JEROEN DERWALL

The Economic Virtues of SRI and CSR

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De economische meerwaarde van duurzaam beleggen en ondernemen

Proefschrift

ter verkrijging van de graad van doctor
aan de Erasmus Universiteit Rotterdam
op gezag van de rector magnificus
Prof.dr. S.W.J. Lamberts
en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op
donderdag 1 maart 2007 om 16.00 uur

door
Jeroen Maurits Maarten Derwall
geboren te Heerlen

Promotiecommissie

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Erasmus Research Institute of Management (ERIM)
RSM Erasmus University / Erasmus School of Economics
Erasmus University Rotterdam
Internet: http://www.erim.eur.nl

ERIM Electronic Series Portal: http://hdl.handle.net/1765/1

ERIM Ph.D. Series Research in Management, 101

ISBN-10: 90-5892-132-8
ISBN-13: 978-90-5892-132-1

Design: B&T Ontwerp en advies www.b-en-t.nl / Print: Haveka www.haveka.nl
Front Cover: Environmental Investment Collage

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Preface

This PhD. dissertation bundles six empirical studies on the topic of socially responsible investment (SRI) and on the related discipline of corporate social responsibility (CSR). Over the last decades, scholars and practitioners have increasingly acknowledged these concepts, but not without reservations. Although in recent times many pension funds and institutional asset management firms have publicly expressed their growing dedication to investing with SRI principles in mind, they still seem to struggle with the question whether SRI aligns with their fiduciary responsibilities. Despite heightened academic attention in this field, a thorough understanding of the risks and opportunities associated with investing based on social investment criteria is still lacking. At the company level, managers seek to understand whether (and how) CSR can be operationalized not only to meet social responsibility goals but also to act in the interests of shareholders.

Several features underpin the contribution of this doctoral dissertation. We first provide a new and global comparison of SRI equity mutual fund performance vis-à-vis mainstream fund performance. Anecdotal evidence suggests that there are differences both within and across countries in the way SRI is defined and implemented. It is an open question whether current related evidence, most of which stems from the U.S. and U.K markets, is sample-specific and sensitive to the choice of SRI screening methodology. We address these possibilities in greater detail. In addition, the evidence to date almost exclusively revolves around equity markets. This thesis provides new evidence on the potentials of social investing for other asset classes by examining SRI fixed-income fund performance.

The thesis then extends the research scope beyond mutual funds. We draw on the view that the financial consequences of SRI and CSR as such are almost impossible to portray because these concepts are too broad and multidimensional. Because SRI and CSR are "container" concepts, any relation they show to a financial performance measure is ultimately the net effect of those displayed by its constituents. Since SRI mutual funds make investment decisions based on a mixture of different SRI and non-SRI criteria, a study of mutual funds for the purpose of testing the economic value of CSR exacerbates this aggregation problem.

We first demonstrate the importance of disaggregating CSR by building and evaluating SRI equity portfolios based on unique, firm-level, rating data that measure only a subset of firms' CSR performance: eco-efficiency. Contrary to mutual funds, a comparison of self-composed SRI and non-SRI portfolios more accurately uncovers return differences (premiums) associated with SRI criteria, because these portfolios can be designed to be truly mutually exclusive and different in terms of a specific SRI criterion.

Moreover, studies have differed widely in their choice of financial performance measure in their hunt for an association between CSR and "financial performance", but the use of different financial measures makes a comparison of studies a complicated task because these measures may rest on different theories. To overcome this problem, we make use of a framework that systematically helps us to understand the wide range of pathways between CSR policies and different measures of financial performance. We use this framework to single out both the eco-efficiency component of CSR (Chapters 3 and 4) and the human capital management dimension (Chapter 5). We investigate the possible channels of transmission from these CSR dimensions to operating performance, firm value, investors' earnings expectations, and ultimately, stock market performance.

In Chapter 6, we move one step further with disentangling CSR-financial performance relationships by isolating the cost of capital component inherent in valuation. We provide various theoretical scenarios in which the social responsibility attributes of firms account for cross-sectional variation in firms' cost of equity. We then offer empirical evidence on the association between CSR and the cost of equity capital implied in contemporaneous stock prices. Studying this connection is important for understanding whether investors are attentive to CSR attributes and whether markets are potential catalysts for corporate reform.

The reader should note that recent years have witnessed a surge in new but similar concepts. As alternatives to SRI, for example, the terms "sustainable investing" and "ethical investing" have primarily been used by scholars and practitioners in continental Europe and the United Kingdom. More recent concepts embraced by a set of important institutional investors are "ESG investing" (Environmental, Social, Governance), which more explicitly involves corporate governance issues, and "extra-financial investing", which more strongly relies on the view that corporate sustainability criteria are relevant to investors because they complement mainstream financial criteria in understanding the risk and return opportunities of investments. While there are some theoretical differences among these concepts, SRI and CSR will be the lead terms throughout the six studies for the sake of brevity and consistency. Their association with the ESG concept and their usefulness as extra-financial factors are discussed in the concluding chapter.

This work could not have been completed without the help and comments of many colleagues at the Financial Management Department at RSM Erasmus University, who I thank for their support. A number of colleagues deserve some special credits for their roles over the last three years. Obviously, I am indebted to Professor Dr. Kees Koedijk, my promotor, who has been so kind to give me the opportunity to explore a widely debated research topic in finance. I also appreciate the helpful comments provided by my dissertation committee members, Professor Dr. Sylvester Eijffinger, Professor Dr. Johan Graafland, and Dr. Ronald Mahieu. I owe much to Nadja Guenster, who has been a great research collaborator, and who is partly responsible for the papers incorporated in

Chapters 3 and 4 of this dissertation. Also, I thank Rob Bauer, who has laid the groundwork for the academic road I have pursued ever since I obtained my Master's degree under his supervision at Maastricht University. I look forward to working with you on new topics and on making our new research centre a success. I thank Patrick Verwijmeren for his contribution to research that in part resulted in Chapter 6.

Many thanks also go out to Joop Huij, Christian Huurman, Francesco Ravazollo, Chen Zhou, Michiel de Pooter, and all my off-campus friends, all of whom have made sure that long hours, and some demanding nights, of academic research can easily be combined with good pizza, movies, street soccer, and laughs and drinks at bars. Last but not least, I am grateful to ERIM for having generously provided the resources necessary to complete this dissertation.

Jeroen Derwall
Rotterdam, January 2007

Chapter 1
SRI Mutual Fund Performance around the World[1]

1.1. INTRODUCTION

For several decades, socially responsible investing (SRI) has attracted the attention of scholars, policy makers, and the world's largest investment firms and pension trusts. Almost all large investment firms and pension funds report their involvement in socially responsible investing. Examples are Goldman Sachs, State Street Global Advisors and CalPERS in the U.S., the Norwegian Petroleum Fund, the Swedish AP funds, and ABP and PGGM in the Netherlands.[2] Paradoxically, even though a sizeable number of (institutional) asset managers now publicly express their devotion to ethical issues, the vast majority of these investors do not employ SRI as a mainstream investment vehicle. Despite mounting academic work on SRI, there is still much disagreement about the financial implications of corporate social responsibility screens. Does adding an ethical dimension to investment decisions conflict with the fiduciary duties of portfolio managers in terms of the return-risk ratios they are expected to deliver? Anecdotal evidence indicates that the money management industry has its reservations about SRI due to concerns that social screening significantly constrains portfolio optimization.

Most previous studies have helped to understand the risk and return characteristics of SRI by evaluating the performance of socially responsible mutual funds, which are representative of practical investment portfolios and for which data are easily accessible.[3] Empirical evidence by Bauer, Koedijk and Otten (2005), Gregory, Matatko and Luther (1997), Hamilton, Jo and Statman (1993), and Statman (2000) suggest that the returns of socially responsible funds are no worse than the returns earned by conventional portfolios of similar risk. However, studies up to this point leave several questions unexplained. The existing body of evidence largely involves the U.S. and U.K. retail markets and may not be robust to different methodologies and small-sample problems.

The contributions of our study are threefold. First, we first show that there are various theoretical predictions concerning socially responsible investment returns beyond the widely cited logic that SRI-driven investment constraints impose a diversification

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[1] This chapter is an abridged and modified version of Derwall, J., R. Bauer and K. Koedijk (2006), "SRI Performance: Survey and Global Evidence", Working Paper. Further, a subset of this chapter is available as Bauer, R., J. Derwall and R. Otten (2006), "The SRI Mutual Fund Performance Debate: New Evidence from Canada", *Journal of Business Ethics*.

[2] These developments have been joined by regulatory changes designed to promote corporate social responsibility. For instance, an amendment to the 1995 Pension Act in the UK, which was enforced in 2000, requires pension funds to disclose how they consider social and environmental issues.

[3] In the mid-nineties, Kurtz (1997) provided a thorough review of SRI literature up to that point.

penalty on social investors. We present a number of theories on the expected returns of SRI that have their antecedents in mainstream literatures on asset pricing and capital markets. These theories lay the foundations for tests on SRI returns.

Second, this study tests SRI fund performance in many countries around the world, using samples and performance evaluation models that are more comprehensive than those observed hitherto. Our international database of mutual funds has several attractive features, from both an economic and statistical point of view. It covers a much larger time horizon than did prior studies, which helps to improve the statistical power of asset pricing tests. It also helps to address the critical view that SRI returns seem competitive because most evidence predates the last bear market (e.g., Entine (2003)). For several countries, our data covers seventeen years of monthly fund returns. We can also investigate whether SRI fund performance is country-specific. Compiling global evidence is relevant because the performance of SRI portfolios could be a function of the way socially responsible investment universes are determined. Our global perspective is motivated by reports of social investment forums, including SIF (2003) and Eurosif (2003), which point out that countries might differ in defining and implementing SRI. Given these differences, it is unclear whether current views on SRI fund performance hold up on a worldwide scale.

Third, we also improve on studies that examine SRI funds at the aggregate level. The approach adopted by most fund portfolio studies on SRI, such as Bauer, Koedijk and Otten (2005), is to report *ex post* risk-adjusted returns of an equally weighted portfolio that comprises all SRI funds in a given country. This method might be of limited practical relevance because of its implicit assumption that all investors in socially responsible mutual funds will hold the same composite of all SRI funds in a given country. Moreover, evidence on historically earned risk-adjusted returns offers the investor limited *ex ante* information, i.e., whether past SRI fund performance carries over to the future. Therefore, besides examining cross-country variation in aggregate SRI fund performance, this study explores performance from the perspectives of two different types of SRI mutual fund investors: (i) an investor who seeks to optimize the non-financial utility from the social, ethical, and environmental attributes inherent in SRI by selecting funds with strong "social responsibility" track records, and (ii) an investor who chooses to pursue the joint goals of social responsibility and optimal financial return.

To adopt the perspective of the first type of mutual fund investor, we investigate heterogeneity in funds' screens and return-risk characteristics among SRI funds in a given country. The SRI industry offers a rich array of retail investment funds that span investors' varying interests for many social and environmental issues, such as alcohol, tobacco, weapons and defense, and eco-efficiency. While most previous studies have implicitly assumed that SRI investors have homogeneous tastes for social responsibility attributes, we explore the extent to which an investor's preference for a specific social screening methodology or a specific set of SRI criteria affects the return and risk characteristics of his resulting SRI fund portfolio. We collected information on the funds' policies concerning social, ethical and environmental issues in order to bundle and evaluate funds based on their SRI investment policy.

To adopt the perspective of the second type of investor, we employ tests of persistence in (i.e., the predictability of) SRI versus conventional fund performance. Evidence of persistence would support the idea that information about a fund's past performance can be exploited by a socially responsible investor in search of the highest *ex ante* return on his portfolio. There are reasons to suspect that SRI fund performance is predictable. For example, poorly performing SRI funds might not be disciplined by the market and continue to provide inferior returns because they are held by loyal investors who enjoy non-financial utility from these funds' social resposnbility features. Consistent with loyalty, Bollen (2006) finds that the volatility of investor cash flows is lower in the case of socially responsible funds than in the case of conventional funds. In our main test, we examine persistence by evaluating the out-of-sample performance of a strategy that holds SRI funds based on their past performance. This method, which is well established in studies on mutual fund performance persistence, enable us to distinguish individual SRI funds based on their track records and to investigate whether their short-run performance in the past carries over to subsequent periods.

We avoid that our results are susceptible to benchmarking errors. Since sizeable evidence underlines that investment performance estimates are driven by the choice of benchmark variables, we evaluate mutual funds relative to a broad range of benchmark assets identified by previous research. Our benchmark specifications include models based on a priori specified variables (like Carhart (1997), Fama and French (1993), and Ferson and Schadt (1996)) and models that contain a combination of ad hoc and statistical risk factors (see, e.g., Geczy, Stambaugh and Levin (2003)).

This chapter is organized as follows. Section 2 provides a brief overview of the socially responsible investment industry and explains the ways by which SRI funds around the world implement SRI. Section 3 presents theoretical discussions and develops hypotheses about the expected (risk-adjusted) returns of SRI mutual funds relative to those of conventional funds. Section 4 discusses the mutual fund and benchmark data used in this study. Section 5 reports empirical results. Section 6 concludes this research.

1.2. BACKGROUND

SRI Market History and Current Overview

The origins of socially responsible investing trace back centuries, but in more recent decades social investment seems to have become a fact of life. For years, the financial industry in the U.S. has witnessed numerous examples of institutions divesting from (investing in) socially controversial (responsible) investment vehicles. In the sixties and in subsequent decades, socially responsible investing developed progressively.[4] Provoked by the Vietnam War, the Cold War, and by other political conflicts, pressure groups echoed concerns over the issue of corporate citizenship. Several American medical associations, universities, Catholic institutions, pension funds, and many other institutional investors demonstrated their discomfort with investing in stocks of companies that actively operate in, e.g., the tobacco, alcoholic beverages, and gambling industries. Many businesses with controversial regimes, such as those observed in South Africa in earlier decades, in Nigeria, and in China, came under strenuous attack by politically driven activists. Environmental disasters, such as the Exxon Valdez oil spill, triggered concerns for the economic and environmental implications of lagging corporate environmental management. Shareholders protested against bad environmental governance and in certain occasions, these pressures resulted in environmentalist being allowed to raise environmental awareness at a company in the role as a corporate board member (Teoh, Welch, and Wazzan (1999)).

It was anticipated that the SRI industry would expand globally. Indeed, the number of investors applying social, moral or environmental screens on businesses in their investment universe has grown substantially over the last decade, despite the stock market decline of 2000. However, as Bauer, Koedijk and Otten (2005) point out, most markets for socially responsible investments cover just a small fraction of their mainstream counterparts. To give some impression of the SRI markets, we present two series of statistics in Table 1 and in Figure 1. Table 1 separates SRI size statistics per country into assets under management in retail and non-retail markets. These statistics offer a snapshot of the status of SRI markets in mid-2003, when institutional and retail market trends were examined almost simultaneously by various social investment organizations around the world. The table clearly illustrates that the United States dominates the SRI industry in terms of assets under management, where now about 1 out of 9 dollars is invested in a socially responsible manner. According the estimates presented in Table 1, the US social investment industry comprises more than $2 trillion dollars, which reflects an increase of about 240% over the last eight years (SIF (2003)). Of this amount, more than $160 billion is covered by the U.S. retail market for SRI. Remarkably, the Canadian mutual fund market constitutes the second-largest SRI retail industry. According to estimates by Canada’s Social Investment Organization (2003), over $51 billion of assets are in total invested based on ethical principles. Of this amount, approximately $10 billion represents SRI retail funds.

In Europe, the United Kingdom is by far the largest SRI market. Non-retail investors collectively hold more than £370 billion of assets subject to social investment

[4] In fact, the first SRI mutual fund emerged in the United States almost a century ago.

criteria (Eurosif (2003)). As for the retail market, the amount of assets managed by UK SRI funds is estimated at £3.9 billion/$5.9 billion (Avanzi SRI Research / SIRI Group (2003)). Most other markets in Europe are smaller but growing steadily.

In the eastern region, Australia covers a significant portion of socially responsible investments. However, all-encompassing data are lacking for this region. Anecdotal evidence suggests that several Asian markets for socially responsible assets are rising.

TABLE 1. Summary of SRI Size Estimates per Country (2003)
Sources: Social Investment Forum (2003), Social Investment Organization (2003), Avanzi SRI Research / SIRI Group (2003, 2005), Ethical Investment Association (2003), UKSIF (2003),[5] and Eurosif (2003). "Non-retail" is computed as the difference between "Total" and "Retail" statistics. *All statistics are converted to billion U.S.$.*

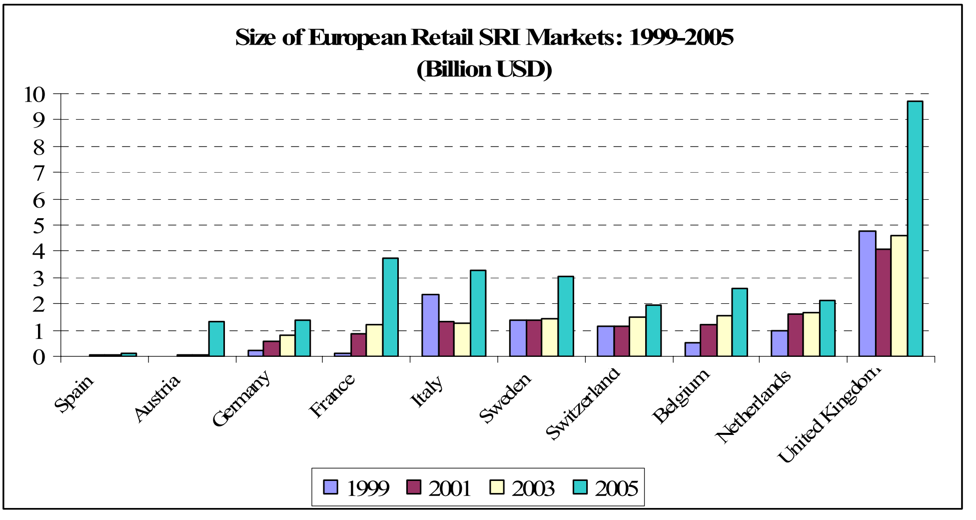
Country	Total	Retail	Non-Retail
United States	2150.00	162.00	1988.00
Canada	51.40	9.94	41.46
UK	378.94	5.94	373.00
The Netherlands	5.43	1.77	3.66
Australia	15.33	1.73	13.6
Switzerland	5.07	1.53	3.54
Germany	1.58	1.30	0.28
France	3.66	1.18	2.48
Italy	4.37	0.83	3.54
Austria	1.26	0.08	1.18
Spain	0.14	0.05	0.09
Belgium	n/r	1.55	n/r
Sweden	n/r	1.46	n/r

Figure 1 provides a further look at the growth of SRI assets in Europe over time. Using Figure 1, we summarize European retail market trends reported periodically by Avanzi/SiRi Group (Avanzi (2001, 2003, 2005)). Like their mainstream counterparts, SRI funds underwent a strong growth until the bear market of 2000. Recently, the SRI retail industry has regained growth in size as a result of the recovery of international stock markets. Next to the U.K., several countries are becoming frontrunners in the European SRI industry, most notably the rapidly growing markets in France, Belgium, Sweden, and

[5] http://www.uksif.org/Z/Z/Z/sri/data/index.shtml#inst

Italy. It should be noted, however, that the majority of Italian SRI vehicles comprise fixed-income securities, whereas other markets are mostly represented by equity (Avanzi (2005)).

FIGURE 1. Trends in European Retail Market for SRI.



SRI Criteria and Implementation Methods

Although the abovementioned market estimates might suggest the contrary, SRI and CSR are ambiguous and multidimensional concepts, and thus sensitive to subjective interpretation. SRI funds may conceptually share a dedicated interest in social, ethical or environmental issues, but these funds might differ substantially in their methods to determine a socially responsible investment universe. For example, the first generation of SRI funds in the United States and in the United Kingdom predominantly employs "negative" (i.e., exclusionary or restricted) screens. Negative screeners seek to avoid investments in so-called "sin" sectors, which include businesses that yield substantial revenues from alcohol, tobacco, weapons and gambling. Sound intuition tells us that portfolios that omit these oriented sectors display a tilt towards growth stocks, which have been shown to possess unique risk-return features. More recent SRI mutual funds adopt "positive" screens. Unlike exclusionary screens, positive screeners seek to include leaders in corporate social responsibility in the investment opportunity set. Positive screens are often employed on criteria that are less suitable for restrictive or exclusionary policies. A special variant of positive screening is "best-in-class" analysis, which involves ranking firms on ethical issues relative to industry peers. Best-in-class SRI portfolio managers might enjoy better industry diversification compared to other common alternatives, but their investment in socially controversial companies may fuel criticism that they insufficiently represent social awareness. In its defense, the best-in-class approach can be theoretically justified by the fact that a non-sector-neutral ranking approach might bias social investors to holding sectors that are generally more transparent on corporate social responsibility but not necessarily better social performers. More importantly, best-in-class analysis builds on the conjecture that sustainable corporate behavior of companies should be assessed relative to vis-à-vis industry average performance because only firms operating in the same industry face similar social and environmental challenges.[6] This line of reasoning also suggests that best-in-class is very suitable for active investment managers who intend to use SRI as filters for a firm's management quality and for detecting sources of risk and cash flow. Last but not least, the best-in-class approach more closely aligns with tracking-error considerations (Statman (2006)).

Moreover, SRI fund performance may rely heavily on local factors, because SRI implementation has been shown to vary across continents and across countries. Market overviews by SIF (2003) and Eurosif (2003) indicate that SRI funds in the U.S. and the U.K. often exercise exclusionary screens on companies in the alcohol, tobacco, gambling and armaments industries combined with positive screens concerning, e.g., environmental performance, human rights issues and labor relations.[7] Funds in continental Europe are increasingly showing interest in positive criteria within a best-in-class framework, but also use restrictive screens.[8] As for specific criteria, tobacco has been a dominant criterion in the United States, but SRI funds in Europe and Asia have put much emphasis on environmental issues (SIF (2003)).

1.3. SRI PERFORMANCE IN THEORY

The influence of social, ethical and environmental screens on portfolio construction and performance is still the subject of debates, with the central bottleneck often being the tradeoff between moral and financials investment goals. Our intention is to show that there many theoretical views about SRI returns that reach beyond the traditional diversification disputes. However, although theories on the effects of social investment screens on investor returns are well documented, they are not well organized. To explain how SRI could be consequential to investors and mutual fund performance, the following sections

[6] Apart from focusing on screens, SRI markets around the world are now also witnessing a gradual shift from a screening-based approach to shareholder engagement policies.

[7] Some SRI funds exclude financials because their network most likely includes controversial firms.

[8] See for example the SRI fund overview maintained by the U.S. Social Investment Forum: http://www.socialinvest.org/areas/sriguide/mfpc.cfm

present a set of hypotheses concerning the return implications of SRI policies in financial markets. For expositional convenience, we name them (i) the constrained diversification hypothesis, (ii) the value relevance hypothesis, (iii) the discriminating tastes hypothesis, (iv) the stock neglect hypothesis, (v) the cash flow mispricing hypothesis and (vi) the irrelevance hypothesis. Most of these hypotheses have their antecedents in the standard literatures on rational expectations and behavioral finance.

SRI and Constrained Diversification

The origins of debates on SRI trace back to mean-variance theory in the tradition of Markowitz (1952), according to which a rational economic agent seeks to achieve the highest return-risk tradeoff by means of diversification across securities, where the optimal allocation is a function of securities' return dispersion, return covariation, and the investor's risk appetite. Assuming a world with mean-variance investors, the oft-cited hypothesis against SRI performance, which we dub the *constrained diversification hypothesis*, concentrates on the restrictions that SRI screens impose on portfolio construction. Critics in the finance profession, such as Rudd (1981), warn that these restrictions induce inefficient diversification and raise the non-systematic risk of the investment portfolio. Not surprisingly, an empirical question central to the majority of research on socially responsible investing is whether the investment opportunities that one forgoes due to social screens significantly affect (risk-adjusted) performance. Anecdotal evidence suggests that social investment screens applied on an unconstrained universe of securities leads to a decline of approximately 30% in the investment opportunity set, on average, although extreme filters that preclude up to 70% of the market can also be witnessed in practice.

One counterargument to this constrained diversification hypothesis is the fact that diversification is economically valuable only to some extent. Since buying shares involves transactions costs, an increase in the number of stocks in a portfolio is beneficial as long as the marginal benefits from adding stocks (i.e. the diversification benefits) exceed the marginal costs (i.e. transaction costs). Statman (1987) suggested that about 30 (randomly selected) stocks are needed for having a well-diversified portfolio. According to updated estimates, however, the optimal number of stocks from a mean-variance perspective has increased too over 300 (see Statman (2004)). Overall, it is still an open question whether SRI opportunity sets are large enough to satisfy that requirement.

Many of the theoretical objections to SRI seem to have revolved around mean-variance efficiency, yet an overwhelming part of the money management industry is represented by active portfolio managers who deviate from mean-variance optimized investing to operationalize their security selection skills. Admittedly, SRI screens might preclude the selection of financially attractive stocks for purely non-financial reasons, thereby imposing a constraint on active money management. On the other hand, many active SRI portfolio managers proclaim to act on the view that CSR criteria are important for obtaining a more complete view of a company's financial risks and sources of long-term cash flow, and that the use of these "extra-financial" criteria steers them away from the stock market's future underperformers. A sound judgment about the validity of either of these views requires our understanding of the implications of investors' social concerns for securities' expected (risk-adjusted) returns, which is the central theme of the next section.

SRI, Financial Markets, and Expected Returns

It is interesting to distinguish different schools of thought that help to relate firms' social responsibility attributes to (risk-adjusted) expected returns. One school offers a somewhat behavioral explanation for a relation between a firm's corporate social responsibility characteristics and expected return by suggesting that financial markets have discriminatory tastes against (in favor of) socially controversial (responsible) companies beyond any risk or profit motive. The idea here is that socially controversial companies are more cheaply priced because they are disliked by an important set of norm-constrained investors who drive up their expected return. The theory is "behavioral" in the sense that the rise in expected return is not necessarily due to greater traditional financial risks because investors also discount losses in non-financial utility. However, the effects can be rationally priced.

Whether the effects of norms manifest in market equilibrium is not entirely clear. Consistent with norm-constrained investors affecting financial markets, Heinkel, Kraus and Zechner (2001) present a calibrated equilibrium model that allows so-called green investors to influence the expected return of polluting firms relative to that of non-polluters in the form of boycotts to polluters. In their theoretical setup, markets can drive up the cost of capital of firms with low environmental standards because the presence of environmental norms affects the risk-sharing opportunities of investors holding controversial stocks. The model predicts that when shares of environmentally controversial firms are held by a small portion of non-SRI investors, their expected returns are higher to compensate for investors' limited risk-sharing potential (i.e., not being able to share risk with social investors). This *discriminating tastes hypothesis* is not confined to environmental issues and it can be tested for any other social criterion. Implicit in the hypothesis are the assumptions that the number of investors who screen stocks on social or environmental criteria is sufficiently large and that social investors are homogenous in the choice of SRI criteria. Researchers have yet to reach consensus on the validity of those assumptions. (See, for instance, Malkiel and Quandt (1971), Haigh and Hazelton (2004), Heinkel, Kraus and Zechner (2001), and Hong and Kacperczyk (2006).)

Alternatively, Hong and Kacperczyk (2006) hypothesize that such discriminatory tastes against socially controversial companies cause the value of socially controversial stocks to be depressed below the fundamental value due to pure neglect. The taste-based *stock neglect hypothesis* they introduce in an SRI context builds on a setting inspired by Schleifer and Vishny (1997), in which there are (norm-constrained) investors causing the neglect, and natural arbitrageurs (such as hedge funds, mutual funds, and independent advisors) that fail to eliminate mispricing because of a set of arbitrage risks and constraints. Consequently, Hong and Kacperczyk (2006) posit that "sin stocks" (of companies earning revenues from tobacco, alcohol and gaming) are underpriced and produce anomalously positive returns, controlling for traditional risk factors such as beta, firm size and book to market.

Investments based on corporate social responsibility criteria need not be solely driven by non-financial tastes in markets. We can also define a *value relevance hypothesis* that posits that markets are rationally responsive to social responsibility because CSR conveys clear financial information about a firm's risks and cash flows. In that case, investors carrying the official SRI label may not be the only ones responsive to certain social and environmental issues.

To begin with, the old-school view embraced by SRI skeptics is that CSR is costly to shareholders because it requires the sacrifice of resources that could be dedicated to value-maximizing projects (e.g., Henderson (2002)). Barnea and Rubin (2006) go as far as claiming that CSR could be a source of agency costs because a firm's insiders (managers, directors, and blockholders) have an incentive to promote CSR investment beyond financially optimal levels in order to gain reputational benefits. This interpretation ties CSR to corporate governance issues, like agency risks and information asymmetry. Alternatively, better CSR has been linked to lower litigation risks, investor trust, and other intangible advantages. The implication of this view is that investors have clear financial motivations for eschewing socially controversial companies. Recent interesting work by Karpoff, Lott and Wehrly (2005) suggests that investors rationally price-protect against litigation risks that stem from socially irresponsible activities, as measured by environmental violations. They found that the magnitude of share price responses to environmental violations fully reflects investors' anticipation of legal sanctions, consistent with CSR being informationally relevant. Kahn, Lekander and Leimkuhler (1997) observed that many U.S. states indeed view the threat of negative long-term consequences of litigation as a valid financial argument for tobacco stock divestment.

When CSR is costly to investors in the aforementioned ways, the value relevance hypothesis predicts that SRI portfolios earn a higher risk-adjusted return than their non-responsible counterparts. When CSR is value relevant because controversial firms are subjected to greater litigation risk, SRI portfolios should earn a lower risk-adjusted return.

A competing hypothesis, which we call the *cash-flow mispricing hypothesis*, is that the market underestimates the sources of cash flow created by strong CSR policies. For example, it has been suggested that investors misunderstand the long-term financial benefits to CSR, possibly because financial markets and companies fixate on short-term performance. Several scholars posit that the majority of money managers undertake short-term oriented investment decisions that align with their three- to five-year judgment periods and tracking-error restrictions (see, e.g., Rappaport (2005)). Also related to the mispricing described above is the argument that many of the suggested benefits to CSR are either of intangible nature or the outcome of a complex set of mutually reinforcing mechanisms within a firm (e.g., Hillman and Keim (2001)). Complications associated with measuring firms' long-term value creation potential have been articulated by a substantial number of researchers, such as Chan, Lakonishok and Sougiannis (2001), Damodaran (2002), and Bassi, Harisson, Ludwig, and McMurrer (2001).

Finally, we identify an *irrelevance hypothesis* for socially responsible investing criteria, which by definition holds when all other hypotheses are rejected. Specifically, the hypothesis says that the expected (risk-adjusted) returns on stocks (or stock portfolios) of socially responsive companies are no different from those of non-responsive firms because CSR and SRI criteria are irrelevant in financial markets. This is because CSR does not convey financially relevant information tied to traditional non-diversifiable investment risks, or because norm-constrained agents who shun stocks for their poor CSR attributes do not represent a high enough percentage of investors.

Although each hypothesis carries implications for the expected returns of SRI and non-SRI mutual funds, it is difficult to reject one hypothesis in favor of another. First, the hypotheses as such are not perfectly mutually exclusive, and several convey similar predictions about expected returns. Second, because corporate social responsibility is a multidimensional concept that includes a broad range of specific issues, it is questionable whether one hypothesis holds for all individual CSR criteria. Some CSR performance dimensions are contentious and sensitive to subjective interpretation whereas others are more objectively measurable and theoretically strongly linked to financial risk. Third, any mispricing test that uses an estimated equilibrium model for expected returns is plagued by the well-known joint-hypothesis dilemma.

Because performance evaluation models common to the literature do not incorporate factors associated with corporate social responsibility, socially responsible (non-responsible) portfolios are expected to deliver a risk-adjusted return that differs significantly from zero under all hypotheses other than the irrelevance hypothesis. Consequently, whether an observed abnormal return is attributable to an omitted (risk) factor in the expected return model or to mispricing is unavoidably difficult to say.

Notwithstanding the earlier mentioned methodological difficulties, the performance of SRI portfolios is an empirical question because one can argue different ways concerning the association between corporate social responsibility and risk-adjusted stock returns.

1.4. DATA

Mutual Fund Samples

Using a unique and comprehensive database, we study the performance of SRI equity mutual funds vis-à-vis the performance of conventional funds in the United States, Canada, The United Kingdom, The Netherlands, Belgium, France, Germany and Switzerland, respectively. We identified socially responsible mutual funds using various SRI fund information services and previous literature. U.S. SRI funds were identified via the U.S. Social Investment Forum (SIF) and through Hamilton, Jo and Statman (1993), and Statman (2000). Canadian SRI funds were identified using the Canadian Social Investment Forum. SRI funds in the U.K. were identified based on, respectively, the annual report of the Investment Management Association (IMA), the SRI Compass service, TrustNet, Ethical Investors Group, and previous empirical research (Gregory, Matatko and Luther (1997), Luther and Matatko (1994), and Mallin, Saadouni and Briston (1995)). We focus exclusively on domestic funds in these three countries because internationally oriented SRI funds are very scarce. In contrast, SRI funds in all other countries are mainly internationally oriented, and so we omitted domestic funds from samples specific to those countries. The funds were identified using the SRI Compass Guide, ECO-reporter, and Schroeder (2003), respectively. Since our focus is on funds that hold diversified equity portfolios, our fund samples do not include specialty funds, sector-specific funds, fixed-income funds, balanced funds, guaranteed funds, and closed-ended funds.

We compare the monthly returns of SRI funds with those of a relevant sample of conventional funds. Domestic (international) SRI funds in a country are evaluated relative to all conventional funds in that country which also invest domestically (internationally). We do not match funds on their investment style – e.g. small cap, value, growth, or momentum investing – because the performance attribution models we will employ in this study control for the influence of style and sector tilts on fund returns. Our samples also include ‘dead’ funds - which have disappeared over time, e.g. due to poor performance – in order to manage potential survivorship bias. Brown, Goetzmann, Ibbotson and Ross (1992) emphasize that the results of many performance evaluation studies are biased upwards because non-survivors are not present in the sample. Our sample of U.S. fund returns are from the CRSP U.S. Mutual Fund Database, a database that is survivor-bias free by construction. The returns of Canadian mutual funds are from Globefund. For all other countries in our study, we collected fund returns from Datastream. Since neither Globefund’s nor Datastream’s fund browser services keeps track of names for funds that have disappeared over time, our initial sample suffered from mutual fund survivorship bias. To tackle survivorship bias in the DataStream user interface, we manually inspected a listing of 20,218 dead funds (worldwide), including their Datastream identification codes, which were provided by Thomson Financial.[9] After excluding dead funds that are not relevant to this study, we recovered monthly returns of dead equity funds from the Datastream database. All returns are corrected for distributions and splits and are net of expenses.

One contribution of this chapter is that we disaggregate composite fund return series into clusters based on SRI funds' social screening policies and investment criteria. Our U.S. and U.K. samples are sufficiently heterogeneous to study mutual fund returns subject to different screening methodologies. For U.S. funds, we draw on a listing of SRI funds' policies maintained by SIF. SIF's overview allows for a characterization of a socially responsible fund's position towards the following dimensions: alcohol, tobacco, gambling, weapons and defense, animal testing, products and services, environmental performance, human rights issues, labor relations, employment equality, community investing, and proxy voting. We cross-checked the accuracy of SIF's overview by manually inspecting each SRI fund's prospectus and corrected discrepancies when necessary. Using SIF's 12 social criteria, we also examine the social screening policies of all domestic SRI trusts in the United Kingdom. In order to describe UK fund screens in a manner similar to that for the U.S. sample, we hand-collected social screening information through, respectively, the funds' websites, prospectuses, e-mail communication with the fund management companies, and SRI Compass.

Table 2 presents summary statistics on the funds. Panel A reports mean annualized returns, annualized standard deviations of returns, annualized Sharpe ratios, and the number of funds that are included in the samples. In addition, we report the Z_{JK}-statistic proposed by Jobson and Korkie (1981) for testing the null hypothesis that SRI and conventional funds have identical Sharpe ratios. Several observations emerge from these descriptive statistics.

First, there are no obvious consistencies in the average return differences between SRI funds and conventional funds across countries. SRI funds earned higher (lower) average returns in five (three) out of eight cases. Second, the returns of SRI funds seem more volatile than the returns of conventional funds. In six out of eight cases, SRI funds have a higher standard deviation than their conventional peers. The higher dispersion of SRI fund returns might be an indication that these funds differ from their conventional counterparts in terms of systematic and non-systematic risk. Nevertheless, the Sharpe ratios indicate that some SRI funds provided a higher average return adjusted for volatility while others seem to have been outclassed by their conventional peers. Most reported Z_{JK}-scores do not reach the conventional critical levels, suggesting that the difference in Sharpe ratio is marginal.

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[9] Recently, after we completed of this study, Thomson Financial improved its dead-fund interface.

TABLE 2. Descriptive Statistics on Global Mutual Fund Samples

Panel A of the table reports the average return, the standard deviation of return and the Sharpe ratio, all annualized, for the SRI and conventional fund portfolios in the eight countries we investigate (the funds in each portfolio are weighted equally). The absolute value of the Z_{JK}-score corresponds to a test of the null hypothesis that SRI and conventional funds have equal Sharpe ratios ($Sharpe_{SRI} - Sharpe_{conv.} = 0$). Z_{JK}, as originally introduced by Jobson and Korkie (1981), is assumed to have a standard normal distribution when the number of observations is sufficiently large. Panel B (on the next page) reports fund characteristics.

Panel A: Return Statistics

Country	Mean Return %		St. Dev. Return		Sharpe Ratio		
	SRI	Conventional	SRI funds	Conventional	SRI funds	Conventional	Abs(Z_{JK})
United States	12.27	9.57	16.44	15.18	0.4	0.32	0.91
Canada	6.77	7.63	13.78	13.85	0.18	0.24	0.72
United Kingdom	8.71	8.92	15.85	15.55	0.10	0.10	0.07
France	7.94	7.55	17.64	19.91	0.20	0.17	0.61
Germany	2.07	6.45	16.06	15.42	-0.15	0.15	1.83
Netherlands	10.65	8.4	17.66	14.73	0.35	0.27	1.14
Belgium	5.48	4.48	16.22	15.48	0.06	0.01	0.29
Switzerland	7.23	6.25	22.94	17.22	0.16	0.13	0.26

TABLE 2 *Continued*. Descriptive Statistics on Global Mutual Fund Samples

Panel B of the table reports fund characteristics. We report the number of socially responsible and conventional mutual funds in every country central to this study. We also report the investment scope of the funds we investigate and the performance evaluation period. U.S. funds data are from the CSRP Mutual Funds Database, Canadian funds data are from Globefund, and data on all remaining mutual funds are from Datastream.

Panel B: Fund Characteristics

Country	# Mutual Funds in Sample		Scope	Period
	SRI funds	Conventional		
United States	42	4113	Domestic Equity	Jan. 1987 - Sep. 2003
Canada	8	267	Domestic Equity	Mar. 1993 - Jan. 2003
United Kingdom	19	505	Domestic Equities	Feb. 1987 - Dec. 2003
France	34	184	European Equities	Feb. 1996 – Jan. -2004
Germany	15	113	International Equities	Dec. 1990 – Jan. 2004
Netherlands	9	99	International Equities	Jan. 1995 – Jan. 2004
Belgium	18	62	International Equities	Feb. 1994 – Jan. 2004
Switzerland	11	48	International Equities	Jan. 1994 - Jan. 2004

As panel B points out, the fund samples differ in investment scope and evaluation period. The statistics presented thus far intend to provide a basic feeling of SRI, and we proceed with evaluating SRI funds more comprehensively throughout the remainder of this study, using performance attribution models that take into account fund market risk exposure, investment style tilts, and country biases.

Benchmark Data

Measuring fund returns against one or several passive benchmark asset returns has become the conventional performance evaluation approach in the empirical literature. Our study focuses on explaining SRI and conventional mutual fund performance by multiple benchmark returns, which are well capable of explaining the cross-sectional and time-series variation in mutual fund returns; see, for example, Jensen (1968), Fama and French (1993), and Carhart (1997).

Our primary multifactor model includes the returns on four benchmark portfolios to explain mutual fund performance. As in the single-index CAPM, the first variable is the return on a broad market portfolio over a risk-free Treasury bond rate. In line with Fama and French (1993), the second and third benchmark factors are two zero-investment portfolios: SMB is the return difference between a small cap portfolio and a large cap portfolio, and HML is the return difference between high a book-to-market portfolio and a low book-to-market portfolio. The portfolios are constructed after a two-dimensional sort of all stocks on, respectively, market capitalization and the book-to-market ratio. For further details on the construction of SMB and HML, see Fama and French (1993). Following Carhart (1997), we augment the three-factor model by a variable that describes the returns on a momentum portfolio. The returns on the momentum factor are obtained by ranking all stocks in the investment universe annually on their past 12-month return. The momentum factor (MOM) is the return difference between the portfolio of past 12-month winners and the portfolio of past 12-month losers.

Our benchmark portfolios are explicitly designed to avoid a mismatch between the funds' official investment scope and the market coverage of the benchmark portfolios, i.e., we evaluate mutual funds with a domestic (international) investment scope relative to domestic (international) benchmark models. For evaluating U.S. funds, the three factor-mimicking portfolio returns developed by Fama and French (1993) are available from the Kenneth French Data Library.[10] The U.S. momentum factor we use is from Mark Carhart (1997).[11] For non-U.S. funds, we composed benchmark portfolios using an international stock database provided by Style Research. Style Research builds benchmark portfolios based on all stocks in the Worldscope universe.[12] The Worldscope database is

[10] See Ken French's website: mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
[11] We thank Mark Carhart for kindly providing the momentum factor returns.
[12] Http://www.styleresearch.co.uk

comprehensive, covering 98% of total market capitalization, and allows for developing benchmark portfolios with sizeable market coverage. We constructed factor-sorted benchmark portfolios based on the Fama and French (1993) and Carhart (1997) methodologies by ranking all stocks in the Worldscope universe on the abovementioned fundamental characteristics (size, book-to-market and past annual return) and on geographical scope.[13]

As a robustness check, we estimate two additional multifactor models. One specification is a conditional model, similar to Ferson and Schadt (1996), that allows for time variation in mutual fund performance and in factor sensitivities due to changes in fundamental economic variables. The lagged economic instruments we use as conditioning instruments are the (a) dividend yield of a representative market index, (b) the 12-month inflation rate, (c) and the term spread measured by a long government bond yield in excess of a Treasury bill rate. The last multifactor model we employ contains country factors orthogonal to variables in the four-factor model. The country factors are obtained from principal components analysis (PCA) applied on the returns of MSCI country indexes, which are available from Datastream.

1.5. EMPIRICAL ANALYSIS

Aggregate SRI Fund Performance around the World

We use an array of multifactor models to assess SRI and conventional mutual fund performance in response to mounting evidence that these models are most efficient in explaining equity returns.[14] Multifactor models can be characterized by the following equation:

$$R_{it} - R_{ft} = \alpha_i + \sum_{j=1}^{J} \beta_{ij} F_{jt} + \varepsilon_{it} \qquad (1)$$

where R_{it} is the return on mutual fund i in month t, R_{ft} denotes the one-month T-Bill rate, F_{jt} is the (excess) return on determinant j at t, and J denotes the number of determinants. If

[13] Our approach differs only in one respect. After composing 6 value-weighted portfolios of stocks ranked on size and book-to-market, we use the 20th percentile of market capitalization as the discriminating factor between 'small' caps and 'large' caps. Fama and French (1993) use the median market value. Consistent with Fama and French (1993), the book-to-market breakpoints that we use to identify 'value', 'neutral' and 'growth' stocks are the 30th and 70th percentiles. The sorting procedure is performed independently for all countries or regions. We rebalance all portfolios annually at the end of June, ignoring transaction costs.

[14] Fama and French (1993, 1998), Jegadeesh and Titman (1993) and others provide evidence suggesting that passive investment styles produce alphas that differ significantly from zero in the single-index framework.

the factors F are solely excess returns on passive investments, the β_{ij}'s can be thought of as the weights assigned to a set of passive portfolios that most closely explain the time-variation in the fund's return. Generally, Jensen's alpha can be interpreted as the contribution of active money management to investment return. However, since our research involves a comparison between SRI mutual funds and conventional funds, the interpretation of Jensen's alpha can be different. While conventional fund alpha measures the incremental value of active management after subtraction of expenses and after correction for factor-sensitivities, the SRI mutual fund alpha also captures the influence of social screens on average portfolio return. Thus, by comparing alphas we formally test a joint hypothesis that the average abnormal return on conventional funds resulting from active management and expenses is equal to the abnormal returns of SRI funds resulting from active portfolio management, expenses, and from social screens. If we assume that fund expenses associated with SRI funds are no different from those of their conventional peers then our empirical tests more explicitly measure the return consequences of SRI screens (in the form of the earlier mentioned diversification effects and/or selection effects). This assumption is sensible, as suggested by SIF (2003).

We consider various multifactor models. Our main multi-index model incorporates the widely known factor-mimicking returns put forward by Fama and French (1993) and Carhart (1997). This four-factor specification is equivalent to the single-index CAPM model augmented by three passive zero-investment portfolios.[15] The second variable in the model, SMB, is calculated as the return difference between a small cap and a large cap portfolio. The third variable in the model, HML, is computed as the return differential between a value stock portfolio with a book-to-market ratio and a "growth" portfolio with a low book-to-market ratio. The fourth passive zero-investment strategy, MOM, buys a portfolio consisting of prior 12-month "winner" stocks and sells short prior 12-month "losers". Empirical evidence points out that expanding the single-factor framework by these three variables is particularly important when performance assessment involves SRI mutual funds; see for example Bauer, Koedijk and Otten (2005), who suggest that SRI funds are tilted towards stocks with high market-to-book ratios.

The resulting model is written as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(R_{mt} - R_{ft}) + \beta_{1i}\, SMB_t + \beta_{2i}\, HML_t + \beta_{3i}\, MOM_t + \varepsilon_{it} \qquad (2)$$

where R_{it} is monthly return on fund portfolio i in month t in excess of the risk-free rate proxy (R_{ft}), and where the four common factor-mimicking returns are designed to match the geographical investment scope of the funds that generate R_{it}.

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[15] Although there is an ongoing discussion about whether these additional factors proxy for risk, we have no opinion in this debate but merely use the factor mimicking portfolio returns as control variables in the fund performance evaluation methodology.

As a robustness check, we estimate several alternative specifications, starting with the widely documented CAPM. Even though empirical evidence points out that the CAPM framework is unable to explain a recent chain of security return regularities, the single-index model has strong theoretical roots.[16]

Our second alternative model incorporates eight-factors. Although the four-factor model has been popularized in recent empirical finance literature, the international version of the model is not suitable to account for risks and returns associated with strong country tilts in internationally-oriented mutual funds. For this reason, the eight-factor specification includes statistical factors designed to mitigate this problem. The underlying rationale is that passive country indexes can display abnormal performance in the absence of a robust performance evaluation model, but that the unexplained returns are accounted for by just a few common factors. To identify the country indexes, we use a principal components analysis (PCA) similar to Geczy, Stambaugh and Levin (2003). We derive a multifactor model that explains country return variation that is left unexplained by the four-factor model by collecting a large set of MSCI country-based equity indexes and running individual regressions of the country index returns on the four factor-mimicking returns. We extracted factors from unexplained series, defined as the residuals plus the intercept from each regression, by means of a principal components analysis of the covariance matrix based on uncentered variables.[17] From the PCA, the first four computed scores were added to the four-factor model.[18] The resultant eight-factor model was used to estimate fund alphas.[19]

The last alternative model we explore is the conditional multifactor model that allows for time-varying factor sensitivities in response to (macro)economic development. In line with Ferson and Schadt (1996), we condition a fund's factor loadings on a set of economic instruments. However, whereas Ferson and Schadt (1996) introduced a model of the form

$$R_{it} - R_{ft} = \alpha_i + \beta_{i0}(R_{mt} - R_{ft}) + B'i\ Y_{t-1}(R_{mt} - R_{ft}) + \varepsilon_{it}, \qquad (3)$$

where Y_{t-1} is a vector of fundamental economic variables, we extend their approach in order to arrive at a four-factor model with four factor loadings that vary over time in response to variation in economic variables. The vector of economic variables we use is

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16 See Sharpe (1964), Lintner (1965) and Mossin (1966).

17 Examples of non-SRI studies that derive statistical factors from residuals are Elton, Gruber and Blake (1999), Jones and Shanken (2004) and Pastor and Stambaugh (2002).

18 There are no strict rules of thumb for choosing the number of components. We used two common approaches: an eigenvalue scree plot suggested by Catell (1966), and an inspection of total variance explained by the four components.

19 We also developed models with global industry variables instead of the country variables. However, inclusion of the industry factors, which were derived from a PCA on global industry

based on the funds' geographic scope and includes the (a) dividend yield of a relevant market index, (b) the 12-month percentage change in the consumer price index observed monthly in a rolling window, and (c) the term spread as measured by the yield difference between a long-term government bond and a short rate.

Table 3 presents the results of estimating the four-factor models using, respectively, excess SRI fund returns and excess conventional fund returns as the dependent variable. In addition, we formally compare SRI mutual funds with their respective conventional counterparts using the returns on a "difference" portfolio as the dependent variable, which are obtained by subtracting conventional fund returns from the returns of SRI funds. Generally the loadings on the broad market portfolio, SMB, HML and MOM point out that mutual funds not only have significant aggregate market sensitivity but also experience significant style tilts. For example, SRI and conventional mutual funds in the U.S., Canada, the U.K., France and Germany tend to have positive and significant loadings on SMB, suggesting that these funds are exposed to small caps. Loadings on HML (i.e. the value-versus-growth factor) and those on MOM (the momentum factor) are less pronounced, as we observe significant coefficients on these regressors occasionally. As for the alpha estimates, the regression results largely tell a consistent story. Neither SRI mutual funds nor conventional funds outperform the set of passive indexes: the average abnormal returns mostly do not differ significantly from zero. Finding no anomalously positive mutual fund returns at the aggregate level is consistent with a large literature on mutual funds; see, for example, Jensen (1969) and Elton, Gruber, Das and Hlavka (1992), and Carhart (1997).

Central to our study are statistical tests involving the "difference portfolios", which explicitly highlight how well SRI funds fare against their conventional peers and how they differ in risk. Table 3 presents two important observations. First, contrary to previous studies, we do not find uniform evidence that SRI funds and conventional funds are differentially sensitive to the risk and style factors at the aggregate level. While Bauer, Koedijk and Otten (2005) observed that SRI funds tend to be less market sensitive, our global results contradict their findings. In five countries, the difference in market exposure between SRI and conventional funds is not significant at the usual cut-off levels. In the U.S., the Netherlands, and Switzerland, our "difference" portfolios show a significantly positive loading on the broad market portfolio, thus pointing out that SRI funds in these markets are more market-sensitive than their conventional peers. Similarly, HML exposures portfolios with respect to the "difference" portfolios do not support the conjecture made by previous work of a relative bias toward growth-stocks. In the Canadian and French retail markets, we observe that SRI funds have been more (less) exposed to

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indexes based on FTSE industry classification, yielded similar results.

TABLE 3. Carhart (1997) Four-Factor Alpha Estimates for SRI and Conventional funds

SRI (conventional) fund returns are regressed on a constant and the four factor-mimicking portfolios (see Fama and French (1993) and Carhart (1997)), which are customized to funds' geographical scope. The non-U.S. factor portfolios were developed based on all stocks from Worldscope. Alphas are annualized. The "difference" returns are obtained by subtracting the returns of conventional funds from those of SRI funds.

