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The Performance of Nordic ESG Mutual Funds

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ABSTRACT

This paper seeks to answer if the Nordic investor pays the price of ethics when investing in Nordic ESG funds. Over the 2010-2020 period, we take the perspective of a Nordic investor and compare the risk and return of 38 Nordic environmental, social and governance (ESG) funds relative to a matched sample of 76 conventional funds. We analyse and compare funds environmental, social and governance (ESG) performance and seek to find a relationship between ESG risk and risk-adjusted performance.

Although our study indicates that both ESG and the conventional fund have underperformed the benchmark portfolio over the sample period, the results suggest that Nordic investors do not pay the price for ethics when investing in ESG funds. Further, we find weak evidence of a positive relationship between performance in ESG and risk-adjusted return.

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1 Introduction

The profitability of socially responsible investing (SRI) funds is a controversy that has engaged practitioners and scholars for many decades. As modern portfolio theory suggests that portfolios constructed of a restricted stock universe would result in suboptimal portfolios, another school of thought suggests that socially responsible portfolios may exhibit better risk-adjusted performance as sustainable stocks are exposed to less risk within Environmental, Social and Governance (ESG) issues.

Under the SRI umbrella, we find ESG investing, which has caught the public eye. Going back 10-15 years, ESG investing was more a niche investment strategy reserved for professionals. With the green shift finding its way into financial markets in later years, this has drastically changed. From the launch of the UN-supported Principles for Responsible Investment (PRI) (UNPRI, n.d.) in 2006, and later the implementation of the UN Sustainable Development Goals (SDGs) (UNSDG, n.d.) in 2015, awareness about ESG issues among investors has increased substantially. This newfound interest in ESG investing has created new business opportunities for the financial services industry. A new business segment, ESG data and ratings, has made it increasingly easy for investors to evaluate the ESG risk of their investments. These new financial tools have made responsible investing more accessible to the public, which along with the growing awareness of global challenges, has caused funds to flow into ESG labelled products.

The shift towards sustainable finance represents a fundamental change in the investment landscape. The spike in interest for ESG has caused the number of ESG committed funds (ESG funds) to increase substantially. According to European Sustainable Fund Landscape: 2020 in Review (Bioy et al., 2021), European asset managers launched a total of 505 new ESG funds and repurposed more than 250 conventional funds in 2020. Looking forward, PwC (PwC, 2020) forecast ESG funds to outnumber conventional funds by 2025. Considering the current market share of approximately 15%, ESG funds may experience a fourfold jump in capital inflow over the next four years.

With money pouring into ESG-labelled products, finance is vital in allocating funds towards good projects and companies contributing to the green shift. However, as

ESG has become a part of the investment mainstream, ESG concerns may be used to attract fund flows. That is, asset managers may "greenwash" their investment vehicles to attract interest from environmentally minded investors (Mooney, 2021). Consequently, regulators have put ESG funds under scrutiny, and in March 2021, the EU launched the Sustainable Finance Disclosure Regulation (SFDR). The regulation aims to foster better transparency through standards of reporting and disclosure on sustainability. By creating an industry standard, the SFDR makes the EU fund market easier to navigate for the end-investor.

This thesis contributes to the emerging literature on ESG investing by investigating different aspects of importance to most investors. The first objective is to evaluate the risk and return of Nordic ESG mutual funds investing in the global stock market relative to a comparable group of conventional funds over the 2010-2020 period. We expect to find an outperformance by ESG funds, primarily driven by the emergence of ESG data and increased awareness of ESG risk. The second objective is to compare the Morningstar Sustainability Rating (ESG rating) of ESG funds relative to conventional funds. Since the Nordic countries have been ranked as top performers on SR and ESG practices for many years (Baselli, 2020), we argue that the Nordic asset managers should have the necessary expertise and tools to distinguish the good from the bad. Therefore, we expect ESG funds to perform better on ESG than conventional funds. The final objective is to examine the relationship between financial performance and ESG rating.

Following the methodology of Renneboog, Horst and Zhang (2008) and Nofsinger and Varma (2014), we first identify a sample of ESG funds that subsequently are matched with a control group of conventional funds with similar characteristics. Next, we explore the differences in risk-adjusted return between ESG- and conventional funds using three different benchmark models. Finally, to quantify the impact of sustainability rating on fund performance, we divide funds into portfolios based on their historical ESG rating (top 20%, middle 60%, and bottom 20%).

The paper is structured as follows. Section 2 introduces SR/ESG investing. Section 3 reviews relevant literature. Section 4 present the hypotheses and the methodologies used. Section 5 describes the data and its constraints. Section 6 present empirical findings and discuss the results. Section 7 concludes.

2 Sustainable investing

The literature often uses the term CSR (Corporate Social Responsibility) and ESG (Environmental, Social and Governance) interchangeably. Although the concepts are related, they capture slightly different aspects of socially responsible investing (SRI). For instance, as ESG typically refers to incorporating Environmental, Social and Governance into investor and company management decisions, CSR comprises only the Environmental and Social dimensions of ESG. Funds that integrate some or all components of ESG are generally known as Socially Responsible (SR) or SRI funds.

Following Liang and Renneboog's paper (2020), we derive the components of ESG. Specifically, the Environmental (E) dimension may consider a company's energy usage, emissions (e.g., greenhouse gases), pollution (e.g., oil spills) or the environmental risk the company might face. The Social (S) dimension look at a company's relation with its stakeholders, such as the workforce, customers, and society. If a company can maintain loyal workers, satisfy customers, and be a good citizen within the community it operates, it typically performs well socially. Finally, we have the Governance (G) dimension, which is harder to interpret. In the context of CSR, (G) refers, on the one hand, to the traditional corporate governance mechanism, such as safeguarding shareholder rights, maintaining a competent board, and avoiding fraud and illegal practices. On the other hand, (G) is sometimes defined more narrowly to diversity and inclusion among the board of directors, the management, or corporate processes.

2.1 Socially responsible and ESG funds

A mutual fund is, by definition, a professionally managed investment vehicle that pools money from investors and invests that money in securities such as stocks, bonds, or short-term debt. The U.S. Securities and Exchange Commission (Investor.gov, n.d.) divide mutual funds into four main categories:

1. **Money market funds.** Invest typically in highly liquid, short-term debt securities, such as US Treasury bills and commercial papers.
2. **Bond funds.** Also known as fixed-income funds. Invest typically in corporate bonds and municipal bonds.

3. **Stock funds.** Also known as equity funds. Invest in corporate stocks. In Norway, equity funds must invest a minimum of 80% of the capital in stocks distributed over at least 16 different holdings.
4. **Target date funds.** Also known as lifecycle funds. Structured in an optimised way for a specific holding period and invest typically in a mix of stocks, bonds, and other investments.

Socially responsible funds are, as earlier described, funds making up their portfolios based on ethical or other responsible investing considerations. Pax World funds were established in 1971 as the first socially responsible mutual fund in the US. The fund, initially for church assets, practised a negative screening approach by excluding companies contributing to the Vietnam War (Liu, 2020). Today, investors can find various responsible investing funds under the sustainable investing umbrella, such as ESG funds, impact funds, and sustainable sector funds.

With social responsibility high on the public agenda, we see an increasing trend not only in SR and ESG branded financial products, but also a rise in the general level of social responsibility from the financial institutions in the Nordics. Consequently, most of the financial institutions in the Nordic has adopted some form of negative screening approach to all their funds. Still, if a fund is subject to an institution-wide exclusion, the asset manager may still ignore the (S) and (G) of the ESG framework. For this thesis, we define ESG funds as open-end funds that go beyond excluding stocks and claim to use binding ESG criteria for their investment selection by prospectus, fact sheet or other available resources[1].

[1] Morningstar define those funds that refer to ESG criteria in their prospectuses as one set of factors considered in their investment process as "ESG consideration funds". Contrarily, those funds that make sustainability factors a featured component of their processes for both security selection and portfolio construction are referred to as "ESG focus funds". The latter group, (ESG focus funds) equals ESG funds for this thesis.

2.2 Strategies for sustainable investing

The negative screening strategy introduced by Pax World Funds is still widely used by asset managers. However, other methods have emerged over time, and today we have at least seven well-known responsible investment strategies (Eurosif, n.d.):

1. **Negative or exclusionary screening.**
2. **Positive or best-in-class screening.**
3. **Norms-based screening.** E.g., screening based on UN Global Principles.
4. **ESG integration.** E.g., incorporating ESG factors into financial analysis.
5. **Sustainability-themed.** E.g., investments in sectors such as renewables.
6. **Engagement & voting.** E.g., the fund managers practice an active engagement in shareholders campaigns and voting.
7. **Impact investing.** E.g., investments in companies with a positive social and environmental impact.

Research finds that the most dominant strategies among institutions are engagement, integration, and negative screening, although norms-based, positive screening and thematic strategies have gained more emphasis over time (Gibson, Glossner, Krueger, Matos & Steffen (2020)). However, the strategies are not mutually exclusive, and most asset managers implement multiple strategies simultaneously.

2.3 Company ESG rating

Quantitative assessments of a firm's ESG performance has become increasingly important in economic research. Nowadays, most financial data providers offer a wide variety of ESG data, but most notably and valuable for most investors are the company ESG rating. For investors, ESG scores make it easier to identify, understand and manage each company's exposure to environmental, social and governance issues in their portfolio. There are multiple ESG data providers at a company level, such as Sustainalytics, Refinitiv ESG, Bloomberg, MSCI and FTSE. These are also the most well-known providers that offer global coverage of company ESG data. The methodology used to calculate company ESG rating differ among the providers. Whereas some ratings are comparable across different industries, such as the ESG risk rating provided by Sustainalytics (Sustainalytics,

2021), others are restricted relative to the company's industry peers, such as the MSCI ESG rating (MSCI ESG Research, 2020).

Since ESG ratings are a relatively new concept, there exists no standardised method for determining company ESG performance. Each provider of ESG data has its unique methodology, which is often complex and comprises both quantitative ESG data and input from company research analysts. As ESG rating for each company can vary among providers, researchers have found interest in examining this issue. Today, there is a wide range of research on ESG rating disagreement [see Berg, Kölbel and Rigobon (2020)]. The lack of *common theorisation* and *commensurability*[2] is problematic as findings from existing studies could depend on the choice of rating provider (Gibson, Krueger, Riand & Schmidt (2020)).

2.4 Portfolio ESG rating

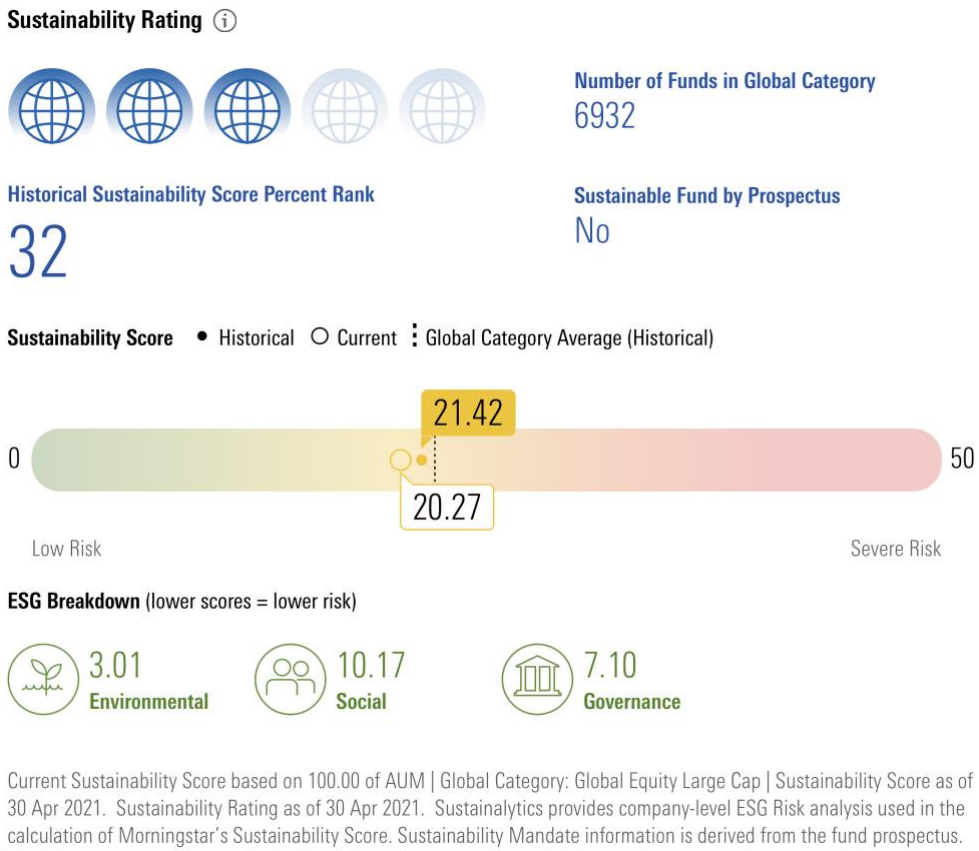
In contrast to company ESG data, few platforms offer ESG rating at a fund level. This paper utilises the sustainability rating introduced by Morningstar in 2016 (Morningstar, 2019). The rating, displayed as a score between 0 and 100, is an asset-weighted average of Sustainalytics' company-level ESG risk rating, taken end of the month. A score of 0 indicates that a portfolio has no unmanaged ESG risk, and 100 indicate the highest level of ESG risk. Hence, lower is better. At least 67% of the portfolio's holdings must have a company ESG Risk Rating to receive a Portfolio Sustainability Score (ESG score).

