How Investor Characteristics Shape Sin-Stock Performance in Europe

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Bachelor Thesis in Finance
Stockholm School of Economics
May 2018

Abstract

Whereas the majority of other studies on sin stocks have focused on *if* there is a sin-stock alpha on a specific geographical market, this paper investigates how and why the sin-stock alpha *differs* between countries. Specifically, it investigates whether investor characteristics such as welfare, consumption patterns, and religion affect the performance of alcohol, tobacco, and gambling stocks on the European market. To test this, regressions using monthly stock data for a sample of 22 countries, over the time period 1999 through 2017, are run. Firstly, it is found that the sin-stock alpha is greater in high-welfare countries than in low-welfare countries, conceivably due to a greater prevalence of ethical investing and herd bias in the former countries. Additionally, actively choosing to abstain from investing in unethical stocks is reasoned to be a privilege mainly investors in high-welfare countries can afford to enjoy. Secondly, it is found that, generally, the alpha of stocks in companies producing or selling a certain sinful good is greater in countries consuming less, than in countries consuming more, of the sinful good in question. It is argued that familiarity bias and a greater sin aversion among investors in low-consumption countries are two explanations for this alpha differential. Thirdly, and lastly, it is found that the sin-stock alpha is greater in Protestant countries than in Catholic countries, supposedly because Protestants are more sin averse than Catholics. This difference in alphas can also be explained by different welfare and consumption characteristics, however, as the Protestant sample countries have higher welfare and are less heavy consumers of sinful goods, than the Catholic sample countries.

Keywords: Consumption, Investor Characteristics, Religion, Sin Stocks, Welfare

Tutor: Cristian Huse, Assistant Professor at the Department of Finance at the Stockholm School of Economics.

Acknowledgements: We would like to thank our tutor, Cristian Huse, for valuable advice in the process of writing this bachelor thesis. Furthermore, we would like to thank Michael Halling, Associate Professor at the Department of Finance at the Stockholm School of Economics, for guidance and support throughout the process.

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1. Introduction

"I'd rather laugh with the sinners than cry with the saints." - Billy Joel (1977)

Within the area of finance, many studies have been conducted with the aim of determining the validity of the above quote – do unethical investors have more reasons to laugh, than do ethical investors? Specifically, does holding sin stocks earn investors abnormal returns? While somewhat ambiguous, the results from several studies support the notion of a sin-stock premium (Hong and Kacperczyk, 2009; Fabozzi and Oliphant, 2008; Liston and Soydemir, 2010). Remarkably, however, limited research has been conducted with the aim of explaining how and why this premium *differs* between countries. This paper focuses on investigating these *how* and *why* questions.

While what is considered sinful is highly subjective, this paper uses a widespread definition of sin stocks, including stocks of companies operating in the alcohol, tobacco and gambling industries. Moreover, these sub-categories of stocks make up three of the most common types of stocks excluded in socially responsible investing, an ethical investing strategy which has experienced significant growth during the last decades (Eurosif, 2016).

Previous studies, investigating the existence of a sin-stock alpha on a specific geographical market, have discussed possible explanations for why the stocks of sinful companies might generate abnormal returns. Firstly, it may be due to a neglect effect. Specifically, when investors, oftentimes out of ethical reasons, abstain from investing in sin stocks, the market for these stocks becomes less efficient, leading to mispricing. Secondly, it may be due to a common feature of the sinful goods, namely their addictiveness. This feature brings about a steady demand for the goods regardless of business cycle, and generally makes them subject to excise taxation and regulation. The latter creates barriers to entry and decreases competition in the sin industries. Hence, stable and profitable businesses might cause the viable sin-stock performance. In this study, three additional explanations to the sin-stock alpha, all of them concerning investor characteristics, will be introduced; namely welfare, consumption of sinful goods, and religious denomination.

This paper is built on three hypotheses. Firstly, it is hypothesized that the sin-stock alpha is greater in high-welfare countries than in low-welfare countries. This hypothesis is based on the concept of herd bias[1], i.e. that investors tend to invest in what is currently considered trendy, and the fact that ethical investing has become especially prevalent in high-welfare countries, leading to a more extensive neglect of sin stocks in these countries. In this study, the Human

[1] Also known as "herd mentality" and "herd effect".

Development Index (HDI) acts as a proxy for welfare. Secondly, it is hypothesized that the sin-stock alpha of companies producing or selling a certain sinful good is greater in countries consuming less, than in countries consuming more, of the sinful good in question. This hypothesis is based on the assumption that people, due to familiarity bias, are more prone to buying stocks in a sinful company if they are in fact consumers of the sinful good in question. Thirdly, based on studies stating that Protestants are more conservative and restrictive than Catholics regarding alcohol and gambling (Fairbanks, 1977; Johnson and Meier, 1990), it is hypothesized that the sin-stock alpha is greater in countries in which the former religious denomination is predominant.

To test the three hypotheses, this study uses monthly stock data for a sample of 22 European countries, for the 19-year time period 1999 through 2017. The sample countries are grouped based on five different categorizations, namely HDI, alcohol consumption, tobacco consumption, gambling consumption, and religious denomination. For each category, two long sin-stock portfolios and one long-short sin-stock portfolio are created. The monthly excess returns of each portfolio are then regressed on the factors of the Fama French Five-Factor Model. To determine whether there is a sin-stock-alpha differential between the different groups of countries, the magnitudes of the alphas of the long portfolios within each category are compared, and the significances of the alphas of the long-short portfolios are assessed.

Since all long portfolios yield significantly positive alphas, the results of this study support the notion of a sin-stock premium in Europe. More notably, however, sin-stock-alpha differentials are found. Specifically, in accordance with the hypothesis posed, it is found that the sin-stock alpha of high-HDI countries is bigger than that of low-HDI countries. Moreover, for the tobacco- and gambling-consumption portfolios, it is found that the sin-stock alpha is greater in low-consumption countries than in high-consumption countries. Lastly, also in accordance with what is hypothesized in this paper, it is found that the sin-stock alpha is greater in Protestant countries than in Catholic countries.

As mentioned above, whereas many studies have investigated whether sin stocks *do* generate abnormal returns, this paper contributes to the current research by investigating how and why the sin-stock alpha *differs* between groups of countries, something that hitherto has not been thoroughly investigated. To the authors' knowledge, only one similar study, carried out by Salaber (2007), has previously been conducted. In her study, Salaber investigates how excise taxation, litigation risk, and religion affect sin-stock performance on the European market. In comparison to Salaber's study, this study is based on more recent data and an expanded set of European countries and, hence, it offers new perspectives on how religion

affects sin-stock performance. Furthermore, this study pioneers the area of how welfare and consumption habits shape sin-stock performance.

This paper proceeds as follows: in Section 2, a theoretical background is presented. Sections 3, 4, and 5 present hypotheses, data, and methodology, respectively. Empirical results are displayed in Section 6. These results, as well as limitations to this research, are discussed in Section 7. Section 8 concludes and offers perspectives for future research.

2. Theoretical Background

The vast majority of previous studies on sin stocks have investigated *if* sin-stock investments yield positive risk-adjusted returns; how and why these returns might differ between countries has received considerably less attention. In answering the *how* and *why*, one can turn to the area of behavioural finance, specifically to that of psychological biases, for guidance. This section will, first, present previous research investigating the existence of a sin premium. Then, information on behavioural biases of relevance for this study will be presented.

A number of studies conclude that sin stocks yield positive risk-adjusted returns on the U.S. market (Fabozzi and Oliphant, 2008; Liston and Soydemir, 2010). One of the most influential papers is that of Hong and Kacperczyk (2009). In their study, sin stocks are defined as stocks of companies producing or selling alcohol, tobacco and gaming services. The authors use monthly stock data for the time period 1926 through 2004. Regressing monthly excess returns using the Capital Asset Pricing Model (CAPM) and the Carhart Four-Factor Model, they find that both of their portfolios - one long sin stocks, and one long sin stocks and short comparable stocks - yield abnormal returns. The authors hypothesize that sin-stock characteristics such as low analyst coverage, high litigation risk, and being less held by norm-constrained institutions may serve as possible explanations for their results.

Salaber conducts a study similar to that of Hong and Kacperczyk, as she examines sin-stock returns on the U.S. market, using an identical sin-stock definition (2009). Conversely, however, the time period considered is extended by one year, and the asset pricing model used is the Fama French Three-Factor Model. In addition to the methodology used by Hong and Kacperczyk, Salaber includes macroeconomic variables controlling for factors such as time-varying market conditions. Interestingly, her results invalidate the notion that sin stocks, in general, yield positive risk-adjusted returns on the U.S. market. Instead, Salaber finds that sin stocks outperform the market only in periods of economic downturn. A reason for this might

be that companies in the alcohol, tobacco and gaming industries have a more stable performance across business cycles due to the addictiveness of their goods and services.

Furthermore, there are some studies invalidating the existence of a sin premium altogether. Lobe and Walkshäusl investigate sin-stock performance on the global market (2011). They study a time period of 13 years; 1995 through 2007. In contrast to the above authors, Lobe and Walkshäusl include stocks of companies producing or selling adult entertainment, nuclear power, and weapons in their sin-stock sample, in addition to the alcohol, tobacco and gaming stocks commonly included. Regressing global, regional, and domestic sin-stock portfolios using single- and multifactor frameworks, the results of this study do not support the existence of a sin premium on the European, nor the global, market. The authors have, however, been criticized for including nuclear power stocks in their sin-stock sample, why the validity of their results can be questioned (Blitz and Fabozzi, 2017).

Similarly, Blitz and Fabozzi conduct a global study, using monthly stock data for a 27- to 54-year time period, depending on which market is investigated (2017). Here, sin stocks are defined as stocks of companies operating in the alcohol, tobacco, gambling, and weapon industries. The authors find that when sin-stock excess returns are regressed on the factors of the Fama French Five-Factor Model, there are no abnormal returns. Blitz and Fabozzi conclude that any sin-stock premium that previous studies might have indicated, can be fully explained by the profitability and investment factors included in the Five-Factor Model.

In contrast to the studies mentioned above, Salaber conducts research with the aim of investigating differences in sin-stock returns between a set of 18 European countries (2007). She defines sin stocks as alcohol, tobacco, and gaming stocks, and uses 32 years of monthly stock data, for the time period 1975 through 2006. Moreover, Salaber tests her hypotheses regressing long as well as long-short portfolios, and using the CAPM and the Fama French Three-Factor Model. In accordance with her hypotheses, she finds that sin stocks outperform other stocks in countries with high excise taxation and high litigation risk, and that there is a sin premium in Protestant countries but not in Catholic countries. As for the former, she argues that external costs are greater in countries with high litigation risk, leading to higher risk-adjusted sin-stock returns in these countries. As for the latter, based on the findings of Fairbanks (1977), Johnson and Meier (1990), and Stulz and Williamson (2003), she argues that Protestants, in general, are more risk averse and more willing to legislate for strict alcohol and gambling controls, than Catholics, leading to higher risk-adjusted sin-stock returns in Protestant countries.