	Alpha	Market	SMB	HML	MOM	Adj. R^2	Fund Scope
United States (1987:01 - 2003:03)							
SRI Funds	-0.24%	0.97***	0.22***	0.07*	0.02	0.95	Domestic Eq.
	(-0.23)	(47.81)	(4.68)	(1.90)	(0.98)		
Conventional Funds	-1.31%	0.87***	0.26***	0.02	0.04	0.96	Domestic Eq.
	(-1.17)	(23.47)	(8.37)	(0.44)	(1.36)		
Difference	1.24%	0.10**	-0.04	0.06	-0.02		
	(0.79)	(2.02)	(-0.66)	(1.08)	(-0.59)		
Canada (1993:03-2003:01)							
SRI Funds	-3.80%**	0.87***	0.17***	0.10***	-0.02	0.91	Domestic Eq.
	(-2.27)	(29.30)	(2.99)	(2.75)	(-0.45)		
Conventional Funds	-2.50%*	0.89***	0.19***	0.04	-0.09***	0.95	Domestic Eq.
	(-1.92)	(30.31)	(5.51)	(1.37)	(-3.52)		
Difference	-1.30%	-0.02	-0.01	0.06**	0.07***		
	(-1.12)	(-0.92)	(-0.30)	(2.48)	(2.90)		

** Significant at 10% level, ** 5% level, *** 1% level.*

TABLE 3 *Continued*. Carhart (1997) Four-Factor Alpha Estimates for SRI and Conventional funds

	Alpha	Market	SMB	HML	MOM	Adj. R^2	Fund Scope
United Kingdom (1987:02 - 2003:09)							
SRI Funds	-0.97%	0.89***	0.61***	-0.11	0.06	0.91	Domestic Eq.
	(-0.75)	(37.07)	(6.87)	(-1.34)	(1.36)		
Conventional Funds	-1.18%	0.90***	0.46***	-0.07*	0.08***	0.96	Domestic Eq.
	(-1.29)	(56.18)	(9.93)	(-1.86)	(2.85)		
Difference	0.21%	-0.01	0.15**	-0.04	-0.02		
	-0.22	(-0.50)	(2.19)	(-0.69)	(-0.81)		
France (1996:02 - 2004:01)							
SRI Funds	-2.39%	0.89***	0.15**	-0.06	-0.08**	0.90	European Eq.
	(-1.34)	(28.15)	(2.07)	(-0.95)	(-2.30)		
Conventional Funds	-2.56%	0.92***	0.10	-0.12**	-0.03	0.94	European Eq.
	(-1.49)	(33.98)	(1.62)	(-2.53)	(-0.92)		
Difference	0.17%	-0.02	0.05	0.07 *	-0.05***		
	(0.14)	(-0.76)	(0.84)	(1.78)	(-2.72)		
Germany (1990:12 - 2004:01)							
SRI Funds	-6.41%**	0.80***	0.60**	0.05	0.01	0.74	International Eq.
	(-2.21)	(16.15)	(2.32)	(0.41)	(0.43)		
Conventional Funds	-1.68%	0.81***	0.13	-0.10	0.04**	0.82	International Eq.
	(-0.81)	(16.62)	(0.60)	(-1.12)	(2.11)		
Difference	-4.78%**	-0.01	0.40***	0.15	-0.03		
	(-2.00)	(-0.27)	(2.55)	(1.47)	(-1.20)		

** Significant at 10% level, ** 5% level, *** 1% level.*

TABLE 3 *Continued (II)*. Carhart (1997) Four-Factor Alpha Estimates for SRI and Conventional funds

	Alpha	Market	SMB	HML	MOM	Adj. R^2	Fund Scope
Netherlands (1995:01 - 2004:01)							
SRI Funds	1.94%	0.84***	-0.31	-0.12	-0.02	0.75	International Eq.
	(0.64)	(15.99)	(-1.48)	(-0.90)	(-0.31)		
Conventional Funds	0.28%	0.74***	0.06	0.04	-0.02	0.80	International Eq.
	(0.11)	(13.55)	(0.31)	(0.39)	(-0.38)		
Difference	1.66%	0.10***	-0.38**	-0.16	-0.00		
	(0.82)	(4.22)	(-2.25)	(-1.57)	(-0.04)		
Belgium (1994:02 - 2004:01)							
SRI Funds	-1.19%	0.83***	-0.23	-0.11	-0.08	0.80	International Eq.
	(-0.43)	(16.96)	(-1.11)	(-1.06)	(-1.44)		
Conventional Funds	-2.37%	0.82***	-0.31*	-0.13	-0.02	0.89	International Eq.
	(-1.37)	(18.25)	(-1.79)	(-1.39)	(-0.32)		
Difference	1.18%	0.00	0.07	0.01	-0.07		
	(0.59)	(0.06)	(0.48)	(0.15)	(-1.61)		
Switzerland (1994:01 - 2004:01)							
SRI Funds	-0.80%	0.91***	-0.06	0.07	-0.01	0.81	International Eq.
	(-0.33)	(21.95)	(-0.27)	(0.50)	(-0.13)		
Conventional Funds	-1.10%	0.85***	-0.05	0.08	0.03	0.82	International Eq.
	(-0.48)	(17.86)	(-0.21)	(0.67)	(0.42)		
Difference	0.45%	0.07*	0.04	0.05	-0.01		
	(0.20)	(1.83)	(0.20)	(0.35)	(-0.25)		

** Significant at 10% level, ** 5% level, *** 1% level.*

value (growth) stocks compared to conventional funds. In all other countries, however, differential loadings on HML are not statistically significant. The fact that our more globally oriented research does not fully align with previous work hints that prior evidence is country-specific.

Second, the reported differences in alpha strongly suggest that the risk-adjusted return delivered by SRI funds matches the return of conventional funds. We find that German SRI mutual funds have underperformed their conventional peers significantly, by approximately 4.7 percent per annum. In all other cases, the performance difference between SRI funds and conventional funds is not significant at the usual cut-off levels.

In Table 4, we report results for the alternative multifactor model specifications.[20] Since most alternative regressions produce loadings which are more difficult to interpret than those from unconditional four-factor regressions, we focus only on their alphas. We imported the four-factor alpha estimates from the previous table and additionally report alphas and differential alphas estimated for the single-factor CAPM, eight-factor model and the conditional four-factor model, respectively. Differences between the four-factor alphas and CAPM alphas are marginal. Compared to the four-factor models, the eight-factor models (8F) more frequently point to significantly negative fund alphas for international funds. In contrast, the conditional four-factor model (C4F) delivers mutual fund alpha estimates which exceed the alphas obtained from the unconditional regressions (4F). This observation is consistent with past research on conditional mutual fund performance, e.g., Ferson and Schadt (1996). The differential alphas, however, are robust to the choice of performance attribution model and confirm our previous conjecture that SRI funds and conventional funds earn comparable risk-adjusted returns. Thus, also after controlling for country risk, and time variation in funds' risk factor loadings, the results suggest that the aggregate performance of SRI funds is robust across countries.

In one of the most critical articles ever written on the topic of socially responsible investing, Entine (2003) suggests that current views on SRI performance are exaggerated because most empirical evidence comes from the long bull-market state of the nineties. Entine (2003) argues that SRI funds are more likely to outperform unscreened portfolios in certain market states because screened funds typically hold "growth" stocks. Although the four factors in the Carhart model should be able to control for such style tilts in fund holdings, one may still be interested in risk- and style-adjusted performance over different markets conditions. We can slightly modify the conditional performance evaluation framework to allow SRI and conventional fund alphas and betas to vary across discrete "bull" and "bear" regimes, using the following model:[21]

[20] Statistical model selection criteria (the adjusted R^2, the Log likelihood, the Akaike information criterion, and the Schwarz criterion) suggest that models with four country factors perform better than does the four-factor model. The criteria regarding the conditional models suggest these models only occasionally have more explanatory power compared to the four-factor model.

[21] Theoretically, the view that SRI mutual fund performance varies across stock market regimes can be justified by the stylized fact that stock returns exhibit different correlations during "down"

$$R_{it} - R_{ft} = \alpha_i + A' Z_{t-1} + \beta_{i0}(R_{mt} - R_{ft}) + B'_i Z_{t-1}(R_{mt} - R_{ft}) + \varepsilon_{it}, \quad (4)$$

This model is similar to the conditional model of Christopherson, Ferson and Glassman (1998) with the exception that we use one dummy as instrumental variable. Z_{t-1} is a variable indicating bear market states. Estimating (4) is equivalent to estimating a model with time-varying betas and two dummies – one indicating bear markets and one denoting bull markets - and without a regular constant. We define a bull (bear) market phase as the period in which the 6-month moving average return on the value-weighted market portfolio is higher than (less than) zero percent. We generalize model (4) to a multivariate framework, allowing loadings on Carhart's (1997) fund alpha and factors loadings to vary over time.

In Table 5, we present differential alphas between socially responsible and conventional mutual funds. Interestingly, SRI funds in North-America and the United Kingdom outperformed their conventional peers more strongly in bear markets than in bull markets. In contrast, the performance difference between SRI funds and conventional funds in continental Europe is mostly positive during bull markets and negative during bear markets. While there is an economically large variation in differential alpha across the different regimes, these differences are mostly not statistically significant. In most cases, a simple Wald test shows that the hypothesis that bear-market alpha equals bull-market alpha cannot be rejected at the standard significance levels. In only two cases, the results are significant. Canadian socially responsible funds underperformed conventional funds significantly in bull markets, by 2.40 percent annually, but outperformed their conventional peers significantly in bear markets, by 2.58 percent. In Belgium, SRI funds outperformed conventional funds by an amazing 5.4 percent during bull markets but underperformed their conventional counterparts by an equally large percentage during bear markets. Given the lack of statistically significant excess returns across different states, we conclude that the returns of socially responsible funds relative to conventional mutual are reasonably robust to changes in stock market conditions.

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markets, as evidenced by Erb, Harvey and Viskanta (1994) and Campbell, Koedijk and Kofman (2002). Given that security return covariation appears to be stronger during bear markets, we could argue the impact of SRI screens on the management of (idiosyncratic) risk via diversification or selectivity skills depends on the state of the market.

TABLE 4. Robustness Tests: Alpha under Alternative Models

Reported are alphas obtained under the Carhart (1997) four-factor model (4F), 1-factor CAPM, (1F), the 4-factor model with four extra country factors derived from PCA (8F), and the conditional four-factor model (C4F). Alphas are annualized. T-statistics are in parentheses.

	4F	1F	8F	C4F
United States				
SRI Funds	-0.24%	0.37%	0.01%	0.11%
	(-0.23)	(0.30)	(0.01)	(0.11)
Conventional Funds	-1.31%	-0.82%	-1.33%	-0.33%
	(-1.17)	(-0.75)	(-1.21)	(-0.53)
Difference	1.24%	1.16%	1.49%	0.44%
	(0.79)	(0.81)	(0.95)	(0.44)
Canada				
SRI Funds	-3.80%**	-1.92%	-4.72%***	-1.77%
	(-2.27)	(-0.90)	(-2.68)	(-0.91)
Conventional Funds	-2.50%*	-1.15%	-2.91%**	-1.15%
	(-1.92)	(-0.53)	(-2.18)	(-1.00)
Difference	-1.30%	-0.77%	-1.81%	-0.62%
	(-1.12)	(-0.63)	(-1.51)	(-0.49)
United Kingdom				
SRI Funds	-0.97%	-1.45%	-1.10%	-0.11%
	(-0.75)	(-0.94)	(-0.87)	(-0.10)
Conventional funds	-1.18%	-1.37%	-1.05%	0.25%
	(-1.29)	(-1.20)	(-1.25)	(0.31)
Difference	0.21%	-0.08%	-0.06%	-0.36%
	(0.22)	(-0.09)	(-0.06)	(-0.42)

** Significant at 10% level, ** 5% level, *** 1% level.*

TABLE 4 *Continued*. Robustness Tests: Alpha under Alternative Models

	4F	1F	8F	C4F
France				
SRI Funds	-2.39%	-2.76%	-3.27%**	-0.79%
	(-1.34)	(-1.51)	(-1.99)	(-0.38)
Conventional funds	-2.56%	-3.64%**	-3.49%**	-0.63%
	(-1.49)	(-2.20)	(-2.52)	(-0.39)
Difference	0.17%	0.88	0.22%	-0.16%
	(0.14)	(0.71)	(0.19)	(-0.11)
Germany				
SRI Funds	-6.41%**	-7.09%**	-6.46%**	-3.69%
	(-2.21)	(-2.43)	(-2.42)	(-1.37)
Conventional funds	-1.68%	-2.44 %	-1.89%	0.79%
	(-0.81)	(-1.15)	(-1.40)	(0.46)
Difference	-4.78%**	-4.68%*	-4.59%*	-4.62%**
	(-2.00)	(-1.75)	(-1.94)	(-2.01)
Netherlands				
SRI Funds	1.94%	1.92%	1.34%	5.23%
	(0.64)	(0.64)	(0.56)	(1.66)
Conventional funds	0.28%	0.29%	-0.19%	1.90%
	(0.11)	(0.12)	(-0.14)	(0.83)
Difference	1.66%	1.63%	1.53%	3.33 %
	(0.82)	(0.81)	(0.76)	(1.44)
Belgium				
SRI Funds	-1.19%	-1.44%	-1.61%	-1.06%
	(-0.43)	(-0.56)	(-0.87)	(-0.46)
Conventional funds	-2.37%	-2.39%	-2.54%**	-1.60%
	(-1.37)	(-1.33)	(-2.42)	(-1.22)
Difference	1.18%	0.93%	0.94%	0.54%
	(0.59)	(0.49)	(0.54)	(0.28)
Switzerland				
SRI Funds	-0.80%	-0.43%	-1.09%	1.36%
	(-0.33)	(-0.18)	(-0.61)	(0.54)
Conventional funds	-1.10%	-0.96%	-1.42%	-1.05%
	(-0.48)	(-0.43)	(-1.38)	(-0.49)
Difference	0.45%	0.53%	0.33%	2.41%
	(0.20)	(0.27)	(0.17)	(1.07)

** Significant at 10% level, ** 5% level, *** 1% level.*

TABLE 5. Differential Alphas under Bull and Bear Markets

Performance evaluation results are based on equation (4). The conditioning variable is a bear-market identifier, which is equal to unity if the 6-month moving average return on the market portfolio (R_m) is below zero percent. The differential alphas are annualized. Each F-statistic (and respective p-value) tests the whether the differential risk-adjusted return between SRI and conventional funds is equal across bull and bear market states.

	Differential Fund Alpha: SRI-Conventional Funds		Wald Test: Bull Alpha = Bear Alpha	
	Bull Market	Bear Market	F	Probability
United States	1.10% (0.88)	5.55%** (2.08)	1.07	0.3
Canada	-2.40%* (-1.72)	2.58%* (1.67)	5.45**	0.02
United Kingdom	0.01% (0.01)	0.50% (0.86)	0.03	0.87
France	1.17% (0.55)	-1.22% (-1.23)	1.07	0.3
Germany	-3.97% (-1.10)	-6.50%** (-2.09)	0.29	0.59
Netherlands	2.16% (0.64)	0.34% (0.13)	0.19	0.66
Belgium	5.36%** (1.99)	-5.36%** (-2.44)	10.07***	0.00
Switzerland	1.14% (0.40)	-0.08 (-0.03)	0.15	0.70

** Significant at 10% level; ** 5% level; *** 1 % level.*

Sorts on Social Screening Policy

The foregoing sections studied SRI mutual fund performance at the aggregate level. However, aggregation may introduce a loss of information on the effects of social screens on investment performance if SRI funds differ in social screening methodology. Research up to this point has paid little attention to how a fund's SRI screening methodology can be consequential to SRI fund investors. Here, we focus on SRI fund performance from the perspective of an investor who prefers funds that return a certain level of non-financial performance from the social, ethical, and environmental attributes inherent in these investment vehicles. Therefore, we explore whether an investor's choice for funds with a specific social screening methodology or a certain level of screening intensity will affect the risk-adjusted return of the resulting SRI fund portfolio.

To our knowledge, only one earlier study relates to ours. Using panel data, Barnett and Salomon (2002) investigated the sensitivity of fund returns to the adoption of specific social investment criteria. They observe a curvilinear relationship between the performance of a SRI fund and the number of social criteria the fund adopts. As the number of screens adopted by an SRI fund increases, risk-adjusted returns decline at first, but rebound as the number of screens reaches a maximum. Their results suggest that the constrained diversification and mispricing hypotheses coexist: those funds that adopt an average number of SRI screens materially suffer from constraints on the investable universe whereas those with a large number of SRI filters enjoy better stock picking.

Barnett and Salomon use panel data regressions of SRI fund returns on dummy variables indicating a fund' s specific social investment criteria (as reported by the U.S. social investment forum for each fund), but we adopt a clustering approach.[22] Our method differs from that of Barnett and Salomon (2002) because we adopt the perspective of an investor forming a portfolio of SRI funds given his taste for a certain level of social responsibility. Another motivation for doing so is the fact that neither the stringency of social screens nor the screening methodology can be determined with absolute certainty based on publicly available information. The interpretation of what is a negative screen or a positive screen varies across mutual funds management companies. For example, although many fund prospectuses proclaim to pursue exclusionary screens on certain ethical criteria, these funds sometimes weigh a firm's negative attributes against its positive features. Consequently, if a firm has sufficiently positive attributes, some SRI mutual funds may acquire shares in that company notwithstanding the presence of negative attributes. Our intention is to look more broadly at differences between funds rather than exploring fund return sensitivities to specific criteria that are not well-defined.

Since only the U.S. and U.K. samples are sufficiently heterogeneous, our comparison of socially responsible funds that differ in social screening methodology is

[22] In addition, Barnett and Salomon (2002) largely include fund specific characteristics as controls but do not adjust fund returns for risk and style exposures by means of multi-index returns.

limited to these two markets. The U.S. social investment forum (SIF 2003) provides an outline of screening criteria that are used for every SRI fund in the United States and demonstrates that SRI funds display variation in their choice of screens.

The criteria we use for clustering were originally identified by SIF for the U.S. market and portray a fund's position towards several broad categories: [23]

- Alcohol: this criterion typically involves screening out companies with significant revenues from the sales of alcoholic beverages.
- Tobacco: this criterion involves not investing in companies that report significant revenues from the sales of tobacco and tobacco-related products.
- Gambling: this criterion excludes companies that have a significant association with gambling.
- Weapons and defense: this screen excludes companies operating in the weapons and defense industry.
- Animal testing: this criterion screens whether firms engage in the abuse of animals for testing their products.
- Products and services: this criterion encourages investment in companies developing products and services that are of high quality, safe, and contribute to a sustainable development.
- Environmental performance: with this screen funds typically seek to invest in companies that have strong environmental policies.
- Human rights issues: this screen involves investment in companies that support human rights, pay fair wages, and implement a code of conduct.
- Labor relations: investment in companies that have strong employee relations, fair benefits, and safe working conditions.
- Employment equality/diversity: when applying this criterion, funds include (or exclude) companies based on equality and diversity issues, for example, women and minority contracting, or specific gay/lesbian employment policies.
- Community impact and involvement: SRI funds may decide to base stock inclusion on a company's involvement on the community, for example, charitable giving, volunteer programmers, support for education, and involvement in non-U.S. communities.

[23] Our approach implicitly assumes a time invariant screening policy. Since we could not obtain screening policies over time for all the funds in our study, this assumption is necessary. Geczy, Stambaugh and Levin (2003), report that the vast majority of U.S. SRI funds in their sample did not change their SRI criteria over time.

For more detailed information on the areas covered by each social investment criterion, we refer to SIF (2003, pp. 42). For each SRI fund in our U.S. and U.K. samples, we manually collected the fund's stance towards the abovementioned criteria.

Table 6 presents an overview of the screens employed by the funds in the sample. Reported is the frequency by which the funds in these two retail markets adopt each criterion via either a negative/restricted screening approach or a positive approach. A brief inspection of the table indicates that all U.S. funds in the sample factor the criteria "tobacco", "gambling" and "weapons/defense" into their investment policies, primarily as a negative screen. The criterion "animal testing" is clearly underrepresented. U.K. funds seem to put most emphasis on "tobacco", "weapons/defense" and on environmental issues. Least reported by U.K. funds are the criteria "labor relations", "employment equality", and "community involvement".

We first use the U.S. and U.K. samples to investigate the performance of SRI funds clustered by social *stringency*, which we define as the number of SRI criteria a fund employs to establish a socially responsible investment opportunity set. The procedure we adopt to disaggregate our samples into mutually exclusive subsets is somewhat sample-dependent. Specifically, we label U.S. SRI funds as having either "high stringency" (employing more than 8 criteria) or "medium stringency" (applying 5 to 8 criteria) or "low stringency" (applying 4 criteria or less). For U.K. funds, however, we are restricted in allowing for such discrepancies because a limited number of funds employ few criteria. We allocate UK funds to either a group with high stringency (applying more than 6 criteria) or a group with low stringency (using a maximum of 6 criteria). Alternative breakpoints are not feasible.

Secondly, we study SRI fund samples broken up into subsets based on screening *methodology*. One sample subset includes funds that limit their social investment policies solely to restrictive or negative screens. A second sample, which can only be identified in the U.S. case, includes funds that merely employ positive criteria. A third sample comprises funds that adopt a combination of negative (or restrictive) and positive criteria.

Table 7 gives the results of estimating the four-factor model for funds sorted on screening stringency. Several interesting observations emerge. Looking at the U.S. SRI funds, we observe that highly stringent social screeners have underperformed their least stringent counterparts by approximately 5 percent annually. This performance gap is significant at the 1% cut-off level. At first glance, this result seems to support the conjecture that stringent social screens lead to portfolios with risk-adjusted returns below the returns of conventional funds. However, the observed differential is mostly attributable to the counterintuitively large and significant positive abnormal return on SRI funds with low stringency. Because least restrictive screeners are less likely to differ much from conventional funds in terms of security holdings, we would a priori expect that the returns of the least stringent SRI funds most closely match those of conventional funds.

TABLE 6. Examination of SRI Funds' Social Screens: U.S. and U.K.

The table presents hand-collected information regarding the social criteria that U.S. and U.K. funds apply. For each fund, we derived the adopted SRI criteria from prospectuses, e-mail communication with fund management firms and SRI websites. The criteria are common to the SRI industry. For more detailed information on the areas covered by each social investment criterion, see SIF (2003, pp. 42). The percentage a specific screen receives in the table indicates the total number of funds that employ the respective screen divided by the total number of funds in the sample.

Screen Approach	Alcohol	Tobacco	Gambling	Weapons	Animal Tests	Products/Services	Environment	Human Rights	Labor Relations	Employment Equality	Community
United States											
Negative/Restricted	67%	97%	62%	79%	51%	18%	23%	13%	13%	13%	5%
Postive	0%	3%	38%	21%	0%	56%	62%	51%	54%	69%	33%
None identified	33%	0%	0%	0%	49%	26%	15%	36%	33%	18%	36%
United Kingdom											
Negative/Restricted	65%	95%	70%	90%	85%	15%	30%	40%	0%	0%	0%
Postive	0%	0%	0%	0%	0%	55%	60%	35%	40%	40%	30%
None identified	35%	5%	30%	10%	15%	30%	10%	25%	60%	60%	70%

The results in Table 7 indicate the contrary, showing that highly stringent SRI funds weakly outperformed their conventional peers, by 1.02 percent.

The results for the U.K. retail market reinforce the hypothesis that SRI funds earn risk-adjusted returns similar to those earned by their conventional peers. We find that highly stringent SRI funds in the United Kingdom perform neither better nor worse relative to least stringent social screeners, and relative to conventional funds. For example, the performance difference between SRI funds with high stringency and those with low stringency is small (-0.27 percent per annum) and statistically insignificant.

Table 8 reports the outcomes of estimating four-factor specifications for SRI funds after sorts on screening methodology. Empirical results for the U.S. and U.K. samples suggest that neither negative/restricted screeners, nor positive screeners, nor funds that employ both negative and positive criteria produce abnormal returns. In all cases, we cannot reject the null hypothesis of a zero alpha.

Even though neither most restrictive nor least restrictive SRI funds underperform conventional funds, Tables 7 and 8 do highlight differences in investment risk and style across the sub-aggregate fund groups we investigate. According to Table 7, exposure to SMB tends to increase as the number social investment criteria adopted by a fund decreases. Furthermore, sensitivities to HML indicate that U.S. social funds which adopt few criteria are more tilted to low book-to-market stocks than their most restrictive counterparts. Similarly, several fund categories load differently on the momentum factor. The patterns with respect to HML are consistent with a widely held view about first-generation SRI funds, i.e., that these funds screen out high book-to-market sectors. This interpretation of the results, however, suggests that screening stringency interacts with the decision to pursue either negative or positive screens. Table 8 partially supports that idea, showing that negative screeners in the U.S. load negatively on the HML factor. U.K. SRI funds, however, are generally growth-stock oriented, independent of the screening policy.

An interesting message emerges from the results of this section. Our evidence suggests that an association between the returns of SRI mutual funds, on risk- and style-corrected basis, and the choice of social screening policy is not very evident. It seems that, provided style tilts are managed carefully, investors can allocate their money to almost any set of SRI funds that meet their social, moral and environmental preferences without being subjected to a significant financial sacrifice.

Sorts on Past Performance

We now explore the potential return earned by a socially responsible investor who chooses to pursue the joint goals of social responsibility and optimal financial return. This investor accepts a minimum level of social responsibility by only choosing funds that carry the SRI label, but wishes to *ex ante* maximize the performance of his fund portfolio. Prior sections

TABLE 7. Risk-Adjusted Returns of SRI Funds Sorted on Screening Stringency: U.S. and U.K.

Funds are clustered into groups based on the total number of criteria employed. "High stringency funds" in the U.S. adopt more than eight criteria. "Low stringency funds" use less than five criteria. "Medium stringency funds" are all remaining funds. High stringency funds in the U.K. adopt more than six criteria, whereas all other funds are classified as low stringency funds. Four-factor alphas are annualized. For each SRI fund, we identified screening policies for the following criteria: alcohol, gambling, tobacco, weapons and defense, animal testing, products and services, environmental performance, human rights, labor relations, employment equality/diversity, and community impact and involvement.

	Alpha	(R_m-R_f)	SMB	HML	MOM	Adj. R^2
United States (1994:09-2003:03)						
High Stringency SRI Funds	-1.63%	0.96^{***}	0.10^{***}	0.09^{***}	0.01	0.97
	(-1.36)	(39.32)	(3.27)	(4.02)	(0.87)	
Medium Stringency SRI Funds	-0.46%	0.94^{***}	0.18^{**}	0.48^{***}	0.17^{***}	0.84
	(-0.22)	(15.04)	(2.41)	(9.20)	(6.44)	
Low Stringency SRI Funds	$4.96\%^{**}$	0.99^{***}	0.20^{***}	-0.23^{***}	-0.05^{**}	0.91
	(2.11)	(36.07)	(3.66)	(-4.23)	(-2.38)	
High - Low Stringency	$6.59\%^{***}$	-0.02	-0.10^{*}	0.32^{***}	0.07^{***}	
	(2.88)	(-0.65)	(-1.73)	(6.21)	(2.92)	
High Stringency - Conventional	1.02%	-0.03	-0.24^{***}	-0.01	-0.06^{***}	
	(1.19)	(-0.95)	(-9.12)	(-0.40)	(-3.35)	

** Significant at 10% level; ** 5% level; *** 1 % level.*

TABLE 7 *Continued.* Risk-Adjusted Returns of SRI Funds Sorted on Screening Stringency: U.S. and U.K.

	Alpha	(R_m-R_f)	SMB	HML	MOM	Adj. R^2
United Kingdom (1996:11-2003:12)						
High Stringency SRI Funds	-0.67%	0.96***	0.48***	-0.12	0.14***	0.83
	(-0.20)	(18.02)	(2.60)	(-0.85)	(2.56)	
Low Stringency SRI Funds	-0.40%	0.97***	0.60***	-0.17	0.10	0.76
	(-0.10)	(12.75)	(3.63)	(-1.47)	(1.42)	
High - Low Stringency	-0.27%	-0.00	-0.12	0.05	0.04	
	(-0.10)	(-0.03)	(-1.39)	(0.59)	(1.06)	
High Stringency - Conventional	-0.93%	-0.01	0.00	0.04	0.07**	
	(-0.42)	(-0.16)	(0.03)	(0.34)	(2.11)	

*** Significant at 5% level; *** 1 % level.*

evaluated fund performance *ex post*, but did not tell whether the alpha estimates convey *ex ante* information about performance, which is what matters to this type of investor.

In essence, the approach central to this section of the study involves tests for persistence in the performance of SRI funds relative to that of conventional funds. Even though the vast majority of mainstream mutual fund studies documents that most active managers are not able to produce anomalously positive returns over the long term, recent work provides strong evidence that mutual fund managers have “hot hands”. Hendricks, Patel and Zeckhauser (1993), Brown and Goetzmann (1995), Bollen and Busse (2005) and others document persistence in the performance of actively managed funds over various short-term investment horizons. The rationale of studies on short-term performance persistence is that, provided managerial skill truly exists, the superior investment performance of a skilled manager realized over a certain period should also manifest itself in at least one subsequent period. Further, poorly performing funds might continue to earn lagging returns when the market does not discipline these funds. Evidence on cash flows into SRI funds by Bollen (2006) hints that SRI clientele are less likely to discipline their fund for poor returns because they invest in part to obtain non-financial utility from the SRI attribute. Alternatively, the investment return implications of social screening might be short-lived because of a learning phase that young SRI fund undergo before optimally incorporating SRI screens. Bauer, Koedijk and Otten (2005), for instance, suggest that SRI funds initially witness a period of underperformance before delivering returns that match those of conventional funds.

To maintain the perspective of a fund investor, our main test deals with a fund selection strategy in the spirit of Hendricks, Patel and Zeckhauser (1993). Our strategy involves out-of-sample evaluation of SRI funds ranked on their historical financial track record. In case of persistence, funds that did well in the past continue to do so. At the start of every calendar year, we sort all SRI funds on their past four-factor alpha relative to the average conventional fund alpha. We allocate all SRI funds that outperformed their conventional peers to a “winner” portfolio and those which underperformed to a ”loser“ fund portfolio, and collect the portfolios’ monthly returns over the subsequent 12-month period. After having repeated this procedure up to the end of the evaluation period, we evaluate the post-rank returns of the portfolios using the four-factor model. Obviously, a rank portfolio strategy requires a minimum number of funds to be present in the sample every calendar year in order to obtain reasonably diversified portfolios. For this reason, we can only report performance evaluation results involving equally weighted portfolios of SRI funds in the U.S., U.K., and French market. We note that the appendix to this chapter reports on alternative performance persistence tests that do not require portfolio construction.

Table 8. Risk-Adjusted Returns of SRI Funds Sorted on Screening Methodology: U.S. and U.K.

Funds are sorted on screening methodology. Negative screeners filter out firms engaging either fully or partially in socially controversial activates, such as firms from "sin sectors". Positive screeners seek for firms with positive social, moral and environmental attributes. Negative/restrictive and positive screeners adopt exclusionary (restrictive) screens for some criteria and positive screens for others.

	Alpha	(R_m-R_f)	SMB	HML	MOM	Adj. R^2
United States (1996:07-2003:03)						
Negative/Restricted Screeners	1.60%	0.97***	0.08***	-0.09**	-0.01	0.97
	(1.23)	(42.62)	(2.72)	(-2.49)	(-0.80)	
Positive Screeners	2.89%	1.07***	0.29***	0.39***	-0.03	0.85
	(0.76)	(22.60)	(4.37)	(4.64)	(-0.75)	
Neg./Res. and Positive Screeners	-1.12%	0.96***	0.10***	0.12***	0.03**	0.97
	(-0.77)	(34.50)	(2.91)	(5.86)	(2.24)	
United Kingdom (1988:04-2003:12)						
Negative/Restricted Screeners	-0.54%	0.96***	0.73***	-0.16*	0.09	0.87
	(-0.31)	(25.60)	(6.37)	(-1.89)	(1.50)	
Neg/Res. and Positive Screeners	-1.61%	0.83***	0.54***	-0.19**	0.06	0.84
	(-0.98)	(24.07)	(5.59)	(-2.19)	(1.37)	

** Significant at 10% level; ** 5% level; *** 1 % level.*

TABLE 9. Out-of-Sample Alpha and Factor Loadings of Performance-Ranked SRI Portfolios

At the beginning of every year, we allocated each SRI fund to a either a winner or a loser portfolio, where the allocation criterion is prior 12-month alpha from a four-factor regression relative to the respective alpha from the conventional fund portfolio. Portfolios are rebalanced every year. Reported are the post-rank (out-of-sample) performance evaluation results for the SRI winner and loser portfolios. Alphas are annualized.

	Alpha	Market	SMB	HML	MOM
United States (1988:01 - 2003:03)					
SRI Winners	0.19%	0.94***	0.24***	-0.04	1.00E-03
	(0.12)	(31.83)	(5.76)	(-0.95)	(0.03)
SRI Losers	-2.94%**	0.95***	0.27***	0.21***	0.08***
	(-1.98)	(23.18)	(3.78)	(4.57)	(3.20)
Winners - Losers	3.41%**	-0.01	-1.40E-03	-0.25***	-0.08*
	(2.20)	(-0.11)	(-0.02)	(-4.30)	(-1.70)
Winners - Conventional	2.43%	0.03	-0.03	-0.08*	-0.05*
	(1.18)	(0.90)	(-0.43)	(-1.70)	(-1.86)

** Significant at 10% level; ** 5% level; *** 1 % level*

TABLE 9 *Continued*. Out-of-Sample Alpha and Factor Loadings of Performance-Ranked SRI Portfolios

	Alpha	Market	SMB	HML	MOM
United Kingdom (1989:03-2003:09)					
SRI Winners	0.70%	0.81***	0.63***	-0.07	0.17*
	(0.26)	(9.08)	(3.36)	(-0.48)	(1.94)
SRI Losers	-4.80%*	0.69***	0.38***	-0.02	0.07
	(-1.91)	(7.60)	(2.85)	(-0.16)	(1.11)
Winners - Losers	5.50%*	0.12	0.25	-0.05	0.11
	(1.81)	(0.99)	(1.16)	(-0.34)	(1.47)
Winners - Conventional	1.79%	-0.10	0.14	0.05	0.10
	(0.82)	(-1.27)	(0.83)	(0.39)	(1.48)
France (1998:01-2003:12)					
SRI Winners	0.40%	0.99***	0.11	-0.09	-0.04
	(0.15)	(20.23)	(1.11)	(-1.11)	(-0.94)
SRI Losers	-5.54%**	0.93***	0.25	0.03	-0.06
	(-2.17)	(19.31)	(1.51)	(0.42)	(-1.03)
Winners - Losers	5.94%*	0.06	-0.14	-0.12	0.02
	(1.78)	(1.05)	(-0.72)	(-1.41)	(0.23)
Winners - Conventional	2.34%	0.04	0.08	-0.02	-0.04
	(1.29)	(0.87)	(1.21)	(-0.27)	(-1.42)

** Significant at 10% level; ** 5% level; *** 1 % level*

The post-rank alphas in Table 9 suggest that past performance can be used to discriminate between repeat winner and loser SRI funds. Whatever the sample, the return difference between the winner portfolio and the loser portfolio is economically large and statistically significant. The winner SRI portfolio in the U.S. outperforms the loser portfolio by almost 3 percent per year after risk- and style adjustment. In the U.K. and France, the out-of-sample performance difference amounts to more than 5 percent. However, consistent with most non-SRI studies in this area, Table 9 also shows that persistence largely traces to repeat loser funds, which tend to undergo consistent underperformance vis-à-vis the benchmark model. The winner portfolios outperform the both the benchmark model and the average conventional fund, but not significantly so.

The rank portfolio results support the idea that a strategy of avoiding past losers optimizes the performance of an SRI fund portfolio.[24] We note that the appendix to this chapter offers alternative persistence tests, which confirm persistence in relative underperformance. There are several possible causes of performance persistence. A large body of evidence attributes persistence to improper risk-adjustment of returns, and persistent differences in funds' expense ratios, fund characteristics, and managerial skill. In the context of SRI funds, the influence of social screens might additionally factor into persistence patterns. This study has mitigated (if not eliminated) risk- and style bias using the four-factor benchmark model, leaving several sources a candidate explanation for the strong differential returns.

The causes of persistence as well as the question whether investors in SRI funds can benefit from fund return predictability after sales loads are interesting topics for further research, which should be addressed in greater length as soon as the SRI fund universe expands substantially.

1.6. CONCLUDING REMARKS

This chapter has offered new evidence on the performance of socially responsible mutual funds by studying the robustness of SRI fund performance in several ways. First, this study compiled a global sample, covering fund markets from eight developed countries, to determine whether the return and risk characteristics of SRI funds relative to conventional

[24] While we focus on optimization within a SRI universe, the optimization impact of SRI can be evaluated accross SRI and non-SRI universes. Geczy, Stambaugh and Levin (2003) investigate the SRI constraint to an investor who develops a fund portfolio with the maximum *ex ante* Sharpe ratio given a prespecified fund universe, and given his prior beliefs about mutual fund management skill and asset pricing models. Their Bayesian setup suggests that the difference between the certainty-equivalent returns of a portfolio optimized based on a SRI-constrained fund universe and those of an optimized portfolio derived from the unconstrained universe can be significant to an investor who refutes skill but believes in multifactor asset pricing models. Also, diversification restrictions imposed by SRI do not seem as costly as the limits to selection of skilled fund managers.

funds differ across countries. Our evidence strongly suggests that the average SRI fund has earned returns similar to those of mainstream mutual funds in many countries around the world. Using a battery of multifactor performance evaluation models and SRI samples from eight retail equity markets, we found that the risk-adjusted returns of aggregated SRI fund samples are not statistically different from those of their conventional peers.

We also explored performance from the perspectives of two different types of SRI mutual fund investors. First, we examined the influence of screening methodology on SRI fund performance. This exploration is relevant from the perspective of an investor who wishes to achieve a certain level of non-financial utility by investing in a set of funds that deliver a desired level of "social responsibility". We did so by sorting funds based on screening intensity, and we largely observed that neither stringent social screeners nor their least stringent counterparts underperform conventional funds. Equivalently, we found no strong evidence that a fund's decision to adopt either an exclusionary or a positive approach to socially responsible investing has significant financial consequences. Although these results lend support to the belief that investors are free to choose a fund that offers the social return they expect without a binding impact on risk-adjusted return, the screening categories display distinctive style (risk) sensitivities that should be taken into account.

Second, we investigated persistence in the performance of SRI funds, which is relevant to an investor in pursuit of the joint objectives of social responsibility and optimal financial return. Analysis of rank portfolio returns suggests that SRI funds classified as prior-year losers delivered a large negative risk-adjusted return out-of-sample when compared to winners. This observation could imply that a strategy of avoiding SRI funds with poor past returns enhances the risk-return profile of a fund portfolio. Given that most of the persistence is due to SRI funds that continue to lag their benchmarks, it seems that the market does not discipline SRI funds that repeatedly underperform. This observation could be in line with the idea that investors in socially responsible mutual funds are willing to forgo investment return as long as they enjoy sufficient non-financial utility from socially screened portfolios, but this theory must await further empirical research.

Most of the evidence in this study, by reporting no significant differential performance between SRI and conventional funds, supports only one of the wide range of hypotheses discussed in this chapter. The *irrelevance hypothesis,* which says that corporate social performance is not priced, would be supported by finding no SRI portfolio returns beyond those predicted by appropriate benchmark models. However, although the evidence in this paper is comprehensive, we hasten to argue that our findings on mutual funds should be interpreted with the appropriate perspective. It is not clear whether evidence on the performance of SRI *mutual funds* has a more general applicability, since fund data are insufficiently informative to reveal all merits and weaknesses associated with social investment policies. Although SRI funds have the advantage of representing real tradeable portfolios, we posit that a better understanding of the valuation of corporate social responsibility as such requires that we expand the scope beyond mutual funds. For example, because funds adopt a mixture of different SRI criteria, we cannot adequately examine whether stock-return information is conveyed by specific constituents of the broad corporate social responsibility concept. This task is carried out in Chapters 3-6.

APPENDIX: Alternative Tests for Performance Persistence

This section summarizes the results of two alternative tests commonly applied in persistence research which we employ within the context of SRI fund performance.

We develop contingency tables to investigate persistence in the performance of socially responsible funds. The persistence test concentrates on the annual performance of SRI funds. We first estimate the annual four-factor alpha of each SRI fund at 12-month non-overlapping intervals. Based on the risk-adjusted performance of each SRI fund (relative to the median performance) in two consecutive calendar years, we then allocate each SRI fund into one of four cells in a 2-by-2 contingency table, where each cell in the matrix represents a unique combination of performance in year t and year t+1. For example, the upper left cell contains the number of SRI funds that earned a risk-adjusted return that exceeds the median abnormal return in two consecutive periods, whereas the bottom right cell denotes consistent relative underperformance. Subsequently, we test for persistence by formally comparing the actual frequencies by which funds ended up in the cells with the respective expected frequency. Malkiel (1995) suggests that persistence is proven when the probability that a fund with better returns in the past repeats superior performance subsequently is significantly greater than fifty percent. Under his null hypothesis of no persistence, a "winner" ("loser") in the past is equally likely to end up a "winner" or a "loser" in the successive year. Hence, given a certain performance in the past, a fund can end up in either of two cells with an expected probability of 0.5. For each cell, Malkiel (1995) computes a simple Z-score:

$$Z = (WW - np) / \sqrt{np(1-p)}, \quad (5)$$

In our tests, WW represents the number of times a socially responsible fund persistently delivers a relatively higher four-factor alpha ("Winner"/"Winner"), and p denotes the probability that an SRI fund that displays relative outperformance in a given year t continues to do so in the successive year t+1, and n indicates the number of SRI funds with a superior year-t performance. Note that in a manner analogous to the aforementioned approach, we can test for persistence in SRI underperformance.

An alternative and more general persistence measure involves a Chi-square test (CHI), which focuses on all four quadrants simultaneously and which tests the null hypothesis that all cells have an equal probability.

$$CHI = ((WW - N/4)^2 + (WL - N/4)^2 + (LW - N/4)^2 + (LL - N/4)^2) / N, \quad (6)$$

where N is the total number of observations in either the winner or the loser segment. See Carpenter and Lynch (1999) for a discussion of contingency table test statistics.

The contingency table results are presented in Table 10. Reported are the allocations to each cell in year t and the number of cases better or worse performance occurs in the following year. In addition, we indicate, respectively, the frequency by which winner (loser) SRI funds continue to outperform be winner (loser) in the subsequent year and the corresponding Z-score. The last column in Table 10 reports the Chi-square statistic. Of the Z-scores reported in Table 10, several reach values that correspond with strong significance. All significant Z-scores, namely those observed for the U.S., Germany, The Netherlands, and Switzerland, point to a significant persistence in SRI underperformance. The results thus suggest that persistence is found because SRI funds which underperformed their conventional counterparts in the previous year continue to do so in the year thereafter. This finding is reinforced by a Z-test on a sample that accumulates all country observations in order to increase statistical power (reported in the last row). The Chi-square statistics suggest that persistence in the performance difference between SRI funds and conventional funds is not apparent in most countries we investigate. However, when we accumulate all country-specific observations, we reject the null of no persistence.

Although the contingency table has the advantage of being quite robust to outliers because it focuses on the sign of excess fund performance instead of the magnitude, it only tests for persistence in the performance of SRI funds relative to other funds. In order to give an impression about whether performance persistence is caused by some funds consistently outperforming or underperforming passive benchmarks indexes, a simple SRI fund selection strategy inspired by Hendriks, Patel and Zeckhauser (1993) was carried out earlier in this chapter. Overall, those results align with the results reported here in that they point to persistence in (relative) underperformance of SRI funds.

TABLE 10. Contingency Table Tests for Persistence in SRI Fund Performance

Under the null hypothesis of no persistence, a "winner" ("loser") in the past is equally likely to end up a "winner" or a "loser" in the successive year. We indicate, respectively, the frequency by which outperforming (underperforming) SRI funds continue to outperform (underperform) in the subsequent year and the corresponding Z-score. In addition, a Chi-square test focuses on all four quadrants simultaneously, where the null hypothesis is that all cells have an equal probability. See equations (5) and (6) for further details.

Country	Year-*t* Relative Performance	Year t+1 Relative Performance		Total *n*	% Repeated Outperformance (Underperformance)	*Z*-Test Repeat Performance	Chi-Sq. Test Persistence
		Higher alpha	Lower alpha				
United States	Higher alpha	55	52	107	51.40%	0.29	1.89
	Lower alpha	38	66	104	63.46%	2.75 ***	
Canada	Higher alpha	7	9	16	43.75%	-0.50	0.14
	Lower alpha	10	9	19	47.37%	-0.23	
United Kingdom	Higher alpha	11	10	21	52.38%	0.22	1.77
	Lower alpha	23	16	39	41.03%	-1.12	
France	Higher alpha	21	16	37	56.76%	0.82	0.33
	Lower alpha	21	23	44	52.27%	0.30	

**** Significant at 1% level*

TABLE 10 *Continued.* Contingency Table Tests for Persistence in SRI Fund Performance

We indicate, respectively, the frequency by which outperforming (underperforming) SRI funds continue to outperform (underperform) in the subsequent year and the corresponding Z-score. In addition, a Chi-square test focuses on all four quadrants simultaneously, where the null hypothesis is that all cells have an equal probability. See equations (5) and (6) for further details.

Country	Year-*t* Relative Performance	Year t+1 Relative Performance		Total *n*	% Repeated Outperformance (Underperformance)	*Z*-Test Repeat Performance	Chi-Sq. Test Persistence
		Higher alpha	Lower alpha				
Germany	Higher alpha	4	8	12	33.33%	-1.15	2.25
	Lower alpha	7	16	23	69.57%	1.88 **	
Netherlands	Higher alpha	7	2	9	77.78%	1.67	3.42 *
	Lower alpha	3	14	17	82.35%	2.67 ***	
Belgium	Higher alpha	9	6	15	60.00%	0.77	1.80
	Lower alpha	6	16	22	72.73%	2.13 **	
Switzerland	Higher alpha	5	9	14	35.71%	-1.07	0.63
	Lower alpha	7	11	18	61.11%	0.94	
All Countries	Higher alpha	119	112	231	51.52%	0.46	4.54 **
	Lower alpha	115	171	286	59.79%	3.31 ***	

*** Significant at 5% level,*** at 1% level*

Chapter 2
Socially Responsible Fixed-Income Funds

2.1. INTRODUCTION

Socially responsible investing (SRI) is gaining momentum. The largest institutional investors around the world are demonstrating their interest in investing based on SRI principles. Nevertheless, SRI has not yet been embraced by the mainstream investment community, in part because there exists uncertainty as to whether adding an ethical dimension to the stock selection process adds or hurts value to investors. Conflicting theories about SRI performance have fuelled empirical research in the area of socially responsible mutual fund performance. As we have learned from Chapter 1 and prior studies, there now is global evidence that strongly suggests that the risk-adjusted performance difference between SRI equity mutual funds and their conventional peers is not statistically significant.

Remarkably, almost all empirical research in this field has involved SRI common stock mutual funds and little is known about the performance of retail products that invest in socially responsible fixed-income securities.[25] Our objective is to fill that gap. In this chapter, we evaluate the performance of socially responsible fixed-income (henceforth SRI fixed-income) mutual funds in the United States relative to the returns of their mainstream counterparts. Because time-series information on the social responsibility features of (corporate) bonds is underdeveloped, SRI fixed-income mutual funds provide the best laboratory for testing the financial impact of social screens on fixed-income portfolio returns. We focus on two sets of samples: SRI funds which fully invest in bonds (SRI bond funds), and balanced funds which hold both socially responsible debt and equity (SRI balanced funds).

Our study is important for several reasons. First, now that SRI has attracted the attention of the world's largest investors, it is important to understand whether SRI can be aligned with mainstream asset allocation problems. More specifically, although institutional investors are increasingly viewing SRI as a viable approach to meeting not only their financial objectives but also their social duties, they need a better understanding of SRI for different asset classes in order to make optimal strategic and tactical asset allocation decisions. Focusing solely on SRI equity return has only limited value to strategic asset managers who seek to optimize their asset mix. Yet, there is barely any information on the track record of SRI in the fixed-income area. By concentrating on SRI

[25] D'antionio, L. Johnsen and Hutton (1997) raised the possibility that the concept of socially responsible investing is applicable to bonds, but these authors did not study SRI fixed-income fund performance.

fixed-income portfolio performance, we thus add new insights that are relevant for making such allocation decisions. Second, studying socially responsible bond funds is relevant because these vehicles allow investors to purchase a stake in companies that are not publicly traded on financial markets (i.e. owned through private equity). Through fixed-income funds, investors are thus indirectly able to participate in socially responsible companies they cannot access directly. Finally, the massive size of the market for corporate and government debt illustrates there is enormous potential for SRI in fixed-income markets. Moreover, recent estimates by the Investment Company Institute (2004) emphasize the overwhelming demand for bond mutual funds. Of the $7.4 trillion invested in all mutual funds at the end of 2003, more than $1.2 trillion were invested in bond funds and $2.1 trillion were invested in money-market funds. Assessments of SRI fixed-income fund performance relative to conventional funds can add new and significant insights concerning the prospects of SRI within this tremendous industry.

Prior to the empirical section, we discuss theory on the performance of socially responsible investments in fixed-income markets. Subsequently, we discuss the data and explain the importance of multi-index models for evaluating fixed-income mutual fund performance. Using these models, we demonstrate that socially responsible fixed-income funds have performed no worse, if not better, than their conventional peers.

2.2. THEORETICAL BACKGROUND

The previous chapter outlined a number of alternative theories about whether incorporating ethics into investment decisions affects performance. An oft-cited claim is that socially responsible investors face a financial penalty for imposing ethical constraints on the investment universe: by avoiding assets for ethical reasons, socially responsible investors constrain portfolio risk-return optimization. Chapter 1 showed that the adoption of social screens does not have material consequences for the risk-adjusted returns of SRI mutual funds in the equity domain, when compared to returns of conventional funds.

How important is the problem of inefficient diversification and how well do conventional theories about SRI fare in the fixed-income area? Anecdotal evidence suggests that approximately 30% of all companies are screened out by SRI bond funds on social, moral or environmental grounds.[26] Do these screens influence fixed-income portfolio optimization? A prevalent belief among scholars is that bonds constitute a homogenous asset class, that is, their returns are largely a function of variation in a few systematic (i.e. non-diversifiable) risk factors. For investors in government bonds and most high-quality corporate bonds, timing the market by changing the duration structure of a portfolio to exploit future changes in market-wide interest rates is considered more

[26] See, for example, Stephen Taub (2004), 'Socially Responsible Bonds', *BondsOnline Advisor*.

important in enhancing portfolio return than managing idiosyncratic risk through selection or diversification. If idiosyncratic factors have little impact on bond returns, then the benefits of (and limits to) bond risk diversification are fairly scant.

However, several studies support the belief that a sizable portion of the risk of non-government bonds is firm-specific and can either be exploited by active management or be eliminated by means of diversification, which also suggests that social investment constraints might have a non-trivial impact on investment performance. Indeed, active managers perform credit analysis with the objective to identify non-government bonds that are likely to witness a change in credit quality in the future and to invest in those securities that yield a larger premium than is suggested by their risk or credit rating.[27] Hottinga, van Leeuwen and Ijserloo (2001), suggest that corporate bond selection strategies based on security-specific and firm-specific attributes yield superior information ratios.[28] Particularly high-yield corporate bonds might constitute a credit-risk sensitive investment vehicle, displaying heterogeneity (Barnhill, Joutz and Maxwell (1991)) and unique risk-return characteristics (Blume and Keim (1987), Cornell and Green (1991)).

Empirical evidence on actively managed bond funds suggests that not only investment constraints but also expenses can be central to discussions about SRI bond fund performance. A number of studies on bond fund performance evaluation support the view that the average bond fund underperforms its benchmark portfolio by the expenses it charges (e.g., Blake, Elton and Gruber (1993), Elton, Gruber and Blake (1995), and Huij and Derwall (2006)). One could expect that ethical screens come at a cost, because SRI asset management companies purchase corporate social performance data from rating vendors and spend time on translating the data into investment decisions. These costs raise the question as to whether SRI fixed-income funds have higher expense ratios compared to their conventional peers (and whether differences in expense ratio fully account for a difference in performance). Bauer, Koedijk and Otten (2005) suggest that SRI equity funds have higher expense ratios than the equity retail market as a whole.