Although the ESG score is relatively new, the methodology has undergone various changes over the past few years. For instance, the portfolio holding threshold for being assigned an ESG rating was increased from 50% to 67% in 2018. In 2019, Morningstar further improved the portfolio ESG score by adopting the ESG risk rating provided by Sustainalytics. Before 2019, the ESG rating was industry relative, meaning that it was not comparable across industries. The new rating accounts for within-industry differences by penalising companies exposed to sectors or industries with high ESG risk.

[2] "The concept of a *common theorization* refers to the idea that raters (or information intermediaries) agree on a common definition of CSR. Absence of *commensurability* captures the idea that different raters do not use the same measures when quantifying the same feature" (Gibson, Krueger, Riand, et al., 2020, p. 5)

When evaluating a fund's performance on sustainability relative to the overall market, the portfolio sustainability score may be the most informative measure. For the common investor, the sustainability score could be hard to interpret. Consequentially, Morningstar has, similarly to its star ratings, simplified the sustainability score into Morningstar Globes. The globe ratings are a percentile rank of sustainability scores, ranking funds relative to other funds within the same Morningstar fund category. Morningstar Globes express a five-globe system based on percentile rank cut-offs, where five globes indicate a top-performing fund in its peer group. Figure 1 provides an example of a sustainability score and globe rating for a mutual fund displayed on the Morningstar website.

Figure 1 - Example of Morningstar sustainability rating



This figure provides an example of how Morningstar display sustainability information on a fund level on its webpage.

2.5 Sustainable investing in the Nordic

Nordic investment institutions have for the past decades been among the world leaders in embedding environmental, social and governance practices in their investment process (Baselli, 2021). Liang and Renneboog (2017) document that firms from civil law countries have higher CSR ratings than common law companies, with Scandinavian companies on top. Dyck, Lins, Roth and Wagner (2019) provide evidence that firms are stepping up their Environmental and Social (E&S) performance because institutional investors are asking for it. Although financial motives are an important motivating factor for improving firms' E&S performance, Dyck et al. (2019) also prove that culture makes its way into economic decision making. That is, institutional investors domiciled in countries with social norms supportive of strong E&S commitments are the ones that impact firms' E&S performance. Measured with the World Value E&S Index, European countries rank high in social norms towards E&S, with Sweden, Norway, and Finland as number one, two, and five.

With social responsibility high on the public agenda, we see a rise in the general level of social responsibility from the financial institutions in the Nordics. For instance, DNB Asset Management, one of the leading financial institutions in the Nordic region, has adapted a group standard for responsible investments to all its financial investments across all asset classes (DNB, n.d.). As most institutions in the Nordic follow some ethical guidelines, the ethical guideline of DNB is not unique. Consequently, we argue that the mass of funds offered in the Nordic is somewhat sustainable by default.

3 Literature review

Along with the growing public interest in sustainability, sustainable finance is taking a more prominent place in financial research. In recent years, research on socially responsible investing at both stock and fund levels has found its way into top financial journals. The reoccurring question among researchers when talking about socially responsible investing is; does it pay? A large body of research has tried to examine this question. In the following sections, we present prior empirical studies that motivate our research questions. Section 3.1 covers research on SRI mutual fund performance, whereas section 3.2 review more recent papers investigating the relation between ESG ratings and mutual fund performance.

3.1 Empirical research on SRI fund performance

In most earlier studies, researchers apply either of two approaches when comparing the performance of socially responsible mutual funds with conventional funds; matched-pair analysis or means of groups. This thesis uses the latter. However, since the economic theory is equal across methods, we review studies using both matched-pair analysis (section 3.1.1) and means of groups (section 3.1.2). In addition, some scholars distinguish between crisis and non-crisis periods. Specifically, researchers find it interesting to examine whether SRI funds experience less downside risk during market turmoil. We review relevant literature on this field in section 3.1.3.

3.1.1 Matched-pair analysis

Mallin, Saadouni and Briston (1995) compare the financial performance of UK ethical investments funds with non-ethical funds and benchmark portfolios over the 1986-1993 period. Interestingly, they find weak evidence for ethical trusts to outperform non-ethical funds on a risk-adjusted basis, while both groups of funds tend to underperform the market. The researchers explain this weak superior performance of SRI funds as a temporary phenomenon caused by increased awareness and interest in ethical investments, pushing the demand and prices for appropriate investment products. However, like Gregory, Matatko and Luther (1997) stated, Mallin et al. (1995) did not correct the established size bias in the ethical unit trusts portfolio. By re-evaluating the results of Mallin et al. (1995) on both size and risk-adjusted benchmark, Gregory et al. (1997) conclude that the difference in performance between the ethical and non-ethical unit trust was not

statistically different from zero. Following the work of Gregory et al. (1997), Kreander, Gray, Power and Sinclair (2005) extend the work of Mallin et al. (1995) to a European setting and find no significant differences between the performance of ethical and non-ethical funds.

Whereas the financial performance of SR mutual funds is a well-examined topic, the case of environmental constrained funds (green funds) is less explored. Climent and Soriano (2011) separate green from SRI and examine the performance of 7 green funds from the US, relative to 14 SRI and 28 conventional funds. Green funds are those considered as environmentally friendly by Bloomberg. Although green funds underperform their conventional peers over the full sample period (1987-2009), the difference is insignificant for the most recent sub-period (2001-2009). Across all sub-periods, green funds show a high exposure to small-capitalisation (small-cap) stocks compared with SRI and conventional funds. However, the authors suggest that the limited universe of green funds may have strongly influenced the results. As for Climent and Soriano, we observe that a common denominator in early research is that the sample size of sustainable funds is relatively small. Therefore, a more diversified sample of socially responsible mutual funds could make the results more robust.

3.1.2 Means of groups analysis

Bauer, Koedijk and Otten (2005) compare the performance of 103 ethical funds from Germany, the UK and the US over the 1990-2001 period with a matched sample of 4,384 conventional funds using fund age and size as matching criteria. The study provides several findings of interest. First, no evidence for differences in return between ethical and conventional funds was found, even after controlling for common factors like size, book-to-market, and momentum. Second, whereas US ethical funds tend to invest more in large-capitalisation (large-cap) stocks, German and UK ethical funds tend to invest more in small-cap stocks. Third, ethical funds tend to be more growth-oriented and less exposed to market return variability than conventional funds.

Because studies from the 1990s and the early 2000s often are based on different methodologies and relatively small samples, scholars like Renneboog et al. (2008) argue that it is difficult to draw any definitive conclusions. As an effort to contribute

to this issue, Renneboog et al. investigate the risk and return of 440 SRI funds from 17 different countries over the 1991-2003 period, relative to a reference group of 16,036 non-SRI funds. After controlling for risk factors such as size, book-to-market, and momentum, the researchers find SRI funds from the US, the UK, and many continental European and Asian-pacific countries strongly underperform their domestic benchmark portfolios by -2.2% to -6.5% per annum. However, when comparing alphas with matched conventional funds, SRI funds appear to perform no different. The exception is France, Ireland, Sweden, and Japan, where SRI alphas are reported 4% to 7% below conventional alphas.

Ibikunle and Steffen (2017) comparatively examine the performances of 175 green, 259 black and 976 conventional mutual funds over the 1991-2014 period. In the study, green funds are those with a sole commitment to environmental principles and engagements. In contrast, black funds invest in companies from fossil fuel, mining, or other raw material industries. For the full research period (1991-2014), Ibikunle and Steffen document that green funds underperform conventional funds by -3.34% at the 5% level. At the same time, green funds experience a significant small-cap effect and high exposure to growth stocks. Due to the unavailability of adequate information, Ibikunle and Steffen suggest that investors have undervalued green stocks in their early emergence years. To investigate this hypothesis, the researchers divide funds into sub-periods and document that green funds enhance performance over time. For the most recent sub-period (2012-2014), green funds outperform their black counterparts with 14.36%, significant at the 5% level. Equally, green fund shows no significant difference in performance relative to conventional funds.

3.1.3 SRI funds during crisis periods

Munoz, Vargas and Marco (2014) distinguish between green, religious and ESG funds when evaluating the financial performance and managerial abilities of 18 US and 89 European socially responsible mutual funds. No evidence suggests that green funds perform worse than other SR mutual funds. Still, results show that European green fund managers tend to achieve lower results in crisis market periods and exhibit lower managerial abilities. Contrarily, US green fund managers prove better managerial abilities, as they show a successful ability to time the size and book-to-market style during crisis periods. These findings are partially consistent

with Kreander et al. (2005), which conclude that many European fund managers cannot time the market successfully.

Nofsinger and Varma (2014) compare the risk-adjusted return of 240 US-domiciled socially responsible funds with a matched sample of 720 conventional funds from 2000 to 2011. The objective is to understand better the role of fund focus and screening strategies on fund performance during market crises. Although very few prior studies seem to find any evidence for superior performance of SRI funds, Nofsinger and Varma conclude that SRI funds with a positive screen outperform conventional funds during times of market crisis by an annualised 1.61-1.70%. On the other hand, SRI funds appear to give up a fraction of return, resulting in an underperformance of 0.67-0.95% during non-crisis periods. Since funds with a negative screening strategy do not outperform in crisis periods, the researchers attribute the outperformance to funds with a positive screening, i.e., funds implementing shareholder advocacy and ESG issues in their investment decisions.

3.2 Empirical research on sustainability rating and fund performance

Most research that examines the effects of sustainability on fund performance and flows before the mid-10s relied on a comparison between SRI and conventional funds. Conversely, as ESG data has become more available, research on the relation between ESG rating and performance has emerged. In this section, we review recent research that investigates this relationship.

El Ghoul and Karoui (2017) examine the effects of mutual fund CSR rating on fund performance and flows. The researchers constructed an asset-weighted CSR score from MSCI ESG data for 2,168 US equity funds over the 2003-2011 period. An interesting remark is a potential problem caused by changes in rating methodologies, making ratings incomparable over time. El Ghoul and Karoui alleviate this problem by adjusting the CSR score each year and restricting the sample to funds with at least 67% of the portfolio covered by the CSR rating. The researcher divides funds into two groups, either above or below the median CSR score, and finds that CSR score is negatively related to volatility, R-square, and the number of stocks held in the portfolio. Furthermore, their results show that funds with higher CSR ratings exhibit inferior financial performance relative to funds with lower CSR ratings.

Hartzmark and Sussman (2019) analyse fund flow and performance of US mutual funds based on Morningstar Globe Ranking. The Morningstar Globes are illustrated in Figure 1, found in section 2.4. Over 11 months, from March 2016 through January 2017, the authors find a positive relation between globe ratings and fund flow. Funds with the highest globe rating (five globes) received more than $24 billion in net fund inflows, whereas those with the lowest rating (one globe) faced a net outflow of $12 billion. Results show that one-globe funds slightly outperformed five, but only statistically significant at the 10% level. Although the findings are consistent with the researchers' hypothesis; that one-globe funds outperform five-globe funds, Hartzmark and Sussman emphasise that only 11 months of data makes it difficult to make definitive statements.

Gibson, Krueger and Mitali (2020) examine whether the rise of sustainable investing has affected the risk-adjusted performance of 13F[3] institutional investors in the period 2002-2015. The researchers propose a measure of the overall sustainability of institutional investors by creating stock level standardised ESG ratings across data providers (Refinitv ESG and MSCI), which they combine to get an investor portfolio aggregated score. This approach is similar to the procedure by El Ghoul and Karoui (2017). These scores examine the relationship between the "sustainable footprint" of 13F institutions and their risk-adjusted-performance. Gibson et al. (2020) document a positive relationship between the sustainable footprint and risk-adjusted performance in more recent periods, which they suggested likely to be driven by the price pressure on high sustainability stocks in recent years.

[3] "13F institution" refers to institutional investment managers with $100 million assets under management, which are required to submit a quarterly report (form 13F) to the Securities and Exchange Commission (SEC). Non-US investors can also be required to file Form 13F. For more information see investor.gov.

4 Hypothesis and methodology

Before introducing the models used to evaluate fund performance, we present our hypotheses and the main arguments favouring these hypotheses.

4.1 Hypothesis

To answer whether investors pay a price for being sustainable, we examine the risk and return of a Nordic portfolio of ESG funds matched against a comparable group of conventional funds. From section 3, we observed that most existing research struggles to document any difference in performance over time. Therefore, as the aim of this study is to answer whether Nordic domiciled ESG funds have performed differently from their conventional peers over the 2010-2020 period, we present our first hypothesis:

H_0: The risk-adjusted return of ESG funds does not differ from conventional funds
H_A: The risk-adjusted return of ESG funds differ from conventional funds

Although a common assumption in asset pricing models is that investors solely focus on the payoff from their portfolios, Fama and French (2007) argue that taste for sustainable assets can affect the price of sustainable stocks, a hypothesis later confirmed by Pástor, Stambaugh and Taylor (2020). Therefore, sustainable investments may have experienced a demand-driven price pressure, resulting in a difference in performance. Moreover, companies with sound ESG performance may face a lower implied cost of capital caused by signals of good managerial qualities and superior access to cheap money over time. Some studies also indicate that sustainable companies face better long-term prospectus and less downside risk. If financial markets have incorrectly priced the value of these companies in the past, sustainable assets may outperform their peers as the value adjusts over time.

Contrarily, Hong and Kacperczyk (2009) and Fitzgibbson and Pomorski (2020) find that sin stocks (e.g., alcohol, tobacco and gaming) carry a positive risk premium. The logic behind the sin premium is that investors, due to social norms, require compensation for holding these stocks. As a result, ESG investors should expect lower returns since stocks with good E, S, or ESG should be more expensive. In addition, ESG screening may limit investment opportunities and thus reduce

diversification. On a portfolio level, the consequence could be an unfavourable shift in the mean-variance frontier towards a portfolio with higher risk or lower return. Since ESG screening could be a costly and time-consuming process, the associated fees of ESG funds should be higher than those of conventional funds. Gil-Bazo, Ruiz-Verdú and Santos (2010) shed light on the debate and found no economically or significant differences in costs between SRI and conventional funds. Surprisingly, SRI funds proved to be cheaper when management companies offered SRI and conventional funds. As shown in Table 3, the ESG funds in this study also display lower management fees than conventional funds.

