, LLP	Investment Advisor/Hedge Fund	Active	2 282	0.2
Folketrygdfondet	Pension Fund	Active	2 188	4.2