Since several theoretical perspectives seem to plague SRI in fixed-income investment context, how could SRI investors reap the benefits from social screening? One theory that we already articulated in Chapter 1 says that SRI investors enjoy an information advantage, because the economic benefits (liabilities) corporations reap (avoid) by adopting strong CSR policies tend to materialize slowly, which may be overlooked by an investment community that is obsessed with short-term judgment periods (e.g. Kurtz (1997), Moskowitz (1972)). Graham, Maher and Northcut (2000) indeed find evidence to confirm the value-relevance on environmental information for assessing firms'

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[27] Another element of selectivity is exploiting differences in liquidity across bonds. Furthermore, bond managers may adopt a sector-rotation approach.

[28] There are more examples of studies that find management of non-systematic factors to be an important source of improving return-to-risk ratios; see, for example, Dynkin et al. (1999) and

creditworthiness. Their empirical evidence suggest that firms' environmental liabilities, as measured by either monetary or non-monetary indicators based on public data from the Environmental Protection Agency (EPA), are negatively associated with their credit rating. Their study suggests that the inclusion of environmental information in rating models results in increased rating classification accuracy. Hence, a small body of evidence lends support to the view that social criteria carry value-relevant information beyond that conveyed by mainstream fundamental indicators.

Moreover, SRI has attracted the attention of investors in sovereign bond markets. Sovereign states represent an overwhelming portion of debt issuers, perhaps because the case for SRI in this segment is most straightforward (see, for instance, EPN (2004)). Bond rating agencies seem to agree that sovereign credit risk is driven by quantifiable and non-quantifiable instruments related to social, political and economic factors (Cantor and Packer (1996)). Here, socially responsible investors make a case for integrating environmental and social factors into international investment decisions, because these factors influence countries' long-term economic development and political stability. The case of Argentina, for example, makes it clear that social inequality can hinder long-term economic growth with potentially severe consequences for default rates. However, beyond such anecdotal examples, empirical evidence on whether social investment criteria systematically enhance fixed-income portfolio management is scarce.

2.3. DATA

Mutual Fund Samples

Our data set contains bond and balanced mutual funds that are labeled by the US Social Investment Forum[29] as socially responsible in investing, and matched samples consisting of conventional fixed-income funds. We manually inspected fund prospectuses and websites to verify the presence of a social investment policy. All bond mutual funds in our sample are U.S.-oriented and primarily invest in intermediate- and long-term fixed-income securities. All balanced funds hold a mixture of domestic bonds and domestic equity. We evaluate SRI fund performance relative to matched samples of conventional fixed-income funds. Each socially responsible mutual fund is matched against an equally weighted portfolio of five conventional funds using fund age, end-of-period fund size, and investment objective as matching criteria. In using these criteria, we control for the potentially interfering influence of, respectively, fund age, fund size, and investment scope on fixed-income fund returns. For example, Philpot, Hearth, Rimbey, and Schulman (1998) document a positive relationship between bond fund performance and total fund

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Dynkin, Hyman and Konstantinovsky (2002).

[29] See SIF (2003)

assets, suggesting that bond mutual funds are able to enjoy economies of scale. We select five funds to compose a matched sample, instead of one fund, in order to mitigate the problem that mutual funds are not entirely equal in terms of the size criterion. This discrepancy averages out. The fund data are primarily from the CRSP U.S. Mutual Fund database and cover the period 1987:09-2003:03. Supplementary data were obtained from Datastream and Morningstar.

Table 1 shows summary statistics on the bond mutual funds (Panel A) and on the balanced funds (Panel B). Panel A shows that the majority of pure bond funds in the sample invest in high-quality bonds (ICDI classification "BQ", as reported by CRSP). Approximately one-eighth of all funds invest in high-yield debt instruments ("BY"). Panel B shows that the number of SRI balanced funds in our sample is smaller than the number of pure SRI bond funds. However, both retail markets can be traced back several decades. While some SRI bond funds and SRI balanced funds have existed for almost twenty years, most socially responsible funds commenced operations in the nineties.

Table 1 also reports the statistics of the funds as a group. Group statistics on the bond fund samples indicate that the average SRI bond fund has a lower expense ratio compared to its conventional counterpart. SRI balanced funds, on average, have a higher expense ratio. (The calculation of the average expenses ratio does not include the New Covenant Balanced Fund, because this is a fund of funds with a very low expense ratio). Taken as a whole, the difference in expense ratio between socially responsible fixed-income funds and conventional funds is trivial. This observation adds new insights on the costs of social screening, because evidence on equity funds suggests that socially responsible investments are associated with relatively higher expense ratios (see Bauer, Koedijk and Otten (2005)). Apparently, the costs associated with screening fixed-income securities do not necessarily translate into higher expense ratios.

A glance at some simple return statistics in Table 1 suggests that SRI bond funds provided a higher average return and a higher Sharpe ratio compared to conventional funds. The socially responsible balanced fund group has a higher return, a lower standard deviation, and a higher Sharpe ratio compared to its conventional peer. Note, however, that these statistics are merely descriptive of nature. Throughout this chapter, we shed more light on these performance differentials using rigorous performance attribution approaches and formal tests for significance of the results.

Benchmark Data

We evaluate SRI and conventional fixed-income fund performance using benchmark models that include US bond and equity indexes as performance attribution variables. Several studies on bond funds suggest that a few indexes jointly explain most of the

TABLE 1. Summary Statistics on the Mutual Funds

Mean returns, standard deviations, and Sharpe ratios are annualized. End-of-sample-period fund size is measured by total net assets. BQ and BY identify high-quality and high-yield bond funds. Fund group statistics are based on equal-weighted portfolios.

Panel A: SRI Bond Funds

Fund Samples	Mean Return	St Dev	Sharpe	Inception	Size (mln)	Expense	ICDI Objective
Aquinas Fixed Income	5.78%	3.75%	0.38	1994	46	1.00%	BQ
Calvert Social Investments Bond	7.78%	4.51%	0.65	1987	136	1.18%	BQ
Citizens Income	5.86%	3.79%	0.46	1992	67	1.38%	BQ
CRA Qualified Investments	7.72%	4.43%	0.92	1999	470	1.00%	BQ
Domini Social Bond	8.91%	2.89%	2.08	2000	38	0.95%	BQ
MMA Praxis Intermediate Income	5.87%	4.07%	0.37	1994	43	1.20%	BQ
Parnassus Fixed Income	6.80%	4.97%	0.53	1992	24	0.81%	BQ
Pax World High Yield	2.24%	8.27%	-0.16	1999	44	1.48%	BY
New Covenant Income	4.68%	4.25%	0.35	1999	507	0.86%	BQ
Ariel Premier Bond	6.34%	3.13%	0.71	1997	26.85	0.85%	BQ
Capstone SERV Bond Fund	5.57%	3.98%	0.44	1999	43.37	0.67%	BQ
Timothy Plan Fixed Income *	-11.34%	5.05%	-3.22	1999	24	1.35%	BQ
Aha Full Maturity Fixed Income	7.78%	3.88%	0.78	1988	36.72	0.76%	BQ
Lutheran Brotherhood Income	7.25%	4.45%	0.54	1972	634	0.84%	BQ
Lutheran Brotherhood High Yield A **	0.18%	9.99%	-0.39	1997	521.13	1.03%	BY
Group SRI Bonds	7.05%	4.13%	0.53	1987	177	1.02%	BQ/BY
Group Conventional Bonds	6.66%	3.71%	0.48	1987	136	1.17%	BQ/BY

** Coverage stopped in 2000, ** Started as Class A fund in 1997*

TABLE 1 *continued*. Summary Statistics on the Mutual Funds

Mean returns, standard deviations, and Sharpe ratios are annualized. End-of-sample-period fund size is measured by total net assets. BAL identifies balanced funds. Fund group statistics are based on equal-weighted portfolios.

Panel B: SRI Balanced Funds

Fund Samples	Mean Return	St Dev	Sharpe	Inception	Size (mln)	Expense	ICDI Objective
New Covenant Balanced Income	-6.00%	6.95%	-1.32	1999	124	0.18%	BAL
Calvert Social Balanced	6.77%	9.75%	0.20	1982	447	1.25%	BAL
Green Century Balanced	12.74%	15.87%	0.54	1992	33	2.39%	BAL
Pax World Balanced	9.56%	9.10%	0.52	1970	1012	0.95%	BAL
Walden Social Balanced	-0.80%	9.00%	-0.50	1999	19	1%	BAL
Aquinas Balanced	9.59%	9.55%	0.49	1994	15	1.50%	BAL
Aha Balanced	9.57%	10.24%	0.47	1998	26	1.13%	BAL
Working Assets Citizens ***	6.14%	5.46%	0.34	1992	45	1.75%	BAL
Smith Barney Social ****	5.18%	12.98%	0.08	1992	234	1.17%	BAL
Group SRI Balanced	9.08%	9.45%	0.45	1987	217	1.42%	BAL
Group Conventional Balanced	8.17%	9.92%	0.33	1987	300	1.30%	BAL

**** Merged into Citizens Growth in 1995. No returns included after merger.*

***** Became socially responsible in 1997. No returns included before 1997.*

variation in bond portfolio returns. See, for example, Blake, Elton and Gruber (1993), Elton, Gruber and Blake (1995), and Detzler (1999). We employ different sets of indexes to capture the entire spectrum of investment exposures a fund might have. These indexes possess several unique risk and return characteristics to account for the fact that fixed-income funds can differ in scope and "style".

Our primary set of benchmark indexes is maintained by Citigroup. We utilize total returns on their CGBI US Broad Investment-Grade Bond Index (USBIG) as well as the returns on some of its subsets. The indexes are aimed at providing stable and easily replicable benchmarks by including all investment opportunities that are available to market participants under regular conditions. USBIG is a value-weighted index that includes fixed-rate Treasury, government-sponsored, mortgage, asset-backed, and investment-grade issues that have a remaining maturity of at least one year. The issues are eligible for inclusion when they pass a size criterion that is designed to ensure the bonds are reasonably available. Further details on the Citigroup Bond Index construction methodology can be found in Citigroup (2003). Because the CGBI High-Yield index does not span the entire sample period, we use the Merrill Lynch High Yield Index to account for a fund's exposure to high yield instruments.

Our study also allows for the possibility that fixed-income fund performance can be explained partially by equity return variation. Although bond indexes are the primary instruments for evaluating pure bond funds, adding an equity index to bond performance models is important for evaluating the returns of balanced funds and bond funds that hold convertible debt. The stock market variable we employ is defined as the value-weighted return on all stocks in the NYSE-AMEX-Nasdaq universe over the risk-free rate proxy from Ibbotson Associates, and is from Fama and French (1993).

Apart from including benchmark asset returns, we also consider models that include variables related to the macroeconomy. Previous research has suggested that risk premiums associated with fundamental economic variables are potentially relevant in explaining bond mutual fund returns (e.g, Elton, Gruber and Blake (1995)). For this purpose, we collected data on the U.S. inflation rate and on economic development (more information is detailed in Appendix I).

2.4. EMPIRICAL ANALYSIS

Performance Evaluation of Fund Portfolios

In this section, we compare portfolios of SRI fixed-income funds with their conventional peers using multifactor benchmark models. Our decision to adopt multi-index models follows from evidence that single-index specifications cannot explain the returns of all bond classes. Blake, Elton and Gruber (1993) illustrate that the returns of high-yield bond funds are poorly captured by a broad market index. (Equivalently, the returns of bond funds with broad market exposure are poorly explained by a high-yield index.) Hence, under single-index benchmark specifications, even passive bond investment strategies can easily deliver significant abnormal return estimates if there is a mismatch between the funds manager's strategy and the benchmark used for evaluation of the fund. Consider, for example, a mutual fund that mainly invests in investment-grade bonds and does so in a socially responsible manner. If the manager of this fund chooses to be tilted slightly towards high-yield debt, provided this is allowed within some prespecified range, then a single-index regression of the fund's return on a broad investment-grade bond index will deliver an inaccurate estimate of mutual fund performance. Performance evaluation models that suffer from this form of misspecification bias can severely hamper a sound judgment on the effects of SRI screens on fund performance.

If we have a set of investment indexes in vector F and economic variables in G, the multifactor models we employ can be written as:

$$R_{it} - R_{ft} = \alpha_i + \sum_{j=1}^{J} \beta_{ij} F_{jt} + \sum_{k=1}^{K} \beta_{ik} G_{kt} + \varepsilon_{it} \qquad (1)$$

where R_{it} is the return on bond mutual fund i in month t, R_{ft} denotes the one-month T-Bill rate, F_{jt} is the excess return on determinant j at t, and J denotes the number of determinants (passive indexes) F used in the model. Equivalently, G_{kt} is the value for fundamental economic variable k at t and k indicates the number of fundamental variables. The coefficients in this model can be interpreted along various lines, depending on the nature of the determinants. Generally, the coefficients reflect sensitivities to the regressors of an APT model which builds on Chen, Roll and Ross (1986). However, if the factors are solely excess returns on passive investments, the β_{ij}'s can also be thought of as the weights assigned to a set of passive portfolios that most closely explain the time-variation in the fund's return.

Analogous to the intercept term in equity fund performance models, α (i.e., Jensen's (1968) alpha) is usually viewed as the contribution of active money management to fixed-income portfolio return. As we also explained in Chapter 1, our interpretation of Jensen's alpha is different because this research involves a comparison between SRI mutual funds and conventional funds. While conventional fund alpha measures the added value of active management net of expenses and after correction for factor-sensitivities, the alpha for SRI mutual funds additionally reflects the potential influence of social screens on average portfolio return. By comparing the alphas we thus formally test a joint hypothesis that the average abnormal return of SRI funds resulting from active portfolio management, expenses, *and* social screens is equal to the abnormal returns on conventional funds resulting from active management and expenses. If we assume that management timing skills and expenses are similar for both mutual fund categories, then our tests point more explicitly to the influence of SRI screens. The previous section showed that the assumption concerning expenses is acceptable. There is also no reason to expect that the market timing skill of the average SRI fixed-income portfolio manager differs from the skills of conventional managers.

Since there is no consensus on the optimal set of bond indexes is most suitable for explaining the returns on bond funds, we consider several models. The principal model we use is a four-factor model developed by Elton, Gruber and Blake (1995). The model's first variable, which captures broad market sensitivity, is computed as the return on the USBIG Index in excess of a risk-free rate proxy. The second variable, DEFAULT, is defined as the return spread between the High Yield Index and the USBIG Treasury Index and is intended to capture default risk compensation in fixed-income portfolio returns. The third variable, OPTION, is computed as the difference in return between the USBIG GNMA Mortgage Index and the USBIG Treasury Index. Blake, Elton and Gruber (1993) introduced the mortgage index to capture option features in specific bonds. Finally, we include an EQUITY variable, which is defined as the value-weighted return on a portfolio of all stocks listed on the NYSE-AMEX-Nasdaq markets in excess of the risk-free rate. Including an equity variable is relevant because balanced funds have a significant exposure to the stock market and because bond funds may hold convertible debt. Thus, the main model is written as:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(USBIG_{mt} - R_{ft}) + \beta_{1i}Default + \beta_{2i}Option_t + \beta_{3i}\,Equity_t + \varepsilon_{it}, \quad (2)$$

where $USBIG_{mt} - R_{ft}$ represents the return on the broad investment grade bond index above the Ibbotson risk-free rate, $DEFAULT_t$ is the return spread between the Merrill Lynch High Yield Index and the USBIG Treasury index, $OPTION_t$ denotes the return difference between the USBIG GNMA index and the Treasury Index, and $EMKT_t$ is the excess return on the CRSP value-weighted U.S. stock portfolio.

The alternative multifactor specifications we construct in robustness tests are as follows. We develop a five-factor model that additionally includes a term structure variable, which is defined as the return difference between the CGBI 20-year+ Treasury Index and the 1-3-year Treasury Index. Second, we consider a model that additionally includes two variables that reflect market prices of risk stemming from innovations in fundamental economic variables. Following Elton, Gruber and Blake (1995), we use a joint-estimation approach to estimate the risk premiums on innovations in inflation and in economic development; see Appendix I for more details on the methodology employed for estimating the unobservable risk premiums. The inflation variable is computed as the monthly change in the 12-month expected inflation rate. Variation in economic development is measured by changes in 12-month industrial production growth. The last specification we employ offers a slight methodological innovation. This model improves upon the seven-factor model by removing pricing errors that are neither attributable to the contribution of active money management nor to the influence of a social investment policy. The model is designed such that it accounts for errors in explaining the returns of alternative passive indexes by means of statistically derived factors. For a whole host of alternative passive indexes, we run individual regression of passive index returns on the seven-factor model. The unexplained returns (i.e. the model's intercept and the residual series) are decomposed by means of a principal components analysis on the covariance matrix of non-centered variables. The redidual returns on passive bond indexes were obtained from several investment-grade corporate bond indexes (with different maturities), government bond indexes (with different maturities), and the high-yield market index. The first two principal components, which capture 85 percent of the residuals, are added to the seven-factor model. The resulting model is a nine-factor model. Note that studies that only use principal components to describe bond returns typically extract three factors, which are known as level, steepness, and curvature (e.g., Litterman and Scheinkman (1991)). A portfolio's loading on the first component describes bond duration, which is equivalent to the coefficient on the bond market index in our models. Thus, we only use two principal components.

In Table 2, we report the results of regressing excess mutual fund returns on the sets of indexes. Panel A reports performance evaluation results for pure bond funds, while panel B displays results for balanced funds. In panel A, we also report separate results for high-yield bond funds because low-grade bond returns are relatively less market interest-rate sensitive and more dependent on selectivity skill and risk diversification. High-yield fixed-income fund returns may therefore display a higher than average sensitivity to the diversification constraints inherent in social screens. All SRI bond funds are grouped into an equal-weighted SRI bond fund portfolio prior to the estimation of the models. The same method is applied to the conventional fund samples. This section, thus, concentrates on evaluating SRI fund *group* performance relative to that of conventional funds. We formally compare the SRI fund portfolios with their respective matched samples using the returns on a "difference" portfolio, which are obtained by subtracting conventional fund returns from the returns of SRI funds. Differences in risk-adjusted performance, as indicated by the difference in alpha, are implicitly attributed to differences in social responsibility between the matched samples.

Regression R^2s indicate that the four-index model does a good job in explaining the returns of fixed-income mutual funds. From the broad market index sensitivities, it can be observed that market risk estimates for the aggregated fund groups are large and comparable to equity market betas that tend to vary around unity. Corresponding *t*-statistics point out that the coefficients on the broad market factor are highly significant at the standard cut-off levels. Moreover, the results point to the relevance of the DEFAULT,

TABLE 2. Four-Factor Model for Fixed-Income Funds

Fixed-income fund performance is estimated with a four-factor model (see Elton, Gruber and Blake (1995)). Alphas are annualized, and *t*-statistics based on Newest-West (1987) standard errors are reported in parentheses. The SRI bond fund samples and matched samples are based on equally weighted portfolios of all funds.

Panel A: Performance of Pure Bond Funds

	Alpha	USBIG	Default	Option	Equity	Adj. R^2	#Obs.
Using All Funds in Sample (1987:01 – 2003:03)							
SRI Bond Funds	-1.08% ***	0.98 ***	0.10 ***	-0.17 ***	0.02 ***	0.95	195
	(-3.91)	(46.19)	(5.11)	(-3.74)	(2.64)		
Matched Sample	-1.28% ***	0.91 ***	0.13 ***	-0.05 ***	0.01 *	0.95	195
	(-5.10)	(30.53)	(9.36)	(-0.90)	(1.91)		
Difference	0.20%	0.07 **	-0.03 **	-0.12 ***	0.00		195
	(0.84)	(2.48)	(-2.49)	(-2.85)	(1.11)		
Using High Yield Funds (1997:01 – 2003:03)							
SRI Bond Funds	-1.99%	0.80 ***	0.79 ***	-0.23	0.04	0.86	71
	(-1.28)	(4.66)	(13.36)	(-0.93)	(1.56)		
Matched Sample	-1.85%	0.66 ***	0.80 ***	-0.35	0.02	0.86	71
	(-1.26)	(4.67)	(14.18)	(-1.51)	(0.71)		
Difference	-0.13%	0.15	-0.01	0.12	0.02		71
	(-0.15)	(1.04)	(-0.26)	(0.73)	(0.97)		

** Significant at 10% level, ** at 5% level, *** at 10% level*

TABLE 2 *continued*. Four-Factor Model for Fixed-Income Funds

Fixed-income fund performance is estimated with a four-factor model (see Elton, Gruber and Blake (1995)). Alphas are annualized, and *t*-statistics based on Newest-West (1987) standard errors are reported in parentheses. The SRI balanced fund sample and the matched sample are based on equally weighted portfolios of all funds.

Panel B: Performance of Balanced Funds (1987:01 – 2003:03)

	Alpha	USBIG	Default	Option	Equity	Adj. R^2	#Obs.
SRI Balanced Funds	0.11%	0.20 ***	0.06 *	-0.13	0.54 ***	0.94	195
	(0.16)	(3.60)	(1.80)	(-1.56)	(35.16)		
Matched Sample	-1.25% ***	0.26 ***	0.03	-0.09 **	0.59 ***	0.98	195
	(-2.97)	(8.97)	(1.32)	(-2.13)	(74.45)		
Difference	1.36% **	-0.06	0.03	-0.04	-0.04 ***		195
	(2.04)	(-1.03)	(0.97)	(-0.45)	(-3.01)		

** Significant at 10% level, ** at 5% level, *** at 10% level*

OPTION, and EQUITY variables. Not only are the coefficients on these regressors mostly significant from a statistical perspective, they also have economically plausible signs. For example, the group of high-yield funds loads heavily on the default variable, which confirms their exposure to default risk associated with investing in low-grade bonds. Balanced funds load less USBIG and more on EQUITY, compared to pure bond funds, resulting from significant investment in both bonds and stocks.

After controlling for benchmark sensitivities, we make two important observations. First, full-sample results show that both SRI bond funds and conventional bond funds, as a whole, underperformed the set of benchmark indexes by more than 1 percent per annum. The *t*-statistics corresponding to the intercepts indicate that the underperformance is significant below the 1% cut-off level. For high-yield funds, the average underperformance is in the order of 2 percent, but is not significant. Although these percentages might seem large at first glance, the negative excess returns we observe are consistent with the results of previous research on mainstream bond mutual funds. More importantly, the difference portfolio results suggest that difference in average risk-adjusted return between the SRI bond fund portfolio and conventional fund portfolio is 0.20 percent per annum when all funds are included in the evaluation and -0.13 percent when the analysis is restricted to high-yield funds. These performance differentials may be economically important, but statistical tests do not reject the null hypothesis of a zero return difference at the standard significance levels. Second, the results for balanced funds are more optimistic about SRI fund performance. While SRI balanced fund returns do not exceed significantly the returns predicted by the performance evaluation model, conventional funds underperformed the set of benchmark indexes significantly, by 1.25 percent. Consequently, the differential return between SRI balanced funds and their conventional peers is economically large (1.36 percent) and statistically significant. Thus, SRI balanced funds have been able to produce highly competitive risk-adjusted returns.

Table 3 reports alpha estimates under alternative specifications. In the first column of results, we report single-index alphas because single-factor measures are widely monitored in practice and have strong theoretical roots. The indexes used in this model are tailored to the scope of the funds: USBIG is used to measure pure bond fund alphas, the high-yield index is employed for evaluating high-yield bond funds, and an equally weighted portfolio of USBIG and EQUITY is used to estimate balanced fund alphas. The other columns report the results of estimating, respectively, the five-factor model that augments the four-factor model by the term spread, the seven-factor model that additionally includes two fundamental economic variables, and the nine-factor model that further includes statistical factors.

All scenarios corroborate the evidence from our initial four-factor model. On average, SRI bond funds and conventional bond funds earned similar benchmark-adjusted returns whereas SRI balanced funds outperformed their conventional peers.

Residual Risk and Risk-Adjusted Return

Rudd (1981) criticizes SRI by stressing that socially motivated investment screens inherently induce higher risk. He argues that SRI portfolios underperform the "normal" portfolio, i.e., a portfolio that is most efficient in maximizing the risk-return tradeoff by means of diversification, because SRI portfolios do not offer extra return to compensate for the additional residual risk. Residual risk can be separated into two components. The first component is extra-market covariance, which arises when portfolio managers deviate from the normal portfolio by investing in highly correlated stocks with fundamental commonalities (or "style" investing); the second component is firm-specific risk which is due to firm-specific tilts in the portfolio. One could expect most of the extra-market covariance to be accounted for by our multifactor models. However, since fund alphas assume zero idiosyncratic risk, additional performance measures are necessary to test Rudd's predictions.

Several measures of performance that correct for idiosyncratic risk have been proposed in the literature. The most widely known measure is the Sharpe ratio, which corrects portfolios' excess return for total risk. A statistical test for comparing Sharpe ratios of funds was originally developed by Jobson and Korkie (1981). Let the Sharpe ratio be the ratio of portfolio return in excess of the risk-free rate to the standard deviation of excess return. If μ_{SRI} and μ_c are, respectively, the mean SRI fund portfolio return and the mean return of the respective conventional fund, and if σ_{SRI} , σ_c and $\sigma_{SRI,c}$ are the standard deviations and covariance of the excess returns of the two fund portfolios, then Jobson and Korkie's Z_{JK} score becomes:

$$Z_{JK} = \frac{\sigma_{SRI}(\mu_c - R_f) - \sigma_c(\mu_{SRI} - R_f)}{\sqrt{\Theta}} \tag{3a}$$

where

$$\Theta = \frac{1}{T}\left[2\sigma_{SRI}^2\sigma_c^2 - 2\sigma_{SRI}\sigma_c\sigma_{SRI,c} + \frac{1}{2}\mu_{SRI}^2\sigma_c^2 + \frac{1}{2}\mu_c^2\sigma_{SRI}^2 - \frac{\mu_{SRI}\mu_c}{2\sigma_{SRI}\sigma_c}\left(\sigma_{SRI,c}^2 + \sigma_{SRI}^2\sigma_c^2\right)\right] \tag{3b}$$

and T is the number of monthly return observations, and where R_f is a risk-free rate proxy. When T is sufficiently large, Z_{JK} has a standard normal distribution with a zero mean and unit standard deviation.

The Sharpe ratio, although capable of risk-adjusting to some extent, has limitations similar to the single-index performance evaluation model in that it does not facilitate a comparison between portfolios while controlling for differences in the

TABLE 3. Alternative Specifications for Robustness Tests

The single-factor model includes the excess return on a broad market index (i.e. USBIG for bond funds in the full sample, the high-yield index for high-yield funds, and an equal-weighted portfolio of USBIG and the EQUITY factor portfolio for balanced funds). The five-factor model augments the four-factor model by the term spread variable. The seven-factor model additionally includes monthly spreads associated with changes in the annual inflation rate and in industrial production. The nine-factor model further contains two statistical factors derived from PCA. Alphas are annualized, and *t*-statistics appear in parentheses.

Panel A: Pure Bond Funds

	Single-factor CAPM α	Five-factor model α	Seven-factor model α	Nine-factor model α
Using All Funds in Sample (1987:01 – 2003:03)				
SRI Bond Funds	-0.85% **	-1.06% ***	-1.05% ***	-1.07% ***
	(-2.55)	(-3.62)	(-3.65)	(-4.08)
Matched Sample	-0.87% **	-1.15% ***	-1.15% ***	-1.13% ***
	(-2.25)	(-5.43)	(-5.41)	(-5.56)
Difference	0.01%	0.09%	0.10 %	0.06%
	(0.06)	(0.45)	(0.49)	(0.31)
Using High Yield Funds (1997:01 – 2003:03)				
SRI Bond Funds	-2.41%	-1.87%	-1.75%	-2.22%
	(-1.43)	(-1.23)	(-1.16)	(-1.53)
Matched Sample	-2.75%	-1.66%	-1.32%	-1.32%
	(-1.54)	(-1.17)	(-1.03)	(-1.03)
Difference	0.34%	-0.21%	-0.44%	-0.43%
	(0.38)	(-0.24)	(-0.48)	(-0.48)

*** Significant at 5% level, *** at 1% level*

portfolios' investment style. A more convenient measure that overcomes this caveat is one that estimates the residual risk-adjusted return on funds subsequent to a systematic risk-and style-adjustment. A multifactor variant of the "appraisal ratio" of Treynor and Black (1973) or the "information ratio" described in Goodwin (1998) satisfies this requirement. We slightly modify the Jobson and Korkie (1981) statistic to make equation (3a) suitable for comparing appraisal ratios obtained from (multi)index models. See Appendix II for more details.

Table 4 reports F-statistics for differences in residual risk, measured by residual

TABLE 3 *continued*. Alternative Specifications for Robustness Tests
The single-factor model includes the excess return on a broad market index (i.e. USBIG for bond funds in the full sample, the high-yield index for high-yield funds, and an equal-weighted portfolio of USBIG and the EQUITY factor portfolio for balanced funds). The five-factor model augments the four-factor model by the term spread variable. The seven-factor model additionally includes monthly spreads associated with changes in the annual inflation rate and in industrial production. The nine-factor model further contains two statistical factors derived from PCA. Alphas are annualized, and *t*-statistics appear in parentheses.

Panel B: Balanced Funds (1987:01 – 2003:03)

	Single-factor CAPM α	Five-factor model α	Seven-factor model α	Nine-factor model α
SRI Balanced Funds	-0.77%	0.28%	0.28%	0.23%
	(-0.93)	(0.38)	(0.38)	(0.32)
Matched Sample	-2.06% ***	-1.08% **	-1.08% **	-0.90% *
	(-4.06)	(-2.31)	(-2.33)	(-1.92)
Difference	1.29% *	1.36% *	1.36%*	1.13% *
	(1.95)	(1.89)	(1.89)	(-1.79)

** Significant at 10% level, ** at 5% level, *** at 1% level*

variance, for the fund portfolios described earlier. According to the majority of performance evaluation models in Panel A, SRI bond funds have a relatively higher residual risk. A simple F-test for equal variances rejects the null hypothesis that the difference in residual variance between SRI funds and conventional funds is zero in almost all cases. Interestingly, the residual variance of high-yield SRI funds is not significantly different from that of the matched sample, which is somewhat surprising because basic intuition tells us that deviations from a normal portfolio are most likely to influence the residual risk of portfolios that invest in heterogeneous segments of the fixed-income market. It should be noted, however, that the high-yield fund return regressions are prone to small sample issues. Panel B shows that SRI balanced funds have a higher residual risk than their conventional counterparts, rejecting the null hypothesis of equal residual variances strongly. Thus, notwithstanding the results for high-yield SRI funds, the observed residual risk differences are consistent with the idea that SRI portfolios deviate from conventional benchmark assets in terms of securities held.

To verify whether these residual risk differences are materially large enough to affect our view on SRI funds' risk-adjusted performance, Table 5 presents Z-scores for the

Sharpe ratios and for the appraisal ratios obtained from our set of multi-index models. The Z-scores should be handled with caution under particular circumstances, since the Sharpe ratio is often interpreted differently when the excess return of a portfolio is positive compared to when the excess return is negative. This caveat complicates a comparison of the Sharpe and appraisal ratios delivered by balanced fund in our sample. With this difficulty in mind, we report Z-scores for all our fund samples but refrain from an economic interpretation of the results. The Z-scores do not alter the evidence from previous sections dramatically. The Sharpe and appraisal ratios of SRI bond funds and high-yield SRI funds are somewhat higher than those of conventional funds but not significantly so. The results for balanced funds are unsurprisingly stronger, since SRI funds earned positive multifactor alphas while conventional funds underperformed the benchmark model. Z_{AR} scores suggest a statistically significant difference in appraisal ratio.

Taken as a whole, the results of this section suggests that the higher-residual risk associated with SRI fixed-income funds has a negligible impact on the risk-adjusted returns of SRI funds relative to those of their mainstream counterparts.

Fama-MacBeth Setup

An attractive feature of grouping funds into portfolios is that long-run mutual fund performance can be assessed at the aggregate level without requiring all funds in the data to have a long-term history. The aggregation process inherent in the portfolio evaluation approach may sacrifice some information for simplicity. This section presents a final robustness check by relating fund alphas to fund-specific attributes in a cross-sectional analysis.

Inspired by Fama and MacBeth (1973), our approach involves a two-step regression methodology. As a starting point, we use the four-factor model described earlier to estimate 12-month non-overlapping alphas for each fund in our sample. Subsequently, for each calendar year, we use fund-specific attributes to explain the cross-section of fund alphas. To evaluate SRI fixed-income fund performance, our model includes well-documented fund characteristics augmented by a variable that identifies a socially responsible fund. If SRI screens influence benchmark-adjusted fund returns, then the SRI fund identifier should explain the cross-sectional variation in fund alphas. Our set of fund-specific attributes contains the following variables: fund size (Log TNA) as measured by the natural log of total net assets, a fund's expense ratio (EXPENSES), a fund's turnover rate over year t (TURNOVER), and a dummy variable for SRI funds. The resulting specification can be thought of as a model that estimates the average benchmark-adjusted return of fixed-income funds after controlling for fund size, expenses, turnover, and the presence of SRI screens. The model can be described as follows:

$$\alpha_{it} = a_{ot} + \gamma_{1it} LogTNA_{it} + \gamma_{2it} EXPENSES_{it} + \gamma_{3it} TURNOVER_{it} + \gamma_{4it} SRI + \varepsilon_{it} \, , \qquad (4)$$

TABLE 4. Residual Variance of SRI versus Conventional Fixed-Income Funds

The F-statistics (and p-values in parentheses) test the null hypothesis that SRI and conventional funds have an equal residual variance (with F-stat of 1). Sample period for bond funds (full sample) and balanced funds: 1987:01-2003:03. Sample period for high-yield funds: 1997:01-2003:03.

Panel A: Pure Bond Funds

	Residual Risk (Variance) SRI / Conventional			
	4-factor model	5-factor model	7-factor model	9-factor model
Using All Bond Funds (1987:01 – 2003:03)				
F-stat for equal residual risk	1.17	1.27**	1.35**	1.13
	(0.14)	(0.02)	(0.02)	(0.20)
Using High Yield Funds (1997:01 – 2003:03)				
F-stat for equal residual risk	1.07	1.05	1.08	1.10
	(0.39)	(0.42)	(0.37)	(0.34)

Panel B: Balanced Funds (1987:01 – 2003:03)

	Residual Risk (Variance) SRI / Conventional			
	4-factor model	5-factor model	7-factor model	9-factor model
F-stat for equal residual risk	2.61***	2.64***	2.65***	2.84***
	(0.00)	(0.00)	(0.00)	(0.00)

**** Significant at 1% level, at 5% level*

TABLE 5. Residual-risk Adjusted Return of SRI and Conventional Fixed-Income Funds

The Sharpe ratio is the return above the risk-free rate, divided by the standard deviation of excess return. The appraisal ratio is the intercept from the employed model divided by the regression's standard error. All ratios are annualized. The Jobson and Korkie (1981) test compares the ratios between SRI and conventional funds via a Z_{JK} (Z_{AR}) score. P-values are parenthesized.

Panel A: Bond Funds

	Sharpe Ratio	Appraisal Ratio			
		4-factor model	5-factor model	7-factor model	9-factor model
Using All Funds in Sample (1987:01 – 2003:03)					
SRI Bond Funds	0.53	-1.22	-1.20	-1.21	-1.21
Matched Sample	0.48	-1.56	-1.53	-1.53	-1.59
Abs.(Z_{JK})	0.66				
	(0.51)				
Abs. (Z_{AR})		1.56	1.53	1.52	1.58
		(0.11)	(0.12)	(0.12)	(0.11)
Using High Yield Funds (1997:01 – 2003:03)					
SRI Bond Funds	0.21	-0.63	-0.60	-0.56	-0.56
Matched Sample	0.20	-0.58	-0.53	-0.48	-0.55
Abs.(Z_{JK})	0.12				
	(0.90)				
Abs. (Z_{AR})		0.17	0.23	0.44	0.04
		(0.87)	(0.82)	(0.66)	(0.97)

TABLE 5 *continued.* Residual-risk Adjusted Return of SRI and Conventional Fixed-Income Funds

The Sharpe ratio is the return above the risk-free rate divided by the standard deviation of excess return. The appraisal ratio is the intercept from the employed model divided by the regression's standard error. All ratios are annualized. The Jobson and Korkie (1981) test compares the ratios between SRI and conventional funds via a Z_{JK} (Z_{AR}) score. P-values are parenthesized.

Panel B: Balanced Funds (1987:01 – 2003:03)

	Sharpe Ratio	Appraisal Ratio			
		4-factor model	5-factor model	7-factor model	9-factor model
SRI Bond Funds	0.45	0.05	0.12	0.12	0.12
Matched Sample	0.33	-0.86	-0.74	-0.74	-0.65
Abs.(Z_{JK})	1.56				
	(0.11)				
Abs. (Z_{AR})		2.84 ***	2.65 ***	2.67 ***	2.46 ***
		(0.00)	(0.01)	(0.01)	(0.01)

**** Significant at 1% level*

Since the cross-section of funds in our sample is too small in early years in order to produce informative regression results, the analysis is restricted to the period 1994-2002. The parameters in model (4) are estimated over each calendar year. Subsequently, we compute time-series averages of the cross-sectional coefficient estimates. We then compute corresponding *t*-statistics by using standard errors from the time-series parameters.

Table 6 reports Fama-Macbeth regression results for bond funds and balanced funds, respectively. Both the intercept term and the coefficients on the SRI dummy variables are annualized and expressed as percentages. The reported sensitivities with respect to the control variables are supported by existing literature (e.g., Blake, Elton and Gruber (1993), Carhart (1997)), but not all coefficients are statistically significant. Consistent with a large body of fund performance studies, the expense ratio is significantly and negatively related to excess fixed-income fund returns. The other controls have coefficients that are consistent in terms of sign but not highly significant. Central to this section are the SRI fund identifiers. Notwithstanding the fact that previous sections enjoyed a larger sample window, the loadings on the SRI dummy variables in this cross-sectional framework support our portfolio evaluation results. The coefficient on the SRI bond fund dummy variable is virtually zero. The coefficient on the SRI balanced fund dummy is in magnitude similar to the differential alphas reported in the previous section (1.3 percent) but not statistically significant. Thus, the cross-sectional regressions suggest that the excess returns of SRI bond funds and SRI balanced funds match those of their conventional peers.

2.5. CONCLUDING REMARKS

Sizeable academic interest has been shown in the performance of socially responsible equity mutual funds. To the best of our knowledge, no evidence exists in the investment literature regarding the performance of SRI funds that focus on fixed-income securities. Using several performance attribution techniques, we showed that socially responsible fixed-income funds have been steady performers over the period 1987-2003.

We found that a portfolio of SRI bond funds earned a benchmark-adjusted return similar to that of its conventional counterpart. A portfolio of SRI balanced funds outperformed conventional balanced funds by 1.3 percent per year. Although SRI funds generally seem to have a higher residual risk, which is consistent with them being different from normal portfolios, controlling for residual risk does not materially affect our conclusions. Finally, cross-sectional models that include fund size, expenses, turnover, and an SRI dummy as determinants of fund alpha offer supportive evidence. Coefficients on the SRI dummies indicate that socially responsible fixed-income funds have performed no

TABLE 6. Fama-MacBeth Regressions

This table reports the results of annual regressions of a fund's 12-month four-factor alpha on a constant, the log of total net assets (Log TNA), the fund's expense ratio, (Expenses), the turnover rate (Turnover), and a dummy indicating that a fund is a socially responsible fixed-income fund. In the tradition of Fama and MacBeth (1973), we calculate time-series average of the cross-sectional coefficient estimates. We then compute corresponding *t*-statistics by using standard errors from the time-series parameters. Sample period: 1994-2002. The intercept terms and the coefficients on the SRI fund dummy variables are presented as an annual percentage. The *t*-statistics are shown in parentheses.

	Fama-MacBeth Time-Series Average Coefficients	
	Pure Bond Funds	Balanced Funds
Intercept	0.25%	0.80%
	(1.32)	(0.39)
Log TNA	-1.07E-03	2.60E-04
	(-1.74)	(0.13)
Expenses	-0.98 ***	-1.57 ***
	(-4.23)	(-4.40)
Turnover	-0.02	-1.05 *
	(-0.26)	(-2.22)
SRI Fund Dummy	0.02%	1.34%
	(0.14)	(0.89)

** Significant at 10% level, *** at 10% level*

worse than their conventional peers. Note that the returns investigated in this study are post-expense fund returns. The expenses charged by SRI funds, on average, match those charged by our matched sample of conventional funds, and evidently do not cause SRI funds to underperform. At the very least, our evidence shows that SRI funds face no financial penalty and supports the idea that SRI in the fixed-income industry is a financially viable investment approach.

APPENDIX I: Construction of Models with Risk Premiums for Expected Inflation and Economic Innovation

Consider a model for the return generating process, consistent with an APT framework (see Chen, Roll and Ross (1986), Elton, Gruber and Blake (1995)), that incorporates both returns on benchmark portfolios and fundamental economic variables:

$$r_{it} = E[R_i] + \sum_{j=1}^{J} \beta_{ij}\left(R_{jt} - E[R_j]\right) + \sum_{k=1}^{K} \delta_{ij} g_{kt} + \varepsilon_{it} \tag{5}$$

where r_{it} denotes the period-*t* return on asset *i,* R_{jt} is the return on (benchmark) portfolio *j,* g_{kt} indicates the unexpected change in fundamental variable *k,* β_{ij} and δ_{ij} represent (risk) factor sensitivities for asset *i*, and ε_{it} is the return on asset *i* independent of sensitivities with respect to benchmark portfolios and innovation in fundamental variables. This model says that the return on an asset is a combination of the expected return and unexpected returns due to unexpected variation in tradeable portfolio returns and unexpected changes in fundamental variables. $E[g_k] = E[\varepsilon_i] = 0$ because the expected values of unexpected changes are zero. Elton, Gruber and Blake (1995) use APT reasoning to specify the expected return of an asset:

$$E[R_i] = \tau_0 + \sum_{j=1}^{J} \beta_{ij} \tau_j^* + \sum_{k=1}^{K} \delta_{ij} \tau_k \tag{6}$$

where τ_0 indicates the risk-free rate of return, and τ_j^* and τ_k indicate the market prices associated with sensitivity to portfolio *j* and fundamental factor *k*. It is relatively easy to understand market prices of risk when determining variables are investable portfolios, which then become the returns of those portfolios above the risk-free rate: $\tau_j^* = E[R_j] - \tau_0$. This relationship, when we use R_f as substitute for τ_0, can be used to modify (6) into:

$$E[R_i] = R_f + \sum_{j=1}^{J} \beta_{ij}\left(E[R_j] - R_f\right) + \sum_{k=1}^{K} \delta_{ij} \tau_k \tag{7}$$

Equations (6) and (7) can be combined to arrive at:

$$r_{it} - R_f = \sum_{j=1}^{J} \beta_{ij} \left(R_{jt} - R_f \right) + \sum_{k=1}^{K} \delta_{ij} \left(\tau_k + g_{kt} \right) + \varepsilon_{it} \tag{8}$$

(with $R_f = R_{ft}$).

When APT holds (assuming that the model is correctly specified), the following model applies:

$$r_{it} - R_f = \alpha_i + \sum_{j=1}^{J} \beta_{ij} \left(R_{jt} - R_f \right) + \sum_{k=1}^{K} \delta_{ij} \left(\tau_k + g_{kt} \right) + \varepsilon_{it} \tag{9a}$$

with the restriction

$$\alpha_i = \sum_{k=1}^{K} \delta_{ij} \tau_k \tag{9b}$$

Following Elton, Gruber and Blake (1995), we use this condition to derive proxies for the unobservable "true" risk premiums associated with two fundamental variables: inflation and economic development. Like Elton, Gruber and Blake (1995) we define unexpected changes as changes in expected values of the variables and use survey data to determine expectations. The expected U.S. inflation rate is based on the U.S. consumer opinion survey, which is maintained by the University of Michigan. The economic development variable is computed as the change in industrial production index from The Federal Reserve Bank. We jointly estimate the APT-based model subject to aforementioned restriction with multiple passive benchmark asset returns as the dependent variables. The passive bond portfolios employed are the CGBI USBIG short-term Treasury Index (which includes 1-3 year maturity vehicles), the intermediate Treasury Indexes (3-7 years and 7-10 years), long-term Treasury Indexes (10+ and 20+ years), CGBI USBIG Corporate Bond Indexes (1-3, 7-10 and 10+ years), the GNMA Index, and the Merrill Lynch High-Yield Index. Our fitting approach implicitly assumes time invariant risk premiums (τ_k).

APPENDIX II: Statistical Test for Comparing Appraisal and Information Ratios

To test for the difference in appraisal ratio between SRI funds and conventional funds, we build on the test statistic developed by Jobson and Korkie (1981), which focused on differences between Sharpe ratios and between Treynor ratios. For example, let the Sharpe ratio be the ratio of portfolio return in excess of the risk-free rate to the standard deviation of excess return. If μSRI and μc are, respectively, the mean SRI fund portfolio return and the mean return of the respective conventional fund, and if σSRI , σc and $\sigma_{SRI,c}$ are the standard deviations and covariance of the excess returns of the two fund portfolios, then Jobson and Korkie's Z_{JK} score becomes:

$$Z_{JK} = \frac{\sigma SRI(\mu c - Rf) - \sigma c(\mu SRI - Rf)}{\sqrt{\Theta}} \tag{3a}$$

where

$$\Theta = \frac{1}{T}\left[2\sigma_{SRI}^2\sigma_c^2 - 2\sigma_{SRI}\sigma_c\sigma_{SRI,c} + \frac{1}{2}\mu_{SRI}^2\sigma_c^2 + \frac{1}{2}\mu_c^2\sigma_{SRI}^2 - \frac{\mu_{SRI}\mu_c}{2\sigma_{SRI}\sigma_c}\left(\sigma_{SRI,c}^2 + \sigma_{SRI}^2\sigma_c^2\right)\right] \tag{3b}$$

Let the excess returns denoted as λ_{SRI} and λc be, respectively, $\mu_{SRI} - \mu_{b1}$ and $\mu_c - \mu_{b2}$, where μ_{b1} and μ_{b2} are the average benchmark returns (i.e., returns predicted by an estimated single- or multi-index model) corresponding to SRI and conventional funds, and let $\sigma_{\lambda SRI}$, $\sigma_{\lambda c}$, and $\sigma_{\lambda SRI,c}$ be the respective standard deviations and covariance of the portfolios' excess returns. Then, we compare the funds' appraisal ratios by means of the following Z_{AR} score:

$$Z_{IR} = \frac{\sigma_{\lambda SRI}\lambda_c - \sigma_{\lambda c}\lambda_{SRI}}{\sqrt{\Theta}_{AR}} \tag{10a}$$

where

$$\Theta_{AR} = \frac{1}{T}\begin{bmatrix} 2\sigma_{\lambda SRI}^2\sigma_{\lambda c}^2 - 2\sigma_{\lambda SRI}\sigma_{\lambda c}\sigma_{\lambda SRI,c} + \frac{1}{2}\lambda_{SRI}^2\sigma_{\lambda c}^2 + \frac{1}{2}\lambda_c^2\sigma_{\lambda SRI}^2 \\ -\frac{\lambda_{SRI}\lambda_{\lambda c}}{2\sigma_{\lambda SRI}\sigma_{\lambda c}}\left(\sigma_{\lambda SRI,c}^2 + \sigma_{\lambda SRI}^2\sigma_{\lambda c}^2\right) \end{bmatrix} \tag{10b}$$

The benchmark returns can be obtained via an index or by estimating the returns according to an estimated expected return model. We choose the latter and compare the returns on bond funds with those on a benchmark portfolio of similar risk using the four-index model outlined earlier, where the benchmark returns are defined as the funds' estimated four-factor loadings multiplied by the returns of the four indexes.

Chapter 3
The Eco-Efficiency Premium Puzzle[30]

3.1. INTRODUCTION

Many businesspeople believe that companies cannot use their financial resources to improve environmental performance without decreasing shareholder value. A common line of reasoning is that a company's costs of adhering to environmental standards will translate into higher product prices, a competitive disadvantage, and lower profitability (Walley and Whitehead (1994)). Others believe that improved environmental performance can enhance a company's input–output efficiency or generate new market opportunities. Porter and Van der Linde (1995) argued that active policies to improve environmental performance can create a competitive advantage because of the more cost-efficient use of resources. If this argument is true and the benefits of social or environmental initiatives outweigh their costs, then businesses that embrace the concept of corporate environmental responsibility should be able to report higher corporate earnings than less responsible companies.

The extent to which environmental screening policies contribute to *investment returns*, however, depends on the financial markets' ability to factor the financial consequences of corporate social responsibility into share prices. The belief is still widespread that at the investment level, incorporating environmental criteria into investment decisions comes at the cost of portfolio performance. Asset-pricing theory that relies on the efficient market hypothesis posits that (i) investment portfolios deliver returns proportional to associated risk and that (ii) the optimal investment portfolio is a well-diversified one. Therefore, any empirical evidence of anomalous risk-adjusted investment performance on the part of stocks grouped by company-specific characteristics—such as size, book-to-market ratio (BV/MV), or corporate social responsibility—are attributable to deficiencies in the performance evaluation models that attempt to explain them. After the methodological shortcomings are corrected, no abnormal returns should exist. This reasoning suggests that socially responsible investors, who would be inherently suffering from imposed limits to diversification, should report suboptimal returns when the appropriate performance attribution framework is used. Proponents of SRI, however, typically argue that corporate social responsibility reflects the company managers' views on how the company will perform in the long term. These views may be mispriced because

[30] As published in the Financial Analysts Journal (See Derwall, J., N. Guenster, R. Bauer and K. Koedijk (2005), "The Eco-Efficiency Premium Puzzle", *Financial Analysts Journal*, vol 61.(2), pp. 51-63.) I thank the French Social Investment Forum for awarding this article the 2005 Finance and Sustainability Research Award and associated financial support.

of short-term thinking within the financial community. This school of thought suggests that SRI can be incrementally profitable over long-run horizons.

The central empirical question arising from this debate is whether corporate environmental responsibility is associated with financial performance. A large body of research has investigated the social/environmental–financial performance link empirically by comparing the historical returns of socially responsible *mutual funds* with those of conventional funds or market indexes. Although this research approach provides useful evidence on the financial consequences of SRI in a practical context, the method has some limitations. Results from mutual fund studies may be biased because of nonquantifiable aspects, such as management skill, unknown portfolio holdings, and screening methods. Furthermore, mutual fund studies cannot adequately establish whether a social or environmental responsibility *premium* exists because holdings of social funds and conventional funds are not mutually exclusive.

In this study, we avoid these difficulties by using the Innovest Strategic Value Advisors rating database to evaluate self-composed equity portfolios. Despite being well established in the investment community, these ratings are rarely used in empirical research. The Innovest scores build on the concept of "eco-efficiency," which can be interpreted as the economic value a company adds (e.g., by producing products and delivering services) relative to the waste it generates when creating that value. Focusing exclusively on the environmental element of social responsibility, our study investigates whether a long-run premium or penalty exists for holding environmentally responsible companies. We construct two mutually exclusive portfolios with distinctive eco-efficiency scores. We then apply performance attribution models to test whether any performance differential between the portfolios is significant and attributable to the environmental component. This method allows us to examine the long-term benefits of including environmental criteria in the investment process.

We explicitly attempt to overcome the performance attribution problems outlined earlier by using several sophisticated performance evaluation methods. Following Carhart (1997), we evaluate the portfolios while controlling for multiple non-environmental factors known to determine stock performance. This process is a methodological improvement on most related (non-mutual fund) studies on SRI, which typically account only for volatility or market risk. The major benefit of the approach we use, as empirically confirmed by Fama and French (1993) and Carhart, is that we also control for the presence of style tilts (based on, for example, size, value versus growth, or momentum effects) in stock portfolios. This approach is particularly important because of the mounting evidence that environmentally and socially screened portfolios in the United States tend to be biased toward large-capitalization growth stocks (see, for example, Bauer, Koedijk, and Otten (2005)). Following Geczy, Stambaugh, and Levin (2003), our study applies a four-factor model augmented by factors that capture industry effects in socially responsible equity portfolios. Last, we check the performance of best-in-class and worst-in-class portfolios that are industry neutral by construction.

