



The effect of social screening on bond mutual fund performance



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ABSTRACT

This study measures the financial impact of screening for environmental, social and governance criteria on corporate bond portfolios. Specifically, the risk-adjusted financial performance of 103 socially responsible bond funds in the US and the Eurozone is compared with a matched sample of conventional funds. During the period 2001–2014, socially responsible bond funds outperform by one-half of one percent annually. An evaluation of fund holdings and a performance-attribution analysis suggest that this outperformance is directly related to the mitigation of ESG risks, which is achieved by the exclusion of corporate bond issuers with poor corporate social responsibility activities. A separation of crisis and non-crisis periods further indicates that the outperformance is especially likely to occur during recessions or bear market periods. We confirm this crisis-related return effect from a sample of socially screened bond indices. Moreover, our results are robust to alternative definitions of sustainability, survivorship bias, fund characteristics and stable in the US and Eurozone sub-samples.

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1. Introduction

The consideration of corporate social responsibility (CSR) in investment decisions is becoming an increasingly important process for investment decisions. Socially responsible investments (SRI) complement conventional portfolio optimization with the integration of environmental, social and governance (ESG) criteria. In practice, SRI fund managers filter their investments using ESG ratings to achieve portfolios with social attributes. This study investigates the extent to which screening for CSR or ESG criteria has an effect on the financial performance of bond portfolios. We believe this is a relevant question for a number of reasons. First, the considerable market size of SRI fixed income investments, along with the increasing attention paid to socially responsible bond investing in practice, are arguments for more empirical research on this market segment. The market for SRI has grown to a substantial segment of investments due to very high growth rates in the past 20 years. In 2016, there are more than 1440 institutional investors worldwide who are signatories to the United Nations-backed Principles for Responsible Investing. These signatories commit themselves to integrate

ESG criteria into their investment processes; they include investment managers with 12.4 billion USD of assets under management or 19% of the global asset market. Thereof, SRI fixed-income investments account for the largest asset class. With the amount of money invested in SRI and the attention that an increasing number of retail and institutional investors are giving to CSR, it is important to understand the extent to which the integration of CSR or ESG criteria in investment decisions affects financial returns.

Second, it is important to know whether there is a trade-off between financial and non-financial investment objectives. If ESG screening of bond portfolios has a negative effect on financial performance, investing in SRI will create a potential breach of fiduciary duty. In the event of negative return implications caused by ESG screening, only asset managers with the mandate to screen for ESG could apply this approach without running the risk of committing misconduct related to their fiduciary duties. Conversely, if there are beneficial return effects from ESG screening, fiduciary duties instead suggest integrating ESG screening into portfolio management. If ESG screening has no return effect, SRI bond funds offer only non-financial attributes that address specific investors' taste.

Third, litigation risks related to ESG criteria are becoming increasingly material for companies. To cite an example related

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to increasing environmental risks, the number of climate-related events that cause severe losses has increased from fewer than 400 events per year in the 1980s to more than 800 events per year after 2000. Consequently, losses related to such events are constantly increasing, exceeding 200 billion USD in some recent years.¹ Social risks such as substandard worker conditions and safety standards can interrupt corporate supply chains or cause physical harm. For example, the April 2013 collapse of the Rana Plaza factory building in Bangladesh was followed by a consumer outcry to avoid products that are manufactured under unsafe conditions. Probably the most prominent examples of corporate governance risks are financial institutions' litigation payments, which have exceeded 275 billion USD since the financial crisis. Over time, the increasing materiality of ESG risks for companies emphasizes the relevance of ESG risk mitigation for investment portfolios.

Fourth, we observe different ESG screening approach among bond compared to equity SRI portfolio managers. SRI equity fund managers aiming to identify companies that might outperform the market usually focus their attention on the most sustainable or responsible companies. Because of their strong emphasis on risk reduction, SRI fixed-income fund, in contrast, avoid only the most unsustainable or irresponsible companies. Thus, even though SRI bond and equity funds both apply the same ESG data, their screening processes differ tremendously. Prominent examples of these different screenings involve common sustainability benchmark indices. The Dow Jones Sustainability (equity) index is defined as the selection of the 10% most sustainable companies in each industry. In contrast, the Barclays MSCI Corporate Sustainability (bond) index includes 50–75% of the most sustainable companies, i.e., only the 25–50% most unsustainable companies are filtered out. We consider these benchmark indices as representative of the most common SRI equity and bond investment approaches. Thus, an investigation of SRI bond funds is not expected to simply provide empirical findings on a particular asset class. More precisely, in contrast to SRI equity fund studies, we assess whether the bottom end of the sustainability rating scale has economic relevance to investments' financial performance.² Specifically, we investigate whether just the exclusion of bond issuers with the lowest ESG ratings has an effect on the financial performance of bond portfolios.

This study primarily aims to investigate any ESG screening-related return effect using a representative sample of 103 SRI and 309 matched conventional bond mutual funds from the US and the Eurozone. In particular, our study relies on all of the SRI corporate bond funds that are listed on current or historic fund lists provided either by the US Social Investment Forum (US SIF) or the European Social Investment Forum (Euro SIF). We test the hypothesis that screening for ESG criteria has an effect on financial performance. Moreover, this investigation of a potential effect of ESG screening on bond portfolio returns indirectly answers the question of whether ESG risks are material influence factors for corporate bond returns.

Many studies have assessed the financial performance of SRI equity investments. The results of these studies are mixed. Generally, there appears to be no significant difference between the

financial performance of SRI funds and that of conventional equity funds.³ Such findings are in line with the view of [Cheng et al. \(2014\)](#) and [Di Giuli and Kostovetsky \(2014\)](#) that investments in CSR activities are not generally positive net present value activities from the perspective of shareholders. [Flammer \(2015\)](#) investigates shareholder votes on CSR proposals and identifies that the only types of proposals that have a high level of acceptance among shareholders relate to initiatives to overcome labor issues (e.g., nondiscrimination or fairness policies) and initiatives to mitigate environmental hazards. Both this study and [Krueger \(2015\)](#) find a positive effect on shareholder value of CSR initiatives that aim to overcome corporate irresponsibility. Apparently, CSR is of more economic relevance for companies with poor CSR activities than for companies with strong ones. In addition, several pieces of recent evidence support a risk-reduction view of CSR. [Koh et al. \(2014\)](#), for example, identify that strong CSR activities (such as sincere corporate governance, good environmental management, and employee satisfaction) decrease future litigation risks. Moreover, [Godfrey et al. \(2009\)](#), [Goss and Roberts \(2011\)](#), [El Ghouli et al. \(2011\)](#) and [Bouslah et al. \(2013\)](#) provide empirical evidence suggesting that strong CSR activities reduce idiosyncratic firm risks. [Stellner et al. \(2015\)](#) complement that CSR is rewarded in the corporate bond market especially in countries with above average ESG ratings. [Bhojraj and Sengupta \(2003\)](#), [Klock et al. \(2005\)](#), and [Chava et al. \(2009\)](#) find that strong corporate governance mechanisms provide benefits to bond investors, whereas, for example, antitakeover provisions add no value. [Kim et al. \(2014\)](#) and [Callen and Fang \(2015\)](#) identify a higher stock-price crash risk for companies with weak corporate governance monitoring mechanisms or insufficient accounting transparency. [Sharfman and Fernando \(2008\)](#), [Bauer and Hann \(2011\)](#), and [Chava \(2015\)](#) measure a higher cost of debt and weaker credit ratings for companies with higher environmental risks or poor environmental management. Moreover, [Edmans \(2011\)](#) and [Derwall et al. \(2011\)](#) argue that the average capital market participant underestimates the importance of ESG issues. Therefore, CSR activities are neither timely nor efficiently incorporated into market prices. Once the economic influence of such issues materializes, stocks of companies with low ESG ratings decrease and vice versa. [Koelbel and Busch \(2013\)](#) complement this view and identify negative stock price reactions to negative media news on corporate ESG issues. We believe these arguments are of even greater relevance for bond investments, because bonds are generally less efficiently priced than stocks.

We contribute to the discussion of SRI and ESG's economic relevance with an economically and statistically significant outperformance of 0.33–0.49% annually of SRI compared to conventional bond funds during the period 2001–2014.⁴ We argue that this result is the outcome of a systematic effect of social screening on financial performance caused by the hypothesized risk

¹ Climate-related events include climatological, hydrological and meteorological events. The number of events and their loss quantifications are available from Munich Re's NatCatSERVICE as of January 2015.

² Further anecdotal evidence related to fixed-income portfolio managers suggests that ESG data are predominantly applied to reduce corporate risks; that evidence can be found in the transparency reports of signatories to the United Nations Principles for Responsible Investing. For example, PIMCO describes its primary reason for choosing ESG integration as follows: "In our view, the term ESG refers to an investment process that considers environmental, social and governance risk factors when assessing the long-term sustainability of a company or government. We believe that the consideration of these ex-financial risk factors leads to a more robust assessment of our investments."

³ The extensive literature on SRI equity mutual funds provides mixed results on the financial performance impact of ESG screenings for different time series, geographic regions and research methods. Three studies find significant underperformance of SRI ([Renneboog et al., 2008a,b](#); [Belghitar et al., 2014](#)). Three studies report no significant difference compared to conventional investments ([Bauer et al., 2005](#); [Kreander et al., 2005](#); [Gregory and Whittaker, 2007](#)). Seven studies assess mixed results with regard to different ESG-screening methods, asset classes and time periods ([Galema et al., 2008](#); [Derwall and Koedijk, 2009](#); [Derwall et al., 2011](#); [Renneboog et al., 2011](#); [Nofsinger and Varma, 2014](#); [Borgers et al. \(2015\)](#); [Flammer, 2015](#)). [Derwall et al. \(2005\)](#) and [Kempf and Osthoff \(2007\)](#) find that a "best-in-class" screening for ESG criteria generates significantly outperforming stock portfolios. [Abdelsalam et al. \(2014\)](#) identify performance persistence among the best and worst SRI funds.

⁴ To the best of our knowledge, this is the first paper to investigate how ESG screening methods impact the risk-adjusted financial performance of bond portfolios. In a previous paper, [Derwall and Koedijk \(2009\)](#) analyze the financial performance of US-oriented SRI fixed-income funds with a dataset of 15 bond funds and nine balanced funds over the period 1987–2003. They find a statistically significant outperformance of SRI balanced funds and a similar performance of SRI bond funds compared to their conventional peers. Prior to the year 2000, SRI bond investing was mostly related to the exclusion of weapon, alcohol, tobacco and gambling companies.

reduction conferred by CSR activities in combination with SRI bond funds' exclusion of irresponsible corporate bond issuers.

