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Sustainable Mutual Fund Performance and Investment Style: Evidence from Sweden

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ABSTRACT:

This paper analyzes differences in performance and investment style between the most and least sustainable open-end mutual funds. We investigate Swedish funds using four different factor models, and find no significant difference in risk-adjusted returns (alphas) between funds with high sustainability ratings and those with low ratings for the 2011-2016 period. We do, however, find that high-sustainability funds in our samples are less exposed to market risk than low-sustainability funds are. We also provide evidence that the former group invests relatively more in large-cap stocks than the latter. These findings are robust to the choice of rating provider and sample period. We do not find consistent evidence of significant differences in exposures to value and momentum factors between the two groups. In contrast to the existing literature, our analysis is not based on matched samples and funds' self-reported sustainability assessments. Instead, we use newly released ratings from two independent data providers (Morningstar and MSCI), which renders our sustainability classifications more objective than those used in research to-date.

JEL Classification: G11

Keywords: Mutual Funds, Performance Evaluation, Style Analysis, Performance Attribution Models, Sustainable Investing, ESG, Morningstar Sustainability Rating, MSCI ESG Fund Metrics, Pensionsmyndigheten

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Table of Contents

List of Appendices

List of Abbreviations

AUM	Assets under management
CMA	Conservative minus aggressive (Investment factor)
CSR	Corporate social responsibility
DSI	Domini Social Index
ESG	Environmental, Social and Governance (Sustainability dimensions)
Eurosif	European Sustainable Investment Forum
GSIA	Global Sustainable Investment Alliance
HML	High minus low (Value factor)
MOM	Momentum (Momentum factor)
PM	Pensionsmyndigheten (The Swedish Pensions Agency)
RMW	Robust minus weak (Profitability factor)
SMB	Small minus big (Size factor)
SR	Socially responsible
SRI	Socially responsible investing
UN PRI	United Nations Principles for Responsible Investment

1. Introduction

The global sustainable investment market has grown significantly over the past years, and has been expanding its share of professionally managed assets worldwide. Rapid global growth stems from both increased investor demand and new regulation. The sustainable investing approach has changed over time; formerly, sustainable funds simply excluded "sin stocks", i.e. companies involved in the production of undesirable products such as tobacco, weapons, gambling and alcohol. Today, sustainable investing often entails fund managers explicitly incorporating environmental, social, and governance (ESG) issues into investment analysis and portfolio construction (Nofsinger and Varma, 2014). In other words, investors are now actively employing positive and best-in-class screens to select investment opportunities, in addition to simple exclusions. Examples of desirable inclusion opportunities could be firms that have progressive hiring policies, seek to reduce pollution, exercise good labor relations, have a clean human rights record, and are responsible corporate citizens (Benson, Brailsford, and Humphrey, 2006). The techniques nowadays also entail more sophisticated approaches such as impact investing aimed at solving environmental and social problems, and influencing sustainability practices by means of corporate engagement and shareholder action (Global Sustainable Investment Alliance, 2015).[3]

Most academic research on sustainable investing in the last decade has focused on the performance aspect, namely, whether or not sustainable investing entails financial costs beyond those associated with conventional investment (Revelli and Viviani, 2015). Previous studies on the relationship between fund sustainability and performance reach conflicting conclusions. Many papers show no notable difference in risk-adjusted financial performance between sustainable and conventional funds (see Bauer, Koedijk, and Otten, 2005). Others, such as Renneboog, Horst, and Zhang (2008b), find that investors do pay a price for sustainable investing because socially responsible funds underperform conventional ones. Nofsinger and Varma (2014) conclude that mutual funds labelled as socially responsible outperform conventional ones in times of market crises; however, the reverse is true in non-crisis periods. Meta-studies, which use statistical methods to combine findings from empirical literature, conclude that neutral performance is the most prevalent result (Revelli and Viviani 2013, 2015; Sjöström 2011, 2015).

Despite a surge in demand for sustainable investment research, the appropriate tools to measure sustainability thus far have been lacking. In particular, an industry standard in

[3] See Appendix 2 for a list of sustainable investing approaches as classified according to GSIA.

assessing the sustainable aspect of mutual funds has been missing until recently. However, with the introduction in early 2016 of the Morningstar Sustainability Rating and MSCI ESG Metrics, the sustainable dimension will likely become a more quantifiable aspect of asset managers' decision-making.

In this paper, we use the newly launched Morningstar and MSCI fund sustainability ratings in order to categorize our sample funds into high-sustainability and low-sustainability groups. Then, we compare the performance and investment style characteristics between the two groups. We use four factor models—CAPM, Fama-French 3-Factor model, Fama-French-Carhart 4-factor model, and Fama-French 5-factor model—to infer factor loadings for equally-weighted portfolios of high-sustainability funds, low-sustainability funds, and a portfolio long in the former and short in the latter ("sustainability-difference portfolio").

After controlling for risk factors, we find no evidence of either outperformance or underperformance of high-sustainability funds compared to low-sustainability ones, which is in line with the aforementioned performance studies indicating mainly neutral results. Our results for the sustainability-difference portfolio include negative market betas and negative exposure to the SMB (size) factor, which is in line with earlier studies (see Bauer et al., 2005; Bollen, 2007). These results are robust to data provider (Morningstar vs. MSCI), time period (5 vs. 10 years), and sustainability categorization (32.5^{th} vs. 20^{th} sustainability percentile). We do not find consistent evidence for differences in loadings on the HML (value) and momentum factors, which is in contrast to earlier studies (see Guerard, 1997; Nofsinger and Varma, 2014).

Several aspects distinguish this paper from earlier literature. Our thesis is the first academic study to use Morningstar and MSCI sustainability ratings to investigate the performance and investment style characteristics of open-end mutual funds. There are no earlier empirical papers on sustainability that have studied this large sample of Swedish funds. In order to make our study more relevant to Swedish retail investors, we investigate not only the sample of Swedish funds, but also Pensionsmyndigheten (PM) funds (i.e. those available for investing within the Swedish premium pension scheme). Furthermore, unlike earlier studies on sustainable investing, we are able to disentangle three dimensions of sustainability: environmental, social and governance. Also, ours is the first paper to employ the Fama and French (2015) 5-factor model to evaluate performance of sustainable funds.

As for terminology used in this paper, we refer to *high-sustainability (high-SRI) funds* and *low-sustainability (low-SRI) funds* based on their Morningstar and MSCI sustainability percentile ratings. The term *sustainable investing* is used in relation to the general approach of

incorporating environmental, social and governance (ESG) factors in portfolio selection and management. The definition is in line with the Global Sustainable Investment Alliance (GSIA) terminology from 2015. The terminology is for the purposes of this paper only, as there is no consensus on a unified definition of *sustainable investing* among researchers and practitioners. For this reason, we use the terms *sustainable investing*, *socially responsible investing (SRI)*, and *responsible investing* interchangeably throughout this paper. When we refer to other studies, particularly in the Literature review section, we use the same terms as the researchers do in their respective papers.

The remainder of this paper proceeds as follows. Section 2 explains the rationale for studying performance and investment style of sustainable investments and highlights the distinguishing features of our study. Section 3 reviews earlier literature on the topic and derives the research question and hypotheses. Section 4 describes the methodology employed for our regression analysis. Section 5 presents the key characteristics of data used, including details on the Morningstar and MSCI ratings, and descriptive statistics. The data section also discusses survivorship bias and its implications. Section 6 analyzes the results and reports robustness tests performed. Section 7 considers the limitations of this paper and proposes some topics for future research. Section 8 concludes.

2. Research Rationale

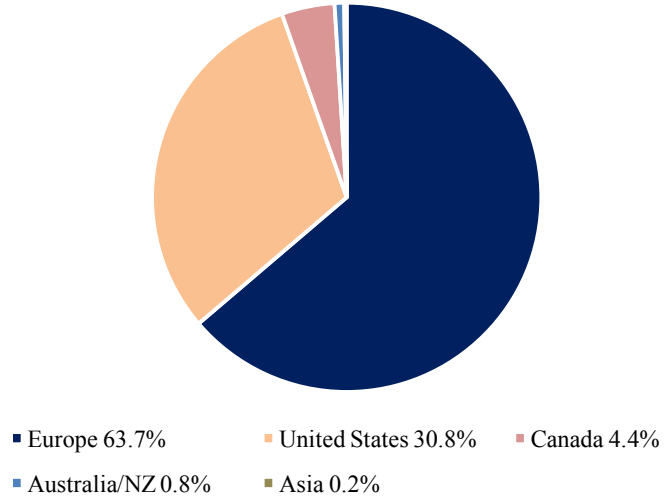
The rationale for exploring the financial characteristics of sustainable funds stems from both retail investors' and portfolio managers' interest. An increasing number of retail investors seek understanding of the financial implications of their sustainable investing decisions, while portfolio managers try to quantify the sustainability dimension of portfolio choice in order to incorporate it into their decision-making process. These, and other research rationale factors, are discussed in more detail below.

First, since sustainable investing is growing rapidly in importance and becoming increasingly integrated into the investment landscape across the globe, we find it important to understand the financial profile of SR mutual funds compared to their less sustainable counterparts. The global sustainable investment market has grown from $13.3 trillion at the start of 2012 to $21.4 trillion at the outset of 2014, expanding its share from 21.5% to 30.2% of professionally managed assets globally (Global Sustainable Investment Alliance, 2015).

Second, so far research has been focused on the United States (see e.g. Bello, 2005; Geczy, Stambaugh, and Levin, 2005; Goldreyer and Diltz, 1999; Hamilton, Jo, and Statman,

1993) leaving the research gap in Europe largely unfilled. Even though the United States is experiencing the most growth in this industry, the majority of sustainable assets are in Europe (63.7% of total). Interest in these types of investments is also growing tremendously in Sweden. The CAGR growth of sustainably-themed investments in the country was 124%, second highest in Europe after France. Swedish asset managers believe that this commitment will increase further in the upcoming years, driven by new market developments (e.g. green bonds), institutional demand, and external pressure from NGOs, trade unions and media (Eurosif, 2014).

Figure 1. Proportion of Global Sustainable Assets by Region (out of $21.4 trillion total) (Global Sustainable Investment Alliance, 2015)



Third, our research has important practical implications, as investors increasingly demand better understanding of the financial performance of responsible investments. So far, the growing demand can be partly explained by a demographic shift: there will be a significant wealth transfer from baby-boomers to their heirs (millennials) in the upcoming years (Accenture, 2015). 67% of millennials believe that investments are a way to "express social, political and environmental value" compared to only 36% of baby boomers (US Trust, 2014). Within the next decade, two thirds of all wealth will be controlled by younger women. There is definitely a distinct shift in mentality for the average investors (MSCI, 2016). The shift to include more sustainable considerations can also be explained by new legislation. Eurosif, the European sustainable investment forum, notes that new EU corporate non-financial disclosure legislation and the recent EU Proposal to revise the current Shareholder Rights Directive have contributed to the rise in sustainable investing (Eurosif, 2014).

Fourth, fund statistics with sustainability measures used to be self-reported and no industry standard has previously existed. However, significant steps have recently been taken by providers of market intelligence to standardize sustainability reporting. In March 2016, the two largest players in the market for mutual fund performance reporting—Morningstar and MSCI—independently released their fund sustainability ratings. The release signifies the emergence of an industry reference framework, which is likely to lead to more solid quantitative analysis in the area of sustainability. This is crucial, since some funds market themselves as being "ethical" or "sustainable"; however, with the release it became clear that many funds do not live up to their name from an external rating perspective (Avanza, 2016).

Fifth, and relating to the above point, prior studies often categorize funds in simple terms as either sustainable or conventional. This black-and-white approach does not accurately convey the whole spectrum of sustainability characteristics, however. For example, Bollen (2007) uses Social Investment Forum's classification scheme and notes that the nature of classification would entail a low hurdle for inclusions, which would lead to sustainable and conventional funds being more similar in attributes. Furthermore, studies comparing sustainable funds to conventional ones inevitably rely on a matched samples approach, which entails selecting conventional funds to match sustainable ones. This approach is prone to sampling bias (LaLonde, 1986), as researchers cannot construct a matching sample with equivalent characteristics to the sustainable funds sample while maintaining a randomized treatment. In our study, however, sustainability ratings allow for new approaches to analysis: we classify funds into high-sustainability and low-sustainability categories based on externally defined criteria (i.e. the sustainability rating); also, sustainability is evaluated on a scale rather than dichotomously, and can be broken down into its disparate elements (environmental, social, and governance).

3. Literature Review

The literature review section includes studies relating to sustainability at both fund- and company level, given that our two data providers derive their ratings from the sustainable characteristics of the fund holdings. We focus on fund level research to derive testable hypotheses on differences in factor loadings between high-sustainability and low-sustainability portfolios of mutual funds.

3.1 Performance of Sustainable Companies

Early research mainly focuses on the relationship between corporate social performance and corporate financial performance. The main question asked is whether or not corporate social responsibility (CSR) enhances companies' economic performance. The stakeholder management perspective posits that good corporate social performance would entail a sustainable comparative advantage, which, in turn, enhances firm profitability (Jones, 1995). On the other hand, CSR practices could be viewed as misallocations of valuable corporate resources, and as such, weaken firm profitability (Friedman, 1970).

As for empirical studies; Derwall, Guenster, Bauer, and Koedijk (2005) find positive abnormal returns for environmentally clean firms. On the other hand, Hong and Kacperczyk (2009) find that sin stocks, which sustainable investors avoid, earn positive abnormal returns. A recent Harvard study notes that it is important to distinguish between sustainability issues that are *material* to a company and those that are not, when evaluating the link between sustainability and performance. The researchers find that firms with good sustainability performance on material issues significantly outperform firms with poor performance on these same matters. Firms with good sustainability performance on *immaterial* issues did not underperform firms with poor performance on these same issues (Khan, Serafeim, and Yoon, 2015). The majority of empirical papers find a positive relationship between sustainability and financial performance: a meta-analysis from 2015 concludes that out of 2,000 academic papers published since 1970, 62.6% show a positive correlation between ESG strategies and strong financial performance (Friede, Busch, and Bassen, 2015).

A positive relation between sustainability and performance at the company level does not automatically imply the same relation at the fund level (Guenster, 2012). For example, including sustainable companies with positive alphas in the investment portfolio might lead to outperformance; however, excluding "sin stocks", some of which might also have positive alphas, could have the opposite effect. The overall effect at the fund level, then, would not necessarily be as straightforward.

3.2 Performance of Sustainable Funds

Building on the corporate social responsibility literature, the academic debate shifts to the discussion on whether sustainable funds outperform conventional ones. Indeed, for fund-level research, there is no consensus on alphas: studies find "neutral" relationships (meaning that

sustainable funds would neither underperform nor outperform their conventional peers) "positive" relationships (outperformance of sustainable funds relative to peers) or "negative" relationships (underperformance of sustainable funds relative to peers) (Revelli and Viviani, 2015). A neutral relationship seems to be the most prevalent finding thus far (Sjöström, 2015).

Early fund-level sustainable investing literature mostly uses the CAPM-based single-index model, where the intercept gives Jensen's alpha, gauging performance relative to the market proxy (see e.g. Hamilton et al., 1993; Mallin, Saadouni, and Briston, 1995). A few later studies use more elaborate multi-factor models based on Fama and French (1993) and Carhart (1997), since these better explain the variation in fund returns (see e.g. Bauer et al., 2005; Bollen, 2007; Nofsinger and Varma, 2014; Renneboog et al., 2008b). In this section, we present the research we deem most relevant and credible at the fund level, as well as some theoretical underpinnings, where applicable.

3.2.1 Neutral Performance

A number of studies find no difference in terms of risk-adjusted performance (i.e. Jensen's alpha) between sustainable and conventional funds. Two early papers (Hamilton, et al., 1993; Goldreyer and Diltz, 1999) study small samples of socially responsible U.S. mutual funds (32 and 49 funds respectively) and compare these to matched samples of conventional mutual funds over time. Both papers conclude that social screening does not affect investment performance. Bello (2005) uses a similar method to analyze the risk-adjusted performance of 42 socially responsible mutual funds in the United States, and does not find any significant performance differences between the two groups either. Literature on sustainability and financial performance focusing on European funds (and Swedish funds in particular) is rather limited. Kreander, Gray, Power, and Sinclair (2005) study 40 European SRI funds (of which 11 are Swedish) and find that the average Jensen's alphas of SRI-funds and non-SRI are not statistically different. It is worth pointing out that, in contrast to the previous studies mentioned that use longer sample periods of about ten years, Kreander et al. (2005) use a shorter time frame of two years only.

A few studies have extended their analysis to include multi-factor models. Bauer et al. (2005) screen 103 German, UK and US ethical mutual funds over the period 1990-2001. Their CAPM and multi-factor analyses suggest no significant difference in alphas between ethical and conventional funds, in any of the three countries.

3.2.2 Positive Performance

Nofsinger and Varma (2014) also employ multi-factor models, and find partial evidence of superior performance of socially responsible funds. From studying 240 US domestic equity SRI funds during 2000-2011, Nofsinger and Varma (2014) conclude that socially responsible mutual funds outperform conventional funds in times of market crises. Positive environmental, social and governance (ESG) characteristics, they argue, dampen the downside risk and offer crisis protection, since companies that exhibit ESG responsibility are less likely to be affected by large, negative events in both bull and bear markets. Furthermore, they find that it is positive screening in general (i.e. screening for desirable attributes rather than for the absence of undesirable characteristics) that accounts for positive alphas during market turmoil. They also note that funds with underlying holdings in companies that use good corporate governance practices perform better during times of market crisis. The researchers find the reverse to hold in bull times however: socially responsible funds underperform in non-crisis periods.

An industry report from MSCI (2016) also reveals that the specific screening approach in question matters and that ESG can add alpha if it is integrated within the investment process. The paper finds that both so called 'tilt' (a strategy overweighting stocks with higher ESG-ratings) and 'momentum' (a strategy overweighting stocks that have improved their ESG-ratings in recent times) portfolios outperformed the MSCI World Index over the eight-year sample period.

3.2.3 Negative Performance

Underperformance of sustainable funds is consistent with Markowitz (1952) financial portfolio theory; since sustainability screens constrain portfolio optimization, risk-adjusted returns should be inferior to those of conventional funds. One illustration for this logic is presented by Renneboog et al. (2008a): sustainable funds avoid investing in companies that generate negative externalities such as pollution, regardless of whether or not these companies generate positive net present value (NPV) to its shareholders. Sustainable investors would therefore underinvest in financially attractive opportunities. Furthermore, sustainable funds care about social objectives and thus actively invest in companies that generate positive externalities such as better environment or community, also regardless of NPV. As a result, sustainable investors also overinvest in financially unattractive opportunities (i.e. those

generating negative NPV). For these two reasons, sustainable funds are expected to underperform conventional ones.

Renneboog et al. (2008b) focus on ethics and stakeholder governance in their extensive global study of 440 (alive and dead) international SRI funds. Using multi-factor models (Fama and French; Carhart), the researchers find that SRI funds underperform their conventional counterparts in the UK, US and in many continental European and Asia-Pacific countries. The difference is not statistically significant, however, except for in the case of France, Ireland, Sweden and Japan.

3.3 Investment Style (Betas) of Sustainable Funds

In this section, we provide an overview of literature exploring differences between high-sustainability and low-sustainability funds in terms of factor loadings (see Fama and French, 1993; Carhart, 1997). Although the findings on style factors are more limited than performance aspects (stemming from the fact that most early literature employed single-index models only), results generally support significant differences in risk exposure between sustainable and conventional funds. Below, we present the studies that have found significant difference in loadings on Fama-French factors:

In terms of *market risk*, a number of studies find that ethical funds are less market-sensitive, i.e. they have lower systemic risk compared to conventional funds. Kreander et al. (2005) confirm this notion using the CAPM. Bauer et al., (2005) show that these results hold both in CAPM and in a 4-factor Fama-French-Carhart model.