The remainder of this chapter is organized as follows. In the next section, we review prior studies on the relation between environmental responsibility and stock market performance. Subsequently, we explain the data we use to measure firms' environmental performance and we outline in detail how we use them to construct SRI portfolios. We then evaluate our portfolios in several asset pricing frameworks. We end our analyses by testing best-in-class and worst-in-class portfolios, including long-short positions, under several transaction costs scenarios. Last, we summarize the results and conclude Chapter 3.

3.2. ENVIRONMENTAL RESPONSIBILITY AND STOCK RETURNS

A large body of literature has investigated the relationship between environmental and financial performance. Unfortunately, the empirical evidence to date is inconsistent. As pointed out by Ullman (1985) and by Griffin and Mahon (1997), the conflicting results in prior research are mainly attributable to differences in methodology and in the choice of financial and environmental performance indicators. For the studies that used stock returns as the financial performance measure, Wagner (2001) identified three categories: portfolio studies, event studies, and (multivariate) regression studies.

Portfolio studies typically compose mutually exclusive portfolios based on various corporate social performance indicators and investigate the portfolios' return differences over some investment horizon. For instance, Diltz (1995) studied daily returns for a variety of portfolios constructed on the basis of several ethical performance indicators. Diltz found that, although many screens did not improve portfolio performance significantly, environmental screens enhanced stock performance significantly during the 1989–91 period. Cohen, Fenn, and Konar (1997) constructed industry-balanced portfolios with different environmental responsibility characteristics to investigate the financial performance difference between low-polluter and high-polluter companies in the United States. Contrary to the Diltz study, their findings suggest that there is neither a premium nor a penalty for investing in companies that are leaders in nonpollution issues. A comparison by Yamashita, Sen, and Roberts (1999) of 10-year risk-adjusted returns showed, however, that their environmentally highest-ranked stocks performed significantly better than the lowest-ranked stocks. White (1996), furthermore, examined the performance of "green," "oatmeal," and "brown" equity portfolios and demonstrated that the green portfolio provided a significantly positive Jensen's alpha while the other two alternatives failed to outperform the market. In addition to these studies, some studies have compared self-composed socially screened portfolios with a regular investment portfolio. One of Innovest's online research publications (Blank and Daniel (2002)) discussed the potential usefulness of eco-efficiency scores in making investment decisions. Blank and Daniel reported that an equal-weighted eco-efficiency portfolio delivered somewhat higher Sharpe ratios than the S&P 500 Index during the 1997–2001 period. Finally, Guerard (1997) used the social performance database of Kinder, Lydenberg, Domini & Company and concluded that portfolios derived from a socially screened investment universe did not perform differently from those obtained from an unscreened set during the 1987–96 period.

The most pronounced evidence of a link between environmental and stock market performance is found in event studies. Shane and Spicer (1983) documented that companies experienced abnormal declines in stock prices two days prior to their pollution figures being reported by the Council on Economic Priorities in the United States. Moreover, on the day of publication, negative returns were significantly larger for companies with relatively poor records of pollution control than for companies with better rankings. Hamilton (1995) reported a significantly negative abnormal return for publicly traded companies following the first release of their TRI (toxics release inventory) pollution figures. Consistent with previous results, Klassen and McLaughlin (1996) found evidence that positive corporate events, measured by environmental awards given to companies by third parties, are associated with positive subsequent abnormal returns. Significantly negative returns tend to follow environmental crises. Similarly, Rao (1996) reported that the performances of companies following pollution reports by the Wall Street Journal between 1989 and 1993 were significantly below the companies' expected market-adjusted returns. Only Yamashita, Sen and Roberts (1999), studying scores of environmental conscientiousness published in July 1993's Fortune magazine, did not find significant stock market responses to the scores.

A third category of literature has used primarily regression or correlation analysis to examine whether a long-term relationship exists between corporate environmental responsibility and stock performance. Taken as a whole, these studies provide only limited support for such a relationship. Spicer (1978) documented that companies in the U.S. pulp and paper industry with the better pollution control records have higher profitability and lower stock betas. Chen and Metcalf (1980), however, in replicating Spicer's study but controlling for the impact of company size on environmental performance, cast doubt on his findings. Using a similar method, Mahapatra (1984) also found no evidence that pollution control initiatives are rewarded with improved stock performance.

Most prior research, implicitly resting on Sharpe's (1964) CAPM (capital asset pricing model) framework, controlled portfolio performance or observed relationships for only a single risk factor. Evidence presented by Fama and French and by Carhart indicates, however, that a single factor cannot explain the cross-sectional variation in equity returns. Therefore, the relationship between environmental and financial performance observed in studies to date may have been driven by latent factors that were not used as control variables in the research. Surprisingly, the empirical literature addressing some of such unobserved influences is limited to non-U.S. studies. They include Thomas (2001), who added environmental policy dummies to a two-factor model that controlled for size effects in addition to market sensitivity in the U.K. market, and Ziegler, Rennings, and Schröder (2002), who controlled for market risk, company size, and the BV/MV effect in the European market. Both studies found some evidence of a positive association between environmental responsibility and stock performance.

We extend prior portfolio research, particularly Blank and Daniel (2002), by considering advanced performance attribution frameworks and a larger sample.

3.3. MEASURING ENVIRONMENTAL PERFORMANCE

Whereas most proxies for environmental performance represent absolute pollution levels, the concept of eco-efficiency is frequently used to measure the environmental performance of a company in a relative sense. Eco-efficiency can be thought of as the ratio of the value a company adds (e.g., by producing products) to the waste the company generates by creating that value (see, for instance, Schaltegger, Burritt, and Petersen 2003). To understand the difference between absolute and relative environmental performance, consider, for example, companies that operate in such environmentally sensitive industries as mining, energy, or chemicals. In absolute terms, these companies are typically labeled poor environmental performers. On the eco-efficiency performance measure, however, these companies can still do well relative to their competitors facing the same environmental challenges.

To proxy for corporate eco-efficiency, we obtained rating data from Innovest. The main benefits of these scores are their comprehensiveness. Using more than 20 information sources, both quantitative and qualitative in nature, Innovest's analysts evaluate a company relative to its industry peers via an analytical matrix. Companies are evaluated along approximately 60 dimensions, which jointly constitute the final rating. For each of these factors, each company receives a score between 1 and 10. Because these variables are not considered equally important in the overall assessment of ecoefficiency, each factor is weighted differently. For example, a company's environmental product development is usually considered more important than, for instance, outside certification by any non-governmental organization. The final numerical rating assigned to a company is converted into a relative score based on the total spread of scores in the sector to which the company belongs.

To summarize, the criteria can be grouped into five broad categories, which address five fundamental types of environmental factors (Innovest 2003):

- historical liabilities—risk resulting from previous actions;
- operating risk—risk exposure from recent events;
- sustainability and eco-efficiency risk—future risks initiated by the weakening of the company's material sources of long-term profitability and competitiveness;
- managerial risk efficiency—ability to handle environmental risk successfully;
- environmentally related strategic profit opportunities—business opportunities available to the company relative to industry peers.

Although the Innovest database contains scores on more than 1,200 companies globally, we consider only U.S. companies. The number of companies was about 180 at the end of May 1997 and increased steadily to approximately 450 at the end of May 2003. All ratings are dated for the month in which they were made available.

3.4. EMPIRICAL ANALYSIS

Portfolio Construction

We construct two mutually exclusive stock portfolios with distinctive eco-efficiency characteristics.[31] After matching all companies in the Innovest universe with the CRSP stock database, we rank the companies annually on their most recent eco-efficiency ratings. The high-ranked (low-ranked) portfolio consists of companies making up the 30 percent of total capitalization rated highest (lowest) by Innovest. The annual re-ranking and portfolio rebalancing occurs at the end of June. When constructing the portfolios, we take into account a one-month lag for the ranking data to avoid look-ahead bias. Companies for which no rankings were available at the rebalancing date are excluded automatically for the subsequent 12-month period.

The Innovest database contains scores only for the 1997–2003 period, but asset-pricing tests require many data points. Therefore, we confronted a small-sample problem. To obtain meaningful results, we extend the July 1997 ratings backward through July 1995. Because eco-efficiency ratings tend to have low variability, we believe that extending the data backward for two years is acceptable. As a result, we observe end-of-month portfolio return data for the period July 1995 through December 2003. We are aware that this procedure potentially introduces look-ahead bias. However, the ratings' variability is extremely low, and the results of using the 'real-time' period 1997-2003 are similar to those reported in the paper. These results are available upon request.

[42] It should be noted that the sorting approach proposed in this study does not allow for an explicit judgment on the direction of causality between environmental and financial variables. We are merely concerned with the long-term benefits of incorporating environmental criteria into the investment process.

Table 1 gives descriptive statistics for the two portfolios and for a value-weighted portfolio consisting of all stocks in the CRSP database, which is a proxy for the market (as in Fama and French (1993)). These basic statistics suggest that the portfolio consisting of highly eco-efficient companies performed better than the eco-inefficient portfolio, even after adjusting for volatility. The low-ranked portfolio also has a substantially lower Sharpe ratio than the market proxy. The last columns of Table 1 report some additional time-series properties. Ljung-Box Q-statistics and corresponding p-values in parentheses serve as tests for autocorrelation (AC) and heteroskedasticity (HC). These test statistics suggest that we cannot reject the null hypothesis of no autocorrelation and no heteroscedasticity up to one lag.[32] Hence, autocorrelation and heteroscedasticity are not a concern throughout the remainder of our research. The skewness and kurtosis estimates indicate only weak deviation from a normal distribution.[33]

Portfolio Performance in a CAPM-Framework

To account for differentials in the portfolios' market risk, we first measure portfolio performance via the well-established CAPM-framework. Specifically, for all portfolios we employ a (OLS) regression to estimate the model of the form:

$$R_{it} - R_{ft} = \alpha + \beta_i \left(R_{mt} - R_{ft} \right) + \varepsilon_{it} \quad (1)$$

where, R_{it} is the return on portfolio i in month t, R_{ft} indicates the one-month T-Bill rate at t, R_{mt} represents the return on a value-weighted market proxy in month t, and ε is an error term. The value-weighted market proxy and the risk-free rate were provided by the Kenneth French Data Library. The model-β ('beta') is interpreted as measuring a portfolio's market risk exposure and α (Jensen's 'alpha') represents the average abnormal return in excess of the return on the market proxy. Hence, in this scenario it is implicitly assumed that the difference between the return on a portfolio and the return on the single-factor benchmark according to an estimated CAPM provides an accurate estimate of risk-adjusted performance.

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[32] When multiple lags were considered, we also did not detect AC and HC at other lags.

[33] In most cases, a Jarque–Bera nonparametric test of normality did not reject the null hypothesis of a normally distributed series.

TABLE 1. Descriptive Statistics

The high-ranked portfolio consists of stocks of firms with the highest eco-efficiency ratings. The low-ranked portfolio contains companies with the lowest eco-efficiency scores. The market proxy is represented by the value-weighted market portfolio documented in Fama and French (1993). The Sharpe ratio is the ratio of the mean excess return to the standard deviation of return. The mean return, the standard deviation and the Sharpe ratio are annualized. The last four columns describe supplementary time series properties. We report Q-statistics (and corresponding p-values in brackets) for the returns and for their variances in order to test for, respectively, autocorrelation (AC) and heteroskedasticity (HC) up to 1 lag. We also report skewness and kurtosis. Sample period: 1995:07 – 2003:12

Portfolio	Mean %	Std. Dev.	Sharpe	Max.	Min.	AC-Q	HC-Q	Skewness	Kurtosis
High-Ranked Companies	12.2	17.82	0.46	13.06	-12.86	0.25 (0.62)	0.44 (0.51)	-0.42	2.95
Low-Ranked Companies	8.87	17.01	0.28	9.95	-11.48	0.00 (0.98)	0.98 (0.32)	-0.31	2.65
Market Proxy	11.31	17.07	0.42	8.33	-15.69	0.16 (0.69)	0.01 (0.93)	-0.7	3.21

Table 2 reports performance evaluation results obtained from the CAPM framework. Because the primary focus of the research is the performance differential between the high-ranked portfolio and the low-ranked portfolio, we provide the returns on a "Difference" portfolio, which is constructed by subtracting the low-ranked portfolio returns from the returns on the high-ranked stock portfolio. The influence of environmental screening on investment performance is the difference between the alpha on the high-ranked portfolio and the alpha on the low-ranked portfolio.

TABLE 2. Empirical Results 1-Factor Regressions

This table reports the results of estimating CAPM-based regression models; see equation (1). The *difference* portfolio is constructed by subtracting low-ranked portfolio returns from the returns on the high-ranked stock portfolio. The final row displays the results of estimating the difference in industry-adjusted return using three additional regressors obtained via a principal components analysis; see equation (2). Coefficients on the principal component scores $IP_{1\text{-}3t}$ are not reported. T-statistics (in parentheses) are derived from Newey-West (1987) standard errors. Sample period: 1995:07 – 2003:12. Alphas are annualized percentages.

Equity Portfolio	α	$(R_m - R_{ft})$	adj. Rsq.
High-Ranked Companies	1.29	0.94^{***}	0.82
	(0.51)	(22.62)	
Low-Ranked Companies	-1.76	0.91^{***}	0.83
	(-0.86)	(15.87)	
Difference	3.05	0.04	0.00
	(1.09)	(0.66)	
Industry-Adjusted Difference	3.82	0.03	0.00
	(1.42)	(0.39)	

**** Significant at 1% level*

According to the reported alpha estimates and corresponding *t*-statistics, neither portfolio's performance is significantly different from that of the market proxy. Furthermore, a comparison of the betas reveals that the portfolios do not differ significantly in exposure to the market factor. The most important observation is that the alpha of the Difference portfolio is positive (i.e., 3.05 percent annually), which suggests that the high-ranked portfolio provides a higher market risk–adjusted return than its low-ranked counterpart.

Although economically large, the performance difference in this framework is not statistically significant.

DiBartolomeo and Kurtz (1999) provided evidence that sector exposures drive SRI portfolio returns to a great extent; therefore, we also investigate whether our results tend to be industry sensitive. In testing for industry sensitivity, we use an approach similar to that of Pastor and Stambaugh (2002) and Jones and Shanken (2004). This approach, previously applied on socially responsible mutual fund returns by Geczy, Stambaugh and Levin (2003), involves the construction of a factor model composed of the excess market return and three industry factors mechanically extracted from returns orthogonal to the primary factor. To derive these regressors, one performs a principal-components analysis on the portion of Fama and French's 30 excess industry-sorted portfolio returns that cannot be explained by the single-factor model (i.e., the model's intercept and the residual series). Subsequently, the first three components, by capturing most remaining industry return variation, are taken to complement the single-factor model. The resultant model is of the form:

$$R_{it} - R_{ft} = \alpha + \beta_{0i}\left(R_{mt} - R_{ft}\right) + \sum_{k=1}^{3} \beta_{ki} IP_{kt} + \varepsilon_{it} \tag{2}$$

where $IP_{1\text{-}3t}$ represents three factors (principal components) capturing industry effects.

After performing this regression, we obtain industry bias–free alpha estimates. The results are reported in the bottom row of Table 2. Note that Table 2 does not report loadings on the industry adjustment variables because these coefficients are difficult to interpret. The return on the Difference portfolio after industry adjustment increases to 3.82 percent a year, indicating that the performance estimates reported previously were adversely affected by industry exposures. The model intercept, nonetheless, remains insignificant.

Performance in a Multifactor Framework

After empirically establishing the inefficiency of the single-factor CAPM framework, Fama and French (1993) introduced a three-factor model that adds to excess market return a capitalization-based factor (small-cap stock returns minus large-cap stock returns, SMB) and a BV/MV factor (stock returns for companies with high BV/MV minus stock returns for companies with low BV/MV, HML). Although the benefits of the three-factor model are acknowledged, the model has been subject to further improvement. For example, examining persistence in U.S. mutual fund performance, Carhart demonstrated that the three-factor model fails to explain the Jegadeesh and Titman (1993) momentum strategy and proposed the addition of a momentum factor (MOM) to existing performance models.

In this section, we report our analysis of the historical monthly return distribution of the two portfolios by means of the multifactor performance model used by Carhart (1997). In using three additional control variables, we mitigate potentially severe biases that could result from style tilts in stock portfolios (size, value versus growth, or momentum effects).[34] This control is particularly important in light of mounting evidence that the returns on style investment strategies account for a considerable portion of SRI portfolio performance (see, for example, Bauer, Koedijk and Otten (2005), Gregory, Matatko, and Luther (1997)). As a further adjustment of average returns for industry effects, we extend the industry-adjustment process to the multivariate setting by analyzing the residuals derived from a regression of Fama and French's industry-sorted portfolio returns on the four factors.

Formally, the approach to performance assessment entails estimation of the following equations:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(R_{mt} - R_{ft}) + \beta_{1i}\,SMB_t + \beta_{2i}\,HML_t + \beta_{3i}\,MOM_t + \varepsilon_{it}, \tag{3}$$

Where SMB_t represents the return difference between a small cap portfolio and a large cap portfolio in month t, HML_t is defined as the return difference between a value (high B/M) portfolio and a growth (low B/M) portfolio in month t, MOM_t is the return difference between a portfolio of past 12-month winners and a portfolio of past 12-month losers in month t, and

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(R_{mt} - R_{ft}) + \beta_{1i}\,SMB_t + \beta_{2i}\,HML_t + \beta_{3i}\,MOM_t + \beta_{4\text{-}6i}\,IP_{1\text{-}3t} + \varepsilon_{it} \tag{4}$$

SMB and HML were obtained from the Kenneth French Data Library. The momentum factor (MOM) came from Mark Carhart.

Table 3 reports performance estimates resulting from estimation of the four-factor model (Equation 3). Table 3 has several prominent differences with Table 2. First, the adjusted R^2s from the models have increased. This observation confirms the incremental explanatory power of a multivariate framework. Second, the high-ranked portfolio is reported to have earned a significant average factor-adjusted return of 3.98 percent a year, whereas the low-ranked portfolio performed poorly. Third, factor loadings on the additional determinants, SMB, HML, and MOM, are generally significant. For both the high-ranked portfolio and the low-ranked portfolio, the coefficient on SMB is significantly negative, which implies a bias toward large-cap stocks in the Innovest database. The factor loadings on HML suggest that the high-ranked portfolio was somewhat growth-stock

[34] Although there is an ongoing discussion about whether these additional factors proxy for risk, we bypass that subject and merely use the factor-mimicking portfolio returns as control variables in performance estimation.

oriented during the period examined whereas the low-ranked portfolio was significantly tilted toward value stocks.

Note also the significantly negative coefficients on the momentum factor. They suggest that both stocks with relatively bad past-year performance and those with good past-year performance tend to have relatively poor eco-efficiency rankings, which seems counterintuitive. Because prior related studies revealed evidence of a positive relationship between financial performance and subsequent social performance (e.g., Chung, Eneroth, and Schneeweis (2003)), we expected the high-ranked portfolio to be positively related to the momentum factor.

Results with regard to the Difference portfolio show that the performance differential between the two portfolios, 5.06 percent a year for the full period after adjusting for multiple factor loadings, is also significant at the 10% level (and almost significant at the 5% level).

Table 3 also reports some subsample analyses on the Difference portfolio to allow for the possibility that the stock market crash of March 2000 introduced a structural break in the data. Subsample results for this portfolio suggest that the influence of the crash was negligible. The subsample alphas remain economically large—more than 6 percent a year. And, in spite of the small samples, the alphas remain statistically significant, at the 10% level.

As for the factor loadings, the results confirm that there are significant differences in styles or risk sensitivities between the two extreme portfolios. In line with the outcomes within the CAPM framework, the two portfolios do not significantly differ in exposure to market risk. Only with respect to HML does the Difference portfolio exhibit a significant factor exposure.

The bottom row in Table 3 reports coefficients estimated by Equation 4—that is, the seven-factor model that additionally controls for industry tilts. These results show that after industry effects are taken into account, the difference in performance between the high-ranked portfolio and the low-ranked portfolio increases slightly (to 6.04 percent a year) and becomes statistically significant at the 5% level.

Note, however, that the interpretation of performance results can be overly driven by various parameters in the measurement process that have been specified exogenously. Therefore, continuing with the analysis of industry-adjusted returns, we "endogenize" some of these parameters by considering alternative portfolio construction methodologies and return calculations. The empirical results of these robustness checks are reported in Table 4. In the first row of Table 4, we report the outcome of estimating the seven-factor model but using equal-weighted (instead of value-weighted) industry-adjusted portfolio returns. The performance gap between the high-ranked portfolio and its low-ranked counterpart, as represented by the Difference portfolio, narrows to 2.17 percent from the 6.04 percent of Table 3, indicating that alpha depends more on large-cap stocks than on smallcap stocks. Portfolio construction based on equal weighting is uncommon, however, in practice.

TABLE 3. Multifactor Regression Results

This table reports empirical results corresponding to the multifactor regressions described by equation (3). $R_{mt} - R_{ft}$ represents the returns on the market proxy in excess of the risk-free rate, SMB denotes the difference in return between a small cap portfolio and a large cap portfolio, HML denotes the return spread between a value portfolio and a growth portfolio and MOM is the return difference between a prior 12-month winner portfolio and a prior 12-month loser portfolio. SMB and HML are discussed in Fama and French (1993) and MOM is from Carhart (1997). The final row displays the results of comparing portfolio returns after adding 3 industry-adjustment factors to the four-factor model. Coefficients on principal component scores are not reported. T-statistics (in parentheses) are derived from Newey-West (1987) standard errors. Sample period: 1995:07 – 2003:12. Alphas are annualized percentages.

Equity Portfolio	α	$(R_m - R_{ft})$	SMB	HML	MOM	adj. R^2
High-Ranked Companies	3.98*	0.90***	-0.22***	-0.08	-0.10***	0.87
	(1.93)	(25.02)	(-4.30)	(-1.16)	(-5.99)	
Low-Ranked Companies	-1.08	0.95***	-0.15***	0.11**	-0.08***	0.88
	(-0.55)	(19.09)	(-3.70)	(2.29)	(-2.62)	
Difference	5.06*	-0.05	-0.07	-0.19**	-0.02	0.01
	(1.86)	(-0.80)	(-0.95)	(-2.20)	(-0.43)	
Difference	6.21*	0.00	0.01	0.12	0.07	0.03
(1995:07-2000:02)	(1.71)	(0.04)	(0.08)	(0.95)	(1.16)	
Difference	6.71*	-0.06	-0.11	-0.32***	-0.01	0.13
(2000:03-2003:12)	(1.84)	(-0.62)	(-0.97)	(-2.96)	(-0.29)	
Industry-Adjusted Difference	6.04**	-0.20*	-0.14*	-0.30**	-0.01	0.01
	(2.38)	(-1.79)	(-1.87)	(-2.18)	(-0.18)	

** Significant at 10% level, ** at 5% level, *** at 1% level*

TABLE 4. Robustness Analysis: Results under Alternative Methodologies

The table reports the results of performing regression (4) after applying some changes to various parameters in the methodology. The first row presents the difference in alpha estimates between the high-ranked portfolio and the low-ranked portfolio derived from industry-adjusted equal-weighted portfolio returns. The second and third row reports the results of changing the size of the upper (lower) deciles of the portfolios to 20% and 40% of total capitalization, respectively. Finally, the last row reports the industry-adjusted performance difference when only companies belonging to environmentally sensitive industries are considered. T-statistics (in brackets) are derived from Newey-West (1987) standard errors. Sample period: 1995:07 – 2003:12. Alphas are annualized percentages.

	α	$(R_m - R_{ft})$	SMB	HML	MOM	R^2 adj.
Equal – Weighting						
Industry-adjusted Difference portfolio	2.17	-0.10	-0.15***	-0.12*	-0.01	0.18
	(1.11)	(-1.08)	(-3.33)	(-1.75)	(-0.41)	
20% portfolios						
Industry-adjusted Difference portfolio	8.60***	-0.21	-0.09	-0.23	0.01	-0.04
	(2.83)	(-1.40)	(-1.21)	(-1.36)	(0.28)	
40% portfolios						
Industry-adjusted Difference portfolio	4.69**	-0.31**	-0.22***	-0.28**	0.01	0.06
	(2.40)	(-2.62)	(-3.41)	(-1.98)	(0.51)	
Sensitive sectors only						
Industry-adjusted Difference portfolio	4.47**	-0.17**	-0.14***	-0.24**	0.09***	0.15
	(2.07)	(-2.25)	(-2.72)	(-2.60)	(3.77)	

* *Significant at 10% level,* ** *at 5% level,* *** *at 1% level*

In the analysis of value-weighted industry-adjusted returns, we also find that the results are somewhat sensitive to changes in portfolio formation. The second and third rows in Table 4, which report the results of using size deciles of, respectively, 20 percent and 40 percent of total capitalization, reveal different outcomes from the results of the initial scenario (30 percent breakpoints). When 20 percent quintiles are used, thereby increasing the distinction in environmental performance between the highest and lowest ranked portfolios, we find that the performance gap widened from the 6.04 percent of Table 3 to 8.60 percent. When portfolios covering 40 percent of total market value are used, the performance of the Difference portfolio falls to 4.69 percent. In both cases, however, the excess return remained significant from both an economic and a statistical perspective.

Finally, we compute alphas for portfolios comprising only stocks from environmentally sensitive industries (electric utilities, chemistry, metal and mining, paper and forest products, aerospace and defense, and petroleum). The last row in Table 4 shows that the industry-adjusted performance differential falls to 4.47 percent, but it remains statistically significant at the 5% level. A relatively lower alpha for SRI strategies pertaining only to environmentally sensitive industries is remarkable because environmental performance expenditures in these industries are usually substantial.

Overall, we find that companies that perform relatively well along environmental dimensions collectively provide superior returns. The average return on the Difference portfolio is economically large and statistically significant on a risk-, style-, and industry-neutral basis. In terms of statistical significance, the premium estimate is reasonably robust to variations in methodology. Therefore, the results as a whole corroborate the notion that environmentally responsible investing provides benefits.

Our findings also, however, call for an important discussion of the eco-efficiency premium. Given that efforts to correct for investment style and industry bias fail to explain the observed performance differential, what is the nature of the eco-efficiency premium? Is the observed performance gap attributable to latent risk factors or to mispricing?

Many so-called anomalies, such as the size effect (Banz (1981)), the value premium (Fama and French (1993)), and the momentum anomaly (Jegadeesh and Titman (1993)) have become the subject of considerable debate. A large number of scholars suggest most return anomalies can be interpreted as proxies for various forms of risk – see for example (Fama and French (1993), Vassalou and Xing (2004), and Pastor and Stambaugh (2003)) – while others attribute the observed effects to market inefficiencies (e.g. Lakonishok, Schleifer and Vishny (1994), or Haugen and Baker (1996)). Contrary to these well-documented return premia, however, the eco-efficiency premium is difficult to explain within the well-known risk-return paradigm. We also find it difficult to attribute the results to deficiencies in the performance attribution analysis, because our results are robust to, if not strengthened by, the inclusion of factors that control for investment risk, investment style and industry effects.

The alternative explanation — in the tradition of Lakonishok, Schleifer and Vishny (1994) and Haugen and Baker (1996) —is that our findings are the result of the market's inability to price eco-efficiency in an efficient manner. This interpretation could also explain the smaller magnitude of the eco-efficiency premium observed within environmentally sensitive industries. In environmentally sensitive sectors, where eco-efficiency is arguably a significant driver of future corporate performance, investors are more likely to factor environment-related information into investment decisions. In sectors where the benefits of eco-efficiency are less obvious, corporate eco-efficiency information may be priced inappropriately by financial markets.

3.5. PRACTICAL IMPLICATIONS: A BEST-IN-CLASS STRATEGY

We have shown that a portfolio comprising stocks of companies ranked high as to eco-efficiency outperforms its low-ranked counterpart after adjusting returns for market risk, investment style, and industry effects. Obtaining evidence by adjusting returns after the fact may not be very useful, however, from an investor's perspective. Therefore, in this section, we outline the economic implications of our findings by demonstrating how one can construct an environmentally responsible investment portfolio under practical conditions. To take into account our evidence that industry tilts greatly influence portfolio performance, we construct an SRI portfolio based on "best-in-class" analysis, an approach that is commonly applied in the SRI industry.

We first use Fama and French's industry classification scheme to identify 12 industries.[35] In each group, we first rank all the companies in our dataset by their eco-efficiency scores. Within each industry, we then construct a value-weighted portfolio of high-ranked stocks and a portfolio of low-ranked stocks. As a general rule, the two portfolios are equal in size—namely, 30 percent of total capitalization—and mutually exclusive. In the rare case of a too small number of companies within an industry, we assign companies to both the high-ranked group and the low-ranked alternative to maintain a balance in the portfolios' asset sizes. Based on the ratio of total industry capitalization to total market value of all companies in the NYSE/Amex/NASDAQ universe, we compute 12 industry weights. Finally, we assign these weights to our subportfolios to obtain a best-in-class portfolio and a worst-in-class portfolio.

Summary statistics on the portfolios are reported in Table 5. The best-in-class portfolio (before transaction costs) outperformed the worst-in-class portfolio by about 3 percentage points. The portfolio Sharpe ratios indicate that the performance difference persisted after adjusting for volatility. Notice also that the worst-in-class portfolio comprised more companies and exhibited a higher turnover than the best-in-class portfolio.

Figure 1 shows the cumulative absolute return over time for the two portfolios. The cumulative performance difference between the high-ranked portfolio and the low-ranked portfolio was substantial at the end of the observation period (i.e., approximately 66 pps), but the return gap widened predominantly during the second half of the observation window.

[35] Companies were assigned to one of the following industries: Consumer Durables, Consumer Non-Durables, Manufacturing, Energy, Chemical, Business Equipment, Telephone and Television, Utilities, Shops, Health, Money/Finance, and all remaining.

TABLE 5. Descriptive Statistics: Best-in-Class vs. Worst-in-Class Portfolio

The table reports summary statistics on the two extreme portfolios. The best-in-class (worst-in-class) portfolio comprises firms having the highest (lowest) eco-efficiency score in each industry group. The Sharpe ratio is the ratio of the mean excess return to the standard deviation of return.The mean return, the standard deviation and the Sharpe ratio are annualized. Sample period: 1995:07 – 2003:12

	Mean	StDev	Sharpe	Avg. Turnover	Avg # firms
Best-in-Class Portfolio	13.07	17.23	0.53	19.67%	88
Worst-in-Class Portfolio	9.88	18.04	0.33	28.65%	163

FIGURE 1. Cumulative Returns of Two Portfolios, July 1995–December 2003

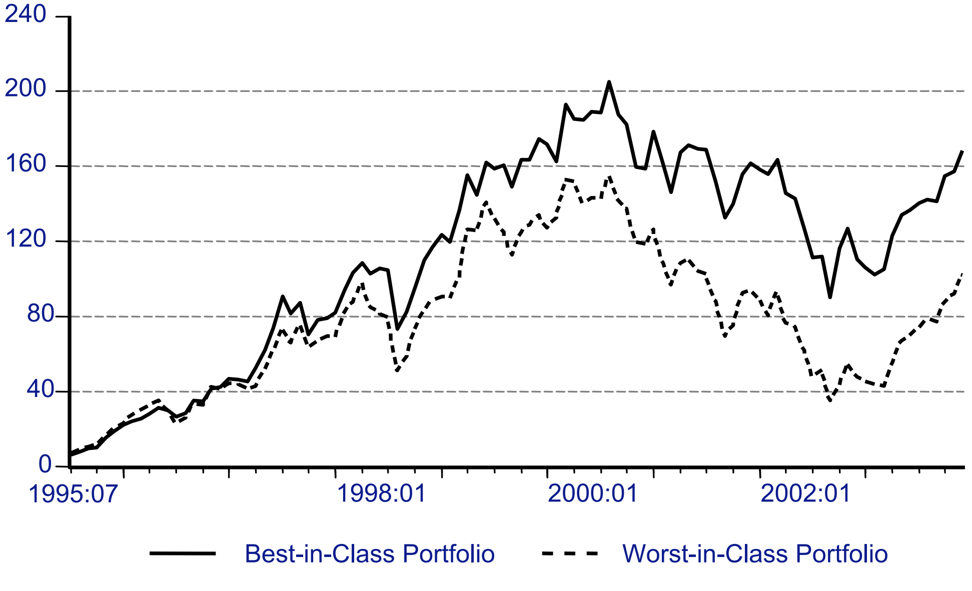

Table 6 reports performance results in the CAPM framework (Equation 1) for the two portfolios under several transaction-cost scenarios. Because best-in-class and worst-in-class strategies are industry neutral in nature, we do not consider the model given by Equation 2. As in previous cases, we report alphas and factor loadings for the long position on the best-in-class portfolio, the long position on the worst-in-class portfolio, and the Difference portfolio (the worst-in-class portfolio returns subtracted from the best-in-class returns). Additionally, we evaluate a zero-investment strategy that goes long on the high-ranked portfolio and short on the low-ranked portfolio. The long–short portfolio return is computed as the return on the Difference portfolio with zero transaction costs minus the sum of transaction costs associated with each of the two positions.

On a market risk–adjusted basis, the alpha computed for the Difference portfolio (3.55 percent) is significant at the 10% level. Notice that this performance difference resembles the one reported previously in Table 2. Furthermore, the difference in performance between the two portfolios is also robust to the introduction of transaction costs. In fact, an increase in transaction costs leads to a widening of the return gap because the worst-in-class portfolio suffered from a higher turnover rate than the best-in-class portfolio. For example, in the 200 bp cost scenario, the return on the Difference portfolio is 3.83 percent on a market risk–adjusted basis.

Performance evaluation results for the long–short strategy underline the difficulties of long–short investing in the presence of transaction costs. As the level of transaction costs gradually increases from 0 to 200 bps, the long–short investment strategy experiences a decrease in risk-adjusted return. The statistical significance of alpha also falls. Although remaining economically large in all transaction costs scenarios, Jensen's alpha is slightly affected in terms of statistical significance. The t-statistic corresponding to alpha under transaction costs of 50 basis points is 1.65 and the p-value is 0.101.

Table 7 reports the outcomes of using Equation 3 for multivariate performance attribution analysis. As expected, the results are generally more pronounced after controlling for style bias. In the absence of transaction costs, the best-in-class portfolio outperformed the worst-in-class portfolio with an alpha for the Difference portfolio of almost 6 percent that is significant at the 5% level. Again, note that this performance estimate is similar to the one reported in Table 3.

In the presence of transaction costs, the excess return on the best-in-class portfolio remains statistically significant. For instance, even in the scenario of 200 bp transaction costs, we find that the annualized alpha of the best-in-class portfolio is still large (3.43 percent) and statistically significant at the 10% level. Unsurprisingly, the factor-adjusted return on the Difference portfolio is statistically significant at the 5% level in all transaction-cost scenarios. Table 7 also reports that the performance of the long–short portfolio is much better when we control not only for market risk but also for style tilts. All four-factor alphas are significant at standard levels regardless of the assumed level of

TABLE 6. Market risk-adjusted Returns under Different Transactions Costs Scenarios

The table reports the results of performing regression (1) under various levels of transactions costs (roundtrip). Alphas and betas are presented for the long position on the best-in-class portfolio, for the long position on the worst-in-class portfolio, for the *difference* in long positions, and for a long-short position under the zero transaction costs scenario. The *long-short* portfolio return is the return on the *difference* portfolio under zero transaction costs minus of the sum of transaction costs associated with each of the two positions. Alphas under higher transaction costs scenarios are reported in the final four columns. Alphas are annualized percentages. T-statistics (in brackets) are derived from Newey-West (1987) standard errors. Sample period: 1995:07 – 2003:12.

	α (0bp tc)	Rm-Rf	Adj. Rsq	α (50 bp tc)	α (100 bp tc)	α (150 bp)	α (200bp tc)
Best-in-Class Portfolio	2.46	0.91***	0.83	2.30	2.15	2.00	1.85
	(1.15)	(20.78)		(1.07)	(1.00)	(0.93)	(0.86)
Worst-in-Class Portfolio	-1.09	0.96***	0.84	-1.31	-1.54	-1.76	-1.98
	(-0.44)	(19.96)		(-0.53)	(-0.62)	(-0.71)	(-0.79)
Difference	3.55*	-0.05	0.00	3.62*	3.69*	3.76*	3.82*
	(1.85)	(-1.20)		(1.88)	(1.91)	(1.94)	(1..97)
Long-Short Strategy	3.55*	-0.05	0.00	3.18	2.80	2.43	2.05
	(1.85)	(-1.20)		(1.65)	(1.45)	(1.25)	(1.05)

* *Significant at 10% level,* ** *at 5% level,* *** *at 1% level*

TABLE 7. Multifactor-adjusted Returns under Different Transactions Costs Scenarios

The table reports the results of performing regression (3) under various levels of transactions costs (roundtrip). Alphas and factor loadings are presented for the long position on the best-in-class portfolio, for the long position on the worst-in-class portfolio, for the *difference* in long positions, and for a long-short position under the zero transaction costs scenario. The *long-short* portfolio return is the return on the *difference* portfolio under zero transaction costs minus of the sum of transaction costs associated with each of the two positions. Alphas under higher transaction costs scenarios are reported in Panel B. All alphas are annualized. T-statistics (in brackets) are derived from Newey-West (1987) standard errors. Sample period: 1995:07 – 2003:12.

Panel A: Zero Transaction-Costs Scenario

	α (0bp tc)	Rm-Rf	SMB	HML	MOM	Adj. Rsq
Best-in-Class Portfolio	4.15**	0.92***	-0.19***	0.02	-0.09***	0.88
	(2.11)	(24.15)	(-4.14)	(0.26)	(-5.31)	
Worst-in-Class Portfolio	-1.81	1.03***	0.04	0.23***	-0.08***	0.86
	(-0.77)	(27.49)	(0.93)	(4.59)	(-2.86)	
Difference	5.96**	-0.12***	-0.23***	-0.22***	-0.01	0.17
	(2.54)	(-3.02)	(-3.82)	(-3.52)	(-0.20)	
Long-Short Strategy	5.96**	-0.12***	-0.23***	-0.22***	-0.01	0.17
	(2.54)	(-3.02)	(-3.82)	(-3.52)	(-0.20)	

* *Significant at 10% level,* ** *at 5% level ,* *** *at 1% level*

TABLE 7 *Continued*. Multifactor-adjusted Returns under Different Transactions Costs Scenarios

The table reports the results of performing regression (3) under various levels of transactions costs (roundtrip). Alphas and factor loadings are presented for the long position on the best-in-class portfolio, for the long position on the worst-in-class portfolio, for the *difference* in long positions, and for a long-short position under the zero transaction costs scenario. The *long-short* portfolio return is the return on the *difference* portfolio under zero transaction costs minus of the sum of transaction costs associated with each of the two positions. Alphas under higher transaction costs scenarios are reported in Panel B. All alphas are annualized. T-statistics (in brackets) are derived from Newey-West (1987) standard errors. Sample period: 1995:07 – 2003:12.

PanelB: Different Transaction-Costs Scenarios

	α (0bp tc)	α (50 bp tc)	α (100 bp tc)	α (150 bp)	α (200bp tc)
Best-in-Class Portfolio	4.15**	3.97**	3.79*	3.61*	3.43*
	(2.11)	(2.02)	(1.92)	(1.82)	(1.72)
Worst-in-Class Portfolio	-1.81	-2.06	-2.31	-2.56	-2.80
	(-0.77)	(-0.88)	(-0.98)	(-1.09)	(-1.20)
Difference	5.96**	6.02**	6.10**	6.16**	6.23**
	(2.54)	(2.56)	(2.58)	(2.60)	(2.62)
Long-Short Strategy	5.96**	5.53**	5.10**	4.68*	4.25*
	(2.54)	(2.34)	(2.14)	(1.94)	(1.73)

* *Significant at 10% level,* ** *at 5% level ,* *** *at 1% level*

transaction costs.

In brief, our results suggest that various practical ways to exploit the eco-efficiency premium are available. Which investment approach would be best is, however, difficult to say. Generally, the liquidity of the stocks, trading costs, the presence of short-sales constraints, an investor's attitude toward short selling, and the investor's style preference play important roles in determining the optimal strategy. Liquidity seems a minor issue in the context of the SRI strategies in our study because the eco-efficient companies are the larger companies in the U.S. investment universe. As for trading costs, although we have examined them in general, a practitioner would be wise to carry out a more detailed analysis of potential trading costs of specific stocks before making investment decisions. Keim and Madhavan (1997), for example, documented variations in trading costs among institutions, investment styles, and markets. Short-selling constraints may limit investors' abilities to exploit the eco-efficiency premium by using long–short positions, but the results provided here suggest that long positions in a simple best-in-class strategy are also capable of producing significant alpha under practical circumstances. Finally, given the importance of size and style factors in explaining the SRI portfolio returns, implementing SRI not only on an industry-balanced basis but also on a style-neutral basis could be incrementally valuable.

3.6. CONCLUDING REMARKS

While conventional investment theory predicts that investors should be cautious about adopting SRI, we present evidence that a stock portfolio consisting of companies labeled 'most eco-efficient' sizably outperformed its 'less eco-efficient' counterpart over the period 1995-2003. Using several enhanced performance attribution models to overcome methodological concerns, we show that the observed performance difference cannot be explained by differences in market sensitivity, investment style, or industry bias. Even in the presence of transaction costs, a simple best-in-class stock selection strategy historically earned a higher market risk-adjusted and style-adjusted return of 6% compared to a worst-in-class portfolio. Overall, our findings suggest that the benefits of considering environmental criteria in the investment process can be substantial.

Our results are puzzling in the sense that it is difficult to reconcile the observed performance differential with conventional asset pricing theory, and particularly the well-established return-risk paradigm. The fact that common risk factors fail to account fully for the observed results raises the possibility of a mispricing story. However, testing a mispricing hypothesis is beyond the scope of this chapter. For now, we leave our findings open to interpretation and encourage future research to concentrate on longer time-series data and to present complementary evidence from different countries. In Chapter 4, we provide further evidence on the sources of the observed abnormal return patterns.

Chapter 4
The Economic Value of Corporate Eco-Efficiency[36]

4.1. INTRODUCTION

Corporate environmental performance is considered an important component of the CSR construct, and its potential usefulness as a forward-looking measure of firm financial performance has gained acceptance, both in the literature and in practice. Although the assessment of the CSR-financial performance relationship relies heavily on qualitative data and subjective interpretation, the financial impact of environmental governance is easier to assess a priori, particularly now that the law punishes negative environmental performance with concrete financial penalties more than ever before. For example, 15 years after the widely reported Exxon Valdez oil spill drama in Alaska, a federal judge recently imposed punitive damages of more than $4 billion on the Exxon Mobil Corporation.

However, several scholars have stressed that the financial information content of environmental performance is not evident by itself. Among others, Hart and Ahuja (1996), King and Lenox (2002), and Russo and Fouts (1997) emphasize that companies can display environmental awareness through "end-of-pipe" pollution control, where companies clean up emissions subsequent to the production process, but that proactive pollution prevention techniques embedded in the firm's production processes are more likely to increase operating efficiency and profitability.

Building on these assertions, we continue to focus on the concept of corporate eco-efficiency, a concept that reflects the environmental governance of the firm beyond that which is indicated by elementary environmental compliance and pollution control policies. Broadly, we can define eco-efficiency as creating more value with fewer environmental resources resulting in less environmental impact (for example, less pollution or natural resource exhaustion).

Using a comprehensive database of firm-level eco-efficiency scores produced by Innovest Strategic Value Advisors, we examine the relationship between corporate eco-efficiency and financial performance over the period 1997 to 2004. The eco-efficiency data we use are made available on a monthly basis, allowing us to exploit statistical power. While the eco-efficiency scores we study are based on multidimensional research and are

[36] This chapter extends the paper entitled "The Economic Value of Corporate Eco-Efficiency". (See Guenster, N., J. Derwall, R. Bauer and K. Koedijk (2005), "The Economic Value of Corporate Eco-Efficiency", Paper Presented at the 2005 Meeting of The Academy of Management, Honolulu.) I thank the U.S. Social Investment Forum and the Haas School of Business for awarding the paper the 2005 Moskowitz Prize and for financial support.

now monitored by some of the world's largest institutional investors, the data have not yet received much attention in the empirical literature.

By means of an accounting-based and a market-based measure, we capture different ways in which eco-efficiency influences financial performance. We use return on assets (ROA) which represents operating performance and profitability, and Tobin's *q* (*Q*), which proxies for a company's valuation. *Q* and ROA have several aspects in common but also differ in some important respects. ROA is based on firms' contemporaneous income, whereas Tobin's *q* is a forward-looking measure that reflects the intangible value investors assign to a company. Since eco-efficiency is associated with both, tangible and intangible benefits, discrepancies might occur between its relation to ROA and *Q*.

The intangible nature of the benefits of eco-efficiency makes the task of valuing environmental governance complicated. Our recent study offers evidence that eco-efficiency is value-relevant but is incorporated slowly into a company's stock price. In Chapter 3, we composed two equity portfolios of stocks sorted on the eco-efficiency scores and assess their performance using elaborate performance attribution models. The results suggest that companies labeled the most eco-efficient significantly outperformed their least eco-efficient counterparts by approximately 6 percent per annum over the period 1995-2003 after controlling for differences in risk, investment style and sector exposure. This evidence seems to contradict the widely held view that assets are priced efficiently. The abnormal returns could be explained by a period of adjustment, where stocks of eco-efficient companies are initially undervalued and undergo a positive price correction subsequently. Accordingly, the upward trend in firm valuation generates anomalously high returns.

The results reported in Chapter 3 have interesting research implications, suggesting that the relation between environmental governance and firm valuation should be studied in a multi-period cross-sectional framework. If stock prices did not accurately incorporate environmental information then studies on the market valuation of corporate environmental management that implicitly assume market efficiency may have been time-specific and difficult to generalize. To our knowledge, this study is the first to investigate whether the market's valuation of environmental performance has strengthened over time by using a unique longitudinal sample of corporate eco-efficiency scores. We adopt a research design that allows for an exploration into both static and dynamic empirical relationships.

Moreover, we study errors in the expectations of financial analysts to offer an explanation for both the abnormal return on stocks of environmental leaders reported in an earlier study and the prediction of a time-varying relation between eco-efficiency and firm value. We argue that the idea of a causal relation between firms' eco-efficiency and stock performance is reinforced if we can link errors in analysts' earnings forecast to firms' environmental performance. Consistent with this intuition, we document a positive association between analysts' earnings forecast errors and firms' eco-efficiency ranking. We find that analysts' surprises about future earnings are more positive (or less negative) for our set of most eco-efficient firms, controlling for other factors correlated with earnings surprises. In doing so, we lend support to the conclusion that the positive abnormal returns associated with environmental leaders are realized because investors are positively surprised by the reported earnings of eco-efficient companies.

Chapter 4 is organized as follows. First, in the next section, we give an overview of prior related research, taking into consideration the financial variables of interest to this research. This section also notes several limitations encountered in the literature and highlights the contribution of this study. Second, we outline several theoretical lines of reasoning pertaining to the link between corporate social (environmental) performance and financial performance. Third, we describe in more detail the database on corporate eco-efficiency. Finally, we discuss the empirical analysis and the results of our study.

4.2. LITERATURE REVIEW

Researchers have long sought empirical evidence on the environmental-financial performance link. However, studies on CSR are well documented, but not well structured. Griffin and Mahon (1997) and Ullman (1985), among others, discuss this literature and point out that methodological inconsistencies across studies make most evidence incomparable and inconclusive. In this section, we review prior research while keeping in mind the financial performance variables central to this study: stock returns, firm value measured by Tobin's q, and return on assets.

Prior Evidence

The empirical literature relating the environmental component of CSR to stock performance separates into three subsets: event studies that explore the immediate effects of social or environmental performance proxies on short-term stock price variability; cross-sectional regression analyses that attempt to establish a longer-term relationship between CSR and stock returns; and portfolio studies that investigate the benefits of embedding CSR into investment decisions.

To date, event studies provide the best evidence of a link between environmental and stock market performance. This body of research, which includes studies by Hamilton (1995), Klassen and McLaughlin (1996), and Shane and Spicer (1983) suggests that although environmental pollution figures generally tend to have an influence on stock market performance, there is also an asymmetrical stock return sensitivity to environmental news. For example, Klassen and McLaughlin (1996) find evidence suggesting that a stock price increase following positive environmental information about the firm is less strong than a price decline in response to negative news.

A second group of studies uses regression or correlation analysis to explore long-term relationships between corporate environmental responsibility and stock returns. These studies provide mixed support for the notion of a relationship between environmental performance and shareholder value. Spicer (1978) reports that those companies in the U.S. pulp and paper industry that have better pollution control records have higher profitability figures and lower stock betas, but both Chen and Metcalf (1980) and Mahapatra (1984) fail to confirm the idea that pollution control initiatives are rewarded with improved stock performance. More consistent evidence pertains to markets outside the United States, for which Thomas (2001; U.K.) and Ziegler, Rennings and Schroeder (2002; Europe) document moderate evidence of a positive relationship between environmental performance and stock returns.

Portfolio research involves a comparison of average risk-adjusted returns between two or more mutually exclusive portfolios. These portfolios are constructed using a company characteristic as a discriminating factor. Portfolios are usually evaluated by using a performance attribution model that controls for common intervening factors known to influence portfolio performance. Despite the popularity of this approach in the mainstream asset pricing literature (e.g., Fama and French, 1993), remarkably little research has applied environmental firm characteristics as a discerning variable. Among the few exceptions, research by Cohen, Fenn and Konar (1997) suggests that there is neither a premium nor a penalty for investing in environmental leader companies. On the other hand, White (1996) finds that his "green" portfolio provides a significantly positive market-risk adjusted return, while "brown" and "oatmeal" portfolios do not. Recent research in Derwall et al. (2005)/Chapter 3, which uses comprehensive performance evaluation techniques, suggests that eco-efficient companies jointly provide anomalously positive equity returns relative to their less-eco efficient peers over the period 1995-2003.

A relatively recent strand of research addresses the evidence on potential links between environmental performance and firm value. Generally, the evidence is uniform and points to a positive and significant relationship between environmental management policies and Tobin's q. Dowell, Hart and Yeung (2000) separate multinational firms in their U.S. sample into three groups: firms that default internationally to (less stringent) local environmental standards; companies that apply U.S. environmental standards on an international scale; and firms that adopt more stringent standards than those required by U.S. law. Their results suggest that firms that adopt higher, more stringent environmental criteria have a higher firm valuation than those that use less stringent ones.

These findings are consistent with Konar and Cohen (2001), who suggest that firms that are disposing of relatively smaller amounts of toxic chemicals, and those that are confronted with fewer or no environmental lawsuits, tend to have a higher Q. King and

Lenox (2002) further expand previous research by disentangling the emissions of a large number of U.S. firms into sub-aggregates. The important conclusion from their work is that waste prevention and future firm value are positively associated, but that pollution reduction efforts by other means, such as "end-of-pipe" pollution treatment, do not affect Tobin's *q*.

Another massive body of research relies on operating performance measures, predominantly using accounting data. Not surprisingly, the results from this research are somewhat dependent on the choice of operating performance measure. A few empirical studies are of particular concern to our work. Considerable interest has been shown in the company's return on assets as a dependent variable, primarily because ROA is one of the broadest measures of firm operating performance. For example, Freedman and Jaggi (1988) investigate the relation between environmental pollution disclosure and several accounting-based performance indicators but find little evidence to support the conjecture that there is a clear-cut and significant association. However, McGuire, Sundgren and Schneeweis (1988) show that, contrary to alternative measures in their study, ROA does correlate with their corporate social performance index. Russo and Fouts (1997) complement previous work, suggesting that environmental performance is positively connected with ROA but also that this association is more pronounced for high-growth industries. Hart and Ahuja (1996) and Waddock and Graves (1997) also report that several financial measures, including ROA, relate significantly to environmental performance indicators, but express some doubts regarding the direction of causality. In a more recent study, King and Lennox (2002) suggest that pollution prevention, but not pollution treatment, causes higher return on assets.[37]

Contribution to Existing Literature

While the research up to this point seems overwhelming at first glance, a substantial part of the evidence should be interpreted with caution. Our goal in this paper is to overcome several methodological limitations that are often encountered in the empirical literature. Broadly, our enhancements pertain to the following areas.