To further explore the outperformance of SRI bond funds, we evaluate fund portfolio holdings by matching each corporate bond position with an ESG rating. This allows us to measure ESG risks at the portfolio level using sustainability ratings from Sustainalytics.⁵ We reveal two findings on SRI bond funds. First, one-third of funds that claim to be socially responsible invest in portfolios with ESG ratings below the average of conventional funds. We consider these conventional funds as in disguise. Second, the remaining two-thirds of funds appear to integrate ESG criteria by especially excluding bonds of companies with very low ESG ratings. The direct assessment of the exposure of each fund portfolio to ESG risks allows for a more precise performance measurement of only those SRI bond funds that conduct an ESG screening. Consistent with our hypotheses, SRI bond funds with an ESG screening are particularly likely to outperform by 0.58–0.70% annually. The returns of the remaining SRI bond funds show no difference from conventional funds. To further test whether there is a systematic effect of social screening on financial returns, we conduct multifactor model regressions with an ESG screening-related return factor. After controlling for this ESG-specific factor, fund alphas of SRI bond funds decline significantly. As the next step, we apply this ESG return factor in a performance-attribution analysis. It turns out that the ESG screening component explains 8–10% of the return variation of SRI bond funds. Thus, the return variation that arises from the bond portfolio ESG screening explains a significant share of the active return.

By looking at different market regimes, we further investigate whether the outperformance of SRI bond funds relates to a potential risk-reduction effect of CSR. More specifically, the risk-mitigation view assumes that bond issuers with high ESG ratings manage ESG risks more effectively and therefore are less exposed to risks. *Shefrin and Statman (1993)* and *Hirshleifer (2008)* find that investors examine firm risks and corporate behavior more closely when the economy is weak. If investors indeed pay greater attention to ESG risks in times of crisis, we infer that any positive effect for bond portfolio performance caused by ESG screening should be especially likely to occur during crisis periods such as economic recessions or bear markets. In line with this argument, *Nofsinger and Varma (2014)* show a downside risk-reduction effect for SRI equity investments caused by SRI equity funds' outperformance during stock market crises. *Lins et al. (2015)* argue that companies can build trust among their investors with strong corporate social responsibility (CSR) activities. They find a strong outperformance of companies with strong CSR during the financial crisis, but no return difference between high and low CSR companies either before or after the crisis period.

In this study, we identify a strong outperformance for SRI bond funds during crisis periods of 0.65–0.74% for the US sample and of 0.77–0.92% for the Eurozone sample. In turn, the return difference of SRI bond funds compared to conventional funds in non-crisis periods is smaller and, especially during non-bear market periods, statistically insignificant. Thus, the outperformance of SRI bond funds during the period 2001–2014 arises because of the sequence of three crisis periods: the burst of the dot-com bubble in 2001–2003; the financial crisis in 2008–2009; and the Eurozone sovereign debt crisis, especially in the years 2011–2012. In conclusion, our findings provide additional empirical evidence for the risk-reduction view of CSR activities.

In the final section of the paper, we perform several robustness checks. Potential alternative explanations for our results include variations in fund manager skills, omitted risk factors, investment styles, cross-sectional differences in fund characteristics, differences in social screening over time and across funds and a SRI label effect. Overall, the identified effects of social screening on bond fund returns are consistent for the US and Eurozone samples and robust to the application of various factor models, alternative sustainability ratings, annual fund portfolio evaluations, various fund-level control variables, potential SRI label effects and survivorship bias. Moreover, we reconfirm a crisis period related return effect from ESG screening out-of-sample among socially screened corporate bond indices in comparison to conventional bond indices.

The remainder of this paper includes a market and data overview in Section 2; empirical results on financial performance, portfolio holdings and performance attribution on SRI bond funds in Section 3; a discussion of alternative explanations and robustness tests in Section 4; and a conclusion in Section 5.

2. Market and data overview

This study focuses on corporate bond mutual funds in the two largest markets, the US and the Eurozone, because of those markets' high level of transparency and data availability. The market for SRI has grown to a considerable segment of investments because of those investments' very high growth rates. According to the US SIF 2014 Report on Sustainable and Responsible Investing Trends in the United States, the SRI market reached 6.6 trillion USD in total assets under management by the beginning of 2014. This segment covers approximately 18% of the entire 37 trillion USD in total assets under management tracked by Thomson Reuters in the US. Based on data from the Center for Research in Security Prices (CRSP), mutual fund database assets under management by all US SRI bond mutual funds had a compound annual growth rate of approximately 12% compared to an overall market growth of 8% per year from 1995 until 2014. According to the Euro SIF European SRI Studies (2006, 2008, 2010, 2012, 2014), the European SRI market had a compound annual growth rate of approximately 31% from 2005 until 2014 and reached the size of 7 trillion Euros. This accounts for the largest market of SRI investments globally. Overall, SRI with bonds accounts for 40% of all SRI assets under management.

With an SRI and matched conventional bond fund sample, we investigate the financial performance of SRI with bonds. In a matching process, three non-SRI funds are selected for each SRI fund with the same yield objective (investment-grade versus high-yield), a comparable maturity range, and almost the same fund age and end of sample size.⁶ If fund coverage ended during the sample period, conventional funds that ceased to exist in approximately the same calendar year are included. Thus, we avoid any look-ahead bias by generating a dataset in which the survival rate of a fund is a matching criterion. Therefore, the survival rates for the SRI and conventional samples are identical. This generates a dataset free of survivorship bias that contains 103 SRI and 309 conventional corporate bond funds. Furthermore, all of the conventional funds are selected from 98 US and 109 Eurozone different fund families to avoid any performance influence by large fund families. The classification of SRI funds is based on fund lists from either US SIF or Euro SIF.⁷ Funds without an explicit description of their investment

⁵ Sustainalytics supports this study by providing sustainability ratings and sub-scores for the three ESG criteria. Sustainalytics emerged from leading sustainability research companies with more than 20 years of experience in Germany, the Netherlands, Spain and Canada, which merged to become a leading sustainability rating agency with more than 100 ESG analysts in 13 countries covering more than 5,000 companies of all of the major stock and bond indices worldwide.

⁶ In most cases, conventional funds are selected with inception in the same year as the respective SRI fund and the closest match in the end-of-sample total net assets. Especially for Eurozone and high-yield funds, the matching of inception dates is extended to three years around SRI fund inception because of a limited number of matching funds.

⁷ The US SIF and Euro SIF lists are matched with information from Morningstar, Bloomberg and national social investment forums, Novethics for France, Ecoreporter for Germany and SRI Fund Advice for the US.

Table 1
Summary statistics on fund characteristics.

	US sample					Eurozone sample				
	SRI funds		Conventional funds		Difference	SRI funds		Conventional funds		Difference
	Mean (1)	Median (2)	Mean (3)	Median (4)		Mean (6)	Median (7)	Mean (8)	Median (9)	Mean (10)
<i>Fund characteristics</i>										
Fund age (years)	15.6	13.5	15.6	16.0	0.0	11.0	9.0	10.2	9.0	0.9
t-Value					(−0.03)					(0.94)
Fund size (mln)	641	301	524	137	117	186	45	118	49	68
t-Value					(0.83)					(1.59)*
Expense ratio (%)	0.66%	0.75%	0.85%	0.74%	−0.19%	0.89%	0.83%	0.96%	0.91%	−0.06%
t-Value					(−2.54)***					(−1.14)
Management fees (%)	0.51%	0.50%	0.42%	0.40%	0.09%	0.69%	0.60%	0.78%	0.73%	−0.09%
t-Value					(2.40)**					(−1.13)
Front load (%)	1.26%	0.00%	1.02%	0.00%	0.24%	1.74%	1.25%	2.21%	2.50%	−0.46%
t-Value					(0.75)					(−1.93)**
Back load (%)	0.59%	0.00%	0.60%	0.00%	−0.01%	0.02%	0.00%	0.21%	0.00%	−0.19%
t-Value					(−0.05)					(−2.06)**
Sales (12B-1) fees (%)	0.13%	0.13%	0.20%	0.02%	−0.07%					
t-Value					(1.50)*					
Maturity (years)	9.9	8.4	10.2	10.3	−0.3	5.3	5.8	5.8	5.7	−0.6
t-Value					(−0.31)					(−1.28)
Duration (years)	4.8	4.4	4.9	5.1	−0.1	4.8	5.1	5.0	5.0	−0.2
t-Value					(−0.16)					(−0.19)
Diversification ratio	0.02	0.02	0.03	0.02	−0.01	0.0384	0.0294	0.0650	0.0407	−0.0267
t-Value					(−1.03)					(−2.41)***
Turnover ratio	1.40	1.01	1.48	0.82	−0.08					
t-Value					(−0.25)					
Manager tenure (years)	10.4	10.0	9.2	9.0	1.3					
t-Value					(0.13)					
Fund family size (mln)	245,318	30,324	391,771	124,300	−146,453	8000	2,882	6408	2320	1591
t-Value					(−1.10)					(1.33)*
Number of funds	N = 38		N = 114			N = 65		N = 195		

In this table lists characteristics of SRI and conventional bond funds for US and Eurozone samples. For each criterion the table reports mean and median values for SRI and conventional bond funds separately. *t*-Values indicate significance of sample mean comparison tests with unequal variances for the comparison of SRI with conventional funds. 12b-1 fees, fund turnover ratios and tenure of portfolio managers are only available for the US sample. All characteristics are end-of-sample values for calendar year 2014. ***, ** and * asterisks indicate *p*-values for significance at the 1%, 5% and 10% levels.

process with respect to ESG integration are excluded. Each fund in the sample of SRI bond funds claims to conduct a screening for ESG criteria, thereby fulfilling the US and European definitions of SRI.⁸ Furthermore, variable annuities, funds of funds and funds with more than 25% of fund holdings in equity or less than 50% of fund holdings in corporate bonds at any point in time are excluded. In this study, we analyze 38 US and 65 Eurozone SRI corporate bond funds with 24 billion USD and twelve billion EUR, respectively, of assets under management. A minimum of twelve months of fund history and available fund portfolio holdings are required. For the financial performance measurement, the primary data sources are the CRSP Survivorship Bias-Free US Mutual Fund Database for the US sample and Bloomberg for the Eurozone sample. All fund holdings based on single bond positions are retrieved from Bloomberg for end of the calendar years 2010–2014. This database provides no earlier fund holdings data. Therefore, we retrieved additional fund holdings data for the US sample from CRSP for the entire sample period of 2001–2014.

Tables A1 and A2 in the internet appendix contain complete lists of all US and Eurozone SRI bond funds, including names and descriptive information for each mutual fund. We deliberately analyze the years after 2000 in order to cover only the period when

screening for ESG criteria became the common standard for SRI bond funds.⁹ Table 1 provides summary statistics for fund characteristics of SRI and matched conventional funds.

Table 1 shows descriptive statistics for expense ratios, management fees, front and back loads, fund age, fund size, fund family size, average fund maturities, option adjusted durations as well as diversification ratios based on sums of squared weights of fund holdings. For the US sample only, we additionally list fund portfolio turnover, portfolio manager tenure and 12b-1 sales fees. Results of two samples mean comparison tests indicate for most fund characteristics of the US sample that there are no statistically significant differences. However, management fees are slightly higher and expense ratios as well as 12b-1 fees of SRI funds are slightly lower compared to conventional funds. The comparison of fund characteristics for the Eurozone sample shows significantly lower fund loads and diversification ratios as well as slightly higher fund and fund family sizes of SRI funds compared to conventional funds. These descriptive statistics contradict the view that SRI bond mutual funds might diversify less and views by conventional media that the market segment of SRI funds might be more expensive than conventional funds in order to recover cost for additional portfolio screenings. The differences in annual expenses and sales fees are of no concern for the financial performance measurement as we assess total returns before any expenses or sales fees of fund portfolios. Thus, differences in fees cannot bias the evaluation.