For *size*, Luther, Matatko, and Corner (1992), and Gregory, Matatko and Luther (1997) study UK funds and find a bias of SRI funds toward small capitalization stocks. Bauer et al. (2005) find different loadings depending on region: UK and German ethical funds have a higher exposure to small-cap, whereas US ethical funds are more exposed to large-cap. Bollen (2007) documents that SRI funds are relatively more weighted towards large-cap stocks than conventional funds are. Also Nofsinger and Varma (2014) arrive at similar results: SRI funds load less on small-cap stocks compared to conventional funds.

For *value*, Guerard (1997) finds a growth bias in the DSI (Domini Social Index). Bauer et al. (2005) reach similar conclusions; that ethical funds are more growth-oriented, or less value-oriented, than conventional ones. The reason, they argue, might be that ethical funds would shun certain traditional value-stocks such as energy, chemical, and basic industries since these would typically entail higher environmental risk. These findings are

furthermore supported in company-level studies, in which a "top-overall minus bottom overall" portfolio in terms of socially responsible companies is tilted towards growth stocks. For example, Derwall et al. (2005) find that high ranked eco-efficient portfolios are more growth-stock oriented whereas low-ranked ones are more value-oriented.

Finally, in terms of *momentum*, Bollen (2007) as well as Nofsinger and Varma (2014) find a significantly smaller exposure of SR funds to the momentum factor compared to conventional funds. Bauer et al. (2005) show that German ethical funds are relatively less exposed to momentum than conventional ones are, although the opposite holds true for US funds.

Bollen (2007) finds a tighter range of factor coefficients for SR funds, which is consistent with an argument presented in Geczy et al. (2005), namely that SR funds have fewer opportunities than conventional funds in terms of exposure to risk factors. This limited diversification would hamper the performance of sustainable fund portfolios relative to conventional funds.

3.4 Research Question and Hypotheses

Given investors' interest in the link between sustainability and financial performance of mutual funds, we seek to compare performance of high-sustainability mutual funds to that of low-sustainability ones. We also wish to investigate the particular investment styles of these funds. We rely on Morningstar and MSCI percentile ratings of sustainability in order to answer the following research question:

What are the differences in terms of risk-adjusted returns (alphas) and investment style (factor betas) between the most and least sustainable open-end mutual funds?

Investment style refers to factor betas, which in this case include the market (MKT), size (SMB), value (HML), momentum (MOM), profitability (RMW), and investment (CMA). Previous studies (see Bauer et al., 2005; Renneboog et al., 2008b) have used the term "investment style" in this context. With the most and least sustainable funds we refer to the top and bottom percentiles of fund ratings (32.5% in the main specification and 20% in robustness tests). Throughout this paper we denote these two groups as "high-sustainability" and "low-sustainability" or "high-SRI" and "low-SRI" (the two alternative terms are used interchangeably).

Because our analysis focuses on Swedish mutual funds (as defined by at least 50% of holdings in Swedish equities) and Pensionsmyndigheten (PM) mutual funds (available for investment within the Swedish premium pension plan), we formulate two research sub-questions with respect to each sample:

- *What are the differences in terms of risk-adjusted returns (alphas) and investment style (factor betas) between the most and least sustainable Swedish open-end mutual funds?*

- *What are the differences in terms of risk-adjusted returns (alphas) and investment style (factor betas) between the most and least sustainable PM open-end mutual funds?*

We rely on previous empirical studies discussed above, as well as on theoretical literature, to derive testable hypotheses. One important caveat is that previous empirical studies on sustainable mutual funds use a different classification approach: they typically compare a sample of SRI funds to a matched sample of conventional ones. Our sorting approach, on the other hand, relies on externally provided sustainability ratings, which eliminates the benchmark problem (see Bauer et al., 2005) of finding appropriate conventional funds to match the SRI sample funds. This difference in classification means that some characteristics of our "high-SRI" and "low-SRI" categories do not directly correspond to previous studies' "SRI" and "conventional" classifications respectively.

Fama and French (2007) propose a simple framework for incorporating investor tastes (including the preference for socially responsible mutual funds) in asset pricing models. They relax the CAPM assumption that investors are only concerned with payoffs of their portfolios, and instead treat investment portfolios as consumption goods, allowing for taste to impact investors' decisions. According to their theory, tastes in certain types of assets may lead investors to choose a different set of investments than the equilibrium tangency portfolio. Furthermore, because tastes are unlikely to change over time, price effects of asset tastes may be persistent. With respect to our analysis, Fama and French's (2007) framework implies the possibility of systematically higher prices (and hence lower returns) for sustainable portfolios, if the majority of investors display a systematic preference for sustainable investing. However, as discussed in the previous section, empirical research points towards no difference in risk-adjusted returns between SRI funds compared to conventional funds (Revelli and Viviani, 2015; Sjöström, 2015). This might be because on average, there is no

systematic preference for SRI among investors. Based on the findings of the majority of empirical studies we propose our first hypothesis:

Hypothesis 1: *A portfolio long in high-SRI funds and short in low-SRI funds delivers no significant alpha, after controlling for Fama-French factors.*

We also expect lower market betas for more sustainable funds, in line with Bauer et al. (2005). This prediction is furthermore aligned with evidence from Oikonomou, Brooks, and Pavelin (2012), who argue that sustainable companies are less likely to suffer large negative losses related to social considerations or be prone to regulatory or legal issues. This leads to our second hypothesis:

Hypothesis 2: *A portfolio long in high-SRI funds and short in low-SRI funds loads negatively on the market factor.*

Bollen et al. (2007) and Nofsinger and Varma (2014) find that SR funds are less exposed to the SMB factor, suggesting these funds invest more in large-cap stocks compared to conventional funds. Bauer et al. (2005) find this to hold true at least for their U.S. sample. The reason might be related to exclusion of smaller companies that do not have resources to monitor sustainable issues. Hence, we formulate our third hypothesis in the following manner:

Hypothesis 3: *A portfolio long in high-SRI funds and short in low-SRI funds loads negatively on the SMB (size) factor.*

Guerard (1997) and Derwall et al. (2005) find a relatively larger exposure to growth rather than value factors among SRI funds. Bauer et al. (2005) also provide evidence that German, UK and US SRI funds are more growth- than value-oriented. Hence, the Fama-French HML (high B/M minus low B/M, or value minus growth) factor beta would have to be negative for SRI minus conventional portfolio. This prompts us to the following fourth hypothesis:

Hypothesis 4: *A portfolio long in high-SRI funds and short in low-SRI funds loads negatively on the HML (value) factor.*

Nofsinger and Varma (2014) find that SRI funds are relatively less exposed to the momentum factor. As a momentum strategy is especially costly due to turnover incurred, a lower loading on momentum is consistent with a lower turnover for SRI funds. Indeed, Geczy et al. (2005) show that sustainable funds incur lower turnover compared to conventional ones. The fifth hypothesis we test relates to momentum:

Hypothesis 5: *A portfolio long in high-SRI funds and short in low-SRI funds loads negatively on the MOM (momentum) factor.*

Now that we outlined the rationale for our study, as well as reviewed the relevant literature and presented the research question and hypotheses, we proceed to discuss the methodology and data used to answer our research question.

4. Methodology

4.1 Performance Attribution Models

In order to investigate the differences in performance and factor exposure between Swedish mutual funds with high and those with low sustainability ratings, we rely on factor models of performance attribution: CAPM (Lintner, 1965; Sharpe, 1964; Treynor, 1962), Fama and French (1993) 3-factor model, Carhart (1997) 4-factor model, and Fama and French (2015) 5-factor model.

The main conclusions are drawn from the 3-factor and 4-factor models, as these tend to have relatively greater explanatory power based on regression R^2. Additionally, as shown by Flam and Vestman (2014), Fama-French and Carhart factor models are appropriate for mapping performance and systemic risk exposure of Swedish mutual funds.

We omit CAPM from final interpretation, as it was shown to lack explanatory power over the variability in stock returns (Chan, Jegadeesh, and Lakonishok, 1996; Fama and French, 2004). CAPM can nevertheless be useful in gauging the loadings on the market factor for preliminary understanding of exposure to market risk among high-SRI and low-SRI funds.

We also run the Fama and French (2015) 5-factor model, which includes profitability and investment factors. The relevance of this model for examining mutual fund performance has not yet been established, and no other studies have used it for sustainable fund performance mapping. We therefore devote relatively less analysis to the 5-factor model, as it

generally performs worse in explaining the variation in fund returns in our sample, and is less relevant for comparing factor loadings against other studies of sustainable funds.

Previous studies on SR mutual funds have also employed multi-factor models for comparisons between responsible and conventional mutual funds (Bauer et al., 2005; Nofsinger and Varma, 2014). Similar to these studies, we construct two equally-weighted portfolios: one of high-SRI funds and one of low-SRI funds, and then map the factor loadings for excess returns (i.e. return above the risk-free rate) for each of the portfolios. Additionally, we construct a third portfolio: long in equally-weighted high-SRI funds and short in low-SRI ones. Factor loadings for the third portfolio are indicative of the difference between funds with high sustainability ratings and those with low ones.

Our regression specifications are as follows:

$$R_t^{Dif} = \propto_1 + \beta_{MT,1}(Rm_t - Rf_t) + \varepsilon_{1,t} \quad (1)$$

$$R_t^{Dif} = \propto_2 + \beta_{MT,2}(Rm_t - Rf_t) + \beta_{SMB,2}SMB_t + \beta_{HML,2}HML_t + \varepsilon_{2,t} \quad (2)$$

$$R_t^{Dif} = \propto_3 + \beta_{MT,3}(Rm_t - Rf_t) + \beta_{SMB,3}SMB_t + \beta_{HML,3}HML_t + \beta_{MOM,3}MOM_t + \varepsilon_{3,t} \quad (3)$$

$$R_t^{Dif} = \propto_4 + \beta_{MT,4}(Rm_t - Rf_t) + \beta_{SMB,4}SMB_t + \beta_{HML,4}HML_t + \beta_{RMW,4}RMW_t + \beta_{CMA,4}CMA_t + \varepsilon_{4,t} \quad (4)$$

$$R_t^{Dif} = R_t^{high\_SRI} - R_t^{low\_SRI}$$

Where R_t^{Dif} (or SRI-difference return) is the return in month *t*, on a portfolio long in high-SRI funds, and short in low-SRI funds. R_t^{Dif} is calculated as the difference between returns of the equally-weighted portfolio of high-SRI funds ($R_t^{high\_SRI}$) and those of low-SRI funds ($R_t^{low_{SRI}}$).

Rm_t – return on the region's value-weight market portfolio in month *t.*[4]

Rf_t – return on one-month risk-free rate in month *t.*

SMB_t – return on size factor in month *t,* calculated as the difference between small and big stock portfolio returns for the region.

HML_t – return on value factor in month *t,* calculated as the difference between high and low book to market portfolios for the region.

[4] We use Kenneth French's website (Kenneth R. French – Data Library) to download monthly returns on regional market value-weighted portfolios. Global portfolios are used for PM sample analysis, and European portfolios are used for Swedish sample analysis.

MOM_t – return on momentum factor in month *t,* calculated as the difference between a portfolio of past 12 months winners and that of losers for the region.

RMW_t – return on profitability factor in month *t*, calculated as the difference between robust and weak operating profitability portfolios.

CMA_t – return on investment factor in month *t*, calculated as the difference between conservative and aggressive investment portfolios.

β coefficients measure factor loadings – how much the SRI-difference portfolio return changes as a result of 1 percentage point change in the factor return.

$\propto$ coefficients measure excess return of SRI-difference portfolio above the compensation for factor exposures.

In addition to regressions for the SRI-difference portfolio (R_t^{Dif}), we also use factor models to analyze high-SRI portfolio returns ($R_t^{high\_SRI}$) and low-SRI returns ($R_t^{low\_SRI}$) separately. Regressions are structured in the following manner (3-Factor model presented as an example):

$$R_t^{high\_SRI} - Rf_t = \propto_5 + \beta_{MT,5}(Rm_t - Rf_t) + \beta_{SMB,5}SMB_t + \beta_{HML,5}HML_t + \varepsilon_{5,t} \quad (5)$$

$$R_t^{low\_SRI} - Rf_t = \propto_6 + \beta_{MT,6}(Rm_t - Rf_t) + \beta_{SMB,6}SMB_t + \beta_{HML,6}HML_t + \varepsilon_{6,t} \quad (6)$$

The notation used in equations (5) and (6) corresponds to those in equations (1) – (4). Mathematically, the coefficients in SRI-difference regressions can be computed as the difference between corresponding coefficients in high-SRI regressions and low-SRI regressions. For example, the market beta in a 3-factor SRI-difference model is the difference between market betas from the high-SRI regression and low-SRI regression:

$\beta_{MT,3} = \beta_{MT,5} - \beta_{MT,6}$. In this example, the t-statistics on the $\beta_{MT,3}$ coefficient shows whether or not there is a significant difference between market betas for high-sustainability funds and low-sustainability funds.

4.2 Sorting by High-SRI and Low-SRI Characteristics

We use the newly launched sustainability ratings of Morningstar and MSCI in order to form high-SRI and low-SRI portfolios. As both ratings were released in early 2016, to the best of our knowledge there are no academic studies using this approach to evaluate performance of mutual funds subject to sustainability profiles. What separates our paper from previous studies in the area of sustainable investing is that ratings allow us to sort funds based on their relative

sustainability characteristics, as well as based on the subcomponents of sustainability score: environmental, social, governance and controversy considerations. The sustainability score is calculated by subtracting the controversy adjustment from the ESG score. Our dataset includes percentile ranks across all four components of the sustainability rating of each fund.

The Morningstar Sustainability Rating of a mutual fund is derived from a value-weighted average of sustainability scores of the underlying fund holdings. Based on the holdings' scores, a sustainability score is assigned to each fund and compared against its Morningstar category peers in order to derive a sustainability rating. Morningstar's ratings are normally distributed, and correspond to the following five descriptive ranks: funds ranked among the highest 10% are assigned a "High" rank, next 22.5% - "Above Average" rank, next 35% - "Average" rank, next 22.5% - "Below Average" rank, and lowest 10% - "Low" rank (see Appendix 3 for details on the Morningstar rating methodology).

In order to construct the three variables of interest — $R_t^{high\_SRI}, R_t^{low\_SRI}, R_t^{Diff}$—we sort Morningstar-rated funds into two groups: "High-SRI" are in the top 32.5% of sustainability rating (those with "High" and "Above Average" descriptive ranks); "Low-SRI" are in the bottom 32.5% of sustainability rating (those with "Low" and "Below Average" descriptive ranks). Then, we construct equally-weighted portfolios of returns for the low-SRI portfolio and high-SRI portfolio. Finally, we subtract the former from the latter in order to obtain SRI-difference portfolio returns. In alternative specifications, we also perform the sorting based on 20th percentiles instead of 32.5th percentiles. However, for the main specification we use 32.5% sorting, as it allows for the greater sample size. 20%-based results will be discussed in the section on robustness checks.

Morningstar data on subcomponents of the rating—controversy, environmental, social and governance—allows us to perform similar analyses for the four dimensions of the rating. We run regressions specified in equation (1) - (4) also for difference portfolios formed based on individual ratings along the subcomponent dimensions. We only report results for the three main dimensions—environmental, social, and governance (see Appendix 1 for examples of ESG subcomponents)—as the controversy dimension is based on discretionary events within a year of the rating date and hence does not provide sufficient consistency over time to use it for analysis over 5- or 10-year periods.

MSCI ESG Fund Metrics provide a similar sustainability rating, also evaluating mutual funds based on environmental, social and governance aspects of managing sustainability risks and opportunities. As in the Morningstar case, the MSCI rating is also

derived from the underlying holdings' ratings, and the resulting scores are benchmarked against fund category peers. Overall, Morningstar and MSCI ratings seek to capture sustainability in a similar manner. However, there are two important differences between Morningstar and MSCI ratings. First, Morningstar requires 50% of holdings to be rated in order to assign a fund rating, while MSCI uses a higher threshold of 65%. Second, Morningstar ratings rely on company ratings by Sustainalytics, a third-party ratings provider, while MSCI company ratings are computed in-house.

We primarily rely on Morningstar ratings for sorting funds based on sustainability. We also use MSCI-based sorting for the overlapping sample of funds—those covered by both MSCI and Morningstar ratings—as this allows us to demonstrate whether our results are specific to the Morningstar rating, or if they hold for both sustainability rating providers currently available in the market at fund level. Even though MSCI provides subcomponent ratings too, we do not have access to these through our limited data release on the same fund sample.

4.3 Regressions Based on Sustainability Subcomponents

One of the unique characteristics of our dataset is the possibility to disentangle the overall sustainability rating by its subcomponents. This allows us to perform the sorting in the following ways:

a) Based on the overall Morningstar rating, with resulting variable:

$$R_t^{Dif} = R_t^{high\_SRI} - R_t^{low\_SRI}$$

b) Based on individual subcomponents, with resulting variables:

- $R_t^{Dif\_Env} = R_t^{high\_Environmental} - R_t^{low\_Environmental}$
- $R_t^{Dif\_Soc} = R_t^{high\_Social} - R_t^{low\_Social}$
- $R_t^{Dif\_Gov} = R_t^{high\_Governance} - R_t^{low\_Governance}$

In our analysis, we utilize this data on different sustainability dimensions to run regressions *(1) - (4)* using subcomponents-based specifications of R_t^{Dif}, as outlined in *(b)* above. This allows us to capture the differences in factor loadings not only for sustainability overall, but also for the three other sorting variables (environmental, social, and governance).

5. Data

We use the trial version of the Morningstar Direct database to obtain mutual fund returns (in US dollars) at monthly frequency, Morningstar sustainability rating variables, and fund characteristics such as industry exposures and market values of the funds. Additionally, we obtain MSCI ESG Fund Metrics via the limited data release from MSCI. Fama and French factors (in US dollars) at monthly frequency are downloaded from Kenneth French's web-site (Kenneth R. French—Data Library). We use European factors for Swedish sample regressions, and Global factors for PM (Pensionsmyndigheten) sample regressions.

The Swedish sample includes data on open-end mutual funds investing at least 50% of their holdings in Swedish equities, and the PM sample encompasses open-end mutual funds that invest at least 50% in equities (irrespective of country exposure) and are available to Swedish pension takers. To be included in our sample, funds should have a Morningstar sustainability rating.

5.1 Swedish Sample

The Swedish sample consists of 137 sustainability-rated open-end funds with at least 50% net exposure to Swedish equities. We choose to explore open-end mutual funds as opposed to closed-end funds, as the former are more prevalent among retail investors. Also, closed-end funds typically use leverage (Dimson and Minio-Kozerski, 1999), which makes their returns less comparable.

5.2 PM Sample

The PM sample consists of 508 sustainability-rated funds with at least 50% net exposure to equities. PM funds are those registered with Pensionsmyndigheten (The Swedish Pensions Agency), which handles the national retirement pension in Sweden. One of the components of the national retirement pension is the so called "premium pension" to which 2.5% of Swedish pension-takers' salaries and other taxable benefits are allocated. Pension takers can select for themselves up to five mutual funds to invest in among the ones registered with Pensionsmyndigheten.