The results from Salaber's study described above denote that investor characteristics help explain sin-stock premiums. While Salaber investigates how sin-stock returns differ between countries due to excise taxation, litigation risk, and religious preferences, there are, to the authors' knowledge, no studies investigating how they differ between countries with respect to differences in welfare and/or the consumption of sinful goods and services. Nevertheless, there are theories from the area of behavioural finance describing psychological biases and how they affect investment decisions. For example, herd bias is the tendency of investors to follow general market trends, irrespective of whether the investment decision, in fact, is in line with the individual investor's overarching strategy and risk preference (Bilgehan and Bayrakdaroğlu, 2016; Stalter, 2015). Research shows that this conformity is a result of social pressure as well as a belief by the individual investor that the uniform act of a group of people cannot be wrong. As described more thoroughly in Section 3, this paper investigates whether the herd bias can help explain sin-stock-return differentials between high- and low-welfare countries. Additionally, familiarity bias is the tendency of investors to seek investment opportunities in companies whose brands and products they are familiar with (Speidell, 2009). Just like the herd bias, the familiarity bias can cause investors to pursue suboptimal investment decisions. This paper investigates whether the familiarity bias can help explain sin-stock-return differentials between countries which are, respectively, heavy and less heavy consumers of sinful goods and services. Section 3 describes this proposed correlation in greater detail.

In summary, previous literature is ambiguous regarding the existence of a sin-stock premium on the European as well as the global market. Furthermore, limited research has been conducted regarding how sin-stock returns differ between countries due to investor characteristics. One exception is Salaber's 2007 study, in which it is found that excise taxation, litigation risk, and religious preferences affect sin-stock performance. Moreover, the area of behavioural finance, and more specifically the herd and familiarity biases, might serve as possible explanations for differences in sin-stock returns between countries.

3. Hypotheses

This study has three hypotheses, all of them concerning differences in sin-stock performance on the European market, caused by investor characteristics. The quantity used to gauge sin-stock performance is alpha, described in greater detail in Section 5.1. Note that the hypotheses are not conditional on the sin-stock alphas being either positive or negative; instead, it is the *difference* in alphas that is of interest in this paper.

All hypotheses are based on a sin-stock definition including stocks of companies producing or selling alcohol, tobacco, and gambling services. These stocks are often called "the triumvirate of sin stocks" (Blitz and Fabozzi, 2017) and are, hence, included in most sin-stock studies. In contrast to those of the triumvirate of sin stocks, the industry classifications of stocks related to porn and defence are oftentimes ambiguous, why those stocks are excluded from this study.

Lastly, when posing the hypotheses, it is assumed that investors invest on their domestic market only. This assumption is critical to the study as it makes it possible to make inferences about investor characteristics and sin-stock performance.

3.1. Hypothesis 1

The first hypothesis is based on findings from the area of behavioural finance. Specifically, as stated in Section 2, herd bias is the tendency of investors to follow general market trends, irrespective of whether the investment decision, in fact, is in line with the individual investor's overarching strategy and risk preference (Stalter, 2015). According to the Eurosif 2016 European SRI Study (2016), socially responsible investing (SRI) has become increasingly prevalent on the European market recently. SRI entails screening of companies based on the nature of their business; positive SRI screening favours investments in companies whose business are deemed to be socially responsible, whereas negative SRI screening excludes companies whose business are deemed to be socially irresponsible. Tobacco, gambling, and alcohol companies make up three of the most common types of companies excluded by negative screening. In addition, when ranking countries with respect to the Euro value of ethical assets under management, France, Germany, the United Kingdom, and Switzerland – all countries consistently ranked among the most developed countries in the world – make up the top tier. This suggests that, while SRI has become increasingly prevalent on the entire European market, ethical investing has become especially prevalent in high-welfare countries. Thus, sin stocks are likely to have become more extensively neglected by investors in high-welfare countries, and herd bias is assumed to have reinforced this neglect effect. As stocks become neglected, markets become less efficient and mispricing, e.g. alpha, is bound to appear.

In order to test the first hypothesis, the sample countries are divided into two groups based on their Human Development Index (HDI) values (see Section 4.2. for the division), which are used as a measure of their welfare. The HDI takes into account life expectancy,

education, and gross national income per capita (UNDP, 2018). Consequently, the first hypothesis is:

*Hypothesis 1***:** The sin-stock alpha is greater in high-HDI countries than in low-HDI countries.

3.2. Hypothesis 2

In addition to the level of welfare in a country, consumption characteristics might affect sin-stock performance. As stated in Section 2, familiarity bias is the tendency of investors to seek investment opportunities in companies whose brands and products they are familiar with (Speidell, 2009). Hence, investors in countries consuming alcohol, tobacco and/or gambling heavily can be assumed to be more likely to invest in stocks of these companies, since they are more exposed to the sinful brands and products. Additionally, one can assume that investors in high-consumption countries are less averse of the goods in question. Consequently, since sin stocks are assumed to be less shunned in high-consumption countries, the neglect effect is assumed to be less severe there. Thus, the second hypothesis is:

Hypothesis 2: The sin-stock alpha of companies producing or selling a certain sinful good is greater in countries consuming less, than in countries consuming more, of the sinful good in question.

3.3. Hypothesis 3

Lastly, the third hypothesis builds on the work of Salaber and her results indicating that investors in Protestant countries are more sin averse, and thus demand a greater sin premium, than investors in Catholic countries (2007). As declared by Fairbanks (1977) and Johnson and Meier (1990), Protestants are, generally, more risk averse than Catholics. Moreover, Stulz and Williamson (2003) find that, compared to Catholics, Protestants are more willing to legislate for strict alcohol and gambling controls.

With the intent of investigating whether this difference in risk-adjusted returns still is prevalent on the European market, using more recent data and an expanded set of sample countries, the third hypothesis is:

Hypothesis 3: The sin-stock alpha is greater in Protestant countries than in Catholic countries.

4. Data

4.1. Stock Data

Investigating sin-stock performance on the European market, this study aspires to, under certain conditions, include as many European countries as possible. Starting with the 50 countries declared European by the European Union (2018), countries that are not members of the International Organization of Securities Commission, countries for which no stock data is available in the Thomson Reuters Datastream (TRD) database, and countries for which an HDI, consumption, and/or religious classification cannot be made, are excluded from the sample. The first exclusion is done to assure that the sample countries adhere to viable, internationally recognized securities regulations (International Organization of Securities Commissions, 2018). The second exclusion is done to ensure coherent data for the entire sample. The third exclusion is done as a result of the focus of this paper. Consequently, 22 European countries are included in this study: Austria, Belgium, Croatia, Denmark, Finland, France, Hungary, Iceland, Ireland, Italy, Lithuania, Luxembourg, Malta, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom (the UK).

For the sample countries, monthly stock data for the time period 1999 through 2017 for all active and dead common equity available is downloaded from TRD. The inclusion of dead equity benefits elimination of survivorship bias, i.e. the tendency to overestimate past performance by taking only surviving companies' stocks into consideration (Brown et al., 1992). Both time-series and static data is downloaded: the former being price, return index, market value, market-to-book value, and dividend yield, and the latter being subsector industry classification benchmark (ICB) code, geography code, and the dates of the first and last stock price observations in the database. All time-series data is downloaded in Euro.

In order to improve the quality of the TRD data, screening suggested by Ince and Porter (2006) and Schmidt at al. (2011) is undertaken. A similar process is undertaken by Salaber (2007). By explicitly downloading data on major listings of common equity trading on the domestic and primary stock exchange, non-major listings and foreign securities are excluded (Ince and Porter, 2006; Schmidt et al., 2011). This first screening process results in a total of 22,423 stocks being downloaded from TRD.

The second screening process, removing duplicate stocks, eliminates 2,054 stocks from the sample. The third screening process involves eliminating stocks that have no observations for a given time-series or static variable (Schmidt et al., 2011). This eliminates 10,641 stocks. Another 4 stocks are eliminated in the fourth screening process wherein stocks for which the

dates of the first and the last price observations are the same, indicating that the stocks were active merely for one day. The fifth screening process involves eliminating foreign stocks by making sure each stock has a geography code equal to that of the country in which the stock is listed (Ince and Porter, 2006). This screening process does not eliminate any stocks.

The fifth screening process involves manually inspecting the names of the remaining stocks, searching for combinations of letters indicating that the stocks are not common equity (Ince and Porter, 2006). The searched letter combinations are "ADR", "GDR", "PF", "PFRF", "PREF", "ETF", and "REIT", attempting to find stocks that are American depositary receipts, global depositary receipts, preferred shares, exchange-traded funds and/or real estate investment trusts. This screening process eliminates 22 stocks.

The sixth and final screening process has to do with the way TRD calculates price and dividend yield data. In order to exclude potentially faulty numbers due to rounding errors, stocks for which at least one price observation is below €0.1 or above €1,000,000, or at least one dividend yield observation is above 50%, are eliminated (Ince and Porter, 2006; Schmidt et al., 2011). Respectively, this eliminates 2,038, 0, and 187 stocks from the sample.

After these screening processes, 7,477 stocks remain in the sample. 181 of these stocks are sin stocks, identified by their ICB codes. The alcohol stocks amount to 116 and are made up by 58 distillers and vintners (ICB code 3533) and 58 brewers (ICB code 3533). Moreover, 9 tobacco stocks (ICB code 3785) and 56 gambling stocks (ICB code 5752) are included in the sin-stock sample. Being a static variable, only the latest ICB code for each stock is provided by TRD. Thus, this study assumes that all companies included in the sample have operated in their last-observed industry their entire active lives.

Unlike share price observations, dividend yield observations are calculated on an annual basis in the TRD database. Since this paper investigates monthly – not annual – returns, the price and dividend yield observations cannot be used for the calculation of monthly returns. Instead, the TRD monthly return index observations are used. These observations take into account dividend payments, assuming they are reinvested in the stocks (Schmidt et al., 2011). In order to obtain the monthly excess returns, the corresponding monthly one-month Euribor interest rate, downloaded from the Global Rates website (Triamia Media BV, 2018), is deducted from the gross monthly returns.