⁸ For the US sample, the funds' investment process descriptions are all consistent with US SIF's 2005 definition: "An investment process that considers the social and environmental consequences of investments, both positive and negative, within the context of rigorous financial analysis." For the Eurozone SRI funds, we refer to the Euro SIF's commonly used 2008 definition of SRI: "A generic term covering ethical investments, responsible investments, sustainable investments, and any other investment process that combines investors' financial objectives with their concerns about environmental, social and governance (ESG) issues."

⁹ The understanding of responsible investments has changed tremendously in the last 20 years. In the 1980s and 1990s, SRI bond funds primarily made religious exclusions of tobacco, alcohol, gambling and weapons companies. Major developments of different screening methods for SRI were only published at the end of the 1990s.

Moreover, robustness tests control for any influence of fund characteristics on financial performance.

3. Empirical results for socially responsible bond funds

3.1. Financial performance measurement

For the financial performance measurement of bond funds, a five-factor model is applied that combines the approaches of Cornell and Green (1991), Blake et al. (1993), Fama and French (1989) and Elton et al. (1995). The five factors include an AGGREGATE, a DEFAULT, an EQUITY, an OPTION and a TERM factor. The AGGREGATE factor consists of the excess total returns of a US broad investment-grade corporate bond index over one-month treasury yields. The DEFAULT factor is based on the excess total returns of a US high-yield corporate bond index over an investment-grade government-bond index with comparable average durations. The EQUITY factor is generated from the excess returns of the S&P 500 total return equity index over the one-month treasury yields. The OPTION factor is calculated from the excess total returns of a US GNMA securitized debt index return over an investment-grade government bond index with comparable average durations to cover both, bonds' option characteristics and the market for securitized debt. The TERM factor conforms to the return differences between long- and short-term investment-grade government-bond indices to cover the term structure slope, which indicates the expectations of market participants with respect to changes in interest rates over time.¹⁰ In this study, we utilize the indices of Barclays Capital to derive the benchmark variables. The following time-series regression Eq. (1) is applied to all SRI and conventional bond funds:

$$(R_{p,t} - R_{f,t}) = \alpha_p + \beta_a(R_{a,t} - R_{f,t}) + \beta_d(R_{h,t} - R_{g,t}) + \beta_e(R_{e,t} - R_{f,t}) + \beta_o(R_{s,t} - R_{g,t}) + \beta_m(R_{glong,t} - R_{gshort,t}) + \epsilon_{p,t}, \quad (1)$$

where the dependent variable is the monthly return of fund portfolio p minus the one-month treasury yields in month t ; the alpha of each bond mutual fund p equals the constant α_p ; β_a is the estimated factor exposure to the broad investment-grade corporate bond index return $R_{a,t}$ in excess of the one-month treasury yields $R_{f,t}$; β_d and β_e are sensitivities for returns of a broad index of high-yield corporate bonds $R_{h,t}$ in excess of investment-grade government bond index returns $R_{g,t}$ and the excess returns of the equity market indices $R_{e,t}$ over the one-month treasury yields; β_o and β_m are the sensitivities to the excess returns of a broad index of securitized debt $R_{s,t}$ over a government bond index with comparable average durations and the return differences between long- and

short-term government bond indices $R_{glong,t}$ and $R_{gshort,t}$ and $\epsilon_{p,t}$ is the error term at time t which cannot be explained.

In Table 2, we report equally weighted average monthly returns of all SRI and conventional bond funds based on monthly excess returns over the risk-free rate and before costs. Moreover, Table 2 lists regression results of the risk-adjusted performance measurement with the five-factor model. To remove any potential influence of heteroskedasticity or autocorrelation, we apply Newey and West's (1987) standard errors with a lag of twelve months.

The time series of equally weighted fund returns in Table 2 indicates annual returns for US and Eurozone SRI bond funds that are one-half of one percent higher than those of conventional bond funds. Risk-adjusted annualized alphas of the return difference of equally weighted SRI minus equally weighted conventional funds reach a statistically significant 0.33% for the US and 0.49% for the Eurozone. Furthermore, Table 2 reports adjusted R^2 s of 86–90% for regressions of average SRI and average conventional bond fund returns, which indicates a good fit of the five-factor model. The time series variation of differences between equally weighted SRI and equally weighted conventional bond fund returns can be explained by 31% for the US sample and by 36% for the Eurozone sample. In the US, the return difference has a positive exposure to the aggregate corporate bond return, the default risk premium and the OTION factor, which indicates higher sensitivities of SRI bond fund returns to these factors. The Eurozone return difference has higher sensitivities to the AGGREGATE and OPTION factors and negative exposure to the DEFAULT and EQUITY factors, which indicates lower sensitivities to these factors. The insignificance of the TERM factor in both regressions indicates that the return difference of SRI compared to conventional funds is unrelated to any difference in fund maturities or durations.

The outperformance of SRI over conventional bond funds in the US and Eurozone over the period 2001–2014 raises several additional questions. In the following chapters, we investigate this return difference based on evaluations of fund portfolio holdings, performance attributions and financial performance in sub-periods.

3.2. Fund portfolio evaluation

The major difference between SRI and conventional bond funds is that SRI fund managers claim to reduce corporate ESG risks. Therefore, we hypothesize that the overall outperformance of SRI bond funds relates to the screening for ESG criteria. We continue with an assessment of the extent to which SRI bond funds invest in different portfolios than do conventional funds. Therefore, we measure average sustainability ratings of corporate bond issuers of all portfolio holdings for both SRI and conventional funds. For this social evaluation of bond fund portfolios, we follow the methodology of Statman (2006). He measures the degree of sustainability overall and separately for ESG criteria of US equity indices. More specifically, he utilizes corporate ESG data for US stock companies and generates average values for SRI and conventional indices. Kempf and Osthoff (2008) apply this approach to analyze US SRI equity funds. To the best of our knowledge, we are the first to assess the degree of social screening in fixed-income portfolios. To apply the same sustainability ratings to fund holdings of US and Eurozone funds, we choose company sustainability ratings from Sustainalytics because of their global coverage of corporate bond issuers. Thereby, the understanding of sustainability both in general and for specific ESG criteria follows Sustainalytics' sustainability assessments. This agency considers not only general qualitative and quantitative data but also industry-specific measures of sustainability. The quarterly ratings are measured on a metric scale from one (worst) to 100 (best) points for

¹⁰ We follow the rationale of Fama and French (1989) to include an equity factor to explain bond fund returns. However, we only apply one equity factor instead as the three that they propose, because Elton et al. (1995) achieve better explanatory power for factor models with relatively more bond- than equity-specific factors. For example, Du et al. (2009) test both models and find that the Elton et al. (1995) model outperforms the Fama and French (1989) model. Elton et al. (1995) obtain no statistical significance for a term structure factor and apply the remaining four factors, changes in expected inflation rates and changes in the expected growth of gross national product to cover expectations of future changes in interest rates and economic growth. Because the term structure and equity factors cover these economic rationales in the five-factor model, we do not add the two fundamental variables. The five regression factors for the Eurozone sample measure the sensitivity to the broad Eurozone investment-grade corporate bond index returns in excess of one-month German government bond yields, the returns of the Eurozone high-yield corporate bond index in excess of the investment-grade government bond index with comparable average durations, the excess returns of the Eurostoxx 600 total return equity index over the one-month German government bond yields, the excess returns of the Eurozone securitized debt index returns over the investment-grade government bond index with comparable average durations and the return differences between the long- and short-term investment-grade government bond indices.

Table 2

Average socially responsible and conventional fund returns.

	US sample			Eurozone sample		
	SRI funds (1)	Conventional funds (2)	Difference (3)	SRI funds (4)	Conventional funds (5)	Difference (6)
Annual return	4.29%***	3.78%***	0.49%***	3.03%***	2.49%***	0.52%***
t-Value	(4.43)	(4.11)	(3.30)	(4.31)	(3.64)	(2.44)
Five factor alpha	1.43%***	1.10%***	0.33%**	0.70%*	0.21%	0.49%**
t-Value	(4.02)	(3.20)	(2.52)	(1.78)	(0.83)	(2.03)
Aggregate factor	0.41***	0.39***	0.02**	0.61***	0.54***	0.07**
t-Value	(5.34)	(5.20)	(2.05)	(11.42)	(12.23)	(2.44)
Default factor	0.00***	0.00***	0.00***	−0.04***	−0.01	−0.03**
t-Value	(3.04)	(2.70)	(4.15)	(−3.20)	(−0.57)	(−2.06)
Equity factor	0.00	0.00	0.00	0.01	0.02***	−0.01***
t-Value	(−0.56)	(−0.09)	(−0.78)	(1.43)	(2.76)	(−3.40)
Option factor	−0.25***	−0.28***	0.03**	−0.08**	−0.27***	0.19***
t-Value	(−4.95)	(−5.40)	(2.11)	(−2.17)	(−4.24)	(3.94)
Term factor	0.06	0.07*	0.00	0.06***	0.07***	−0.01
t-Value	(1.50)	(1.66)	(−0.46)	(4.73)	(6.16)	(−1.03)
Adj. R ²	0.88	0.86	0.31	0.90	0.90	0.36
Number of funds	N = 38	N = 114		N = 65	N = 195	

In this table reports average annual returns and five factor model alphas for equally weighted monthly returns of SRI and matched conventional funds as well as the difference of these two time series over the period 01/2001 until 12/2014. Five factor models are applied as described in Section 3.1. Alphas are annualized. *t*-Values in the first row indicate if values are significantly different from zero. In all other rows *t*-values report the significance of regression coefficients based on Newey and West (1987) standard errors with a lag of twelve months. ***, ** and * asterisks indicate *p*-values for significance at the 1%, 5% and 10% levels.

corporate ESG criteria. For the fund portfolio evaluation, ESG ratings for bond issuers are applied to each corporate bond position of each fund's holdings. The extensive scope of sustainability ratings from Sustainalytics covers the majority of all fund holdings.¹¹ For each fund, the portfolio scores for corporate bonds are calculated based on equally weighted scores for ESG and the individual ESG categories. The ESG ratings of the first quarter of a calendar year are applied for the fund holdings of the last quarter of the previous calendar year to best match these data in time. To provide a first overview of the aggregate portfolio holdings of SRI bond funds, Fig. 1 compares the relative distributions of corporate ESG ratings, normalized on a scale between zero and one, among corporate bond indices and the aggregate corporate bond portfolio holdings of all SRI funds.