The Swedish Pensions Agency does not engage in active selection of funds, based on their past performance. Any fund that files the necessary application documents can become

part of the PM universe, as long as it has not engaged in unlawful or unethical behavior (Pensionsmyndigheten, personal communication, February 25, 2016).

5.3 Morningstar Sustainability Rating

The Morningstar sustainability rating is based on the normally distributed ordinal score of each fund relative to this fund's category. Two key rating-related variables in our dataset are: descriptive rank (Low, Below Average, Average, Above Average, and High) and percentile rank (with the 10th percentile corresponding to the 10% best-rated funds and so on). These variables are available for the overall sustainability scores, as well as for its subcomponents: controversy, environmental, social, and governance (see Appendix 3 for the details on Morningstar rating methodology).

As shown in Table 1, both of our samples generally reflect the overall distribution of Morningstar descriptive ratings (e.g. for the Swedish sample: 13% in Low, 17% in Below Average, 35% in Average, 21% in Above Average, 11% in High; similar to the PM sample).

Table 1. Distribution of sustainability descriptive ratings, % of funds

	Low	***Below Average***	***Average***	***Above Average***	***High***
Swedish sample	13%	17%	35%	21%	11%
PM sample	10%	22%	35%	24%	9%

The Morningstar Sustainability Rating is the normally distributed ordinal score and descriptive rank relative to the fund's category. The resulting rating encompasses five groups: Low, Below Average, Average, Above Average, and High.

The Morningstar rating relies on scores by Sustainalytics, a sustainability data provider at company level. The minimum requirements for the fund to be rated are: (1) that at least 50% of its assets under management (AUM) are rated, and (2) that there are at least 10 rated funds in its Morningstar fund category (see Appendix 4 for details on Sustainalytics' ESG ratings).

Regarding the AUM criterion, as shown in Table 2, funds in our samples have on average 80-90% of their AUM covered by Sustainalytics. Regarding the funds per category criterion, Table 3 demonstrates the average number of funds per category corresponding to our sample funds. For the Swedish sample, the average fund is compared against a category of 65 funds that meet the threshold to receive an ESG score, whereas for the PM sample the average category contains 244 funds. Hence, the sustainability ratings are based on sufficient

coverage data to ensure reliability (see Appendix 6.1. for more detailed statistics on the distribution of AUM scores in relation to fund scores).

Table 2. Average % of assets under management with Sustainalytics ESG and Controversy scores

	Swedish sample			***PM sample***		
% of AUM covered	High	Low	All	High	Low	All
ESG	82%	80%	82%	85%	82%	85%
Controversy	85%	85%	86%	91%	88%	90%

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

Table 3. Average number of funds analyzed per category

	Swedish sample			***PM sample***		
Number of funds	High	Low	All	High	Low	All
ESG	59	70	65	263	204	244
Controversy	62	72	67	268	210	250
Sustainability	59	70	65	263	204	244

Morningstar Categories distinguish funds by what they own, as well as by their prospectus objectives and styles. While the prospectus objective identifies a fund's investment goals based on the wording in the fund prospectus, the Morningstar Category identifies funds based on their actual investment styles as measured by their underlying portfolio holdings (e.g. "Category - Large Value") (Morningstar Variable definitions, 2016).

5.4 MSCI ESG Fund Metrics[5]

The MSCI sustainability rating is similar to Morningstar's in deriving the overall score from environmental, social and governance pillars for value-weighted portfolio holdings, and then relying on the score to calculate the peer percentile rank. Unlike in the Morningstar ratings, peer groups are based on Lipper's Global Classification and company-level ratings data is retrieved in-house. The requirements for a fund to receive a rating are: (1) at least 65% of holdings should be rated, (2) the peer group should have at least 30 funds, and (3) the standard deviation of the group's ESG score should be greater or equal to 0.1 (see Appendix 5 for details on the MSCI rating methodology).

[5] *The ESG data contained herein is the property of MSCI ESG Research Inc. (ESG). ESG, its affiliates and information providers make no warranties with respect to any such data. The ESG data contained herein is used under license and may not be further used, distributed or disseminated without the express written consent of ESG*

In the regression analysis, we use only one variable from the MSCI dataset – the ESG percentile rank, which indicates the percentage of peer group's funds with ESG scores at or below the fund's ESG score. In order to make our regression results comparable, we use only those MSCI-rated funds that are present in the Morningstar-rated sample. We obtain 341 matching funds for the PM sample (67% of the original PM sample) and 78 for the Swedish sample (56%). As shown in Table 4, MSCI ratings cover on average 91% of the value of fund holdings in the Swedish sample, and 89% in the PM sample. The number of funds used to calculate the peer percentile ESG score average 127 for the Swedish sample, and 703 for the PM sample.

Table 4. Coverage statistics – MSCI subsample[6]

	Swedish sample			***PM sample***		
	High	Low	All	High	Low	All
Classification size	223	80	127	724	652	703
Fund ESG coverage, %	91%	89%	91%	90%	87%	89%

Classification size refers to the number of funds used to calculate the Fund ESG Score - Peer Percentile. This is based on the Lipper Global Classification and reflects the funds that are in the MSCI ESG Fund Metrics coverage universe. Fund ESG coverage, % refers to percent by weight of a fund's holdings that have ESG Data (MSCI ESG Fund Metrics Data Dictionary, 2016).

We use peer group percentile ratings to classify funds as "High" (with high sustainability rating) or "Low" (with low sustainability rating). First, we transform the MSCI percentile variable as follows:

$$Percentile\_MSCI_{tranformed} = 1 - Percentile\_MSCI_{original}$$

This is to make MSCI and Morningstar percentile variables comparable: as in the original data, the 10th percentile of Morningstar sustainability rating corresponds to the 10% best-rated funds in their peer group, whereas the 10th percentile in MSCI sustainability rating corresponds to the 10% worst-rated funds in their peer group.

Second, we define "High" sustainability-rated funds as those with a percentile rank at or below 32.5%, which corresponds to "High" and "Above Average" descriptive ranks in Morningstar classification. We define "Low" sustainability-rated funds as those with a

[6] *Reproduced by permission of MSCI ESG Research Inc. ©2016 MSCI ESG Research Inc. All rights reserved.*

percentile rank at or above 67.5%, which corresponds to "Low" and "Below Average" descriptive ranks in the Morningstar classification. We choose percentile thresholds taking into account the trade-off between using more extreme thresholds and having more funds in the "High" and "Low" subsamples. Later, we relax this specification and use the 20th percentile as an alternative threshold. We report the results from the latter specification in the Robustness Tests section.

As shown in Tables 5 and 6, the distribution of funds between "High" and "Low" sustainability categories is roughly similar for both rating providers. However, MSCI and Morningstar ratings agree on classifying the fund as "High" in 70% of cases, and as "Low" in 53% of cases for the Swedish sample. For the PM sample the scores correspond to each other in 59% and 46% of cases respectively.

Table 5. Funds with Morningstar and MSCI ratings – Swedish sample

Overall number of funds with both Morningstar and MSCI ratings - Swedish sample			
78			
High (Morningstar)	High (MSCI)	Low (MSCI)	Low (Morningstar)
23	25	30	26
Funds with "High" in both ratings		Funds with "Low" in both ratings	
16 (70%)		14 (53%)	

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating.

Table 6. Funds with Morningstar and MSCI ratings – PM sample

Overall number of funds with both Morningstar and MSCI ratings - PM sample			
341			
High (Morningstar)	High (MSCI)	Low (MSCI)	Low (Morningstar)
116	118	97	105
Funds with "High" in both ratings		Funds with "Low" in both ratings	
69 (59%)		48 (46%)	

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating.

The objective of using both MSCI and Morningstar ratings in our analysis is not to compare the two data providers; it is rather to use different proxies for sustainability. Because Morningstar and MSCI are currently the only two independent rating providers at fund level,

it is especially important to understand whether or not our results for factor loadings of high- vs. low-sustainability funds hold irrespective of the data provider used.

5.5 Survivorship Bias

We recognize that the nature of the ratings we obtained from our two data providers may be prone to survivorship bias, which would entail overestimation of overall returns (see Brown, Goetzmann, Ibbotson, and Ross, 1992). For Morningstar, funds are rated as of December 31, 2015, whereas for MSCI, as of February 26, 2016. Because the ratings are currently available only as point-in-time variables (rather than as time-varying variables), the rating date restricts our sample to funds that existed as of this particular date. Funds that did not exist as of the rating date ("dead funds") are not rated by either one of our data-providers, and therefore cannot be analyzed subject to the lack of data.

It should be noted, however, that earlier studies on sustainable funds also use point-in-time classifications of sustainable funds, which implicitly subject them to survivorship bias. Viviers and Eccles (2012) note that most previous papers evaluating sustainable fund performance suffer from some type of bias, either explicit or implicit. Therefore, the limitations in the data used in this thesis are also prevalent in the literature on sustainable funds overall.

In our sample, the dead funds are, as expected, worse performers (see Section 5.6 "Return Series"). At the same time, we reason that it is not evident that one of the surviving groups (high vs. low sustainability) would be more or less affected than the other, and that it is not certain that the sustainability-difference portfolio, as such, would suffer from this bias. Either way, we interpret all performance-related findings with caution.

To compare the characteristics of surviving rated funds with those of dead and non-rated funds, we compute descriptive statistics (e.g. returns and Sharpe ratios, equity style exposures, industry exposures, etc.) for all three groups. This allows us to interpret our results in relation to the sample we study.

As illustrated in Table 7, the surviving rated and dead funds are very similar in their equity style exposure for the PM sample: both groups load more on the growth (33-35%) than on the value strategy (28%). For the Swedish sample, however, these exposures differ slightly: surviving rated and non-rated are relatively more exposed to the growth strategy, whereas the dead funds are roughly equally exposed to both strategies.

Table 7. Style and sector exposures, net %

	Swedish sample			***PM sample***		
	Dead funds	Surviving funds, rated	Surviving funds, non-rated	Dead funds	Surviving funds, rated	Surviving funds, non-rated
Number of funds	109	137	35	104	508	99
Equity style, net %						
Value	30%	25%	20%	28%	28%	29%
Growth	29%	38%	40%	33%	35%	29%
Sector exposure, net %						
Cyclical	40%	42%	43%	35%	41%	41%
Defensive	10%	12%	10%	18%	21%	18%
Sensitive	42%	36%	38%	39%	34%	28%

Morningstar Super Sectors are defined as follows: "Cyclical" includes Basic Materials, Consumer Cyclical, Financial Services, Real Estate; "Defensive" includes Healthcare, Consumer Defensive and Utilities; "Sensitive" includes Communication Services, Energy, Industrials, and Technology (Morningstar Report: Stock Data Definitions, 2016).

In terms of sector exposures (Table 7), loadings on the cyclical vs. defensive sectors are fairly similar across the three subsamples. Hence we expect no significant differences in market betas across Morningstar-rated funds, non-rated funds and dead funds.

Table 8. Market cap exposures, net %

	Swedish sample			***PM sample***		
	Dead funds	Surviving funds, rated	Surviving funds, non-rated	Dead funds	Surviving funds, rated	Surviving funds, non-rated
Giant	18%	15%	6%	36%	33%	18%
Large	35%	32%	11%	27%	30%	20%
Mid	24%	32%	26%	18%	22%	23%
Small	9%	14%	27%	7%	8%	16%
Micro	5%	3%	19%	3%	2%	10%

Giant-cap stocks are defined as those that account for the top 40% of the capitalization of each style zone; large-cap stocks represent the next 30%; mid-cap stocks represent the next 20%; small-cap stocks represent the next 7% and micro-cap stocks represent the bottom 3%. For value-growth scoring, giant-cap stocks are included with the large-cap group for that style zone, and micro-caps are scored against the small-cap group for that style zone (Morningstar Report: Stock Data Definitions, 2016).

Market cap exposures (Table 8) indicate that the regression sample is quite similar to the dead funds in terms of exposures to small- vs. large-capitalization stocks. However, surviving funds without a Morningstar rating tend to invest more heavily in small stocks. This is not surprising, given the nature of the rating: because Sustainalytics follows major indices to determine its research universe (following investor demand), smaller firms are less likely to

be rated (Sustainalytics, personal communication, April 28, 2016), which, in turn, could prevent small-cap focused funds from receiving the rating. However, the two groups of funds not used for regression analysis—dead funds and surviving non-rated funds—tend to deviate in opposite directions in terms of their equity style and size exposures: compared to the regression sample, dead funds load relatively more on value and large stocks, while surviving non-rated funds are more biased towards growth (in the Swedish sample) and small stocks. Therefore, the value and size characteristics of the sample overall (i.e. if all three groups were combined) are rather close to the regression sample characteristics.

Other fund characteristics, such as domiciles, asset allocation, investment areas, detailed industry exposures, and management fees are presented in Appendices 6.2-6.6. Morningstar-rated funds are larger than both dead and non-rated funds, and PM funds are slightly larger than funds in the Swedish sample (Appendix 6.6).

Overall, even with minor differences across subsamples, we do not find evidence to believe that the exclusion of dead and non-rated funds would bias our results significantly. Because the distribution of high-SRI and low-SRI funds in the excluded subsamples is unknown, we cannot perform more elaborate analysis of these issues.

5.6 Return Series

Now that we have established industry, style and size exposures in the three sub-samples, let us analyze the average return series of these. In our main regressions, we use monthly fund returns for the period January 2011-February 2016. We calculate equally-weighted averages of returns for the high-sustainability funds and low-sustainability funds to obtain variables $R_t^{high\_SRI}$ and $R_t^{low\_SRI}$. In robustness tests, we use also a 10-year sample of returns (January 2006-February 2016), so we provide descriptive statistics for both time periods.

The five-year sample was chosen in view of the trade-off between the relevance of the sustainability rating and availability of more data points in time series of returns. Our analysis assumes that a fund's sustainability rating stays relatively stable over time, so that our classification into high-sustainability and low-sustainability categories holds for the duration of the time period analyzed. This, in turn, requires two conditions to be true: (1) that sustainability ratings of individual portfolio holdings do not change in the same direction over time, (2) that fund's weights in those companies do not change in a systematic (sustainability-enhancing or sustainability-degrading) fashion. Overall, we believe this assumption is quite plausible in the short- to medium term (five years), although less plausible in the long term

(10 years). Therefore, we perform our analysis for the five-year sample, and then extend the sample period to 10 years in the robustness tests.

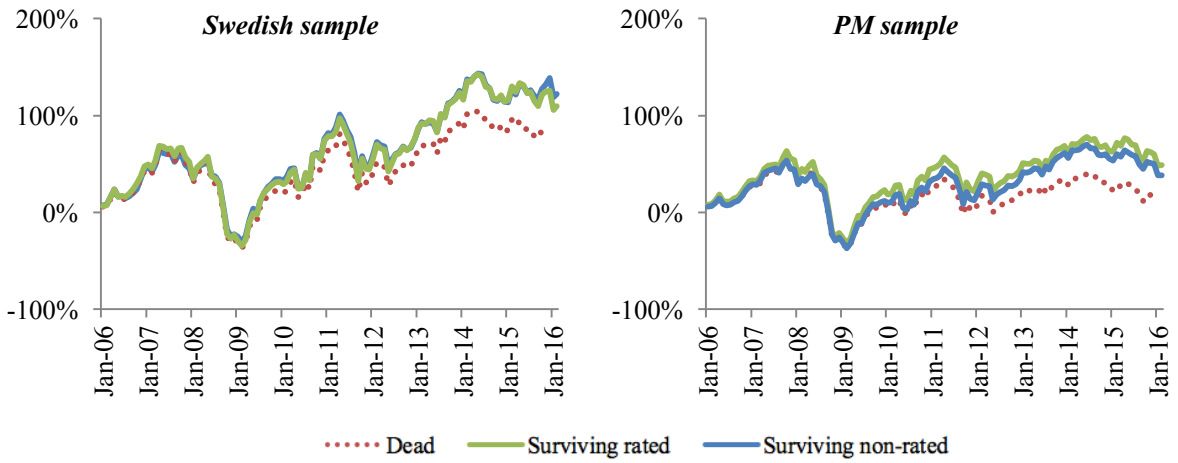
As shown in Table 9 and Figure 2, the Swedish sample generally demonstrates better performance than the PM sample, as indicated by the monthly 10-year Sharpe ratio of 0.12 for the former, and 0.08 for the latter. For the Swedish sample, dead funds underperform the regression funds; however, non-rated funds outperform the regression funds. This is illustrated by Sharpe ratios, as well as cumulative returns. Not including dead funds in the Swedish sample could hence bias alphas upwards; however, not including non-rated funds would bias them downwards. In the case of the PM sample, dead funds also underperform regression funds, as do non-rated funds in the 10-year period (although not in the five-year period). Hence, for the five-year sample the outcome is similar for Swedish and PM samples: excluding dead funds inflates average fund performance, but excluding non-rated funds decreases it. On balance, the overall performance of the three subsamples combined would be rather similar to the regression sample.

Table 9. Sharpe ratios and cumulative returns

	Swedish sample			***PM sample***		
	Dead funds	Surviving funds, rated	Surviving funds, non-rated	Dead funds	Surviving funds, rated	Surviving funds, non-rated
Number of funds	109	137	35	104	508	99
5-year cum return	16.08%	20.53%	26.22%	-5.33%	2.89%	5.09%
10-year cum return	85.04%	109.75%	122.15%	18.12%	48.69%	38.71%
5-year Sharpe ratio	0.07	0.08	0.10	0.003	0.03	0.04
10-year Sharpe ratio	0.11	0.12	0.13	0.05	0.08	0.07

Sharpe ratios are calculated by dividing average monthly excess returns by standard deviations of monthly return series. Five-year cumulative returns refer to cumulative returns for the period January 2011-February 2016, 10-year cumulative returns – for the period January 2006-February 2016.

Figure 2. Cumulative returns for dead funds, surviving rated funds and surviving unrated funds



As illustrated in Table 10, the Swedish sample has slightly higher mean returns, standard deviation and kurtosis compared to the PM sample. Across subsamples, surviving rated funds have higher mean, median and standard deviation of returns compared to dead and non-rated funds. All three subsamples are moderately negatively skewed. Kurtosis measures suggest that extreme outliers are equally likely across subsamples of PM funds, albeit relatively more likely for regression funds in the Swedish sample.

Overall, the distribution of returns is quite similar across subsamples. The similarity is more pronounced for the 10-year sample (see Appendix 6.7 for 10-year descriptive statistics) than for the five-year sample (Table 10), suggesting that the distribution of returns for the three sub-samples converges over time.

Table 10. Five-year return distributions

	Swedish sample			***PM sample***		
	Dead funds	Surviving funds, rated	Surviving funds, non-rated	Dead funds	Surviving funds, rated	Surviving funds, non-rated
min value	-14.22%	-14.34%	-14.50%	-12.81%	-12.38%	-12.09%
20th percentile	-3.31%	-3.23%	-2.74%	-2.55%	-2.65%	-2.40%
40th percentile	-0.69%	-0.48%	-0.59%	-0.91%	-0.63%	-0.55%
60th percentile	1.44%	1.50%	1.44%	1.07%	0.99%	1.15%
80th percentile	4.60%	4.46%	3.85%	3.91%	3.82%	3.49%
max value	16.57%	17.11%	14.56%	11.91%	12.61%	11.28%
Mean	0.40%	0.86%	0.50%	0.01%	0.15%	0.17%
Median	0.18%	0.93%	0.38%	-0.02%	0.08%	-0.07%
Standard deviation	5.43%	7.09%	5.09%	4.60%	4.51%	4.27%
Skewness	-0.02	-0.19	-0.22	-0.35	-0.27	-0.40
Kurtosis	1.32	2.39	1.07	1.08	1.11	1.11

All measures are calculated for monthly (not annualized) returns.