4.2. HDI Data

To test the first hypothesis, i.e. that the sin-stock alpha is greater in high-welfare countries than in low-welfare countries, the 22 sample countries are divided into two groups based on their level of welfare. As stated in Section 3.1., this paper uses the HDI as a proxy for welfare. The HDI of a certain country is the geometric mean of the normalized indices for life expectancy, education, and gross national income per capita in that country, and ranges from 0 to 1 (UNDP, 2018a).

HDI data is gathered from the United Nations Development Program, UNDP (2018b). **Table 1** shows the HDI values for each country included in this study. Norway has the highest value, 0.896, while Croatia has the lowest value, 0.757. Following Hong and Kacperczyk, this paper uses mean values to gauge characteristics (2009).[2] Consequently, **Table 1** also shows the division of the countries into high- and low-consumption groupings based on the mean HDI value for the entire sample. It is assumed that this division is representative for the entire sample period.

In this paper, Norway, Switzerland, Sweden, Denmark, Belgium, Iceland, Ireland, the UK, Luxembourg, Finland, France, Slovenia, and Austria make up the high-HDI, i.e. the high-welfare, countries, while Italy, Spain, Slovakia, Lithuania, Malta, Poland, Portugal, Hungary, and Croatia make up the low-HDI, i.e. the low-welfare, countries.

4.3. Consumption Data

In order to examine the second hypothesis, i.e. that the sin-stock alpha of companies producing or selling a certain sinful good is greater in countries consuming less, than in countries consuming more, of the sinful good in question, the sample countries are separated into different groups based on consumption data. As stated for the HDI division, this paper divides the countries based on their mean values.[3] Furthermore, it is assumed that the divisions are representative for the entire sample period.

The alcohol consumption data is gathered from the World Health Organization, WHO, and measures the annual per (over 15 years old) capita consumption of pure alcohol, quantified in litres (2015a). In the sample, Lithuania has the highest alcohol consumption, consuming 15.4 litres pure alcohol per capita and year, while Italy has the lowest alcohol consumption,

[2] A division of countries by the *median* HDI values, and the consequential regressions, is done as a robustness test. See Section 5.3. for the methodology and Section 6.4. for the results.
[3] A division of countries by the *median* values, and the consequential regressions, is done as a robustness test. See Section 5.3. for the methodology and Section 6.4. for the results.

consuming 6.7 litres pure alcohol per capita and year. **Table 2** illustrates the per capita consumption for all sample countries, as well as the high-and low-consumption groupings. Lithuania, Hungary, Slovakia, Portugal, Poland, Finland, Croatia, France, Ireland, Luxembourg, Slovenia, the UK, Denmark, and Spain constitute the high-consumption countries, while Belgium, Switzerland, Austria, Sweden, Norway, Iceland, Malta, and Italy constitute the low-consumption countries.

To quantify the tobacco consumption in the sample countries, data from the Tobacco Atlas is used (American Cancer Society, Inc. and Vital Strategies, 2018). This data denotes the percentage of adults using tobacco daily. Since the data is by country and gender, the mean value for each country is obtained by calculating the arithmetic mean of the respective male and female values, thus assuming that the European population is made up by 50% men and 50% women. Eurostat data corroborates this assumption (European Commission, 2018a).[4] As demonstrated in **Table 3**, Austria (32.50%) and Sweden (13.95%) hold, respectively, the highest and lowest percentages of daily tobacco users. Using the mean value of 24.10% to divide the countries into two groups, Austria, Croatia, France, Belgium, Hungary, Lithuania, Poland, Spain, Luxembourg, Ireland, and Italy make up the high-consumption countries, whereas Slovenia, Portugal, Malta, Slovakia, the UK, Switzerland, Denmark, Finland, Norway, Iceland, and Sweden make up the low-consumption countries.

Lacking an index measuring the consumption of all gambling goods and services for all sample countries, data from Morss Global Finance on per capita gambling revenues (Morss, Elliott R., 2009) is used as a proxy for gambling consumption. In this paper, the sample countries included on the list of the top 25 per capita gambling revenue countries in the world, constitute the high-consumption countries, while the rest of the sample countries constitute the low-consumption countries. As **Table 4** shows, Finland, France, Italy, Portugal, Spain, Sweden, Switzerland, and the UK make up the former, whereas Austria, Belgium, Croatia, Denmark, Hungary, Iceland, Ireland, Lithuania, Luxembourg, Malta, Norway, Poland, Slovakia, and Slovenia make up the latter.

4.4. Religion Data

In order to investigate the third hypothesis, i.e. that the sin-stock alpha is greater in Protestant countries than in Catholic countries, the sample countries are divided into two groups based on religious denomination. In accordance with the procedure undertaken by Salaber, a country is

[4] Between 2008 and 2017, the EU28 countries were populated by roughly 50% men and 50% women.

reckoned to be Protestant (Catholic) if the fraction of the population practicing Protestantism (Catholicism) is greater than the fraction of the population practicing any other religion (2007).

Three data sources are used to determine the main religious denominations of the sample countries. As in Salaber's study, the CIA World Fact Book (Central Intelligence Agency, 2018) and the Adherents List of Predominant Religions (Adherents.com, 2005) are used. In addition, this paper uses UN data to determine religious denomination (United Nations Statistics Division, 2018). The data from the three sources harmonize with and complement each other.

Table 5 demonstrates the main religious denomination by country. It is assumed that a country's main religious denomination has not changed during the sample period. As illustrated, Denmark, Finland, Iceland, Norway, Sweden, and the UK make up the Protestant countries of this study, whereas Austria, Belgium, Croatia, France, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovakia, Slovenia, Spain and Switzerland, make up the ditto Catholic countries.

Worth mentioning is that while the countries included in this study are not identical to the ones included in Salaber's study (2007), the countries that are in fact included in both studies obtain the same religious denominations in the two studies. This fact supports the assumption of a constant main religion during the sample period. Moreover, the proportions of Protestant versus Catholic countries included in the two studies are practically identical: 27% versus 73% in this study as opposed to 28% versus 72% in Salaber's study.

4.5. Factor Data

Since country-specific factors of the Fama French Five-Factor Model are not available for all countries included in this study, European such factors are used. The monthly European market risk premium (MRP), small-minus-big (SMB), high-minus-low (HML), robust-minus-weak (RMW), and conservative-minus-aggressive (CMA) factors, as well as the corresponding risk-free rate (RF), are acquired from the Kenneth R. French data library (2018).

Whereas this paper uses monthly stock excess returns stated in Euro, the factors from the Kenneth R. French data library are stated in U.S. Dollars. Hence, using exchange rate data from TRD, any appreciation of the Euro-to-USD exchange rate is deducted from the Market Gross Premium (MRP+RF), SMB, HML, RMW, and CMA factors. The MRP used in this study is then obtained by deducting the monthly one-month Euribor interest rate from the monthly Market Gross Premium adjusted for exchange rate appreciation. The Euribor data is downloaded from the Global Rates website (Triamia Media BV, 2018).

The revised factors are used in the Fama French Five-Factor Model regressions performed in this study (see Section 5.1. for a thorough explanation of the model and its risk factors).

4.6. Robustness Test Data

European factors of the Fama French Three-Factor Model and the Carhart Four-Factor Model, described in Sections 5.1. and 5.3., are gathered from the Kenneth R. French data library (2018). The exchange rate appreciation and Euribor procedures carried out on the factors of the Fama French Five-Factor Model, described in Section 4.5., are carried out on these factors as well.

4.7. Comments

This paper uses data provided by established, trustworthy institutions and scholars such as the World Health Organization, the United Nations, and Kenneth R. French. Furthermore, many times multiple sources are used to verify the accuracy of the data.

Thomson Reuters, too, is an established institution. Just like the authors of this study, miscellaneous academics, such as Hong and Kacperczyk (2009), Salaber (2007), and Blitz and Fabozzi (2017), use the Thomson Reuters Datastream database to download stock data for their studies. However, since it has been discovered that the quality of this data can be improved, the Datastream data used in this study has been subject to the screening processes described in Section 4.1., suggested by Ince and Porter (2006) and Schmidt et al. (2011). Similar screening processes have been undertaken by Salaber (2007).

As stated in Section 4.3., data from Morss Global Finance on per capita gambling revenues (Morss, 2009) is used to group the sample countries with respect to gambling consumption. The sample countries included on the list of the top 25 per capita gambling revenue countries in the world, make up the high-consumption countries, while the rest of the sample countries make up the low-consumption countries. Thus, since the source does not provide actual data for all countries - only for those included on the list - there is a risk that Morss Global Finance has not taken into account one or many of the low-consumption countries of this study. To mitigate the failing of accurately grouping the sample countries based on gambling consumption, the authors of this paper consider alternative data gauging the consumption in question. For example, data on the number of casinos by country is considered (Statista, 2011). The alternative data verifies that, in general, the same set of countries make up the high- and low-consumption groups, respectively.

Lastly, when dividing the sample countries based on the five categorizations of this study, it is noted that the tobacco, gambling, and religion divisions result in rather similar groups. Specifically, all Protestant countries are also categorized as high-HDI as well as low-tobacco-consumption countries, and all high-tobacco-consumption countries are also categorized as Catholic (note that since the number of countries constituting the sub-groups of each category are not the same for all categories, the exact same set of countries do not make up the sub-groups of any two categories). These overlaps complicate the act of determining whether the magnitude of a sin-stock alpha is due to consumption or religion, and they will be further discussed in Section 7.

5. Methodology

The hypotheses of this paper are tested running ordinary least squares regressions on monthly stock data for the time period January 1999 through December 2017. Specifically, after constructing appropriate sin-stock portfolios, the monthly excess returns of the portfolios are regressed on the factors of the Fama French Five-Factor Model. The resulting alphas, and their statistical significance, are then gauged. Ultimately, four robustness tests are undertaken to assess the validity of the results. This section explains the methodology in greater detail.

5.1. The Fama French Five-Factor Model

The Fama French Five-Factor Model is an extension of the Capital Asset Pricing Model (CAPM), upgraded with four additional risk factors. In addition to the risk-free rate and the market risk premium included in the CAPM, the Five-Factor Model incorporates size, value, profitability and investment factors (Fama and French, 2015).