Fig. 1 displays distributions of corporate ESG ratings in the upper half for US and Eurozone corporate bond indices and in the lower half for US and Eurozone aggregate SRI bond funds. The comparison of the aggregate SRI bond portfolio with the respective index indicates much fewer observations of ESG scores in the lowest quartile, slightly fewer observations in the second lowest quartile and slightly more observations in the higher two quartiles. This suggests that the average portfolio manager of a SRI bond fund reduces the fund's exposure, especially to corporate bonds with very low ESG ratings. Moreover, the aggregate SRI bond portfolio appears to invest in a broad range of companies instead of focusing on the companies with the very highest ESG ratings. This suggests that portfolio managers of SRI bond funds conduct a "worst-in-class" exclusion instead of a "best-in-class" portfolio screening, which is common among SRI equity funds.

A brief analysis of bond fund holdings indicates some international bond positions in most fund portfolios. Therefore, we now compare SRI with conventional bond fund portfolios instead of with a domestic index. We generate annual, equally weighted ESG scores for each portfolio and aggregate this data into one value for each fund. Therefore, we normalize all of the annual fund scores and take the time-series average of these scores for each fund. Table 3 provides empirical results for comparisons of ESG scores of SRI and conventional funds in the US and the Eurozone.

The upper half of Table 3 reports two sample mean comparison test results for the US and Eurozone samples separately. In both samples, the average ESG fund scores are higher for SRI than for conventional funds. However, this difference is much stronger and highly statistically significant for the Eurozone sample only. Statistically, the difference of US SRI bond funds is significant only for the total ESG and the social and environmental sub-score.¹² Kempf and Osthoff (2008) apply such equally weighted portfolio scores to show differences between SRI equity funds, where the majority of funds follow a "best-in-class" screening, and conventional funds. As described above in Fig. 1, the strongest difference between SRI and conventional bond portfolios appears to stem from an exclusion of companies with the lowest ESG ratings. To better display this difference between SRI bond funds and conventional funds, we repeat the two sample mean comparison tests based on semi-portfolio ESG scores in the lower half of Table 3. These scores are based on equally weighted corporate ESG ratings of the lower half of portfolio holdings, i.e., all observations below the median ESG rating of a fund. If the majority of SRI bond funds are especially likely to exclude bond issuers with the lowest ESG scores, the differences between SRI and conventional bond fund portfolios become more visible with this alternative score. Indeed, in the lower half of Table 3, differences in semi-portfolio scores are even more significant for the total ESG and each sub-score for ESG. The only exception remains corporate governance among US SRI funds. We believe that this is the case, because in an international comparison the overall level of corporate governance ratings of US companies is on average very high.

To verify the results above, we perform two robustness tests. First, we assess robustness with respect to the provider of ESG ratings. Table A3 in the internet appendix reports comparable results for the US sample with MSCI ESG ratings (formerly known as KLD ratings) instead of Sustainalytics ratings. Again, US SRI bond fund portfolios appear to invest in companies with higher environmental and social ratings. But there is no significant difference regarding corporate governance. Second, we test the robustness of all

¹¹ In 2014, for the US sample the coverage reaches 82% of corporate bonds for SRI funds and 79% for conventional funds. For the Eurozone funds, corporate bond positions are covered by 92% for SRI funds and by 88% for conventional funds.

¹² The statistical results for bond funds' ESG scores are robust if instead of applying an equally weighting approach, one applies a value weighting approach for each bond portfolio position. For the US and Eurozone SRI bond funds, almost all ESG criteria achieve the same levels of statistical significance or insignificance.

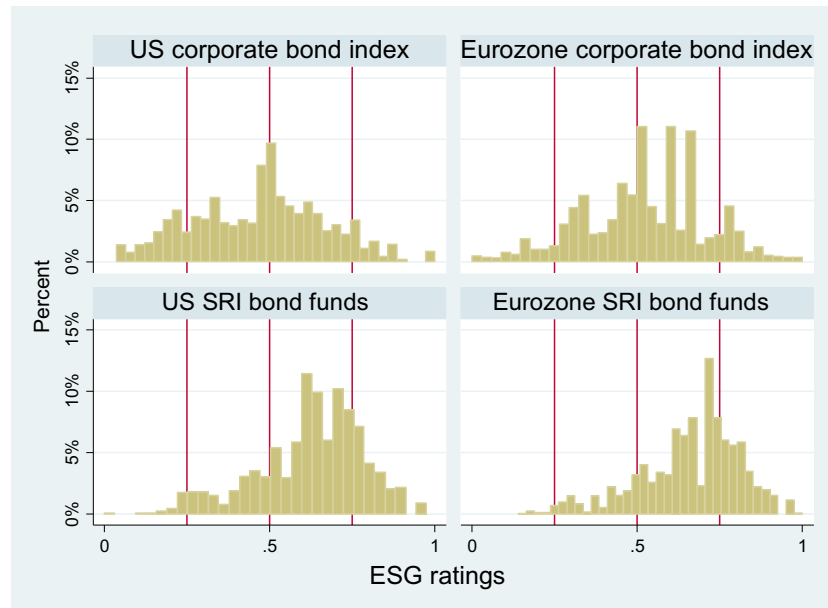


Fig. 1. Histogram of corporate sustainability ratings. In this figure depicts the relative distribution of ESG ratings among US and Eurozone Barclays Corporate Bond indices in the upper half in comparison to aggregate portfolios of all US and all Eurozone investment grade SRI bond funds in the lower half. The index constituents and fund holdings are applied as of end of December 2014. ESG ratings are normalized between zero and one among all bonds of the US index/US SRI bond funds and among all bonds of the Eurozone index/Eurozone SRI bond funds separately.

Table 3
Descriptive statistics for ESG scores of fund portfolios.

	US sample 2003–2014					Eurozone sample 2010–2014				
	Sample size (1)	ESG (2)	G (3)	S (4)	E (5)	Sample size (6)	ESG (7)	G (8)	S (9)	E (10)
<i>Portfolio ESG scores</i>										
Means of SRI funds	N = 38	0.55	0.54	0.56	0.62	N = 65	0.62	0.66	0.65	0.63
Means of conventional funds	N = 114	0.51	0.56	0.51	0.55	N = 195	0.52	0.58	0.55	0.54
Difference in means		0.04	−0.02	0.05	0.07		0.10	0.07	0.09	0.09
t-Value		(1.50)*	(−0.95)	(1.84)**	(2.07)***		(3.20)***	(2.96)***	(3.56)***	(3.74)***
<i>Semi-portfolio ESG scores</i>										
Means of SRI funds	N = 38	0.59	0.55	0.58	0.63	N = 65	0.59	0.58	0.58	0.63
Means of conventional funds	N = 114	0.52	0.54	0.49	0.52	N = 195	0.47	0.48	0.45	0.51
Difference in means		0.07	0.01	0.09	0.11		0.12	0.10	0.13	0.12
t-Value		(1.93)**	(0.21)	(2.66)***	(3.12)***		(3.72)***	(3.48)***	(4.17)***	(4.02)***

In this table reports average ESG scores of SRI and conventional bond funds in the US for the period 2003–2014 and the Eurozone for the period 2010–2014. End of year fund portfolio holdings are matched by each corporate bond position with scores of ESG, environmental, social and governance sustainability ratings. In the upper half of the table the entire fund portfolios are considered. In the lower half of the table only portfolio holdings with ESG ratings below the median observation of the respective fund are included. Each portfolio position is equally weighted. Fund score values are normalized between zero and one within the US and Eurozone samples separately and for each year. The time-series average normalized fund scores of SRI and conventional funds are compared with two sample mean comparison tests with unequal variances. ***, ** and * asterisks indicate *p*-values for significance at the 1%, 5% and 10% levels.

findings on the ESG scores of SRI bond funds by performing a comparison with broad investment-grade indices of corporate bonds in the US and the Eurozone. Results are reported in Table A4 of the internet appendix. On average, Eurozone SRI bond funds invest in companies with significantly higher ESG ratings compared to the benchmark index. For the US sample the differences are minor. We believe that this is due to a higher share of conventional funds in disguise among the SRI bond funds in the US compared to the Eurozone sample.¹³

Kempf and Osthoff (2008) apply another assessment of social values for SRI funds by ranking all funds into quintiles according

to their sustainability scores. Therefore, the time-series average of fund scores for each fund are ranked and split into five groups of equal size. Table 4 reports the distribution of SRI and conventional bond funds into quintiles based on scores for ESG and separately for each ESG criterion.

The values for ESG in Table 4 indicate only slightly higher distributions of US SRI funds in the highest two quintiles compared to an almost equal distribution of US conventional funds. For social and environmental sustainability the SRI funds are more frequently classified into the highest two quintiles and less frequently into the lowest two quintiles. However, for corporate governance sub-scores SRI funds appear to hold portfolios of companies with slightly below rather than above average ratings. This result contradicts the results in Kempf and Osthoff (2008) for US equity funds. In a comparable ranking, those authors find that approximately 75% of all SRI equity funds are distributed to the highest

¹³ Furthermore, we consider the comparison of fund portfolio holdings with domestic indices in Table A4 as less suitable than the analyses in Table 3, because most fund holdings of SRI and conventional bond funds include corporate bonds of international companies.

Table 4
Ranking of ESG scores for socially responsible and conventional funds.

	US sample 2003–2014								Eurozone sample 2010–2014							
	SRI funds				Conventional funds				SRI funds				Conventional funds			
	ESG (1)	G (2)	S (3)	E (4)	ESG (5)	G (6)	S (7)	E (8)	ESG (9)	G (10)	S (11)	E (12)	ESG (13)	G (14)	S (15)	E (16)
<i>Quintiles</i>																
0–20%	16%	26%	16%	16%	22%	17%	22%	21%	12%	6%	11%	12%	23%	25%	23%	23%
20–40%	18%	21%	16%	11%	21%	19%	22%	24%	7%	15%	14%	6%	25%	22%	22%	25%
40–60%	21%	16%	21%	18%	19%	22%	19%	22%	26%	28%	27%	24%	18%	17%	17%	18%
60–80%	21%	18%	18%	29%	20%	21%	21%	16%	30%	32%	20%	30%	17%	16%	20%	17%
80–100%	24%	18%	29%	26%	18%	21%	16%	18%	25%	19%	28%	28%	18%	20%	17%	17%
Probability of highersocial ranking	58%	44%	61%	60%					65%	62%	62%	66%				

In this table shows the distribution of equally weighted ESG, environmental, social and governance scores of SRI and conventional bond funds into quintiles for the US for the period 2003–2014 and the Eurozone for the period 2010–2014. End of year fund portfolio holdings are matched by each corporate bond position with scores of ESG, environmental, social and governance sustainability ratings. Each portfolio position is equally weighted. Fund score values are normalized between zero and one within the US and Eurozone samples separately and for each year. The time-series average of normalized fund scores of all SRI and conventional funds are ranked. Based on this ranking, funds are separated into five quintiles of equal amounts of funds. Percentage values report how many SRI or conventional funds are ranked into each quintile. In addition, the table reports results of simulations of one million draws of random pairs of a SRI and a conventional fund of each sample and indicate the probability that the equally weighted ESG score of the SRI fund is higher than the respective score of the conventional fund.

two quintiles compared to an even distribution for conventional funds across all five quintiles. For the Eurozone sample, [Table 4](#) reports supporting evidence that fund managers of SRI bond funds achieve higher social rankings than their conventional peers. There are fewer observations among the lowest two quintiles and more observations in the highest two quintiles. However, this distribution into quintiles is again completely different from the findings of [Kempf and Osthoff \(2008\)](#).