6. Results

We find insignificant alphas for the portfolios in nearly all regressions run[7]. Other key findings in our regression results are related to significantly different factor exposures between high-SRI and low-SRI portfolios. In all specifications we obtain negative market and size factor (SMB) loadings for the sustainability-difference portfolio (i.e. the portfolio obtained by subtracting low-sustainability returns from high-sustainability ones). In other words, our findings suggest that high-sustainability funds are relatively less exposed to market risk, and relatively more exposed to large-cap stocks. Positive exposure to the value factor (HML) is significant only for the five-year Swedish sample, while loadings on the momentum factor are mostly insignificant[8]. These main results, based on the Morningstar sustainability rating, are presented in Section 6.3.

We also run similar regressions for subcomponents of the sustainability rating, and in the Swedish sample find the social dimension of sustainability to be the main contributor to negative market betas in the SRI-difference portfolio, and the environmental dimension the main driver behind negative SMB betas and positive HML betas. In the five-year PM sample, environmental and social dimensions do not produce significant differences in factor loadings; however, the governance dimension results in negative market and SMB betas. The results for subcomponents regressions are discussed in Section 6.5.

Our results are robust to using different data providers, as well as alternative time samples and sustainability thresholds. When the MSCI rating is used as a proxy for sustainability characteristics, coefficients become larger in absolute value, and remain statistically significant, with signs consistent for Morningstar-based regressions. MSCI results are discussed in Section 6.4, while other robustness checks are presented in Section 6.6.

The descriptive statistics presented in Sections 6.1-6.2 compare characteristics of high-sustainability and low-sustainability fund portfolios in order to help us interpret the regression results in the subsequent sections.

[7] Exceptions are in the five-year PM sample on MSCI data, which generated positive and significant alphas on the difference portfolio in the CAPM (0.16% monthly) (see Appendix 7.4) and in 3-factor Fama-French model (0.13% monthly) (see Table 18), as well as in the five-year Swedish sample on Morningstar data which saw one negative and significant alpha on the social-subcomponent (-0.11% monthly) in the CAPM (see Appendix 7.5).
[8] One exception is in the five-year PM sample on MSCI data, in which the coefficient on momentum is 0.06 for SRI-difference portfolio (see Table 18).

6.1 Descriptive Statistics – Morningstar Sustainability Rating

First, let us compare the characteristics of high-sustainability and low-sustainability portfolios. Similar to the previous section, we base our comparison on equity style, industry and size exposures, as well as on the four moments of returns (mean, standard deviation, skewness and kurtosis).

As illustrated in Table 11, high-SRI funds tend to load relatively more on value, and relatively less on growth, compared to low-SRI funds. High-sustainability funds are also relatively more exposed to large-cap stocks compared to small-cap ones (Table 12). However, sector exposures are generally homogeneous for both sustainability categories of funds. This suggests that any differences in market factor loadings between high-SRI and low-SRI portfolios are unlikely to stem from industry exposures.

Table 11. Style and sector exposures, net %

	Swedish sample			***PM sample***		
	High	Low	All	High	Low	All
Equity style, net %						
Value	28%	22%	25%	29%	27%	28%
Growth	32%	43%	38%	34%	37%	35%
Sector exposure, net %						
Cyclical	47%	42%	43%	42%	40%	41%
Defensive	10%	12%	10%	21%	20%	21%
Sensitive	36%	36%	38%	33%	35%	34%

Morningstar Super Sectors are defined as follows: "Cyclical" includes Basic Materials, Consumer Cyclical, Financial Services, Real Estate; "Defensive" includes Healthcare, Consumer Defensive and Utilities; "Sensitive" includes Communication Services, Energy, Industrials, and Technology (Morningstar Report: Stock Data Definitions, 2016).

Table 12. Market cap exposures, net %

	Swedish sample			***PM sample***		
	High	Low	All	High	Low	All
Giant	18%	9%	15%	36%	29%	33%
Large	33%	28%	32%	30%	28%	30%
Mid	27%	37%	32%	21%	26%	22%
Small	12%	18%	14%	7%	9%	8%
Micro	3%	3%	3%	1%	2%	2%

Giant-cap stocks are defined as those that account for the top 40% of the capitalization of each style zone; large-cap stocks represent the next 30%; mid-cap stocks represent the next 20%; small-cap stocks represent the next 7% and micro-cap stocks represent the bottom 3%. For value-growth scoring, giant-cap stocks are included with the large-cap group for that style zone, and micro-caps are scored against the small-cap group for that style zone (Morningstar Report: Stock Data Definitions, 2016).

The portfolio performance measures (Table 13) for the high-SRI portfolio are quite similar to those of the low-SRI portfolio. Sharpe ratios are the same, and cumulative returns roughly match, too. Also, first and second moments of returns of the two groups are close; however, high-SRI funds in the Swedish sample tend to have less negatively skewed returns than low-SRI funds (Appendices 6.10-6.11). This difference in skewness is not present in the PM sample, however. Kurtosis is also similar for high- and low-sustainability funds, suggesting that both groups are equally likely to have extreme outliers.

Other fund characteristics presented in Appendices 6.8-6.9 do not suggest major differences between high-SRI and low-SRI funds in terms of asset class exposures or Swedish vs. foreign investment exposures. On average, low-SRI funds tend to be larger ($600M vs. $450M for the Swedish sample, and $715M vs. $707M for the PM sample) than high-SRI ones, and charge higher management fees (1.21% vs. 1.16% for the Swedish sample, and 1.56% vs. 1.44% for the PM sample). Although we do not run any formal tests for the difference in management fees, it is interesting to note that lower management fees for high-SRI funds are not typical in earlier research. For example, Geczy et al. (2005) find that sustainable funds charge higher fees than conventional funds, and Brill, Brill, and Feigenbaum (1999) argue that higher fees might be motivated by higher spending on sustainability screenings.

Table 13. Performance measures

	Swedish sample			***PM sample***		
	High	Low	All	High	Low	All
Number of funds	47	45	137	176	157	508
5-year cum return	18.56%	23.05%	20.53%	5.46%	2.02%	2.89%
10-year cum return	107.82%	111.88%	109.75%	54.61%	41.67%	48.69%
5-year Sharpe ratio	0.07	0.08	0.08	0.04	0.02	0.03
10-year Sharpe ratio	0.12	0.12	0.12	0.09	0.08	0.08

Sharpe ratios are calculated by dividing average monthly excess returns by standard deviations of monthly return series. Five-year cumulative returns refer to cumulative returns for the period January 2011-February 2016, 10-year cumulative returns – for the period January 2006-February 2016.

Overall, the similarity in performance measures and return distributions suggests no reason to believe that either high-SRI or low-SRI funds would outperform the other group. The implication for performance attribution is that we do not expect significant alphas in sustainability-difference portfolios (with R_t^{Dif} as a measure of returns for this portfolio). As for size and value loadings, high-SRI funds are relatively more exposed to large-cap and value stocks, whereas low-SRI are relatively more exposed to small-cap and growth stocks. Hence, we expect positive HML and negative SMB factor loadings for sustainability-difference portfolios. Industry exposures are homogenous for high-SRI and low-SRI funds; hence, loadings on cyclical vs. defensive stocks do not imply ex ante negative market betas based on industry exposures.

6.2 Descriptive Statistics – MSCI ESG Fund Metrics[9]

As stated in the data section, we run regressions using both Morningstar and MSCI ratings. Because not all funds from the Morningstar sample are rated by MSCI (341 out of 508 PM funds and 78 out of 137 Swedish funds are rated), we use the overlapping part of the two samples in our MSCI regressions to make the results comparable. Next, we present the descriptive statistics for this overlapping MSCI subsample.

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Table 14. Style and sector exposures – MSCI rating

	Swedish sample			***PM sample***		
	High	Low	All	High	Low	All
Equity style, net %						
Value	34%	22%	27%	28%	29%	28%
Growth	29%	45%	37%	36%	36%	36%
Sector exposure, net %						
Cyclical	50%	44%	47%	39%	41%	40%
Defensive	9%	15%	12%	24%	20%	21%
Sensitive	38%	38%	38%	33%	35%	35%

Morningstar Super Sectors are defined as follows: "Cyclical" includes Basic Materials, Consumer Cyclical, Financial Services, Real Estate; "Defensive" includes Healthcare, Consumer Defensive and Utilities; "Sensitive" includes Communication Services, Energy, Industrials, and Technology (Morningstar Report: Stock Data Definitions, 2016).

Table 15. Market cap exposures – MSCI rating

	Swedish sample			***PM sample***		
	High	Low	All	High	Low	All
Giant	22%	12%	17%	39%	28%	35%
Large	40%	34%	38%	32%	29%	31%
Mid	24%	35%	30%	18%	26%	22%
Small	10%	14%	10%	5%	10%	7%
Micro	1%	3%	2%	1%	2%	1%

Giant-cap stocks are defined as those that account for the top 40% of the capitalization of each style zone; large-cap stocks represent the next 30%; mid-cap stocks represent the next 20%; small-cap stocks represent the next 7% and micro-cap stocks represent the bottom 3%. For value-growth scoring, giant-cap stocks are included with the large-cap group for that style zone, and micro-caps are scored against the small-cap group for that style zone (Morningstar Report: Stock Data Definitions, 2016).

As shown in Tables 14 and 15, the MSCI subsample has similar characteristics to the overall Morningstar sample: high-SRI funds (as classified by MSCI) are relatively more exposed to large-cap and value than to small-cap and growth stocks. However, in the PM sample high- and low-sustainability funds have similar relative exposures to growth (28% and 29%) and value (36% for both). Hence, for MSCI SRI-difference portfolios we expect negative loadings on the SMB factor, and positive loading on the HML factor (except for HML coefficients in the PM sample, which are likely to be insignificant).

As for industry exposures, these are less uniform across high-SRI and low-SRI funds, compared to the Morningstar sample. In particular, the Swedish sample's high-SRI funds are more exposed to cyclical stocks, while low-SRI are more exposed to defensive stocks (in relative terms). In the PM sample, the opposite holds true. This could suggest negative market betas for PM SRI-difference portfolios, and positive market betas for Swedish ones.

Table 16. Performance measures – MSCI rating

	Swedish sample			***PM sample***		
	High	Low	All	High	Low	All
Number of funds	24	29	78	117	94	341
5-year cum return	17.53%	17.60%	17.00%	8.19%	-0.28%	3.95%
10-year cum return	103.68%	105.02%	102.15%	54.25%	39.86%	46.64%
5-year Sharpe ratio	0.07	0.07	0.07	0.05	0.02	0.03
10-year Sharpe ratio	0.12	0.12	0.11	0.09	0.07	0.08

Sharpe ratios are calculated by dividing average monthly excess returns by standard deviations of monthly return series. Five-year cumulative returns refer to cumulative returns for the period January 2011-February 2016, 10-year cumulative returns – for the period January 2006-February 2016.

In terms of performance characteristics, the MSCI sample is very close to the Morningstar sample (see Tables 16 and 13 for comparison). High-SRI funds and low-SRI funds are very similar in the Swedish sample, while in the PM sample high-SRI portfolios seems to display relatively better performance compared to low-SRI portfolios. Additional descriptive statistics, including return distributions, detailed industry exposures, investment area and asset allocation, are presented in Appendices 6.12-6.17.

6.3 Regression Results – Morningstar Sustainability Rating

6.3.1 Alphas

We do not find evidence that high-SRI funds either outperform or underperform low-SRI funds. In all of our factor models, alphas in SRI-difference portfolios are insignificant for both of our samples. In the Swedish sample, alphas are also insignificant in regressions for high-sustainability and low-sustainability portfolios. In the PM sample, alphas on both high-sustainability and low-sustainability portfolios are negative and significant at 5% level, after controlling for Fama and French factors. High-SRI alphas are slightly less negative than low-SRI ones; however, the difference is not statistically significant (see Table 17).

In general, these findings are consistent with the majority of earlier empirical studies that find no difference in risk-adjusted returns between SRI and conventional funds (Revelli and Viviani, 2015; Sjöström, 2015). Our findings contradict the Markowitz (1952) portfolio theory which suggests underperformance of sustainable funds, and seem to be inconsistent with Fama and French (2007) taste-based investing framework (under the assumption of excess demand for SRI portfolios). However, it is possible that some SRI funds offer positive alphas by means of inclusions, which counterweight the negative effects of exclusions – in line with Guenster's (2012) "cancelling out" argument. Because performance measures such as Jensen's alpha are likely to be affected by survivorship bias, we interpret our results on alphas with caution. It is possible that dead funds, if assigned a rating and included in our sample, could reduce the average overall alpha. If sustainable funds are more likely to close down or merge, high-SRI alphas would be overestimated in our sample (and the opposite would be true if low-SRI funds are more likely to close down). Because of the lack of sustainability ratings for dead funds, we leave this area open to further research.

6.3.2 Market Betas

Performance attribution models for both the PM and Swedish samples consistently show negative and significant market betas for the sustainability-difference portfolios. As shown in Appendices 7.1 and 7.2, in all four model specifications high-SRI portfolios load less on the market factor compared to low-SRI portfolios. In other words, high-sustainability portfolios are less exposed to market risk compared to low-sustainability portfolios. This suggests that investments in high-SRI funds co-move with the market to a lesser degree than investments in low SRI-funds. As discussed in the previous section, this result is not driven by industry exposures, as the defensive vs. aggressive industry loadings of the two groups of funds are homogeneous.

Differences in market betas are more pronounced for the Swedish sample than for the PM sample. As shown in Table 17 (a condensed version of Appendices 7.1 and 7.2), when the market moves by 1 percentage point, returns of Swedish high-sustainability funds move by 1.19 percentage points, while those of low-sustainability funds move by 1.25 percentage points on average. For the PM funds, however, the difference is smaller (albeit statistically significant): market beta of 1.16 for high-SRI funds vs. 1.18 for low-SRI funds (according to the 3-factor model). This means that the difference in market sensitivities between high-SRI and low-SRI funds is more pronounced for the Swedish sample than for the PM sample. One

possible explanation might be related to Swedish companies being subject to more scrutiny on sustainability matters, which in turn makes them more likely to suffer losses in bad market conditions if they are engaged in any unethical practices.

Our results for market betas are in line with earlier research. For example, Renneboog et al. (2008b) report that Swedish SRI funds load less on market betas compared to conventional funds. In terms of magnitude, their beta coefficient on SRI-difference portfolio (computed as SRI minus conventional) is -0.15 (significant at 10% level). However, the sample period (1991-2003) and funds studied (26 Swedish SRI funds vs. 28 matched conventional funds) are quite different from our paper. Bauer et al. (2005) results are closer to ours: in their 1990-2001 international sample, market betas on SRI minus conventional portfolio are also negative in the range between -0.04 and -0.12, depending on the country. Despite differences in classification of sustainable funds and different time samples used, our findings confirm the consensus result that sustainable funds tend to be less sensitive to market risk compared to their less sustainable counterparts.

6.3.3 SMB (Size) Betas

Our results show negative and significant coefficients on the SMB (size) factor in all SRI-difference regressions. This reflects the fact that high-SRI funds invest relatively more in larger companies than low-SRI funds. Such result is not surprising, given the descriptive statistics presented in Section 6.1. This effect is more pronounced in the Swedish sample than in the PM sample, which is also consistent with descriptive statistics presented in Table 12.

This result is also in line with the recent literature: Bauer et al. (2005) find significant SMB betas of -0.31 on an Ethical-minus-Conventional portfolio in their international sample and -0.07 in the domestic US sample. Similarly, Nofsinger and Varma (2014) report SMB betas of -0.04. These findings are close to our results (Table 17): in the Swedish sample, the high-SRI SMB coefficient is 0.27, compared to the low-SRI coefficient of 0.39, resulting in a -0.12 loading on SMB factor in SRI-difference portfolio.

Findings for the SMB factor suggest that highly sustainable funds are relatively more likely to invest in large companies than in small ones. While this is consistent with the most recent studies of sustainable investing (see Bauer et al., 2005; Bollen et al., 2007; Nofsinger and Varma, 2014), early research documented a bias towards smaller companies in sustainable investing research (see Gregory et al., 1997). Differences in identification and definition of socially responsible mutual funds and matching conventional funds certainly

influenced earlier studies. In our paper, externally provided ratings eliminate any selection biases. However, it is still possible that larger companies are more likely to receive a sustainability rating due to better disclosure, which in turn leads more large-cap oriented funds to be assigned a rating.

6.3.4 HML (Value) Betas

Our regression results provide weak evidence of positive HML (value) loadings in SRI-difference portfolios. In the Swedish SRI-difference portfolios, HML coefficients are positive and significant in the 3-factor model; however, not significant in the 4-factor and 5-factor models. Both high-SRI and low-SRI portfolios load more on growth than on value, as shown by negative coefficients on HML. In the PM sample, HML betas are not significantly different between high-SRI and low-SRI funds (see Table 17). This is expected given the descriptive statistics (see Table 11), which show that Swedish funds tend to display wider differences in value vs. growth exposures between high-sustainability and low-sustainability funds, compared to PM funds.

Zero or positive difference between HML coefficients is consistent with Bollen (2007) and Nofsinger and Varma (2014), who found a positive (insignificant) HML loading of 0.01 and 0.02 respectively for SRI minus Conventional portfolio in their US samples. However, our findings contrast Guerard (1997) and Derwall et al. (2005), who found a relatively larger exposure to growth rather than value among SRI funds. One source of differences might be related to varying identification and selection criteria for SRI samples and matching samples. In our sample, rated funds overall are more exposed to growth rather than value stocks, although high-SRI funds are a bit less so. It is possible that this is because mature value companies have relatively more resources to dedicate to sustainability practices (corporate social responsibility) than growth companies.

6.3.5 Momentum Betas and Other Factors

The momentum factor is not significant in our regressions, except for in one 4-factor model for the low-SRI portfolio (see Table 17). This suggests that the two categories of funds we analyze do not, on average, demonstrate persistence in returns on a monthly frequency, and there is no significant difference between the two groups in terms of the momentum loading.

Our results are consistent with Bauer et al. (2005), who find insignificant differences in momentum coefficients for UK and US domestic funds. However, our findings are in

contrast to those of Nofsinger and Varma (2014), who provide evidence of SRI funds loading relatively less on momentum than conventional funds, as do Bauer et al. (2005) in their international samples.

Investment and profitability factors in 5-factor models are significant for some high-SRI and low-SRI portfolios separately, although we find no significant differences in these factors between high-sustainability funds and low-sustainability ones.