As mentioned earlier, asset managers from the Nordic are considered world leaders in embedding ethical and sustainable considerations into their investment decisions. Consequently, we argue that all funds offered in the Nordic are to a certain degree socially responsible. If that is the case, it is interesting to investigate whether ESG funds perform differently from conventional funds regarding sustainability rating. Therefore, we present our final hypothesis:

H_0: The sustainability rating of ESG funds does not differ from conventional funds
H_A: The sustainability rating of ESG funds differ from conventional funds

4.2 Factor models

We study the performance of Nordic ESG mutual funds using an equal-weighted (EW) and value-weighted (VW) portfolio approach. The EW portfolio is the arithmetic mean of monthly excess return, whereas the VW portfolio is weighted each month according to each fund's respective TNA at the start of each month. We evaluate risk and return from a Nordic investor's perspective by applying a currency conversion of factor returns obtained from Kenneth French's data library[4]. Three different factor models are adapted when estimating risk-adjusted performance: the Capital Asset Pricing Model (CAPM), the Fama-French five-factor model (2015), and the Fama-French five-factor + momentum model (2018). We first introduce the widely used CAPM-based Jensen's alpha (1968):

[4] See: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,mkt}(R_{m,t} - R_{f,t}) + \varepsilon_{i,t}$$

Where, $R_{i,t}$ is the return from a portfolio of funds in month t, $R_{f,t}$ is the return on the risk-free rate, $R_{m,t}$ is the market return, $\beta_{i,mkt}$ is the coefficient measuring the portfolio's market risk exposure, $\varepsilon_{i,t}$ stands for the idiosyncratic return, and α_i (the intercept) encapsulates the risk-adjusted return of the portfolio.

Researchers find multi-factor models to be superior to the CAPM in explaining fund returns. Therefore, we employ the Fama-French five-factor model (2015):

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,mkt}(R_{m,t} - R_{f,t}) + \beta_{i,SMB}SMBt + \beta_{i,HML}HMLt + \beta_{i,RMW}RMWt + \beta_{i,CMA}CMAt + \varepsilon_{i,t}$$

The five-factor model builds on the CAPM by adding additional factors; $\beta_{i,SMB}$, $\beta_{i,HML}$, $\beta_{i,RMW}$ and $\beta_{i,CMA}$, which are coefficients measuring the effects of size, value, profitability, and investment, respectively. The premiums, $SMBt$, $HMLt$, $SMBt$ and $CMAt$ are monthly returns on long-short portfolios of (Small minus Big), (High minus Low), (Robust minus Weak) and (Conservative minus Aggressive)[5].

Jegadeesh and Titman (1993) document that winner stocks, on average, generate significant positive returns over a three to twelve-month period. As a response to these findings, Fama and French (2018) included the momentum factor in the five-factor model:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,mkt}(R_{m,t} - R_{f,t}) + \beta_{i,SMB}SMBt + \beta_{i,HML}HMLt + \beta_{i,RMW}RMWt + \beta_{i,CMA}CMAt + \beta_{i,WML}WMLt + \varepsilon_{i,t}$$

Where, $\beta_{i,WML}$ is the factor coefficient for momentum and $WMLt$ are monthly returns on a long-short portfolio of winners minus losers.

[5] For details on how the five factors are constructed for developed markets, see more information on: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_5developed.html

As a robustness check of the portfolio approach, we employ a two-step regression approach. First, we run Fama-French five-factor + momentum regressions at the fund level. Next, to control for the difference in the performance of ESG versus conventional funds, we run a cross-sectional regression with the fund alphas on a dummy variable and a constant. The dummy variable takes the value 1 if the fund is an ESG fund and 0 otherwise, and the coefficient of the dummy variable displays the average difference in abnormal returns between ESG and conventional funds. For the EW portfolio, regression coefficients and corresponding test statistics are the simple arithmetic mean of fund coefficients:

$$\bar{\beta} = \frac{1}{N}\sum_{i=1}^{N} \widehat{\beta}_i$$

To test the robustness of the VW portfolio, we follow the same procedure, with the only difference being that coefficients are weighted according to fund size. Funds are weighted by taking the sum of monthly TNAV's for each fund, divided by the sum of all TNAV observations across all periods:

$$w_i = \frac{\sum_{t=1}^{T} TNAV_{i,t}}{\sum_{i=1}^{N}\sum_{t=1}^{T} TNAV_{i,t}}$$

This procedure allows us to weigh each fund according to its size and adjust for the number of months the funds are available in our sample. For the cross-sectional regression, we use weighted alphas as the dependent variable. To obtain the average difference of abnormal returns, we multiply the dummy coefficients with the number of ESG funds in our sample.

We correct regression coefficients for possible autocorrelation and heteroscedasticity for both fund-level and portfolio regressions by estimating standard errors following the Newey-West procedure (Newey & West, 1987). Finally, we set truncation lags to the integer part of $\left[4 * \left(\frac{T}{100}\right)^{\frac{2}{9}}\right]$ (Brooks, 2014, p. 201).

4.3 Traditional performance measures

While the alphas measure the portfolio returns to the market index, the Sharpe ratio measures the returns to the standard deviation. Thus, in contrast to the alphas, the Sharpe ratio is not dependent on a high R-square to be meaningful. Moreover, since the Sharpe ratio is relative to the standard deviation, it can evaluate the risk-adjusted return across different asset classes.

$$Sharpe\ Ratio = \frac{R_p - R_f}{\sigma_p}$$

The numerator, $R_p - R_f$ is the portfolio returns subtracted by the risk-free rate, and the denominator σ_p is the standard deviation of returns. A higher Sharpe ratio indicates a better return relative to the amount of risk taken. In contrast, a negative Sharpe ratio means that the portfolio return is less than the risk-free investment. A caveat of the Sharpe ratio is that it does not describe the amount of risk taken by the investor, as it only describes the ratio between standard deviation and return.

As the Sharpe ratio describes the average excess returns to standard deviation, it equally penalises downside and upside volatility. The Sortino ratio, on the other hand, considers only the portfolios downside risk. Since most investors are often worried about adverse outcomes, some argue that the Sortino ratio is a better indicator for risk-adjusted returns as it only considers downside risk.

$$Sortino\ Ratio = \frac{R_p - R_f}{LPSD}$$

The Sortino ratio describes the average excess returns to the lower partial standard deviation (LPSD). LPSD is the standard deviation of returns that falls below a benchmark target. When considering risk-adjusted returns, we are interested in negative excess returns, specifically when portfolio returns are below the risk-free rate.

$$LPSD = \sqrt{\frac{\sum_{i=1}^{n}(R_i - R_f)^2}{n-1}} \quad \text{where } R_i < r_f$$

5 Data

This section describes the data used to study the performance of Nordic ESG and conventional funds from 2010 to 2020. Section 5.1 explain the screening process and the matching procedure. Section 5.2 describe how the portfolio sustainability score is computed. Section 5.3 describe fund returns and benchmark factors, and section 5.4 show summary statistics. Lastly, in section 5.5, we discuss potential weaknesses in our data.

5.1 Mutual fund data

We utilise Morningstar Direct to identify Nordic domiciled funds for our sample. The Nordic countries include Denmark, Finland, Iceland, Norway, and Sweden.

Table 1 - Screening criteria used in Morningstar for Mutual Funds

Criteria	Socially Responsible MF	Conventional MF
A. Investment Type	Open-end Fund	Open-end Fund
B. Domicile	Denmark, Finland, Iceland, Norway, Sweden	Denmark, Finland, Iceland, Norway, Sweden
C. Asset Allocation Stock (Net) (mo-end)	Min. 80%	Min. 80%
D. Inception Date	Before 31.12.2019	Before 31.12.2019
E. Global Category	Global Equities	Global Equities
F. Oldest Share Class	Yes	Yes
G. Fund of Funds	No	No
H. Index Fund	No	No
I. Sustainable Investment - Overall (mo-end)	Yes	N/A

This table displays the selection of criteria applied to the sample selection from Morningstar. For Global Category, we chose a series of criteria, including all Global Equities. This selection excludes Fixed-Income, Currency, Guaranteed and Sector Equity funds from our sample. For criterion I, we select N/A when screening for conventional funds and simply pull the list of ESG funds out of the selection.

Table 1 describes in detail the criteria used in Morningstar. The screening criteria follow the global open-ended equity funds industry standard set by The Norwegian Fund and Asset Management Association (VVF). VFF defines international open-ended equity funds as funds with at least 80% of total assets in the global stock market and a minimum of 80% invested in equities (VVF, n.d.). To be included in our sample, we require at least 12 months of data. As a result, we set an inception date requirement to 31.12.2019.

5.1.1 ESG mutual funds

To separate sustainable funds from conventional funds, we utilise the *Sustainable Investments* screening criterion from Morningstar. This process proves an initial list of 50 ESG funds. Morningstar defines a Sustainable Investment Fund as a fund

focusing on sustainability, impact, or ESG factors in its prospectus or other regulatory filings. Although the screening criterion is an effective way to identify sustainable funds, one should be aware of its shortcomings. After carefully examining each fund's prospectus and investment objectives, we find 13 funds with no evidence for incorporating ESG in its investment process, which is removed from our sample. Next, we review funds from the same fund family and identify four pairs of funds with identical stock compositions. We keep those with the earliest inception date and remove the four others. Finally, we withdraw four funds that violate the percentage criterion of total assets in the global stock market and two funds that recently have changed their investment strategy.

After sorting out miscategorised funds, the ESG list comprises 27 funds. However, since we identified inconsistencies in the Morningstar screening function, we find it reasonable to look through the list of Nordic conventional funds. To identify additional ESG funds, we search for specific keywords, which indicates a socially responsible mandate[6]. Using this method, ten funds not captured by the initial screening process are detected. Lastly, we investigate the prospectus of funds with a high ESG rating to find additional miscategorised funds. This process discovers one last fund that clearly emphasises sustainability in its mandate, which is not categorised as an ESG fund by Morningstar. The screening process leaves a sample with 38 ESG funds, of which 17 funds are Danish, 3 Finnish, 6 Norwegian, and 12 Swedish. Since no funds from Iceland entered the sample, the research of this paper covers the four other Nordic countries. Appendix 1 shows the list of ESG funds.

5.1.2 Matching conventional mutual funds

We follow the methodology of previous research on socially responsible mutual funds [see Climent and Soriano (2011); Muñoz, Vargas and Marco (2014); Nofsinger and Varma (2014)] and construct a reference group of conventional funds. For each ESG fund, we identify two conventional funds with similar inception dates, investment objectives and total net asset value (TNAV). In addition, we ensure that the matched funds are from different fund families[7]. The

[6] Examples of keywords used: "SRI", "ESG", "Impact", "Sustainable", "Etisk", "Ethic", "Grønn", "Green", "Hällbar", "Bæredygtige", "Illmasto", "Vähähiilinen", "Kestävä".
[7] All funds managed by a single institution are a fund family. For instance, all mutual funds offered by Nordea Asset Management would be part of the same fund family.

aim is to achieve a matched sample of funds with similar characteristics as the sample of ESG funds. We utilise the Morningstar Global Category function, which groups funds into categories based on their portfolio holdings.

Researchers seem to agree that fund characteristics, such as size and age, significantly impact the risk and return of mutual funds. However, it is unclear which are most important. As a result, methodologies used in prior research concerning matching inception date and size varies. For instance, older research such as Mallin et al. (1995) and Gregory et al. (1997) match only on inception date, whereas Kreander et al. (2005) emphasise that the method of Gregory et al. (1997) of matching by year of inception resulted in significant divergence in fund size towards the end of the sample period. Consequently, Kreander et al. (2005) match fund size in the middle of the sample period to correspond closely with fund size. Often, only a limited amount of comparable funds is available, which causes a trade-off between finding funds with similar size and inception date. Since a significant proportion of funds introduced throughout the sample period are ESG funds, we face the same issue in this study.

More recent research, such as Climent and Soriano (2011), Muñoz et al. (2014), and Nofsinger and Varma (2014), are less strict than earlier researchers with regards to the start date criterion, in the event where there are no conventional peers available. As a result, we choose to follow the examples of Nofsinger and Varma (2014) and match funds closest in size at the end of the sample period, with inception dates within a year. If no conventional peers exist within a year, we relax the start date criterion to three years or remove it completely. Table 2 displays the number of ESG and conventional funds in the dataset, resulting from the matching process:

Table 2 - ESG and conventional funds in the data sample

	01:2010	12:2010	12:2011	12:2012	12:2013	12:2014	12:2015	12:2016	12:2017	12:2018	12:2019	12:2020
ESG	16	19	20	21	21	22	23	25	28	34	37	38
Conventional	32	35	39	41	42	43	46	50	58	68	76	76

This table displays the total number of ESG and conventional mutual funds included in our dataset throughout the 2010:2020 period. 01:2010 corresponds to 31.01.2010, whereas 12:2020 corresponds to 31.12.2020.

Table 2 illustrates that the number of funds increases throughout the period. The number of ESG funds is low early in the sample, which is partly due to limitations in our dataset, as it does not contain liquidated or merged funds. As interest in ESG increase, more ESG funds are added toward the end of the period. Because inception date is a matching criterion, the number of conventional funds follows the number of ESG funds throughout the period. By the end of 2020, the dataset of 76 Nordic conventional funds comprises 33 Danish, 16 Finnish, 13 Norwegian and 14 Swedish funds. Appendix 2 shows the list of conventional funds.