First, we address the problem of choosing an appropriate proxy for environmental performance. Corporate social (environmental) responsibility is a broad construct that can only be assessed with multidimensional indicators. As also suggested by Waddock and Graves (1997), the majority of related literature relies on measures that either lack sufficient depth and detail or, alternatively, are too noisy to be fully capable of measuring corporate social or environmental performance. In addition, as underscored by Konar and

[37] Orlitzky, Schmidt and Rynes (2003) do not follow the empirical methods of these studies but apply a meta-analytical approach on 52 prior studies that relate various CSR proxies to financial performance measures. Their findings suggest that better social responsibility and, to a lesser extent, better environmental responsibility most likely pay off in the form of better accounting performance.

Cohen (2001), most previous research analyzes data that only point towards historical performance. In contrast, our study builds on the concept of eco-efficiency, which is a more strictly defined construct and can be quantified by using Innovest's eco-efficiency rating methodology. As we explain, the rating is not only intended to reflect historical environmental performance, but also to identify future environmental risks and opportunities.

Our second contribution concerns the choice and interpretation of financial performance criteria. We first use accounting-based and a market-based measures to assess the different pathways leading environmental management to financial performance. Using return on assets, we capture the association between environmental and operating performance. Via Tobin's q (Q), we capture the value investors assign to environmental policies.

Moreover, we then extend earlier studies that implicitly infer a static relation between environmental management and performance based on market value measures. While Dowell, Hart and Yeung (2000), King and Lennox (2002), and Konar and Cohen (2001) suggest that environmental governance is positively related to market value measures of performance, recent evidence casts doubt on whether environmental information is valued accurately. Chapter 3 of this dissertation points to an anomalously positive stock return differential between environmental leaders and laggards, suggesting that environmental information is incorporated slowly into stock prices. Those results motivate us to analyze whether the relation between environmental performance and Tobin's q has strengthened over time. The environmental database we study is unique in that it covers monthly environmental performance ratings for more than eight years. Thus, it is an excellent means for testing time-varying relationships. Using a variant of the two-step modeling approach introduced by Fama and MacBeth (1973), we are able to exploit the richness of information contained by both cross-sectional and time-series dimensions of the data.

Finally, unlike other studies, this study aims to investigate the association between environmental performance and errors in investors' expectations. If there is indeed a causal relation between environmental performance and stock return, consistent with the mispricing hypothesis to be discussed hereafter, we could expect that investors are systematically surprised by the differential operating income between eco-efficient firms and least eco-efficient firms. According to this interpretation, stocks of eco-efficient companies earn their larger return following the realization of positive surprises. We develop a proxy for investor surprises using errors in analysts' earnings-per-share forecasts.

4.3. THEORETICAL DEBATES AND HYPOTHESES

For several decades, the academic community has postulated models and hypotheses that relate corporate social and environmental responsibility to financial performance, mostly with the intention to provide a framework that aligns CSR with shareholder value creation. Despite the growing academic attention for the CSR-financial performance relationship, management scientists and financial economists have developed their ideas in this area almost autonomously. Corporate management theories up to this point discuss many benefits to CSR, but leave unexplained questions that are critically relevant to shareholders of socially and environmentally responsible companies. Modern investment theories fill that gap. In this section, we introduce and test hypotheses that combine management and financial theories. Both theories are critical for understanding how firms' environmental management relates to financial performance.

Management Theories

The CSR-financial performance relationship is the source of considerable debate. Theories in the management literature are far from uniform and, as pointed out by Griffin and Mahon (1997), more than 25 years of empirical research has been unable to overcome long-lasting theoretical divides.

The roots of the debates go back decades. During the 1960s, the concepts of corporate social responsibility and socially responsible investing were gaining momentum. However, opponents of CSR quite forcefully questioned the validity of CSR in the context of what they believed is the purpose of the firm: maximizing shareholder wealth. In general, opponents of the concept of CSR raise two critical points:

- CSR is far from well defined. A view shared by many skeptics, including Friedman (1962), is that managers are unable to determine what the social responsibility of their company is. Many managers believe that the only responsibility of the firm is to engage in profitable activities. Shareholders themselves are capable of deciding whether their stock income sufficiently represents social awareness.

- CSR is expensive and decreases shareholder value. At least partially because of the problem of determining the social responsibility of businesses, a common criticism of CSR cites the financial dangers of adopting corporate social responsibility principles. Several critics stress that CSR initiatives inherently demand significant portions of a company's financial resources, but the potential financial benefits of such initiatives are mostly in the distant future, if these benefits are evident at all (e.g., Henderson (2002), Walley and Whitehead (1994)).

Briefly, the main concern expressed by CSR skeptics is that the costs associated with corporate social performance improvements are likely to outweigh the financial benefits, which makes CSR inconsistent with the principles of shareholder wealth maximization.

In contrast, a sizable number of CSR proponents have put forward a long list of the advantages to corporate social responsibility. Their reasoning is that organizations can generate significant goodwill and new market opportunities by displaying social and environmental awareness (e.g., Fombrun, Gardberg and Barnett (2000), Hart and Ahuja (1996), Porter and Van der Linde (1995) Russo and Fouts (1997)). However, there is a growing belief that the economic benefits depend on the nature of environmental performance. More and more often, researchers argue that the advantages resulting from social and environmental compliance with regulatory requirements are not a primary source of competitive advantage. For example, the mere fact of environmental compliance hardly allows a company to distinguish itself from its competitors, because most intra-industry peers are affected by compliance in a similar way. As pointed out by Dowell, Hart and Yeung (2000), Hart and Ahuja (1996), and Russo and Fouts (1997), real benefits to organizations are likely to come from more rigorous (i.e., proactive) forms of environmental performance that require both changes in production and manufacturing processes and a forward-looking management style. Hillman and Keim (2001) add that CSR initiatives can pay off, as long as these efforts are in the interest of the company's primary stakeholders.

Conditional on these lines of reasoning, specific arguments in favor of CSR include:

- CSR is associated with reputational benefits. Several scholars suggest that adopting corporate social responsibility policies may lead to improvements in the firm's image (e.g., Davis, 1973). Because the firm's social performance record can proxy for labor conditions, socially responsible companies gain a competitive advantage by improving their ability to attract high-quality employees. Empirical evidence by Turban and Greening (1996) strongly supports this line of reasoning. Apart from human-resource benefits, other researchers, for instance, Vandermerwe and Oliff (1990), and Russo and Fouts (1997), mention the possibility that reputational advantages result in sales benefits, because customers may be sensitive to social issues. Similarly, reputational increases may affect relationships with potential suppliers and lenders.

- CSR can also serve as a proxy for management skills. Alexander and Buchholz (1978) and Bowman and Haire (1975) suggest that corporate social and environmental performance reflects management quality. A structural and dedicated CSR policy might inherently require commitment to CSR among and between all levels of the firm as well as a forward-thinking, long-term-oriented management (Shrivastava (1995)).

- CSR may also reflect (technological) innovativeness. For example, Porter and van der Linde (1995) argue that poor environmental performance is a sign of the firm's operational inefficiency, which ultimately leads to competitive disadvantages. In addition, the resource-based view towards environmental governance, as outlined by Russo and Fouts (1997), says that a proactive environmental policy within the firm ultimately requires a structural change in production and service delivery processes. This redesign involves the development, acquisition, and implementation of new technologies and may lead to economic advantages vis-à-vis competitors.

In fact, the resource-based view suggests that only pro-active environmental governance is a source of financial benefits, which will be unique to the firm and difficult to obtain by competitors. Since eco-efficiency closely coincides with the resource-based view in that it represents pro-active environmental management, we arrive at the following hypothesis:

H_1: Eco-efficiency relates positively to operating performance, ceteris paribus.

Financial Theories

Now, more than ever before, financial-market participants have been paying attention to CSR. Institutional investors are demonstrating their interest in the concepts CSR and socially responsible investing (SRI) as a means of fulfilling their social and financial obligations. Recent estimates by the Social Investment Forum (2003) suggest that the market for socially responsible investments currently covers approximately 12 percent of the market as a whole.

Analogous to these developments, researchers, starting with Moskowitz (1972), have put forward theoretical frameworks that either support or reject the validity of CSR from an investor perspective. These frameworks rely on established asset pricing theories which center on the risk-return paradigm.

The risk-return paradigm is important because it highlights that managerial perspectives towards CSR are only one part of the story. Although there is a tendency among management scholars to believe that firms are doing well by engaging in activities that increase their (intangible) value, financial theories add important insights on benefits from such activities in terms of risk-adjusted returns to stockholders. Whether investors benefit from holding stocks of socially responsible companies depends on how investors perceive CSR.

Recall Hamilton, Jo, and, Statman (1993), who note that financial markets may respond to corporate social responsibility information in three different ways:

- In scenario one, the market does not value corporate social responsibility. Investors do not tie better social or environmental performance to lower risk. Consequently, the expected stock returns of CSR leaders are no different from those of laggards, all else equal, and firm value is independent of environmental governance. This scenario would be supported empirically by evidence that a relation between CSR and market-based measures of firm value is not statistically significant. This scenario can apply to CSR as well as any of its subsets. When focused on the concept of eco-efficiency, the hypothesis that follows from this scenario can be stated as:

  H_{2a}: Eco-efficiency is not associated with firm value, ceteris paribus.

- Contrary to scenario one, the second scenario predicts that investors do value CSR. As suggested by Narver (1971), Shane and Spicer (1983) and Spicer (1978), firms with a strong social or environmental performance record might be regarded as less risky investments compared to poor environmental performers. In the risk-return framework, the notion that social and environmental leaders are less risky investments than laggards implies that investors demand a lower return on these firms' stocks. Because investors assign a lower discount rate to expected future cash flows of socially responsive companies, these firms have a higher value. We note that if capital markets incorporate information related to CSR efficiently, we can assume that expected returns on stocks compensate investors fairly for the associated risk, and that risk-adjusted stock returns are consistent with an equilibrium setting. When the focus is on the economic significance of corporate eco-efficiency, the hypothesis consistent with the second scenario is stated as:

  H_{2b}: Eco-efficiency is positively associated with firm value, ceteris paribus.

- Scenario three describes disequilibrium. This scenario raises the possibility that the paradigm is violated in practice and suggests that the market does not price CSR efficiently. Investors may find it complicated to value the benefits or costs associated with environmental governance, particularly intangible ones. Whether environmental information is slowly impounded into stock prices has important implications for both firm value and stock returns. Under the previous scenario, the expected returns on environmental leaders firms, all else equal, should be lower than those of environmental laggards. In the third case, however, stocks of socially responsible companies can be initially undervalued (overvalued) relative to those of less socially responsible companies and ultimately produce higher (lower) risk-adjusted returns. Our recent evidence from Chapter 3 indicates that eco-efficient stock portfolios outperformed their least eco-efficient counterparts by more than is suggested by investment risk, supporting an undervaluation hypothesis. The study in Chapter 3 motivates the following hypothesis:

H_{2c}: The valuation differential between the most eco-efficient firms and the least eco-efficient firms increases over time, ceteris paribus.

Collecting evidence in support of this hypothesis requires that we analyze the market's valuation of firms' CSR characteristics over time. The unique longitudinal dimension of the environmental data in this study satisfies that condition.

Up to this point, empirical evidence in favor of or against the mispricing hypothesis mainly stems from studies that evaluate the risk-adjusted stock returns of firms that embrace CSR versus those of firms that do not. A more direct test in support of a mispricing story, one that is also consistent with a causal relation between environmental performance and future stock returns, focuses on whether investors fully anticipate the earnings performance differentials of firm that differ in environmental performance. Our final hypothesis is based on the idea that if investors indeed do not understand the implications of environmental management for future operating cash flows, they will be surprised when the realized earnings of environmental leaders (laggards) firms are high (low) relative to their earnings forecast. To establish that (operating) cash flow differences caused by environmental management trigger, in turn, future stock return differences, we must test the hypothesis that the differential operating performance between eco-efficient and least-eco efficient companies was unexpected by investors. When we take into account prior evidence of positive abnormal returns for eco-efficient firms and when we use analysts' earnings forecast as a proxy for investors' expectations, we derive the following hypothesis:

H_3: Analysts' earnings forecast errors are more positive (less negative) for eco-efficient firms than for less eco-efficient firms, ceteris paribus.

4.5. DATA

Eco-Efficiency Data

Among both managers and scholars, there is no consensus as to precisely what constitutes the social or environmental responsibility of the firm. Traditional proxies for environmental performance, such as environmental reports by third-party organizations, typically rely on news concerning absolute pollution levels. However, these indicators of environmental responsibility address merely a single dimension of a company's environmental performance and usually reflect historical environmental events.

We focus on eco-efficiency. As noted earlier, we define a firm's eco-efficiency as the ability to create more value while using fewer environmental resources, such as water, air, oil, coal and other limited natural endowments. Dowell, Hart and Yeung (2000) interpret eco-efficiency as the ability of companies to minimize pollution by improving the production and manufacturing process. This form of environmental responsibility represents proactive environmental management, one which concentrates on good environmental performance from changes in operational efficiency, rather than by adopting standards for pollution control at the "end of the pipe".

Eco-efficiency usually measures the environmental performance of a firm in a relative sense. To understand the difference between absolute and relative environmental performance, consider, for example, firms that operate in environmentally sensitive industries such as mining, energy, or chemicals. In absolute terms, these firms are usually regarded as poor environmental performers. However, at the intra-industry level, firms facing the same environmental challenges can still do well relative to competitors, and can benefit from this financially.

We explore empirical relationships between eco-efficiency and several dimensions of corporate financial performance. To do so, we use eco-efficiency scores developed by Innovest Strategic Value Advisors. Since the Innovest data have received little attention in previous research, by using Innovest's data we can provide new evidence. One of the main strengths of this database is its comprehensiveness. Using over 20 information sources, both quantitative and qualitative in nature, Innovest's analysts evaluate a company relative to its industry peers via an analytical matrix. Companies are evaluated by more than 60 criteria, which jointly constitute the final rating. For each of these factors, all companies receive a (sub)score. As these variables are not considered equally important in the overall assessment of eco-efficiency, each factor is weighted differently. For example, Innovest analysts consider a firm's environmental product development as more important than certification by a third party that is devoted to promoting environmental awareness. The final numerical rating analysts assign to a company is converted into a relative score based on the total spread of scores in the sector to which the firm belongs.

The eco-efficiency score reflects environmental performance in five fundamental areas. The first broad area covers historical liabilities, which concern the risks (and opportunities) a firm faces in consequence of past environmental behavior. Among other things, this category covers superfund liabilities, state and hazardous waste sites, and toxic torts. A second component represents contemporaneous operating risk, addressing risk exposures from events that are more recent. This category includes, for example, toxic emissions, product risk liabilities, waste discharges, and supply-chain management risk. The third area, which can be labeled "sustainability and eco-efficiency risk," pertains to the weakening of a firm's material sources of long-term profitability and competitiveness, and the potential future risks initiated by this development. This area spans energy intensity, energy efficiency, the durability and recyclability of the product life cycle, but also the extent to which companies are exposed to changes in consumer values. The fourth area covered by the score concerns managerial risk efficiency. This category represents the ability of the company to manage environmental risks successfully, as can be witnessed from, e.g., the quality of supply chain management, environmental audit/accounting capacity, the strength of environmental management systems, training capacity. The last dimension involves business prospects resulting from eco-efficiency, such as the degree to which businesses can reap future competitive advantages from environmentally driven market trends and profit opportunities provided that the company's management has well-developed eco-efficiency policies.

From this brief overview, it becomes apparent that Innovest's eco-efficiency measure is intended to embody both ex post (i.e., historical and current) and ex ante (i.e., forward-looking) dimensions of corporate eco-efficiency.

In this paper, we consider firms listed on the U.S. stock markets. As we also use various financial data, we match the Innovest database to the CRSP U.S. stock database and to the Compustat U.S. Research database. We match by ticker, company name, and CUSIP number. The resulting data set is survivor-bias-free in the sense that it includes not only firms that were covered by Innovest recently, but also those which disappeared over time, for instance, due to merger or bankruptcy. Further details on the financial data will be given in the appropriate sections.

We convert Innovest's seven non-numerical ratings into numerical eco-efficiency scores, where the highest-ranked firms receive a rating equal to six and lowest-ranked firms receive a rating of zero.

Table 1 shows some statistics on the eco-efficiency scores over time. These statistics are merely descriptive and serve as some background for the analyses that follow.

The table shows results for five particular dates. We note that the last date covered by Table 1 is September 2004, because the financial data are reported on a quarterly basis (i.e., we regress fourth-quarter financial measures on eco-efficiency scores that are dated September). Over the period 1996-2004, the average rating decreases from 3.04 to 2.30.

The median rating decreases from 3 to 2. The standard deviation varies only mildly over time.

The table also reports the frequency of the eco-efficiency score broken up into seven categories. Statistics on the number of firms within each rating category explain the decrease in average eco-efficiency rating. The number of firms that receive an eco-efficiency score below 3 increases more strongly compared to the number of firms that have a score of 4 or higher.

The number of firms in the sample increases considerably over time. Our data set includes scores for 154 companies at the end of December 1996 and 519 firms at the end of September 2004.

Financial Data

To accomplish our objective of investigating the association between eco-efficiency and several dimensions of corporate financial performance, we first analyze the connection between eco-efficiency and operating performance. Our primary interest is in a broad measure of operating performance that addresses both profitability and efficiency. Inspired by Barber and Lyon (1996), we measure operating performance by the company's return on assets. Our set of control variables is similar to Waddock and Graves (1997). We control for the influence of firm size and the firm's riskiness. We measure size by the firm's total assets and by total sales. The debt-to-asset ratio represents risk. We use data from Compustat to construct all variables.

Next, we turn our attention to the role of eco-efficiency in firm valuation, using the Tobin's *q* measure. Following Kaplan and Zingales (1997), we compute *Q* as the market value of assets divided by the book value of assets. The market value of assets is defined as the sum of the book value of assets and the market value of common stock outstanding minus the sum of the book value of common stock and balance sheet deferred taxes. Although there are more sophisticated approaches to computing *Q*, we use the most efficient approximation to ensure sufficient data availability throughout our sample period. Further, as shown by Perfect and Wiles (1994), and by Chung and Pruitt (1994), this proxy for *Q* is highly correlated with estimates that are more complex.

Our Tobin's *q* analysis accounts for potentially confounding influences. Because researchers such as Hirsch (1991) show that recent sales growth is positively related to company valuation, we include past two-year sales growth as a control variable. Furthermore, related work, including Dowell, Hart and Yeung (2000), King and Lenox (2002), and Konar and Cohen (2001), suggests that firm value is positively related to R&D expenses. To parse out this relationship, our control set contains research and development expenses scaled by sales as an additional explanatory variable. To condition on differences in operating performance we use return on assets. Following Gompers, Ishii and Metrick (2003), we use the logarithm of the book value of assets to account for differences in firm size. We also include firm age. As an approximation of the firm's age, we compute the difference between the first trading day and the respective date of the analysis. Since the database "Exshare", from which we retrieve the first trading days, was established in November 1984, we lack information before 1984. If firms were founded before this date, we still assume that founding occurred in 1984.

TABLE 1. Summary Statistics on Eco-Efficiency Scores

The table summarizes the mean eco-efficiency and median scores, the standard deviation of the score, and the number of firms with a given score, observed at the end of 1996, 1998, 2000, 2002, and September 2004, respectively. The *Change* column gives changes in these values over the beginning and the end of the sample period.

	Dec.-96	Dec.-98	Dec.-00	Dec.-02	Sept.-04	*Change ('96-'04)*
Eco-Efficiency Ratings						
Mean Rating	3.04	2.82	2.71	2.49	2.30	*-0.74*
Median Rating	3	3	3	2	2	*1.00*
Standard Deviation	1.80	1.94	1.88	1.83	1.68	*0.03*
Number of Companies						
Eco-Efficiency = 0	19	46	79	65	71	52
Eco-Efficiency = 1	13	39	54	99	133	120
Eco-Efficiency = 2	28	39	63	66	109	81
Eco-Efficiency = 3	28	43	102	65	70	42
Eco-Efficiency = 4	27	46	64	62	67	40
Eco-Efficiency = 5	27	37	45	43	49	22
Eco-Efficiency = 6	12	28	42	30	20	8
Total	154	278	449	430	519	365

Finally, we consider a dummy variable that is equal to unity if the firm is listed on the Nasdaq exchange and zero otherwise. The dummy controls for atypically high Tobin's *q* values of Nasdaq firms that may have occurred during the stock market hype of the late nineties. We construct all variables other than firm age using data from Compustat.

TABLE 2. Summary Statistics on Tobin's *q* and ROA

Cross-sectional statistics are reported for the first quarter (Q1) of 1997, 1999, 2001, 2003 and the last quarter of 2004.

	1997 Q1	1999 Q1	2001 Q1	2003 Q1	2004 Q4
Tobin's q (Q)					
Mean *Q*	1.73	2.30	2.22	1.75	1.99
Median *Q*	1.46	1.55	1.56	1.30	1.61
Standard Deviation	1.00	1.87	1.68	1.16	1.23
Skewness	2.91	2.41	2.30	2.68	2.68
Kurtosis	14.83	9.21	9.50	13.29	13.36
Return on Assets (ROA)					
Mean ROA	0.04	0.04	0.04	0.03	0.04
Median ROA	0.04	0.04	0.03	0.03	0.03
Standard Deviation	0.02	0.02	0.03	0.02	0.02
Skewness	0.08	0.51	0.38	0.89	0.59
Kurtosis	5.60	3.66	5.90	6.42	5.16

To show the distribution of ROA and *Q*, Table 2 reports descriptive statistics pertaining to five specific dates. The distribution of ROA is quite symmetric. Median and mean values for ROA do not display a large discrepancy, being similar in value and time invariant. As for the distribution of Tobin's *q*, we can see that there is some non-normality in the data. *Q* has a distribution that is peaked and leptokurtic, as indicated by the high values for skewness and kurtosis. Arguably, the stock market fad of 2000 plays an important role in explaining the long right tail in the *Q* data. Further, we observe differences in the cross-sectional median Q and the mean Q over time. The median values for Tobin's q remain relatively stable but mean values are much higher during the technology boom and bust period. We alleviate potential problems associated with non-normality by doing robustness tests after having industry-adjusted, taken in logs, and trimmed the data, respectively. The dummy variable for companies listed on the Nasdaq Stock Exchange captures potentially extreme Tobin's q values during the technology bubble.

4.6. EMPIRICAL ANALYSIS

Eco-Efficiency and Return on Assets

In order to analyze the relation between eco-efficiency and operating performance, we follow the multivariate model of Waddock and Graves (1997). Cross-sectional analysis is most suitable for testing our hypotheses. Since our data are longitudinal in nature, periodical regressions can be performed. We estimate the following cross-sectional models quarter by quarter from 1997 to 2004:

$$ROA_{it} = \alpha_i + \beta_1 Eco\text{-}Efficiency_{it} + \boldsymbol{\gamma_{it} X_{it}} + \varepsilon_{it}, \quad (1)$$

$$ROA_{it} = \alpha_i + \beta_0 High\ Eco\text{-}Efficiency_{it} + \beta_1 Low\ Eco\text{-}Efficiency_{it} + \boldsymbol{\gamma_{it} X_{it}} + \varepsilon_{it}, \quad (2)$$

where ROA_{it} denotes return on assets. We consider modeling both ROA and the firm's ROA relative to the industry median ROA. $Eco\text{-}Efficiency_{it}$ in model (1) represents the firm's eco-efficiency score. This model, therefore, assumes linear relations. To account for the possibility of nonlinearity in the relation between eco-efficiency and our financial measures we develop an alternative model. In specification (2), we replace the absolute eco-efficiency score with two dummy variables that specify whether firm i is the most or the least eco-efficient. $High\ Eco\text{-}Efficiency_{it}$ ($Low\ Eco\text{-}Efficiency_{it}$) is equal to one if firm i is rated five or six (zero or one) at t, and zero otherwise. $\boldsymbol{X_{it}}$ is a vector of control variables and $\boldsymbol{\gamma}$ is a vector of coefficients. We allow for permutations of the regressors. Candidate control variables include the firm's size measured either by total assets or by total sales, and the debt-to-asset ratio. Using a variant of the Fama-MacBeth (1973) method, we compute time-series averages of the 32 cross-sectional regression coefficients. We calculate corresponding *t*-statistics based on standard errors from the 32 parameter estimates which we obtain for each variable.

Table 3 reports the time-series average coefficients and corresponding *t*-statistics. We note that the coefficient estimates for all control variables are consistent with those reported by Waddock and Graves (1997). With the exception of total sales, they are all statistically significant at the usual cut-off levels.

In panel A of Table 3, we report coefficients on the eco-efficiency score. ECO_{it} has a coefficient that is positive and significant at the 1% level. All specifications indicate that the positive relation between eco-efficiency and ROA is robust to changes in the set of dependent and control variables. The results of replacing Eco-$Efficiency_{it}$ with High Eco-$Efficiency_{it}$ and Low Eco-$Efficiency_{it}$ are shown in Panel B of Table 3. There is weak evidence of an asymmetry in the relation between eco-efficiency and operating performance. Our estimates suggest that the underperformance of the least eco-efficient firms (relative to the reference group) is almost twice as large as the outperformance of the most eco-efficient companies. Moreover, the operational underperformance associated with environmental laggards is significant at the 1% level in all specifications. The outperformance of environmental leaders is marginally significant.

From an economic perspective, eco-efficiency relates sizably to operating performance. The increase in absolute ROA resulting from a one-point rise in eco-efficiency ranking is estimated at 0.09 percentage points, *ceteris paribus*, which is about 2.2 percent of the sample average ROA we observe in Table 2. To get an impression of the asymmetrical influence of eco-efficiency on operating performance, we can estimate how much loss in ROA a firm in the reference group (category 2, 3 and 4) would prevent by avoiding a low eco-efficiency ranking. Panel B points out that the loss prevention amounts to about 0.32 percentage points, which is 8.4 percent of the average ROA. The gain a firm can achieve by obtaining a high eco-efficiency rating is approximately 0.14 percent points, which is about 3.6 percent of the average ROA.

In support of H_1, we find a positive relation between eco-efficiency and operating performance. Our evidence also suggests that the relation is asymmetric, for which we offer two explanations. First, although our ratings are converted into numbers, they have no real unit of measurement. Caveats associated with ordinal data could prevent us from accurately measuring differences in eco-efficiency and induce false suggestions of an asymmetry. A second explanation is that the negative financial impact resulting from poor environmental governance is mostly tangible of nature and therefore visibly reflected in operating performance. Anecdotal evidence suggests that the clean-up costs associated with oil spills and hazardous waste sides might directly decrease earnings. In addition, the reputational damage resulting from environmental accidents can lead to customer boycotts which directly affect sales and profits. In contrast, strong environmental policies might largely be associated with intangible benefits, such as strong management skills, technological innovativeness and brand reputation that materialize slowly.

TABLE 3. Eco-Efficiency and Return on Assets

The table reports the Fama-MacBeth (1973) time-series mean coefficient and the corresponding *t*-statistic (in parentheses). Note: Low Eco-Efficiency = 1 if firm ranked ≤ 1. High-Eco-Efficiency =1 if firm ranked ≥ 5. To compute the difference between the coefficients, we subtract the Low Eco-Efficiency coefficient from the coefficient of the High Eco-Efficiency dummy. The coefficients are multiplied by 100. Ind-Adj. ROA is industry-adjusted return on assets. The sample period is 1997-Q1 – 2004-Q4.

	Panel A: Equation (1)			
	ROA	Ind.Adj. ROA	ROA	Ind.Adj. ROA
Intercept	4.19***	0.20***	4.17***	0.20***
	(26.70)	(3.76)	(26.31)	(3.72)
Eco-Efficiency	0.09***	0.09***	0.08***	0.08***
	(8.05)	(6.69)	(7.22)	(6.55)
Low Eco-Efficiency				
High Eco-Efficiency				
Difference: High - Low Eco-Efficiency				
Control variables:				
Book Value of Assets	-4.74 E^{-6} ***	-2.23 E^{-6} ***		
	(-11.81)	(-4.98)		
Debt/Assets	-3.17***	-1.86***	-3.27***	-1.91***
	(-6.45)	(-5.83)	(-6.77)	(-5.88)
Sales			-5.32 E^{-6}	-7.39 E^{-6} *
			(-1.54)	(-2.01)

*Significant at 10% level, ** at 5% level, *** at 1% level*

TABLE 3 *Continued.* Eco-Efficiency and Return on Assets

The table reports the Fama-MacBeth (1973) time-series mean coefficient and the corresponding *t*-statistic (in parentheses). Note: Low Eco-Efficiency = 1 if firm ranked ≤ 1. High-Eco-Efficiency =1 if firm ranked ≥ 5. To compute the difference between the coefficients, we subtract the Low Eco-Efficiency coefficient from the coefficient of the High Eco-Efficiency dummy. The coefficients are multiplied by 100. Ind-Adj. ROA is industry-adjusted return on assets. The sample period is 1997-Q1 – 2004-Q4.

	Panel B: Equation (2)			
	ROA	Ind.Adj. ROA	ROA	Ind.Adj. ROA
Intercept	4.50***	0.51***	4.45***	0.50***
	(27.42)	(8.61)	(26.50)	(8.24)
Eco-Efficiency				
Low Eco-Efficiency	-0.34***	-0.32***	-0.31***	-0.31***
	(-7.45)	(-6.49)	(-6.63)	(-6.33)
High Eco-Efficiency	0.19**	0.11*	0.15**	0.10
	(2.60)	(1.75)	(2.20)	(1.64)
Difference: High - Low Eco-Efficiency	0.52***	0.43***	0.46***	0.41***
	(9.05)	(6.98)	(7.92)	(6.86)
Control variables:				
Book Value of Assets	-4.64 E^{-6} ***	-2.17 E^{-6} ***		
	(-10.90)	(-4.89)		
Debt/Assets	-3.20***	-1.89***	-3.31***	-1.94***
	(-6.38)	(-5.74)	(-6.69)	(-5.80)
Sales			-4.70 E^{-6}	-6.25 E^{-6}
			(-1.30)	(-1.69)

Significant at 10% level, ** at 5% level, * at 1% level*

Eco-Efficiency and Firm Value

To examine empirically the relation between eco-efficiency and firm valuation, we estimate quarterly the following cross-sectional models:

$$Q_{it} = \alpha_i + \beta_1 \, Eco\text{-}Efficiency_{it} + \boldsymbol{\gamma_{it}} \boldsymbol{X_{it}} + \varepsilon_{it}, \quad (3)$$

$$Q_{it} = \alpha_i + \beta_0 \, High\ Eco\text{-}Efficiency_{it} + \beta_1 Low\ Eco\text{-}Efficiency_{it} + \boldsymbol{\gamma_{it}} \boldsymbol{X_{it}} + \varepsilon_{it} \quad (4)$$

In model (3), Q_{it} denotes Tobin's q for firm i in quarter t, and Eco-Efficiency$_{it}$ represents the eco-efficiency rating of firm i at t. $\boldsymbol{X_{it}}$ is a vector of control variables and $\boldsymbol{\gamma}$ denotes a vector of coefficients. In model (4), we replace Eco-Efficiency$_{it}$ with two dummy variables that indicate whether firm i is eligible for inclusion in a high-ranked portfolio or a low-ranked portfolio similar to that of Derwall et al. (2005); see Chapter 3. The variable High Eco-Efficiency$_{it}$ (Low Eco-Efficiency$_{it}$) is equal to unity if firm i is rated five or six (zero or one), and zero otherwise.

Because we consider several model specifications, $\boldsymbol{X_{it}}$ contains permutations of the following candidate regressors: the firm's two-year sales growth, firm age, firms size measured by the logarithm of the book value of total assets, return on assets, R&D spending, an interaction term between sales growth and R&D spending, and a dummy variable for Nasdaq companies. From the 32 quarterly regressions, performed over the period January 1997 to December 2004, we compute Fama-MacBeth (1973) time-series averages and their respective t-statistics. We also allow for some variation in the dependent variable by repeating the estimation of (1) and (2) using, respectively, an industry-adjusted Q (Q minus the industry median Q), Q in logs, and a trimmed Q as a dependent variable. Trimming mitigates the effect of potential outliers in Tobin's q. We adopt the trimming approach of Collins, Maydew and Weiss (1997) and remove observations using the 0.995 percentile and the 0.005 percentile as upper and lower boundaries.

Table 4 shows the results for the main model specifications. Panel A of Table 4 reports the results of estimating equation (3). The first column of this panel reports the results of a regression based on a standard, unmodified Q. The additional columns present the results of using, respectively, industry-adjusted Q (Q minus the industry median Q), Q in logs, and trimmed Q. Taken as a whole, regardless of the choice of the dependent variable, the coefficients on most control variables (sales growth, size and ROA and firm age) are significant and carry signs that are consistent with a priori expectations and with previous research. The only exceptions are the age variable, for which the coefficient weakens once we use industry-adjusted Tobin's q, and the sales growth variable, which becomes insignificant when we take the logarithm of Q as a dependent variable.

TABLE 4. Eco-Efficiency and Firm Value (Tobin's *q*)

The table reports the Fama-MacBeth (1973) time-series mean coefficient and the corresponding *t*-statistic (in parentheses). Note: Low Eco-Efficiency = 1 if firm ranked ≤ 1. High-Eco-Efficiency =1 if firm ranked ≥ 5. To compute the difference between the coefficients, we subtract the Low Eco-Efficiency coefficient from the coefficient of the High Eco-Efficiency dummy. Ind.-adj. *Q* is the industry-adjusted *Q*. Sample period: 1997-Q1 – 2004-Q4.

	Panel A: Equation (3)			
	Q	Ind. Adj. *Q*	Log(*Q*)	Trimmed *Q*
Intercept	1.59***	-0.78**	0.49***	1.55***
	(4.75)	(-2.62)	(4.51)	(4.93)
Eco-Efficiency	0.07***	0.05***	0.03***	0.07***
	(5.46)	(6.45)	(8.16)	(5.35)
Low Eco-Efficiency				
High Eco-Efficiency				
Difference: High-Low Eco-Efficiency				
Control variables:				
Sales Growth	0.15**	0.13**	2.78E-3	0.13*
	(2.30)	(2.10)	(0.21)	(2.03)
Firm Age	-0.02**	-0.02*	-8.72E-3***	-0.02**
	(-2.28)	(-1.73)	(-3.30)	(-2.37)
Log (Book Value of Assets)	-0.10***	1.85E-3	-0.05***	-0.09***
	(-4.07)	(0.10)	(-6.48)	(-3.86)
Return on Assets	38.89***	30.94***	13.98***	37.03***
	(17.65)	(19.02)	(22.91)	(16.76)

Significant at 10% level, ** at 5% level, * at 1% level*

TABLE 4 ***Continued*****. Eco-Efficiency and Firm Value (Tobin's *q*)**

The table reports the Fama-MacBeth (1973) time-series mean coefficient and the corresponding *t*-statistic (in parentheses). Note: Low Eco-Efficiency = 1 if firm ranked ≤ 1. High-Eco-Efficiency =1 if firm ranked ≥ 5. To compute the difference between the coefficients, we subtract the Low Eco-Efficiency coefficient from the coefficient of the High Eco-Efficiency dummy. Ind.-adj. *Q* is the industry-adjusted *Q*. Sample period: 1997-Q1 – 2004-Q4.

	Panel B: Equation (4)			
	Q	Ind. Adj. *Q*	Log(*Q*)	Trimmed *Q*
Intercept	1.78***	-0.70**	0.57***	1.75***
	(4.89)	(-2.21)	(4.88)	(5.06)
Eco-Efficiency				
Low Eco-Efficiency	-0.28***	-0.21***	-0.11***	-0.29***
	(-8.96)	(-7.55)	(-7.37)	(-8.59)
High Eco-Efficiency	0.10**	$6.02E^{-3}$	0.07***	0.10**
	(2.09)	(0.18)	(6.89)	(2.28)
Difference: High-Low Eco-Efficiency	0.39***	0.22***	0.17***	0.39***
	(5.87)	(5.60)	(8.53)	(5.89)
Control variables:				
Sales Growth	0.15**	0.13**	$2.07E^{-3}$	0.13**
	(2.29)	(2.07)	(0.15)	(2.04)
Firm Age	-0.02*	-0.02	-0.01***	-0.02**
	(-2.00)	(-1.46)	(-3.10)	(-2.06)
Log (Book Value of Assets)	-0.09***	$8.73E^{-3}$	-0.05***	-0.09***
	(-3.93)	(0.48)	(-6.40)	(-3.73)
Return on Assets	38.85***	31.00***	13.98***	36.99***
	(17.55)	(18.88)	(22.58)	(16.61)

Significant at 10% level, ** at 5% level, * at 1% level*

TABLE 5. Eco-Efficiency and Firm Value: Robustness Checks

The table reports the Fama-MacBeth (1973) time-series mean coefficient and the corresponding *t*-statistic (in parentheses). Note: Low Eco-Efficiency = 1 if firm ranked ≤ 1. High-Eco-Efficiency =1 if firm ranked ≥ 5. To compute the difference between the coefficients, we subtract the Low Eco-Efficiency coefficient from the coefficient of the High Eco-Efficiency dummy. Ind.-adj. *Q* is the industry-adjusted *Q*. Sample period: 1997-Q1 – 2004-Q4.

	Panel A: Equation (3)			
	Q	*Q*	*Q*	*Q*
Intercept	1.59^{***}	0.62^{*}	0.53^{*}	0.65^{**}
	(4.75)	(2.02)	(1.83)	(2.55)
Eco-Efficiency	0.07^{***}	0.04^{***}	0.04^{***}	0.05^{***}
	(5.46)	(4.45)	(4.69)	(4.95)
Low Eco-Efficiency				
High Eco-Efficiency				
Difference: High-Low Eco-Efficiency				
Control variables:				
Sales Growth	0.15^{**}	0.67^{***}	-0.04	0.09^{*}
	(2.30)	(3.61)	(-0.31)	(1.92)
Firm Age	-0.02^{**}	-0.01	-0.01	$-4.45E^{-3}$
	(-2.28)	(-0.91)	(-0.89)	(-0.55)
Log (Book Value of Assets)	-0.10^{***}	-0.05^{**}	-0.03	-0.03
	(-4.07)	(-2.34)	(-1.38)	(-1.60)
Return on Assets	38.89^{***}	41.11^{***}	41.18^{***}	38.41^{***}
	(17.65)	(26.50)	(23.96)	(20.05)
R&D / Sales		9.48^{***}	7.91^{***}	
		(7.37)	(11.27)	
R&D*Sales Growth			10.66^{***}	
			(4.23)	
Nasdaq Dummy				1.61^{***}
				(6.45)

*Significant at 10% level, ** at 5% level, *** at 1% level*

TABLE 5 *Continued*. Eco-Efficiency and Firm Value: Robustness Checks

The table reports the Fama-MacBeth (1973) time-series mean coefficient and the corresponding *t*-statistic (in parentheses). Note: Low Eco-Efficiency = 1 if firm ranked ≤ 1. High-Eco-Efficiency =1 if firm ranked ≥ 5. To compute the difference between the coefficients, we subtract the Low Eco-Efficiency coefficient from the coefficient of the High Eco-Efficiency dummy. Ind.-adj. *Q* is the industry-adjusted *Q*. Sample period: 1997-Q1 – 2004-Q4.

	Panel B: Equation (4)			
	Q	*Q*	*Q*	*Q*
Intercept	1.78***	0.72**	0.63**	0.78***
	(4.89)	(2.27)	(2.09)	(2.81)
Eco-Efficiency				
Low Eco-Efficiency	-0.28***	-0.12*	-0.13***	-0.17***
	(-8.96)	(-1.98)	(-2.78)	(-5.23)
High Eco-Efficiency	0.10**	0.13*	0.09	0.12**
	(2.09)	(1.72)	(1.56)	(2.32)
Difference: High-Low Eco-Efficiency	0.39***	0.25***	0.22***	0.29***
	(5.87)	(4.73)	(4.74)	(5.22)
Control variables:				
Sales Growth	0.15**	0.66***	-0.03	0.09*
	(2.29)	(3.51)	(-0.22)	(1.88)
Firm Age	-0.02*	-0.01	-0.01	$-3.38E^{-3}$
	(-2.00)	(-0.71)	(-0.70)	(-0.40)
Log (Book Value of Assets)	-0.09***	-0.05**	-0.03	-0.03
	(-3.93)	(-2.36)	(-1.42)	(-1.46)
Return on Assets	38.85***	41.12***	41.22***	38.43***
	(17.55)	(26.28)	(24.05)	(20.03)
R&D / Sales		9.62***	8.05***	
		(7.16)	(10.95)	
R&D*Sales Growth			10.30***	
			(4.21)	
Nasdaq Dummy				1.60***
				(6.18)

*Significant at 10% level, ** at 5% level, *** at 1% level*

The observation most relevant to our study is that under all scenarios, the coefficient on Eco-Efficiency$_{it}$ is positive and statistically significant at the 1% level. Our estimate of the eco-efficiency coefficient (β_1) in equation (3) is approximately 0.07 when *Q* is the dependent variable. The coefficient decreases due to rescaling when *Q* is taken in log, but remains highly significant. Furthermore, we note that neither industry adjustment nor trimming of Tobin's *q* affects the coefficient estimates substantially. The latter observation is important because it suggests our results are not driven by outliers arising from, for instance, the stock market crash of 2000. Overall, these parameter estimates support H_{2b}.

Panel B of Table 4, adds to understanding the positive association between ECO and *Q*. The panel reports the outcomes of replacing Eco-Efficiency$_{it}$ with the dummy variables High Eco-Efficiency$_{it}$ and Low Eco-Efficiency$_{it}$ (equation (4)). The results indicate a slightly asymmetric relationship between eco-efficiency and *Q*: The negative coefficient on the Low Eco-Efficiency dummy is larger in magnitude than the positive coefficient on the High Eco-efficiency dummy. However, evidence of asymmetry varies across the specifications and should be handled with care. Most important to our research question is the fact that the most eco-efficient firms have a significantly higher valuation than their least eco-efficient counterparts.

To evaluate the robustness of the relationships further, we estimate additional models that include different sets of control variables. Table 5 presents the outcomes for these alternative specifications. For reasons of comparison, we import the initial results pertaining to equations (3) and (4) from the previous table. In line with Konar and Cohen (2001) two alternative models augment the first set of control variables by R&D expenditure. In the second model, we also add an interaction term between sales growth and R&D expenditure. We note that the inclusion of R&D spending decreases our sample size substantially, since this information was not available for a large number of firms. The last alternative specification expands the first model by the Nasdaq dummy.

In panel A, the results show that even in the presence of additional control variables, the sensitivity of *Q* with respect to the eco-efficiency score remains positive and significant at the 1% level. The coefficient estimate of Eco-Efficiency decreases somewhat once we include R&D spending as an additional control. However, because limited availability of (cross-sectional) R&D data induces a small sample problem, the results we find under the third and fourth set of control variables should be interpreted with caution.

The results of replacing Eco-Efficiency$_{it}$ with High Eco-Efficiency$_{it}$ and Low Eco-Efficiency$_{it}$ are given in Panel B of Table 5. Again, the evidence supports H_{2b}. After the inclusion of the additional control variables, the asymmetry weakens. Independent of the set of control variables, we find a significant valuation differential between the most eco-efficient and the least eco-efficient firms.

In order to assess the economic significance of eco-efficiency, we can estimate how much a firm would enjoy an increase in valuation resulting from a unit increase in eco-efficiency ranking. Table 4, panel A, suggests that the impact of a one-point increase in eco-efficiency ranking on Tobin's *q* amounts to 0.07, *ceteris paribus*, which is approximately 3.2 percent of the average *Q* we observe for all firms in the sample. To address the asymmetrical influence we estimate how much loss in *Q* a firm in the reference group would prevent by avoiding a low eco-efficiency ranking. Panel B suggests that the loss avoidance varies from 9 percent to 13 percent of the sample-average *Q*, depending on the choice of model. The gain from receiving a high eco-efficiency rating is in the range of almost 0 to 7 percent.

Eco-Efficiency and Firm Value: Tests for a Time-Varying Market Response

A positive (though potentially asymmetrical) relation between eco-efficiency and firm value is consistent with the notion that eco-efficiency is a "priced" factor, i.e., that investors drive up the value of environmental leaders by lowering their expected stock return and their cost-of-capital. However, up to this point, the association between Tobin's *q* and eco-efficiency does not reconcile with the evidence in Chapter 3 that eco-efficient stock portfolios have realized anomalously high risk-adjusted returns relative to their least eco-efficient counterparts. Their results raise the possibility that the market has undervalued eco-efficient firms relative to less eco-efficient companies. In an equilibrium setting, the expected returns on a group of eco-efficient companies can be lower than the returns on a group of less eco-efficient companies because eco-efficient firms are deemed less risky. After adjustment for these risk differences, there should be no abnormal difference in return. However, under the hypothesis that the market reacts to eco-efficiency with a drift, firms can be under- or overvalued and risk-adjusted portfolio returns can be anomalous.

In Chapter 3, the zero investment portfolio of the most eco-efficient firms versus the least eco-efficient firms earns an average abnormal return in the order of 2.2 percent to 8.6 percent per annum, depending on the portfolio construction method and the performance attribution model used. By examining the sensitivity of Tobin's *q* to corporate eco-efficiency under each separate cross-sectional regression, we can investigate whether the superior stock performance associated with eco-efficiency translates into a higher valuation over time for eco-efficient companies relative to their eco-inefficient counterparts. We could expect the abnormal returns associated with eco-efficient firms to induce an upward trend in their Tobin's *q* values.

To shed more light on the nature of the large return differential documented in Chapter 3, we now exploit the attractive features of the Tobin's *q* measure and of the Fama-MacBeth (1973) regression technique. First, we divide our sample period into two subperiods. Table 6, which reports regression results for Tobin's *q* broken up into two

TABLE 6. Eco-Efficiency and Firm Value: Subperiod Results

Reported are the time-series mean coefficients and the *t*-statistics (in parentheses) of the difference between High Eco-Efficiency and Low Eco-Efficiency based on equation (4). Low Eco-Efficiency = 1 if firm ranked ≤ 1. High Eco-Efficiency =1 if firm ranked ≥ 5. To compute the difference between the coefficients, we subtract the Low Eco-Efficiency coefficient from the coefficient of the High Eco-Efficiency dummy. The subperiods are 1997-Q1 to 2000-Q4 and 2001-Q1 to 2004-Q4.

	Fama-MacBeth Time-series Average Coefficients			
		Ind.Adj.		Trimmed
	Q	*Q*	Log(*Q*)	*Q*
Subperiod 1 (1997 Q1 to 2000 Q4)				
Difference:				
High-Low Eco-Efficiency	0.20*	0.13*	0.08***	0.22*
	(1.82)	(1.93)	(3.61)	(1.90)
Subperiod 2 (2001 Q1 to 2004 Q4)				
Difference:				
High-Low Eco-Efficiency	0.57***	0.31***	0.26***	0.56***
	(15.19)	(10.05)	(24.89)	(15.84)
Complete Period				
Difference:				
High-Low Eco-Efficiency	0.39***	0.22***	0.17***	0.39***
	(5.87)	(5.60)	(8.53)	(5.89)

* *Significant at 10% level,* *** *at 1% level*

subsamples, confirms our expectations. The table shows time-series average coefficients for the 1997-2000 and 2001-2004 periods, respectively. The subsample results indicate a strong time variation in the difference between the coefficients on High Eco-Efficiency and Low Eco-Efficiency. In the later subperiod, eco-efficient companies were selling at a premium more than twice as large as that in the earlier subperiod, consistent with a scenario that investors have changed their view on the value of eco-efficiency.

In Table 7, we express the time-varying market response to eco-efficiency by estimating a trend in the relation between eco-efficiency and Tobin's *q*. More specifically, we perform a time-series regression using the differences between the quarterly estimates of the cross-sectional coefficients on the two dummy variables (β_0 High Eco-Efficiency - β_1 Low Eco-Efficiency) as the dependent variable and time as the regressor. To account for potential autocorrelation, we compute *t*-statistics based on Newey-West (1987) autocorrelation-robust standard errors. Results based on conventional standard errors are qualitatively similar and are not reported. Our findings are similar and available upon request.

Table 7, Panel A, reports the annual increases in valuation differential based on the specifications described in Table 4, whereas Table 7, Panel B, presents those corresponding to Table 5. Independent of the specification, we find that the trend in valuation is significantly different from zero. The intercept combined with the time coefficient demonstrate that although eco-efficient firms were not selling at a relative premium at the beginning of the sample period, the premium increases strongly over time. Equally important is the economic interpretation of the trend. Our estimates of the trend range between 2.8 percent and 5 percent. These percentages resemble the abnormal returns outlined in Chapter 3.

The subperiod results as well as the upward-sloping trend line support H_{2c}. The time-varying pattern may indicate that the value of eco-efficiency is not well understood by capital markets. Although finding that environmental information is priced gradually seems to contradict the notion that markets are efficient, our study is not the first to show that some information about companies is slowly incorporated into stock prices. For example, there is evidence that stock repurchases (Ikenberry, Lakonishok and Vermaelen (1995)) and dividend omissions (e.g., Michaely, Thaler, Womack (1995)), all of which are arguably more concrete events than environmental events, have a post-event drift.

At the very least, our results suggest the market shows increased interest in information about the environmental management of the firm. Alternatively, investor surprise about the economic benefits to strong environmental governance could lie at the heart of the observed patterns in valuation. We advance on this possibility in the next section.

Eco-Efficiency and Analyst Forecast Errors

Finally, we study the association between eco-efficiency and investor surprise about the future operating cash flow of firms using analyst forecast data from the IBES detail files. We use one-year ahead earnings forecast as a proxy for investors' expectations about firms' performance. We define the consensus earnings forecast as the median of individual analysts' forecasts and then compute the forecast errors as the actual earnings per share (EPS) minus the median forecast of earnings per share. The error is scaled by the end-of-prior-year stock price to arrive at the earnings forecast error central to our tests. A negative error implies a negative earnings surprise (or equivalently, a too optimistic forecast), whereas a positive error implies a positive earnings surprise (a too pessimistic forecast).

TABLE 7. Trend in Eco-Efficiency Premium

Based on the difference between β_0 and β_1 for each quarterly estimation of equation (4): $Q_{it} = \alpha_i + \beta_0$ High Eco-Efficiency$_{it}$ + β_1 Low Eco-Efficiency$_{it}$ + γ_{it} $X_{it} + \varepsilon_{it}$, we estimate the time trend: $\beta_0 - \beta_1 = \alpha + \beta_2$ time$_t + \varepsilon_t$, where time ranges from 1 to 32. We compute Newey-West (1987) adjusted standard errors. Panel A reports the coefficients of time and the corresponding *t*-statistics for all specifications shown in Table 4. Panel B shows the time trend coefficient and *t*-statistics for all estimations presented in Table 5.