Table 17. Performance attribution regression results – Morningstar rating

	Swedish sample						PM sample					
	3-Factor model			4-Factor model			3-Factor model			4-Factor model		
	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif
alpha	-0.23	-0.22	-0.02	-0.24	-0.23	-0.01	-0.47***	-0.51***	0.04	-0.38**	-0.42**	0.03
	(-0.97)	(-0.86)	(-0.3)	(-0.96)	(-0.87)	(-0.15)	(-3.07)	(-3.23)	(1.19)	(-2.43)	(-2.56)	(0.90)
MKT	1.19***	1.25***	-0.07***	1.19***	1.25***	-0.07***	1.16***	1.18***	-0.02**	1.15***	1.17***	-0.02**
	(20.16)	(20.07)	(-5.08)	(19.84)	(19.77)	(-5.08)	(28.58)	(28.19)	(-2.41)	(27.94)	(27.61)	(-2.19)
SMB	0.27**	0.39***	-0.12***	0.27*	0.39***	-0.12***	0.16	0.22*	-0.05**	0.16	0.21*	-0.05**
	(2.01)	(2.75)	(-4.11)	(1.99)	(2.73)	(-4.09)	(1.46)	(1.88)	(-2.15)	(1.45)	(1.88)	(-2.13)
HML	-0.43***	-0.48***	0.05**	-0.43***	-0.47***	0.05	-0.09	-0.09	0.01	-0.16	-0.17	0.01
	(-3.67)	(-3.89)	(2.03)	(-3.28)	(-3.43)	(1.63)	(-0.84)	(-0.88)	(0.32)	(-1.41)	(-1.49)	(0.56)
MOM				0.01	0.02	-0.01				-0.12	-0.13*	-0.01
				(0.11)	(0.21)	(-0.53)				(-1.66)	(-1.76)	(-0.69)
R^2	0.90	0.89	0.38	0.90	0.89	0.38	0.94	0.94	0.14	0.94	0.94	0.15
R^2 adj	0.89	0.89	0.35	0.89	0.88	0.34	0.93	0.93	0.10	0.93	0.93	0.09

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.

Regression sample: monthly returns (in USD) for 1) Morningstar sustainability-rated funds with at least 50% invested in Swedish equities, and 2) Morningstar sustainability-rated funds available for investment within the Swedish premium pension scheme, with at least 50% invested in equities. Sample period: January 2011-February 2016.

Dependent variables: SRI_high refers to $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest Morningstar sustainability ratings), SRI_low refers to $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest Morningstar sustainability ratings). SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$.

Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor.

N.B.: This output regression table is a distilled version of full output presented in Appendices 7.1 and 7.2. The latter also includes CAPM and 5-factor model outputs.

6.4 Regression Results – MSCI ESG Fund Metrics

In general, regression results for MSCI-categorized high-sustainability and low-sustainability funds are consistent with those for Morningstar-categorized funds. Our results do not indicate that either group of funds would outperform the other; most SRI-difference alphas turn out insignificant except for in the 3-factor case (PM sample). We find that market and SMB betas are higher for low-SRI funds than for high-SRI funds, and the difference is significant at the 1% level. We also find a statistically significant positive difference in loading on the value factor between high-SRI and low-SRI funds in the Swedish sample, however, not in the PM sample. Table 18 reports the coefficient estimates for 3-factor and 4-factor models, whereas full regression results are presented in Appendices 7.3 and 7.4.

The MSCI SRI-difference portfolio loads negatively on the market, and the beta coefficients are higher in absolute terms compared to Morningstar regressions (-0.08 for the Swedish sample and -0.09 for the PM sample in 3-factor models, compared to -0.07 for the Swedish sample and -0.02 for the PM sample in Morningstar regressions). Based on descriptive statistics analysis, we cannot say that this dynamic in market factor exposures stems from industry loadings: as shown in Table 14, Swedish high-sustainability funds are more exposed to cyclical industries, which would suggest positive market beta loadings in SRI-difference portfolios rather than negative ones. Our results are in line with our findings in the Morningstar sample, as well as in line with earlier research, which posits that sustainable funds are less sensitive to market risk.

SMB factor loadings are also in line with Morningstar regressions, suggesting higher exposure to large than to small stocks; however, differences between high-SRI and low-SRI funds are larger (e.g. -0.21 vs. -0.12 in the Swedish sample, -0.15 vs. -0.05 in the PM sample in 3-factor models).

HML factor loadings also demonstrate similar dynamics: positive and significant loading on HML factor in the SRI-difference portfolio suggests that in the Swedish sample high-SRI funds are relatively more exposed to value than growth, which is not the case for the PM sample. This is in line with descriptive statistics presented in Table 14, and in line with findings for the Morningstar sample.

The momentum factor is insignificant for most regressions, apart from the low-SRI and SRI-difference regressions in the PM sample. SRI-difference regression results suggest that high-SRI funds display more persistence in monthly returns for a one-year horizon than low-SRI funds do. However, this result stems from a significant negative loading on

momentum of low-SRI funds (momentum is insignificant for high-SRI funds). Hence, this is evidence of reversals in returns for low-SRI funds rather than momentum in returns for high-SRI funds.

Overall, using the MSCI rating as a proxy for sustainability confirms our findings from Morningstar regressions. This means that data of two existing sustainability rating providers produces the same signs on factor exposures when comparing factor loadings on high-SRI and low-SRI Swedish and PM mutual funds. As our intention is to investigate performance and investment style differences between high-SRI and low-SRI funds, rather than to compare our two data-providers, we leave the source of any small discrepancies in factor loadings up to further research.

Table 18. Performance attribution regression results – MSCI rating

	Swedish sample						PM sample					
	3-Factor model			4-Factor model			3-Factor model			4-Factor model		
	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif
alpha	-0.20	-0.30	0.10	-0.22	-0.31	0.09	-0.40***	-0.54***	0.13**	-0.34**	-0.43***	0.09
	(-0.84)	(-1.21)	(1.19)	(-0.88)	(-1.19)	(1.18)	(-2.79)	(-3.50)	(1.94)	(-2.26)	(-2.76)	(1.29)
MKT	1.18***	1.26***	-0.08***	1.18***	1.26***	-0.08***	1.12***	1.21***	-0.09***	1.11***	1.19***	-0.08***
	(19.90)	(20.59)	(-4.46)	(19.62)	(20.26)	(-4.33)	(29.03)	(29.59)	(-4.96)	(28.19)	(29.23)	(-4.53)
SMB	0.18	0.39***	-0.21***	0.18	0.39***	-0.21***	0.11	0.26***	-0.15***	0.11	0.25**	-0.14***
	(1.36)	(2.86)	(-5.38)	(1.35)	(2.84)	(-5.34)	(1.06)	(2.29)	(-2.89)	(1.04)	(2.32)	(-2.91)
HML	-0.39***	-0.51***	0.11***	-0.38***	-0.49***	0.12***	-0.10	-0.06	-0.04	-0.15	-0.15	0.01
	(-3.31)	(-4.14)	(3.21)	(-2.88)	(-3.69)	(3.13)	(-1.04)	(-0.60)	(-0.85)	(-1.46)	(-1.36)	(-0.11)
MOM				0.03	0.01	0.02				-0.09	-0.15**	0.06*
				(0.28)	(0.12)	(0.53)				(-1.29)	(-2.08)	(1.85)
R^2	0.90	0.89	0.41	0.90	0.89	0.41	0.94	0.94	0.36	0.94	0.94	0.40
R^2 adj	0.89	0.89	0.38	0.89	0.89	0.37	0.93	0.94	0.33	0.93	0.94	0.35

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for 1) Morningstar sustainability-rated funds that also have MSCI sustainability rating, with at least 50% invested in Swedish equities, and 2) Morningstar sustainability-rated funds that also have MSCI sustainability rating, for investment within the Swedish premium pension scheme, with at least 50% invested in equities. Sample period: January 2011-February 2016.
Dependent variables: SRI_high refers to $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest MSCI sustainability ratings), SRI_low refers to $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest MSCI sustainability ratings). SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor.
N.B.: This output regression table is a distilled version of full output presented in Appendices 7.3 and 7.4. The latter also includes CAPM and 5-factor model outputs.

6.5 Regression Results – Morningstar Sustainability Subcomponents

We analyze regression results for sustainability rating subcomponents to better understand the source of negative market betas in the SRI-difference portfolios. Results suggest that the social subcomponent produces factor loadings that are relatively greater in magnitude in the Swedish sample, while governance subcomponent is relatively more important in the PM sample. Table 19 presents 3-factor and 4-factor model results for the subcomponent regressions, while the full set of results (including CAPM and 5-factor model) are displayed in Appendices 7.5 and 7.6.

Sorting based on sustainability subcomponents does not produce abnormal returns in either of our samples. This is in line with Nofsinger and Varma (2014), who distinguished between the subcomponents of ESG (environmental, social and governance) and did not find evidence of significant alphas. However, there are multiple studies that demonstrate that companies with good corporate governance outperform those with poor one (Bauer, Guenster, and Otten, 2004; Cremers and Nair, 2005; Gompers, Ishii and Metrick, 2003). It is possible that company-level governance characteristics do not directly translate into fund-level outperformance due to multiple dimensions of portfolio selection, that might lead to good and bad performance cancelling out in aggregate.

Regression results for the Swedish sample suggest that the social subcomponent has the most pronounced negative loading on the market factor. All three subcomponents–environmental, social and governance–follow a similar pattern in their market loadings: negative on the market and size factors, and positive on value factor. This is in line with loadings on the overall sustainability factor. One interpretation of such dynamics might be that companies with good track record of stakeholder engagement or good labor relations are less likely to be severely hit during market crisis, but are also more likely to underperform in boom years, as maintaining these good social practices is costly and might divert resources from investment projects etc.

In the PM sample, the governance subcomponent primarily drives negative market loadings, as well as negative SMB, and positive HML exposures. It is plausible that firms with strong governance practices are less sensitive to market risk, which is in line with earlier evidence on well-governed companies facing lower risk of takeovers (Cremers and Nair, 2005) and showing better profitability in the market crises (Gompers et al., 2003). Factor coefficients on environmental and social dimensions are not significant in the PM sample.

Table 19. Sustainability rating subcomponents – Morningstar rating

	Swedish sample						PM sample					
	3-Factor model			4-Factor model			3-Factor model			4-Factor model		
	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif
alpha	-0.03	-0.06	-0.01	-0.02	-0.05	0.00	-0.05	-0.03	0.01	-0.02	-0.01	0.01
	(-0.49)	(-1.07)	(-0.19)	(-0.35)	(-0.85)	(0.03)	(-1.04)	(-0.56)	(0.16)	(-0.40)	(-0.26)	(0.21)
MKT	-0.06***	-0.07***	-0.05***	-0.06***	-0.07***	-0.05***	-0.01	-0.02	-0.03**	-0.01	-0.02	-0.03**
	(-3.66)	(-4.68)	(-3.79)	(-3.66)	(-4.71)	(-3.86)	(-0.53)	(-1.18)	(-2.27)	(-0.95)	(-1.33)	(-2.24)
SMB	-0.19***	-0.11***	-0.09***	-0.19***	-0.11***	-0.09***	-0.03	-0.03	-0.08**	-0.04	-0.03	-0.08**
	(-5.39)	(-3.27)	(-3.00)	(-5.36)	(-3.26)	(-3.01)	(-0.90)	(-0.91)	(-2.51)	(-0.96)	(-0.92)	(-2.50)
HML	0.09***	0.06**	0.06**	0.08**	0.06*	0.05*	0.04	0.02	0.03	0.02	0.01	0.03
	(2.78)	(2.24)	(2.39)	(2.34)	(1.76)	(1.84)	(1.28)	(0.56)	(1.17)	(0.49)	(0.19)	(1.01)
MOM				-0.01	-0.02	-0.02				-0.05*	-0.02	-0.00
				(-0.43)	(-0.66)	(-0.80)				(-1.92)	(-0.86)	(-0.18)
R^2	0.38	0.32	0.25	0.38	0.32	0.26	0.04	0.04	0.17	0.10	0.05	0.17
R^2 adj	0.35	0.28	0.21	0.34	0.27	0.20	-0.01	-0.01	0.12	0.04	-0.02	0.11

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for 1) Morningstar sustainability-rated funds with at least 50% invested in Swedish equities, and 2) Morningstar sustainability-rated funds for investment within the Swedish premium pension scheme, with at least 50% invested in equities. Sample period: January 2011-February 2016.
Dependent variables: Env_dif refers to the difference between returns of the top and bottom 32.5% rated funds in environmental subcomponent ($R_t^{Dif\_Env} = R_t^{High\_Env} - R_t^{Low\_Env}$), Soc_dif – in social subcomponent, Gov_dif – in governance subcomponent.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor.
N.B.: This output regression table is a distilled version of full output presented in Appendices 7.5 and 7.6. The latter also includes CAPM and 5-factor model outputs.

6.6 Robustness Tests

Our results are robust to using alternative sample definitions, sustainability sorting thresholds, and rating providers. We run robustness checks for the following alternative specifications:

- A Swedish sample defined as all funds that invest at least 70% (rather than 50%) in Swedish equity, and a PM sample defined as all funds within the premium pension investable universe that hold at least 70% (rather than 50%) in equity (Appendix 8.7).
- High-SRI funds defined as those with the 20% (rather than 32.5%) highest sustainability ratings, and low-SRI funds – with 20% (rather than 32.5%) lowest sustainability ratings (Appendix 8.7).
- Sample period defined as January 2006-February 2016, rather than January 2011-February 2016 (Appendices 8.1 – 8.6).
- MSCI rating (rather than Morningstar) used to define high-SRI and low-SRI fund categories. This specification was explored in Section 6.4.

We report robustness test results only for the 3-factor model in order to preserve space. Also, the 3-factor model generally demonstrated slightly better explanatory power compared to other multi-factor models we use. As shown in Appendix 8.7, negative market betas for the SRI-difference portfolio hold in all four alternative specifications. In the PM sample the negative betas tend to be smaller in absolute value, however, still statistically significant.

A negative exposure to the SMB factor also holds in most alternative specifications, except for in the PM sample with at least 70% in equity, and in the sample with 20% rating threshold for high- and low-SRI groups. The HML factor is not significantly different between high-SRI and low-SRI funds, in line with earlier results from our main specifications. However, in the Swedish sample it receives a significant positive coefficient, in line with our hypothesis.

Sustainability subcomponent-based regressions also produce very similar results in both time horizons (see Appendices 8.5 and 8.6). For the Swedish 10-year sample, environmental and social dimensions produce coefficients of greater magnitude in terms of negative market and SMB loadings. For the PM 10-year sample, governance remains the dominant subcomponent, although environmental also produces significant coefficients in SRI-difference regressions. The social subcomponent does not display significant market betas in the multi-factor models, consistent with the five-year sample.

The difference between PM and Swedish samples might be related to the country-specific nature of sustainable characteristics. As for time horizon effects of sustainable

investing, we refrain from drawing conclusions based on our sample, and leave this area to future research, which might benefit from the release of time-varying sustainability ratings data.

7. Limitations and Suggestions for Further Research

We recognize that there are a few limitations to our study, in addition to the potential issue of survivorship bias, which has already been extensively discussed and addressed throughout this paper. One caveat is that not all surviving funds in the Swedish and PM investable universes are rated. This, in turn, is likely due to an insufficient percentage of holdings with a rating (the thresholds are 50% and 65% for Morningstar and MSCI respectively). For example, funds that focus on smaller stocks without a company-level rating are more likely to be excluded from the ratings universe. These limitations are embedded in the ratings data, and cannot be directly mitigated.

A second, related, caveat is that not all *fund holdings* have been rated. Because both MSCI and Morningstar ratings rely on the weighted average of underlying company ratings to derive a fund-level rating, the sustainability classification is prone to error. Simply put, the rating might overlook the impact from sustainability features of the non-rated companies. However, as shown in the descriptive statistics (see Data section), 80-90% of assets under management (AUM) are covered for our sample funds by the Morningstar rating, and 91% are covered by the MSCI rating. This ensures relatively high reliability of our SRI classification.

Further, even though the ratings uniquely assess different types of sustainability-components, it still does not explicitly distinguish between disparate sustainability investment approaches such as whether a fund engages in exclusion or inclusion. Investor activism is not taken into account in the overall assessment, and improvement in terms of sustainability is not considered. The rating is effectively a snap-shot in time, based on underlying holdings, and does not paint a complete picture of investor intentionality or strategy. Distinguishing between different sustainable investing approaches is however beyond the scope of our paper, and calls for further research.

Another limitation is the point-in-time nature of our ratings and the underlying assumption that fund sustainability categorization stays relatively constant over time. All previous studies exploring the difference between SRI and conventional funds rely on this assumption in their analysis. Ratings may, however, change over time, either due to change in portfolio holding composition or to change in company scoring. A fund's score may change if

an underlying company has been involved in ESG-related controversies: for example, Volkswagen's score changed quite a bit in light of the company's emissions scandal in September 2015. Since MSCI and Morningstar ratings do not currently include the historical data on ratings, we cannot adjust our high-SRI and low-SRI fund portfolios for the time variability of ratings. We leave this matter up to future researchers, who might be able to benefit from the potential release of historical Morningstar sustainability ratings of mutual funds later in 2016.

Future studies could further enhance both methodological and conceptual aspects of sustainable investing research. For example, additional sustainable investment approaches could be analyzed, beyond screening techniques. In particular, investor activism and impact investing deserve more attention. Data from our rating providers could be supplemented with direct assessments of fund managers' intentionality and track record. We expect further research to benefit from data providers' releases of ever more intricate tools to evaluate performance and investment style-differences between mutual funds, subject to the specific sustainable investment approach.

8. Concluding Remarks

This study presents new evidence on performance and investment style of sustainable mutual funds in the rapidly growing Swedish sustainable investing market. We analyze the topic from the perspective of investors in Swedish equity funds, and Swedish premium pension takers. The table below illustrates how our findings relate to our initial hypotheses:

Hypothesis	***Outcome***
H1: *A portfolio long in high-SRI funds and short in low-SRI funds delivers no significant alpha, after controlling for Fama-French factors.*	Yes
H2: *A portfolio long in high-SRI funds and short in low-SRI funds loads negatively on the market factor.*	Yes
H3: *A portfolio long in high-SRI funds and short in low-SRI funds loads negatively on the SMB (size) factor.*	Yes
H4: *A portfolio long in high-SRI funds and short in low-SRI funds loads negatively on the HML (value) factor.*	No
H5: *A portfolio long in high-SRI funds and short in low-SRI funds loads negatively on the MOM (momentum) factor.*	No

In line with *Hypothesis 1*, and most previous literature (see e.g. Bauer et al., 2005; Revelli and Viviani, 2015; Sjöström, 2015) we find no evidence for differences in performance (alpha) between the two groups of funds classified as the most and least sustainable. This finding holds for both the Swedish and PM samples, irrespective of the time sample and sustainability rating used.

In line with *Hypothesis 2*, and most previous literature (see e.g. Bauer et al., 2005; Kreander et al., 2005) our results suggest that high-SRI funds are less sensitive to market risk than low-SRI funds. The difference is statistically significant for all specifications; however, MSCI-based sorting produces more economically significant results compared to Morningstar-based sorting. Also, sorting based on sustainability subcomponents—environmental, social, and governance—results in similar coefficients on the market factor.

In line with *Hypothesis 3*, the SRI-difference portfolio is more exposed to large-cap than small-cap stocks. This finding is also robust to the time period, rating provider and sample analyzed. We also find a similar result when forming difference portfolios based on environmental, social and governance ratings. Our findings on size are in line with more recent literature (see e.g. Bollen, 2007; Nofsinger and Varma, 2014), although in contrast with earlier studies (see e.g. Gregory, et al., 1997; Luther et al., 1992).

Hypothesis 4 holds only for some model specifications in the Swedish sample, although not in the PM sample. We find that Swedish high-SRI funds tend to be relatively more exposed to value than growth stocks, compared to low-SRI funds. This is also true for the Swedish sample in sustainability subcomponents regressions, with the environmental subcomponent displaying stronger value tilt than social and governance subcomponents. In contrast, previous literature finds a bias towards growth (see e.g. Bauer et al., 2005; Derwall et al., 2005; Guerard, 1997).

We do not find any evidence for *Hypothesis 5* in our regression results. The momentum factor is generally not significant for either high-SRI or low-SRI portfolios, and the two portfolios do not differ significantly in terms of loadings on momentum.