Furthermore, [Table 4](#) lists probabilities for SRI fund scores being higher than the probabilities for conventional funds. Following the simulation method of [Kempf and Osthoff \(2008\)](#), we draw one million random pairs of SRI and conventional funds. For the US, the probabilities that the ESG scores of SRI bond funds are higher than those of conventional funds are 44–61%. For the Eurozone, the probabilities are between 62% and 66% that SRI bond funds hold portfolios of corporate bonds with higher ESG scores. After considering all analyses on portfolio holdings, we identify two main findings. First, there appear to be some SRI bond funds that hold portfolios comparable to conventional funds. Therefore, we conclude that not all SRI bond funds integrate ESG criteria into their bond selection process to the same extent. Several US and Eurozone SRI bond funds appear to be conventional funds in disguise. Second, SRI bond funds invest in much broader portfolios than SRI equity funds. The distribution of SRI bond funds into quintiles shown in [Table 4](#) is inconsistent with the common “best-in-class” screening. As indicated in [Fig. 1](#), there rather appears to be an exclusion of very low ESG ratings in most SRI bond fund portfolios. Accordingly, fund managers screen out corporate bond issuers with very high ESG risks only. This can best be described as a “worst-in-class” exclusion screening. The combination of both findings largely explains the various distributions into quintiles and the various probabilities for higher social rankings compared to those found in [Kempf and Osthoff \(2008\)](#) for SRI equity funds.

The evaluation of each fund portfolio offers the unique possibility of splitting the overall sample of SRI bond funds into those that obviously apply an ESG screening and those that apparently do not screen for ESG criteria. For 23 of the US SRI funds and 46 of the Eurozone SRI funds, the time-series average fund score is above the mean fund score of conventional funds. Henceforth, we apply this separation of the SRI bond funds when we refer to SRI funds with or without ESG screening. In [Table 5](#) we provide summary statistics on risk-adjusted financial performance measurements with the [Elton et al. \(1995\)](#) five-factor model for all SRI bond funds, separated sub-samples of SRI funds with or without ESG screening and respective conventional funds.

Based on the five-factor model alphas, US SRI bond funds achieve statistically significant 0.42% higher risk-adjusted annualized returns. The level of outperformance and statistical significance increases if I consider only SRI bond funds with ESG screening. These funds beat their conventional peer group by 0.58%. Thus, for the US this analysis indicates that in general, SRI funds outperform conventional funds. The sub-sample of US SRI funds without ESG screening achieves risk-adjusted returns comparable to those of conventional funds. For the Eurozone sample, [Table 5](#) lists 0.49% higher fund alphas for SRI compared to conventional funds. For SRI funds with ESG screening, the difference reaches 0.70% higher annual alphas and there is no return difference for SRI funds without ESG screening. Thus, the financial performance of US and Eurozone SRI bond funds suggests that those funds that hold fund portfolios with higher average ESG scores compared to conventional funds are especially likely to achieve an outperformance.¹⁴ Because of the obvious correlation between fund performance and fund portfolio holdings, we conclude that social screening of bond portfolios has a systematic effect on financial performance. To assess that systematic return effect, we add a sixth factor to the [Elton et al. \(1995\)](#) five-factor model. More specifically, we generate a time-series of return differences between the Barclays Corporate Bond index and the Barclays MSCI Corporate Sustainability index. Columns (4) and (9) of [Table 5](#) provide descriptive statistics of the fund alphas of this customized multifactor model that incorporates an extra factor for ESG screening. For SRI funds in the US and the Eurozone samples, the alphas decline by 0.18–0.26%.¹⁵ The alphas of SRI funds with ESG screening drop by 0.20–0.24%. For the SRI funds without ESG screening, this alternative factor model has no significant influence on the fund alphas. In conclusion, a multifactor model with an ESG screening related return factor reduces the fund alphas of the US SRI funds to an

¹⁴ The finding of an outperformance by those SRI funds with ESG screening is robust, if the semi-portfolio ESG score is applied instead of the equally weighted portfolio ESG score. If only the fund holdings below the median ESG rating are considered for each SRI and conventional fund, the sub-samples of US and Eurozone SRI funds with ESG screening change only by one and two funds, respectively.

¹⁵ Because the Barclays MSCI Corporate Sustainability index has only existed since December 2006, this analysis with an additional regression factor covers only the period from 01/2007 until 12/2014. With the regular five-factor model, the differences between SRI and conventional fund alphas remain statistically significant, with 0.32% for the US and 0.42% for the Eurozone during this time period. Thus, there is indeed a reduction of alphas related to the additional regression factor for ESG screening. The reduction of SRI bond fund alphas is not just related to the different time period of this analysis compared to the overall sample period from 01/2001 until 12/2014.

Table 5

Financial performance of socially responsible and conventional funds.

		US sample					Eurozone sample				
			01/2001–12/2014		01/2007–12/2014			01/2001–12/2014		01/2007–12/2014	
		Samples size	5 factor alpha	Adj. R ²	5 + ESG factor alpha	Adj. R ²	Samples size	5 factor alpha	Adj. R ²	5 + ESG factor alpha	Adj. R ²
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SRI funds	Mean	N = 38	1.38%	0.72	1.62%	0.72	N = 65	0.89%	0.64	1.21%	0.66
	Median		1.45%	0.74	1.76%	0.72		0.92%	0.73	1.47%	0.76
	Min		−0.39%	0.08	−0.93%	0.12		−2.65%	0.01	−2.69%	−0.01
	Max		4.32%	0.97	2.90%	0.96		2.93%	0.94	3.00%	0.96
Conventional funds	Mean	N = 114	0.96%	0.67	1.46%	0.64	N = 195	0.40%	0.53	0.90%	0.54
	Median		1.19%	0.73	1.96%	0.69		0.75%	0.57	1.08%	0.57
	Min		−3.81%	0.05	−3.99%	0.04		−6.15%	−0.08	−4.20%	−0.01
	Max		2.89%	0.97	3.90%	0.96		4.11%	0.96	6.12%	0.96
	Difference in means		0.42%**		0.16%			0.49%***		0.31%***	
	t-Value		(2.05)		(0.61)			(2.37)		(0.62)	
SRI funds with esg screening	Mean	N = 23	1.61%	0.71	1.78%	0.71	N = 46	1.06%	0.66	1.42%	0.67
	Median		1.46%	0.73	1.93%	0.71		1.16%	0.75	1.71%	0.77
	Min		−0.08%	0.38	0.25%	0.37		−2.65%	0.01	−2.69%	−0.01
	Max		4.32%	0.97	2.90%	0.96		2.61%	0.94	2.77%	0.96
Matched conventional	Mean	N = 69	1.03%	0.64	1.44%	0.64	N = 138	0.37%	0.53	0.92%	0.54
	Median		1.24%	0.70	2.05%	0.69		0.66%	0.56	1.15%	0.56
	Min		−2.89%	0.05	−2.63%	0.04		−6.15%	0.00	−4.20%	−0.01
	Max		2.89%	0.97	3.90%	0.96		4.11%	0.96	6.12%	0.96
	Difference in means		0.58%***		0.34%			0.70%***		0.50%**	
	t-Value		(2.40)		(1.00)		(2.71)		(1.92)		
SRI funds without esg screening	Mean	N = 15	1.02%	0.74	1.57%	0.75	N = 19	0.46%	0.59	0.75%	0.61
	Median		1.12%	0.78	1.36%	0.80		0.46%	0.68	0.85%	0.71
	Min		−0.39%	0.08	0.70%	0.12		−1.17%	0.04	−1.59%	0.11
	Max		2.79%	0.93	2.35%	0.95		2.93%	0.94	3.00%	0.94
Matched conventional	Mean	N = 45	0.85%	0.71	1.34%	0.61	N = 57	0.46%	0.54	0.85%	0.55
	Median		1.09%	0.77	1.57%	0.68		0.75%	0.58	1.03%	0.58
	Min		−3.81%	0.06	−2.63%	0.10		−3.54%	−0.08	−3.56%	0.00
	Max		2.47%	0.96	3.90%	0.96		2.86%	0.94	4.41%	0.94
	Difference in means		0.17%		0.23%			0.00%		−0.10%***	
	t-Value		(0.47)		(0.51)		(−0.01)		(−0.26)		

In this table reports summary statistics on regression results for SRI and conventional bond fund returns from 01/2001 until 12/2014 measured with [Elton et al. \(1995\)](#) five factor multi-indices models in columns (2) and (7). In columns (4) and (9), an additional sixth factor based on the excess return of the respective US or Eurozone Barclays MSCI Corporate Sustainability bond indices are added. Alphas are annualized and *t*-statistics of regressions of each fund are based on [Newey and West \(1987\)](#) HAC standard errors with a lag of twelve months. Differences report results of two sample mean comparison tests with unequal variances between SRI and conventional bond funds with *t*-values in parentheses. For each sample results are reported first for all SRI and matched conventional funds, then for all SRI funds with an ESG screening and those without ESG screening compared to respective matched conventional funds. ***, ** and * asterisks indicate *p*-values for significance at the 1%, 5% and 10% levels.

insignificantly higher risk-adjusted return. Although the Eurozone alphas also decline, they remain statistically significant. Thus, there appears to be a systematic effect on financial performance related to ESG screening of bond portfolios. We investigate this issue further with a performance-attribution analysis in the next section.

3.3. Performance attribution

By using a performance-attribution analysis, we investigate whether here is a systematic ESG screening-related effect on the variation of SRI fund returns. [Ibbotson and Kaplan \(2000\)](#) separate fund-return influences into market movements and return effects related to asset allocation policies. [Xiong et al. \(2010\)](#) and [Aglietta et al. \(2012\)](#) further differentiate asset allocation and active fund-management return effects. [Brière et al. \(2014\)](#) extend previous models by an additional component that measures the effect of social screening on equity portfolio returns. More specifically, this additional component measures the return difference between conventional asset allocation-specific returns and a socially screened benchmark index. We apply this method for the first time to SRI bond funds by separating the influence of market movements, fixed-income asset-allocation policies, ESG screening and active portfolio management. The excess return of each bond

fund over the risk-free rate is decomposed into the following components:

$$(R_{p,t} - R_{f,t}) = \beta_{p,m}(R_{m,t} - R_{f,t}) + \beta_{p,al}(R_{al,t} - R_{m,t}) + \beta_{p,esg}(R_{esg,t} - R_{al,t}) + \beta_{p,act}[(R_{p,t} - R_{esg,t}) + \epsilon_{p,t}], \quad (2)$$

where the dependent variable is the monthly return of a fund portfolio $R_{p,t}$ minus the one-month treasury yields $R_{f,t}$; β_m is the estimated factor exposure to the US or Eurozone broad investment-grade aggregate bond index return $R_{m,t}$ in excess of the one-month treasury yields; β_{al} are sensitivities for investment-grade or high-yield corporate bond asset-allocation-specific returns $R_{al,t}$ and; β_{esg} measures the sensitivity to the excess returns $R_{esg,t}$ of a US or Eurozone socially screened bond index over the asset-allocation-specific returns;¹⁶ and β_{act} for sensitivities of active portfolio management returns. All of the beta coefficients are estimated from univariate regressions of $R_{p,t} - R_{f,t}$ on one component of the right-hand side of Eq. (2) each time. Thus, Eq. (2) is not a multivariate regression equation; instead, it is a standard return

¹⁶ These are the US and Eurozone Barclays MSCI Corporate Sustainability indices as applied in [Table 1](#). These indices are constructed from Barclays benchmark indices with exclusion of the 25–50% of bond issuers with the lowest ESG ratings.