Panel A

	Intercept	Annual % Trend
Q	-0.02	4.32***
	(-0.15)	(3.56)
Ind.Adj. *Q*	-0.01	2.42***
	(-0.14)	(4.47)
Log(*Q*)	0.01	3.83***
	(0.36)	(5.65)
Trimmed *Q*	-0.01	4.30***
	(-0.10)	(3.61)

Panel B

	Intercept	Annual % Trend
Q	-0.02	4.98***
	(-0.15)	(3.56)
Q	-0.07	3.34***
	(-0.81)	(4.28)
Q	-0.08	3.16***
	(-1.45)	(5.18)
Q	-0.08	3.93***
	(-1.13)	(4.16)

*** *Significant at 1% level*

Formally, our main model takes the form:

$$EFS_{it} = \alpha_i + \beta_0\, High\ Eco\text{-}Efficiency_{it} + \beta_1 Low\ Eco\text{-}Efficiency_{it} + \sum_{k=1}^{K} \gamma_k X_{k,it-1} + \varepsilon_{it} \qquad (5)$$

Where EFS_{it} is the earnings surprise for firm i, which we define as the price-deflated difference between a firm's realized earnings per share in year t and the median of the one-year-ahead EPS forecasts for year t, and where X is a vector of lagged controls. The control variables price-to-book and firm size (as measured by either market value of equity or total assets) in logarithmic form are the most conventional controls in studies on earnings surprises, and we thus include them in our specification (see, for example, Core, Guay and Rusticus (2006) and Richardson, Teoh and Wysocki (2004)). We control for time variation in earnings surprises using year fixed effects. Our main attention goes to the two dummy variables that identify firms with a high eco-efficiency ranking and those with a low ranking. Because our sample of annual forecasts spans only a limited number of years we prefer a pooled cross-sectional regression to the Fama-MacBeth (1973) methodology. Table 8 reports on fixed-effects models with White standard errors.[38]

Consistent with our expectation, the results suggest that firms deemed most eco-efficient are associated with significantly higher (more positive or less negative) earnings surprises. The positive and significant coefficient on the high eco-efficiency dummy variable reinforces the hypothesis that investors underestimate the implications of eco-efficiency for performance and that their positive surprise underlies the abnormal return on the eco-efficient stock portfolio discussed previously. Since Chapter 3 finds no abnormal return for a portfolio of least eco-efficient companies, we expect a non-significant loading on the low-eco-efficiency dummy variable. This is indeed what we find. When we replace the eco-efficiency indicator variables by the absolute eco-efficiency score, we find no significant coefficient on this score. Hence, the results altogether imply non-linearity in the relation between eco-efficiency and earnings surprises, and suggest that investors misunderstand the economic consequences of strong eco-efficiency but not those of weaker eco-efficiency.

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[38] Despite limited annual observations on earnings surprises, we obtain qualitatively similar results when we deviate from fixed effects and choose a Fama-MacBeth (1973) regression with size and price-book as controls. The time-series average of the eight cross-sectional coefficients on the high eco-efficiency dummy is positive and significant at the 10% level when we control for size using total assets, and significant at 5% when we control for size using the market value of equity. Also here, neither the coefficient on the low eco-efficiency dummy nor that on the absolute eco-efficiency score is statistically significant at the conventional cut-off levels. All controls have loadings that are also similar to those reported in Table 8, in terms of sign and statistical significance.

TABLE 8: Eco-Efficiency and Analyst Forecast Errors

We define the earnings forecast error as the price-deflated difference between a firm's realized earnings per share in year t and the median of the one-year-ahead EPS forecasts for year t. We use a fixed-effects model that reports *t*-statistics (in parentheses) based on White standard errors; see equation (5). Low Eco-Efficiency = 1 if firm ranked ≤ 1. High Eco-Efficiency =1 if firm ranked ≥ 5. Yearly observations span the period 1997-2004.

	Dependent Variable: (Actual – 1-yr Forecast EPS) / Share Price		
	Model (5a)	Model (5b)	Model (5c)
Intercept	-0.01	0.01	-0.01
	(-0.50)	(0.52)	(0.72)
High Eco-Efficiency	$0.5\ E^{-2}$ **	$0.5\ E^{-2}$ **	
	(2.23)	(2.16)	
Low Eco-Efficiency	$0.3\ E^{-2}$	$0.3\ E^{-2}$	
	(1.61)	(1.63)	
Eco-Efficiency			$4.09\ E^{-5}$
			(0.07)
Price / Book Value	$0.44\ E^{-2}$ **	$0.39\ E^{-2}$ *	$0.43\ E^{-2}$ **
	(2.12)	(1.11)	(2.02)
Log (Market Value of Equity)	$-7.46\ E^{-5}$		$-\ 9.76\ E^{-5}$
	(0.04)		(0.04)
Log (Total Assets)		$-0.25\ E^{-2}$	
		(-0.95)	
# Observations	1669	1672	1669
Adj. R-2	0.29	0.29	0.28

*Significant at 10% level, ** at 5% level.*

4.7. CONCLUSION

Can corporate environmental management be aligned with the economic objectives of a firm? This study provides new answers to this question. Focusing on the concept of eco-efficiency, we perform an extensive analysis on the relation between corporate eco-efficiency and several dimensions of financial performance. Using a large database containing monthly scores for the period December 1996 - December 2004, we find evidence suggesting that the virtues of a strong corporate eco-efficiency policy can be significant from a financial perspective.

Our study points to a positive and slightly asymmetric relation between eco-efficiency and operating performance. Firms that are deemed eco-efficient have only a slightly superior return on assets than the control group. The least eco-efficient firms show strong operational underperformance. Overall, our findings strongly reject the notion expressed by CSR skeptics, that the benefits of adopting a strong environmental policy are unlikely to outweigh the costs.

Our study provides new evidence of a positive and time-varying relation between eco-efficiency and firm valuation as measured by Tobin's *q*. An exploration into the time-varying sensitivities of firm value with respect to the eco-efficiency scores shows that environmental winner companies initially did not trade at a premium relative to losers. Over time, the valuation differential between winners and losers widened substantially. The observed upward trend in relative firm valuation offers an explanation for the portfolio return evidence detailed in Chapter 3. This trend suggests that the shares of most eco-efficient firms relative to the least eco-efficient firms were initially undervalued but later experienced an upward price correction. At the very least, Tobin's *q* regression results suggest, that these days, the market assigns more value-relevance to environmental information about firms.

We more explicitly test the possibility of investor mispricing by studying analysts' earnings expectations. We find that analysts' surprises about future earnings are more positive (less negative) when firms rank high on eco-efficiency, controlling for other factors. These patterns in earnings surprises complement the investment portfolio study of Derwall, who document abnormal returns on a portfolio on eco-efficient companies over the period 1995-2003, as well as our conjecture that that these returns induce a positive time trend in the association between eco-efficiency and Tobin's *q*. Our evidence on earnings forecast errors is consistent with investors' underestimating the economic benefits to environmental management: our results support the hypothesis that the positive abnormal returns associated with environmental leaders are realized because investors are positively surprised by the reported earnings of eco-efficient companies.

We believe the results of this paper have implications for both managers and investors. It appears that managers have little reason to worry that an environmental policy conflicts with the company’s primary financial objectives. Investors may interpret our results as evidence that corporate environmental performance is a potential source of information that helps them generate superior excess returns. As for these excess returns, it is an open question whether the upward trend in the valuation differential between environmental winners and losers, combined with the errors in analysts’ expectations, reflect a learning phase for investors that persists into the future.

Chapter 5.
Human Capital Management and Financial Markets

5.1. INTRODUCTION

Major publicly traded companies portray an image of being actively involved in human capital management. Indeed, many managers and academics agree that more than ever before, firms must rely on human resources to obtain a sustainable competitive advantage through process innovation and better product quality (see, for example, Porter (1985), Pfeffer (1994, 2001), Zingales (2000)). Increased globalization has fueled the need for companies to manage human resources in a way that fosters their objective to increase shareholder wealth. Several surveys point out that over the last decades, firms have shifted from traditional personnel management to so-called performance-oriented workplace innovations. (See, for example, Osterman (2000)).

Because the competitive arena is so hungry for well-performing human capital, companies seek perfect ways to put HCM to work. There is an abundance of research that offers alternative ways in which firms can successfully manage their pool of human resources. (We use the terms "human capital (management)" and "human resources (management)" interchangeably.) For example, some researchers, such as Chambers et al. (1998), believe that superior corporate performance is achieved by winning the “war for talent” with performance classification and generous compensation packages, while others assert that firms exploit the potentials of their current employees through employee development programs, such as training, appraisal, teamwork, and information-sharing systems (e.g., Pfeffer (2001)). In addition, more and more often, financial markets offer incentives that shape the behavior of corporate management to achieve not only financially, but also socially desirable, outcomes. In response to the growth in socially responsible investment (SRI), companies increasingly blend strong business ethics and concerns for the well-being of employees with principal financial objectives.

The problem with HCM is that although its (strategic) benefits to shareholders are theoretically justifiable, they are costly at the outset. Moreover, although high-performance work practices to shape the workforce might require a large initial outlay, much of the economic value they create, if any, might be intangible and materialize only slowly. A sound judgment on the added value of human capital management is further clouded by underdeveloped accounting standards, which have not adapted to the rise of the people-sensitive business environment (Grossman (2005), Chen and Lin (2005)). Accounting conventions tend to abide by the logic that given their unsure contribution to corporate performance, investments in HCM should not be capitalized, but instead expensed through the income statement. These complexities raise the question of whether investors fully understand the sources of cash flow created by human capital management practices (Bassi, Harisso, Ludwig and McMurrer, henceforth BHLM, (2001)).

In this study, we carry the topic of human capital management over to a financial market perspective and ask several important empirical questions: Do HCM practices improve profitability? Is corporate investment in human capital management systems value-relevant to investors? Is the value of HCM understood by financial markets? We use an empirical setting that ultimately helps us to determine whether investors indeed respond favorably to HCM practices.

To accomplish our objective of testing the financial consequences of human capital management, we examine both the tangible and intangible effects of adopting HCM practices. We first use firms' returns on assets (ROA) to assess the relation between HCM and profitability. The hypothesis we implicitly test with this measure is that HCM systems enhance operating performance by, for example, improving employee motivation and increasing labor productivity. Next, we use Tobin's q, i.e., the market value of the firm divided by the replacement value of the firm's tangible assets. We use Q to quantify the intangible value directly assigned to HCM practices. Stock markets offer an excellent laboratory to test such intangible benefits. Because market prices change in response to value-relevant information, finding a significant relation between the HCM indexes and Tobin's q would be consistent with the hypothesis that human capital management is an intangible asset for which investors are willing to pay a premium above the firm's book value.

After examining the operational benefits and intangible value associated with human capital management, we explore whether HCM variables are useful predictors of stock returns. At the core of return predictability lies the possibility of mispricing. Given the complex nature of human capital management and the scarcity of well-developed human capital accounting standards, investors may find it complicated to accurately assess the (intangible) value associated with HCM policies. The idea that expensed sources of cash flow are difficult to capitalize and amortize accurately is not unique to this study. For example, prior studies have hypothesized that investors face such difficulties for research and development and advertising (see, e.g., Chan, Lakonishok and Sougiannis (2001)). However, human capital investments are more difficult to capitalize than other common sources of intangible value. Unlike with R&D and advertising, key inputs to valuing human capital investment are often not provided as one consolidated item in accounting statements. Moreover, the problem of determining the amortizable life of human capital is exacerbated by the fact that human capital is mobile, unlike fixed assets (Damodaran (2002)). These and other complications raise the question whether the market systematically under- or overestimates the value created by HCM policies. If so, then unexpected rises or declines in firms' market values should in part be traceable to human capital management practices.

We examine the role of HCM variables as candidate stock-return predictors along several lines. Since returns in efficient markets are generally unpredictable and reflect a premium for firms' exposure to systematic risk factors, we estimate cross-sectional models for raw returns as well as returns independent of firms' risk sensitivities (betas). We also adopt a portfolio formation approach under which we allocate firms to mutually exclusive investment portfolios. To do so, we use the HCM indexes as discriminating criteria. We then investigate the extent to which the portfolios earn a return beyond that suggested by their risk factor sensitivities.

To examine a possible mispricing story in greater length, we analyze analysts' earnings forecasts to test whether investor surprises about firms' realized earnings can be linked to HCM practices. Our idea is that if financial markets do not understand the economic implications of HCM, then analysts are surprised by unexpectedly high (low) earnings caused by HCM systems.

We illustrate the possible pathways leading human capital management practices to measures of corporate financial performance and stock market performance using four alternative indexes of HCM practices. Our first index of human capital management practices reflects a Talent Attraction and Retention system that captures issues such as employee selection rigor, employee turnover, and the degree to which a firm makes use of different compensation schemes. Our second index is called Human Capital Development. This index tracks employee training and appraisal instruments, skill gap management, and the formal controlling of human resource policies. Our third index is Organizational Learning. It quantifies the use of learning and knowledge management systems, which are typically aimed at deepening employees' understanding of the firm's strategy and its core activities and building intellectual capital. Our fourth index, Labor Practices, measures firms' disclosure quality with respect to typical corporate social responsibility issues, such as workforce diversity, healthy and safe working conditions, grievance procedures, and employee layoffs.

Since the choice of HCM practices has been hotly debated in different research areas, the different HCM indexes we investigate should add new and interesting perspectives. Our unique, comprehensive sample covers firms from many countries around the world, all of which have been systematically and consistently evaluated on their HCM practices. The indexes of practices we use in this study are bundles or "systems" of HCM practices that have gained acceptance in different academic fields (e.g., Milgrom and Roberts (1990, 1995), Huselid (1995), Ichniowski, Shaw, and Prennushi (1997)). The systems approach stems from the prevailing view that individual HCM initiatives adopted in isolation yield only marginal organizational benefits. In contrast, HCM systems comprise a set of mutually reinforcing instruments that jointly contribute to better firm performance.

This chapter is organized as follows. In Section 2, we present a theoretical background. Section 3 describes the data and Section 4 presents the empirical analysis. Section 5 summarizes and concludes.

5.2. BACKGROUND AND PRIOR RESEARCH

Various academic fields offer theoretical predictions to explain the effects of human capital management on financial performance. For example, Zingales (2000) suggests that classical finance theory implicitly assumes that firms are (physical) asset intensive and vertically integrated. The traditional agency problem mainly concerns the balance of power between top executives and shareholders, because firms have a high degree of control over non-executive employees. In today's landscape, employees not only form a large portion of the firm's intellectual backbone, but also enjoy more leeway in exploiting alternative employment opportunities. That is, employees can extract (human) capital from the company.

One role HCM can play in modern organizations is that of creating a competitive advantage by shaping human capital in ways that make it an asset that has value to the firm, but not to its competitors. This role is consistent with the resource-based view towards HCM that has gained acceptance in the area of strategic management (Barney (1991)). Alternatively, firms may engage in a "war for talent". Chambers et al. (1998) posit that the most successful companies are those that are willing to pay high prices for winning the talent war. Pfeffer (2001) differs from this view, and points to the adverse effects that talent wars have on corporate performance. First, by being obsessed with attracting talent, companies can create an organizational environment that provokes internal competition rather than creating a teamwork environment. Second, glorifying outside people can have an adverse effect on the morale, motivation, and productivity of a firm's current personnel. Third, fighting a talent war does not encourage company loyalty: employees who come for money easily go for money.

The fields of corporate social responsibly (CSR) and socially responsible investing focus on the ethical (or social) dimensions of labor practices. CSR is a broad, but also contentious, concept that deals with companies' concerns about their performance with respect to environmental, moral, and social issues. Common examples of labor-related CSR issues are employee diversity, equal employee treatment, employee health, and workplace safety.

The value relevance of CSR is the subject of ongoing discussions. Critics warn that the concept is too ambiguous to be implemented effectively, and inherently demand the sacrifice of financial resources that could have been used for value-maximizing purposes. (See, for example, Friedman (1962) and Henderson (2001).) However, Rappaport (1998) explains that market forces are increasingly causing value-maximizing managers to make decisions with socially desirable consequences. Unsafe working conditions are accompanied by higher wages that employees demand for bearing extra risk. Further, accidents in the workplace might affect the morale and productivity of the workforce and increase safety costs. In addition, a firm might be able to enjoy reputational advantages and the prospect of attracting motivated, skilled employees by being perceived in markets as a socially responsible employer (Kreps and Spence (1985), Turban and Greening (1996)). In this framework, embracing CSR through HCM systems that maintain high-quality workplace conditions can lead to significant financially desirable outcomes.

Also, the choice of specific HCM practices is still open to debate. For example, several theories cast doubt on the effectiveness of incentive pay mechanisms when adopted in isolation. To illustrate, Kandel and Lazear (1992) focus on the motivational effects of partnerships and profit-sharing. They argue that a free-rider problem plagues the motivational influence of profit-sharing due to a lack of peer pressure among workers. Their model suggests that the effectiveness of profit-sharing depends on a firm's investment in stimulating empathy and trust, two potentially critical drivers of the peer pressure needed to achieve the intended outcome of incentive pay. Kandel and Lazear's theoretical framework implicitly points out that the effectiveness of one HCM practice depends on the presence of other HCM instruments, consistent with the "systems" view that has received considerable attention in recent decades. Many studies, including those by Milgrom and Roberts (1990, 1995), Huselid (1995), and Ichniowski, Shaw, and Prennushi (1997), assert that these systems, or bundles of internally coherent and mutually enforcing practices, are more effective than the individual policies as such. Under the systems view, the whole of the coherent mechanisms yields more economic virtues to a firm than just the sum of its parts.

Koch and McGrath (1996) derive one set of potentially important elements in such a system These authors consider that there are three broad HCM practices which are critical for enhancing labor productivity: (i) human resource planning, such as a constant evaluation of a firm's needs in changing conditions and a formal assessment of human resource policies that allows a firm to learn from mistakes of the past; (ii) an employee hiring process that incorporates productivity-related information about applications; (iii) an employee development system that realizes the ultimate potential of each employee, such as training and "promotion-from-within". The last element is underpinned theoretically by the view that the more that employees are trained and allowed to enjoy internal promotions, the more firm-specific and value relevant their skills become over time.

Human resource management studies provides empirical evidence on a wide array of systems. Using a sample of 968 U.S. firms, Huselid (1995) takes a factor-analytical approach to derive two systems of human resource practices and to investigate their relation to an array of corporate performance measures. The first system, called "employee skills and organizational structures", comprises information sharing, formal job analysis, information-sharing programs, grievance procedures, profit-sharing plans, training, and talent attraction, among other things. The second system, "employee motivation", includes performance appraisals, promotion rules, and other items that could reinforce desired employee behavior. In Huselid's work, the HRM variables are mostly positively related to profitability, Tobin's *q*, and productivity (measured by sales per employee), and negatively associated with turnover.

Huselid, Jackson, and Schuler (1997) expand on previous work by distinguishing "technical" HRM from "strategic" HRM systems. Their evidence, which they obtain from a sample of 293 U.S. companies, suggests that strategic, but not technical, HRM measures influence firm performance. This finding is consistent with the conjecture that only strategic measures of HRM offer firms a way to differentiate themselves from competitors. However, we note that these authors somewhat subjectively label their HRM items strategic (e.g., teamwork, employee and manager communications, developing talent to meet future business needs) or technical (activities pertaining to traditional personnel management, such as recruitment and selection, performance appraisal, and training).

Another broad construct from HRM is "organizational learning". Watkins and Marsick (1997) define a learning organization as one that strategically integrates learning with regular work practices. For example, such firms promote dialogue and inquiry, thus empowering employees to develop a collective vision and to establish methods that continuously capture and share learning information.

Even though the concept of the learning organization has gained momentum in theoretical work, it has received little attention in empirical research. An exception is a study by Ellinger, Ellinger, Yang, and Howton (2002), which investigates the economic information content of seven learning dimensions learning that were originally identified by Watkins and Marsick (1997). Using a sample of approximately 200 U.S. firms, Ellinger et al. show that the learning system is positively related to both objective financial measures (ROA, ROE, market value added, and Tobin's *q*) and subjective measures (i.e., performance perceived by a firm's representative).

A concept related to organizational learning is total quality management (TQM). As with HCM, the definition of TQM is ambiguous, but the central tenet of TQM systems is that a continuous focus on employee involvement and development, jointly with process innovation, product quality, and customer orientation, is critical to a successful competitive strategy. Easton and Jarell (1998) investigate the performance of 108 U.S. firms that they identify though interviews as having seriously implemented a TQM procedure. Using an approach similar to event study methodology, they report that firms that adopt TQM substantially improved their performance over the subsequent five-year period in terms of both unexpected accounting performance and cumulative stock returns.

Evidence on the relation between human capital management and corporate financial performance is not limited to the United States. Guest, Mitchie, Conway, and

Sheehan (2003) collect data from 366 U.K. companies on 48 items that cover nine dimensions of HRM. Their regressions show that these firms' overall HRM score is positively associated with profits per employee. However, this relation seems to prevail only in the manufacturing sector, not in the service sector. The Guest et al. evidence does not support a relation between human resource management and productivity, but it does support a negative association between HRM and labor turnover. However, their tests cast doubt on the direction of causality, since including previous firm performance in their models subsumes the relation between contemporaneous HRM practices and next-period performance measures.

In contrast to studies of HRM, most financial scholars focus on a single dimension of employee motivation practices that could easily fit within the broader human capital management framework. For example, Frye (2004) studies the effect of equity-based compensation (EBC) for executive and non-executive employees on firm performance and finds that equity-based compensation is positively associated with Tobin's q. However, the relation between EBC and return on assets in the study is positive for an early-period sample but negative for a later sample. Bhargava (1994) uses data for the period 1979-1989 on 114 U.K. companies to investigate the effect of profit sharing on profitability. The results of Bhargava's panel data regressions suggest that the introduction of a profit-sharing scheme positively affects a firm's profitability. The results also suggest that profit sharing does not increase profitability once it is existence.

Elayan, Swales, Maris, and Scott (1998) use an event-window analysis to test the influence of corporate layoff announcements on share price returns. Their evidence suggests that layoff announcements lead to negative abnormal stock returns although layoffs positively influence a firm's operational performance. This finding is consistent with the hypothesis that markets interpret layoff news as an indication that a firm's investment opportunities are declining. Similar studies that find either a negative effect or no wealth effect in response to layoff announcements include Abowd, Mickovich, and Hannon (1990) and Blackwell, Marr, and Spivey (1990).

The event window setting used by previous research that relates HCM to stock returns builds on a rational expectations framework in which information relevant to the present value of firms' expected future cash flows is quickly factored into stock prices. However, there are theoretical justifications for the belief that stock-return effects from HCM show up beyond a short-term event window. Several observers, such as Grossman (2005), assert that financial markets focus on short-term performance and cost-control metrics to determine the values of companies. Other scholars, such as Porter (1992) and Hall (1993), suggest that a short-term performance focus in financial markets causes investors to underappreciate rewards to long-term investment. If so, investors' fixation on short-term performance may cause them to, for example, overlook the intellectual capital a company sacrifices by making layoff decisions. In addition, investors may find it complicated to assess a firm's HCM practices or its implications for stock prices, the benefits of which may largely be intangible and far from certain. This problem is exacerbated by underdeveloped accounting principles, which do not accurately reflect the contribution of human resource investments to corporate value (see for example Chen and Lin (2004)). These complications make it difficult for investors to make portfolio decisions based on HCM information (BHLM (2001)).

There is one segment of the financial market that does actively incorporate into its investment decisions the information on a firm's employee policies. Investors who incorporate social responsibility criteria, including HCM practices, into their portfolio management promote the idea that socially responsible practices have economic consequences. Many of these socially responsible investors contend that corporate social responsibility conveys value-relevant information that could be overlooked by mainstream investors (e.g., Kurtz (1997)). However, empirical studies to validate this claim report mixed evidence and call for further research; see Bauer, Koedijk and Otten (2005), Van de Velde, Vermeir, and Corten (2005) and Chapters 3 and 4 of this thesis for recent evidence on SRI performance.

5.3. DATA

Data on Human Capital Management

We study a unique, proprietary, database of firms' human capital management practices provided by SAM Sustainable Asset Management (SAM).[39] SAM is an asset management firm exclusively focused on sustainability investing and, among other activities, provides the Dow Jones Sustainability Indexes (DJSI) based on a broad set of indicators of corporate sustainability.[40] An important subset of their sustainability database deals with human capital management practices of publicly listed firms around the world. With SAM's indicators, we examine the economic benefits of human capital management practices.

Our data set covers 633 companies from 31 countries, all of which have been systematically and consistently assessed by SAM. SAM selects firms out of the largest 2500 companies of the Dow Jones Global Index for inclusion in the DJSI. Our database is longitudinal, covering HCM practice indicators for firms that SAM published during the years 2003 and 2004.

SAM groups information from more than 35 assessment questions into four categories to construct composite indexes of HCM that rank firms on a one to 100 scale.

[39] www.sam-group.com
[40] http://www.sustainability-index.com/

We explain how the indexes are developed, because current research does not have a consensus approach to quantifying human capital management practices.

Although some studies use factor analysis to derive indexes of human capital management (such as Huselid (1995)), Wood (1999) suggests that these statistical approaches are likely to deliver theoretically counterintuitive solutions. Also, factor analysis research implicitly assumes that all variables data are nondiscrete, which might not always be the case. Nonlinear methods that deal with both continuous and discrete data are relatively underdeveloped. Therefore, the most straightforward alternative approach is to bundle several inter-related HCM practices into clusters that are based on sound theoretical rationale. This somewhat supervised clustering method most closely resembles the research approach that underlies our HCM data.

The database of human capital management indicators comprises four broad clusters. These clusters span different dimensions of human resource practices, all of which are well-known practices in both human capital management studies and practice. The four scores are like indexes that reflect "systems" of human capital management in the tradition of those described in prior studies.

The first index concentrates on Talent Attraction and Retention. This index ranks firms annually on:

- Employee selection rigor (i.e., how many employees are subjected to a formal selection test).
- Employee turnover, and employee outplacement due to underperformance of the worker.
- The degree to which the performance-related compensation is used throughout the company, such as profit shares and sales commissions.
- The use of additional benefits, such as health insurance and pension plans.
- The ways in which a firm tracks employee satisfaction.

Generally, increases in the number of employees who are hired based on formal assessment, greater use of employee satisfaction tracking methods, and performance-related compensation schemes, and decreases in employee turnover lead to a higher rating along this index.

To some extent, this index relates to the war for talent, a phenomenon that gained substantial attention after a number of McKinsey publications (such as Chambers et al. (1998)) advocated a talent mindset in firms, accompanied by proactive and possibly expensive strategies to recruit. We note that most of the compensation plans in this index are traditionally used by firms to reward top management and key employees and to link their interests with shareholders. However, more companies now consider that most or all employees are key members of their business, which explains why such compensation schemes are increasingly deemed organization-wide instruments of talent retention.

The second index is Human Capital Development. This index represents the following areas:

- The number of employees covered by a formal company training program.
- The degree to which the firm uses formal appraisal methods.
- The degree to which the firm controls potential skill gaps due to a mismatch between either the number or the skills of current employees vis-à-vis those required to execute a business plan.
- The use of formal, quantitative, indicators to measure the success human resource policies.

Greater use of employee training, review, and appraisal methods, and of the quantitative measures for controlling human resource management policies and skill gaps leads to a higher index value. Many businesses regard the components of this index as performance-enhancing instruments. For example, a survey undertaken by the European Foundation for Living and Working Conditions (2001) indicates that a substantial number of European companies intend to protect their workforce investments through a combined use of training and appraisal, in conjunction with other common practices.

The third index refers to Organizational Learning (or Knowledge Management). Companies typically put learning systems into operation with the intention of enhancing support innovation, deepening workers' understanding of the firm's strategy, and enlarging intellectual capital. These systems may include intranet-based learning and knowledge networks integrated into the firm's daily processes, bonuses related to sharing knowledge and communication, expert directories, and company "academies". Surveys suggest that firms use formal organizational learning or Knowledge Management systems to strengthen their competitive position (KPMG (2000)). Broadly, the Organizational Learning Index ranks firms on:

- The number of employees involved in learning or knowledge sharing systems.
- How important several common learning systems are deemed by the company, with respect to expanding employees' knowledge about the firm's strategy, support innovation, building intellectual capital, and structuring information.

Firms that report a higher importance assigned to learning systems receive higher index values.

Our last index of HCM is Labor Practice Indicators. This index primarily measures the disclosure of fair labor practices and other issues related to labor relations. To construct this index, SAM queries firms on:

- The quality of disclosure concerning workforce diversity policies (e.g., the distribution and salaries of males and females at different levels within the company, and a breakdown of the workforce based on cultural or ethnic backgrounds), employee layoffs, and policies that ensure healthy, safe working conditions.
- The ability of the firm's employees to associate with unions and bargaining agreements.
- Systems to collect and handle employee grievances and complaints.
- The firm's public commitment to human rights issues.

Arguably, most of the system's constituents reflect an ethical side to labor practices. This ethical side is not unique to HCM studies, but it has attracted considerable interest by corporate social responsibility scholars and socially responsible investors.

We study the four indexes individually, but we also build an aggregate index composed of all four measures. We compute the aggregate human capital management index, which we call "Total HCM", by taking the equal-weighted average of the four subindexes.

Table 1 presents summary statistics on the HCM practice indicators per country. Since we do not adjust the HCM variables for each country, we can develop an impression of whether the human capital management ratings differ around the world. The country averages of the total HCM scores and those of the subscores do not display sizable cross-country variation. Only a small number of countries score atypically high (low) on specific dimensions, but these countries have noisy averages due to very low firm coverage. We can conclude that an exploration into whether country-level differences in corporate valuation can be traced to differences in human capital management systems is not suitable. Therefore, our study focuses entirely on human capital management at the firm level. However, these exploratory results do not imply that there is a universal framework of human capital management around the world. Several papers illustrate the fact that human capital management (and human resource management) is a broad, multidimensional concept. Further, HCM practices are not necessarily independent of the legal and cultural environment (e.g., Brewster (1994), Ichniowski and Shaw (1999)). Our intention is not to model the HCM construct as such, but to investigate the association between the financial performance of firms and the four indexes of human capital management, based on large-scale and standardized survey data. Whether the data we use

TABLE 1. Firm-Average HCM Scores per Country

	Average Scores 2003				
	Total HCM	Human Capital Development	Organizational learning	Labor Practice Indicators	Talent Attraction & Retention
Australia	51	57	45	57	45
Austria	56	59	57	61	45
Belgium	56	62	46	63	52
Brazil	59	71	53	59	54
Canada	57	63	56	58	50
Chile	64	67	52	86	50
Denmark	52	53	52	60	44
Finland	56	67	51	59	47
France	56	63	51	65	47
Germany	58	64	57	60	50
Greece	57	75	49	57	49
Hong Kong	57	72	60	48	50
Indonesia	NA	NA	NA	NA	NA
Ireland	56	61	62	58	44
Italy	44	48	40	46	42
Japan	54	62	51	54	47
Luxembuorg	50	64	61	18	57
Malaysia	57	76	62	46	43
Netherlands	56	64	53	58	48
Norway	63	66	65	63	57
Portugal	52	52	46	57	54
Singapore	55	77	53	60	32
South Africa	65	75	66	69	49
South Korea	58	80	49	53	50
Spain	62	74	59	64	50
Sweden	47	49	44	53	41
Switzerland	51	54	50	55	45
Taiwan	66	96	57	58	54
Thailand	NA	NA	NA	NA	NA
United Kingdom	56	61	54	64	46
United States	54	56	57	57	46

TABLE 1*Continued*. Firm-Average HCM Scores per Country

	Average Scores 2004				
	Total HCM	Human Capital Development	Organizational learning	Labor Practice Indicators	Talent Attraction & Retention
Australia	59	70	55	59	54
Austria	53	54	48	58	52
Belgium	56	55	57	54	59
Brazil	66	77	60	67	59
Canada	60	66	61	58	54
Chile	65	80	59	66	57
Denmark	60	65	66	61	49
Finland	59	69	60	61	47
France	60	65	58	67	50
Germany	62	68	65	62	51
Greece	59	69	56	57	54
Hong Kong	59	71	61	51	55
Indonesia	50	67	34	40	60
Ireland	49	56	44	48	48
Italy	56	63	50	58	53
Japan	56	63	57	53	52
Luxembuorg	71	75	86	75	49
Malaysia	41	46	33	35	49
Netherlands	60	62	64	60	52
Norway	64	64	70	70	54
Portugal	50	54	43	54	50
Singapore	NA	NA	NA	NA	NA
South Africa	71	80	73	75	55
South Korea	70	79	87	57	58
Spain	65	75	66	64	57
Sweden	56	61	56	62	46
Switzerland	57	60	55	62	51
Taiwan	65	85	74	50	52
Thailand	70	92	78	72	40
United Kingdom	59	65	58	64	50
United States	59	63	63	59	53

in this study fully capture the entire spectrum of HCM practices for any given country is beyond the scope of this research.

Financial Data

We use various alternative measures of financial performance to ensure that evidence on the link between HCM and corporate financial performance is not a statistical artifact.

First, we explore the influence of human resource management policies on corporate valuation, using Tobin's *q* as our measure of firm value. We adopt the pragmatic computation of *Q* values around the world described in La Porta, Lopez-de-Silanes, Schleifer, and Vishny (LLSV 2002). Although there are more sophisticated approaches to computing *Q*, we use the most efficient approximation to ensure sufficient data availability throughout our sample period. Further, as shown by Perfect and Wiles (1994), and Chung and Pruitt (1994), computationally efficient proxies for *Q* are highly correlated with estimates that are more complex.

In brief, we define Tobin's *q* as the ratio of the firm's market value of assets to the book value of assets. We compute the market value of assets as the sum of market value of common stocks and the book value of assets minus the sum of book value of assets and balance sheet deferred taxes. Since q might have a fat-tailed and asymmetric distribution, we trim the outliers at the 0.5th and 99.5th percentiles.

Our second financial measure examines the operational performance of a firm and reflects profitability. We use return on assets as our measure of operating performance. To make certain that the relationships we observe between our HCM indicators and the dependent variables are not due to other correlated factors, we collect data on a wide array of well-known control variables. The annual data for the controls include a firm's total assets; three-year sales growth; the long-term debt-to-assets ratio a firm's age, which we derive from the date of first stock exchange listing; and total sales. We also use country identifiers, Dow Jones market sector classifications, and primary SIC codes to develop country and industry dummy variables.

Our third financial criterion is stock return, which we analyze in two different ways. We model annual returns in a cross-sectional framework, using the HCM variables as predictors of interest and firm size (market value of equity), the price-to-book-ratio, the dividend yield, and firms' prior three-year stock return as control variables. The controls account for most return anomalies described in Fama and French (1992, 1993), Jegadeesh, and Titman (1993) and Brennan, Chordia, and Subrahmanyam (1998). We then compare the time-series variation in returns on portfolios of stocks sorted on their HCM ranking. To do so, we use a multifactor benchmark model that controls for the portfolios' market risk and for their exposure to elementary investment styles unrelated to HCM, which are known to deliver anomalously high average returns.

To obtain the financial data, we match SAM's data with the Thomson Financial and Worldscope databases, using firms' Stock Exchange Daily Official List (SEDOL) codes as the primary matching criterion. As a rule, all financial data are from Thomson Financial. Exceptions are the items balance sheet deferred taxes, and end-of-year share price (close), which we obtain from Worldscope. We develop the monthly benchmark portfolio returns we use in our portfolio performance evaluation models with data from the Style Research database. Since we verify our stock return evidence with patterns in analysts' earnings expectations, we collect IBES analysts' earnings forecast data through the Wharton Research Database.

The choice of financial measures warrants some justification. One strand of research suggests that motivational influences are best captured by a firm's labor productivity (Batt (1999), Capelli and Neumark (2001)), as estimated by sales per employee, but this criterion overlooks the fact that HCM practices can be costly. (As a robustness check we do report on the productivity measure briefly.)

Tobin's *q*, which proxies for a company's valuation, and return-on-assets, which represents operating performance and profitability, have attracted substantial attention in previous research. *Q* and ROA have several aspects in common, but they also differ in some important respects. ROA is primarily an accounting measure, and therefore sensitive to managers' latitude. But Tobin's *q* reflects the markets' expectations about the future growth potential of a firm. A firm's ROA primarily represents tangible aspects of performance, since it is mostly based on realized income, but Tobin's *q* is a forward-looking measure that incorporates the intangible value that investors in capital markets assign to a company. However, it might not be clear when certain intangible advantages of a firm will materialize, which makes it possible for discrepancies to occur between a variable's relation to ROA and its relation to *Q*.

The added advantage of equity return is that directly measures value added to shareholders. Moreover, returns makes it possible to investigate whether investors are able to earn more than is suggested by a rational expectations framework that is based on the semi-strong form of market efficiency in which long-term shareholder return equals the cost of equity. However, because stock returns are difficult to predict and to a great extent behave beyond the control of company management, it is complicated to directly link managerial actions to stock performance.

The complementary features of all three measures of financial performance motivate us to include them in our research.

Table 2 presents descriptive statistics for Tobin's *q*, ROA, total equity return, and our primary set of controls. Even though *Q* has displayed an unlikely distribution over the last decade due to the stock market boom, our research is not sensitive to possible skewness in the distribution of *Q*. In unreported tests we check the consistency of our results by using the natural logarithm of Tobin's *q* as the dependent variable. The results are qualitatively similar and do not affect our conclusions. In addition, we check whether our analysis of firm value is affected by atypical developments subsequent to the Nasdaq bubble of 2000. In another unreported sensitivity test, we check whether Nasdaq firms have atypical *Q* values that drive our results but find no evidence of that for our sample. As can also be seen from Table 2, the average company in the sample is large and reasonably mature.

5.4. EMPIRICAL ANALYSIS

Human Capital Management and Tobin's *q*

Previous sections suggest that firms can manage their human capital in ways that make it a source of competitive advantages, which can translate into both tangible and intangible economic value. Intangible assets need not necessarily be incorporated in firms' accounting statements under current reporting principles (Chan, Lakonishok, and Sougiannis (2001), BHLM (2001)), but financial markets impound both tangible and intangible value-relevant information into firms' stock prices. If HCM practices constitute an intangible asset, we can expect that investors will assign a higher value to firms with strong HCM policies than is suggested by book values, all else equal. In this section, we use the Tobin's *q* measure to investigate whether corporate valuation is tied to human capital management, and which subsets of HCM systems are valued most highly.

To estimate our models we use regressions of Tobin's *q* on the set of explanatory variables. These models take the form:

$$Q_{it} = \alpha_i + \sum_{j=1}^{J} \beta_j H_{j,it} + \sum_{k=1}^{K} \gamma_k C_{k,it} + \varepsilon_{it} \qquad (1)$$

where Q_{it} is Tobin's *q* of firm i in period t, H_{jt} is human resource practice variable j observed at t, and J denotes the number of human resource variables included in the model. Equivalently, C_{kt} is the value for control variable k at t and K indicates the number of controls. Since our data set is longitudinal in nature, we use pooled regression methods. The first approach we adopt is a pooled setup with a common intercept ($\alpha_i = \alpha_0$), four human resource practice indicators, and several control variables. We also add country and industry dummy variables to the models to account for cross-country and cross-industry variation in corporate valuation.

Although this model improves on pooled models with just one intercept, we can better capture the possibility of omitted variables by using firm fixed effects. For this reason, our second method involves a fixed-effects regression in which the independent

TABLE 2. Summary Statistics on Firm Variables

This table reports descriptive statistics on some firm variables for the firms in our sample. The pooled statistics are obtaining by stacking the data for the years 2003 and 2004. Reported are the annual mean, median, and standard deviation.

Panel A: Summary Statistics on Firm Variables for 2003

Variable	Mean	Median	St. Dev.
Tobin's *q*	1.54	1.21	0.84
ROA	4.16	3.8	6.1
Annual Stock Return	21.56	20.21	40.32
Assets (million USD)	56320.48	11322.05	152515.07
Debt-Assets	27.73	26.93	17.10
3-year Sales Growth	5.66	3.50	15.26
Firm Age	19.57	20.00	11.42

Panel B: Summary Statistics on Firm Variables for 2004

Variable	Mean	Median	St. Dev.
Tobin's *q*	1.58	1.29	0.80
Annual Stock Return	25.47	19.89	34.64
ROA	5.64	4.72	5.80
Assets (million USD)	67342.57	13098.98	188067.18
Debt-Assets	26.47	25.49	16.70
3-year Sales Growth	4.76	3.62	12.64
Firm Age	20.57	21.00	11.42

Panel C: Summary Statistics on Firm Variables for Stacked Sample

Variable	Mean	Median	St. Dev.
Tobin's *q*	1.56	1.25	0.82
ROA	4.89	4.41	6.00
Annual Stock Return	23.97	20.54	36.38
Assets (million USD)	59990.42	12049.85	167579.60
Debt-Assets	27.13	26.33	16.74
3-year Sales Growth	5.20	3.64	13.97
Firm Age	20.67	21.00	11.23

variables are the HCM indexes, the control variables, and firm-specific terms (α_i). Our decision to report estimates from both simple pooling and the fixed-effects model relates to the work of Hsiao (1986), who underlines that fixed-effects specifications can deliver more biased estimators in the presence of measurement error.

Note that a plausible alternative to fixed effects would be to estimate all parameters with a random-effects specification. However, unreported tests show that such models produce counterintuitive coefficients on our control variables. Moreover, our untabulated Hausman (1978) test results consistently reject the random-effects specification in favor of fixed effects, independent of the financial variable we investigate. In both setups, our regressions produce parameter estimates along with White (1980) heteroskedasticity-robust standard errors.

To control for the variation in Tobin's *q* that is not attributable to HCM, we use permutations of several financial variables.[41] Our first control is firm size, which we measure by the natural logarithm of total assets. Much of the recent empirical evidence finds a negative relation between size and *Q*. The second control variable is three-year sales growth, which is our proxy for firms' potential investment and growth opportunities. Third, our models include the firm's long-term debt-to-assets ratio, which is our proxy for both leverage and risk. Fourth, we include an approximation of a firm's age, which we derive from the date of first stock exchange listing. Fifth, we replace sales growth by the capital expenditures to sales ratio, which is another proxy for future growth opportunities. Last, to distinguish the effects of HCM practices on operating performance from those on firm value, we include ROA.

We note that we could use the ratio of annual R&D expenses to sales as an additional candidate control variable. However, due to the scarcity of R&D data for companies around the world, including this variable would require our study to sacrifice a substantial number of observations. Like other globally oriented studies on corporate valuation, to avoid small sample issues we leave out this variable.[42]

Table 3 reports the results for several models of Tobin's *q*. These models use Human Capital Management Indexes, firm size, sales growth, debt/assets, firm age, ROA, and fixed effects as explanatory variables. We report two separate analyses. Panel A shows results based on the entire international sample. Panel B reports results based on a sample that omits Japanese firms and firms with the Dow Jones financials industry classification. We choose to examine this second sample so as to ensure that the full sample results are not driven by unique features of the omitted subset. Because financial firms have a large

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[41] The variables our models include are well documented, in both empirical literature on *Q* (Lindenberg and Ross (1981), Hirschey (1985)) and literature related to HCM (see, e.g., Huselid (1995), Mehran (1995), and Frye (2004)).

[42] We expect much of the cross-sectional variation in R&D to be industry-dependent and thus captured by industry identifiers.

pool of human capital and relatively few fixed assets, the value-relevance of human capital is rather straightforward (Damodaran (2002)). In addition, both financials and Japanese firms have historically displayed unconventional valuation multiples.

Within each panel, we summarize four different estimations. Regressions 1 and 2 include the four HCM indexes but differ in the choice of dummy variables. The first regression (Pooled) controls for country- and industry-wide differences in firm valuation, and the second model allows for firm-level fixed effects (FE). The last two specifications in each panel replace the HCM subindexes with the Total HCM index. We note that we multiply the coefficients on the four indexes by 100 in all Tobin's *q* regressions. Most control variables have signs consistent with the findings in earlier studies. Those that do not carry the appropriate signs are typically not statistically significant.

Our models in Table 3 consistently point to a positive relation between the Human Capital Development Index and firm value. The rise in *Q* resulting from a 100-point increase in human capital development (i.e., from the lowest to the highest possible score) ranges between 0.17 and 0.52, depending on the choice of model. The corresponding *t*-statistics indicate that the estimated relation is highly significant (i.e., either below the 5% or 1% cut-off level), independent of which specification we use. Thus, Table 3 provides compelling evidence that companies with a relatively greater deployment of employee development systems are able to enjoy a relatively higher firm value, all other influences equal.

In contrast, none of the reported coefficients on the Organizational Learning Index in Table 3 are statistically significant. This finding suggests that firms cannot differentiate themselves in terms of their valuation through so-called learning and knowledge-sharing practices. The estimated coefficients on the other two HCM variables are mixed.

The Labor Practices Index displays no significant relation to corporate valuation in the full-sample regressions, but models that we derive from the sample of non-Japanese and non-financial firms suggest that a higher score on this index is associated with a lower Tobin's *q*. In only one case is the coefficient on the labor practices variable significant below the 5% level.

For the Talent Attraction and Retention Index, we find weak evidence that a greater use of systems aimed at attracting and retaining talented employees comes at the expense of a lower Tobin's *q*. Again, we note that only one out of four specifications yields a negative coefficient that is significant at the 5% level.

Overall, Table 3 points out that the economic significance of human capital management prevails only for specific systems. We find little evidence that the Total HCM index relates to corporate valuation, which is consistent with the predictions of the four subindex specifications. This observation could have important practical and research implications, because it suggests that too broad measures of human capital management might conceal information on the value added by HCM.

TABLE 3. HCM and Tobin's *q* around the world: Pooled Cross Sectional Regressions

Tobin's *q* is explained by several indexes of human capital management (HCM), several financial variables, and either country and industry dummy variables ("Pooled") or firm fixed effects ("FE"). "Total HCM Index" is defined as the average of the four HCM indexes: Organizational Learning, Human Capital Development, Labor Practice, and Talent Attraction and Retention. Controls are the log of a firm's total assets, past three-year sales growth, the debt-to-assets ratio, firm age, and return on assets. Pooled sample periods: 2003 and 2004. The first panel reports models derived from the entire global sample. The panel on the next page presents models derived from a sample that excludes Japanese and financial firms. Coefficients on the HCM indexes are multiplied by 100. T-statistics based on White (1980) errors are in parentheses.

	Dependent Variable: Tobin's *q*			
	Pooled	FE	Pooled	FE
Human Capital Management Indexes				
Total HCM Index			0.20	-0.05
			(1.18)	(-0.46)
Organizational Learning	0.04	0.04		
	(0.41)	(0.59)		
Human Cap Develop	0.35 ***	0.17 **		
	(2.74)	(2.44)		
Labor practices	-0.26	-0.09		
	(-1.64)	(-1.61)		
Talent A & R	-0.30	-0.30 **		
	(-1.23)	(-1.98)		
Control Variables				
Log Assets	-0.07 ***	-0.87 ***	-0.07 ***	-0.88 ***
	(-3.53)	(-4.86)	(-3.71)	(-4.76)
3-yr Sales Growth	0.9 E^{-3}	-1.8 E^{-3}	0.8 E^{-3}	-1.6 E^{-3}
	(0.52)	(-1.64)	(0.51)	(-1.45)
Debt/Assets	-0.01 ***	-0.01 ***	-0.01 ***	-0.01 ***
	(-4.52)	(-2.70)	(-4.41)	(-2.37)
Firm Age	-1.4 E^{-3}	0.06 ***	-1.2 E^{-3}	0.06 ***
	(-0.72)	(3.64)	(-0.63)	(3.78)
ROA	0.06 ***	4.2 E^{-3}	0.06 ***	4.4 E^{-3}
	(7.13)	(0.86)	(7.18)	(0.88)
Country & Industry Dummies	Y		Y	
Adj. R^2	0.56	0.94	0.56	0.94
N*T (unbalanced)	942	942	942	942

** Significant at 10% level; ** at 5% level; *** at 1% level*

TABLE 3 *Continued.* HCM and Tobin's *q* around the world

Tobin's *q* is explained by several indexes of human capital management (HCM), several financial variables, and either country and industry dummy variables ("Pooled") or firm fixed effects ("FE"). "Total HCM" is defined as the average of four index of HCM: Organizational Learning, Human Capital Development, Labor Practice, and Talent Attraction and Retention. Controls are the log of a firm's total assets, past three-year sales growth, the debt-to-assets ratio, firm age, and return on assets. Pooled sample periods: 2003 and 2004. The first panel reports models derived from the entire global sample. The panel on the next page presents models derived from a sample that excludes Japanese and financial firms. Coefficients on the HCM indexes are multiplied by 100. T-statistics based on White (1980) errors appear in parentheses.

	Dependent Variable: *Q* excl. Japan & Financials			
	Pooled	FE	Pooled	FE
Human Capital Management Indexes				
Total HCM Index			0.40 *	-0.04
			(1.83)	(-0.30)
Organization. Learning	0.10	0.03		
	(0.82)	(0.32)		
Human Cap Develop	0.52 ***	0.22 **		
	(3.26)	(2.34)		
Labor practices	-0.41 **	-0.12 *		
	(-2.00)	(-1.69)		
Talent A & R	-0.29	-0.27		
	(-0.90)	(-1.57)		
Control Variables				
Log Assets	-0.08 ***	-0.93 ***	-0.09 ***	-0.95 ***
	(-2.90)	(-4.88)	(-3.09)	(-4.81)
3-yr Sales Growth	1.8 E^{-3}	-1.8 E^{-3}	1.8 E^{-3}	-1.6 E^{-3}
	(0.97)	(-1.45)	(0.97)	(-1.30)
Debt/Assets	-0.01 ***	-0.01 **	-0.01 ***	-0.01 **
	(-4.01)	(-2.44)	(-3.94)	(-2.21)
Firm Age	-0.7 E^{-3}	0.05 **	-4.9 E^{-4}	0.05 **
	(-0.27)	(2.27)	(-0.20)	(2.38)
ROA	0.05 ***	2.8 E^{-3}	0.06 ***	3.1 E^{-3}
	(6.69)	(0.60)	(6.74)	(0.65)
Country & Industry Dummies	Y		Y	
Adj. R^2	0.55	0.94	0.54	0.94
N*T (unbalanced)	680	680	680	680

** Significant at 10% level; ** at 5% level; *** at 1% level*

TABLE 4. HCM and Tobin's *q*: sensitivity to changes in control variables

See table 3 for a discussion of the specifications. In the first pair of specifications firm age is replaced by a year 2003 dummy variable. The second pair of models includes the capital expenditures-assets ratio instead of sales growth. The last pair of models (on the next page) replaces the logarithm of assets by the logarithm of total sales. Pooled sample periods: 2003 and 2004. Coefficients on the HCM indexes are multiplied by 100. T-statistics based on White (1980) errors appear in parentheses.

	Dependent Variable: Tobin's *q*			
	Pooled	FE	Pooled	FE
Human Capital Management Indexes				
Organizational Learning	0.05	0.03	0.08	0.08
	(0.49)	(0.50)	(0.74)	(1.13)
Human Cap Develop	0.34 ***	0.18 ***	0.30 **	0.15 **
	(2.65)	(2.60)	(2.21)	(2.14)
Labor Practices	-0.28 *	-0.09	-0.31 **	-0.08
	(-1.83)	(-1.55)	(-1.89)	(-1.35)
Talent A & R	-0.28	-0.31 **	-0.30	-0.23
	(-1.14)	(-2.05)	(-1.20)	(-1.56)
Control Variables				
Log Assets	-0.07 ***	-0.86 ***	-0.08 ***	-1.11 ***
	(-3.83)	(-4.89)	(-3.61)	(-6.78)
3-yr Sales Growth	$1.1.E^{-3}$	$-1.9\ E^{-3}$ *		
	(0.67)	(-1.71)		
Debt/Assets	-0.01 ***	-0.01 ***	-0.01 ***	$-4.6\ E^{-3}$ *
	(-5.60)	(-2.71)	(-4.33)	(-1.67)
Firm Age			$-1.6\ E^{-3}$	0.08 ***
			(-0.79)	(4.98)
ROA	0.05 ***	$4.2\ E^{-3}$	0.05 ***	$2.5\ E^{-3}$
	(7.21)	(0.86)	(6.89)	(0.62)
Year 2003 Dummy	0.01	-0.06 ***		
	(0.17)	(-3.68)		
Capital Expenditures / Assets			0.01	-0.01 ***
			(0.98)	(-2.95)
Country & Industry Dummies	Y		Y	
Adj. R^2	0.57	0.94	0.55	0.95
N*T (unbalanced)	948	942	888	888

** Significant at 10% level; ** at 5% level; *** at 1% level*

TABLE 4 *Continued*. HCM and Tobin's *q*: sensitivity to changes in controls
See table 3 for a discussion of the specifications. In the first pair of specifications firm age is replaced by a year 2003 dummy variable. The second pair of models includes the capital expenditures-assets ratio instead of sales growth. The last pair of models replaces the logarithm of assets by the logarithm of total sales. Pooled sample periods: 2003 and 2004. Coefficients on the HCM indexes are multiplied by 100. T-statistics based on White (1980) errors appear in parentheses.