Our results have important practical implications for investors interested in sustainable mutual funds, particularly those considering Swedish equity funds and retail investors selecting funds within the Swedish premium pension scheme. Our findings suggest that investors should not expect any of the two groups of funds ("high-SRI" or "low-SRI") to either out- or underperform the other. This is valuable information for those considering sustainable investing, but are concerned it would hurt financial performance. One explanation for our results may be that different investment strategies—inclusions, leading to

outperformance (see MSCI, 2016) and exclusions, leading to underperformance (see Markowitz, 1952)—have cancelling out effects. We see that sustainable funds could at least offer other benefits, such as lower sensitivity to market fluctuations and larger exposure to large-cap firms. These benefits could serve as diversification mechanisms, subject to investors' current portfolio composition. For example, an investor with high exposure to market-sensitive assets (e.g. real estate), could consider funds with high sustainability ratings to reduce such an exposure.

One reason for why high-SRI funds would invest relatively more in large-cap companies, might be because bigger and more mature companies may have more resources to devote to corporate social responsibility. As for market sensitivity, a concrete possibility is that sustainable companies would be less likely to suffer from e.g. labor- and environment-related controversies, and hence, expected to perform relatively well in market downturns. Since CSR-practices could be costly however, they would have more modest performance in the market upturns. We leave it to further research to explore the exact reasons for these differences. The potential hedging characteristics of sustainable funds is another promising topic for further exploration.

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Appendices

Appendix 1: ESG Examples

Environmental	***Social***	***Governance***
Climate Change and Carbon Emissions	Gender and Diversity Policies	Board Composition
Air and Water Pollution	Human Rights	Executive Compensation
Energy Efficiency	Labor Standards	Audit Committee Structure
Waste Management	Employee Engagement	Bribery and Corruption Policies
Water Scarcity	Customer Satisfaction	Lobbying Activities
Biodiversity and Deforestation	Community Relations	Political Contributions

Source: Environmental, Social and Governance Issues in Investing: A Guide for Investment Professionals, CFA Institute (Hayat and Orsagh, 2015).

Appendix 2: Sustainable Investing Approaches

Approach	*Description*
Negative/Exclusionary screening	Involves excluding companies or sectors from the investing universe based on specific ESG criteria
Positive/Best-in-class screening	Entails including companies or sectors for positive ESG performance in relation to sector peers
Norms-based screening	The investments are screened against set standards of ESG-performance, based on international norms (set by e.g. United Nations Global Compact)
Integration of ESG-factors	Involves explicit inclusion of ESG risks and opportunities into traditional financial analysis and investment decisions
Sustainability-themed investing	Entails investing in assets related to sustainability such as green technology, agriculture and clean energy
Impact/Community investing	Targeted investments that encompass social integration (e.g. micro-financing) and sustainability-related projects (access to e.g. renewable energy and sustainable agriculture)
Corporate engagement/Shareholder action	A strategy in which shareholders use their power to influence behavior of corporates through e.g. direct corporate engagement and proxy voting

Source: Global Sustainable Investment Review, 2015

Appendix 3: Morningstar Sustainability Rating Methodology

The Morningstar Portfolio Sustainability Score is calculated from company-level ESG-scores and company involvement in ESG-related controversies. The overall score is calculated in the following manner:

$$Portfolio\ Sustainability\ Score = Portfolio\ ESG\ Score - Portfolio\ Controversy\ Deduction$$

The score is in essence an asset-weighted average of normalized company-level ESG scores, companies that have been rated on a scale 1-100. The company level scores reflect how well a firm is addressing ESG issues based on measures of preparedness, disclosure, and performance.

$$PortfolioESG = \sum_{x=1}^{n} ESGNormalized\ x\ Weightadj$$

In order to make company ESG-scores comparable across peer groups, the score is first normalized using a z-score transformation:

$$Zpeer = \frac{ESGx - \mu\ peer}{\sigma peer}$$

where:
$ESGx = Sustainalytics\ company\ ESG\ score$
$\mu peer = Peergroup\ mean\ ESG\ score$
$\sigma peer = Peergroup\ standard\ deviation\ of\ ESG\ scores$

The z-score is transformed into the normalized ESG-score on a 1-100 scale with 50 as mean:

$$ESGNormalized = 50 + (Zpeer\ x\ 10)$$

The ESG Normalized score had the following interpretation:

70+	=	Company scores at least two standard deviations above average in its peer group
60	=	Company scores one standard deviation above average in its peer group
50	=	Company scores at peer group average
40	=	Company scores one standard deviation below average in its peer group
30-	=	Company scores at least two standard deviations below average in its peer group

The normalized company scores are asset-weighted to form the Portfolio ESG-score.

At least 50% of underlying company assets must have an ESG-score in order to receive a portfolio ESG score, and the % of covered securities AUM is rescaled to 100% in calculating the Portfolio ESG score.

The presence of any controversies (incidents assessed in terms of its impact on the environment, society, and risks to the company itself) are also taken into account and as such, deducted for. In a similar fashion, here too, at least 50% of underlying assets must have a company portfolio controversy score. Since the controversy score is a negative event in the main equation, and since a higher controversy score is assigned to companies with lower level of controversy by Sustainalytics, Morningstar reverses the scale of the company controversy score.

Sustainalytics Controversy Score is illustrated in the below table:

Category	*Impact on Environment or Society*	*Risk to Company*	*Controversy Score*
5	Severe	Serious	0
4	High	Significant	20
3	Significant	Moderate	50
2	Moderate	Minimal	80
1	Low	Negligible	99
0	No evidence of controversy	None	100

$$PortControversy = 100 - \sum_{x=1}^{n} Controversy\ x\ Weightadj$$

In the end, the portfolio controversy score is rescaled in the above fashion to create the Portfolio controversy deduction which goes into the main equation.

Portfolio Controversy Deduction:

Category	*Score*	*Deduction*
Best	0	0
	1	0.2
	0	4
	50	10
	80	16
Worst	100	20

We now arrive at the main equation again:

$$Portfolio\ Sustainability\ Score = Portfolio\ ESG\ Score - Portfolio\ Controversy\ Deduction$$

Next, the Morningstar Sustainability Rating is assigned. Within the funds' Morningstar categories, funds are now assigned rankings, given that there are at least 10 funds with Portfolio Sustainability Scores within the category. The resulting Morningstar Sustainability Rating is its normally distributed ordinal score and descriptive rank relative to the fund's category. The resulting rating is illustrated in the below table, in which five groups: Low, Below Average, Average, Above Average, and High, correspond to scores 1-5.

Distribution	***Score***	***Descriptive Rank***
Highest 10%	5	High
Next 22.5%	4	Above Average
Next 35%	3	Average
Next 22.5%	2	Below Average
Lowest 10%	1	Low

Further, since the company ESG-scores can be split into its components of Environmental, Social, and Governance-factors, Morningstar also calculates a portfolio score for each of these pillar scores:

$$PortfolioPillar = \sum_{x=1}^{n} PillarNormalized\ x\ Weightadj\ x\ PeerPillarWeight$$

The pillar scores are normalized according to the same method as for the Portfolio ESG-scores (please see above). Since the contribution of each pillar to the overall ESG may differ by peer group, the scores are aggregated using the peer-group weighted contribution of the pillar.

Source: Morningstar sustainability rating, 2016

Appendix 4: Sustainalytics ESG Research Methodology

Morningstar bases their fund rankings on underlying company-rankings from Sustainalytics, a sustainability research and analysis-provider. The assessment of a company's ESG performance reflects four dimensions: preparedness (e.g. whether the company has hazardous waste or health and safety programs in place), disclosure (e.g. tax transparency or greenhouse gas emissions scope), quantitative performance (e.g. carbon intensity, employee turnover), and qualitative performance (company involvement in incidents and controversies).

For each industry, Sustainalytics identifies 10-15 key ESG-issues and map these against potential negative sustainable or business impact. For the individual company in question, two to three of the most important ESG-issues are selected for more in-depth analysis and commentary. The company receives an overall ESG score (0-100) as well as separate E- S- and G-scores (0-100). Peer group averages and industry leader averages are also presented.

The company is furthermore assigned a controversy category (1-5) score based on the severity of controversial incidents such as fraud, environmental accidents, or discriminatory behavior:

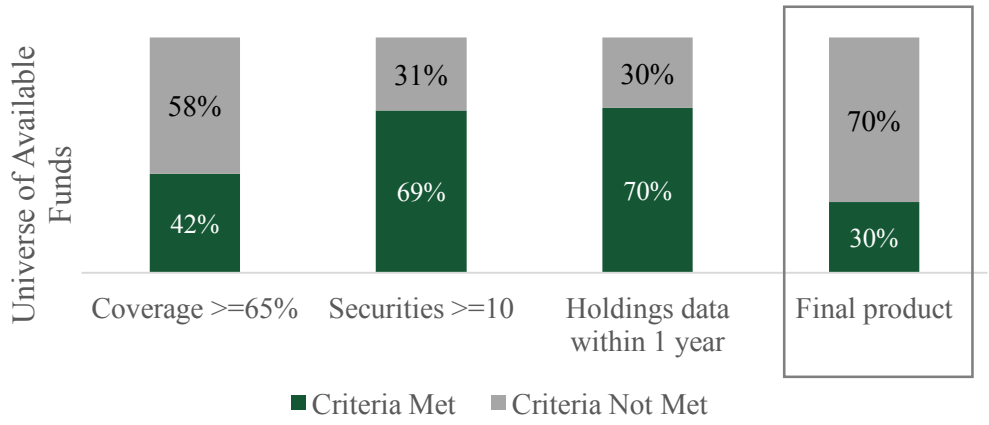
Category	***1***	***2***	***3***	***4***	***5***
Impact on Environment and Society	Low	Moderate	Significant	High	Severe
Risks to Company	Negligible	Minimal	Moderate	Significant	Serious

The rankings are based on collection of company information from publicly available sources, either produced by the company itself or third-party sources (e.g. annual reports, Bloomberg, newspapers). Sustainalytics screens news that would affect the ESG-ranking on a daily basis. Company contact and feedback is also conducted before research is published.

Source: Sustainalytics Description of ESG research services, 2016

Appendix 5: MSCI ESG Fund Metrics Methodology

In order to be included in the fund metrics coverage universe, the fund must pass the following criteria; 1) 65% of fund gross weight should come from covered securities, 2) Fund must have 10 holdings at minimum, and 3) The fund holding data should be less than one year old.



The overall Fund ESG Quality Score is measuring the ESG fund quality as a weighted average of the underlying holding's Overall ESG Scores. The score essentially measures the ability of the underlying holdings to manage key medium- to long-term risks and opportunities resulting from environmental, social and governance-factors.

Below is an example of a calculation of the overall Fund ESG Quality Score. In this example, Security E is dropped since it does not have an ESG score, and the remaining securities are normalized to 100%. These normalized weights together with the ESG scores determine the Fund ESG Quality Score (6.6 in this specific example).

	Weight	***ESG Score***	***Normalized Weight***	***Normalized Weight x Score***
Security A	0.2	4.0	0.25	1.0
Security B	0.4	8.0	0.5	4.0
Security C	0.08	7.0	0.1	0.7
Security D	0.12	6.0	0.15	0.9
Security E	0.2	N/A	0	N/A
Total	**1**		**1**	**6.6**

The implications of the scores are illustrated below:

Score	*ESG Quality*	*Underlying Holdings Rank*
8-10	Very High	Best in class
6-8	High	Above average
4-6	Average	Near global peer average
2-4	Low	Below average
0-2	Very Low	Worst in class

Furthermore, the ESG Quality Score is shown as a percentile within its peer group. This peer percentile (0-100) signifies the percentage of funds in a fund's peer group that has an ESG Quality score equal to or lower than the fund's ESG Score (i.e. the higher percentile score the better). In addition, a fund is assigned a Global Percentile, showing the percentage of overall funds covered by Fund Metrics with a score lower to or equal to the fund's ESG Quality Score.

MSCI Clients also have access to over 100 ESG Metrics. The ESG metrics are divided into the three categories sustainable impact, values alignment, and risk exposure. The issues include carbon, water, sustainable impacts, governance risks, and controversies, among others.

MSCI ESG Ratings Methodology (Company Level)

The fund-level ratings as described above are based on in-house company-level data. MSCI ESG Ratings calculates a company's rating based on its exposure to ESG risks. This is evaluated through a breakdown of the company's business (e.g. its core products and segments, location of assets and revenues, and other relevant aspects such as outsourced production). Furthermore, controversies having occurred within the past three years are continuously monitored and lead to an overall deduction from the overall score on all issues. 37 key issues are selected on an annual basis for each industry and weighted according to MSCI's materiality mapping framework. Examples of these key issues include carbon emission, water stress, toxic emissions and waste, labor management, health and safety, board, pay, business ethics, and anti-competitive practices. Scores on these key issues are weighted and aggregated, and company scores are normalized according to their industries. The final industry-adjusted score corresponds to a scale-rating from AAA (best) to CCC

(worst), relative to company peers. Weights and scores for each of the three pillars (E- S- and G-) are also reported.

The companies' exposure to ESG risks are based on macro data (e.g. NGO, academic and government datasets), company disclosure (e.g. 10-K, sustainability reports), and daily monitored media sources (i.e. the companies are monitored for e.g. controversies and governance events). The companies are subject to in-depth review at least annually. One purpose of the company ratings is to help clients support implementation of the United Nations Principles for Responsible Investment (UN PRI).

Source: MSCI ESG fund metrics methodology, 2016; MSCI ESG ratings methodology, 2015

Appendix 6: Descriptive Statistics

Appendix 6.1. Distribution of AUM in relation to fund scores

	Low	*Below Average*	*Average*	*Above Average*	*High*
Swedish sample					
Overall	0.00%	0.55%	32.32%	30.72%	34.90%
High	0.01%	0.23%	23.89%	31.11%	40.11%
Low	0.00%	0.76%	41.70%	29.39%	28.16%
PM sample					
Overall	2.27%	4.55%	53.92%	21.53%	17.12%
High	1.53%	3.62%	49.62%	23.47%	21.17%
Low	3.04%	5.63%	58.70%	19.92%	12.07%

Sustainalytics calculates a percentile ranking for each scored company, revealing how its ESG score relates to its industry peers. We display the percent of scored assets under management that rank in each of the following five groupings: Low - % AUM with an ESG percentile rank more than 90, Below Average - % AUM with an ESG percentile rank less than 90 and more than 32.5, Average - % AUM with a percentile rank less than 67.5 and more than 32.5, Above Average - % AUM with an ESG percentile rank less than 32.5 and more than 10, High - % AUM with an ESG percentile rank less than 10 (Morningstar Variable Definitions, 2016).

Appendix 6.2. Domicile of sample funds

	Dead funds	*Surviving funds, rated*	*Surviving funds, non-rated*
Swedish sample			
Sweden	81%	81%	77%
Abroad	19%	19%	23%
PM sample			
Sweden	35%	40%	53%
Abroad	65%	60%	47%

"Dead funds" refers to funds that did not exist as of the sustainability rating date (December 31st 2015). "Surviving funds, rated" refers to funds that received Morningstar sustainability rating as of December 31st 2015. "Surviving funds, non-rated" refers to funds that existed as of December 31st 2015, but did not receive the Morningstar rating.

Appendix 6.3. Asset allocation of sample funds

	Swedish sample			*PM sample*		
	Dead funds	Surviving funds, rated	Surviving funds, non-rated	Dead funds	Surviving funds, rated	Surviving funds, non-rated
Cash	4%	3%	7%	4%	3%	4%
Equity	95%	95%	92%	93%	96%	88%
Bond	1%	1%	1%	2%	1%	5%

"Dead funds" refers to funds that did not exist as of the sustainability rating date (December 31st 2015). "Surviving funds, rated" refers to funds that received Morningstar sustainability rating as of December 31st 2015. "Surviving funds, non-rated" refers to funds that existed as of December 31st 2015, but did not receive the Morningstar rating.

Appendix 6.4. Investment area exposures of sample funds

	Swedish sample			***PM sample***		
	Dead funds	Surviving funds, rated	Surviving funds, non-rated	Dead funds	Surviving funds, rated	Surviving funds, non-rated
Sweden	65%	85%	57%	8%	13%	10%
Abroad	35%	15%	43%	93%	87%	90%

Investment area refers to the geographic area that the fund focuses its investments on. Note that "Abroad" may encompass Nordic investment-areas.
"Dead funds" refers to funds that did not exist as of the sustainability rating date (December 31st 2015). "Surviving funds, rated" refers to funds that received Morningstar sustainability rating as of December 31st 2015. "Surviving funds, non-rated" refers to funds that existed as of December 31st 2015, but did not receive the Morningstar rating.

Appendix 6.5. Industry exposures of sample funds

	Swedish sample			***PM sample***		
Sector exposure, net %	Dead funds	Surviving funds, rated	Surviving funds, non-rated	Dead funds	Surviving funds, rated	Surviving funds, non-rated
Basic Materials	5%	8%	6%	6%	7%	5%
Communication Services	5%	3%	1%	4%	4%	3%
Consumer Cyclicals	14%	15%	17%	9%	12%	13%
Consumer Defensive	4%	5%	4%	7%	8%	7%
Healthcare	6%	7%	6%	9%	10%	8%
Industrials	25%	24%	24%	14%	13%	13%
Real Estate	3%	6%	7%	3%	5%	5%
Technology	11%	9%	13%	14%	13%	9%
Energy	1%	0%	0%	6%	5%	3%
Financial Services	19%	18%	13%	17%	16%	18%
Utilities	0%	0%	0%	2%	2%	2%

"Dead funds" refers to funds that did not exist as of the sustainability rating date (December 31st 2015). "Surviving funds, rated" refers to funds that received Morningstar sustainability rating as of December 31st 2015. "Surviving funds, non-rated" refers to funds that existed as of December 31st 2015, but did not receive the Morningstar rating.

Appendix 6.6. Size and management fees of sample funds

	Dead funds	***Surviving funds, rated***	***Surviving funds, non-rated***
Swedish sample			
Market value – average ($)	116,589,129	519,036,892	206,411,828
Market value – median ($)	23,632,440	167,567,897	81,237,779
Max management fee	1.30%	1.20%	1.30%
PM sample			
Market value – average ($)	292,850,010	745,414,955	383,607,183
Market value – median ($)	55,221,923	242,449,233	107,885,290
Max management fee	1.50%	1.50%	1.40%

"Dead funds" refers to funds that did not exist as of the sustainability rating date (December 31st 2015). "Surviving funds, rated" refers to funds that received Morningstar sustainability rating as of December 31st 2015. "Surviving funds, non-rated" refers to funds that existed as of December 31st 2015, but did not receive the Morningstar rating.

Appendix 6.7. Descriptive statistics for returns of sample funds: 10-year returns distribution

	Swedish sample			***PM sample***		
10-year returns	Dead funds	Surviving funds, rated	Surviving funds, non-rated	Dead funds	Surviving funds, rated	Surviving funds, non-rated
min value	-25.49%	-25.45%	-23.04%	-23.93%	-23.68%	-24.15%
20th percentile	-3.46%	-3.64%	-3.23%	-3.26%	-3.01%	-3.06%
40th percentile	-0.56%	-0.36%	-0.52%	-0.40%	-0.43%	-0.31%
60th percentile	2.09%	2.15%	2.10%	1.60%	1.58%	1.56%
80th percentile	5.94%	6.02%	5.84%	4.57%	4.87%	4.42%
max value	23.72%	25.30%	22.33%	15.90%	16.55%	15.94%
Mean	0.77%	0.86%	0.87%	0.32%	0.50%	0.42%
Median	0.61%	0.93%	0.85%	0.43%	0.61%	0.76%
Standard deviation	7%	7.09%	6.57%	5.85%	5.83%	5.63%
Skewness	-0.24	-0.19	-0.17	-0.75	-0.71	-0.81
Kurtosis	2.35	2.39	2.08	2.58	2.60	3.12

"Dead funds" refers to funds that did not exist as of the sustainability rating date (December 31st 2015). "Surviving funds, rated" refers to funds that received Morningstar sustainability rating as of December 31st 2015. "Surviving funds, non-rated" refers to funds that existed as of December 31st 2015, but did not receive the Morningstar rating.