5.2 Portfolio sustainability score

We use the Morningstar Portfolio Sustainability Score as a measure of sustainability. The ESG score is, as outlined in section 2.4, an asset-weighted average of Sustainalytics' company-level ESG Risk Rating:

$$PortfolioSustainability = \sum_{x=1}^{n} ESGRisk\ x\ Weightsadj$$

For each month, we rank ESG and conventional funds into three quantile portfolios based on their ESG score: bottom 20%, middle 60% and top 20% (hereafter denoted Top 20, Mid 60, and Bottom 20). Subsequently, we match funds against monthly returns. Unfortunately, the Morningstar sustainability score is not durable for our full sample period as data is only available from 31.01.2015. Therefore, when examining the relationship between ESG score and fund performance, we limit our research to the 01:2015-12:2020 period.

5.3 Fund returns and benchmark factors

When evaluating fund performance, investors should always look at the total return (TR) over the change in net asset value (NAV). In contrast to net asset value, total return accounts for dividends, distribution, and sales charges[8]. We use Morningstar to collect monthly total returns denominated in EUR. Thereafter, we download monthly USD denominated market factors for developed markets from Professor Kenneth French's data library. To evaluate the regression results from a Nordic

[8] Total returns from Morningstar are expressed in percentage terms and accounts for management, administrative, 12b-1 fees and other costs taken out of fund manager. However, Morningstar does not adjust total returns for front-end loads, deferred loads, or redemption fees.

investor's perspective, we first apply a currency conversion from USD to EUR for the excess return on the market:

$$r_{Mkt-rf}^{EUR} = (1 + r_{Mkt-r_f}^{USD} + r_{f,t}^{USD}) * \left(r_{FX,t}^{EUR/USD}\right) - 1 - r_{f,t}^{EUR}$$

Where $r_{FX,t}^{EUR/USD}$ equals $EUR\ per\ USD$ at time t, divided by $EUR\ per\ USD$ at $t-1$. We take the monthly EUR/USD exchange rates (quoted end of the month) from Refinitiv and use the one-month EURIBOR as a proxy for the risk-free euro rate, $r_{f,t}^{EUR}$. Since Fama and French use MSCI data[9] to construct factors, we utilise the WM/Reuters Closing Spot Rate (EUR/USD), taken at 4 P.M London time as exchange rate when converting into EUR returns. The long-short factors, $SMBt$, $HMLt$, $SMBt$, $CMAt$, and $CMAt$, are converted by multiplying each factor with the exchange rate return:

$$LS_t^{EUR} = (1 + r_{FX,t}^{EUR/USD}) * LS_t^{USD}$$

5.4 Summary statistics

Table 3 - Descriptive statistics of fund characteristics

	ESG			Conventional		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Size (EUR M)	454.4	100.0	1419.6	331.1	120.5	513.5
Age (years)	13.2	11.2	10.8	12.4	9.1	10.5
Management fee	1.43	1.50	0.77	1.92	1.6	1.55
Redemption fee	0.05	0.00	0.20	0.02	0.00	0.13
Front load fee	0.30	0.16	0.43	0.39	0.20	0.63
Deferred load fee	0.25	0.14	0,.32	0.29	0.17	0.045

This table presents descriptive statistics for the sample of ESG and conventional mutual funds over the 2010-2020 period. Specifically, it reports the mean, median and standard deviation of size (total net asset value), fund age, and management-, redemption-, front load- and deferred load fees. All fees are annualised and reported in per cent. Size is the average total net asset value over the 2010-2020 period, measured in millions of Euros. Due to limitations in data, the reported fee structure for conventional funds is based on 72 funds out of 76 funds. In addition, some funds also charge a performance fee. On average, 6% of the ESG funds charge such fee, whereas the fraction is 11% for conventional funds. The data is retrieved from Morningstar Direct.

Table 3 summarises the size, age, and fee structure for ESG and conventional funds. On average, ESG funds exhibit a higher total net asset value throughout the sample

[9] Starting July 26, 2000, MSCI began to use the WM/Reuters Closing Spot Rates, taken at 4PM London time as exchange rate. For more information about the MSCI methodology, see: https://www.msci.com/eqb/methodology/meth_docs/MSCI_April2018_IndexCalcMethodology.pdf

period. In addition, we see that ESG funds in the sample are older than conventional funds. Minor differences are revealed when assessing the fee structure, except for the management fee that seems to differ substantially for ESG and conventional funds. Surprisingly, ESG funds demonstrate a lower annualised management fee (1.4%) than conventional funds (1.9%). Although total return does not adjust for redemption-, front load-, and deferred load fees, it accounts for management fees.

Table 4 - Descriptive statistics of fund returns

Panel A: Value Weighted Portfolio								
	Mean	Median	Std. Dev.	Min	Max	Skewness	Kurtosis	No. Obs
ESG	10.43	1.01	12.10	-10.82	10.88	-0.44	1.14	3307
Conventional	10.15	0.99	12.63	-12.31	12.22	-0.46	1.70	6635
Panel B: Equal-Weighted Portfolio								
	Mean	Median	Std. Dev.	Min	Max	Skewness	Kurtosis	No. Obs
ESG	10.38	1.04	12.10	-12.32	11.02	-0.51	1.69	3307
Conventional	9.85	0.94	12.35	-13.31	11.37	-0.57	2.20	6635

This table shows mean excess return, median, standard deviation, minimum return, maximum return, skewness, and kurtosis of monthly returns. All values are annualised and reported in per cent. Panel A report the characteristics of an equal-weighted portfolio containing all ESG and conventional funds. Panel B report results from a value-weighted portfolio containing all ESG and conventional funds. Kurtosis is reported as excess kurtosis (adjusted with a factor of 3) (Bodie et al., 2018, p. 138). Sample period 01:2010 – 12:2020.

Table 4 display a higher return for ESG funds in both equal-weighted (EW) and value-weighted (VW) portfolios. On average, ESG funds exhibit higher average excess returns in both portfolios, slightly lower standard deviations, and less extreme maximum and minimum values. A higher excess return and a lower standard deviation suggest a better Sharpe ratio for ESG funds than conventional funds. We investigate this relationship later in the thesis. Monthly returns are leptokurtic for both ESG and conventional funds, which means there exist more extreme returns than we would expect from a normal distribution (Table 4 report excess kurtosis). However, kurtosis is lower overall for the ESG portfolio compared to the conventional. Consequentially, the results presented in Table 4 indicate that ESG funds, on average, are less volatile than their conventional peers.

Table 5 - Portfolio ESG rating

	ESG		Conventional	
	Current	Old	Current	Old
Equally Weighted	21.7	51.35	23.08	50.03
Value Weighted	21.56	50.95	22.51	50.52

This table reports the average ESG rating for the ESG and conventional fund portfolio, before (old) and after (current) the change of Morningstar rating methodology. The "Old" rating was used from 01:2015 to 08:2019, whereas the "Current" reflects the period 09:2019 to 12:2020. For the old methodology, a higher score reflected a better ESG performance, whereas, for the current methodology, a lower score reflects higher performance.

Table 5 suggest that ESG funds, on average, invest in companies that are rated higher within environmental, social and governance than conventional funds. With the new rating methodology, we observe that the difference between the two portfolios increases. A possible explanation is that the new ESG risk measure from Morningstar is more comparable across industries. Since the old ESG rating methodology was industry-specific, Oil & Gas companies could receive the same rating as software companies. Consequently, the increased difference between the two portfolios can be due to conventional funds holding stocks in industries that are penalised by the new rating methodology, such as the Oil & Gas industry.

Table 6 - Funds covered with ESG rating

	ESG			Conventional		
	Funds in sample	Funds with ESG rating	Coverage ratio	Funds in sample	Funds with ESG rating	Coverage ratio
31.12.2020	38	38	100%	76	76	100%
31.12.2019	37	37	100%	76	73	96%
31.12.2018	34	33	97%	68	67	99%
31.12.2017	28	25	89%	58	51	88%
31.12.2016	25	20	80%	50	43	86%
31.12.2015	23	18	78%	46	36	78%
31.01.2015	22	12	55%	43	23	53%

This table displays the total number of ESG and conventional mutual funds covered by ESG score each year throughout the 2015:2020 period.

We rank funds each month into three portfolios according to their ESG performance. When the rating was first introduced in 2015, we can see from Table 6 that not all funds are covered with an ESG rating. The coverage ratio improves over time for both portfolios, increasing from approximately 55% in 2015 to 100% in 2020.

Table 7 - Funds allocated to quantile portfolios

	ESG			Conventional		
	Top 20%	Middle 60%	Bottom 20%	Top 20%	Middle 60%	Bottom 20%
31.12.2020	8	22	8	15	46	15
31.12.2019	8	22	7	15	43	15
31.12.2018	7	19	7	13	41	13
31.12.2017	5	15	5	10	31	10
31.12.2016	4	12	4	9	25	9
31.12.2015	4	10	4	7	22	7
31.01.2015	2	8	2	5	13	5

This table displays the total number of ESG and conventional funds allocated to the quantile portfolios throughout the 2015:2020 period.

Table 7 shows that the Top 20 and Bottom 20 ESG portfolios only comprise two funds when the ESG rating is first introduced. Consistent with the growth in coverage ratio illustrated in Table 6, more funds are added to the portfolios over time. As a result, at the end of the period, eight funds are allocated to the 20% ESG portfolios, whereas 15 funds are assigned to 20% conventional portfolios. Table 8 rank the quantile portfolios according to ESG rating.

Table 8 - Portfolios ranked by ESG rating (quantile portfolios)

		EW		VW	
		Current	Old	Current	Old
ESG	Top 20%	19.95	55.2	20.1	54.91
Conv.	Top 20%	21.31	54.71	21.26	53.92
ESG	Middle 60%	21.72	50.98	21.69	51.12
Conv.	Middle 60%	22.84	49.86	22.72	49.97
ESG	Bottom 20%	23.34	48.56	22.86	48.58
Conv.	Bottom 20%	25.55	45.82	24.98	46.22

This table reports the average ESG rating for the Top 20, Middle 60 and Bottom 20 per cent quantile portfolios, based on ESG rating for ESG and conventional funds. Portfolios are ranked according to ESG performance. Specifically, the table report on a value-weighted (VW) and equal-weighted (EW) basis, and before (old) and after (current) changes in Morningstar rating methodology. The "Old" rating was used from 01:2015 to 08:2019, whereas the "Current" reflects the period 09:2019 to 12:2020. For the old methodology, a higher score reflected a better ESG performance, whereas, for the current methodology, a lower score reflects higher performance.

The ESG rating is consistent across both VW and EW portfolios, suggesting that smaller funds (in TNAV) do not perform differently than larger funds. However, when comparing ESG portfolios with conventional portfolios, ESG funds, on average, perform slightly better than conventional funds. When evaluating the ratings, we observe that the Bottom 20 ESG display a score close to the Mid 60 conventional, and the Mid 60 ESG show a performance close to the Top 20

conventional. The worst portfolio is the Bottom 20 conventional, which we find to perform considerably worse than the Bottom 20 ESG on both an EW and VW basis. Although ESG funds on average exhibit higher ESG performance than conventional funds, it is hard to interpret if the difference is substantial or not. Without a reference group from another region, we cannot make any definite conclusions.

5.5 Potential weaknesses in the dataset

5.5.1 Survivorship bias

Due to a lack of necessary access to databases with historical data of merged and liquidated funds, we were unable to obtain data for non-surviving funds. Since our dataset is limited to surviving funds, our analysis may suffer from survivorship bias.

Survivorship bias skews the average performance for the surviving funds, causing a potential overestimation of historical performance. However, prior research finds that the impact of survivorship bias is not substantial and only accounts for approximately 0.5% or less per year [see Grinblatt and Titman (1989); Brown and Goetzmannn (1995); Elton, Gruber and Blake (1996)]. Furthermore, Renneboog et al. (2008) find survivorship bias to vary globally, as ignoring dead funds would overestimate the annual average return of non-SRI funds by 0.12%, 0.24% and 0.36% for Germany, the UK, and the US, respectively. As survivorship bias appears to take small values and applies to both ESG and conventional funds, we argue that this shortcoming should not distort our analysis significantly.

5.5.2 ESG rating

This thesis utilises the Morningstar Sustainability Score, which reflects ESG performance at the fund level. Using only one rating provider could be problematic, as the methodologies used by rating agencies are inherently different (see section 2.4). Rating disagreement and divergence among rating providers have gained attention from researchers. Evidence shows that relying on one provider creates a rater-specific bias [see Berg et al., (2019); Gibson, Krueger, Riand, et al., (2020)].

A weakness of the data is the lack of comparability of ESG ratings across periods. As the Morningstar Sustainability Score evolve, making inferences before and after a rating methodology change is difficult. For example, in section 2.4 we revealed

that the old rating (before 09:2019) is limited to identify “leaders” and “laggards” within an industry. In contrast, the new rating (from 09:2019) measures the degree to which a company's economic value may be at risk due to material ESG issues. Since the old and the new rating represent two different types of risk, we choose to divide our sample into two sub-periods: before and after changes in rating methodology.

Lastly, the ESG rating is only available from 31.01.2015. Consequently, when examining the relationship between ESG rating and fund performance, we limit our research to the period of available ESG data. Section 5.4 shows that the coverage ratio was approximately 55% in 2015. A reduced sample size increases the probability of Type II error, which in turn may lead to false-negative results. As larger sample sizes give more reliable results with greater precision and better statistical power, we expect less conclusive results when working with a limited sample.