	Dependent Variable: Tobin's *q*	
	Pooled	FE
Human Capital Management Indexes		
Organizational Learning	0.02	0.02
	(0.20)	(0.24)
Human Cap Develop	0.33 ***	0.20 ***
	(2.59)	(2.76)
Labor Practices	-0.32 **	-0.15 **
	(-2.03)	(-2.04)
Talent A & R	-0.29	-0.42 **
	(-1.20)	(-2.28)
Control Variables		
Log Assets		
3-yr Sales Growth	9.1 E^{-4}	-3.8 E^{-3} ***
	(0.55)	(-3.42)
Debt/Assets	-0.01 ***	-0.02 ***
	(-5.91)	(-5.63)
Firm Age	-1.9 E^{-3}	0.02
	(-1.00)	(1.00)
ROA	0.06 ***	0.01
	(7.34)	(1.24)
Log Sales	-0.04 **	-0.28 **
	(-2.17)	(-2.28)
Country & Industry Dummies	Y	
Adj. R^2	0.56	0.93
N*T (unbalanced)	942	942

** Significant at 5% level; *** at 1% level*

We also test whether our evidence is robust across different specifications. Table 4 reports our regression results after we change the set of control variables. In the first set of models, we replace firm age with a year 2003 dummy variable. In the second set of models, we replace three-year sales growth with the capital expenditures to sales ratio, because we deem both variables a suitable proxy for firms' potential investment opportunities (LLSV (2002), Lins (2003)). In the last set of models, we replace the natural logarithm of total assets with the logarithm of total sales. Given the bigger relative importance of the subsystems of human capital management, Table 4 does not report on the Total HCM index. The results from the alternative regressions consistently corroborate our finding that the Human Capital Development Index relates positively to Tobin's *q* values. In all specifications, the coefficient on this variable is positive and significant at either the 1% or 5% cut-off level.

Also consistent with the results of Table 3, all regressions reported in Table 4 suggest that investments dedicated to organizational learning do not lead to a higher corporate valuation. Furthermore, Table 4 sheds additional light on the economic relevance of socially desirable labor practices as measured by the labor practice index. Taken together, the results offer weak evidence of a negative relation between this index and Tobin's *q*. The negative loading on labor practices is significant at the 5% level in three out of six models and significant at the 10% level in a fourth model. Finally, the coefficient on talent attraction and retention carries a negative sign but is significant only under two specifications.[43]

Although the regression coefficients reported so far indicate a relation between human capital management and performance, they do not take into account potential non-linearity in the relation between the HCM indexes and firm value. Table 5 further illuminates the economic value of human capital management by reporting differences in the levels of Tobin's *q* between firms that rank high on an HCM index and those that rank low.

In Table 5, we construct a dummy variable for firms with a ranking that equals or exceeds 60, and dummy variable that identifies firms with a ranking equal to or below 40. These specific breakpoints ensure that the firms in our sample are almost equally distributed across the two mutually exclusive categories. In Table 5, these dummy variables replace the HCM indexes from our initial models.

The results for the dummy variables based on the four HCM subindexes are consistent with our previous evidence. Again, the Human Capital Development Index is often the most important for explaining differences in Tobin's *q*. Companies that have a score higher than or equal to 60 are valued at a premium that ranges between 0.02 and

[43] Unreported models containing a dummy variable for Nasdaq-listed firms and models that include the total number of employees instead of total assets yield similar results.

0.12. Companies that are ranked lower than or equal to 40 sell at a small (but statistically nonsignificant) discount relative to the remainder of firms in the sample.

When we compare the dummy variable coefficients, we find that an F-test consistently points to a significant difference in Q between high-ranked and low-ranked companies. In both pooled setups, the difference is significant at the 5% level. Therefore, these results support our previous evidence that human capital development systems are tied to firm valuation. Results for the dummy variables that we derive from the Total HCM score suggest that in the model with country and industry identifiers, the Tobin's q values of firms with a high HCM score exceed those of the remainder of firms by 0.07. Firms with low HCM scores have a lower valuation, but this discount is not statistically significant. However, in the firm fixed-effects model, a company does not sell at a premium when it has a high total HCM score, but is valued at a significant discount (-0.07) when it has a low ranking. The corresponding Wald test statistic indicates that the null hypothesis of a zero difference between the two dummy variable coefficients is rejected, although only in the firm fixed-effects model ($F = 3.89$, $p < 5\%$).

Taken as a whole, the important message that emerges from the analyses so far is that some, but not all, elements of human capital management display a relation with firm valuation. Although there is evidence that human capital management systems contribute to enhancing performance, our work strongly suggests that the specific constituents of the HCM concept are the most value relevant, most notably the human capital development practices that comprise a combination of skill gap management, employee training and appraisal practices, and the controlling of human capital policies.

Human Capital Management and Profitability

Here, we examine the effects of HCM on firm operating performance. We use ROA as our operating performance measure. We describe the models we estimate as:

$$ROA_{it} = \alpha_i + \sum_{j=1}^{J} \beta_j H_{j,it} + \sum_{k=1}^{K} \gamma_k C_{k,it} + \varepsilon_{it} \qquad (2)$$

where ROA_{it} is the annually reported return on assets for firm i, H_{jt} is human capital management score j, and J denotes the number of HCM included in the model. C_{kt} is the value for control variable k and K represents the number of control variables.

As in the previous section, the models we estimate also include either country and industry dummy variables or firm fixed effects. The financial control set we use in our main specifications includes the natural logarithm of total assets, past three-year sales growth, the debt-to-assets ratio, and firm age.

TABLE 5. HCM Dummy Variables and Firm Valuation

We construct a dummy variable for firms with a ranking that equals or exceeds 60, and one for firms with a ranking equal to or below 40. Wald tests on differential coefficients are reported in brackets. T-statistics based on White (1980) errors appear in parentheses. F-test statistics appear in brackets.

	Dependent Variable: Tobin's *q*			
	Pooled	FE	Pooled	FE
Total HCM Score ≥ 60			0.07 *	1.4 E-3
			(1.65)	(0.08)
Total HCM Score ≤ 40			-0.03	-0.07 **
			(-0.40)	(-2.28)
Difference			0.09	0.08 **
			[2.05]	[3.89]
Organizational Learning ≥ 60	-0.07	-0.03 *		
	(-1.64)	(-1.94)		
Organizational Learning ≤ 40	-0.07	-0.03		
	(-1.36)	(-1.33)		
Difference	0.00	0.00		
	[0.00]	[1.20]		
Labor Practices ≥ 60	0.02	4.6 E-3		
	(0.52)	(0.31)		
Labor Practices ≤ 40	0.19 **	0.01		
	(2.23)	(0.40)		
Difference	-0.17 *	-0.01		
	[3.83]	[0.04]		
Human Cap. Development ≥ 60	0.12 ***	0.02		
	(2.90)	(1.16)		
Human Cap. Development ≤ 40	-0.03	-0.05		
	(-0.44)	(-1.60)		
Difference	0.15 **	0.07 **		
	[5.25]	[4.32]		
Talent A & R ≥ 60	-0.05	-0.01		
	(-0.94)	(-0.24)		
Talent A & R ≤ 40	0.06	0.04 *		
	(1.14)	(1.72)		
Difference	-0.11	-0.05		
	[2.28]	[0.01]		
Control Variables				
Financials / C&I Dummies	Y / Y	Y / N	Y / Y	Y / N

** Significant at 10% level, ** at 5% level, *** at 1% level*

In Table 6, we present our results in two sets of regressions, based on different international samples. Panel A reports results of using the entire sample. Panel B reports results based on the sample non-Japanese and non-financial companies. Overall, Table 6 points out that the relations we observe between the HCM indexes and return on assets are not sensitive to the choice of sample. The regression results confirm our previous evidence, suggesting that the Human Capital Development Index is positively related with performance. A 100-point increase in human capital development is associated with an increase in return on assets of about 4 percentage points, all else equal. Under almost all specifications, the positive relation between this index and ROA is significant at the 5% level.

Operational performance benefits involving the other HCM indexes are much less pronounced. Neither the Talent Attraction and Retention Index nor the Labor Practices variable exhibits a statistically significant association with ROA. The relation between the Organizational Learning Index and ROA is marginally significant according to the firm fixed-effects models, but not significant in all other models.

As in previous tables, results for the Total HCM index are mixed. The coefficient on the aggregate HCM variable is significant (at the 1% level) only in the country- and industry-fixed effects model. Alternative models that include the four indexes of human capital management along with different sets of controls, presented in Table 7, tell a similar story. All regressions summarized in Table 7 yield coefficients in magnitude similar to our baseline results.

To account for nonlinear relations between operating performance and the HCM variables, we develop two dummy variables identical to those described in the previous section. We repeat our regression, but now we replace the standard HCM indexes by the dummy variables. Table 8 reports the results for different models.

Although we find some evidence that the Total HCM dummy variables can differentiate companies with higher than average ROA values from those with lower ROA values, the dummy variables that attract the most attention in Table 8 pertain to the human capital development index. Companies that rank high on the Human Capital Development Index experience a higher level of return on assets. The magnitude of operational outperformance is around 1.3 percentage points, which is not only statistically significant but also economically large. Results for lower-ranked firms are less stable. When a firm has a low ranking on the human capital development spectrum, it experiences an economically large operational underperformance (-1.51 percentage points) according to the firm fixed-effects model. However, low-ranked firms do not perform worse than the reference sample according to the pooled model with country and industry controls. Not surprisingly, the Wald test statistic for the difference in ROA between high-ranked on low-ranked companies reveals a strong, highly significant performance differential in the firm-fixed effects model but not in the pooled model.

TABLE 6. Human Capital Management and ROA: Pooled Cross-Sectional Regressions

Reported are the results for different pooled cross-sectional models of ROA. In the models, ROA is explained by several indexes of human capital management, several financial variables, and either country and industry dummy variables ("Pooled") or firm fixed effects ("FE"). "Total HCM Index" is defined as the equal-weighted average of four sub-indexes of HCM: Organizational Learning, Human Capital Development, Labor Practice, and Talent Attraction and Retention. The financial variables we use as controls are the log of a firm's total assets, past three-year sales growth, the debt-to-assets ratio, and firm age. Pooled sample periods: 2003 and 2004. T-statistics based on White errors appear in parentheses.

	Models for ROA (Full Sample)			
	Pooled	FE	Pooled	FE
Human Capital Management Indexes				
Total HCM Score			0.04 ***	0.01
			(2.61)	(0.39)
Organizational Learning	-0.01	-0.02 *		
	(-0.53)	(-1.95)		
Human Cap Develop	0.02 *	0.04 **		
	(1.94)	(2.33)		
Labor Practices	$1.80E^{-3}$	$-1.58E^{-3}$		
	(0.12)	(-0.11)		
Talent A & R	0.03	$-4.92E^{-3}$		
	(1.41)	(-0.19)		
Control Variables				
Log Assets	0.22	-8.61	0.20	-8.81
	(0.57)	(-1.40)	(0.50)	(-1.40)
3-yr Sales Growth	0.03	0.04 *	0.03	0.04 *
	(1.03)	(1.82)	(1.05)	(1.87)
Debt/Assets	-0.06 ***	-0.13 *	-0.06 ***	-0.13 *
	(-3.73)	(-1.85)	(-3.67)	(-1.76)
Firm Age	0.03 *	1.41 ***	0.03	1.41 ***
	(1.68)	(3.41)	(1.59)	(3.36)
Country & Industry Dummies	Y		Y	
Adj. R^2	0.16	0.68	0.16	0.68
N*T (unbalanced)	997	997	997	997

** Significant at 10% level, ** at 5% level, *** at 1% level*

TABLE 6 *Continued*. Human Capital Management and ROA: Pooled Cross-Sectional Regressions

Reported are the results for different pooled cross-sectional models of ROA. In the models, ROA is explained by several indexes of human capital management, several financial variables, and either country and industry dummy variables ("Pooled") or firm fixed effects ("FE"). "Total HCM Index" is defined as the equal-weighted average of four sub-indexes of HCM: Organizational Learning, Human Capital Development, Labor Practice, and Talent Attraction and Retention. The financial variables we use as controls are the log of a firm's total assets, past three-year sales growth, the debt-to-assets ratio, and firm age. Pooled sample periods: 2003 and 2004. T-statistics based on White (1980) errors appear in parentheses.

	Models for ROA (Excl. Japan & Financials)			
	Pooled	FE	Pooled	FE
Total HCM Score			0.06 ***	0.02
			(2.74)	(0.51)
Organizational Learning	-0.01	-0.02 *		
	(-0.52)	(-1.81)		
Human Cap Develop	0.04 **	0.05 **		
	(2.37)	(2.01)		
Labor Practices	0.01	$-7.12E^{-4}$		
	(0.25)	(-0.04)		
Talent A & R	0.03	$1.05E^{-3}$		
	(1.00)	(0.03)		
Control Variables				
Log Assets	-0.02	-9.27	-0.04	-9.48
	(-0.07)	(-1.43)	(-0.16)	(-1.41)
3-yr Sales Growth	-0.04 **	0.05	-0.04 **	0.05
	(-2.38)	(0.93)	(-2.47)	(1.02)
Debt/Assets	-0.07 ***	-0.16	-0.07 ***	-0.14
	(-3.51)	(-1.62)	(-3.49)	(-1.51)
Firm Age	0.02	1.41 ***	0.02	1.44 ***
	(0.85)	(3.24)	(0.71)	(3.22)
Country & Industry Dummies	Y		Y	
Adj. R^2	0.18	0.54	0.18	0.54
N*T (unbalanced)	688	688	688	688

** Significant at 10% level, ** at 5% level, *** at 1% level*

TABLE 7. HCM and Operating Performance: Sensitivity to Changes in Control Variables

See table 6 for a discussion of the pooled specifications. In the first pair of specifications, firm age is replaced by a year 2003 dummy variable. The second pair of models replaces the logarithm of assets by the logarithm of total sales. Pooled sample periods: 2003-2004. T-statistics based on White (1980) errors appear in parentheses.

	Dependent Variable: ROA (Full Sample)			
	Pooled	FE	Pooled	FE
Human Capital Management Indexes				
Organizational Learning	-0.01	-0.02 *	-0.01	-0.02 **
	(-0.68)	(-1.94)	(-0.58)	(-2.25)
Human Cap Develop	0.02 *	0.04 **	0.03 **	0.04 **
	(1.76)	(2.32)	(2.34)	2.24
Labor Practices	$-3.85\ E^{-3}$	$-1.73\ E^{-3}$	$-3.60\ E^{-3}$	-0.01
	(-0.02)	(-0.13)	(-0.02)	(-0.33)
Talent A & R	0.02	$-4.51\ E^{-3}$	0.03	-0.02
	(0.93)	(-0.17)	(1.18)	(-0.54)
Control Variables				
Constant	4.00		4.38 *	
	(1.01)		(1.77)	
Log Assets	0.30	-8.62		
	(0.76)	(-1.41)		
3-yr Sales Growth	0.03	0.04 *	0.02	-0.01
	(1.02)	(1.83)	(0.71)	(-0.39)
Debt/Assets	-0.06 ***	-0.13 *	-0.07 ***	-0.27 **
	(-3.82)	(-1.85)	(-4.21)	(-2.02)
Firm Age			0.02	0.64 ***
			(1.04)	(2.81)
Year 2003 Dummy	-1.15 ***	-1.40 ***		
	(-3.17)	(-3.41)		
Log Sales			0.12	1.49
			(0.60)	(0.76)
Country & Industry Dummies	Y		Y	
Adj. R^2	0.16	0.68	0.22	0.6
N*T (unbalanced)	997	997	997	997

** Significant at 10% level, ** at 5% level, *** at 1% level*

TABLE 8. HCM Dummy Variables and Operating Performance

We constructed a dummy variable for firms with a ranking that equals or exceeds 60, and dummy variable f firms that have a ranking equal to or below 40. Wald tests results are reported in brackets. T-statistics based on White (1980) errors appear in parentheses. F-test statistics appear in brackets.

	Pooled Cross-Sectional Models for ROA			
	Pooled	FE	Pooled	FE
Total HCM Score ≥ 60			1.30 ***	0.42
			(3.24)	(1.09)
Total HCM Score ≤ 40			-0.96	-1.39
			(-1.30)	(-1.93)
Difference			2.27 ***	1.82 *
			[10.08]	[5.18]
Organizational Learning ≥ 60	0.62	0.21		
	(1.31)	(0.66)		
Organizational Learning ≤ 40	0.77	1.14 **		
	(1.35)	(2.35)		
Difference	-0.15	-0.93 *		
	[0.07]	[3.29]		
Labor Practices ≥ 60	0.62	-0.05		
	(1.47)	(-0.14)		
Labor Practices ≤ 40	0.27	-0.11		
	(0.31)	(-0.20)		
Difference	0.35	0.06		
	[0.17]	[0.01]		
Human Cap. Development ≥ 60	1.25 ***	1.36 ***		
	(2.57)	(3.19)		
Human Cap. Development ≤ 40	0.47	-1.51 *		
	(0.75)	(-1.75)		
Difference	0.78	2.87 ***		
	[1.15]	[10.05]		
Talent A & R ≥ 60	0.77	-0.61		
	(1.36)	(-1.41)		
Talent A & R ≤ 40	-0.18	0.56		
	(-0.34)	(1.04)		
Difference	0.95	1.17		
	[1.59]	[2.28]		
Control Variables				
Financials / C&I Dummies	Y / Y	Y / N	Y / Y	Y / N

** Significant at 10% level, ** at 5% level, *** at 1% level*

Consistent with the Tobin's *q* section, the results of this section suggest that a subset of the aggregate HCM index is the one most closely tied to operating performance. Again, the evidence points to the value of the human development system.

Robustness: Local Evidence, Endogeneity, Causility, and Productivity Effects

Country-specific evidence

To coordinate our results with previous research that has primarily collected evidence from U.S. and U.K. samples, we also present results specific to these two countries. Also due to data limitations, our country-specific analyses are confined to the United States and the United Kingdom. Thus, our U.K. and U.S. results should still be interpreted with caution because the cross-section of firms in these two countries remains quite small.

Table 9 documents the estimation results for different models that use *Q* and ROA as the regressant. Despite the fact that the country-specific analyses are potentially vulnerable to a small-sample bias, the majority of regressions support those based on the global sample. We observe positive coefficients for the Human Capital Development Index, regardless of the choice of dependent variable. The coefficient on this index is statistically significant below the conventional cut-off levels in six out of eight cases. The small-sample problem seems to show up in the magnitude of the coefficients, which varies substantially across the different models. Country-specific regressions with the alternative controls, including a year dummy variable, capital expenditures/assets, and the logarithm of sales, produce similar results and confirm our conclusion. However, the parameter instabilities suggest that the results require careful economic interpretation.

Two-Stage Least Squares Regressions

Here, we discuss a robustness test to manage possible endogeneity bias in our research design. We follow Huselid (1995), who uses a two-stage least squares approach to check the robustness of the link he observes between human resource management and performance. Our focus is on the Human Capital Development Index, which consistently displays a relation to both *Q* and ROA. In some robustness tests, we investigate the coefficient on the Human Capital Development Index by using two-stage least squares, which allows this index to be endogenous.

One of the main problems of the approach concerns the identification of appropriate instrumental variables that are uncorrelated with the errors of the structural equation (with performance as the dependent variable) and partially correlated with the endogenous independent variable. As a result, the findings in this section should be interpreted with care.

Table 10 shows results based on the fixed-effects models determined with the instrumental-variables (IV) approach. In this table, each model differs in either the choice

TABLE 9. HCM and firm performance: Results for U.S. and U.K. subsamples

See tables 3 and 6 for a discussion of pooled specifications for Tobin's *q* and ROA. The left panel reports models for Tobin's *q* using a sample of U.S. firms and U.K. firms, respectively. Coefficients on the HCM indexes are multiplied by 100 in the Tobin's *q* models. The right panel presents models for ROA based on the U.S. and U.K. sample, respectively. Pooled sample periods: 2003 and 2004. T-statistics based on White errors are in parentheses.

	Dependent Variable: Tobin's *q*				Dependent Variable: ROA			
	Pooled USA	FE USA	Pooled UK	FE UK	Pooled USA	FE USA	Pooled UK	FE UK
Human Capital Management Indexes								
Organizational Learning	$1.27E^{-3}$	-0.09	$1.39E^{-3}$	$3.91E^{-3}$	0.02	-0.08 **	-0.05 **	-0.05 *
	$(-4.49E^{-3})$	(-0.34)	(0.69)	(0.28)	(0.89)	(-2.46)	(-1.98)	(-1.84)
Human Cap Develop	0.99 **	1.06 ***	0.50 **	0.06	0.02	0.24 ***	0.10 ***	0.07 **
	(2.22)	(3.55)	(2.27)	(0.28)	(0.69)	(3.13)	(3.52)	(2.27)
Labor Practices	-0.34	-0.24	-0.60 **	-0.39 *	-0.02	-0.03	-0.01	0.02
	(-0.62)	(-0.96)	(-2.18)	(-1.90)	(-0.36)	(-0.70)	(-0.18)	(1.23)
Talent A & R	-0.89	-0.26	-0.39	-0.01	0.03	0.09	0.05	0.02
	(-1.26)	(-0.97)	(-0.65)	(-0.02)	(0.65)	(1.61)	(0.79)	(0.40)
Control Variables								
Financials, C&I Dummies	Y / Y	Y / N	Y / Y	Y / N	Y / Y	Y / N	Y / Y	Y / N
Adj. R^2	0.55	0.95	0.68	0.92	0.28	0.59	0.28	0.80
N*T (unbalanced)	159	159	139	139	171	171	147	147

** Significant at 10% level, ** at 5% level, *** at 1% level*

TABLE 10. Two-Stage Least Squares Regressions

Reported are fixed-effect models based on a two-stage least squares methodology. Note: IV set 1 contains past stock alpha and firm age as incremental instruments, set 2 additionally includes talent attraction and retention. Pooled sample periods: 2003 and 2004. Coefficients on the HCM variables are multiplied by 100 in Tobin's *q* models. T-statistics based on White (1980) errors appear in parentheses.

	Models for Tobin's *q*		Models for ROA	
	2SLS/IV (Set 1)	2SLS/IV (set 2)	2SLS/IV (Set 1)	2SLS/IV (set 2)
Human Capital Management Indexes				
Human Cap. Develop	0.13 ***	0.83 **	0.44 ***	0.35 ***
	(2.77)	(2.13)	(3.02)	(3.10)
Control Variables				
Log Assets	-0.92 ***	-0.85 ***	-10.94	-9.86
	(-3.07)	(-3.03)	(-1.15)	(-1.06)
3-yr Sales Growth	$-1.46E^{-3}$	$-1.88E^{-3}$	0.05	0.04
	(-0.83)	(-1.13)	(1.18)	(1.10)
Debt/Assets	-0.01	-0.01 **	-0.04	-0.08
	(-1.47)	(-2.12)	(-0.30)	(-0.68)
ROA	$2.33E^{-3}$	$3.92E^{-3}$		
	(0.27)	(0.46)		
N*T (unbalanced)	936	936	990	990

** Significant at 10% level, ** at 5% level, *** at 1% level*

of financial dependent variable or the instruments.

One set of (incremental) instruments includes a firm's past annual stock return relative to sample average return, and firm age. We base our decision to rely on past excess stock returns on Lins (2003) and other work on corporate valuation. Although Lins (2003) uses this variable in the context of corporate governance, we hypothesize that high past returns motivate a company to put more emphasis on human capital development in response to investors' and competitors' increased interest in the firm. We assume that age effects on Tobin's q are subsumed by the firm size variable in our structural model. A second instrumental set contains the Talent Attraction and Retention Index, building on the assumption that firms use human capital development practices to safeguard the success of their investments in talent attraction. The results corroborate our earlier findings. The positive index sensitivities, in both Tobin's q and ROA models, remain significant at the 5% level. However, the estimated magnitudes of the relation between human capital development and performance are somewhat unstable across the different models.

Past Performance and Human Capital Management

One question that arises frequently in theoretical literature on human resource management and related work on corporate social responsibility is whether greater useof human capital management practices explains better performance, or whether the use of HCM systems is a result of financial performance realized in the past. It is theoretically possible that firms that performed well in the past have more financial capacity available for investments in human capital management systems. This theory, which Waddock and Graves (1997) refer to as the slack resources theory suggests that past financial performance explains future values of our HCM indexes. Guest, Mitchie, Conway and Sheehan (2003) explore both possibilities for most commonly used HRM practices and Waddock and Graves (1997) examine financial factors that could affect a firm's employee relations. Their results are inconclusive.

In unreported robustness tests, we focused on the slack resources theory, where we estimated models that describe the HCM variables using two-year lagged values for the performance measures and controls as explanatory variables. Similar to Waddock and Graves (1997), we independently used each of the four indexes of human capital management as a dependent variable. Like earlier studies, our evidence is too inconclusive to make a strong case against the slack resources theory. However, we hasten to point out methodological limitations. An important avenue for further research would be to explore the theory using more rigorous causality tests for panel data, and using longitudinal than span much more than the two years covered by this study.

Productivity effects

Previous sections illustrate the explicit interest in financial measures that are common to most financial studies on factors that affect corporate performance. There is also research that prefers productivity as the output variable rather than profitability measures and Tobin's *q*. The choice of outcome variable is the subject of debate in HCM papers. Several studies advocate tying HCM to variables other than profitability and market valuation measures. The underlying rationale is that there are factors that interfere with the link between HCM practices and conventional financial criteria, for example, the effect of human capital management systems on labor productivity. On the other hand, productivity measures cannot adequately describe the true value of HCM, since they disregard costs that adversely affect profitability.

Nevertheless, to ensure that our study covers all the possibilities, we also test whether a greater deployment of HCM practices translates into higher productivity in our pooled cross-section setup. Using Batt's (1999) and Capelli and Neumark's (2001) productivity measure, which we define as the natural logarithm of the ratio of sales to total employees, we estimate models similar to those outlined previously. In specifications for return on assets, we replace the ROA variable with productivity and separately estimate a model with country and industry dummies and a model with fixed-effects. The results of these unreported robustness test support our base results: the evidence suggests that the Human Capital Development Index is positively and significantly associated with productivity, even at the 5% level, but in almost all of the models we investigate, the coefficients on all other HCM indexes are not statistically significant. Consequently, although the productivity benefits of human capital management are not the central theme of our paper, our work can be reconciled with research that documents positive productivity effects from HCM investments (see, e.g., Ichniowski, Shaw, and Prennushi (1997), Ichnioswki and Shaw (1999), Cappeli and Neumark (2001), Black and Lynch (2004)) .

Human Capital Management and Stock Returns

Having explained the degree to which human capital management enhances firm value and operating performance, we now investigate whether human capital variables are useful predictors of stock returns. Prior research links human capital management decisions to stock price reactions by using an event window method, under the assumption that the market quickly and accurately impounds new value-relevant information into firms' equity prices. In that framework, firms' long-run stock return is equal to the cost of equity and purely a function of nondiversifiable risk factors. Here, we investigate whether HCM indexes can explain stock returns beyond a short-run event window.

One the one hand, conventional asset pricing theories posit that firm-specific characteristics help to explain the cross-section of stock returns because these firm-specific features are proxies for priced risk factors, rather than instruments for identifying mispriced securities. In the context of human capital, this possibility has been raised, for example, by Hansson (2004), who argues that labor-intensive firms behave like value stocks. On the other hand, predictable patterns could point to a mispricing story such as that in Lakonishok, Schleifer, and Vishny (1994). To deepen our understanding of the nature of a possible predictive relation, we examine whether HCM variables explain raw returns as well as risk-adjusted returns.

We can state the cross-sectional models for describing raw individual firm returns as:

$$r_{it} - R_{ft} = c_i + \sum_{j=1}^{J} \beta_j H_{j,it} + \sum_{k=1}^{K} \gamma_k C_{k,it} + \varepsilon_{it} \tag{3}$$

where r_{it} - R_{ft} indicates the return on firm i or in excess of the risk-free rate of return after log transformation, H is the value corresponding to human capital management variable j, C is the value for control variable k, and β_j and γ_k denote the coefficients on the j-*th* and k-*th* regressor.

The control variables in C are well documented in empirical return predictability literature. (See, e.g., Fama and French (1992), Jegadeesh and Titman (1993) and Brennan, Chordia, and Subrahmanyam (1998).) First, because much research finds a negative relation between stock returns and firm size (e.g., Banz (1981)) the control set includes the firm's market capitalization after logarithmic transformation as an explanatory variable. In response to Fama and French's (1993) evidence of a pervasive value effect in stock returns, we also include the logarithm of the ratio of the company's price-to-book ratio. Third, we include a firm's annual dividend yield. Our last control variable describes the return history of the stock. Research finds that this variable captures return reversal patterns and/or stock price momentum (e.g., Jegadeesh and Titman (1993), De Bondt and Thaler (1985)), and we define our price history variable as the cumulative three-year return observed over the last year. The variables are lagged one year to avoid look-ahead bias and to ensure their predictive nature.

The risk-adjusted returns we utilize in a second model are incrementally valuable for understanding the nature of a possible relation between predictor variables and returns. The intuition of widely popularized asset pricing theories underpinning equation (3), such as the equilibrium version of the APT, tells us that returns depend only on risk characteristics. To test the predictive ability of HCM variables beyond any risk-return relationship we follow the two-stage approach advanced by Brennan, Chordia, and Subrahmanyam (1998), which ultimately involves the following regression:

$$R_{it}^{*} = c_i + \sum_{j=1}^{J} \beta_j H_{j,it} + \varepsilon_{it}^{\otimes} \quad (4)$$

where R_{it}^{*} is a measure of risk-adjusted return that we derive in the following manner: because our sample is globally oriented, we first develop a series of expected annual returns for these firms, as predicted by a market equilibrium model with four risk factors introduced by Fama and French (1993) and extended by Carhart (1997). Our four factor-mimicking portfolios are global variants of their U.S. counterparts, which we developed after sorting all stocks in the global Worldscope universe on firm size, the book-to-market ratio, and past returns. To obtain firms' expected returns according to a global four-factor model, we estimate their sensitivity annually for the four factors, using a 60-month rolling window framework:

$$r_{it} = \alpha_i + \beta_{1i}\left(R_{wt} - R_{ft}\right) + \beta_{2i} SMB_{wt} + \beta_{3i} HML_{wt} + \beta_{4i} MOM_{wt} + \varepsilon_{it}^{*} \quad (5)$$

where $R_{wt} - R_{ft}$ is the monthly return on the world market proxy based on the Worldscope universe above the risk-free rate of return, SMB_w is the return differential between a global small firms portfolio and a large firms portfolio, HML_w is the return difference between a global portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks, and MOM_w is a momentum portfolio that buys stocks with the highest prior 12-month return and sells short past 12-month losers, and where SMB_w, HML_w and MOM_w are constructed in line with the sorting procedure outlined in Fama and French (1993) and Carhart (1997). Using the OLS estimates obtained for the four factor loadings at the end of year t-1, we risk-adjust the annual returns realized in year t in the following manner:

$$R_{it}^{*} = r_{it} - R_{ft} - \left[\beta_{1i,t-1}\left(R_{wt} - R_{ft}\right) + \beta_{2i,t-1} SMB_{wt} + \beta_{3i,t-1} HML_{wt} + \beta_{4i,t-1} MOM_{wt}\right] \quad (6)$$

We provide further details on the construction of the global four-factor model in the appendix.

We do not estimate equations (3) and (4) with pooled regressions because pooled cross-sectional models for stock returns are highly underdeveloped and the use of lagged dependent variables (i.e., past three-year returns) requires a dynamic panel structure. Instead, we choose to estimate two independent sets of cross-sectional models, that is, one set for explaining the cross-section of returns in 2003 and one set for 2004. Table 11 presents the models for raw and risk-adjusted returns. Table 12 replaces the HCM variables with the dummy variables that distinguish high-ranked from low-ranked firms based on a specific HCM index. (See previous sections for a description of the dummy variables.) The control variables carry signs according to expectation.

The loadings on the HCM variables and their respective *t*-statistics tell a consistent story: although the HCM variables have been linked to firm performance, they are not significant predictors of individual stock returns. When we use the two extreme dummy variables for allocating firms to mutually exclusive categories with distinctive HCM scores, we find no material differences in returns. When we apply a Wald test to the difference between the coefficient on the high-ranked firms dummy and that on the low-ranked dummy, the results suggest that high-ranked firms do not have a significantly higher or lower average return, irrespective of the HCM index we use for dummy classification.

To overcome statistical caveats due to noisiness in individual security returns, we also form diversified portfolios. We note that the advantage of testing diversified portfolios comes at the expense of a small-sample problem, since we only have two years of data to develop portfolios of stocks sorted on human capital ranking. Therefore, we extend the 2003 data backwards three additional years and the 2004 data forward one year, under the assumption that the ratings are time-invariant over this period. Given this assumption, the portfolio analysis that follows can be incrementally informative about the predictive ability of HCM variables, but it cannot be considered an explicit test of mispricing. It is not clear whether investors could have foreseen the return patterns in real time.

Beginning with the end of June, starting in 2000 and ending in 2005, we rank all available stocks on one of the four HCM variables. We then allocate all firms rated 60 or higher to a high-ranked portfolio, which is in line with the breakpoints we adopted to construct the two dummy variables in the regressions. The low-ranked portfolio covers all companies that have a ranking of 40 or less. We keep the portfolio composition simple. We equal-weight the two portfolios and ignore transaction costs. After controlling for the portfolios' market risk and their investment style characteristics, we report the average annual return of the portfolios, as measured by the global four-factor model described earlier, in Table 13. The performance evaluation period is July 2000-December 2005.The most interesting results are the positive excess returns on, respectively, the stock portfolio of companies that rank low on the Labor Practice Index and the portfolio of companies ranked highest on the Talent Attraction Index. The positive returns on these portfolios are economically and statistically significant. The portfolio of firms with weak labor practice indicators earned 5.3 percent per year on a risk- and style-adjusted basis, which is statistically significant at the 10% level. Its performance relative to its high-ranked counterpart is more than 7 percent and highly significant. The excess return on the strong Talent Attraction portfolio is in the order of 7 percent and significant at the 5% level. In contrast, the portfolios developed using the other HCM indexes do not produce statistically

TABLE 11. Cross-Section Regressions of Stock Returns

The table reports year-by-year cross-sectional regressions with, respectively, raw excess return and risk-adjusted return as dependent variable. Risk-adjusted return is defined as:

$$R_{it}^{*} = r_{it} - R_{ft} - \left[\beta_{1i,t-1}\left(R_{wt} - R_{ft}\right) + \beta_{2i,t-1}SMB_{wt} + \beta_{3i,t-1}HML_{wt} + \beta_{4i,t-1}MOM_{wt}\right]$$

where SMB_w, HML_w and MOM_w are constructed in line with the sorting procedure of Fama and French (1993) and Carhart (1997). The controls are the natural logarithm of market value of equity, the natural logarithm of the price-to-book ratio, the dividend yield, past 3-year stock return, and country and industry dummies. Each model includes one-year lagged values of the explanatory variables. T-statistics based on White (1980) errors appear in parentheses.

	Raw Excess Return		Risk-Adjusted Return	
	2003	2004	2003	2004
Human Capital Management Indexes				
Organizational Learning	$7.73E^{-4}$	$-2.88E^{-4}$	$1.27E^{-3}$	$-3.06E^{-4}$
	(0.90)	(-0.43)	(0.75)	(-0.44)
Human Cap. Develop	$1.65E^{-4}$	$2.37E^{-4}$	$-1.29E^{-4}$	$4.49E^{-4}$
	(0.17)	(0.30)	(-0.14)	(0.57)
Labor Practices	$-1.18E^{-3}$	$1.39E^{-4}$	$-1.83E^{-3}$	$-4.31E^{-5}$
	(-1.01)	(0.14)	(-1.50)	(-0.04)
Talent A & R	$1.51E^{-3}$	$9.70E^{-4}$	$2.04E^{-3}$	$2.39E^{-4}$
	(0.83)	(0.71)	(1.13)	(0.18)
Control Variables				
Intercept	0.20	0.21 *	0.11	0.29 **
	(1.11)	(1.77)	(0.75)	(2.37)
Log (Market Value Equity)	-0.02	-0.02 *	-0.01	-0.02 **
	(-1.55)	(-1.82)	-(0.43)	(-2.11)
Log (Price-to-Book)	-0.06 **	-0.04	-0.07 **	-0.04
	(-2.16)	(-1.64)	-(2.56)	(-1.45)
Dividend Yield	0.02	0.01 *	0.01	0.01 *
	(1.65)	(1.74)	(1.36)	(1.65)
Past 3-year Return (log)	0.02 ***	0.07 ***	0.02	0.07 ***
	(4.11)	(2.78)	(0.06)	(2.73)
Country & Industry Dummy	Y	Y	Y	Y
Adj. R^2	0.39	0.34	0.40	0.34
N	445	440	407	412

** Significant at 10% level, ** at 5% level, *** at 1% level*

TABLE 12. Regressions of Stock Returns on HCM Dummies

The year-by-year cross-sectional regressions include, respectively, raw excess return and risk-adjusted return as dependent variable; see Table 11 for details. We constructed a dummy variable for firms with a HCM ranking that equals or exceeds 60, and a dummy variable for firms that have a ranking equal to or below 40. T-statistics [F-statistics] based on White (1980) errors appear in parentheses [brackets].

	Raw Excess Return		Risk-Adjusted Return	
	2003	2004	2003	2004
Human Capital Management Dummies				
High Talent A&R Dummy	0.04	-0.02	0.05	-0.02
	(1.28)	(-0.91)	(1.26)	(-0.95)
Low Talent A&R Dummy	-0.01	-0.08 **	-0.02	-0.06 *
	(-0.26)	(-2.32)	(-0.40)	(-1.93)
Difference	0.05	0.06	0.07	0.04
	[1.11]	[2.40]	[1.48]	[1.24]
High Labor Practice Dummy	-0.03	0.01	-0.06 *	0.01
	(-0.89)	(0.24)	(-1.82)	(0.27)
Low Labor Practice Dummy	0.03	0.00	0.01	0.01
	(0.55)	(0.07)	(0.15)	(0.20)
Difference	-0.06	0.01	0.07	0.00
	[1.14]	[0.00]	[1.55]	[0.00]
High Human Cap. Develop	0.01	0.05 *	0.01	0.05
	(0.15)	(1.67)	(0.19)	(1.58)
Low Human Cap. Develop	-0.02	0.08 *	-0.03	0.07
	(-0.56)	(1.94)	(-0.62)	(1.65)
Difference	0.03	-0.03	0.04	-0.02
	[0.40]	[0.52]	[0.57]	[0.27]
High Organizational Learning	-0.03	-0.03	-0.02	-0.04
	(-0.87)	(-1.30)	(-0.61)	(-1.51)
Low Organizational Learning	-0.07 *	-0.01	-0.08 *	-0.02
	(-1.71)	(-0.24)	(-1.92)	(-0.50)
Difference	0.04	-0.02	0.06	0.02
	[1.00]	[0.44]	[1.90]	[0.26]
Control Variables				
Financials / C&I Dummies	Y / Y	Y / N	Y / Y	Y / N

* *Significant at 10% level, ** at 5% level, *** at 1% level*

TABLE 13. Risk-Adjusted Returns of Equity Portfolios Formed on HCM Indexes

We report the average returns on portfolios of stocks ranked on indexes of human capital management after controlling for market risk exposure and investment style. Risk-adjusted returns are estimated by global variant of the four-factor model of Carhart (1997). The four factors are the excess return on a global market portfolio of all stocks in the Worldscope universe (Beta), a global small-large cap (SMB_w) return spread, the spread between a high book-to-market and low book-to-market portfolio (HML_w), and the return on a portfolio (MOM_w) that buys prior 12-month return winners and sells short losers. The construction of the factors is detailed in the appendix. Risk-adjusted return (Alpha) is annualized. T-statistics based on Newey-West (1987) errors appear in parentheses.

Portfolio	Alpha	Beta	SMB_w	HML_w	MOM_w	Adj. R^2
High Organizational Learning	3.42%	0.94 ***	-0.19	0.30 ***	-0.13 **	0.87
	(1.15)	(15.53)	(-1.20)	(3.74)	(-1.99)	
Low Organizational Learning	1.50%	0.88 ***	0.09	0.31 ***	-0.13 *	0.84
	(0.46)	(14.86)	(0.49)	(3.39)	(-1.91)	
Difference	1.92%	0.06 *	-0.28 ***	-0.02	$5.77E^{-4}$	
	(1.28)	(1.86)	(-3.95)	(-0.44)	(0.02)	
High Human Cap. Development	3.96%	0.89 ***	-0.09	0.26 ***	-0.14 *	0.86
	(1.34)	(15.44)	(-0.44)	(3.10)	(-1.88)	
Low Human Cap. Development	1.94%	0.93 ***	0.17	0.25 ***	-0.17 **	0.83
	(0.53)	(13.55)	(0.91)	(2.81)	(-2.24)	
Difference	2.03%	-0.03	-0.26 ***	0.01	0.02	
	(1.41)	(-0.88)	(-2.93)	(0.23)	(0.56)	

** Significant at 10% level, ** at 5% level, *** at 1% level*

TABLE 13 ***Continued*****. Risk-Adjusted Returns of Equity Portfolios Formed on HCM Indexes**

We report the average returns on portfolios of stocks ranked on indexes of human capital management after controlling for market risk exposure and investment style. Risk-adjusted returns are estimated by global variant of the four-factor model of Carhart (1997). The four factors are the excess return on a global market portfolio of all stocks in the Worldscope universe (Beta), a global small-large cap (SMB_w) return spread, the spread between a high book-to-market and low book-to-market portfolio (HML_w), and the return on a portfolio (MOM_w) that buys prior 12-month return winners and sells short losers. The construction of the factors is detailed in the appendix. Risk-adjusted return (Alpha) is annualized. T-statistics based on Newey-West (1987) errors appear in parentheses.

Portfolio	Alpha	Beta	SMB_w	HML_w	MOM_w	Adj. R^2
High Labor Practice Portfolio	1.83%	1.09 ***	0.14	0.48 ***	-0.36 ***	0.83
	(-0.50)	(11.45)	(0.50)	(3.05)	(-2.98)	
Low Labor Practice Portfolio	5.31% *	0.92 ***	0.18	0.14 **	-0.19 **	0.84
	(1.74)	(10.91)	(1.25)	(2.02)	(-1.96)	
Difference	-7.14% **	0.17 *	-0.04	0.33 **	-0.16	
	(-2.08)	(1.70)	(-0.18)	(2.46)	(-1.08)	
High Talent Attraction Portfolio	7.10% **	0.91 ***	-0.12	0.29 ***	-0.13	0.83
	(2.02)	(13.48)	(-0.59)	(3.88)	(-1.38)	
Low Talent Attraction Portfolio	3.05%	0.96 ***	$1.78\ E^{-3}$	0.23 **	-0.27 ***	0.87
	(0.90)	(13.38)	(0.01)	(2.34)	(-4.54)	
Difference	4.05% *	-0.05	-0.13	0.06	0.14 **	
	(1.93)	(-0.99)	(-0.83)	(0.75)	(2.28)	

** Significant at 10% level, ** at 5% level, *** at 1% level*

significant excess returns. This result suggests that information about human capital development and organizational learning practices is not a source of abnormal return.

The results of this section are mixed, but also intriguing. Not finding a significant predictive relation in the set of regressions suggests that stock prices accurately incorporate the value relevance of firms' human capital management systems. However the portfolio study paints a different picture. The two indexes of HCM that almost consistently failed to be capable of explaining operating performance (ROA) and firm value (Tobin's *q*) seem to convey information about (risk-adjusted) stock returns in our portfolio analysis.

Human Capital Management and Earnings Surprises

Generally, there are three ways to interpret abnormal returns. The first explanation is that the abnormal differential returns between two portfolios arise because of a risk factor or other attribution factor that is omitted from the performance evaluation model. A second possibility is that the results are due to sample-specific issues, data snooping, bias emerging from extending the indexes backwards, or random luck. A third explanation is that financial markets "misprice" HCM-based sources of firms' cash flow to investors. Studies on return anomalies suggest that abnormal returns trace back to errors in analysts' earnings expectations (e.g., La Porta (1996)). To add insights to our mixed return evidence, this section builds on the same intuition to explore whether investors are surprised by the earnings of firms that differ in HCM policy. For example, under an errors-in-expectations hypothesis, we can explain the relative outperformance of a stock portfolio of firms with poor Labor Practice Index ratings by pointing to investors' mistakes about the operating performance of these companies. Since our regressions do not show any significant relation between the Labor Practice Index and operating performance, one hypothesis supporting the portfolio return patterns, subject to our other results, would be that investors expect firms with poor labor practice values to display inferior operating performance while these companies actually did not.

As a proxy for investor earnings surprise, we use analysts' earnings forecasts data from IBES to derive consensus earnings forecast errors. We define such errors as the difference between companies' actual earnings at the end of a fiscal year and the mean one-year forecast earnings for that year, following the approach of Laporta (1996), Levis and Liodakis (2001), and Core, Guay, and Rusticus (2005). The implicit assumption we make is that investors' forecasts are at least equally informed as analysts' earnings forecasts. We regress the earnings forecast error against the four HCM indexes and a set of controls that are sources of abnormal return (see the previous section). The base model is:

$$EPSERROR_{it} = \alpha_i + \sum_{j=1}^{J} \beta_j H_{j,it} + \gamma_1 Size_{it} + \gamma_2 PB_{it} + \gamma_2 DY_{it} + \gamma_3 PR3Y_{it} + \gamma_4 Year2003 + \varepsilon_{it} \qquad (7)$$

We define EPSERROR as the price-deflated difference between the actual earning per share and the mean earnings per share forecast. We measure firm size by the natural logarithm of market value of equity. PB is the logarithm of the price-to-book ratio, DY is the annual dividend yield, PR3Y is past three-year return, and Year2003 is a year dummy.

Table 14 reports pooled models with country and industry dummies and the fixed model. To increase the number of observations, we also report models that omit past returns. Overall, the regression results contrast with the stock portfolio evidence. Table 15 displays a significant, positive coefficient on the Labor Practice Index in fixed-effect models and a positive but nonsignificant coefficient in pooled models with country and industry dummies. Only a negative loading on this index would be consistent with the stock portfolio evidence. However, according to our models, the actual-expected earnings gap widens positively (becomes less negative) as a company's performance on the Labor Practice Index increases. The coefficients on the other HCM indexes are not significantly different from zero. This finding is consistent with the hypothesis that the value relevance of human capital systems is correctly embedded in market prices.

Overall, the results support the view that investors accurately assess the economic consequences of HCM. Our findings suggest that evidence of abnormal stock (portfolio) returns from HCM practices is either a chance outcome, or else is caused by other factors correlated with HCM.

5.5. DISCUSSION AND CONCLUDING REMARKS

Human resources play an important role in firms' ability to create value. There are many possible benefits to managing human capital, if it is managed in the right way, and inherently there are associated costs that warrant careful attention, with the net effect being an empirical question. Using a sample of firms around the world, our study's goal is to determine whether – and which – systems of human capital management contribute to enhancing firm performance.

Our results partially support the view that HCM practices relate to firm value and operating performance. Investments in human capital management systems can foster better corporate financial performance, but it becomes apparent that some but not all systems are economically valuable. One important conclusion that we can derive from our results is that too aggregated measures of HCM performance might conceal financially relevant information. By contrast, research on HCM at disaggregated levels yield interesting results.

Despite being popularized in several media, in our sample firms' talent attraction and retention does not account for better profitability and firm valuation. Instead, we find that a human capital development system, one that utilizes skill gap management,

Table 14. Earning Forecast Errors and HCM Indexes

Reported are pooled cross-sectional regressions with the earnings forecast error as the dependent variable. We estimate both a pooled model with country and industry dummies and a fixed effects model. Controls are a year 2003 dummy and one-year lagged values of firm size (market value of equity), price-to-book, dividend yield, and past three-year return. Pooled cross-section period: 2003-2004. T-statistics based on White errors are in parentheses.

	Dependent Variable: (Actual EPS - Forecast EPS) / $Price_{t-1}$			
	Pooled	FE	Pooled	FE
Human Capital Management Indexes				
Talent A & R	-0.04	0.1 E^{-2}	-0.04 *	0.01
	(-1.63)	(0.06)	(-1.72)	(0.48)
Human Cap Develop	-0.01	-0.06	-0.01	-0.05
	(-1.00)	(-1.65)	(-0.85)	(-1.48)
Organizational Learning	0.2 E^{-2}	-0.01	-0.6 E^{-4}	-0.01
	-0.24	(-0.90)	(-0.01)	(-0.94)
Labor Practices	0.04	0.05 **	0.04	0.04 **
	(1.43)	(2.02)	(1.56)	(2.06)
Control Variables				
Constant	4.54		4.34	
	(1.63)		(1.63)	
Log (Market Value Equity)	-0.20 *	1.45 *	-0.17 **	1.29 *
	(-1.85)	(1.88)	(-2.05)	(1.71)
Log (Price-to-Book)	-0.14	1.80	-0.16	1.32
	(-0.62)	(1.56)	(-0.67)	(1.46)
Dividend Yield	-0.04	-0.33 **	-0.11	-0.30 **
	(-0.60)	(-2.02)	(-0.64)	(-1.98)
Past 3-Year Return (log)	-0.80	-0.50		
	(-0.06)	(-0.30)		
Year 2003 Dummy	-0.33	-0.66 **	-0.27	-0.50 *
	(-0.86)	(-2.42)	(-0.71)	(-1.92)
Country & Industry Dummies	Y		Y	
N*T (unbalanced)	642	642	708	708

** Significant at 10% level, ** at 5% level, *** at 1% level*

employee training and appraisal methods, and which controls human capital management effectiveness, contributes positively to corporate economic performance. Our regressions indicate that greater use of human capital development practices is associated with a higher Tobin's q and a higher return on assets. The ties to both Q and ROA suggest that human capital development practices not only improve operating performance, but also encompass sources of intangible value. These findings display parallels with Pfeffer (2001), who suggests that a company benefits from the potentials of its current employees by allowing them to undergo constant development through, e.g., training, appraisal, and teamwork. Parts of the benefits may be realized because employees develop skills that are firm-specific and of little use to direct competitors, as Koch and McGrath (1996) and Rappaport (1998) suggest.

Not finding a relation between talent attraction and retention systems and performance could possibly be harmonized with Pfeffer (2001), who asserts that in waging "the war for talent", a firm creates an organizational culture (i) that fosters internal competition rather than a teamwork environment, (ii) demotivates employees within the firm because it glorifies the idea that better human capital is found outside the organization, and (iii) that ultimately harbors a pool of overconfident and "money-minded" workers instead of company-loyal and productive ones.

Evidence for the other two indexes of HCM practices is not pronounced. Organizational learning systems do not seem to relate to Q and ROA. Admittedly, the functioning of knowledge management systems can be hampered by a free-rider problem similar to that plaguing incentive pay plans. Conflicts of interest may cause employees not to share their knowledge and expertise among co-workers unless the firm guarantees appropriate compensation (Cabrera and Cabrera (2002)).

The evidence on the Labor Practices Index contributes to ongoing discussions on the CSR-financial performance relation. The disclosure of socially desirable labor practices is neither associated with operating performance nor with intangible value. While this observation might imply that the social side of HCM practices is viewed neither favorably nor unfavorably by capital market investors, possibly because CSR is considered a contentious concept, we note that the measure we use in our study reflects information transparency and offers no content on firms' socially responsible labor practices as such.

Last, we lay the foundations for research on markets' assessment of the value added by HCM and its implications for both mainstream and socially responsible investors. If HCM is not well understood in financial markets, the possibility of return predictability due to misprising arises. We investigate associations between the HCM indexes and variation in stock returns and earnings surprises. Our three tests produce mixed results and jointly do not provide compelling evidence that predictable patterns in stock returns could emerge because investors fail to accurately understand the economic implications of human capital management. As more time-series data becomes available, future research should explore the stock return implications of HCM practices in greater length.