Appendix 6.8. Industry exposures – high-SRI and low-SRI funds

	Swedish sample			***PM sample***		
Sector exposure, net %	High	Low	All	High	Low	All
Basic Materials	3%	8%	8%	7%	7%	7%
Communication Services	10%	3%	3%	4%	4%	4%
Consumer Cyclicals	17%	16%	15%	12%	12%	12%
Consumer Defensive	0%	7%	5%	8%	8%	8%
Healthcare	8%	7%	7%	10%	9%	10%
Industrials	32%	25%	24%	13%	14%	13%
Real Estate	0%	5%	6%	7%	4%	5%
Technology	10%	7%	9%	13%	12%	13%
Energy	0%	0%	0%	4%	5%	5%
Financial Services	18%	19%	18%	15%	16%	16%
Utilities	0%	0%	0%	2%	3%	2%

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

Appendix 6.9. Size and management fees of high-SRI and low-SRI funds

	High	***Low***	***All***
Swedish sample			
Market value – average ($)	449,661,601	599,093,232	519,036,892
Market value – median ($)	159,901,606	161,948,100	167,567,896
Max management fee	1.16%	1.21%	1.20%
PM sample			
Market value – average ($)	706,672,410	714,704,896	745,414,954
Market value – median ($)	232,792,518	238,836,859	242,449,233
Max management fee	1.44%	1.56%	1.50%

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

Appendix 6.10. Descriptive statistics for returns of high-SRI vs. low-SRI funds: 5 year return distribution

	Swedish sample			***PM sample***		
Sector exposure, net %	High	Low	All	High	Low	All
min value	-13.65%	-14.93%	-14.34%	-12.31%	-11.96%	-12.38%
20th percentile	-3.07%	-3.48%	-3.23%	-2.51%	-2.65%	-2.65%
40th percentile	-0.44%	-0.54%	-0.48%	-0.61%	-0.61%	-0.63%
60th percentile	1.44%	1.44%	1.50%	1.15%	0.90%	0.99%
80th percentile	4.07%	4.70%	4.46%	3.70%	3.73%	3.82%
max value	16.93%	17.00%	17.11%	12.58%	12.06%	12.61%
Mean	0.41%	0.49%	0.86%	0.18%	0.13%	0.15%
Median	0.17%	0.81%	0.93%	0.33%	-0.16%	0.08%
Standard deviation	5.33%	5.59%	7.09%	4.40%	4.47%	4.51%
Skewness	0.03	-0.08	-0.19	-0.28	-0.29	-0.27
Kurtosis	1.29	1.23	2.39	1.21	0.99	1.11

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

Appendix 6.11. Descriptive statistics for returns of high-SRI vs. low-SRI funds: 10 year return distribution

	Swedish sample			***PM sample***		
Sector exposure, net %	High	Low	All	High	Low	All
min value	-24.92%	-25.63%	-25.45%	-23.47%	-23.45%	-23.68%
20th percentile	-3.58%	-3.57%	-3.64%	-2.96%	-3.11%	-3.01%
40th percentile	-0.26%	-0.38%	-0.36%	-0.39%	-0.35%	-0.43%
60th percentile	2.25%	2.18%	2.15%	1.56%	1.65%	1.58%
80th percentile	5.96%	5.88%	6.02%	4.93%	4.70%	4.87%
max value	25.14%	24.78%	25.30%	16.32%	16.62%	16.55%
Mean	0.84%	0.87%	0.86%	0.53%	0.46%	0.50%
Median	0.86%	0.93%	0.93%	0.61%	0.49%	0.61%
Standard deviation	6.92%	7.15%	7.09%	5.73%	5.78%	5.83%
Skewness	-0.14	-0.24	-0.19	-0.72	-0.70	-0.71
Kurtosis	2.50	2.26	2.39	2.68	2.58	2.60

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

Appendix 6.12. Domicile and Investment area, MSCI subsample[10]

	Domicile			***Investment Area***		
	High	Low	All	High	Low	All
Swedish sample						
Sweden	88%	79%	86%	83%	79%	84%
Abroad	13%	21%	14%	17%	21%	16%
PM sample						
Sweden	44%	40%	41%	9%	12%	10%
Abroad	56%	60%	59%	91%	88%	90%

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

Appendix 6.13. Average Asset allocation, Net, MSCI subsample[10]

	Swedish sample			***PM sample***		
	High	Low	All	High	Low	All
Cash	2%	3%	2%	3%	3%	3%
Equity	97%	97%	97%	96%	97%	97%
Bond	0%	0%	1%	1%	0%	0%

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

Appendix 6.14. Industry exposures, MSCI subsample[10]

	Swedish sample			***PM sample***		
Sector exposure, net %	High	Low	All	High	Low	All
Basic Materials	5%	10%	8%	7%	10%	8%
Communication Services	4%	3%	3%	4%	4%	4%
Consumer Cyclicals	16%	14%	15%	12%	12%	12%
Consumer Defensive	4%	7%	6%	9%	8%	8%
Healthcare	5%	8%	6%	12%	10%	11%
Industrials	24%	27%	25%	13%	14%	13%
Real Estate	8%	3%	5%	5%	4%	5%
Technology	10%	8%	9%	14%	11%	13%
Energy	0%	1%	1%	3%	6%	5%
Financial Services	21%	16%	20%	16%	16%	16%
Utilities	0%	0%	0%	3%	2%	2%

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

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Appendix 6.15. Size and management fee, MSCI subsample[11]

	High	***Low***	***All***
Swedish sample			
Market value – average ($)	543,813,514	539,426,237	659,982,555
Market value – median ($)	221,991,556	108,864,171	251,294,284
Max management fee	0.96%	1.34%	1.07%
PM sample			
Market value – average ($)	800,671,903	635,776,253	707,064,446
Market value – median ($)	293,818,537	246,370,803	277,661,856
Max management fee	1.40%	1.58%	1.44%

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

Appendix 6.16. 5-year returns distribution, MSCI subsample[11]

	Swedish sample			***PM sample***		
Sector exposure, net %	High	Low	All	High	Low	All
min value	-13.64%	-15.40%	-14.50%	-11.48%	-12.90%	-12.02%
20th percentile	-3.40%	-3.55%	-3.55%	-2.44%	-2.67%	-2.50%
40th percentile	-0.55%	-0.56%	-0.47%	-0.48%	-0.83%	-0.63%
60th percentile	1.25%	1.73%	1.28%	1.21%	0.82%	1.08%
80th percentile	4.39%	4.65%	4.34%	3.60%	3.95%	3.82%
max value	16.97%	17.27%	17.18%	12.18%	12.65%	12.46%
Mean	0.41%	0.42%	0.41%	0.22%	0.10%	0.16%
Median	0.08%	0.31%	0.23%	0.45%	-0.09%	0.17%
Standard deviation	5.50%	5.65%	5.59%	4.31%	4.66%	4.46%
Skewness	0.04	-0.10	-0.02	-0.27	-0.28	-0.27
Kurtosis	1.07	1.34	1.21	0.98	1.12	1.03

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

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Appendix 6.17. 10-year returns distribution, MSCI subsample[12]

	Swedish sample			***PM sample***		
Sector exposure, net %	High	Low	All	High	Low	All
min value	-25.84%	-25.22%	-25.73%	-23.28%	-24.03%	-23.60%
20th percentile	-3.65%	-3.81%	-3.78%	-3.01%	-2.97%	-2.91%
40th percentile	-0.26%	-0.45%	-0.35%	-0.33%	-0.49%	-0.41%
60th percentile	2.10%	2.11%	2.22%	1.54%	1.74%	1.61%
80th percentile	5.89%	5.93%	6.11%	4.85%	4.79%	4.85%
max value	24.78%	26.62%	25.78%	15.38%	16.51%	15.97%
Mean	0.84%	0.85%	0.84%	0.52%	0.46%	0.48%
Median	1.02%	0.74%	0.87%	0.64%	0.44%	0.53%
Standard deviation	7.06%	7.22%	7.17%	5.62%	5.94%	5.77%
Skewness	-0.22	-0.16	-0.19	-0.78	-0.73	-0.75
Kurtosis	2.37	2.44	2.41	2.73	2.64	2.63

"High" refers to 32.5% of funds with the highest sustainability rating (as defined by percentile rating against peer groups); "Low" refers to 32.5% of funds with the lowest sustainability rating; "All" refers to all Morningstar-rated funds in the respective samples, irrespective of rating.

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Appendix 7: Results

Appendix 7.1. Performance attribution regression results – Swedish sample, Morningstar rating

	Swedish sample, Morningstar sustainability rating											
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif
alpha	0.04 (0.15)	0.10 (0.36)	-0.06 (-1.09)	-0.23 (-0.97)	-0.22 (-0.86)	-0.02 (-0.3)	-0.24 (-0.96)	-0.23 (-0.87)	-0.01 (-0.15)	-0.14 (-0.56)	-0.08 (-0.31)	-0.06 (-1.03)
MKT	1.05*** (19.69)	1.09*** (18.77)	-0.04*** (-3.51)	1.19*** (20.16)	1.25*** (20.07)	-0.07*** (-5.08)	1.19*** (19.84)	1.25*** (19.77)	-0.07*** (-5.08)	1.12** (17.75)	1.17*** (17.64)	-0.05*** (-3.79)
SMB				0.27** (2.01)	0.39*** (2.75)	-0.12*** (-4.11)	0.27* (1.99)	0.39*** (2.73)	-0.12*** (-4.09)	0.23* (1.67)	0.33** (2.26)	-0.09*** (-3.12)
HML				-0.43*** (-3.67)	-0.48*** (-3.89)	0.05** (2.03)	-0.43*** (-3.28)	-0.47*** (-3.43)	0.05 (1.63)	-0.09 (-0.46)	-0.16 (-0.75)	0.07 (1.42)
MOM							0.01 (0.11)	0.02 (0.21)	-0.01 (-0.53)			
RMW										0.19 (0.66)	0.11 (0.37)	0.08 (1.18)
CMA										-0.67*** (-2.89)	-0.74*** (-3.01)	0.07 (1.27)
R^2	0.87	0.85	0.17	0.90	0.89	0.38	0.90	0.89	0.38	0.91	0.91	0.41
R^2 adj	0.86	0.85	0.16	0.89	0.89	0.35	0.89	0.88	0.34	0.90	0.90	0.36

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for Morningstar sustainability-rated funds with at least 50% invested in Swedish equities. Sample period: January 2011-February 2016.
Dependent variables: SRI_high refers to $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest Morningstar sustainability ratings), SRI_low refers to $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest Morningstar sustainability ratings). SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 7.2. Performance attribution regression results – PM sample, Morningstar rating

PM sample, Morningstar rating												
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif
alpha	-0.47*** (-3.13)	-0,52*** (-3.29)	0.05 (1.36)	-0,47*** (-3.07)	-0.51*** (-3.23)	0.04 (1.19)	-0.38** (-2.43)	-0.42** (-2.56)	0.03 (0.90)	-0.55*** (-3.30)	-0.58*** (-3.32)	0.03 (0.69)
MKT	1.15*** (28.62)	1.17*** (27.83)	-0.02** (-2.12)	1.16*** (28.58)	1.18*** (28.19)	-0.02** (-2.41)	1.15*** (27.94)	-1.17*** (27.61)	-0.02** (-2.19)	1.21*** (22.19)	1.22*** (21.55)	-0.01 (-1.17)
SMB				0.16 (1.46)	0.22* (1.88)	-0.05** (-2.15)	0.16 (1.45)	0.21* (1.88)	-0.05** (-2.13)	0.27 (2.03)	0.31** (2.22)	-0.04** (-1.25)
HML				-0.09 (-0.84)	-0.09 (-0.88)	0.01 (0.32)	-0.16 (-1.41)	-0.17 (-1.49)	0.01 (0.56)	0.13 (0.86)	0.10 (0.66)	0.03 (0.75)
MOM							-0.12 (-1.66)	-0.13* (-1.76)	0.01 (-0.69)			
RMW										0.41* (1.94)	0.36 (1.64)	0.05 (1.01)
CMA										-0.28 (-1.21)	-0.27 (-1.11)	-0.01 (-0.22)
R^2	0.93	0.93	0.07	0.94	0.94	0.14	0.94	0.94	0.15	0.94	0.94	0.16
R^2 adj	0.93	0.93	0.05	0.93	0.93	0.10	0.93	0.93	0.09	0.93	0.93	0.08

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.

Regression sample: monthly returns for Morningstar sustainability-rated funds available for investment within the Swedish premium pension scheme, with at least 50% invested in equities. Sample period: January 2011-February 2016.

Dependent variables: SRI_high refers to $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest Morningstar sustainability ratings), SRI_low refers to $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest Morningstar sustainability ratings). SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$.

Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 7.3. Performance attribution regression results – Swedish sample, MSCI rating

	Swedish sample, MSCI sustainability rating											
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif
alpha	0.04	0.03	-0.01	-0.20	-0.30	0.10	-0.22	-0.31	0.09	-0.09	-0.17	0.08
	(0.14)	(0.10)	(-0.07)	(-0.84)	(-1.21)	(1.19)	(-0.88)	(-1.19)	(1.18)	(-0.33)	-0.66	1.12
MKT	1.06***	1.09***	-0.03	1.18***	1.26***	-0.08***	1.18***	1.26***	-0.08***	1.12***	1.17***	-0.06***
	(20.32)	(18.87)	(-1.75)	(19.90)	(20.59)	(-4.46)	(19.62)	(20.26)	(-4.33)	(17.21)	(18.30)	(-3.09)
SMB				0.18	0.39***	-0.21***	0.18	0.39***	-0.21***	0.13	0.34**	-0.21***
				(1.36)	(2.86)	(-5.38)	(1.35)	(2.84)	(-5.34)	(0.92)	(2.41)	(-5.16)
HML				-0.39***	-0.51***	0.11***	-0.38***	-0.49***	0.12***	-0.16	-0.14	0.01
				(-3.31)	(-4.14)	(3.21)	(-2.88)	(-3.69)	(3.13)	(-0.77)	(-0.71)	(0.25)
MOM							0.03	0.01	0.02			
							(0.28)	(0.12)	(0.53)			
RMW										0.05	0.15	-0.10
										(0.17)	(0.51)	(-1.18)
CMA										-0.57**	-0.79***	0.22***
										(-2.37)	(-3.31)	(3.18)
R^2	0.87	0.86	0.05	0.90	0.89	0.41	0.90	0.89	0.41	0.90	0.91	0.48
R^2 adj	0.87	0.85	0.03	0.89	0.89	0.38	0.89	0.89	0.37	0.89	0.90	0.44

Notation: * ** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for Morningstar sustainability-rated funds that also have MSCI sustainability rating, with at least 50% invested in Swedish equities. Sample period: January 2011-February 2016.
Dependent variables: SRI_high refers to $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest MSCI sustainability ratings), SRI_low refers to $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest MSCI sustainability ratings). SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 7.4. Performance attribution regression results – PM sample, MSCI rating

PM sample, MSCI rating												
	CAPM model			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif
alpha	-0.40**	-0.56***	0.16**	-0.40**	-0.54***	0.13**	-0.34**	-0.43**	0.09	-0.49***	-0.55***	0.05
	(-2.80)	(-3.60)	(2.25)	(-2.79)	(-3.50)	(1.94)	(-2.26)	(-2.76)	(1.29)	(-3.15)	(-3.30)	(0.75)
MKT	1.11***	1.19***	-0.09***	1.12***	1.21***	-0.09***	1,11***	1.19***	-0.08***	1.17***	1.22***	-0.05**
	(29.24)	(28.95)	(-4.64)	(29.03)	(29.59)	(-4.96)	(28.19)	(29.23)	(-4.53)	(22.71)	(22.43)	(-2.21)
SMB				0.11	0.26**	-0.15***	0.11	0.25**	-0.14***	0.22*	0.29**	-0.07
				(1.06)	(2.29)	(-2.89)	(1.04)	(2.32)	(-2.91)	(1.79)	(2.26)	(-1.29)
HML				-0.10	-0.06	-0.04	-0.15	-0.15	0.01	0.09	0.19	-0.09
				(-1.04)	(-0.60)	(-0.85)	(-1.46)	(-1.36)	(-0.11)	(0.69)	(1.22)	(-1.31)
MOM							-0.09	-0.15**	0.06*			
							(-1.29)	(-2.08)	(1.85)			
RMW										0.41**	0.29	0.11
										(2.06)	(1.41)	(1.23)
CMA										-0.23	-0.45*	0.22**
										(-1.05)	(-1.97)	(2.21)
R^2	0.93	0.93	0.26	0.94	0.94	0.36	0.94	0.94	0.40	0.94	0.94	0.44
R^2 adj	0.93	0.93	0.25	0.93	0.94	0.33	0.93	0.94	0.35	0.94	0.94	0.38

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for Morningstar sustainability-rated funds available for investment within the Swedish premium pension scheme, that are also sustainability-rated by MSCI, with at least 50% invested in equities. Sample period: January 2011-February 2016.
Dependent variables: SRI_high refers to $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest MSCI sustainability ratings), SRI_low refers to $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest MSCI sustainability ratings). SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 7.5. Performance attribution regression results, Swedish sample, Morningstar rating subcomponents

Swedish sample, Morningstar sustainability rating subcomponents												
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif
alpha	-0.11	-0.11*	-0.06	-0.03	-0.06	-0.01	-0.02	-0.05	0.00	-0.08	-0.10	-0.05
	(-1.41)	(-1.84)	(-1.03)	(-0.49)	(-1.07)	(-0.19)	(-0.35)	(-0.85)	(0.03)	(-1.15)	(-1.57)	(-0.78)
MKT	-0.02	-0.04***	-0.03**	-0.06***	-0.07***	-0.05***	-0.06***	-0.07***	-0.05***	-0.04**	-0.06***	-0.04***
	(-1.19)	(-3.24)	(-2.24)	(-3.66)	(-4.68)	(-3.79)	(-3.66)	(-4.71)	(-3.86)	(-2.23)	(-3.50)	(-2.71)
SMB				-0.19***	-0.11***	-0.09***	-0.19***	-0.11***	-0.09***	-0.18***	-0.09**	-0.07**
				(-5.39)	(-3.27)	(-3.00)	(-5.36)	(-3.26)	(-3.01)	(-4.51)	(-2.45)	(-2.21)
HML				0.09***	0.06**	0.06**	0.08**	0.06*	0.05*	0.05	0.07	0.07
				(2.78)	(2.24)	(2.39)	(2.34)	(1.76)	(1.84)	(0.83)	(1.37)	(1.41)
MOM							-0.01	-0.02	-0.02			
							(-0.43)	(-0.66)	(-0.80)			
RMW										0.03	0.07	0.06
										0.39	(0.89)	(0.85)
CMA										0.16**	0.07	0.07
										(2.46)	(1.16)	(1.19)
R^2	0.02	0.15	0.08	0.38	0.32	0.25	0.38	0.32	0.26	0.44	0.34	0.28
R^2 adj	0.01	0.13	0.06	0.35	0.28	0.21	0.34	0.27	0.20	0.40	0.28	0.21

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for Morningstar sustainability-rated funds with at least 50% invested in Swedish equities. Sample period: January 2011-February 2016.
Dependent variables: Env_dif refers to the difference between returns of the top and bottom 32.5% rated funds in environmental subcomponent ($R_t^{Dif\_Env} = R_t^{High\_Env} - R_t^{Low\_Env}$), Soc_dif – in social subcomponent, Gov_dif – in governance subcomponent.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 7.6. Performance attribution regression results, PM sample, Morningstar rating subcomponents

	PM sample, Morningstar rating subcomponents											
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif
alpha	-0.06 (-1.12)	-0.03 (-0.55)	0.01 (0.27)	-0.05 (-1.04)	-0.03 (-0.56)	0.01 (0.16)	-0.02 (-0.40)	-0.01 (-0.26)	0.01 (0.21)	-0.06 (-1.21)	-0.06 (-1.12)	-0.02 (-0.40)
MKT	0.00 (-0.21)	-0.01 (-1.01)	-0.02* (-1.75)	-0.01 (-0.53)	-0.02 (-1.18)	-0.03** (-2.27)	-0.01 (-0.95)	-0.02 (-1.33)	-0.03** (-2.24)	0.00 (0.02)	0.00 (0.12)	-0.01 (-0.80)
SMB				-0.03 (-0.90)	-0.03 (-0.91)	-0.08** (-2.51)	-0.04 (-0.96)	-0.03 (-0.92)	-0.08** (-2.50)	-0.01 (-0.24)	0.01 (0.14)	-0.05 (-1.32)
HML				0.04 (1.28)	0.02 (0.56)	0.03 (1.17)	0.02 (0.49)	0.01 (0.19)	0.03 (1.01)	0.17*** (3.41)	0.08 (1.57)	0.07 (1.55)
MOM							-0.05* (-1.92)	-0.02 (-0.86)	0.00 (-0.18)			
RMW										0.15** (2.25)	0.13* (1.93)	0.09 (1.48)
CMA										-0.21*** (-2.88)	-0.06 (-0.74)	-0.02 (-0.28)
R^2	0.00	0.02	0.05	0.04	0.04	0.17	0.10	0.05	0.17	0.20	0.10	0.20
R^2 adj	-0.02	0.00	0.03	-0.01	-0.01	0.12	0.04	-0.02	0.11	0.13	0.02	0.13

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.