6 Results and analysis

This section outlines the results from the empirical analysis on fund risk-adjusted performance. In section 6.1, we estimate traditional risk-adjusted performance measures for each portfolio. Section 6.2 discuss the results from one-factor portfolio regressions, which are further extended to the Fama-French five-factor and five-factor + momentum model in section 6.3. As a robustness check of our portfolio approach, we run regressions at a fund level in section 0. To identify differences across countries, we estimate alphas on a country-level in section 6.5. Section 6.6 show size-conditional alphas, which demonstrate if size impact fund performance. Finally, to obtain a more detailed picture of the relationship between ESG rating and fund performance, we run regressions on the Top 20, Mid 60 and Bottom 20 quantile portfolios over the 01:2015-12:2020 presented in section 6.7.

6.1 Traditional performance measures

We examine two traditional risk-adjusted performance measures for each portfolio. Table 9 reports the Sharpe and Sortino ratios for the ESG and conventional portfolios, whereas Table 10 reports the estimated ratios for the quantile portfolios.

Table 9 - Risk-adjusted performance measures

	Sharpe Ratio		Sortino Ratio	
	ESG	Conventional	ESG	Conventional
Value Weighted	0.88	0.82	1.36	1.24
Equally Weighted	0.87	0.81	1.35	1.22

The table reports the two risk-adjusted performance measures, Sharpe ratio (column 1&2) and Sortino ratio (column 3&4), for the value- and equal-weighted portfolio. All ratios are annualised. The sample period is 01:2015 – 12:2020.

The initial discussion in section 5.4 found that ESG funds generate slightly higher excess returns, were less volatile and displayed less extreme values than conventional funds. Table 9 show Sharpe and Sortino ratios which are consistent with prior results. However, when testing for difference ($SR_{ESG} \neq SR_C$), we do not find statistical evidence for ESG funds to provide a higher Sharpe ratio than conventional funds (p-value: 0.675). To examine the relationship between ESG rating and risk-adjusted performance, we display Sharpe and Sortino ratios for Top 20, Mid 60 and Bottom 20 portfolios in Table 10.

Table 10 - Risk-adjusted performance measures (quantile portfolios)

Panel A: Risk Measures Value-Weighted						
	ESG funds			Conventional Funds		
	Top 20%	Middle 60%	Bottom 20%	Top 20%	Middle 60%	Bottom 20%
Sharpe Ratio	0.97	1.07	1.03	1.13	0.87	0.81
Sortino Ratio	1.53	1.78	1.62	1.89	1.37	1.26
Panel B: Risk Measure Equal-Weighted						
	ESG Funds			Conventional Funds		
	Top 20%	Middle 60%	Bottom 20%	Top 20%	Middle 60%	Bottom 20%
Sharpe Ratio	1.05	1.02	0.91	0.97	0.92	0.77
Sortino Ratio	1.65	1.63	1.42	1.52	1.42	1.15

This table describes the results for the two risk-adjusted performance measures, Sharpe and Sortino ratios, for each quantile ranked by ESG ratings. All ratios are annualised. Panel A report results for the value-weighted portfolios. Panel B report for equal-weighted portfolios. The sample period is 01:2015 – 12:2020.

When ranking funds according to ESG rating in Table 8, we found that the ESG funds consistently displays a better ESG rating than their conventional peers. Recalling the discussion in section 2.4, as the Morningstar Sustainability Rating has evolved, it now captures the ESG risk material to each fund. If this holds, and the ESG score is a measure of risk, lower exposure to ESG issues should contribute to higher risk-adjusted performance. Consistent with this logic, Table 10 shows that except for the Top 20 VW ESG portfolio, funds with less ESG risk exhibit higher risk-adjusted performance. Most striking is the low Sharpe and Sortino ratios from the Bottom 20 conventional portfolio, which is also the portfolio with the highest ESG risk. Despite reporting both lower Sharpe and Sortino ratios than the Top 20 conventional, Mid 60 and Bottom 20 ESG portfolios, the Top 20 ESG VW portfolio still deliver a Sharpe and Sortino ratio higher than both the Mid 60 and Bottom 20 conventional portfolios.

If we compare the Top 20 portfolios, we observe that the VW conventional portfolio report a considerably higher Sharpe (1.13) and Sortino ratio (1.89) than its ESG counterpart, with 0.97 and 1.53. This inconsistency might be due to our matching procedure, as we matched funds according to size. By investigating the composition of the VW Top 20 conventional portfolio, we observe that the portfolio gets dominated by a few larger funds, which explains most outperformance throughout the period. Consequently, due to our sample size, one should be careful to draw conclusions solely based on the VW portfolios.

6.2 One-factor regression results

Table 11 - CAPM one-factor regression

	Panel A: CAPM Value-Weighted			Panel B: CAPM Equal-Weighted		
	α	β_{MKT}	Adj. R^2	α	β_{MKT}	Adj. R^2
ESG (1)	-0.741	0.94	0.96	-0.912	0.95	0.981
	(-0.934)	(40.6)***		(-1.74)*	(74.82)***	
Conventional (2)	-1.544	0.984	0.963	-1.69	0.971	0.982
	(-2.293)**	(52.79)***		(-3.312)***	(72.73)***	
Difference (1-2)	0.803	-0.044	0.113	0.79	-0.022	0.039
	(1.721)*	(-3.242)***		(1.726)*	(-1.943)*	

*This table report coefficient estimates from Jensen's (1968) one-factor model (CAPM). All α estimates are annualised (12 ∗ α) and stated in per cent. Panel A report results from a value-weighted portfolio of excess returns. Returns are weighted each month according to the funds respective TNA. Panel B report results from equal-weighted portfolios of excess returns. Portfolio returns are the monthly arithmetic mean of available observations. For both panels, the difference (1-2) is a long-short portfolio. Factor returns are retrieved from the Kenneth R. French data library for developed markets. Newey-West robust t-statistics are reported in parentheses where ***, **, and * indicate significance at the 1%, 5% and 10% level. The sample period is 01:2010 – 12:2020.*

From the one-factor regression in Table 11, both ESG and conventional funds underperform the market benchmark. The underperformance is most substantial for the portfolio of conventional funds with annualised alphas of -1.544% (VW portfolio) and -1.69% (EW portfolio), significant at the 5% and 1% levels. Compared to the conventional portfolios, the ESG portfolios report less negative excess returns, yet only significant at the 10% level for the EW portfolio. In addition, all portfolios document a market beta below one, significant at the 1% level. These betas suggest that both ESG and conventional funds, on average, are less volatile than the market index. However, given the recurring claim that SRI funds predominantly invest in risky small-cap stocks, we find it surprising that ESG funds report lower betas than conventional funds (0.94 versus 0.984 on a VW basis).

The difference portfolios, which equals a strategy being long 1 EUR in the ESG fund portfolio and short 1 EUR in the conventional fund portfolio, display positive alphas of approximately 0.8% for both VW and EW portfolios. Although the alphas may suggest that ESG funds have outperformed conventional funds over the 2010-2020 period, they are only significant at the 10% level. Consequently, we cannot draw any definitive inferences solely based on the results. However, the low adjusted R^2 for the difference portfolio (0.113 VW and 0.039 EW) may suggest that the difference in alpha is motivated by other factors than systematic differences in market exposure. Hypothetically, one of these factors could be the ESG focus.

We observe high adjusted R^2 for both ESG and conventional portfolios. A high adjusted R^2 implies that the developed market factors fit the data well and that the independent variables explain most of the variation in the dependent variable. However, it should be noted that R^2 often can take values of 0.9 or higher in time-series regressions (Brooks, 2014). In addition to this, empirical evidence from earlier research shows that the one-factor model does not sufficiently explain the variation of the dependent variable. Consequently, one should be careful putting too much emphasis on its results.

6.3 Multi-factor regression results

Table 12 - Fama-French five-factor regression

Panel A: Fama French 5-factor Value-Weighted							
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	Adj. R^2
ESG (1)	-1.167	0.947	-0.087	-0.129	-0.091	-0.005	0.964
	(-1.77)*	(52.52)***	(-2.033)**	(-2.93)***	(-1.133)	(-0.071)	
Conventional (2)	-1.433	0.982	-0.048	-0.035	-0.085	-0.027	0.963
	(-2.375)**	(52.01)***	(-1.143)	(-0.602)	(-0.938)	(-0.28)	
Difference (1-2)	0.2655	-0.035	-0.039	-0.094	-0.007	0.022	0.258
	(0.641)	(-3.011)***	(-1.56)	(-2.804)***	(-0.167)	(0.386)	
Panel B: Fama French 5-factor Equal-Weighted							
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	Adj. R^2
ESG (1)	-1.044	0.95	-0.069	-0.037	-0.041	-0.059	0.982
	(-2.202)**	(81.53)***	(-2.324)**	(-1.14)	(-0.81)	(-1.023)	
Conventional (2)	- 1.826	0.972	-0.002	-0.002	0.026	-0.011	0.981
	(-3.66)***	(68.64)***	(-0.064)	(-0.06)	(0.41)	(-0.19)	
Difference (1-2)	0.783	-0.023	-0.066	-0.035	-0.067	-0.048	0.146
	(1.99)**	(-2.94)***	(-3.7)***	(-1.604)	(-2.206)**	(-1.183)	

*This table report coefficient estimates from the Fama-French (2015) five-factor model. All α estimates are annualised (12 ∗ α) and stated in per cent. Panel A report results from a value-weighted portfolio of excess returns. Returns are weighted each month according to the funds respective TNA. Panel B report results from equal-weighted portfolios of excess returns. Portfolio returns are the monthly arithmetic mean of available observations. For both panels, the difference (1-2) is a long-short portfolio. Factor returns are retrieved from the Kenneth R. French data library for developed markets. Newey-West robust t-statistics are reported in parentheses where ***, **, and * indicate significance at the 1%, 5% and 10% level. The sample period is 01:2010 – 12:2020.*

As with the CAPM results, estimated alphas for both ESG and conventional funds are negative after controlling for SMB_t, HML_t, RMW_t, and CMA_t. The underperformance is, once again, most substantial for conventional funds, ranging from significant values of -1.433% (VW) to -1.826% (EW). Still, we find some noteworthy differences when comparing the five-factor regression results with those of the CAPM. For instance, the five-factor model report significant and

negative alphas for both the EW and VW ESG portfolios. In contrast, the negative alpha was only significant for the EW portfolio in the CAPM.

We observe that the estimated alpha is slightly less negative for the EW ESG portfolio relative to the VW ESG portfolio (-1.044% versus -1.167%). Contrarily, the CAPM reports alphas of -0.912% (EW) and -0.741% (VW). Thus, where the five-factor results suggest that smaller ESG funds tend to perform better than larger ESG funds, the CAPM suggest the opposite. However, for the conventional portfolios, the results appear to be more consistent. As the five-factor model report alphas of -1.433% (VW) and -1.826% (EW), the CAPM suggests -1.544% (VW) and -1.69% (EW). The inconsistency may be due to limitations of the CAPM, as described in section 4.2.

When considering the difference portfolios, the five-factor model pushes the alpha estimates towards zero (0.2655% VW and 0.783% EW) relative to the CAPM (0.803% VW and 0.79% EW). As expected, only the EW portfolio reports a significant alpha. Consistent with the CAPM results, we consider the adjusted R^2 as weak when running the five-factor model (0.258 VW and 0.146 EW). Once again, we find indications for differences in alpha to be driven by other factors than those included in the regression model.

Except for the market factor, none of the factor coefficients is significant in explaining conventional fund returns. In contrast, all ESG portfolios experience a negative size factor (SMB_t) ranging from -0.067 to -0.088. The results contrast with those of Renneboog et al. (2008), who find that Norwegian and Swedish SRI funds tend to invest in small-cap stocks. Since all factors are significant at the 5% level, we have some empirical evidence for ESG funds to have a higher exposure to large-cap stocks than conventional funds. Finally, ESG funds appear more growth-oriented than conventional funds, as the HML_t coefficient ranges from -0.037 to -0.129. Although the results are only significant for the VW portfolio, we still infer that ESG fund tends to be more growth-oriented than conventional funds. The other factors, RMW_t, and CMA_t, seems not to be relevant in our models, as the slopes are close to zero and insignificant.

Table 13 - Fama-French five-factor + momentum regression

Panel A: Fama French 5-factor + Momentum Value-Weighted								
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
ESG (1)	-1.21	0.948	-0.088	-0.118	-0.095	-0.014	0.012	0.964
	(-1.798)*	(52.61)***	(-2.029)**	(-2.53)**	(-1.16)	(-0.194)	(0.468)	
Conventional (2)	-1.358	0.98	-0.047	-0.053	-0.078	-0.012	-0.022	0.963
	(-2.14)**	(49.28)***	(-1.094)	(-0.85)	(-0.883)	(-0.126)	(-0.65)	
Difference (1-2)	0.148	-0.033	-0.041	-0.066	-0.017	-0.002	0.034	0.278
	(0.354)	(-2.801)***	(-1.58)	(-1.92)*	(-0.423)	(-0.035)	(2.436)**	
Panel B: Fama French 5-factor + Momentum Equal-Weighted								
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
ESG (1)	-1.059	0.95	-0.068	-0.033	-0.042	-0.062	0.004	0.982
	(-2.18)**	(79.343)***	(-2.307)**	(-1.032)	(-0.808)	(-1.088)	(0.241)	
Conventional (2)	-1.816	0.9722	-0.002	-0.005	0.027	-0.009	-0.003	0.981
	(-3.445)***	(65.93)***	(-0.055)	(-0.12)	(0.412)	(-0.15)	(-0.14)	
Difference (1-2)	0.757	-0.022	-0.066	-0.028	-0.07	-0.053	0.007	0.141
	(1.874)*	(-2.84)***	(-3.655)***	(-1.106)	(-2.285)**	(-1.213)	(0.496)	

*This table report coefficient estimates from the Fama-French (2018) five-factor + momentum model. All α estimates are annualised ($12 * \alpha$) and stated in per cent. Panel A report results from a value-weighted portfolio of excess returns. Returns are weighted each month according to the funds respective TNA. Panel B report results from equal-weighted portfolios of excess returns. Portfolio returns are the monthly arithmetic mean of available observations. For both panels, the difference (1-2) is a long-short portfolio. Factor returns are retrieved from the Kenneth R. French data library for developed markets. Newey-West robust t-statistics are reported in parentheses where ***, **, and * indicate significance at the 1%, 5% and 10% level. The sample period is 01:2010 – 12:2020.*

Controlling for momentum has no significant impact on the α estimates presented in Table 13. To the same extent as in the five-factor model, all portfolios follow the market closely (0.96 to 0.98), but ESG funds appear to be more exposed to large-cap stocks (SMB_t: -0.068 EW and -0.088 VW) relative to conventional funds. The adjusted R^2 reported by the five-factor + momentum model is the same as for the five-factor model, suggesting that the multi-factor models explain 96% to 98% of the variation in excess fund returns. The momentum factor, WML_t, reveals that ESG funds tend to be more exposed to winner stocks than conventional funds. All ESG portfolios carry a positive momentum exposure, whereas conventional portfolios show negative exposure. However, none of these observations is significant. Consistent with earlier results, ESG funds hint to outperform conventional funds, but once again, the alpha is only significant on an EW basis. In line with most prior literature, both ESG and conventional funds seem to underperform the passive benchmark, although the underperformance is most material for conventional funds.