Building on the work of Harry M. Markowitz (1952), the CAPM was developed independently by William Sharpe (1964), John Lintner (1965), and Jan Mossin (1966) in the 1960s. Since then, the CAPM has been one of the most prominent models used in asset pricing. The theory underpinning the CAPM is that the return on an asset should reflect the time value of money (i.e. the risk-free rate) and the asset's exposure to systematic risk. Indeed, risk is divided into two categories; systematic risk, i.e. fluctuations on the overall market, and unsystematic risk, also known as firm-specific risk. Whereas unsystematic risk can be eliminated by proper diversification, systematic risk is inevitable. Hence, systematic risk - and systematic risk *only* - should be compensated. With the CAPM, the excess return on an asset, i.e. the return in excess of the risk-free rate, is determined by multiplying the market risk

premium (MRP) with the asset's beta coefficient, i.e. its exposure to the market. The MRP equals the return on the market in excess of the risk-free rate, and the beta coefficient of an asset equals the ratio of the covariance of the asset and the market to the variance of the market. A beta value of 1 indicates that the asset is just as volatile as the market, while a beta value less (more) than 1 indicates that the asset is less (more) volatile, and thus less (more) risky, than the market. A positive (negative) beta value indicates that the asset moves in the same (opposite) direction as the market. If the return on an asset is not equal to what the CAPM states, the investor acquires a return which is less or greater than what is required for the risk level in question. When this mispricing occurs, the asset has an alpha. When regressing excess returns on the MRP, an alpha is displayed as a non-zero intercept. To this day, the CAPM is extensively used due to being a simple, yet powerful, asset pricing model. However, criticism has been raised against the model, stating that it does not take into account all risk factors for which an investor should be compensated (Banz, 1981; Rosenberg et al., 1985).

Consequently, Eugene F. Fama and Kenneth R. French have conducted several studies focused on improving the CAPM. First, the Fama French Three-Factor Model, including size and value factors, was developed (1993). The size factor (SMB) was included to consider the fact that stocks of companies with small market capitalizations generally outperform stocks of companies with large market capitalizations (Banz, 1981). Similarly, the value factor (HML) was included to consider the fact that stocks of companies with high book-to-market ratios, value stocks, generally outperform stocks of companies with low book-to-market ratios, growth stocks (Rosenberg et al., 1985). The MRP, SMB, and HML factors make up the Fama French Three-Factor model. Second, Fama and French incorporated profitability and investment factors to create the Fama French Five-Factor Model (2015). The profitability factor (RMW) was included to consider the fact that companies with high operating profitability generally outperform companies with low operating profitability. Similarly, the investment factor, CMA, was included to consider the fact that companies with more conservative investment strategies generally outperform companies with more aggressive investment strategies. Just like the CAPM, the Five-Factor Model states that the excess return on an asset should reflect the asset's exposure to the model's risk factors. In the Five-Factor Model, the excess return is quantified as the sum of the multiples of the factor premiums and the corresponding beta coefficients, where a beta coefficient equals the asset's exposure to the factor in question. Correspondingly, a non-zero intercept, i.e. an alpha, indicates mispricing. Hence, the Fama French Five-Factor Model is defined with the following function:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{i,MRP} * MRP_t + \beta_{i,SMB} * SMB_t + \beta_{i,HML} * HML_t + \beta_{i,RMW} * RMW_t + \beta_{i,CMA} * CMA_t + \varepsilon_{i,t}$$

where:

$r_{i,t} - r_{f,t}$ = The monthly return on asset *i* at time *t*, in excess of the risk-free rate at time *t*. In this study, the risk-free rate is represented by the monthly one-month Euribor interest rate;

α_i = The monthly alpha of asset *i;*

$\beta_{i,x}$ = The beta value of asset *i* on factor *x;*

MRP_t = The monthly return on the market in excess of the risk-free rate at time *t.* In this study, the former return is represented by the monthly return on a value-weighted European market portfolio, and the latter return is represented by the monthly one-month Euribor interest rate;

SMB_t = The monthly return difference between a portfolio of small stocks and a portfolio of big stocks, at time *t.* In this study, the former portfolio is value weighted and made up by the 10% smallest European stocks, and the latter portfolio is value weighted and made up by the 90% largest European stocks;

HML_t = The monthly return difference between a portfolio of stocks in companies with high book-to-market ratios and a portfolio of stocks in companies with low book-to-market ratios, at time *t.* In this study, the former portfolio is value weighted and made up by the stocks of the European companies with the 30% highest book-to-market ratios, and the latter portfolio is value weighted and made up by the stocks of the European companies with the 30% lowest book-to-market ratios;

RMW_t = The monthly return difference between a portfolio of stocks in companies with high operating profitability and a portfolio of stocks in companies with low operating profitability, at time *t.* In this study, the former portfolio is value weighted and made up by the stocks of the European companies with the 30% highest operating profitability, and the latter portfolio is value weighted and made up by the stocks of the European companies with the 30% lowest operating profitability;

CMA_t = The monthly return difference between a portfolio of stocks in companies investing conservatively and a portfolio of stocks in companies investing aggressively, at time *t.* In this study, the former portfolio is value weighted and made up by the stocks of the European companies with the 30% lowest investments (in relation to their size), and the latter portfolio is value weighted and made up by the stocks of the European companies with the 30% highest investments (in relation to their size);

$\varepsilon_{i,t}$ = The error term of asset *i* at time *t.*

5.2. Portfolio Construction and Significance Testing

As demonstrated in Sections 4.2.-4.4., the sample countries are, in all, grouped based on five different categorizations, namely HDI, alcohol consumption, tobacco consumption, gambling consumption, and religious denomination. To test the hypotheses of this study, two types of portfolios - long and long-short, respectively - are constructed. For each category, two long portfolios and one long-short portfolio, i.e. a zero-investment portfolio, are created. All portfolios are made up by the sin stocks of the countries constituting the group in question. **Table 6** illustrates the fifteen different portfolios used in this study.

The long portfolios of each category are, respectively, long the sin stocks of the two subsets of countries. The long-short portfolio of each category is long the sin stocks of one subset of countries and short the sin stocks of the other subset of countries.

Regressing the value-weighted monthly excess returns (the value-weighted monthly gross returns in excess of the one-month Euribor interest rate) of each of the fifteen different portfolios on the factors of the Fama French Five-Factor Model described above, the alpha of each portfolio is established. Student t's tests, also called t-tests, are then undertaken to assess whether the alphas of the long portfolios are significantly different from zero, and whether the alphas of the long-short portfolios are significantly greater than zero.

Salaber (2007) and Hong and Kacperczyk (2009) use similar methods as they construct long-short portfolios to investigate the existence of a sin-stock alpha. While their portfolios are long sin stocks and short comparable non-sin stocks, however, this study uses long-short portfolios made up solely by sin stocks, as the focus of this study is to determine the sin-stock-alpha differential between different groups of countries.

5.3. Robustness Tests

To gauge the validity of the results, four robustness tests are performed. Firstly, a division of the sample countries by their median, rather than by their mean, HDI and consumption values, is done (since the religious denomination groupings do not depend on any mean or median value, these groupings remain unchanged). Regressions are then run with the countries divided into the median-value groupings.

Secondly, assessing the degree to which the results are representative for the entire time period considered in this paper, regressions are run for the two sub-periods of 1999 through 2007 and 2008 through 2017, respectively.

Thirdly, regressions using robust standard errors are run. By the Gauss-Markov theorem, the error terms of an ordinary least squares (OLS) regression – the type of regression performed in this study – should be homoscedastic in order for the regression estimators, i.e. the alpha and beta values, to be the best linear unbiased estimators (BLUE). This homoscedasticity assumption entails that the variances of the error terms should be constant. If, instead, the variances of the error terms are not constant, they are said to be heteroscedastic. While heteroscedasticity does not give rise to biased OLS parameter estimates, it does give rise to estimators that are not BLUE since they do not have the smallest variances possible. This standard error bias causes the test statistic, i.e. the t value, to be biased. If heteroscedasticity is prevalent, robust standard errors address the problem. Running regressions using robust standard errors, and comparing the results from these regressions with those from the OLS regressions, is thus a way to test the robustness of the OLS regression results to heteroscedasticity.

Lastly, the validity of the results is tested, taking into account the choice of asset pricing model used. Whereas the Fama French Five-Factor Model, as stated in Section 5.1., was developed to improve the explanatory power of former asset pricing models, by definition, no *model* explains realty perfectly. Hence, regressions based on, respectively, the Fama French Three-Factor Model and the Carhart Four-Factor Model are run**.** As described in Section 5.1., the Fama French Three-Factor Model aims to explain asset returns with the risk-free rate and the MRP, SMB, and HML factors. Additionally, the Carhart Four-Factor Model, developed by Mark M. Carhart (1997), extends the former asset pricing model by including a momentum (MOM) factor. The MOM factor considers the fact that the price of high-performing (low-performing) stocks generally continue to rise (fall), and is defined as the difference between the return of a portfolio of previous winners and the return of a portfolio of previous losers.

6. Empirical Results

In this section, the regression results which are central to this study are presented. The section has four main sub-sections; three sub-sections are devoted to each of the three hypotheses, and one sub-section is devoted to the robustness tests conducted.

The sin-stock alphas of the fifteen portfolios are reported together with their corresponding significance levels. As described in Section 5.2., for the long portfolios, two-sided t-tests are undertaken to determine whether the alphas are significantly different from zero. In contrast, for the long-short portfolios, one-sided t-tests are undertaken to determine whether the alphas are significantly greater than zero. All fifteen portfolios are depicted in **Table 6**. To improve comparability with similar studies, the results are presented in annual terms.

6.1. Hypothesis 1

The first hypothesis, that the sin-stock alpha is greater in high-HDI countries than in low-HDI countries, is tested using three portfolios (see **Table 6**). **Table 7** shows that the Long High-HDI Portfolio has an alpha of 10.03%, significant at the 1% level. Similarly, the Long Low-HDI Portfolio has an alpha of 6.67%, also significant at the 1% level. In accordance with the hypothesis, the Long-Short HDI Portfolio exhibits a positive, albeit not significant, alpha, of 3.36%.

6.2. Hypothesis 2

The second hypothesis, that the sin-stock alpha of companies producing or selling a certain sinful good is greater in countries consuming less, than in countries consuming more, of the sinful good in question, is tested using nine portfolios (see **Table 6**).

Table 8 depicts the results from the regressions of the alcohol consumption portfolios. Both long portfolios exhibit alphas that are significant at the 1% level, the Long Low-Consumption Portfolio alpha being 8.17%, and the Long High-Consumption Portfolio alpha being 9.57%. Thus, in contrast to the stated hypothesis, the Long-Short Alcohol Portfolio yields a negative alpha of -1.4%. This alpha is not significant at conventional significance levels, however.