Table 6
Performance attribution for SRI bond funds.

	US sample		Eurozone sample	
	Average R^2 (1)	Average marginal R^2 contribution (2)	Average R^2 (3)	Average marginal R^2 contribution (4)
Market = aggregate bond index	35.99%	35.99%	46.53%	46.53%
Asset allocation	29.23%	16.07%	19.57%	15.82%
ESG screening	10.48%	2.86%	7.78%	3.74%
t-Value	(3.72)***	(2.07)**	(6.94)***	(3.89)***
Active management	31.38%	30.96%	30.78%	30.82%
Interaction effect	−7.09%	14.13%	−4.67%	3.09%
Total	100.00%	100.00%	100.00%	100.00%
Market = equal-weighted conventional funds	44.71%	44.71%	45.33%	45.33%
Asset allocation	23.42%	11.89%	21.21%	15.09%
ESG screening	10.48%	2.93%	7.78%	4.78%
t-Value	(3.72)***	(4.13)***	(6.94)***	(5.85)***
Active management	31.38%	22.40%	30.78%	31.06%
Interaction effect	−10.00%	18.06%	−5.10%	3.74%
Total	100.00%	100.00%	100.00%	100.00%

In this table lists average R^2 values of univariate regressions for each SRI bond fund over the period 01/2007 until 12/2014. Market, asset allocation specific and ESG benchmark returns are measured in excess of respective one- month US or German government bond returns. The market factor in the upper half of the table consists of the excess return of US and Eurozone Barclays Aggregate Corporate Bond Indices and in the lower half of the table of the equally weighted conventional bond fund returns. Asset allocation specific return factors are either investment grade or high yield Barclays corporate bond indices minus the respective market factor. The return factor for the ESG screening effect are excess returns of the US and Eurozone Barclays MSCI Corporate Sustainability Indices over the respective asset allocation factor. Active management returns are generated for each fund as difference of fund returns to US and Eurozone Barclays MSCI Sustainability Indices returns. In Columns (2) and (4) asset allocation, ESG screening and active management returns are generated out of orthogonalized variables in order to display only the marginal contribution to the total R^2 of bond fund returns. The interaction effect covers the residual between the other four R^2 values and 100%. Total bond fund returns are thereby completely explained by the following formula:

$$R_M^2 + R_{al}^2 + R_{esg}^2 + R_{act}^2 + R_e^2 = 1, \quad (3)$$

where R_M^2 , R_{al}^2 , R_{esg}^2 , and R_{act}^2 are R^2 values from univariate regressions of market, asset allocation, ESG screening and active management returns as explanatory variables for bond fund returns, and R_e^2 is the balancing term to sum to one.

decomposition equation, as commonly used in performance-attribution analyses.

With univariate time-series regressions, we generate for each individual component of the above formula separate R^2 values for each fund. According to Xiong et al. (2010), all four R^2 values plus an additional balancing term R_e^2 equal the percentages of return variance of a bond fund that can be explained by market movements, asset allocation, ESG screening, active management and an interaction effect between these factors. Table 6 reports both average R^2 s and average marginal R^2 s for each return component.

SRI bond fund returns in the US are explained by market movements, asset allocation, ESG screening and active management of 36%, 29%, 10% and 31%, respectively. To assess the marginal contribution to R^2 in Columns (2) and (4), residuals of regressions with all previous components are applied.¹⁷ Asset allocation, ESG screening and active management achieve marginal contributions to R^2 of 16%, 3% and 31%. For the Eurozone, the components reach 47%, 20%, 8% and 31% in terms of R^2 and 16%, 4% and 31% for asset allocation, ESG screening and active management with respect to marginal R^2 contributions. In the lower half of Table 6, we test for the US and Eurozone separately if the performance-attribution results are robust to the application of an alternative market return based on equally weighted conventional bond fund returns. All of the findings appear to be robust under this alternative setting. The average R^2 for the market return increases for the US bond funds to 45% and slightly decreases for Eurozone bond funds to 45%. Because the market return has no influence on the ESG screening component, the R^2 s for ESG screening are identical. The marginal R^2 contribution increases slightly to 3% and 5% for the US and the Eurozone, respectively. All of the mean values for R^2 and marginal R^2 contributions for

the ESG component of the performance attribution are significantly higher than zero. Thus, the effect of social screening is both measurable and significant. Aglietta et al. (2012) report, unrelated to SRI, comparable results for US fixed-income pension funds. They differentiate a performance attribution of 56%, 21% and 20% for a broad bond index, asset allocation and active management, respectively. For the influence of social screening on equity mutual fund returns, Briere et al. (2014) measure average R^2 values of 6%. This value is close to the 8–10% that we measure with a comparable approach for bond funds. In conclusion, the performance-attribution analysis clearly indicates the existence of a systematic return effect related to social screening of bond portfolios. Reasonable explanations for this performance-attribution result and the fund alphas that remain after controlling for ESG-specific risk factors are the differences in the extent of social screening between funds and active fund management. Unlike SRI equity funds that limit active fund management to only approximately 10% of available stocks, SRI bond fund managers can optimize not only within a remaining investment universe of 50–75% of bond issuing companies but also among the different bond issues, which allows the active steering of fund portfolio duration, average credit rating and coupon size.

3.4. Financial performance in crisis and non-crisis periods

As set forth in the introduction, the risk-mitigation view argues that companies with the highest ESG ratings are less exposed to certain risks. By excluding companies with the lowest ESG ratings, portfolio managers might therefore reduce their exposure to corporate ESG risks. By separating different market regimes, we separate periods with weak and strong influences of risk factors on corporate bond returns. Therefore, we further investigate the financial performance of SRI bond funds during crisis periods. First, we look at economic recessions, because company defaults and credit rating downgrades are more frequent during such periods. If differences in ESG ratings are associated with differences in credit risks, the effect of ESG screening should be stronger in

¹⁷ Asset-allocation returns are orthogonalized over market returns, ESG screening returns are orthogonalized over market and asset-allocation returns and active management returns are orthogonalized over market, asset-allocation and ESG screening returns.

Table 7

Socially responsible and conventional alphas for crisis and non-crisis periods.

	Recession periods N = 38 months (1)	Non-recession periods N = 130 months (2)	Recession periods N = 33 months (3)	Non-recession periods N = 135 months (4)
SRI funds	1.80%*	0.92%**	2.04%***	0.11%
t-Value	(1.75)	(2.52)	(2.95)	(0.55)
Conventional funds	1.14%	0.60%	1.12%	−0.07%
t-Value	(1.16)	(1.65)	(1.54)	(−0.35)
Difference	0.65%*	0.32%**	0.92%*	0.18%
t-Value	(1.88)	(2.04)	(1.71)	(1.27)
SRI funds with ESG screening	2.26%***	1.20%***	2.06%***	0.20%
t-Value	(2.37)	(3.05)	(2.98)	(0.99)
Matched conventional funds	1.31%	0.70%*	0.80%	−0.04%
t-Value	(1.34)	(1.90)	(1.12)	(−0.20)
Difference	0.94%*	0.50%***	1.25%**	0.24%
t-Value	(1.90)	(2.73)	(2.13)	(1.50)
SRI funds without ESG screening	0.77%	0.61%*	1.26%	−0.29%
t-Value	(0.63)	(1.74)	(1.28)	(−1.08)
Matched conventional funds	0.90%	0.42%	1.23%	−0.24%
t-Value	(0.87)	(1.18)	(1.38)	(−1.01)
Difference	−0.13%	0.19%	0.03%	−0.05%
t-Value	(−0.76)	(1.17)	(0.06)	(−0.21)
	Bear market periods N = 42 months	Non-bear market periods N = 126 months	Bear market periods N = 50 months	Non-bear market periods N = 118 months
SRI funds	1.35%	0.41%	0.59%	0.18%
t-Value	(1.19)	(1.14)	(0.92)	(0.96)
Conventional funds	0.61%	0.17%	−0.17%	0.04%
t-Value	(0.60)	(0.46)	(−0.33)	(0.17)
Difference	0.74%*	0.24%	0.77%	0.15%
t-Value	(1.71)	(1.45)	(1.47)	(0.98)
SRI funds with ESG screening	1.72%	0.56%	0.72%	0.21%
t-Value	(1.63)	(1.45)	(1.11)	(1.20)
Matched conventional funds	0.68%	0.28%	0.24%	0.09%
t-Value	(0.68)	(0.74)	(0.96)	(0.41)
Difference	1.02%*	0.27%	0.96%*	0.12%
t-Value	(1.92)	(1.39)	(1.68)	(0.68)
SRI funds without ESG screening	0.69%	0.28%	−0.36%	0.05%
t-Value	(0.51)	(0.81)	(−0.45)	(0.16)
Matched conventional funds	0.51%	0.02%	−0.17%	−0.15%
t-Value	(0.47)	(0.04)	(−0.63)	(−0.26)
Difference	0.18%	0.27%*	−0.21%	0.22%
t-Value	(0.35)	(1.97)	(−0.33)	(0.88)

In this table provides regression results for equally weighted monthly returns of all SRI and all conventional bond funds over crisis and non-crisis periods during the period 01/2001 until 12/2014. In the upper half the crisis periods cover economic recessions for the US of 38 months from 12/2001 until 06/2003 and from 12/2007 until 06/2009 as well as for the Eurozone 33 months from 04/2008 until 06/2009 and from 10/2011 until 03/2013. In the lower half the crisis periods cover bear market periods of 42 months for the US from 01/2001 until 09/2002, from 11/2007 until 02/2009 and from 05/2011 until 09/2011. For the Eurozone, these periods are 50 months from 01/2001 until 10/2002, 11/2007 until 04/2009 and from 02/2011 until 11/2011. For each sample results are reported first for all SRI and conventional funds, then for all SRI funds with an ESG screening and those without ESG screening compared to respective matched conventional funds. Alphas are annualized. ***, ** and * asterisks indicate *p*-values for significance at the 1%, 5% and 10% levels.

economic recessions. For the sample period, the National Bureau of Economic Research lists 38 recessionary months in the US from December 2001 until June 2003 and from December 2007 until June 2009. The Business Cycle Dating Committee for the Euro Area of the Centre for Economic Policy Research identifies 33 months of economic recessions from April 2008 until June 2009 and from October 2011 until March 2013. Table 7 reports risk-adjusted financial performance of SRI and conventional funds in both recession and non-recession periods.