6.4 Fund-level regression results

Following the methodology of Renneboog et al. (2008), we run fund level regressions as a robustness check of the results obtained from the portfolio approach. Results are obtained by taking the cross-sectional average of fund regression coefficient estimates. To find the significance of the average difference in fund alphas, we run cross-sectional regressions on fund alphas obtained from the five-factor + momentum model on a constant and a dummy variable. The dummy variable takes the value of 1 if ESG fund and 0 otherwise.

Table 14 – Fama-French five-factor + momentum regression (fund-level)

Panel A: Fama French 5-factor + Momentum Value-Weighted								
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
ESG (1)	-0.922	0.939	-0.076	-0.096	-0.023	0.005	0.017	0.898
	(-0.857)	(30.581)***	(-1.029)	(-0.935)	(-0.138)	(-0.119)	(0.516)	
Conventional (2)	-1.246	0.976	-0.056	-0.025	-0.058	-0.019	-0.01	0.886
	(-1.054)	(28.321)***	(-0.83)	(-0.095)	(-0.237)	(-0.039)	(-0.243)	
ESG vs. Conventional	0.3							
	(0.427)							
Panel B: Fama French 5-factor + Momentum Equal-Weighted								
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
ESG (1)	-0.186	0.947	-0.03	-0.012	-0.029	0.004	0.033	0.914
	(-0.376)	(29.102)***	(-0.811)	(-0.129)	(0.002)	(-0.073)	(0.442)	
Conventional (2)	-1.31	0.967	-0.031	0.029	-0.011	-0.03	0.027	0.89
	(-0.895)	(23.865)***	(-0.029)	(0.3)	(0.137)	(-0.11)	(0.259)	
ESG vs. Conventional	1.122							
	(1.898)*							

*This table report coefficient estimates from the Fama-French (2018) five-factor + momentum fund regressions. All α estimates are annualised ($12 * \alpha$) and stated in per cent. Panel A report value-weighted coefficients of FF5 + momentum fund regressions. Panel B report the arithmetic mean of coefficients from FF5 + momentum fund regressions. For both panels, ESG versus Conv. report the average difference in alpha between ESG and conventional funds. Factor returns are retrieved from the Kenneth R. French data library for developed markets. Newey-West robust t-statistics are reported in parentheses where ***, **, and * indicate significance at the 1%, 5% and 10% level. The sample period is 01:2010 – 12:2020.*

Overall, the cross-sectional average of fund level regressions reports slightly smaller coefficients, which are lower in significance than the portfolio regressions. For instance, individual regressions do not show a statistically significant relationship between ESG funds returns and large-cap stocks. Although cross-sectional regressions display lower coefficient estimates and t-statistics, the results are consistent with those reported in Table 13. Most notably, the cross-sectional regression does not reveal a significant difference in alphas compared to the long-short portfolio in Table 13. The cross-sectional regression reports an average difference in EW alpha of 1.122% with t-statistics of 1.898. In contrast, the long-short portfolio from section 6.3 displays an alpha of 0.757% with t-statistics of 1.874. Similarly, the cross-sectional regression reports a VW alpha of 0.3% with t-

statistics of 0.427, whereas the portfolio approach displays an alpha of 0.148% with a t-statistic of 0.354. As the fund-level regressions do not uncover a more statistically significant difference between the two portfolios, it increases the robustness of our analysis.

However, it is important to notice the difference between the cross-sectional average of fund-level coefficients in Table 14 and the portfolio regressions in Table 13. Fund-level regressions report more conservative results while still capturing the difference between the two portfolios. The fact that fund level regressions report less significant coefficients provides some evidence that there might be some bias towards fund characteristics in the portfolio regressions. Considering our relatively small sample size of 114 funds, attributes such as fund size might influence our results. Thus, while we find our results robust, one should be careful solely relying on results from portfolio regressions when working with small sample sizes.

6.5 Country regression results

Our sample has funds from 4 different domiciles: Norway, Sweden, Denmark, and Finland. Therefore, it is interesting to investigate whether the difference between ESG and conventional funds varies across countries. Consequently, we extend our fund-level analysis by running a cross-sectional regression on the fund alphas by interacting the ESG dummy (D_{ESG}) with country-specific dummy variables ($D_{country}$), indicating each funds country of origin.

Table 15 - Fama-French five-factor + momentum regressions (country portfolios)

Panel A: Fama French 5-factor + Momentum Value-Weighted									
		α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
Norway	ESG	-0.355	0.869	-0.136	0.021	0.437	0.235	-0.032	0.861
		(-0.347)	(29.82)***	(-1.927)*	(0.093)	(3.077)***	(1.192)	(-0.422)	
	Conventional	-1.67	1.035	0.056	0.085	0.1	-0.017	-0.034	0.917
		(-1.381)	(33.42)***	(0.252)	(0.639)	(0.851)	(-0.085)	(-0.724)	
	ESG vs Conv.	1.315							
		(0.639)							
Sweden	ESG	-1.21	0.952	-0.085	-0.158	-0.149	-0.016	-0.015	0.907
		(-1.085)	(30.28)***	(-1.019)	(-1.546)	(-0.993)	(-0.171)	(0.902)	
	Conventional	-0.049	0.965	-0.055	-0.135	-0.217	-0.169	0.036	0.85
		(-0.229)	(22.58)***	(-0.645)	(-0.859)	(-1.127)	(-0.579)	(0.447)	
	ESG vs Conv.	-1.166							
		(-1.244)							
Denmark	ESG	-0.541	0.933	-0.039	0.014	0.026	-0.063	0.002	0.906
		(-0.718)	(32.95)***	(-0.907)	(0.166)	(-0.199)	(-0.815)	(0.19)	
	Conventional	-1.768	0.947	-0.015	0.04	-0.349	0.003	0.004	0.886
		(-1.299)	(29.759)***	(-0.137)	(0.464)	(-0.237)	(-0.173)	(0.339)	
	ESG vs Conv.	1.227							
		(0.661)							
Finland	ESG	-0.345	0.987	0.089	-0.005	0.0329	-0.033	-0.179	0.889
		(-0.175)	(30.51)***	(0.878)	(0.144)	(0.894)	(-1.115)	(-0.175)	
	Conventional	-1.697	0.972	-0.182	-0.054	-0.028	0.12	-0.057	0.902
		(-1.456)	(29.279)***	(-2.539)**	(-0.384)	(-0.384)	(-0.082)	(0.717)	
	ESG vs Conv.	1.352							
		(0.036)							
Panel B: Fama French 5-factor + Momentum Equal-Weighted									
		α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
Norway	ESG	-0.364	0.956	-0.128	0.014	0.119	-0.015	0.046	0.927
		(-0.252)	(46.83)***	(-2.427)**	(-0.042)	(0.809)	(0.078)	(0.799)	
	Conventional	-1.727	1.093	0.24	0.049	-0.074	0.125	-0.063	0.88
		(-1.135)	(24.59)***	(1.432)	(1.191)	(0.246)	(0.055)	(-0.152)	
	ESG vs Conv.	1.362							
		(1.451)							
Sweden	ESG	0.927	0.969	-0.046	-0.024	-0.124	0.042	0.061	0.917
		(-0.244)	(22.87)***	(-0.886)	(-0.583)	(-0.475)	(0.358)	(0.698)	
	Conventional	-0.231	0.896	-0.016	0.11	-0.014	-0.13	0.137	0.852
		(-0.174)	(17.6)***	(0.339)	(0.433)	(-0.13)	(-0.291)	(0.876)	
	ESG vs Conv.	1.158							
		(0.739)							
Denmark	ESG	-0.637	0.922	-0.013	-0.016	-0.024	0.012	0.016	0.911
		(-0.337)	(26.41)***	(-0.577)	(0.063)	(-0.165)	(-0.265)	(0.223)	
	Conventional	-1.346	0.947	-0.019	0.036	-0.013	-0.063	0.049	0.902
		(-0.826)	(24.36)***	(-0.348)	(0.308)	(0.011)	(-0.253)	(0.712)	
	ESG vs Conv.	0.709							
		(0.903)							
Finland	ESG	-1.728	0.978	0.13	-0.016	0.025	-0.155	-0.005	0.893
		(-1.374)	(33.824)***	(1.391)	(0.431)	(1.242)	(1.01)	(-0.062)	
	Conventional	-1.832	0.971	0.005	-0.074	0.045	0.002	-0.036	0.907
		(-1.473)	(27.743)***	(-0.287)	(-0.558)	(0.544)	(0.211)	(-0.882)	
	ESG vs Conv.	0.104							
		(0.12)							

*This table report coefficient estimates from the Fama-French (2018) five-factor + momentum fund regressions. All α estimates are annualised (12 ∗ α) and stated in per cent. Panel A report value-weighted coefficients of FF5 + momentum fund regressions. Panel B report the arithmetic mean of coefficients from FF5 + momentum fund regressions. For both panels, ESG versus Conv. report the average difference in alpha between ESG and conventional funds in each country. Factor returns are retrieved from the Kenneth R. French data library for developed markets. Newey-West robust t-statistics are reported in parentheses where ***, **, and * indicate significance at the 1%, 5% and 10% level. The sample period is 01:2010 – 12:2020.*

Across all countries, we find that ESG funds outperform their conventional peers on an EW basis. VW coefficients tell the same story, with Sweden as the only exception. The difference in alpha turns negative for Swedish funds, moving from

1.158% (EW) to -1.166% (VW). However, we find this difference due to the same large fund, which distorts the result for the Top 20 VW conventional portfolio.

The difference between ESG and conventional funds are largest among the Norwegian funds on an EW basis, only beaten by Finish funds on a VW basis. The average difference is both smallest (EW) and largest (VW) for Finland. This inconsistency is due to our matching procedure, as funds are not matched according to domicile. The sample consists of 38 ESG funds, where 6 is Norwegian, 12 is Swedish, 17 is Danish, and only 3 has a Finnish origin. As we can see across both panels in Table 15, the low sample size does not yield any statistically significant results. Although the alphas are not significant, we find the results consistent with our earlier findings: ESG funds, on average, provides less negative abnormal returns than their conventional peers.

6.6 Size conditional regression results

The consistent difference between EW and VW alphas, from both portfolio and fund-level regressions, suggest that smaller ESG funds perform better than larger ESG funds. In contrast, larger conventional funds seem to outperform smaller funds. We investigate the robustness of these results by running regressions conditioned on fund size. Based on TNAV, we group funds each month into "above median" and "below median" portfolios.

Table 16 - Fama-French five-factor + momentum regressions (median portfolios)

Panel A: Fama French 5-factor + Momentum Value-Weighted (ESG)								
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
Above Median (1)	-1.279	0.95	-0.093	-0.126	-0.103	-0.012	0.015	0.959
	(-1.803)*	(49.18)***	(-2.002)**	(-2.482)**	(-1.197)	(-0.165)	(0.542)	
Below Median (2)	-0.8	0.927	-0.072	-0.038	-0.001	-0.06	-0.024	0.974
	(-1.26)	(76.18)***	(-2.134)**	(-0.86)	(-0.002)	(-0.992)	(-0.932)	
Panel B: Fama French 5-factor + Momentum Value-Weighted (Conventional)								
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
Above Median (3)	-1.323	0.979	-0.056	-0.056	-0.085	-0.01	-0.022	0.959
	(-2.01)**	(47.42)***	(-1.245)	(-0.84)	(-0.923)	(-0.099)	(-0.632)	
Below Median (4)	-1.77	0.995	0.057	-0.005	0.037	-0.051	-0.003	0.983
	(-3.235)***	(63.96)***	(1.807)*	(-0.117)	(0.592)	(-0.89)	(-0.13)	
Panel C: Difference portfolios								
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
Difference (1-2)	-0.478	0.023	-0.021	-0.089	-0.103	0.047	0.039	0.056
	(-0.867)	(1.46)	(-0.559)	(-1.546)	(-1.936)*	(0.642)	(1.61)	
Difference (3-4)	0.446	-0.016	-0.113	-0.051	-0.123	0.041	-0.019	0.044
	(0.878)	(-1.106)	(-2.749)***	(-0.82)	(-1.78)*	(0.456)	(-0.663)	
Difference (1-3)	0.044	-0.028	-0.037	-0.071	-0.018	-0.003	0.037	0.254
	(0.1)	(-2.253)**	(-1.34)	(-1.964)*	(-0.431)	(-0.04)	(2.523)**	
Difference (2-4)	0.958	-0.068	-0.129	-0.033	-0.037	-0.008	-0.021	0.214
	(1.51)	(-5.47)***	(-3.928)***	(-0.691)	(-0.734)	(-0.14)	(-0.746)	

*This table report coefficient estimates from the Fama-French (2018) five-factor + momentum model. All α estimates are annualised ($12 * \alpha$) and stated in per cent. Panel A report results for ESG funds. Panel B report results for conventional funds. Returns are weighted each month according to the funds respective TNA in the above and below median portfolio. Panel C report long-short portfolios based on median portfolios. Factor returns are retrieved from the Kenneth R. French data library for developed markets. Newey-West robust t-statistics are reported in parentheses where ***, **, and * indicate significance at the 1%, 5% and 10% level. The sample period is 01:2010 – 12:2020.*

Table 16 reports regression results for the median portfolios on a VW basis[10]. We review panel A and panel B and observe that three out of four alphas are significantly different from zero. More precisely, larger ESG funds (above median) underperform the benchmark by -1.279%, whereas smaller ESG funds (below median) underperform by -0.8%. On the other hand, smaller conventional funds underperform the benchmark by -1.77%, while larger conventional funds underperform by -1.323%. The underperformance is most significant for the conventional funds, which may be due to a larger sample.