In **Table 9**, the results from the regressions of the tobacco consumption portfolios are demonstrated. The Long Low-Consumption Portfolio has an alpha of 14.56%, significant at the 1% level. The Long High-Consumption Portfolio has an alpha of 4.75%, significant at the 10%

level. In contrast to the alpha of the Long-Short Alcohol Portfolio, the alpha of the Long-Short Tobacco Portfolio is positive and, thus, in accordance with the second hypothesis. The alpha in question is equal to 9.77% and significant at the 5% level.

Lastly, the results from the regressions of the gambling consumption portfolios are depicted in **Table 10**. The Long Low-Consumption Portfolio has an alpha of 15.57%, significant at the 5% level, whereas the Long High-Consumption Portfolio has an alpha of 9.96%, significant at the 1% level. Consequently, in accordance with the second hypothesis, the Long-Short Gambling Portfolio exhibits a positive alpha of 5.62%. This alpha is not significant at conventional significance levels, however.

6.3. Hypothesis 3

The third hypothesis, that the sin-stock alpha is greater in Protestant countries than in Catholic countries, is tested using three portfolios (see **Table 6**). **Table 11** illustrates that the Long Protestant Portfolio and the Long Catholic Portfolio exhibit alphas of 9.95% and 9.08%, respectively, both significant at the 1% level. Hence, in accordance with the hypothesis, the alpha of the Long-Short Religion Portfolio is positive, specifically 0.88%. This alpha is not significant at conventional significance levels, however.

6.4. Robustness Tests

As described in Section 5.3., four robustness tests are undertaken. For concision, the results from these tests are only briefly commented upon here.[5] Firstly, a division of the sample countries by their median HDI and consumption values generates groupings that are different from the groupings generated when dividing the countries by their mean values, only for the HDI and alcohol consumption divisions. As for the HDI division, two countries are considered being high-value countries when dividing by the mean values, but low-value countries when dividing by the median values. This difference does not seem to matter, however, since the regression results of the two divisions are practically identical. As for the alcohol consumption division, four countries are considered being high-value countries when dividing by the mean values, but low-value countries when dividing by the median values. Running a regression with the median-value groupings, the annual alpha of the Long-Short Alcohol Portfolio increases from -1.40% to -0.74%. However, the t-value of this estimate weakens and is far from statistically significant at the conventional levels.

[5] The interested reader can contact the authors for the detailed results.

Secondly, dividing the time period into two sub-periods, 1999 through 2007 and 2008 through 2017, respectively, generally does not change the original results of this study. Nonetheless, three interesting features are discovered. Firstly, the alphas of all long portfolios are greater in the second time period. Secondly, the alphas of the Long-Short Religion, HDI, and Alcohol Portfolios go from being positive (the HDI portfolio statistically significant at the 10% level) in the first time period to being marginally negative in the second time period. However, the alphas of the second time period are all insignificant at the conventional significance levels. Thirdly, and lastly, the alphas of the Long-Short Tobacco and Gambling Portfolios are, respectively, roughly 50 and 100 percent bigger in magnitude in the second time period than in the first time period. The alphas are not, however, significant at the conventional significance levels. Generally, although the magnitudes and significance levels of the individual estimators change somewhat over time, the authors notice no clear pattern in the way they change across the different portfolios.

Thirdly, running regressions with robust standard errors generates marginally different standard errors – sometimes smaller and sometimes bigger – and the significance levels generally get slightly lower. The difference in results is diminutive, however.

Lastly, the results from the regressions using, respectively, the Fama French Three-Factor Model and the Carhart Four-Factor Model, are practically identical. Specifically, the loadings on the MOM factor are usually small, and significant at the 5- and 10% levels in only one of the fifteen Four-Factor Model regressions run. Furthermore, in comparison with the main results, the Three- and Four-Factor Model regressions provide lower adjusted-R^2 values, and generally lower significance levels. The signs and magnitudes of the estimators are very similar to those of the original regressions, except for the alcohol and gambling portfolios. For example, the Three- and Four-Factor alphas of the Long-Short Alcohol Portfolio are slightly positive, whereas that of the Five-Factor Model is slightly negative. Regardless of asset pricing model used, however, the alpha in question is insignificant. As for the Long-Short Gambling Portfolio, the Three- and Four-Factor Models generate positive alphas that are three to four times as big as that of the Five-Factor Model. Additionally, the alphas in question are significant at the 5% level using the Three- and Four Factor Models.

7. Discussion

In general, given that all long sin-stock portfolios exhibit positive and significant alphas, the results of this study support the idea of a sin-stock premium in Europe. This is in line with the

findings of Salaber (2007). However, since the alphas in question are prevalent when sin-stock excess returns are regressed on the factors of the Fama French Five-Factor Model, the results stand in contrast to those of Blitz and Fabozzi (2017). This difference in results may be due to the different sample periods, sample countries, and sin-stock definitions of the two studies. Furthermore, while not all of them are significant, the long-short portfolio alphas indicate countrywide differences in the degree to which alcohol, tobacco, and gambling are considered sinful. In this section, the results of this study will be analysed, and reasons to why the sin-stock alpha differs between groups of countries will be discussed.

Measuring life expectancy, education, and gross national income per capita, a country's HDI value acts as a measure of its welfare, in this paper. As hypothesized, the sin-stock alpha of the high-HDI countries is greater than that of the low-HDI countries, implying that investors in high-welfare countries are more prone to refrain from investing in sinful companies and, hence, that they are more sin averse. Three reasons to why this may be are discussed in this section. Firstly, it is suggested that sin stocks are neglected to a greater extent in high-welfare countries than in low-welfare countries. As stated in Section 3.1., SRI has become increasingly prevalent on the European market (Eurosif, 2016). This seems to be especially true for high-HDI countries, since eight of the thirteen countries identified as high-HDI countries in this paper, demonstrate significant growth in ethical investing. In addition, when ranking countries with respect to the Euro value of ethical assets under management, France, the UK, and Switzerland – all high-HDI countries – are included in the top tier. Consequently, since positive SRI screening favours ethical stocks over unethical stocks, and negative SRI screening explicitly discards unethical stocks, sin stocks are likely to have become more extensively neglected by investors in high-welfare countries. Given that alcohol, tobacco, and gambling stocks make up three of the most common types of stocks excluded by negative screening, the neglect effect of these stocks ought to be extensive. The neglecting of stocks makes markets more inefficient, and anomalies such as alphas become more prevailing. Secondly, building on the fact that ethical investing has become especially prevalent and sin stocks have become increasingly shunned in high-welfare countries, it is likely that herd bias has intensified these tendencies even more in the countries in question. Indeed, herd bias is the propensity of investors to follow general market trends, not because they are in line with the individual investor's investment strategy, but simply because they are considered trendy. Thirdly, whereas sin stocks obviously generate statistically significant abnormal returns, investors in high-welfare countries are in a position in which they, by definition, can "afford" to abstain from this

alpha to a greater extent than can investors in low-welfare countries. This implies that ethical investing is a privilege.

Just like the long HDI portfolios, the long consumption portfolios exhibit positive and statistically significant sin-stock alphas. While the Long-Short Tobacco and Gambling Portfolios exhibit positive alphas, the corresponding Alcohol Portfolio exhibits a negative alpha and, therefore, the latter portfolio will be discussed separately below. As for the Long-Short Tobacco and Gambling Portfolios, their positive alphas support the second hypothesis of this paper, i.e. that the sin-stock alpha of companies producing or selling a certain sinful good is greater in countries in which the sinful good in question is less heavily consumed. This difference in alphas might be explained by characteristics of, and actions undertaken by, people in low- as well as high-consumption countries. Firstly, people consuming less tobacco and gambling can be assumed to be more averse of the sinful good in question. This might lead to the sinful stocks being more extensively neglected, and hence the corresponding alpha being greater, in low-consumption countries. The opposite can be assumed to be true in high-consumption countries. These tendencies imply that investors literally are putting their money where their mouths are. Secondly, in accordance with the theory of familiarity bias, people consuming more tobacco and gambling ought to be more prone to, in fact, invest in tobacco and gambling companies, since investors tend to invest in companies producing products they are familiar with. As a result, sin stocks are less neglected and the sin-stock alpha diminishes in high-consumption countries. The opposite can be assumed to be true in low-consumption countries.

As stated above, in contrast to the Long-Short Tobacco and Gambling Portfolios, the corresponding Alcohol Portfolio exhibits a slightly negative alpha. This alpha is insignificant at conventional significance levels, however. Furthermore, when conducting robustness tests, the alpha becomes less negative in some instances, while it becomes positive in others. This variation in results is not in line with the second hypothesis, and it complicates the act of establishing a sin-stock-alpha differential between heavy and less heavy alcohol-consuming countries. So, why might there not be a difference in the magnitudes of the alcohol-stock alphas of, respectively, low- and high-consumption countries? This paper argues that alcohol, in contrast to tobacco and gambling, is more frequently consumed by a greater proportion of the European population, and that alcohol consumption is more similar across countries. Indeed, statistics show that, within the European Union, 30.00% (WHO, 2015b) and 1.33% (European Commission, 2017) of the population consume tobacco and online gambling, respectively,

while 61.40% of the population[6] consume alcohol (European Commission, 2018b). Moreover, the difference in alcohol consumption between the sample countries is not substantial. For example, 68.00% of the countries – four of them treated as low-consumption countries and eleven of them treated as high-consumption countries – consume between 9.20 and 12.90 litres pure alcohol per capita and year. The above reasoning suggests that alcohol consumption is more widespread and conventional, and less different between countries, than tobacco and gambling consumption. Consequently, the alcohol-stock alpha ought to be rather similar between low-and high-alcohol-consumption countries, why the alcohol regressions do not support the second hypothesis.