Regression sample: monthly returns for Morningstar sustainability-rated funds available for investment within the Swedish premium pension scheme, with at least 50% invested in equities. Sample period: January 2011-February 2016.

Dependent variables: Env_dif refers to the difference between returns of the top and bottom 32.5% rated funds in environmental subcomponent ($R_t^{Dif\_Env} = R_t^{High\_Env} - R_t^{Low\_Env}$), Soc_dif – in social subcomponent, Gov_dif – in governance subcomponent.

Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 8: Robustness Tests

Appendix 8.1. Performance attribution regression results, PM 10-year sample, Morningstar rating

	PM 10-year sample, Morningstar rating											
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif
alpha	-0.05 (-0.69)	-0.10 (-0.75)	0.05 (1.63)	-0.06 (-0.51)	-0.11 (-0.87)	0.05 (1.58)	-0.03 (-0.27)	-0.07 (-0.61)	0.04 (1.44)	-0.06 (0.51)	-0.11 (-0.85)	0.04 (1.38)
MKT	1.18*** (43.10)	1.19*** (41.97)	-0.01** (-2.23)	1.19*** (44.67)	1.20*** (44.29)	-0.01* (-1.80)	1.18*** (43.05)	1.19*** (42.77)	-0.01 (-1.48)	1.15*** (34.89)	1.16*** (34.22)	-0.01 (-1.59)
SMB				0.26*** (3.17)	0.33*** (4.04)	-0.08*** (-3.92)	0.25*** (3.16)	0.33*** (4.05)	-0.08*** (-3.90)	0.25*** (3.15)	0.33*** (3.98)	-0.08*** (-3.69)
HML				-0.21** (-2.75)	-0.20** (-2.55)	-0.01 (0.63)	-0.27*** (-3.24)	-0.26*** (-3.13)	-0.01 (-0.26)	0.05 (0.53)	0.05 (0.47)	0.00 (0.18)
MOM							-0.07* (-1.86)	-0.08* (-2.07)	0.01 (0.99)			
RMW										0.31** (2.34)	0.29** (2.11)	0.02 (0.64)
CMA										-0.39*** (-3.36)	-0.36*** (-3.08)	-0.02 (-0.72)
R^2	0.94	0.94	0.04	0.95	0.95	0.15	0.95	0.95	0.16	0.96	0.95	0.16
R^2 adj	0.94	0.94	0.03	0.95	0.95	0.13	0.95	0.95	0.13	0.95	0.95	0.12

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for Morningstar sustainability-rated funds available for investment within the Swedish premium pension scheme, that are also sustainability-rated by MSCI, with at least 50% invested in equities. Sample period: January 2006-February 2016.
Dependent variables: SRI_high refers to $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest MSCI sustainability ratings), SRI_low refers to $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest MSCI sustainability ratings). SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 8.2. Performance attribution regression results, Swedish 10-year sample, Morningstar rating

	Swedish 10-year sample, Morningstar rating											
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif
alpha	0.33 (1.46)	0.37* (1.55)	-0.04 (-0.83)	0.23 (1.05)	0.24 (1.09)	-0.01 (-0.34)	0.31 (1.41)	0.31* (1.35)	0.01 (0.14)	0.37 (1.59)	0.36* (1.46)	0.02 (0.48)
MKT	1.09*** (28.39)	1.14*** (28.06)	-0.05*** (-6.09)	1.14*** (25.44)	1.20*** (26.17)	-0.06*** (-6.95)	1.12*** (24.67)	1.18*** (25.34)	-0.01*** (-7.40)	1.07*** (20.53)	1.13*** (21.17)	-0.06*** (-6.37)
SMB				0.33*** (3.00)	0.46*** (4.13)	-0.13*** (-6.55)	0.32*** (2.94)	0.46*** (4.07)	-0.14*** (-6.78)	0.24*** (2.09)	0.39*** (3.28)	-0.15*** (-6.77)
HML				-0.21* (-1.83)	-0.24** (-2.07)	0.03 (1.54)	-0.29** (-2.35)	-0.29** (-2.40)	0.01 (0.66)	-0.07 (-0.39)	-0.08 (0.42)	0.01 (0.22)
MOM							-0.11* (-1.77)	-0.09 (-1.32)	-0.03** (-2.28)			
RMW										-0.07 (-0.28)	0.00 (0.02)	-0.07 (-1.60)
CMA										-0.48*** (-2.61)	-0.45** (-2.37)	-0.03 (-0.98)
R^2	0.87	0.87	0.24	0.88	0.89	0.45	0.89	0.89	0.48	0.89	0.89	0.47
R^2 adj	0.87	0.87	0.23	0.88	0.89	0.44	0.89	0.89	0.46	0.89	0.89	0.44

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for Morningstar sustainability-rated funds with at least 50% invested in Swedish equities. Sample period: January 2006-February 2016.
Dependent variables: SRI_high refers to $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest Morningstar sustainability ratings), SRI_low refers to $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest Morningstar sustainability ratings). SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 8.3. Performance attribution regression results, PM 10-year sample, MSCI rating

	PM 10-year sample, MSCI rating											
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif
alpha	-0.05 (-0.38)	-0.13 (-0.91)	0.08 (1.35)	-0.06 (0.52)	-0.14 (-1.08)	0.08 (1.33)	-0.04 (-0.33)	-0.11 (-0.86)	0.07 (0.23)	-0.09 (-0.71)	-0.10 (-0.81)	0.02 (0.27)
MKT	1.14*** (43.46)	1.19*** (40.98)	-0.06*** (-4.54)	1.16*** (44.86)	1.21*** (43.96)	-0.05*** (-4.38)	1.15*** (43.09)	1.20*** (42.30)	-0.05*** (-3.99)	1.13*** (34.91)	1.15*** (34.27)	-0.02 (-1.44)
SMB				0.20** (2.61)	0.35** (4.17)	-0.14*** (-3.82)	0.20** (2.59)	0.35*** (4.17)	-0.14*** (-3.79)	0.21** (2.69)	0.33*** (4.01)	-0.11*** (-2.97)
HML				-0.23** (-3.03)	-0.24** (-2.95)	0.01 (0.25)	-0.27*** (-3.34)	-0.29*** (-3.38)	0.02 (0.53)	0.00 (0.02)	0.05 (0.51)	-0.05 (-1.02)
MOM							-0.05 (-1.41)	-0.07 (-1.72)	0.02 (0.86)			
RMW										0.32** (2.47)	0.26** (1.93)	0.06 (0.93)
CMA										-0.30* (-2.67)	-0.47*** (-4.04)	0.17*** (3.09)
R^2	0.94	0.92	0.15	0.95	0.95	0.24	0.95	0.95	0.25	0.95	0.95	0.30
R^2 adj	0.94	0.92	0.14	0.95	0.95	0.23	0.95	0.95	0.23	0.95	0.95	0.27

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for Morningstar sustainability-rated funds available for investment within the Swedish premium pension scheme, that are also sustainability-rated by MSCI, with at least 50% invested in equities. Sample period: January 2006-February 2016.
Dependent variables: SRI_high refers to $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest MSCI sustainability ratings), SRI_low refers to $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest MSCI sustainability ratings). SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 8.4. Performance attribution regression results for the Swedish sample, MSCI rating

	Swedish 10-year sample, MSCI rating											
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif	SRI_high	SRI_low	SRI_dif
alpha	0.33 (1.42)	0.34 (1.41)	-0.01 (-0.11)	0.24 (1.03)	0.22 (0.95)	0.02 (-0.28)	0.32 (1.35)	0.31 (1.35)	-0.01 (-0.09)	0.39 (1.54)	0.33 (1.32)	0.06 (0.39)
MKT	1.11*** (27.67)	1.14*** (27.73)	-0.04** (-2.21)	1.16*** (24.51)	1.20*** (25.76)	-0.04** (-3.25)	1.14*** (23.74)	1.18*** (25.00)	-0.04** (-2.98)	1.09*** (19.78)	1.13*** (20.79)	-0.04** (-2.24)
SMB				0.30** (2.62)	0.47*** (4.09)	-0.16*** (-4.89)	0.29** (2.55)	0.46*** (4.03)	-0.16*** (-4.83)	0.22* (1.77)	0.39*** (3.24)	-0.17*** (-4.86)
HML				-0.21* (-1.72)	-0.24* (-1.98)	0.03 (0.79)	-0.28** (-2.19)	-0.32** (-2.54)	0.04 (1.05)	-0.10 (-0.54)	-0.04 (-0.19)	-0.07 (-1.24)
MOM							-0.11 (-1.60)	-0.12* (-1.89)	0.01 (0.87)			
RMW										-0.11 (-0.42)	0.04 (0.17)	-0.15* (-2.04)
CMA										-0.44** (-2.26)	-0.49** (-2.55)	0.05 (0.85)
R^2	0.86	0.87	0.07	0.88	0.89	0.23	0.88	0.89	0.23	0.88	0.89	0.26
R^2 adj	0.86	0.86	0.06	0.87	0.88	0.21	0.87	0.88	0.21	0.88	0.89	0.23

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for Morningstar sustainability-rated funds that also have MSCI sustainability rating, with at least 50% invested in Swedish equities. Sample period: January 2006-February 2016.
Dependent variables: SRI_high refers to $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest MSCI sustainability ratings), SRI_low refers to $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest MSCI sustainability ratings). SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 8.5. Performance attribution regression results, PM 10-year sample, Morningstar rating subcomponents

PM 10-year sample, Morningstar rating subcomponents												
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif
alpha	0.00 (0.07)	0.05 (1.34)	0.01 (0.27)	0.00 (-0.10)	0.05 (1.21)	0.02 (0.67)	-0.01 (-0.29)	0.04 (1.00)	0.02 (0.46)	0.02 (0.36)	0.04 (0.99)	0.01 (0.24)
MKT	-0.03*** (-3.03)	-0.01* (-1.80)	-0.03*** (-3.38)	-0.02** (-2.30)	-0.01 (-1.17)	-0.02*** (-3.21)	-0.02* (-1.84)	-0.01 (-0.72)	-0.02*** (-2.70)	-0.04*** (-3.11)	-0.01 (1.23)	-0.02* (-1.87)
SMB				-0.07** (-2.51)	-0.06** (-2.31)	-0.10*** (-4.40)	-0.07** (-2.49)	-0.06** (-2.29)	-0.10*** (-4.40)	-0.08*** (-2.82)	-0.06** (2.15)	-0.09*** (-3.88)
HML				-0.04 (-1.67)	-0.04 (-1.46)	0.00 (0.16)	-0.03 (-1.08)	-0.02 (0.85)	0.02 (0.69)	0.00 (0.15)	0.00 (-0.07)	0.00 (0.09)
MOM							0.02 (-1.49)	-0.02 (1.58)	0.02 (1.61)			
RMW										0.01 (0.32)	0.05 (1.09)	0.03 (0.70)
CMA										-0.10 (-2.51)	-0.04 (-1.10)	0.02 (0.65)
R^2	0.07	0.03	0.09	0.13	0.08	0.22	0.15	0.10	0.24	0.18	0.10	0.22
R^2 adj	0.06	0.02	0.08	0.11	0.05	0.20	0.12	0.07	0.21	0.14	0.06	0.19

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for Morningstar sustainability-rated funds with at least 50% invested in equities. Sample period: January 2006-February 2016.
Dependent variables: Env_dif refers to the difference between returns of the top and bottom 32.5% rated funds in environmental subcomponent ($R_t^{Dif\_Env} = R_t^{High\_Env} - R_t^{Low\_Env}$), Soc_dif – in social subcomponent, Gov_dif – in governance subcomponent.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 8.6. Performance attribution regression results, Swedish 10-year sample, Morningstar rating subcomponents

Swedish 10-year sample, Morningstar rating subcomponents												
	CAPM			**3-Factor model**			**4-Factor model**			**5-Factor model**		
	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif	Env_dif	Soc_dif	Gov_dif
alpha	-0.07 (-1.07)	-0.07 (-1.25)	-0.03 (-0.69)	-0.03 (-0.53)	-0.03 (-0.70)	0.00 (-0.10)	0.02 (0.43)	-0.02 (-0.42)	0.02 (0.58)	-0.01 (-0.20)	0.00 (0.04)	0.04 (0.92)
MKT	-0.02** (-2.17)	-0.06*** (-6.56)	-0.03*** (-3.87)	-0.04*** (-3.52)	-0.07*** (-8.03)	-0.04*** (-5.08)	-0.05*** (-4.73)	-0.01*** (-8.13)	-0.05*** (-5.86)	-0.05*** (-3.85)	-0.07*** (-6.83)	-0.05*** (-4.79)
SMB				-0.16*** (-5.88)	-0.15*** (-6.61)	-0.12*** (-5.61)	-0.17*** (-6.62)	-0.15*** (-6.68)	-0.12*** (-5.99)	-0.18*** (-5.90)	-0.16*** (-6.63)	-0.14*** (-6.08)
HML				0.06** (2.20)	0.06** (2.48)	0.05** (2.22)	0.02 (0.60)	0.05* (1.88)	0.02 (1.03)	0.10** (2.08)	0.02 (0.42)	0.01 (0.25)
MOM							-0.07*** (-4.66)	-0.02 (-1.25)	-0.04*** (-3.23)			
RMW										0.01 (0.12)	-0.09* (-1.72)	-0.11** (-2.20)
CMA										-0.08 (-1.61)	-0.01 (-0.16)	-0.04 (-0.98)
Rsq	0.04	0.26	0.11	0.29	0.49	0.33	0.40	0.49	0.38	0.30	0.50	0.36
Rsq adj	0.03	0.26	0.10	0.27	0.47	0.31	0.38	0.48	0.36	0.27	0.48	0.33

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression sample: monthly returns for Morningstar sustainability-rated funds with at least 50% invested in Swedish equities. Sample period: January 2011-February 2016.
Dependent variables: Env_dif refers to the difference between returns of the top and bottom 32.5% rated funds in environmental subcomponent ($R_t^{Dif\_Env} = R_t^{High\_Env} - R_t^{Low\_Env}$), Soc_dif – in social subcomponent, Gov_dif – in governance subcomponent.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor, MOM – momentum factor, RMW – robust minus weak (profitability) factor, CMA – conservative minus aggressive (investment) factor.

Appendix 8.7. Performance attribution regression results for robustness checks

	Robustness checks (3-Factor model for SRI_dif)							
	70% in equity		**20% SRI rating threshold**		**10-year horizon**		**Alternative rating provider (MSCI)**	
	Swedish sample	PM sample	Swedish sample	PM sample	Swedish sample	PM sample	Swedish sample	PM sample
alpha	-0.02 (-0.39)	0.00 (0.09)	-0.06 (-0.88)	0.02 (0.30)	-0.01 (-0.34)	0.05 (1.58)	0.11 (1.19)	0.13** (1.94)
MKT	-0.07* (-1.78)	-0.03** (-2.53)	-0.03* (-1.84)	-0.02* (-1.69)	-0.06*** (-6.95)	-0.01* (-1.80)	-0.10*** (-4.35)	-0.09*** (-4.96)
SMB	-0.09*** (-3.13)	-0.03 (-1.01)	-0.15*** (-4.08)	-0.04 (-0.84)	-0.13*** (-6.55)	-0.08*** (-3.92)	-0.29*** (-5.49)	-0.15*** (-2.89)
HML	0.03 (1.12)	0.01 (0.27)	0.05 (1.44)	0.01 (0.25)	0.03 (1.54)	-0.01 (-0.63)	0.14*** (3.14)	-0.04 (-0.85)
R^2	0.15	0.11	0.23	0.08	0.45	0.15	0.41	0.36
R^2 adj	0.11	0.06	0.19	0.05	0.44	0.13	0.38	0.33

Notation: *** denotes coefficients significant at 1% level, ** - at 5%, * - at 10%. T-statistics are reported in parenthesis below each coefficient.
Regression samples: "70% in equity – Swedish sample" includes funds with at least 70% invested in Swedish stocks; "70% in equity – PM sample" includes funds within the Swedish premium pension scheme with at least 70% invested in equities; "20% SRI rating threshold" indicates that 20% of top-rated funds are classified as High-SRI, and 20% of lowest-rated funds – as low-SRI; "10-year horizon" refers to the sample period January 2006-February 2016; "Alternative rating provider (MSCI)" refers to funds classified as High-SRI or Low-SRI according to MSCI ratings. Sample period: January 2011-February 2016 (except for 10-year horizon regressions).
Dependent variables: SRI_dif refers to $R_t^{Dif} = R_t^{High\_SRI} - R_t^{Low\_SRI}$, where $R_t^{High\_SRI}$ – returns on equally-weighted portfolio of high-sustainability funds (32.5% of funds with highest Morningstar sustainability ratings), $R_t^{Low\_SRI}$ – returns on equally-weighted portfolio of low-sustainability funds (32.5% of funds with lowest MSCI sustainability ratings). In regressions for "20% SRI rating threshold", 20% of highest- / lowest-rated funds are used to calculate respective measures.
Explanatory variables: MKT – market factor, SMB – small minus big (size) factor, HML – high minus low (value) factor.