The upper half of Table 7 lists fund alphas separately for recession and non-recession periods in Columns (1) to (4). During recessions, SRI bond funds in the US sample outperform by 0.65% and those of the Eurozone sample outperform by 0.92%. In non-recession periods, US SRI bond funds outperform by 0.32% (which is statistically significant) and Eurozone SRI bond funds generate higher, although statistically insignificant (0.18%), alphas than conventional funds. Moreover, the overall sample of SRI funds is again separated into those with ESG screening and those without ESG screening. The crisis period-related strong outperformance occurs only among those SRI funds with ESG screening.

Economic recessions usually coincide with bear stock market conditions. However, a common observation in capital markets is the anticipation of changes in economic conditions. Accordingly, stock and high-yield bond prices drop a few months before the start of an economic recession and vice versa: prices rise a few months before an economic recession ends. Thus, an alternative or even better identifier for crisis periods is a bear market period in the stock market, which is defined as a drop in a general stock index for at least two consecutive months by at least 20%. During the sample period, there are three bear-market periods lasting 42 months in the US and 50 months in the Eurozone.¹⁸ In the lower half of Table 7, crisis and non-crisis periods are differentiated based

¹⁸ The three bear-market periods for the US are based on the S&P 500 price return. First, the index dropped from 1,521 to 815 points by 41% from September 2000 until September 2002. The second and third drops occurred from November 2007 until February 2009 and from May until September 2011, with index declines of 55% and 19.5%, respectively. The three bear markets for the Eurozone are based on the Eurostoxx 600 price index. The three periods with price returns of −52%, −60% and −24% are September 2000 until September 2002, October 2007 until April 2009 and February 2011 until November 2011.

on these bear capital market conditions. Like in recessions, the five-factor alphas of SRI funds indicate a strong outperformance compared to conventional funds in bear market periods. For the US and the Eurozone, these differences in alphas reach 0.74% and 0.77%, respectively. If only the SRI funds with ESG screening are selected, these values reach 1.02% and 0.96%. The remaining SRI funds again show only minor return differences from those of conventional funds.

We conclude that the outperformance of SRI bond funds is especially driven by crisis periods. There are strong SRI fund alphas during bear-market periods and insignificant alpha differences in non-bear market periods. Our findings on the crisis-related outperformance of SRI bond funds are consistent with previous findings by Nofsinger and Varma (2014) and Lins et al. (2015). Both of these studies report outperformance of socially responsible equity investments during crisis periods. Of course, the variation in returns between crisis and non-crisis periods is much smaller for bond portfolios than for equity portfolios.

We summarize our findings on SRI bond funds. First, using a financial performance measurement of SRI bond funds, we find a risk-adjusted outperformance of 0.33–0.50% during the period 2001–2014. Second, using a portfolio holdings evaluation we can further specify that only SRI funds that apply an ESG screening generate outperformance during this period. Third, a performance-attribution analysis indicates that there is a systematic effect of social screening on the returns of bond portfolios. Fourth, a separation of sub-periods allows for a more precise conclusion. The return effect from social screening is directly related to crisis periods rather than non-crisis periods. Thus, the overall outperformance of SRI bond funds during the sample period appears because of the sequence of the three crisis periods: the bursting of the dot.com bubble, the financial crisis and the Eurozone debt crisis.

Our findings on SRI bond funds differ from those of most SRI equity fund studies for two reasons. First, almost none of the existing SRI equity studies investigate the potential effect on financial performance of a “worst-in-class” exclusion screening, i.e., the avoidance of the most irresponsible 20–50% of companies. Second, we assume that a comparable share of SRI equity funds might be conventional funds in disguise, as in our bond fund sample. Therefore, most performance measurements of SRI equity funds suffer

from this potential bias. This leaves only Kempf and Osthoff (2007), who generate artificial equity portfolios with various alternative ESG screening approaches. They measure a significant underperformance of stock returns of companies with the lowest ESG rating levels, which is consistent with our findings. We continue with robustness tests of our findings and consider socially screened bond indices, cross-sectional fund characteristics, alternative multifactor models and variations of SRI investment approaches.

4. Robustness to alternative explanations

4.1. Out-of-sample robustness and fund manager skills

As our first robustness test, we check whether the ESG screening-related return effect, as identified in the previous section, exists out-of-sample among ESG-screened bond indices. If we do not observe a comparable return effect, the SRI bond fund-specific financial performance might arise from fund manager skills instead of a systematic effect of ESG screening. In Table 8, we display bear market and non-bear market returns of US and Eurozone corporate bond indices with and without a social screening for the period from 01/2007 to 12/2014.

The upper part of Table 8 reports higher returns in bear market periods and lower returns in non-bear market periods for socially screened indices than for the total indices of US and Eurozone corporate bonds. This provides out-of-sample evidence for an effect of social screening on bond portfolio returns independent of any differences in bond characteristics. In this setting of bond portfolios that are comparable in all regards except for ESG ratings, there are return variations between the socially screened and the regular corporate bond indices. The lower part of Table 8 lists the characteristics of each bond index. Socially screened bond indices exclude 27–50% of the corporate bonds with the lowest ESG ratings compared to the total bond indices. Therefore, companies with the lowest sustainability ratings are filtered out of an index independent of any influences such as industry weights, credit ratings or maturities. There are only negligible differences in corporate bond characteristics, as indicated especially by comparable average credit ratings and durations. The return characteristics of socially screened bond indices are consistent with a systematic ESG

Table 8
Returns of socially screened US and Eurozone corporate bond indices.

	US corporate bond index			Eurozone corporate bond index		
	ESG screened (1)	Total index (2)	Difference (3)	ESG screened (4)	Total index (5)	Difference (6)
<i>Index returns</i>						
Total period	6.21%	6.40%	−0.18%	5.25%	5.22%	0.03%
t-Value			(−0.74)			(0.17)
Bear markets	0.64%	−0.19%	0.82%	−0.41%	−1.16%	0.74%
t-Value			(1.09)			(1.56)*
Non-bear markets	7.92%	8.43%	−0.50%	7.67%	7.96%	−0.29%
t-Value			(−2.42)***			(−2.42)***
<i>Index characteristics</i>						
Number of bonds	2.687	5.281	−2.628	1.124	1.542	−418
% of all bonds	50%	100%	−50%	73%	100%	−27%
MSCI ESG ratings	BB-AAA	CCC-AAA	CCC-BB	BB-AAA	CCC-AAA	CCC-BB
Market value (mln)	2.040	4.216	−2.175	1.056	1.442	−386
% of total market value	48%	100%	−52%	73%	100%	−27%
Modified Adj. duration (%)	7.19	7.33	−0.14	4.86	4.83	0.03
Average credit rating	A2/A3	A3/BAA1	Plus one notch	A3/BAA1	A2/A3	Minus one notch
Maturity (years)	10.37	10.81	−0.44	5.52	5.47	0.05
Coupon (%)	4.2	4.39	−0.19	3.55	3.51	0.04

In this table reports average annual returns of the US and Eurozone Barclays MSCI Corporate Sustainability Indices, the US and Eurozone Barclays Corporate Bond Indices and the difference of these indices for the period 01/2007–12/2014. Thereof, 21 month are bear market periods for the US from 11/2007 until 02/2009 and from 05/2011 until 09/2011. For the Eurozone, these periods are 28 months from 01/2001 until 10/2002, 11/2007 until 04/2009 and from 02/2011 until 11/2011. ***, ** and * asterisks indicate p-values for significance at the 1%, 5% and 10% levels.

Table 9

Annual fund alphas and fund characteristics.

	US and Eurozone sample		US sample			Eurozone sample	
	2001–2014 (1)	2003–2014 (2)	2001–2014 (3)	2003–2014 (4)	2001–2013 (5)	2001–2014 (6)	2010–2014 (7)
Intercept	0.02%	0.56%***	0.49%***	0.61%***	0.56%***	−0.16%**	0.10%
t-Value	(0.18)	(2.72)	(4.87)	(6.44)	(6.04)	(−2.04)	(0.79)
Expense ratio	−0.18%***	−0.23%***	−0.38%***	−0.45%***	−0.53%***	−0.22%***	−0.22%*
t-Value	(−3.07)	(−2.96)	(−3.17)	(−3.66)	(−4.10)	(−2.74)	(−1.84)
MGMT fee	0.16%	0.25%	0.21%**	0.22%**	0.27%***	0.14%	0.14%
t-Value	(1.14)	(1.59)	(2.24)	(2.26)	(2.70)	(1.55)	(1.21)
12B-1 fee			0.09%	0.21%	0.20%		
t-Value			(0.63)	(1.50)	(1.37)		
Front load	−0.02%	−0.08%				0.02%	−0.12%
t-Value	(−0.34)	(−1.11)				(0.32)	(−0.48)
Back load	0.04%	0.03%	0.00%	0.00%	0.00%		
t-Value	(0.86)	(0.51)	(−0.68)	(−0.66)	(−0.88)		
Age	0.22%***	0.16%**	−0.09%	−0.05%	−0.07%	0.35%***	0.24%**
t-Value	(3.95)	(2.26)	(−1.19)	(−0.62)	(−0.80)	(4.96)	(2.42)
ln fund size	0.01%	0.04%	0.15%	0.23%***	0.25%**	0.03%	−0.10%
t-Value	(0.15)	(0.50)	(1.35)	(2.47)	(2.35)	(0.33)	(−0.86)
Turnover ratio			0.06%	0.06%	0.08%		
t-Value			(0.77)	(0.74)	(0.88)		
Diversification ratio						0.02%	0.00%
t-Value						(0.30)	(0.01)
ln fund family size	0.02%	0.00%	−0.05%	−0.14%	−0.10%	0.06%	0.10%
t-Value	(0.35)	(0.04)	(−0.55)	(−1.53)	(−1.13)	(0.73)	(0.84)
High yield dummy	−0.12%	0.25%					
t-Value	(−0.50)	(0.95)					
US dummy	0.08%	−0.31%***					
t-Value	(0.27)	(−3.17)					
SRI dummy	0.54%***		0.53%***			0.40%**	
t-Value	(4.32)		(3.02)			(2.31)	
ESG dummy		0.56%***		0.49%**	0.47%**		0.52%*
t-Value		(2.61)		(2.55)	(2.43)		(1.89)
Observations	3.575	2.052	1.064	928	976	2.415	1.123
Adj. R ²	0.0237	0.0162	0.0264	0.0342	0.0364	0.0144	0.0083

This table reports results from pooled regressions of annual five factor model fund alphas and one year lagged cross sectional fund characteristics for the period 01/2001 to 12/2014 or sub-periods thereof. Dummy variables indicate if funds are high yield funds (HIGH YIELD DUMMY), US funds (US DUMMY), SRI funds (SRI DUMMY) or SRI funds with ESG screening (ESG DUMMY). For each year separately, the ESG DUMMY has the value one if a SRI fund has a higher ESG fund score based on Sustainalytics ESG ratings compared to the mean of conventional funds in the same year. Only for the US sample column (5) applies for the ESG DUMMY the fund scores based on MSCI KLD ratings. All fund characteristics except the dummy variables are standardized. Missing observations of fund characteristics are replaced by the respective time-series average values of the same fund. Coefficients are annualized. Out of several correlated fund characteristics the ones with the largest statistical explanatory power are included. ***, ** and * asterisks indicate *p*-values for significance at the 1%, 5% and 10% levels.

screening-related return effect. Moreover, it appears unlikely that the return characteristics of SRI bond funds can be explained by fund manager skills other than applying ESG screening.