As for the last hypothesis, the sin-stock alphas of the two long portfolios are positive and statistically significant. Moreover, the alpha of the Long Protestant Portfolio is greater than that of the Long Catholic Portfolio. Hence, the Long-Short Religion Portfolio exhibits a positive alpha. This is in line with the third hypothesis of this paper as well as with Salaber's findings when conducting a similar study. Three possible reasons for this sin-stock-alpha differential will be discussed in this section; one of them relating to religion and two of them not. Firstly, studies imply that Protestants are more sin averse than Catholics. For example, Stulz and Williamson (2003) find that Protestants are more risk averse than Catholics, and Fairbanks (1977) and Johnson and Meier (1990) find that Protestants, compared to Catholics, hold a more positive view on strict legislation of alcohol and gambling. Defining sin stocks as stocks of alcohol, tobacco, and gambling companies, the findings from the above studies thus suggest that Protestants are more sin averse and, thereby, more likely to require a sin premium to invest in unethical stocks. Secondly, the greater sin-stock alpha in Protestant countries might have to do with welfare. McClearly and Barro (2006) conduct several studies on the relationship between economic growth and religiosity. They find that the populations of highly developed countries are prone to be less religious. Furthermore, they find that Protestants are less religious than Catholics, stating that the latter attend church more frequently and have stronger religious beliefs. Building on this, one can argue that Protestant countries, in general, are more economically developed than Catholic countries. This argument is supported by the overlap between the countries included in the Protestant and high-HDI groups of this study. Indeed, all Protestant countries are also categorized as high-HDI countries. Since the results from the HDI regressions demonstrate a positive relationship between HDI value and sin-stock alpha, it is

[6] Specifically, 72.9% and 49.9% men and women, respectively, within the European Union (EU) consume alcohol. The 61.40% reported in the text is calculated assuming the EU population is made up by 50% men and 50% women. This assumption is corroborated by Eurostat data (European Commission, 2018a).

likely that the greater sin-stock alpha in Protestant countries is due to higher economic welfare. Thirdly, and similarly, the religious sin-stock alpha differential might, in fact, be explained by consumption characteristics. As previously stated, it is reasoned that the sin-stock alpha of companies producing or selling a certain sinful good is greater in countries in which the sinful good in question is less heavily consumed. Furthermore, there is an overlap in the divisions of the sample countries into religion and tobacco-consumption groups, in this study. For instance, all Protestant countries are also categorized as low-tobacco-consumption countries. Thus, the greater sin-stock alpha in Protestant countries might be due to the fact that these countries, generally, are less heavy consumers of sinful goods. In summary, while the sin-stock-alpha differential between Protestant and Catholic countries might be explained by religion, specifically that Protestants are more sin averse than Catholics, additional explanations may be found outside the religious sphere. For example, the level of welfare and the consumption characteristics of the countries in question may serve as possible explanations.

Whereas the overall results of this study support the three hypotheses posed, the majority of the long-short portfolios yield insignificant alphas. This means that this paper cannot, indisputably, establish the characteristics of the sin-stock-alpha differentials of the opposing groups of countries. Worth to mention, however, is that valid conclusions can be drawn from the results of the long-portfolio regressions, which all yield statistically significant alphas. Nevertheless, one might wonder why the long-short portfolios yield insignificant results. It may be that the difference in the magnitudes of the long-portfolio alphas within a certain category is not that big. This is especially true for the HDI and religion portfolios. As for the HDI portfolios, the great convergence of countries, with respect to welfare, may be a possible explanation for the small difference in sin-stock alphas between low- and high-ranking countries. As for the religion portfolios, it may be that religion plays a less impactful role in today's society, and that globalization has made countries more religiously diverse within each country, albeit more religiously similar across countries. Consequently, the norms and values with respect to sinful behaviour, and hence the sin-stock alphas, are bound to be rather similar between countries defined as being either Protestant or Catholic. Additionally, one of the robustness tests of this study corroborates the convergence trend between, respectively, low- and high-HDI countries and Protestant and Catholic countries. When dividing the sample time period in two, it is shown that the sin-stock alphas of the two long-short portfolios in question diminish and are smaller in the second time period than in the first time period. Hence, the fact that the alphas of the long-short portfolio regressions are insignificant, is not too surprising.

In general, all results of this study are robust to dividing the sample countries based on their median rather than their mean HDI and consumption values, and to the choice of asset pricing model used. Moreover, since the regressions run with robust standard errors yield results that are practically identical to those of the original regressions, one can assume that the error terms of the original regressions are homoscedastic. Lastly, the robustness test of dividing the sample time period in two shows that the sin-stock alphas of all long portfolios are larger in the second time period. This is not unexpected, however, since ethical investing has increased materially recently. Indeed, as unethical stocks have become increasingly shunned by investors, the sin-stock alpha is bound to have increased due to the neglect effect.

Being partly built on simplifying assumptions, this study does have some limitations. Firstly, it is assumed that investors invest on their domestic markets only, so that the sin-stock alpha of a country can be attributed to the categorizations imposed on that country and its population. In an increasingly globalized world, this may be considered a slightly unrealistic assumption. The authors of this paper have come to the conclusion, however, that it is reasonable to assume that a market *predominantly* is made up by domestic investors, albeit being exposed to international influences. Secondly, it is assumed that the divisions of countries made based on HDI values, consumption characteristics, and religious denominations are representative for the entire sample period, even though they are based on recent data. The same assumption is made for the industry classification of stocks based on their latest observed ICB code. These assumptions are reckoned to be reasonable, supposing that the relationships between the sample countries have not changed significantly during the 19-year, thus rather limited, time period in question. Indeed, these assumptions are corroborated by the fact that the countries which are included in this study as well as in Salaber's study – a study which was conducted 10 years ago – obtain the same religious denominations in both studies. Thirdly, and lastly, it is assumed that HDI acts as a valid proxy for welfare. Welfare has ambiguous definitions. While some scholars may choose to use a country's GDP per capita as a measure of its welfare, the authors of this paper consider HDI being a more suitable measure since it takes additional focal factors, namely life expectancy and education, into account.

8. Conclusion

This paper focuses on determining how and why sin-stock performance differs between countries, analysing monthly stock data for a sample of 22 European countries over the time period 1999 through 2017. Sin stocks are defined as stocks of companies operating in the

alcohol, tobacco, and gambling industries. Given that significantly positive sin-stock alphas are found to be prevalent throughout the sample countries, the results of this study support the notion of a sin-stock premium in Europe. Furthermore, it is found that the alphas have gotten bigger during the last decade, indicating that Europeans have become more sin averse. More interestingly, however, being the focus of this paper, it is found that the sin-stock alpha differs between countries grouped by investor characteristics. Henceforth, this section will summarize how and why the alpha differs, as the main results for the three hypotheses posed will be presented.

Firstly, the sin-stock alpha is found to be greater in high-welfare countries than in low-welfare countries. This might be due to the fact that socially responsible investing has become especially prevalent in high-welfare countries (Eurosif, 2016), leading to a greater neglect effect of sin stocks there. Furthermore, it is reasoned that herd bias, i.e. the tendency of investors to follow general market trends (Kübilay and Bayrakdaroğlu, 2016), has amplified the neglect of sin stocks in high-welfare countries. Lastly, abstaining from investing in unethical, albeit alpha-generating, stocks may be considered a privilege which mainly investors in high-welfare countries can afford to enjoy.

Secondly, with regards to tobacco and gambling, it is found that the sin-stock alpha of companies producing or selling a certain sinful good is greater in countries consuming less, than in countries consuming more, of the sinful good in question. An intuitive explanation for this is that investors consuming less of a sinful good are more likely to be sin averse. In addition, familiarity bias, i.e. the tendency of investors to invest in companies whose brands and products they are familiar with (Speidell, 2009), may explain the alpha differential. Both explanations entail that sin stocks are more extensively neglected in low-consumption countries. In contrast, however, the results from the alcohol-stock regressions contradict those from the tobacco- and gambling-stock regressions. It may be that alcohol consumption is more widespread and conventional, and less different between countries, than is the consumption of the other sinful goods. Consequently, in accordance with the findings of this study, the alcohol-stock alpha ought to be rather similar between low- and high-alcohol-consumption countries.

Thirdly, it is found that the sin-stock alpha is greater in Protestant countries than in Catholic countries. This result is in line with other studies stating that Protestants are more sin averse than Catholics (Salaber, 2007), and indicates that Protestants require a greater sin premium to invest in unethical stocks. What is more, this paper suggests that, alongside religious reasons, the sin-stock-alpha differential in question might be explained by differences in welfare and consumption characteristics of Protestant and Catholic countries. Indeed, it is

found that all Protestant countries are also categorized as high-welfare as well as low-tobacco-consumption countries. As stated above, both latter categories of countries are found to have greater sin-stock alphas than their opposite groups of countries.

The results of this study raise several interesting questions which could serve as foundations for future research. For example, since this paper studies a set of European countries over a 19-year time period, it would be interesting to conduct a similar study on other geographical areas and over other time periods, investigating whether the results of this study are representative for the overall stock market. Moreover, while this study has identified three investor characteristics that help explain why sin-stock performance differs between countries, future research could focus on finding other such characteristics. What is more, the characteristics identified in this study could be investigated in more detail by, for example, including more religious denominations than Protestantism and Catholicism. Lastly, it would be interesting to alter the sin-stock definition. In this day and age, companies promoting extreme beauty ideals or operating in the fast food industry might be considered equally sinful as companies operating in the alcohol, tobacco, and gambling industries.

In conclusion, this study finds that sin-stock performance differs between countries due to differences in welfare, consumption, and religious denomination. This means that the degree to which the stock market reflects our norms and values, might be greater than previously reckoned. One might wonder: what norms and values are going to influence the stock market of tomorrow?

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10. Appendix

Table 1: Division of Countries Based on HDI

This table reports the division of sample countries into high-HDI and low-HDI groups. HDI stands for Human Development Index. The index is calculated as the geometric mean of the normalized indices for life expectancy, education, and gross national income per capita for a certain country, and ranges from 0 to 1 (UNDP, 2018a). The division of countries is based on the mean HDI value for the entire sample, namely 0.822. The HDI data is collected from the United Nations Development Program (UNDP) (2018b).

HIGH HDI		**LOW HDI**	
Country	**HDI**	**Country**	**HDI**
Norway	0.896	Italy	0.819
Switzerland	0.873	Spain	0.815
Sweden	0.862	Slovakia	0.789
Denmark	0.856	Lithuania	0.779
Belgium	0.851	Malta	0.774
Iceland	0.851	Poland	0.773
Ireland	0.844	Portugal	0.768
United Kingdom	0.844	Hungary	0.767
Luxembourg	0.841	Croatia	0.757
Finland	0.838		
France	0.835		
Slovenia	0.831		
Austria	0.830		

Table 2: Division of Countries Based on Alcohol Consumption

This table reports the division of sample countries into high-alcohol-consumption and low-alcohol-consumption groups. Alcohol consumption is measured as the annual per (over 15 years old) capita consumption of pure alcohol, quantified in litres (WHO, 2015a). The division of countries is based on the mean value for the entire sample, namely 11.05 litres. The data is collected from the World Health Organization (WHO) (2015a).