Considering the (1-2) and (3-4) portfolios from panel C, which is large ESG minus small ESG and large conventional minus small conventional. Although none of the estimated alphas is significantly different from zero, the alphas suggest that smaller ESG funds tend to outperform larger ESG funds by an annualised 0.478%. In contrast, smaller conventional funds underperform larger conventional funds by -0.446%, substantiating our findings from section 6.3. The RMW_t coefficients

[10] For the interest of space, we choose only to report VW results in this section. EW results yield the same results and are reported in Appendix 3.

display a negative slope of -0.103 (1-2) and -0.123 (3-4), both significant at the 10% level. These negative betas suggest that smaller funds favour stocks performing well on profitability relative to larger funds. Further, the negative size coefficient, significant at the 1% level, given by the (3-4) portfolio suggests that larger conventional have greater exposure to large-cap stocks than smaller conventional funds.

Portfolio (1-3) and (2-4) measure differences between ESG and conventional funds. As for the (1-2) and (3-4) portfolios, both estimated alphas are insignificant. Across both portfolios, ESG funds display a negative market slope. Since the coefficient is significant at the 5% and the 1% level, we argue that ESG funds are less sensitive to market risk than conventional funds. Following, we see that the SMB_t and HML_t coefficients report a negative slope in both portfolios, consistent with our findings in section 6.3. Relative to conventional funds, ESG funds appear to favour large-cap stocks and to be more growth-oriented. The low adjusted R^2 of 0.254 and 0.214 support our hypothesis from section 6.2; the difference in alpha may be driven by factors not captured by the model, which could be the ESG focus.

6.7 Quantile portfolios regression results

Our discussion in section 5.4 found that ESG funds, on average, display better ESG performance compared to conventional funds. Therefore, we find it interesting to investigate if portfolios with lower ESG risk experience a higher risk-adjusted performance. We investigate this hypothesis by running a multi-factor regression on the Top 20, Mid 60 and Bottom 20 portfolios.

Table 17 - Fama-French five-factor + momentum regressions (quantile portfolios)

Panel A: Fama French 5-factor + Momentum Value-Weighted								
	ESG Funds				Conventional Funds			
	Top 20%	Middle 60%	Bottom 20%	Top - Bottom	Top 20%	Middle 60%	Bottom 20%	Long-short
α	-0.881	-0.245	-0.316	-0.565	0.911	-1.878	-1.322	2.232
	(-0.762)	(-0.414)	(0.166)	(-0.251)	(0.684)	(-3.033)***	(-0.815)	(1.1)
β_{MKT}	0.915	0.93	0.939	-0.024	0.9	0.963	1.042	-0.142
	(29.252)***	(55. 775)***	(31.589)***	(-0.517)	(27.884)***	(60.416)***	(30.307)***	(-2.777)***
β_{SMB}	-0.064	-0.059	0.101	-0.165	-0.012	-0.007	0.213	-0.225
	(-0.951)	(-1.196)	(1.175)	(-1.75)*	(-0.155)	(-0.164)	(3.552)***	(-2.509)**
β_{HML}	-0.049	-0.16	0.057	-0.106	-0.108	0.07	0.135	-0.243
	(-0.655)	(-2.79)***	(0.657)	(-0.897)	(-1.119)	(1.201)	(1.491)	(-1.53)
β_{RMW}	-0.107	0.075	-0.083	-0.024	-0.031	0.118	0.055	-0.086
	(-0.912)	(1.012)	(-0.57)	(-0.125)	(-0.259)	(2.352)**	(0.397)	(-0.455)
β_{CMA}	-0.042	0.191	0.29	0.249	-0.035	-0.037	0.051	-0.086
	(-0.325)	(1.932)*	(-2.318)**	(1.499)	(-0.266)	(-0.389)	(0.365)	(-0.418)
β_{WML}	0.051	0.004	0.13	-0.08	0.022	0.009	-0.003	0.019
	(1.282)	(0.01)	(2.225)**	(-1.132)	(0.358)	(0.303)	(-0.037)	(0.166)
Adj. R^2	0.961	0.98	0.943	0.032	0.938	0.987	0.964	0.356
Panel B: Fama French 5-factor + Momentum Equal-Weighted								
	ESG Funds				Conventional Funds			
	Top 20%	Middle 60%	Bottom 20%	Top - Bottom	Top 20%	Middle 60%	Bottom 20%	Top - Bottom
α	0.055	-0.243	-1.055	1.11	-0.902	-1.425	-2.34	1.438
	(0.07)	(-0.382)	(-1.084)	(0.908)	(-0.918)	(-2.247)**	(-1.947)*	(1.104)
β_{MKT}	0.915	0.925	0.999	-0.084	0.902	0.94	1.049	-0.147
	(47.79)***	(69.42)***	(42.102)***	(-2.619)**	(43.53)***	(63.82)***	(31.56)***	(-3.75)***
β_{SMB}	-0.129	-0.014	0.075	-0.204	-0.029	-0.025	0.351	-0.379
	(-2.632)**	(-0.357)	(1.42)	(-3.804)***	(-0.643)	(-0.766)	(5.127)***	(-5.75)***
β_{HML}	-0.008	-0.014	0.045	-0.053	0.024	0.019	0.091	-0.068
	(-0.155)	(-0.33)	(0.784)	(-0.589)	(0.446)	(0.616)	(0.99)	(-0.696)
β_{RMW}	-0.051	0.07	-0.136	0.085	0.183	0.079	-0.004	0.187
	(-0.526)	(1.377)	(-1.498)	(0.57)	(2.254)**	(1.387)	(-0.035)	(1.74)*
β_{CMA}	-0.149	0.002	-0.101	-0.048	0.017	0.012	-0.074	0.096
	(-1.379)	(0.02)	(-1.071)	(-0.332)	(0.17)	(0.169)	(-0.536)	(0.65)
β_{WML}	0.017	0.011	0.066	-0.049	-0.004	0.012	-0.015	0.019
	(0.612)	(0.315)	(1.695)*	(-0.963)	(-0.111)	(0.399)	(-0.234)	(0.26)
Adj. R^2	0.978	0.987	0.981	0.254	0.971	0.99	0.973	0.561

*This table report coefficient estimates from the Fama-French (2018) five-factor + momentum model. All α estimates are annualised ($12 * \alpha$) and stated in per cent. Panel A report results from a value-weighted portfolio of excess returns. Returns are weighted each month according to the funds respective TNA. Panel B report results from equal-weighted portfolios of excess returns. Portfolio returns are the monthly arithmetic mean of available observations. For both panels, Top - Bottom is a long-short portfolio based on top 20% and bottom 20%performers on ESG rating. Factor returns are retrieved from the Kenneth R. French data library for developed markets. Newey-West robust t-statistics are reported in parentheses where ***, **, and * indicate significance at the 1%, 5% and 10% level. The sample period is 01:2015 – 12:2020.*

From the results in Table 17, we notice a somewhat unexpected inconsistency in estimated alphas across the Top 20 portfolios. Specifically, for the ESG portfolios, the alpha estimates range from -0.9% (VW) to 0.06% (EW), whereas the conventional portfolios report alphas of 0.9% (VW) and -0.9% (EW). These findings are consistent with those in Table 10, where the Top 20 ESG portfolio delivers a Sharpe and Sortino ratio lower than its counterpart. However, as mentioned earlier, the Top 20 VW portfolio results may be biased towards fund size, and we should not put too much emphasis on the estimated results.

Since only three out of 16 alphas are statistically significant, we find it hard to draw any inferences on the relation between ESG rating and fund performance. However, we see hints of a positive relationship between these two metrics from the regression results. For example, both the Mid 60 and the Bottom 20 EW conventional portfolio reports negative alphas of -1.425% and -2.34%, significant at the 5% and 10% levels. In contrast, the Top 20 EW conventional portfolio display a negative alpha of -0.902%, not statistically different from zero. These alphas are interesting as portfolios with high ESG risk perform worse than portfolios with low ESG risk. This relationship is consistent for both ESG and conventional funds EW.

The SMB_t coefficient display another interesting pattern across the portfolios. While the Top 20 portfolios report negative size factors, the Bottom 20 portfolios show the opposite. Most noteworthy is the highly significant and positive size betas for the Bottom 20 conventional portfolios, which suggest that funds with high ESG risk tilt towards small-cap stocks. These findings put valuable insight into our analysis, as it provides some empirical evidence for funds performing low on ESG to have a higher exposure to small-cap stocks.

7 Conclusion

This paper seeks to answer if the Nordic investor pays the price of ethics when investing in ESG funds. Most prior research finds that the risk-adjusted returns of socially responsible funds are not statistically different from the performance of conventional funds. By conducting a comparative analysis, we do not find statistically significant evidence for Nordic ESG funds investing in the global stock market to underperform conventional funds over the 2010-2020 period. We document that both ESG and conventional funds underperform the market benchmark. However, there exists weak evidence across our models that ESG funds slightly outperform conventional funds. These results are further substantiated by our analysis when examining the relationship between ESG score and fund performance. Consistent across ESG and conventional funds, our results suggest that funds with lower ESG risk deliver higher risk-adjusted returns and are subject to less downside risk.

Our research contributes to the emerging literature on ESG investing by providing insights into the Nordic mutual fund market. As all evidence points towards the Nordics as one of the best-performing markets for incorporating ESG issues, we suggest that researchers examine the Nordic fund market further. With criticism of greenwashing from investors and the recent regulation of the European ESG fund market in mind, we document that Nordic ESG funds, on average, consistently exhibit better ESG scores than conventional funds. However, some argue that ESG funds have a tilt towards the technology industry, which typically exhibit a low environmental risk, making ESG funds similar to tech funds. Consequently, we propose further research on the stock composition of Nordic ESG funds to investigate technology stocks are overrepresented in their holdings.

Finally, as our data are limited to surviving funds and a single ESG rating provider, we suggest additional research on Nordic ESG funds with a larger survivor bias-free sample and multiple rating providers to increase the robustness of our results. Additionally, by comparing the Nordics to other regions, researchers can get a clearer understanding of differences in ESG performance across the globe.