4.2. Omitted risk factors and investment styles

With another robustness test, we investigate whether the identified SRI bond fund alphas could be biased because of any important omitted risk factors in the risk-adjusted performance measurement. Therefore, we especially control for additional 6th and 7th factors with excess returns of government bond indices and global aggregate bond indices. Moreover, we control for fund investment styles with respect to momentum or illiquidity trading strategies. Potentially ESG ratings could be correlated with either of these return drivers. In Tables A5 and A6, the internet appendix reports additional robustness tests of SRI bond fund alphas after controlling for omitted risk factors with one-, three-, five-, six- and seven-factor models and for the US sample only with corporate bond momentum returns and bond illiquidity premiums in addition to the five-factor model. Neither of the additional risk factors explains the identified alphas of SRI bond funds.

4.3. Cross-sectional differences in fund characteristics

As a next robustness test, we control for fund characteristics. Blake et al. (1993) find that annual fund expenses have explanatory

power for differences in bond mutual fund returns. Wermers (2000), Chen et al. (2004), Kacperczyk et al. (2005), Cremers and Petajisto (2009) and Massa and Patgiri (2009) suggest including investment styles, portfolio turnover rates, management fees, sales loads, diversification ratios, fund size, fund age and fund family size for equity fund performance studies. Polwitoon and Tawatnuntachai (2006) and Du et al. (2009) confirm the relevance of most of these fund characteristics for bond funds. In addition to these studies, we add sums of squared portfolio weights as indicators of portfolio diversification when we control for cross-sectional influences of fund characteristics on fund alphas. For the US sample only, we employ fund turnover ratio and 12b-1 sales fees. Additional dummy variables indicate whether funds are high-yield funds, US funds or SRI funds. Five-factor model alphas are obtained for each year with at least ten monthly return observations. These annual alphas are winsorized at the 1st and 99th percentiles. Table 9 lists the results of pooled regressions of annual five-factor fund alphas, dummy variables and one-year lagged fund characteristics.

Table 9 reports findings for the entire sample in Column (1) and results for the US and Eurozone samples in Columns (3) and (5), respectively. To obtain a reasonable intercept and comparable coefficients, we standardize all of the variables except for dummy variables. Because of strong correlations between several fund characteristics, we follow Visco (1978) and include only those variables with the highest explanatory power. Table 9 first shows

a statistically significant dummy variable that differentiates SRI from conventional funds. For the entire sample, SRI funds outperform by 0.54%. If US and Eurozone samples are analyzed separately, SRI funds still outperform by 0.40–0.53%. Thus, the outperformance of SRI corporate bond funds is robust if we control for cross-sectional differences in fund characteristics.

For the US sample, Table 9 provides conventional bond fund alphas for the period 2001–2014 of –0.36% to 0.49% after the inclusion of average annual expense ratios of 0.85%. These values are well within the range found by previous performance studies of US bond fund returns. Elton et al. (1995), Chen et al. (2010) and Rakowski (2010) report average fund alphas (before annual costs) of 0.0–1.1%. Cornell and Green (1991), Blake et al. (1993), Elton et al. (1995), Detzler (1999), Polwitoon and Tawatnuntachai (2006), Huij and Derwall (2008), Du et al. (2009), Chen et al. (2010) and Cici and Gibson (2012) measure average fund alphas (after annual costs) of –0.9–0.0%.

For the Eurozone sample, Table 9 lists fund alphas (before annual costs) of –0.16%, which is lower compared to the US sample. After subtraction of average expense ratios of 0.96%, this value drops to –1.12%, which is slightly below the empirical findings of Silva et al. (2003) for European bond funds and those of Maag and Zimmermann (2000) and Dietze et al. (2009) for German bond funds. For return regressions with multi-indices, those authors report significantly negative bond fund alphas (after costs) of –0.7% to –0.5%.

4.4. Differences in social screening over time

The market niche of SRI bond funds is still evolving and includes several young funds. Some SRI bond funds potentially adjust their ESG screening process throughout the sample period. Therefore, we apply the results of the annual fund portfolio holding evaluations in Columns (2), (4) and (7) of Table 9 to complement a further robustness test. For each year, the SRI funds with ESG fund scores that are above the mean of conventional funds in the same year are indicated with an ESG screening dummy. We obtain these dummies from the portfolio holding evaluations for the years 2003–2014 for the US sample and for years 2010–2014 for the Eurozone sample. With these pooled regressions including annual ESG screening indicators, we control for potential differences over time in the extent of social screening by SRI funds. The dummy variable for SRI funds with ESG screening indicates that these funds achieve 0.49–0.56% higher fund alphas than do conventional funds. Thus, we confirm the outperformance of SRI bond funds that conduct an ESG screening if the extent of social screening in portfolio holdings is assessed each year.

A further possible influence factor is the selected ESG rating provider. Each provider applies a different definition of CSR. Therefore, another important robustness test is reported in Column (5) of Table 9. Instead of the Sustainalytics ESG ratings, we classify the ESG dummy variable based on annual fund portfolio evaluations with MSCI KLD ratings. For this analysis, we are able to cover the period 2001–2013. The coefficient for the ESG dummy variable indicates a 0.47% higher fund alpha of SRI funds with ESG screening.

4.5. Different SRI screening approaches

The next alternative explanation we want to address covers the extent of various social screenings applied by various SRI funds. The distributions of ESG ratings within the aggregate SRI bond fund portfolios in Fig. 1 suggest that the average SRI bond fund is especially likely to exclude companies with very low ESG ratings. Therefore, we argue that the outperformance of SRI bond funds relates to the exclusion of the bonds of companies with the lowest

ESG ratings. In Table A7 in the internet appendix, we compare annual returns of corporate bond portfolios with different degrees of inclusion or exclusion of corporate ESG rating levels. This clearly indicates that the bonds of companies with the lowest sustainability ratings perform extremely poor during bear-market periods. Conversely, there are only minor differences if all remaining ESG rating levels (or just the very highest ratings) are selected. Thus, the effect of social screening during crisis periods is particularly driven by exclusion of the “worst-in-class” corporate bond issuers.

Moreover, the effect of social screening could arise from a specific corporate industry with extreme crisis-period related returns. Therefore, Table A8 in the internet appendix reports corporate bond index returns with and without social screening for several industries in bear and non-bear market periods. Interestingly, the return effect of social screening exists in corporate bond portfolios of industrial, utility and financial companies. More specifically, the crisis period-related return effect occurs in most of the 14 covered industries in the US and the Eurozone. Therefore, we rule out that the over- or underweighting of specific industries by some SRI bond funds causes the overall outperformance.

In addition, screening portfolios for ESG criteria is not the only approach to SRI investing. Hood et al. (2014) differentiate various SRI screening practices that fund companies offer to appeal to different investor clienteles. Some SRI funds in our sample could conduct (in addition to ESG screenings) exclusions of so called “sin companies” that might cause the outperformance of SRI bond funds. Therefore, Table A9 of the internet appendix lists the returns of the corporate bond indices with various alternative non-ESG related screenings. None of these exclusions of “sin companies” indicates a comparable return effect as the effect for the ESG-screened portfolios in bear and non-bear market periods.

4.6. SRI label effect

Finally, instead of an effect from social screening, there could be an effect related to bond funds with an SRI label. One possible explanation for outperforming SRI funds relates to the lower fund-flow volatility identified by Bollen (2007) and Benson and Humphrey (2008). Edelen (1999) and Rakowski (2010) identify fund-flow volatility as a negative return driver because of transaction costs and interference with the optimal discretionary investing of asset managers. First, findings of Table 8 indicated an effect of social screening in a setting independent of any fund labels. Thus, there is an effect of social screening unrelated to the classification of bond funds with a SRI label. Moreover, the separation of SRI funds into those with ESG screening and those without in Table 7 allows for an additional interpretation. The financial returns of average SRI funds with no ESG screening show no indication of outperformance (compared to matched conventional funds) during crisis periods. Therefore, we conclude that the crisis period-related outperformance of SRI bond funds most likely relates to portfolio screening, not to their classification as SRI.

5. Conclusion and implications

This study provides the first comprehensive empirical assessment of the financial performance of ESG-screened bond funds. SRI bond funds outperform conventional funds by one-half of one percent during the period from 2001 to 2014. With a portfolio holdings evaluation, we can further specify that only SRI funds that apply ESG screening generate this outperformance. More specifically, fund managers of these funds appear to exclude bond issuers with the highest ESG risks, as indicated by the lowest ESG ratings. This application of a “worst-in-class” exclusion rather than a “best-in-class” inclusion screening is unique to SRI fixed income

investments. Furthermore, by using a performance-attribution analysis, identify a systematic effect of social screening on the returns of bond portfolios. Finally, the return effect from social screening is directly related to crisis instead of non-crisis periods.

All of this study's empirical findings are consistent with the hypotheses of mispriced ESG risks and the beneficial effects of CSR activities on the reduction of corporate risks for investors. However, future research may further investigate the sources of the crisis period-related abnormal returns of socially screened bond portfolios. Empirical evaluations of the influence of CSR ratings on credit spreads and probabilities for credit rating changes, along with an assessment of the effects of supply and demand for corporate bonds with different ESG ratings, might shed further light on this question. Further research is required to better understand the specific influence of ESG screenings on bond portfolios from different industries, geographic regions, credit ratings and bond maturities. Furthermore, our finding on SRI bond fund returns raises the question whether a “worst-in-class” exclusion might be a better application of CSR data to equity investments than the common “best-in-class” screening used by SRI equity funds.

This study's implication for asset managers is that it makes good business sense to mitigate ESG risks in bond portfolios. Moreover, this study uncovers no empirical evidence to suggest that ESG screening causes a tradeoff between financial and non-financial investment objectives. In addition, this study shows that although most SRI bond fund managers hold broad portfolios, they exclude companies with the very lowest ESG ratings. This screening approach is especially successful during crisis periods. The implication for general investors is that SRI bond funds — especially those that apply ESG screening — are attractive investment opportunities that accumulate abnormal returns during market declines. Especially for long-term investors, such funds are an attractive investment opportunity. For responsible investors, an ESG rating for fund portfolios appears to be necessary to identify truly social investments or the extent of ESG integration by different funds because not all SRI funds consider these criteria to the same extent.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.jbankfin.2016.01.010>.

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