HIGH ALCOHOL CONSUMPTION		**LOW ALCOHOL CONSUMPTION**	
Country	**Consumption (Litres per Capita and Year)**	**Country**	**Consumption (Litres per Capita and Year)**
Lithuania	15.4	Belgium	11.0
Hungary	13.3	Switzerland	10.7
Slovakia	13.0	Austria	10.3
Portugal	12.9	Sweden	9.2
Poland	12.5	Norway	7.7
Finland	12.3	Iceland	7.1
Croatia	12.2	Malta	7.0
France	12.2	Italy	6.7
Ireland	11.9		
Luxembourg	11.9		
Slovenia	11.6		
United Kingdom	11.6		
Denmark	11.4		
Spain	11.2		

Table 3: Division of Countries Based on Tobacco Consumption

This table reports the division of sample countries into high-tobacco-consumption and low-tobacco-consumption groups. Tobacco consumption is measured as the percentage of adults using tobacco daily. The division of countries is based on the mean value for the entire sample, namely 24.10%. The data is collected from the Tobacco Atlas (American Cancer Society, Inc. and Vital Strategies, 2018).

HIGH TOBACCO CONSUMPTION		**LOW TOBACCO CONSUMPTION**	
Country	**Percentage of Population**	**Country**	**Percentage of Population**
Austria	32.50	Slovenia	24.10
Croatia	31.25	Portugal	23.80
France	31.15	Malta	23.45
Belgium	28.50	Slovakia	23.10
Hungary	28.35	United Kingdom	21.75
Lithuania	28.35	Switzerland	21.35
Poland	27.90	Denmark	18.85
Spain	26.65	Finland	18.05
Luxembourg	26.55	Norway	16.75
Ireland	24.70	Iceland	14.50
Italy	24.65	Sweden	13.95

Table 4: Division of Countries Based on Gambling Consumption

This table reports the division of sample countries into high-gambling-consumption and low-gambling-consumption groups. The sample countries included on the list of the top 25 per capita gambling revenue countries in the world constitute the high-consumption countries, while the rest of the sample countries constitute the low-consumption countries. The data is collected from Morss Global Finance (2009).

HIGH GAMBLING CONSUMPTION	LOW GAMBLING CONSUMPTION	
Countries	**Countries**	
Finland	Austria	Lithuania
France	Belgium	Luxembourg
Italy	Croatia	Malta
Portugal	Denmark	Norway
Spain	Hungary	Poland
Sweden	Iceland	Slovakia
Switzerland	Ireland	Slovenia
United Kingdom		

Table 5: Division of Countries Based on Religious Denomination

This table reports the division of sample countries into Protestant and Catholic groups. A country is reckoned to be Protestant (Catholic) if the fraction of the population practicing Protestantism (Catholicism) is greater than the fraction of the population practicing any other religion. Three independent sources are used to determine the religious denomination of a country. The sources are: the CIA World Fact Book (2018), the Adherents List of Predominant Religions (2005), and the United Nations (2018).

PROTESTANT	**CATHOLIC**	
Countries	**Countries**	
Denmark	Austria	Luxembourg
Finland	Belgium	Malta
Iceland	Croatia	Poland
Norway	France	Portugal
Sweden	Hungary	Slovakia
United Kingdom	Ireland	Slovenia
	Italy	Spain
	Lithuania	Switzerland

Table 6: Portfolio Description

This table illustrates the 15 portfolios constructed and used in this study. Long portfolios comprise one group of countries only. Long-short portfolios comprise two opposing groups of countries, being long one group of countries and short the opposing group of countries. The group of high- (low-) HDI countries is made up by the sample countries having an HDI value greater (less) than the mean HDI value of the entire sample. The group of high-alcohol-consumption (low-alcohol-consumption) countries is made up by the sample countries consuming more (less) than the sample mean amount of pure alcohol per capita. The group of high-tobacco-consumption (low-tobacco-consumption) countries is made up by the sample countries in which the percentage of adults using tobacco daily is greater (lower) than the mean value for the entire sample. The group of high-gambling-consumption (low-gambling-consumption) countries is made up by the sample countries (not) included on the list of the top 25 per capita gambling revenue countries in the world. The group of Protestant (Catholic) countries is made up by the sample countries in which the fraction of the population practicing Protestantism (Catholicism) is greater than the fraction of the population practicing any other religion. The sample countries constituting each of the different portfolios are displayed in Tables 1, 2, 3, 4, and 5. Sin stocks are defined as stocks of companies operating in the alcohol, tobacco, and gambling industries.

PORTFOLIO	DESCRIPTION
Long High HDI	Long sin stocks in high-HDI countries
Long Low HDI	Long sin stocks in low-HDI countries
Long-Short HDI	Long the Long High-HDI Portfolio and short the Long Low-HDI Portfolio
Long Low Alcohol Consumption	Long sin stocks in low-alcohol-consumption countries
Long High Alcohol Consumption	Long sin stocks in high-alcohol-consumption countries
Long-Short Alcohol	Long the Long Low-Alcohol-Consumption Portfolio and short the Long High-Alcohol-Consumption Portfolio
Long Low Tobacco Consumption	Long sin stocks in low-tobacco-consumption countries
Long High Tobacco Consumption	Long sin stocks in high-tobacco-consumption countries
Long-Short Tobacco	Long the Long Low-Tobacco-Consumption Portfolio and short the Long High-Tobacco-Consumption Portfolio
Long Low Gambling Consumption	Long sin stocks in low-gambling-consumption countries
Long High Gambling Consumption	Long sin stocks in high-tobacco-consumption countries
Long-Short Gambling	Long the Long Low-Gambling-Consumption Portfolio and short the Long-High-Gambling-Consumption Portfolio
Long Protestant	Long sin stocks in Protestant countries
Long Catholic	Long sin stocks in Catholic countries
Long-Short Religion	Long the Long Protestant Portfolio and short the Long Catholic Portfolio

Table 7: Regression Output for the HDI Portfolios

This table reports the output from the ordinary least square regressions for the three HDI portfolios. The Long High-HDI Portfolio (Long Low-HDI Portfolio) is made up by the sin stocks of the sample countries having an HDI value greater (less) than the mean HDI value for the entire sample. Sin stocks are defined as stocks of companies operating in the alcohol, tobacco, and gambling industries. The Long-Short HDI Portfolio is long the Long High-HDI Portfolio and short the Long Low-HDI Portfolio. When performing the regressions, the monthly excess returns (i.e. the monthly gross returns in excess of the monthly one-month Euribor interest rate) of each portfolio are regressed on the factors of the Fama French Five-Factor Model, over the time period 1999 through 2017. All factors are downloaded from the Kenneth R. French data library (2018). Since the factors are stated in U.S. Dollars but the portfolio excess returns are stated in Euro, the factors are adjusted for any appreciation of the Euro-to-USD exchange rate, using exchange rate data from Thomson Reuters Datastream. All factors are constructed using value-weighted portfolios of all stocks in 16 European countries, proxying for the European market. The MRP factor is defined as the monthly return on the European market portfolio in excess of the monthly one-month Euribor interest rate. The SMB factor is defined as the monthly return difference between a portfolio of the 10% smallest European stocks and a portfolio the 90% largest European stocks. The HML factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% highest book-to-market ratios, and a portfolio of the stocks of the European countries with the 30% lowest book-to-market ratios. The RMW factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% highest operating profitability, and a portfolio of the stocks of the European companies with the 30% lowest operating profitability. The CMA factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% lowest investments (in relation to their size), and a portfolio of the stocks of the European companies with the 30% highest investments (in relation to their size). The beta values of each factor are presented with the corresponding standard error in parenthesis. Similarly, the alphas, i.e. the regression intercepts, are presented with the corresponding standard error in parenthesis. The significance levels of the regression estimators, i.e. of the beta and alpha values, are determined with a t-test and are illustrated using asterisks, where *, **, and *** illustrates statistical significance at the 10%, 5%, and 1% levels, respectively. The R^2 numbers denotes the adjusted-R^2 numbers. All numbers are expressed in annual terms. All numbers, except for the adjusted-R^2 numbers, are expressed in decimals; the adjusted R^2 numbers are expressed in percentages.

PORTFOLIO	ALPHA	MRP	SMB	HML	RMW	CMA	R^2
Long High HDI	0.1003***	0.0035***	-0.2351***	0.0005	-0.1176	-0.0953	26.28
	(0.0069)	(0.0005)	(0.0832)	(0.1138)	(0.1070)	(0.1428)	
Long Low HDI	0.0667***	0.0022***	-0.0245	-0.0844	-0.2380**	0.2612*	11.92
	(0.0064)	(0.0004)	(0.0775)	(0.1060)	(0.0997)	(0.1118)	
Long-Short HDI	0.0336	0.0014	-0.2107**	0.0849	0.1203	-0.3564**	11.70
	(0.0078)	(0.0005)	(0.0950)	(0.1299)	(0.1221)	(0.1630)	

Table 8: Regression Output for the Alcohol Portfolios

This table reports the output from the ordinary least square regressions for the three alcohol-consumption portfolios. The Long High-Alcohol-Consumption Portfolio (Long Low-Alcohol-Consumption Portfolio) is made up by the sin stocks of the sample countries in which the annual per capita consumption of pure alcohol is higher (lower) than the mean value for the entire sample. Sin stocks are defined as stocks of companies operating in the alcohol industry. The Long-Short Alcohol Portfolio is long the Long High-Alcohol-Consumption Portfolio and short the Long Low-Alcohol-Consumption Portfolio. When performing the regressions, the monthly excess returns (i.e. the monthly gross returns in excess of the monthly one-month Euribor interest rate) of each portfolio are regressed on the factors of the Fama French Five-Factor Model, over the time period 1999 through 2017. All factors are downloaded from the Kenneth R. French data library (2018). Since the factors are stated in U.S. Dollars but the portfolio excess returns are stated in Euro, the factors are adjusted for any appreciation of the Euro-to-USD exchange rate, using exchange rate data from Thomson Reuters Datastream. All factors are constructed using value-weighted portfolios of all stocks in 16 European countries, proxying for the European market. The MRP factor is defined as the monthly return on the European market portfolio in excess of the monthly one-month Euribor interest rate. The SMB factor is defined as the monthly return difference between a portfolio of the 10% smallest European stocks and a portfolio the 90% largest European stocks. The HML factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% highest book-to-market ratios, and a portfolio of the stocks of the European countries with the 30% lowest book-to-market ratios. The RMW factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% highest operating profitability, and a portfolio of the stocks of the European companies with the 30% lowest operating profitability. The CMA factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% lowest investments (in relation to their size), and a portfolio of the stocks of the European companies with the 30% highest investments (in relation to their size). The beta values of each factor are presented with the corresponding standard error in parenthesis. Similarly, the alphas, i.e. the regression intercepts, are presented with the corresponding standard error in parenthesis. The significance levels of the regression estimators, i.e. of the beta and alpha values, are determined with a t-test and are illustrated using asterisks, where *, **, and *** illustrates statistical significance at the 10%, 5%, and 1% levels, respectively. The R^2 numbers denotes the adjusted-R^2 numbers. All numbers are expressed in annual terms. All numbers, except for the adjusted-R^2 numbers, are expressed in decimals; the adjusted R^2 numbers are expressed in percentages.