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Appendices

Appendix 1: Sample of ESG funds

ISIN	Name	Domicile	Inception Date	TNA 31.12.20 (EUR millions)	Morningstar Global Category
SE0000537680	Swedbank Robur Transition Global A	Sweden	01/03/1980	427	Global Equity Large Cap
SE0000356263	Handelsbanken Global Tema (Criteria)	Sweden	29/10/1987	2547	Global Equity Large Cap
SE0001112723	Skandia Världen	Sweden	15/06/1989	520	Global Equity Large Cap
SE0000837205	Länsförsäkringar Global Hållbar A	Sweden	27/11/1990	1507	Global Equity Large Cap
SE0000434151	SEB Hållbarhetsfond Global	Sweden	21/10/1991	1391	Global Equity Large Cap
FI0008802434	OP-Ilmasto B	Finland	07/04/1997	125	Global Equity Large Cap
SE0000533945	Öhman Global Hållbar A	Sweden	21/12/1998	1430	Global Equity Large Cap
FI0008802921	Danske Invest Kestävä Arvo Osake K	Finland	01/11/1999	324	Global Equity Large Cap
DK0010270693	Alm. Brand Invest Globale Aktier ETIK	Denmark	21/11/2000	208	Global Equity Large Cap
DK0010301324	Nordea Invest Global Stars	Denmark	07/11/2003	254	Global Equity Large Cap
DK0016286230	Nykredit Invest Globale Aktier SRI	Denmark	01/06/2004	176	Global Equity Large Cap
NO0010606122	PLUSS Utland Etisk	Norway	17/10/2006	2	Global Equity Large Cap
NO0010452782	Nordea Stabile Aksjer Global Etisk	Norway	10/11/2008	1127	Global Equity Large Cap
DK0060212470	Nordea Invest Eng Glb Stab Akt - Et tilv	Denmark	09/07/2009	26	Global Equity Large Cap
DK0060192185	Nordea Invest Klima og Miljø	Denmark	13/11/2009	152	Global Equity Mid/Small Cap
DK0060208791	Jyske Invest Globale Aktier SRI KL	Denmark	01/03/2010	237	Global Equity Large Cap
DK0060183358	Nordea Invest Engros Int. Aktier - Etisk	Denmark	22/03/2010	60	Global Equity Large Cap
DK0060229284	Danske Invest Global Restricted KL	Denmark	25/05/2010	274	Global Equity Large Cap
DK0060287217	C WorldWide Globale Aktier Etik KL	Denmark	23/11/2010	105	Global Equity Large Cap
DK0060361046	Nykredit Invest Bæredygtige Aktier	Denmark	30/11/2011	261	Global Equity Large Cap
NO0010657273	Storebrand Global Solutions A	Norway	01/10/2012	404	Global Equity Large Cap
FI4000148226	OP-Vähähiilinen Maailma A	Finland	22/04/2015	140	Global Equity Large Cap
DK0060681468	Sydinvest Verd Ligevægt Val Etik W DKK d	Denmark	01/02/2016	51	Global Equity Large Cap
DK0060740496	Investin K Invest Low Carbon Global Eq	Denmark	23/08/2016	64	Global Equity Large Cap
NO0010801418	DNB Global Lavkarbon A	Norway	23/08/2017	134	Global Equity Large Cap
NO0010798101	Storebrand Global ESG A	Norway	13/09/2017	278	Global Equity Large Cap
SE0009983729	Penser Sustainable Impact A	Sweden	28/11/2017	0	Global Equity Large Cap
SE0010739920	Länsförsäkringar Global KlimatIndex	Sweden	12/02/2018	21	Global Equity Large Cap
SE0011167899	Swedbank Robur Global Impact A	Sweden	29/05/2018	226	Global Equity Large Cap
NO0010821614	KLP AksjeGlobal Mer Samfunnsansvar	Norway	12/06/2018	154	Global Equity Large Cap
DK0061068624	Formuepleje Better World Env Lds	Denmark	12/09/2018	93	Global Equity Mid/Small Cap
DK0061074515	Maj Invest Value Aktier SRI+ W	Denmark	04/10/2018	272	Global Equity Large Cap
SE0011311091	SEB Hållbar Faktor Global D	Sweden	19/11/2018	12	Global Equity Large Cap
SE0011336783	Handelsbanken Global Selektiv (A1 EUR)	Sweden	14/12/2018	303	Global Equity Large Cap
DK0061116027	Nordea Invest Bæredygtige Aktier KL	Denmark	14/03/2019	46	Global Equity Large Cap
DK0061146529	Formuepleje Better World Glb Opp	Denmark	22/08/2019	124	Global Equity Large Cap
DK0061152840	Falcon Brighter Future	Denmark	29/11/2019	2	Global Equity Large Cap
SE0013041654	Öhman Global Småbolag Hållbar A	Sweden	10/12/2019	17	Global Equity Mid/Small Cap

Appendix 2: Sample of conventional funds

ISIN	Name	Domicile	Inception Date	TNA 31.12.20 (EUR millions)	Morningstar Global Category
SE0000775348	SEB Dynamisk Aktiefond	Sweden	01/01/1977	1028	Global Equity Large Cap
DK0010265503	Nordea Invest Globale UdbytteAktier KL	Denmark	31/10/1985	102	Global Equity Large Cap
DK0010079631	Sparinvest Value Aktier KL A	Denmark	30/04/1986	594	Global Equity Large Cap
DK0010101740	Sydinvest Verden Ligevægt & Value A DKK	Denmark	16/11/1987	61	Global Equity Large Cap
FI0008804851	Aktia Global A	Finland	03/12/1987	84	Global Equity Large Cap
DK0010264027	Jyske Invest Globale Aktier KL	Denmark	07/06/1988	78	Global Equity Large Cap
DK0010157296	Handelsinvest Verden	Denmark	20/06/1990	63	Global Equity Large Cap
DK0010157965	C WorldWide Globale Aktier KL A	Denmark	30/06/1990	610	Global Equity Large Cap
SE0000542979	Swedbank Robur Globalfond A	Sweden	03/01/1994	5939	Global Equity Large Cap
FI0008800131	Evli Global A	Finland	08/04/1994	130	Global Equity Large Cap
FI0008800420	Nordea Global K EUR	Finland	29/10/1997	1833	Global Equity Large Cap
NO0008000973	Storebrand Global Value A	Norway	05/11/1997	67	Global Equity Large Cap
DK0010246396	ValueInvest Global A	Denmark	15/07/1998	357	Global Equity Large Cap
DK0016050974	Nordea Invest Global Small Cap KL	Denmark	20/11/1998	67	Global Equity Mid/Small Cap
NO0010003999	Eika Spar	Norway	16/02/1999	535	Global Equity Large Cap
FI0008800990	Nordea Pro Stable Return K EUR	Finland	24/09/1999	437	Global Equity Large Cap
NO0010028988	ODIN Global C	Norway	15/11/1999	798	Global Equity Large Cap
DK0010274760	Lån & Spar Invest - Verden Selection	Denmark	14/12/2000	159	Global Equity Large Cap
FI0008804752	LähiTapiola Vastuullinen Kasvu A	Finland	17/01/2001	148	Global Equity Large Cap
NO0010075476	Eika Global	Norway	01/06/2001	223	Global Equity Large Cap
SE0001097072	Lancelot Camelot A	Sweden	28/05/2003	391	Global Equity Large Cap
SE0001279480	Nordea Aktieallokering	Sweden	01/11/2004	1129	Global Equity Large Cap
DK0010311125	Sparinvest Momentum Aktier KL A	Denmark	21/04/2005	102	Global Equity Large Cap
DK0060239911	LI Aktier Globale II	Denmark	20/09/2005	13	Global Equity Large Cap
FI0008811104	POP Maailma	Finland	29/09/2006	14	Global Equity Large Cap
NO0010346422	Storebrand Global Multifactor A	Norway	19/12/2006	1101	Global Equity Mid/Small Cap
FI0008812607	Ålandsbanken Global Aktie B	Finland	02/11/2007	1241	Global Equity Large Cap
NO0010325962	Nordea Global	Norway	23/01/2008	1939	Global Equity Large Cap
DK0060120863	MS Invest Value Aktier	Denmark	23/06/2008	46	Global Equity Large Cap
FI4000003900	Säästöpankki Osake Maailma A	Finland	28/09/2009	174	Global Equity Large Cap
NO0010545908	Norse Trend Global	Norway	05/10/2009	18	Global Equity Large Cap
DK0060188662	Stonehenge Globale Valueaktier KL	Denmark	28/01/2010	79	Global Equity Large Cap
SE0003269091	Nordea Inst Aktiefonden Stabil	Sweden	21/05/2010	92	Global Equity Large Cap
DK0060206316	StockRate Invest Globale Aktier	Denmark	14/09/2010	97	Global Equity Large Cap
DK0060273779	Nordea Invest Portefølje Aktier Strategi	Denmark	24/02/2011	760	Global Equity Large Cap
DK0060337095	Formuepleje Globale Aktier	Denmark	24/06/2011	143	Global Equity Large Cap
SE0004167567	Didner & Gerge Global	Sweden	28/09/2011	581	Global Equity Large Cap
DK0060360824	Nykredit Invest Globale Fokusaktier	Denmark	30/11/2011	185	Global Equity Large Cap
DK0060446706	PFA Invest Globale Aktier	Denmark	01/10/2012	300	Global Equity Large Cap
SE0004576452	SPP Global Solutions A SEK	Sweden	01/10/2012	637	Global Equity Large Cap
NO0010660459	Pareto Global C	Norway	01/11/2012	303	Global Equity Large Cap
FI4000052204	Nordea Maailma Osinko B K EUR	Finland	17/12/2012	1433	Global Equity Large Cap
DK0060561645	Investin K Invest Globale Aktier	Denmark	08/09/2014	209	Global Equity Large Cap
FI4000148879	Nordea Equity Core C K EUR	Finland	25/03/2015	161	Global Equity Large Cap
NO0010735129	SKAGEN Focus A	Norway	26/05/2015	127	Global Equity Large Cap
DK0060660389	Wealth Invest L&P Dividende Fond	Denmark	02/11/2015	26	Global Equity Large Cap
DK0060710077	Nykredit Inv Engros Glb Fokusaktier	Denmark	27/04/2016	71	Global Equity Large Cap
FI4000206990	Finlandia Laatuyhtiöt	Finland	13/06/2016	39	Global Equity Large Cap
FI4000206982	Finlandia 2030	Finland	13/06/2016	60	Global Equity Large Cap
SE0008613939	Spiltan Globalfond Investmentbolag	Sweden	04/10/2016	165	Global Equity Large Cap
DK0060696573	Investin K Invest Globale Aktier II	Denmark	11/01/2017	167	Global Equity Large Cap
SE0009580814	PriorNilsson Smart Global	Sweden	01/03/2017	16	Global Equity Large Cap
NO0010782501	Heimdal Tinde	Norway	24/03/2017	15	Global Equity Large Cap
DK0060780526	Jyske Portefølje Managed Vol Aktier KL	Denmark	06/06/2017	184	Global Equity Large Cap
FI4000261334	Nordea Global Enhanced growth NOK	Finland	27/06/2017	683	Global Equity Large Cap
DK0060817708	Nykredit Invest Aktieallokering KL	Denmark	05/09/2017	125	Global Equity Large Cap
NO0010802556	FIRST Global Focus	Norway	15/09/2017	37	Global Equity Large Cap
FI4000288436	Nordea Discre Global Eq C growth NOK	Finland	30/11/2017	341	Global Equity Large Cap
DK0060918571	MMI Globale Value Aktier Akk	Denmark	22/01/2018	604	Global Equity Large Cap
DK0060918738	Nykredit Invest Engros Glb Value Aktier	Denmark	22/01/2018	194	Global Equity Large Cap
SE0010520403	Simplicity Småbolag Global	Sweden	28/02/2018	7	Global Equity Mid/Small Cap
DK0060949378	Falcon Global Momentum	Denmark	26/04/2018	8	Global Equity Large Cap
FI4000320965	Evli Global X IB	Finland	31/05/2018	5	Global Equity Large Cap
DK0060979284	BankInvest Value Globale Aktier W	Denmark	15/06/2018	187	Global Equity Large Cap
SE0011451772	Swedbank Robur Fokus	Sweden	08/10/2018	180	Global Equity Large Cap
SE0011750959	Consensus Global Select D	Sweden	17/10/2018	17	Global Equity Large Cap
SE0011642958	SPP Global Multifactor A SEK	Sweden	24/10/2018	51	Global Equity Mid/Small Cap
NO0010821648	KLP AksjeGlobal Small Cap Flerfaktor	Norway	07/11/2018	257	Global Equity Mid/Small Cap
DK0060908267	SEBinvest AKL Global Opportunity P	Denmark	14/12/2018	113	Global Equity Large Cap
NO0010814478	SR-Bank Verden D	Norway	02/01/2019	67	Global Equity Large Cap
FI4000364088	Titanium Dividend Growth	Finland	01/02/2019	17	Global Equity Large Cap
DK0061538956	Optimal - Globale Aktier KL	Denmark	08/02/2019	6	Global Equity Large Cap
SE0011670843	Captor Scilla Global Equity C	Sweden	12/02/2019	33	Global Equity Large Cap
DK0061112893	Nordea Invest Glo. Small Cap Enhanced KL	Denmark	15/03/2019	148	Global Equity Mid/Small Cap
DK0061134277	Lån & Spar Invest - Globale Aktier Basis	Denmark	08/07/2019	24	Global Equity Large Cap
DK0061148731	Wealth Invest Secure Market Power	Denmark	10/10/2019	40	Global Equity Large Cap

Appendix 3: Equal-Weighted Median portfolio results

Panel A: Fama French 5-factor + Momentum Equal-Weighted (ESG)								
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
Above Median (1)	-1.101	0.948	-0.073	-0.058	-0.026	-0.036	-0.004	0.974
	(-1.954)*	(66.62)***	(-2.021)**	(-1.689)*	(-0.416)	(-0.591)	(0.22)	
Below Median (2)	-0.9655	0.949	-0.06	-0.004	-0.027	-0.1	-0.01	0.978
	(-1.74)*	(82.78)***	(-1.95)*	(-0.108)	(-0.56)	(1.521)	(-0.384)	
Panel B: Fama French 5-factor + Momentum Equal-Weighted (Conventional)								
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
Above Median (3)	-1.61	0.967	-0.044	0.002	0.026	0.032	-0.021	0.97
	(-2.624)***	(55.85)***	(-1.10)	(0.037)	(0.336)	(0.503)	(-0.81)	
Below Median (4)	-2.036	0.979	0.027	-0.027	0.031	-0.054	0.005	0.983
	(-3.824)***	(61.21)***	(-0.876)	(-0.687)	(0.499)	(-0.864)	(0.222)	
Panel C: Difference portfolios								
	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{WML}	Adj. R^2
Above vs. Below (1-2)	-0.135	-0.001	-0.013	-0.054	0.001	0.064	0.013	0.005
	(-0.259)	(-0.072)	(-0.429)	(-0.138)	(0.025)	(1.115)	(0.672)	
Above vs. Below (3-4)	0.426	-0.012	-0.071	0.029	-0.004	0.086	-0.026	0.108
	(0.945)	(-0.082)	(-2.271)**	(0.784)	(-0.087)	(1.467)	(-1.117)	
Above vs. Above (1-3)	0.51	-0.019	-0.029	-0.06	-0.052	-0.069	0.025	0.178
	(1.022)	(-1.73)*	(-1.022)	(-1.921)*	(-1.186)	(-1.387)	(1.544)	
Below vs. Below (2-4)	1.07	-0.031	-0.087	0.023	-0.058	-0.046	-0.014	0.07
	(1.94)*	(-2.257)*	(-3.66)***	(0.56)	(-1.335)	(-0.684)	(-0.555)	