PORTFOLIO	ALPHA	MRP	SMB	HML	RMW	CMA	R^2
Long Low Alcohol Consumption	0.0817***	0.0022***	0.0604	-0.1330	-0.0051	0.1127	7.28
	(0.0081)	(0.0005)	(0.0978)	(0.1337)	(0.1258)	(0.1678)	
Long High Alcohol Consumption	0.0957***	0.0033***	-0.3044***	0.0794	-0.0611	-0.1466	21.92
	(0.0076)	(0.0005)	(0.0919)	(0.1257)	(0.1182)	(0.1578)	
Long-Short Alcohol	-0.0140	-0.0011	0.3648***	-0.2124	0.0560	0.2593	10.02
	(0.0096)	(0.0007)	(0.1165)	(0.1593)	(0.1498)	(0.1999)	

Table 9: Regression Output for the Tobacco Portfolios

This table reports the output from the ordinary least square regressions for the three tobacco-consumption portfolios. The Long High-Tobacco-Consumption Portfolio (Long Low-Tobacco-Consumption Portfolio) is made up by the sin stocks of the sample countries in which the percentage of adults using tobacco daily is higher (lower) than the mean value for the entire sample. Sin stocks are defined as stocks of companies operating in the tobacco industry. The Long-Short Tobacco Portfolio is long the Long High-Tobacco-Consumption Portfolio and short the Long Low-Tobacco-Consumption Portfolio. When performing the regressions, the monthly excess returns (i.e. the monthly gross returns in excess of the monthly one-month Euribor interest rate) of each portfolio are regressed on the factors of the Fama French Five-Factor Model, over the time period 1999 through 2017. All factors are downloaded from the Kenneth R. French data library (2018). Since the factors are stated in U.S. Dollars but the portfolio excess returns are stated in Euro, the factors are adjusted for any appreciation of the Euro-to-USD exchange rate, using exchange rate data from Thomson Reuters Datastream. All factors are constructed using value-weighted portfolios of all stocks in 16 European countries, proxying for the European market. The MRP factor is defined as the monthly return on the European market portfolio in excess of the monthly one-month Euribor interest rate. The SMB factor is defined as the monthly return difference between a portfolio of the 10% smallest European stocks and a portfolio the 90% largest European stocks. The HML factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% highest book-to-market ratios, and a portfolio of the stocks of the European countries with the 30% lowest book-to-market ratios. The RMW factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% highest operating profitability, and a portfolio of the stocks of the European companies with the 30% lowest operating profitability. The CMA factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% lowest investments (in relation to their size), and a portfolio of the stocks of the European companies with the 30% highest investments (in relation to their size). The beta values of each factor are presented with the corresponding standard error in parenthesis. Similarly, the alphas, i.e. the regression intercepts, are presented with the corresponding standard error in parenthesis. The significance levels of the regression estimators, i.e. of the beta and alpha values, are determined with a t-test and are illustrated using asterisks, where *, **, and *** illustrates statistical significance at the 10%, 5%, and 1% levels, respectively. The R^2 numbers denotes the adjusted-R^2 numbers. All numbers are expressed in annual terms. All numbers, except for the adjusted-R^2 numbers, are expressed in decimals; the adjusted R^2 numbers are expressed in percentages.

PORTFOLIO	ALPHA	MRP	SMB	HML	RMW	CMA	R^2
Long Low Tobacco Consumption	0.1452***	0.0021**	-0.2989**	-0.0610	-0.2961	-0.2065	3.82
	(0.0124)	(0.0009)	(0.1506)	(0.2060)	(0.1937)	(0.2585)	
Long High Tobacco Consumption	0.0475*	0.0006	-0.0702	-0.0819	-0.3128**	0.4845***	6.96
	(0.0079)	(0.0005)	(0.0957)	(0.1308)	(0.1230)	(0.1642)	
Long-Short Tobacco	0.0977**	0.0015	-0.2288	0.1430	0.6089***	-0.6909**	7.28
	(0.0137)	(0.0010)	(0.1667)	(0.2280)	(0.2144)	(0.0040)	

Table 10: Regression Output for the Gambling Portfolios

This table reports the output from the ordinary least square regressions for the three gambling-consumption portfolios. The Long High-Gambling-Consumption Portfolio (Long Low-Gambling-Consumption Portfolio) is made up by the sin stocks of the sample countries (not) included on the list of the top 25 per capita gambling revenue countries in the world. Sin stocks are defined as stocks of companies operating in the gambling industry. The Long-Short Gambling Portfolio is long the Long High-Gambling-Consumption Portfolio and short the Long Low-Gambling-Consumption Portfolio. When performing the regressions, the monthly excess returns (i.e. the monthly gross returns in excess of the monthly one-month Euribor interest rate) of each portfolio are regressed on the factors of the Fama French Five-Factor Model, over the time period 1999 through 2017. All factors are downloaded from the Kenneth R. French data library (2018). Since the factors are stated in U.S. Dollars but the portfolio excess returns are stated in Euro, the factors are adjusted for any appreciation of the Euro-to-USD exchange rate, using exchange rate data from Thomson Reuters Datastream. All factors are constructed using value-weighted portfolios of all stocks in 16 European countries, proxying for the European market. The MRP factor is defined as the monthly return on the European market portfolio in excess of the monthly one-month Euribor interest rate. The SMB factor is defined as the monthly return difference between a portfolio of the 10% smallest European stocks and a portfolio the 90% largest European stocks. The HML factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% highest book-to-market ratios, and a portfolio of the stocks of the European countries with the 30% lowest book-to-market ratios. The RMW factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% highest operating profitability, and a portfolio of the stocks of the European companies with the 30% lowest operating profitability. The CMA factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% lowest investments (in relation to their size), and a portfolio of the stocks of the European companies with the 30% highest investments (in relation to their size). The beta values of each factor are presented with the corresponding standard error in parenthesis. Similarly, the alphas, i.e. the regression intercepts, are presented with the corresponding standard error in parenthesis. The significance levels of the regression estimators, i.e. of the beta and alpha values, are determined with a t-test and are illustrated using asterisks, where *, **, and *** illustrates statistical significance at the 10%, 5%, and 1% levels, respectively. The R^2 numbers denotes the adjusted-R^2 numbers. All numbers are expressed in annual terms. All numbers, except for the adjusted-R^2 numbers, are expressed in decimals; the adjusted R^2 numbers are expressed in percentages.

PORTFOLIO	ALPHA	MRP	SMB	HML	RMW	CMA	R^2
Long Low Gambling Consumption	0.1557**	0.0059***	1.1295***	-1.0559***	-0.5874*	0.2214	14.80
	(0.0204)	(0.0014)	(0.2468)	(0.3375)	(0.3173)	(0.4235)	
Long High Gambling Consumption	0.0996***	0.0067***	0.1956	-0.4068**	-0.5889***	0.0083	32.02
	(0.0103)	(0.0007)	(0.1244)	(0.1701)	(0.1600)	(0.0030)	
Long-Short Gambling	0.0562	-0.0008	0.9339***	-0.6491*	0.0015	0.1354	6.93
	(0.0202)	(0.0014)	(0.2451)	(0.3351)	(0.3151)	(0.4296)	

Table 11: Regression Output for the Religion Portfolios

This table reports the output from the ordinary least square regressions for the three religion portfolios. The Long Protestant Portfolio (Long Catholic Portfolio) is made up by the sin stocks of the sample countries in which the fraction of the population practicing Protestantism (Catholicism) is greater than the fraction of the population practicing any other religion. Sin stocks are defined as stocks of companies operating in the alcohol, tobacco, and gambling industries. The Long-Short Religion Portfolio is long the Long Protestant Portfolio and short the Long Catholic Portfolio. When performing the regressions, the monthly excess returns (i.e. the monthly gross returns in excess of the monthly one-month Euribor interest rate) of each portfolio are regressed on the factors of the Fama French Five-Factor Model, over the time period 1999 through 2017. All factors are downloaded from the Kenneth R. French data library (2018). Since the factors are stated in U.S. Dollars but the portfolio excess returns are stated in Euro, the factors are adjusted for any appreciation of the Euro-to-USD exchange rate, using exchange rate data from Thomson Reuters Datastream. All factors are constructed using value-weighted portfolios of all stocks in 16 European countries, proxying for the European market. The MRP factor is defined as the monthly return on the European market portfolio in excess of the monthly one-month Euribor interest rate. The SMB factor is defined as the monthly return difference between a portfolio of the 10% smallest European stocks and a portfolio the 90% largest European stocks. The HML factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% highest book-to-market ratios, and a portfolio of the stocks of the European countries with the 30% lowest book-to-market ratios. The RMW factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% highest operating profitability, and a portfolio of the stocks of the European companies with the 30% lowest operating profitability. The CMA factor is defined as the monthly return difference between a portfolio of the stocks of the European companies with the 30% lowest investments (in relation to their size), and a portfolio of the stocks of the European companies with the 30% highest investments (in relation to their size). The beta values of each factor are presented with the corresponding standard error in parenthesis. Similarly, the alphas, i.e. the regression intercepts, are presented with the corresponding standard error in parenthesis. The significance levels of the regression estimators, i.e. of the beta and alpha values, are determined with a t-test and are illustrated using asterisks, where *, **, and *** illustrates statistical significance at the 10%, 5%, and 1% levels, respectively. The R^2 numbers denotes the adjusted-R^2 numbers. All numbers are expressed in annual terms. All numbers, except for the adjusted-R^2 numbers, are expressed in decimals; the adjusted R^2 numbers are expressed in percentages.

PORTFOLIO	ALPHA	MRP	SMB	HML	RMW	CMA	R^2
Long Protestant	0.0995***	0.0034***	-0.2507***	-0.0073	-0.1194	-0.1344	22.99
	(0.0076)	(0.0005)	(0.0923)	(0.1263)	(0.1187)	(0.1585)	
Long Catholic	0.0908***	0.0033***	-0.0939	-0.0370	-0.1679**	0.1489	30.05
	(0.0054)	(0.0004)	(0.0651)	(0.0891)	(0.0837)	(0.1118)	
Long-Short Religion	0.0088	0.0002	-0.1568*	0.02963	0.0486	-0.2833*	13.02
	(0.0070)	(0.0005)	(0.0843)	(0.1153)	(0.1084)	(0.1447)	