APPENDIX: Global Four Factor-Mimicking Benchmark Portfolios

To evaluate and risk-adjust international equity portfolio returns, we estimate for each portfolio a global version of multifactor performance models originally developed by Fama and French (1993) and extended by Carhart (1997). We build the global factor-mimicking portfolios by using all stocks around the world covered by the Worldscope database. One important benefit of the Worldscope stock data is that it covers over 98% of total market capitalization. The Carhart (1997) model comprises four tradable portfolio return series.

We construct the first portfolio return series by deducting the monthly U.S. T-bill rate from the monthly return on the Worldscope global market proxy. Following Fama and French (1993), we add two regressors, SMB_w and HML_w. SMB_w is the return difference between a small-cap portfolio and a large-cap portfolio. HML_w is the difference in return between a value (high book-to-market stocks) portfolio and a growth portfolio (low book-to-market). We obtain our versions of Fama and French's SMB and HML by composing the six value-weighted portfolios that we form based on firms' market value and the book-to-market ratio. The small-cap-value, small-cap-neutral and small-growth portfolios cover the bottom 20% of total market capitalization after we rank all stocks according to size. We allocate the remaining part (large value, large neutral, and large growth) to the large cap portfolio. Within each size segment, the value and growth portfolios both cover 30% of total capitalization and the neutral portfolio covers the remaining 40%. We compute SMB_w as the average return on the three small-stock portfolios minus that of the three large-stock portfolios:

SMB_w = 1/3 (Small Value + Small Neutral + Small Growth) - 1/3 (Large Value + Large Neutral + Large Growth).

We define HML_w as the average return on the two value-stock portfolios minus the average return on the two growth-stock portfolios,

HML_w = 1/2 (Small Value + Large Value) - 1/2 (Small Growth + Large Growth).

The fourth factor, MOM_w, is the return on a global momentum portfolio. We define MOM_w as:

MOM_w = the monthly return difference between a prior 12-month return winners portfolio and a prior 12-month returns losers portfolio.

After sorting all stocks on their previous 12-month returns, we classify the top 30% of the market (in terms of market capitalization) as winners and the bottom 30% as losers. We rebalance all portfolios annually at the end of June and ignore transaction costs. Table 15 presents summary statistics on the portfolios.

TABLE 15. Statistics on Global Four-Factor Benchmark Portfolios

The global benchmark portfolio returns were developed in line with Fama and French (1993) and Carhart (1997). R_m-R_f is the return on a global market portfolio based on all stocks in Worlscope minus the U.S. Treasury-Bill rate from Ibbotson Associates. SMB is the return differential between a small stock cap portfolio and a large cap portfolio. HML is the difference in return between a high book-to-market and low book-to-market portfolio. SMB and HML are obtained after developing 6 portfolios formed on the basis of firm size (market value of equity) and book-to-market. MOM buys prior 12-month winner return stocks and sells short prior 12-month losers. Mean return and standard deviation are annualized.

Global portfolios	Mean Return	Standard Deviation	# Firms
Small Value	17.86	16.78	8358
Small Neutral	10.86	14.72	6805
Small Growth	5.21	22.44	4506
Large Value	11.23	16.43	727
Large Neutral	6.44	16.10	861
Large Growth	3.17	20.68	545
Prior Winners	10.94	17.26	6808
Prior Losers	5.62	21.34	9014
R_m-R_f	4.13	16.11	
SMB	4.37	7.94	
HML	10.36	14.45	
MOM	5.33	14.93	

Chapter 6.
CSR and the Cost of Equity Capital

6.1. INTRODUCTION

Financial markets have become increasingly responsive to the social, ethical, and environmental consequences of decisions made by publicly listed companies. Nevertheless, social responsibility in the setting of stock markets continues to be hotly debated in academic studies because neither the economic rationale behind SRI policies nor the effects of such policies on public firms are entirely clear. According to a survey undertaken by Lewis and Mackenzie (1999), investors are attracted to socially responsible mutual funds because they believe that SRI can change the behavior of companies. Anecdotal evidence suggests that social investors believe their decisions promote corporate change by influencing firms' cost of capital (Haigh and Hazelton (2004)), but studies cast doubt on the validity of that argument (e.g., Malkiel and Quandt (1971), Rudd (1981), Haigh and Hazelton (2004)).

This chapter describes in greater length how publicly listed companies are affected by a financial market in which there are agents who integrate traditional financial criteria as well as social responsibility criteria into their investment decisions. At the heart of our study is the relation between firms' social responsibility and their cost of equity capital. We provide a number of hypotheses that help to understand the effects of social norms in markets on the cost of equity capital and the stock price of the firm. We present empirical evidence to quantify the effects of investors' concerns for a number of corporate social responsibility attributes on expected returns (i.e., the cost of equity). While prior empirical research revolves around the association between corporate responsibility measures and a firm's market value, none of them explicitly isolates the cost-of-equity component that is critical to portraying equity markets' attention to social responsibility.

To better understand the price impact of social norms present in markets, it can be useful to distinguish investors who monitor CSR attributes for financial reasons from those who enjoy non-financial utility by being socially responsible in investing. According to a non-financial explanation, financial markets have discriminatory tastes against (in favor of) socially controversial (responsible) companies beyond any risk or profit motive. Hong and Kacperczyk (2006) suggest that "sin" companies, i.e., those earning substantial revenues from tobacco, alcohol and gambling, are more cheaply priced because they are disliked by an important set of norm-constrained institutional investors. Heinkel, Kraus and Zechner (2001) present a calibrated equilibrium model that allows so-called green investors to influence the expected return of polluting firms relative to that of non-polluters in the form of boycotts to polluters. In their theoretical setup, markets can drive up the cost of capital of firms with low environmental standards because the presence of environmental norms affects the risk-sharing opportunities of investors holding controversial stocks. The model predicts that investors demand a higher expected return as a compensation for holding more shares of environmentally controversial firms than they would hold in a market free of boycotts from environmentally conscious investors.

This hypothesis, which we dub the *discriminating tastes hypothesis*, is not necessarily confined to environmental issues and could theoretically apply to any other criterion within the CSR domain. Constrained risk sharing due to non-financial tastes is an effect in markets much like that of any ordinary boycott that introduces capital market imperfections, i.e., deviations from a frictionless market with complete information. There are parallels with Merton's (1987) equilibrium model, in which neglected stocks have higher expected returns because these stocks suffer from, e.g., a smaller investor base, asymmetric information problems, and a lower liquidity.[44] Implicit in our social taste-based discrimination framework is the assumption that the number of investors who pursue social or environmental criteria is sufficiently large to materially impact risk sharing. This assumption is unrealistic according to some authors (e.g., Haigh and Hazelton (2004) and Rudd (1981)) but not according to others (e.g., Hong and Kacperczyk (2006)). Moreover, when investors are homogeneous in their tastes (i.e., in investment decisions based on corporate social responsibility), the risk sharing impact of social norms will more quickly materialize than when they are not.

Although some scholars deem CSR a pure non-financial concept, others suggest that investments based on corporate social responsibility criteria need not be solely driven by agents with non-financial tastes. The asset pricing implications of responsible corporate behavior could thus be explained in a traditional rational-expectations framework when CSR is informationally relevant to markets. According to another hypothesis, which we call the *value relevance hypothesis*, markets are rationally responsive to social responsibility because CSR conveys clear financial information about a firm's risks and cash flows. One implication of this hypothesis is that investors carrying the official SRI label may not be the only ones in the market who are responsive to certain social, moral, and environmental issues.

To begin with, the old-school prediction adopted by SRI skeptics is that CSR is costly, because it requires the sacrifice of resources needed to operationalize shareholder value-enhancing projects (e.g., Henderson (2002)). Alternatively, better CSR has been linked to lower litigation risks, increased investor trust, and other intangible advantages, which suggests that there are clear financial motivations for eschewing socially controversial companies. Indeed, Kahn, Lekander and Leimkuhler (1997) observed that

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[44] The deviation from the perfect capital markets assumption also implies that idiosyncratic risk is non-diversifiable due to limited risk sharing or asymmetric information, and thus priced in equilibrium.

many U.S. states view the threat of negative long-term consequences of litigation as a valid financial argument for tobacco stock divestment. Karpoff, Lott and Wehrly (2005) find that the magnitude of share price responses to environmental violations fully reflects investors' anticipation of legal sanctions, consistent with CSR being informationally relevant to the market instead of being merely considered by taste-constrained investors.

Because both hypotheses are not necessarily mutually exclusive, our work does not intend to show how well these theoretical predictions fare against each other. Instead, we consider the price-discount effects of CSR an important empirical question. We explicitly quantify the cost of capital implications of CSR policies, and in doing so, we provide a vehicle for measuring the impact of investors' attention to social, moral and environmental issues on corporate behavior. Our interests go to the financial effect although it is plausible that socially controversial firms will reform to better CSR when the cost-of-capital effect outweighs the cost of reforming.

There are several other reasons why this study is not confined to purely theoretical predictions a là Heinkel, Kraus and Zechner (2001). In essence, conceptual models in this area rest on assumptions that make it complicated to understand their practical relevance. To illustrate, earlier work on the effects of socially aware investors on the behavior of companies implicitly assume that social norms in markets purely manifest in the avoidance of socially undesirable stocks, particularly sin stocks and polluting firms. In practice, the decision not to invest in a company due to its controversial practices is often weighed against other positive CSR yardsticks. Moreover, investors might even choose not to divest from controversial firms because of a shareholder activism policy, or because they follow indexing strategies that preclude selling shares.

Using a panel of U.S. firms with diverse CSR attributes, we investigate whether investors' concerns about corporate social responsibility policies manifests in expected equity returns (the cost of equity). We use the *ex ante* cost of capital implied in contemporaneous stock price and analyst forecast data for this purpose. Unlike earlier theoretical studies, we do not consider a binary classification to distinguish socially responsible firms from non-responsible firms. Our study includes a rich array CSR features that are adopted by a multitude of social investors in the United States, using the well-established and widely monitored data from KLD Research & Analytics.

One of the key distinctions of this study is that we investigate corporate social responsibility beyond the aggregate level. We expect that CSR as such is too much a contentious concept to display a conclusive relation with expected returns. Because corporate social responsibility is a multidimensional construct that includes a broad range of specific issues, it is questionable whether one hypothesis holds for all individual CSR criteria. Some CSR performance dimensions are sensitive to subjective interpretation whereas others are more objectively measurable and theoretically strongly linked to financial risk. Our expectation is therefore that those CSR attributes that have a more natural risk-interpretation are relevant to expected returns according to our value relevance hypothesis. Those that are ambiguous can only be a predictor of expected returns under the discriminating tastes hypothesis, i.e., in a market comprising a sufficient number of discriminatory taste-driven investors with homogenous beliefs about defining CSR. Several studies suggest that investors display heterogeneity concerning social responsibility screens (e.g., Barnett and Salomon (2002)), thereby leaving it an empirical question whether investors' beliefs about a company's overall social responsibility performance are sufficiently congruent to influence the cost of capital.

This chapter is organized as follows. Section 2 describes the data sets employed in this study. Section 3 discusses the methodology and empirical results. Section 4 provides an extended discussion of the results and concludes this chapter.

6.2. DATA

Measuring Corporate Social Responsibility

We use the academic database from Kinder, Lydenberg and Domini Research & Analytics, Inc. (KLD) to measure firms' performance along various CSR dimensions. The KLD sample is the most widely used database in academic studies on corporate social responsibility. KLD now screens approximately 3,000 U.S. companies on various CSR attributes and assigns a strength/weakness indicator to each firm annually.

The social responsibility dimensions covered by KLD are as follows. The first dimension is dubbed "community involvement". Broadly, KLD assigns strengths/weaknesses to firms based on (i) their charitable and innovative givings to, e.g., the economically disadvantaged and non-profit organizations, (ii) their support to educational programs and housing initiatives for economically disadvantaged people, (iii) support for job-training programs, and (iv) decisions or fines related to the community in which the firm operates.

The second dimension is termed "employee relations" and covers (i) a firm's relations with unions, (ii) layoffs, (iii) decisions and penalties involving employee safety, (iv) pension plans, profit shares and other benefits (v) and the degree to which employees are involved in the firm, for example, in decision-making processes.

The third dimension covered by KLD is called "diversity". Here, KLD evaluates companies on (i) their dedication to appointing women and minorities for positions at the executive and non-executive levels, (ii) innovative hiring and employee development policies aimed at providing job opportunities to the disabled, and (iii) benefits programs directed at work/family issues, and (iv) progressive gay and bisexual policies.

The fourth area is labeled "product & service quality" and incorporates (i) marketing related strengths and controversies (e.g. lawsuits involving advertisements, or consumer dissatisfaction), (ii) product innovation as witnessed by, for example, R&D, (iii) the extent to which a firm has quality programs, and (iv) the degree to which products serve the needs of economically disadvantaged.

The fifth area covers the "environment" criterion. To measure environmental performance, KLD looks at whether a company has (i) significant liabilities due to hazardous wastes sites, (ii) involvement in Superfund sites, (iii) fines and penalties from environmentally controversial activities, (iv) toxic emissions, and other environmental controversies. Areas of strength incorporated by KLD include (v) policies to eliminate emissions, (vi) the extent to which the firm makes use of environmentally friendly assets and materials, and (vii) the extent to which the firm earns revenues from the development or sales of alternative fuels that are environmentally friendly.

The sixth aspect of CSR covered by KLD is "human rights". Included in this category are (i) firms' involvement with politically incorrect regimes and operations in controversial countries, (ii) indigenous peoples relations, (iii) labor rights, and (iv) other exceptional human rights initiatives, such as transparency or industry leadership with respect to human rights issues not covered by the other criteria in this category.

The last KLD category we include in this study is termed "governance", although this measure does not capture the entire spectrum of mechanisms that are generally believed to promote strong corporate governance (see, e.g., Gompers, Ishii and Metrick (2003), Ashbaugh-Skaife, Collins and Lafond (2006)).[45] Included here are (i) compensation to top management and board members, where limited compensation is deemed a strength, (ii) ownership of other socially responsible firms, (iii) transparency with respect to reporting on social and environmental performance measures, (iv) political accountability (defined as transparency and accountability regarding involvement in U.S. and non-U.S. politics), and (v) "other" noteworthy initiatives that fit within this category.

Between 2001 and 2003, KLD covered a smaller universe of public companies (about 1000 firms). Before 2001, their coverage mainly involved the S&P 500 constituents. We choose to analyze firm-year observations for the period 2001 onwards to ensure the sample is sufficiently representative of the U.S. equity market.

In transforming the strength/weakness indicators into indexes with numerical values, we are guided by prior studies that employ the KLD database. Like Hillman and Keim (2002), we construct an index of CSR by assigning the value of 1 to each strength and -1 to each weakness. The index comprises the sum of all scores and thus reflects the sum of all strengths net of all weaknesses. One of the key distinctive features of this study is that it evaluates CSR at both aggregated and disaggregated levels. We disaggregate the total CSR index into four subsets: environmental performance, governance, product quality, and social performance, where the social performance index bundles the diversity,

[45] Derwall and Verwijmeren (2006) use a methdodologically identical approach to examine a broader corporate governance measure and find similar cost of capital effects.

human rights, community involvement, and labor relations indicators provided by KLD. Our decision to distinguish environmental, social, and governance issues is motivated by the rise of a universal framework that is gaining momentum in the financial community and that circumvents the somewhat contentious term corporate social responsibility by directly identifying these three (so-called “ESG”) areas as primary CSR constituents. Note that our social index is a composite of four social dimensions, which we consider interconnected because KLD has occasionally transferred social performance indicators from one dimension to one of the three other dimensions; see Kinder, Lydenberg and Domini (2005). We examine the product quality index separately as well, since we see no reason to assume that product and services quality issues relate to the other categories.[46]

Financial Data

The equity cost of capital central to this study is the rate that equates expected cash flows over a specified period to the current stock price. Our implied cost-of-equity models rely on analysts’ consensus earnings forecasts from IBES. We collected the mean 1-year ahead and 2-year ahead earnings forecasts as well as the 5-year earnings growth forecast. All models require that we collect dividend and price information, which we obtain from Compustat. Because some models assume that growth in abnormal earnings beyond a specific year equals the rate of expected inflation, we collect expected 1-year inflation data from the Consumer Opinion Survey (University of Michigan).

In our investigation into the relation between firm’s social responsibility attributes and the cost of equity, we control for other firm characteristics correlated with the dependent variable. Our cost of equity models control for traditional risk proxies: U.S. stock market sensitivity (beta) observed over the previous calendar year, where the Fama-French (1993) market proxy is used to describe daily market return variation, the book value of leverage (debt / assets), firm size measured by the market value of equity after lognormal transformation, and the price-to-book ratio truncated at the 1% level. Returns data are from the CRSP daily stock database. All other data are from Compustat.

6.3. EMPIRICAL ANALYSIS

We examine the association between CSR and firms’ cost of equity capital using the abnormal earnings growth valuation models of Easton (2004) and Ohlson and Juettner-Nauroth (2000).

The Easton (2004) implied cost-of-equity model takes the form:

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[46] Another advantage of our CSR benchmarking approach is that it keeps the CSR ratings easily replicable. See Graafland, Eijffinger and Smid (2004) for a discussion of different CSR benchmarking methods.

$$P_t = (x_{t+2} + r_{peg} * d_{t+1} - x_{t+1}) / r^2_{peg}, \quad (1)$$

where P_t is a firm's market price in year t, x is the expected future earnings per share, d is the expected future net dividends per share, and r_{peg} is the implied cost of equity capital. The intuition behind Easton's price-earnings-growth ratio model is fairly straightforward and the model requires only a limited number of inputs. By using analysts' forecast for the expected earnings and dividends, we solve for the internal rate of return, which is the implied cost of equity capital.

The abnormal earnings growth valuation model by Olhson and Juettner-Nauroth (2000) is described as:

$$P_t = (x_{t+1} / r_{OJ}) * (g_{st} + r_{OJ} * d_{t+1} / x_{t+1} - g_{lt}) / (r_{OJ} - g_{lt}), \quad (2)$$

where we use one-year ahead predicted earnings and dividends per share and forecasts of short-term and long-term abnormal earnings growth. Dividends are set equal to a constant fraction of the predicted earnings. We follow Hail and Leuz (2006) and estimate the short-term growth rate g_{st} as the average between the forecasted percentage change in earnings from year t+1 to t+2 and the five-year growth forecast from IBES. A positive change in forecasted earnings is necessary to obtain a numerical solution. The long-term earnings growth rate g_{lt} incorporates the assumption that growth in abnormal earnings per share beyond year t+1 equals the expected rate of inflation. We use the Consumer Opinion Survey data from the University of Michigan to incorporate inflation expectations into the equation. Year-by-year optimization of (2) by means of an iterative algorithm solves for the expected return for each firm in the sample.

To some extent, the preference for these models is arbitrary. Hail and Leuz (2006) describe these and other models that enable computation of the implied cost of capital, such as the residual income models of Claus and Thomas (2001) and Gebhardt, Lee and Swamanithan (2001). Because Hail and Leuz (2006) find that all four models yield comparable results, we choose the computationally most efficient specifications. Moreover, Botosan and Plumlee (2005) compare alternative cost of equity estimators derived from valuation models and conclude that the implied premium from the Easton (2004) model is superior to most other expected return estimates, based on the correlation between the implied rate of return and well-known risk proxies. Gode and Mohanram (2003) find that the Ohlson-Jeuttner implied rate gives a robust estimate of the markets' perception of risk and that it correlates significantly with traditional risk proxies and *ex post* returns.

The advantage of implied cost of equity estimates is that they reflect *ex ante* expected returns and do not explicitly depend on conventional pricing models using realized returns, which are potentially prone to misspecification. The misspecification problem is a reason for us to eschew existing expected return models that make use of realized returns, especially because none of these models explicitly incorporates factors to describe premiums for the corporate social responsibility attributes of stocks. One critique towards implied cost of capital models concerns the validity of the proxies as a consequence of, for instance, analyst forecasts that are sluggish with respect to information in past stock returns (Guay, Kothari and Shu (2004)). Although we are not primarily interested in the absolute cost-of-capital estimates but in cross-sectional differences in the estimates across firms, limitations to implied models brought forward in earlier work suggest that our results should be handled with appropriate caution.

After having solved for firms' implied cost of equity, we estimate the following pooled regression model:

$$r_{it} = \alpha_i + \sum_{j=1}^{J} \beta_j CSR_{j,it} + \sum_{k=1}^{K} \gamma_k C_{k,it} + \varepsilon_{it} \quad , \tag{3}$$

where r_{it} is either r_{peg} or r_{OJ} in for firm i in year t, CSR_{it} is a vector that consists of either the Total CSR Index or the subindexes we derived from the KLD data, and C_{it} is a vector of (financial) control variables. The controls we use are common to studies on expected returns (e.g., Fama and French (1992), Ashbaugh-Skaife, Collins and Lafond (2006), Hail and Leuz (2006)).

We note that the baseline regression does not explicitly account for fundamental differences in cost of equity across industries because social responsibility is not regarded as an industry-neutral construct in the U.S. A number of businesses have a long-standing tradition of being regarded as socially controversial by investors, in particular those enjoying revenues from gambling, alcohol, weapons and defense, and tobacco. However, recent years have witnessed an increase in the number of social investors that screen firms according to a "best-in-class" approach, which evaluates the social responsibility attributes of a company relative to those of industry peers. (See Chapters 1 and 3 for more complete descriptions of best-in-class analysis.) While removing industry effects could theoretically induce false inferences on the cost of capital effects associated with corporate social responsibility, our analysis will cover various possibilities and show that industry-wide variation in the cost of equity does not drive the results of this study.

Table 1 reports summary statistics on some basic financial data and CSR data used in this study. The average implied cost of equity capital is in the order of 11 percent, independent of the cost of equity model we use. It is also interesting to observe that the four mutually exclusive subindexes of corporate social responsibility that we use in our regressions (i.e., environmental, social, governance, and product quality) are not highly correlated. The strongest correlation, namely that between the environmental and the

Table 1. Descriptive Statistics

Panels A and B of Table 1 report the mean, median and standard deviation for CSR variables and a number of standard financial variables based on pooled cross-sectional data over the period 2001-2005. The Total CSR index is defined as the sum of all strengths a company has along the CSR dimensions identified by KLD minus the sum of all weaknesses. The Environmental, Social, Governance, and Product Quality Indexes comprise subsets of the Total CSR Index. The Environmental Index adds all strength indicators along a number of environmental dimensions and subtracts all environmental weaknesses reported by KLD. In a similar manner, the Social, Governance and Product Quality Indexes accumulate all strengths and subtract weaknesses in their respective areas. All firms are evaluated along the same set of dimensions. Panel C presents correlations based on the pooled cross-sectional data.

Panel A: CSR Variables

Variable	Mean	Median	St. Dev.
Total CSR Index	-0.04	0.00	1.99
Environmental Index	-0.03	0.00	0.63
Social Index	0.19	0.00	1.67
Governance Index	-0.13	0.00	0.67
Product Quality Index	-0.07	0.00	0.61

Panel B: Other Firm Attributes

Variable	Mean	Median	St. Dev.
Implied Cost of Equity			
Easton Model	0.11	0.10	0.05
OJN Model	0.11	0.10	0.03
Market Value of Equity (millions)	9799.83	2225.12	27479.25
Book Debt / Assets	0.25	0.23	0.19
Price / Book Value (Truncated)	3.16	2.38	2.77
Return on Assets (%) (Truncated)	5.39	5.08	9.03

Panel C: Correlations among CSR variables

	Total	Env.	Social	Gov.	Prod.
Total CSR Index	1.00	0.46	0.79	0.21	0.44
Environmental Index	0.46	1.00	0.05	0.03	0.30
Social Index	0.79	0.05	1.00	-0.19	0.02
Governance Index	0.21	0.03	-0.19	1.00	0.09
Product Quality Index	0.44	0.30	0.02	0.09	1.00

Table 2. Total CSR index and the cost of equity: pooled regression results

Table 2 shows the outcome of estimating models for the implied cost of equity, where the cost of equity for U.S. firms is computed using the Easton (2004) computation in Panel A, and where the independent variables are the market value of equity after log transformation, the firm's beta based on daily stock returns over the last calendar year, the book debt-to-assets ratio, the price-to-book ratio (truncated at the 1% level), year fixed effects, and the aggregate corporate social responsibility index (Total CSR). The first model reported additionally controls for whether the firm is a financial services company according to the industry classification scheme of Fama and French (1997). The second model contains all industry dummy variables based on Fama and French's 48 industry classifications. The last model omits financial and utility companies from the sample. The table reports pooled OLS coefficients with *t*-statistics (in parentheses) based on White (1980) standard errors. Pooled sample period: 2001-2005.

	Panel A: Easton implied cost of equity model		
	All firms	All firms	Excl. fin. & util.
Intercept	0.12 ***	0.12 ***	0.13 ***
	(29.72)	(25.70)	(22.86)
Total CSR Index	$-0.17E^{-3}$	$0.17E^{-3}$	$-0.17E^{-3}$
	(-0.60)	(0.60)	(-0.51)
Log (Market Value Equity)	$-5.04E^{-3}$ ***	$-5.12E^{-3}$ ***	$-5.77E^{-3}$ ***
	(-11.08)	(-11.09)	(-9.32)
Beta	$1.83E^{-2}$ ***	$1.43E^{-2}$ ***	$1.52E^{-2}$
	(12.03)	(8.75)	(9.32)
Debt / Assets	0.04 ***	0.05 ***	0.05 ***
	(10.02)	(10.74)	(10.43)
Price / Book Value	$-2.59E^{-3}$ ***	$-2.60E^{-3}$ ***	$-2.34E^{-3}$ ***
	(-9.53)	(-9.34)	(-8.29)
Year Fixed Effects	Y	Y	Y
Financials Controlled	Y	Y	Y
All Industries Controlled	N	N	N
# Observations	4390	4390	3136
Adj. R-squared	0.21	0.20	0.14

** Significant at 10% level, *** at 1% level*

Table 2 *Continued*. Total CSR index and the cost of equity: pooled regressions

Table 2 shows the outcome of estimating models for the implied cost of equity, where the cost of equity for U.S. firms is computed using the Olhson and Juettner-Nauroth (2000) method in Panel B, and where the independent variables are the market value of equity after log transformation, the firm's beta based on daily stock returns over the last calendar year, the book debt-to-assets ratio, the price-to-book ratio (truncated at the 1% level), year fixed effects, and the aggregate corporate social responsibility index (Total CSR). The first model additionally controls for whether the firm is a financial services company according to the industry classification scheme of Fama and French (1997). The second model contains all industry dummy variables based on Fama and French's 48 industry classifications. The last model omits financial and utility companies from the sample. The table reports coefficients with *t*-statistics (in parentheses) based on White (1980) standard errors. Sample period: 2001-2005.

	Panel B: OJN implied cost of equity model		
	All firms	All firms	Excl. fin. & util.
Intercept	0.11 ***	0.11 ***	0.11 ***
	(31.37)	(27.69)	(26.26)
Total CSR Index	-3.78E^{-4} *	-2.15E^{-4}	-8.27E^{-4} ***
	(-1.72)	(-1.10)	(-3.00)
Log (Market Value Equity)	-1.91E^{-3} ***	-1.93E^{-3} ***	-2.15E^{-3} ***
	(-5.30)	(-5.16)	(-4.95)
Beta	0.98E^{-2} ***	0.67E^{-2} ***	4.49E^{-5} ***
	(9.00)	(5.52)	(5.52)
Debt / Assets	0.03 ***	0.03 ***	0.03 ***
	(9.08)	(10.29)	(6.37)
Price / Book Value	-1.80E^{-3} ***	-1.90E^{-3} ***	-2.20E^{-3} ***
	(-8.66)	(-8.83)	(-8.05)
Year Fixed Effects	Y	Y	Y
Financials Controlled	Y	Y	N
All Industries Controlled	N	Y	N
# Observations	3796	3796	2692
Adj. R-squared	0.14	0.18	0.24

** Significant at 10% level, *** at 1% level* product quality index, is 30 percent. Since it appears that each score captures a unique dimension of CSR, multicollinearity is not a concern to our pooled regressions.

To describe the association between the cost of equity and CSR at the aggregate level, we present pooled regressions of the implied cost of equity on the traditional risk factors (size, beta, leverage, and price-to-book) and the Total CSR index. Table 2 shows the results of using the Easton (2004) implied cost of equity estimates (in Panel A) and the Olhson and Juettner-Nauroth (OJN, 2000) estimates (in Panel B) as the dependent variable. Leverage effects are motivated by Modigliani and Miller (1958), who state that the cost of equity should be an increasing function of the amount of debt in a firm's capital structure. The effects of beta, size, and price-to-book are also well tested. Earlier research suggests that the cost of capital is negatively associated with firm size and price-to-book, and positively associated with stock beta, because these variables are proxies for sources of priced risk; see, for example, Fama and French (1992, 1993). It appears that the coefficients on the control variables are significant and carry the expected signs in our models.

In line with our expectations, the models in Table 2 do not make a compelling case for an association between the aggregate CSR measure and the cost of equity. Under the Easton model, the relation between the Total CSR Index and the implied cost of equity is not significantly different from zero. Under the OJN model, we observe a negative association, but the coefficient on the aggregate CSR index is highly significant in only one of three reported specifications. Overall, the evidence that firms with higher values for the aggregate social responsibility index experience of lower cost of equity capital is weak. In Table 3, we present pooled regression results after breaking up the aggregate CSR measure into four elementary subsets. Consistent with our prediction, disaggregated CSR attributes display a significant relation to the cost of equity. The models consistently suggest that leaders along the dimensions environmental performance, product quality, and governance enjoy a lower cost of equity capital, than do laggards. From an economic perspective, this relationship is quite strong and economically feasible: the percentage point decrease in the cost of equity associated with a one-point increase in the environmental responsibility measure, equivalent to one extra strength or the disappearance of one weakness, is in the order of 0.25 to 0.55 percent. A one-point increase in the governance index is associated with a decline in the cost of equity in the order of 0.24 to 0.49 percentage points. A similar improvement in product quality is associated with a decrease in the cost of equity that is in the range of 0.18 to 0.35 percentage points.

By contrast, better performance measured by the Social Index is associated with a higher cost of equity according to the majority of models reported in Table 3. Although the rise in the cost of equity resulting from a one-point increase in social index performance is in magnitude relatively smaller (i.e., in the range of 0.07 – 0.23 percentage points), it is

statistically significant under most specifications. It thus appears that financial markets penalize a firm's investment in social practices via an increase in expected return.
We performed several robustness tests on samples that omit firms with implied risk premiums below a certain threshold, thereby raising the sample-average implied return. We allowed the minimum premium, i.e., the minimum required cost of equity in excess of the annual risk-free rate from Fama and French (1993), to vary up to 5 percent. None of these (unreported) robustness tests affects our conclusions, and none of the threshold levels reduces sample size substantially.

6.4. SUMMARY, DISCUSSION, AND PRACTICAL IMPLICATIONS

This chapter discussed the cost of capital implications of social norms in financial markets. We observe a relation between CSR attributes, as defined by KLD, and the cost of equity capital. Our findings also suggest that the cost of capital implications to corporate social responsibility depend on the choice of CSR attribute. We document a negative and statistically significant association between three of four CSR indexes and our implied cost of equity capital measures. Firms with leading track records in the areas of environmental performance, governance, and product quality, have a lower implied cost of equity capital than laggards, controlling for other well-known predictors. By contrast, the relation between a social index (which covers diversity, human rights, employee relations, and community involvement) and the cost of equity is positive. The net effect of these mixed relationships is that CSR at the aggregate level does not relate to the implied cost of equity.

The results support a number of theoretical frameworks that have helped to understand how the corporate social responsibility attributes central to this study factor into implied risk premiums. Translated into a taste-based explanation in the tradition of Heinkel, Kraus and Zechner (2001), the evidence suggests that investors with discriminatory tastes against companies with controversial environmental, governance and product quality characteristics affect the investor base of these firms, thereby reducing risk sharing. The effect is consequential to investors not avoiding these shares, who command a premium for holding more of a controversial firm than they would otherwise hold. Implicit in this framework is the assumption that CSR is not informationally relevant to markets, but that there are sufficient taste-driven agents to influence a firm's investor base.

Another explanation for our results is that all four indexes are informationally relevant to rational agents because the four CSR dimensions convey information about firm risk that is of hedging concern to investors. Thus, the negative association between the cost of equity and, respectively, environmental performance, governance, and product quality, could signal that the market associates better performance along these three

Table 3. CSR subindexes and the cost of equity: pooled regression results

Table 3 shows the outcome of estimating models for the implied cost of equity, where the cost of equity for U.S. firms is computed using the Easton (2004) computation in Panel A and the Olhson and Juettner-Nauroth (2000) method in Panel B, and where the independent variables are the market value of equity after log transformation, the firm's daily beta, the book debt-to-assets ratio, the price-to-book ratio (truncated at the 1% level), year fixed effects, and the four corporate social responsibility subindexes (Environmental, Social, Governance, and Product Quality). The first model additionally controls for whether the firm is a financial services company according to the industry classification scheme of Fama and French (1997). The second model contains all industry dummy variables based on Fama and French's 48 industry classifications. The last model omits financial and utility companies from the sample. The table reports pooled OLS coefficients with t-statistics (in parentheses) based on White (1980) standard errors. Pooled sample period: 2001-2005.

	Panel A: Easton implied cost of equity model		
	All firms	All firms	Excl.fin. & util
Intercept	0.14 ***	0.14 ***	0.15 ***
	(30.71)	(25.03)	(23.76)
Environmental	$-5.53E^{-3}$ ***	$-4.53E^{-3}$ ***	$-4.92E^{-3}$ ***
	(-6.40)	(-4.81)	(-5.15)
Social	$1.79E^{-3}$ ***	$2.33E^{-3}$ ***	$2.29E^{-3}$ ***
	(5.05)	(6.62)	(5.19)
Governance	$-3.91E^{-3}$ ***	$-4.03E^{-3}$ ***	$-3.34E^{-3}$ ***
	(-3.85)	(-4.04)	(-2.68)
Product Quality	$-1.82E^{-3}$ **	$-2.58E^{-3}$ ***	$-3.15E^{-3}$ ***
	(-2.04)	(-2.87)	(-2.89)
Log (Market Value Equity)	$-7.59E^{-3}$ ***	$-7.95E^{-3}$ ***	$-8.41E^{-3}$ ***
	(-13.79)	(-13.02)	(-12.39)
Beta	$1.84E^{-2}$ ***	$1.39E^{-2}$ ***	$1.55E^{-2}$ ***
	(15.16)	(8.55)	(9.59)
Debt / Assets	0.04 ***	0.05 ***	0.04 ***
	(13.08)	(10.56)	(10.10)
Price-Book Ratio	$-2.47E^{-3}$ ***	$-2.44E^{-3}$ ***	$-2.20E^{-3}$ ***
	(-10.47)	(-8.92)	(-7.86)
Year Fixed Effects	Y	Y	Y
Financials Controlled	Y	Y	N
All Industries Controlled	N	Y	N
# Observations	4390	4390	3136
Adj. R-squared	0.18	0.23	0.24

*** Significant at 5% level, *** at 1% level*

Table 3 *Continued*. CSR subindexes and the cost of equity: pooled regressions

Table 3 shows the outcome of estimating models for the implied cost of equity, where the cost of equity for U.S. firms is computed using the Easton (2004) computation in Panel A and the Olhson and Juettner-Nauroth (2000) method in Panel B, and where the independent variables are the market value of equity after log transformation, the firm's daily beta, the book debt-to-assets ratio, the price-to-book ratio (truncated at the 1% level), year fixed effects, and the four corporate social responsibility subindexes (Environmental, Social, Governance, and Product Quality). The first model additionally controls for whether the firm is a financial services company according to the industry classification scheme of Fama and French (1997). The second model contains all industry dummy variables based on Fama and French's 48 industry classifications. The last model omits financial and utility companies from the sample. The table reports pooled OLS coefficients with t-statistics (in parentheses) based on White (1980) standard errors. Pooled sample period: 2001-2005.

	Panel B: OJN implied cost of equity model		
	All firms	All firms	Excl.fin. & util
Intercept	0.12 ***	0.12 ***	0.12 ***
	(32.73)	(27.89)	(26.07)
Environmental	$-2.45E^{-3}$ ***	$-2.26E^{-3}$ ***	$-2.40E^{-3}$ ***
	(-3.60)	(-3.58)	(-7.56)
Social	$0.91E^{-3}$ ***	$1.13E^{-3}$ ***	$0.73E^{-3}$ **
	(3.35)	(4.40)	(2.21)
Governance	$-4.86E^{-3}$ ***	$-3.12E^{-3}$ ***	$-2.42E^{-3}$ ***
	(-4.33)	(-4.20)	(-2.68)
Product Quality	$-3.50E^{-3}$ ***	$-2.56E^{-3}$ ***	$-3.10E^{-3}$ ***
	(-4.50)	(-4.31)	(-3.90)
Log (Market Value Equity)	$-3.65E^{-3}$ ***	$-3.68E^{-3}$ ***	$-3.56E^{-3}$ ***
	(-8.49)	(-8.17)	(-6.93)
Beta	$0.96E^{-2}$ ***	$0.64E^{-2}$ ***	$0.68E^{-2}$ ***
	(10.17)	(5.31)	(5.69)
Debt / Assets	0.03 ***	0.04 ***	0.03 ***
	(11.04)	(9.94)	(7.93)
Price-Book Ratio	$-1.72E^{-3}$ ***	$-1.77E^{-3}$ ***	$-1.67E^{-3}$ ***
	(-8.94)	(-8.18)	(-7.56)
Year Fixed Effects	Y	Y	Y
Financials Controlled	Y	Y	N
All Industries Controlled	N	Y	N
# Observations	3796	3796	2692
Adj. R-squared	0.15	0.20	0.19

*** *Significant at 1% level*

corporate social responsibility dimensions with lower investment risk. However, while the idea that better CSR lowers risk is a widely spread view among CSR advocates in practice, how these risks manifest is not well explained. Indeed, there are several studies that support the idea thatweaker environmental performance (Karpoff, Lott and Wehrly (2005)), poor product quality (Pruitt and Peterson (1986)), and weak performance on governance issues (Ashbaugh-Skaife, Collins and Lafond (2006)) are relevant in a market that behaves according to the traditional rational-expectations framework. Some of these studies suggest that firms with weaker CSR are more frequently subjected to lawsuit filings. This higher litigation risk, which is further fuelled by discriminatory tastes, could then contribute to a higher risk premium.

It is unavoidably difficult to determine which explanation dominates because investors who seek to maximize financial utility and those who incorporate non-financial objectives in investment decisions coexist. However, the results for the social CSR index seem to point away from the discriminating tastes hypothesis. One possible explanation for the positive association between social performance and the cost of equity is that the market views corporate investment in social attributes as investment in a vague and costly concept, in the tradition of Henderson (2002) and others.[47] Barnea and Rubin (2006) even go as far as claiming that CSR could be a source of agency costs because a firm's insiders have an incentive to promote CSR investment beyond financially optimal levels in order to gain reputational benefits. Ashbaugh-Skaife, Collins and Lafond (2006) offer evidence that investors protect against sources of agency risk by driving up the cost of capital, thus making an agency risk-based explanation consistent with our findings. One possible reason why such agency problems underlie the observed cost of capital effect is that ambiguous CSR practices adopted by firms increase uncertainty and drive up monitoring costs borne by investors. Our results, then, motivate further research on the connection between CSR and traditional risk issues raised by corporate governance literatures.

It is interesting to note that our empirical findings reconcile with studies on investors' beliefs about the importance of specific social responsibility attributes in markets. Epstein and Freedman (1994) asked individual shareholders from all U.S. states to state their demands for information about firms' performance on financial, social and environmental spectrums. Their survey results from a randomly selected group suggest that investors assign most importance to environmental performance and the quality of products, consistent with our evidence that environmental performance and product quality are factors that determine share prices. By contrast, they find that individual investors assign the least importance to community involvement, charity donations, and diversity policies involving benefits to women and minorities.

[47] From conversations with professional CSR rating agencies we indeed learned that rating social performance is generally much more complex than, e.g., assessment of a firm's environmental management.

At the level of shareholder activism by investors, a number of studies lend support to similar conclusions about the importance markets assign to environmental, product, and governance issues relative to social issues. Rehbein, Waddock and Graves (2004) show that shareholder activists file shareholder resolutions involving product quality and corporate environmental performance particularly when a firm displays controversial behavior in these areas, whereas the relation between firms' track record and the number of respective filings in other CSR areas was much less pronounced. Monks, Miller and Cook (2004) study proposals at large U.S. firms over the period 2003-2003 and find that of the 671 proposals filed, more than half concerned traditional corporate governance issues while nearly half dealt with CSR. Of those CSR-related proposals, the strongest shareholder support pertained to climate change and renewable energy.

The implications that our results carry for managers are twofold. First, the results suggest that firms can reduce the cost of equity by simply undertaking activities to strengthen their track record with respect to three of the four CSR dimensions in this study. Alternatively, firms with relatively weak performance along these dimensions could deal specifically with the channels through which CSR affects capital costs under our hypotheses. Two concrete measures of action for firms are improving transparency concerning CSR activity and increasing analyst coverage. An increase in analyst coverage would reduce information uncertainty and asymmetry (Easley and O'hara (2004)) and improve stock liquidity (Amihud and Mendelson (2000)) and increase investor attention, all of which could ultimately counterbalance the neglect effect caused by societal norms in markets.[48] Transparency improvement might help investors better understand the value relevance of CSR investment, as Graafland and Eijffinger (2004) suggest. This policy recommendation implicitly involves the role of corporate governance, and particularly governance mechanisms that improve the quality of reporting, in the construction of value-enhancing corporate social responsibility plans. An interesting avenue for further research would be to test whether the higher cost of equity capital that we associate with better social performance is conditional on the quality of information that a firm provides about its policies, so that better social performance could be tied to lower capital costs when a firm's investment in CSR is better understood by the market.

Furthermore, a natural extension of this study would be to translate our findings based on implied rates of return into models that use realized returns to measure the cost of equity. Evidence on the explanatory power of models that expand mainstream asset pricing models, such as the CAPM and the Fama-French three factor model, with firms' sensitivities to factors (premiums) associated with CSR attributes is highly underdeveloped. However, a caveat that warrants careful attention concerns the

[48] There now is some preliminary evidence that hints that "sin" firms, which earn revenues from alcohol, tobacco and gambling, indeed pursue such transparency strategies to mitigate capital market sanctions (e.g., Kim and Vankatachalam (2006)).

development of ad hoc factor-mimicking portfolios based on CSR attributes. Like any other factor premium obtained by sorting stocks on a firm-specific attribute, such as the book-to-market premium or small firm premium, the estimated CSR premiums can differ substantially from the true (unobservable) premiums.[49] The addition of factor premiums should therefore be weighed against increased uncertainty about the magnitude of all these premiums in order to avoid that the resulting asset pricing model delivers more errors compared to more parsimonious specifications.

[49] This problem is further exacerbated by the fact that there is not yet enough time-series information on firm' social responsibility attributes to estimate long-term CSR premiums.

Chapter 7.
Summary and Concluding Comments

7.1. SUMMARY OF CHAPTERS

This dissertation bundles six empirical studies about socially responsible investing and the related discipline of corporate social responsibility. By means these studies, we have aimed to deepen our understanding of the value of SRI and CSR policies from the perspective of both investors and companies. While there are several financially motivated arguments against, as well as arguments in favor of, adopting SRI and CSR, our empirical studies altogether offer support of the view that implementing these concepts does not come at the expense of a weaker "bottom line" performance.

Chapter 1 offered the first globally oriented study on socially responsible mutual fund performance by evaluating SRI funds in many countries around the world in a systematic way. First, we showed that aggregate socially responsible fund performance is robust across different countries and similar to the returns of their conventional peers. Second, our results suggest that SRI fund performance is reasonably insensitive to the choice of social screening criteria and methodology. Neither the least stringent social screeners nor their most stringent counterparts underperform conventional mutual funds. Third, we tested for performance persistence. Portfolios of SRI funds identified as prior-year "winners" outperform past losers significantly out-of-sample on a risk- and style-adjusted basis. The general conclusion that emerged from Chapter 1 is that SRI equity mutual funds deliver competitive and highly similar returns compared to conventional funds, on a risk-adjusted basis, despite possible cross-country differences in SRI implementation.

Heightened attention for SRI has mainly resulted in academic studies on equity SRI but not in research that expands its scope to include other asset classes. Remarkably, no attempts have been made to evaluate the performance of mutual funds that invest in socially responsible fixed-income securities. Chapter 2 filled that gap by measuring the performance of socially responsible bond and balanced funds relative to matched samples of conventional funds over a sizeable investment horizon. Using multi-index performance evaluation models, we showed that the average SRI bond fund performed similar to conventional funds, while the average SRI balanced fund outperformed its conventional peers by more than 1.3 percent per year. The expenses charged by SRI funds, match those charged by conventional funds and, evidently, do not cause SRI funds to underperform. Thus, Chapter 2 points out that the SRI concept can be implemented in a financially viable way through investment vehicles for the fixed-income industry.

Although socially responsible mutual funds have the advantage of representing practically relevant and investable portfolios, we posited that funds inadequately help to determine whether stock-return information is conveyed by specific constituents of the broad corporate social responsibility concept. In Chapter 3, we illustrated our point by testing self-composed equity portfolios based on a single CSR/SRI element.

We added better insights to the corporate environmental-financial performance debate by focusing purely on the concept of eco-efficiency. Based on a new and unique database of corporate eco-efficiency scores, we constructed and evaluated two equity portfolios that differed in eco-efficiency. Contrary to studies on SRI mutual funds, we found that a high-ranked (i.e., environmentally responsible) portfolio not only provided substantially higher average returns than its low-ranked counterpart over the 1995–2003 period, but also earned an average return beyond that suggested by the portfolio's risk. We controlled for by differences in market sensitivity, investment style, or industry-specific factors. Moreover, the results remained significant for various levels of transaction costs, suggesting that the incremental benefits of SRI can be substantial. Our fresh portfolio approach thus points away from studying mutual funds and helps to obtain a more complete view of the risk-return characteristics associated with the social responsibility attributes of investment strategies. Very recent empirical work that follows our recommendation also arrives at conclusions different from those reached by mutual fund research.[50]

Next to reporting on SRI strategies and asset pricing anomalies involving SRI returns, we concentrated on the relation between eco-efficiency and financial performance at the corporate level from 1997 to 2004. In Chapter 4, we reported that eco-efficiency relates positively to operating performance and market value. Moreover, our results suggest that the market's valuation of environmental performance has been time variant, which may indicate that the market incorporates environmental information with a drift. Although environmental leaders initially did not sell at a premium relative to laggards, the valuation differential increased significantly over time. We tried to explain this upward pattern by providing evidence consistent with investors' mispricing of environmental information: evidence on earnings surprises (measured by analysts forecast errors) suggests that a high degree of eco-efficiency is accompanied by larger positive (less negative) surprises. The results have implications for company managers, who evidently do not have to overcome a tradeoff between eco-efficiency and financial performance, and for investors, who can exploit environmental information for investment decisions.

In Chapter 5, we singled out another common component of the CSR concept: human capital management (HCM). Using a new and global database that reports on four HCM systems for many countries around the world, we studied the economic

[50] See Kempf and Osthoff (2006) and Lee and Faff (2006).

consequences of human capital management practices along several lines. Of the four alternative systems of human capital management that we examined, a "human capital development" system (involving a combination of skill gap management, employee appraisal and training, and quantitative assessment of HCM effectiveness) is positively associated with Tobin's *q* and return on assets. Our results paint a weaker picture for talent attraction and retention systems, organizational learning systems, and disclosure quality concerning socially desirable labor practices, none of which are positively related to Tobin's *q* and ROA. While the results altogether indicate that certain human capital management criteria could be value relevant, we proceeded with examining the extent to which markets fully understand the value created by HCM. Specifically, we investigated the ability of the HCM indexes to explain stock returns and enhance portfolio performance, and we the examined the degree to which errors in analysts' earnings expectations are attributable to HCM. The mixed results from these tests leave us with the conclusion that investors understand the value added by human capital management.

In the last empirical study outlined in this dissertation, we provided evidence that social norms in the U.S. market translate into cross-sectional differences in firms' cost of equity capital caused by differences in corporate social responsibility attributes. The implied cost of equity of laggards in environmental performance, governance, and the quality of products and services exceeds that of leaders significantly. Our findings several (not mutually-exclusive) hypotheses: (i) the view that investors with discriminatory tastes in favor of social responsibility affect risk sharing, and (ii) the notion that "rational" investors associate better performance along these three CSR dimensions with lower non-diversifiable risk. By contrast, firms with better social performance (i.e., better records regarding diversity, employee relations, community involvement and human rights issues) have a higher cost of equity capital. One potential explanation for the latter observed cost-of-capital effect is that rational investors do not welcome undertakings to improve corporate social performance because the associated costs do not outweigh the financial benefits. Overall, Chapter 6 contrasts with several studies in the SRI domain that theoretically argue against an association between CSR and the cost of capital.

7.2. RECOMMENDATIONS

Since associations between CSR and financial performance measures appear to be most pronounced once we disentangle corporate social responsibility, we believe this dissertation has laid the groundwork for more in-depth analysis of the CSR-financial performance link at disaggregated levels. The problem with too aggregate constructs is that they are contentious and their implementation depends a great deal on subjective beliefs. At the very least, future research is recommended to follow the more universal "ESG" framework, which is now being embraced by a set of important institutional investors. With ESG, which stands for environmental, social, and corporate governance issues, important players in the financial industry are now following the view that (at least) three primary areas related to CSR should be made salient to investors in the form of so-called extra-financial factors.[51] Several initiatives, such as the widely endorsed Enhanced Analytics Initiative (EAI), encourage sell-side and other research analysts to routinely incorporate such extra-financial factors into investment recommendations.

As for the (extra-)financial information content of CSR, closely related financial measures should be collectively taken into account by future empirical research. Although there is a clear attractiveness of directly examining stock returns to determine this association, our studies make apparent the need for understanding multiple channels of transmission from CSR measures to corporate financial performance and, ultimately, to a firm's stock market performance. For instance, CSR may influence operating performance and firm value, yet with no (abnormal) return effect so long as investors are not surprised by its economic gains or costs. The analytical approach we adopted in the foregoing chapters builds on that notion and provides researchers with an interesting framework for investigating the economic significance of SRI and CSR in greater detail.

To conclude, the results of this thesis point out that at least some information related to CSR is indeed extra-financial. From a firm's perspective, the decision to adopt a specific CSR policy can be consequential to cash flows and financing costs, both of which are important in the context of shareholder wealth maximization. Our findings also carry a policy recommendation for investment practitioners, suggesting that they benefit from factoring CSR information into security selection decisions. Specifically, CSR information appears relevant to traditional investors involved with managing investment risk and return. In light of our findings, we conclude that the economic relevance of SRI and CSR can be significant.

[51] O'Loughlin and Thamotheram (2005) define extra-financial factors as those likely to have at least a long-term effect on business results but which hardly get integrated into investment decisions, regardless of whether they are part of the research process of analysts.

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Samenvatting (Dutch Summary)

In de afgelopen decennia zijn verschillende partijen in financiële markten, en met name institutionele beleggers, zich gaan roeren in de discussie over het maatschappelijk verantwoord besturen van de onderneming, ook wel bekend als duurzaam ondernemen, alsmede het toezicht daarop. Zo hebben bijvoorbeeld pensioenfondsen een fiduciaire verantwoordelijkheid om de belangen van deelnemers en andere belanghebbenden zo goed mogelijk te behartigen. Het is vervolgens de vraag of deze plicht ook een verantwoordelijkheid inhoudt om de maatschappelijke gevolgen van het beleggen in ondernemingen expliciet in beleggingsoverwegingen te betrekken.

Hoewel deze partijen bij het vaststellen van de kwaliteit van de onderneming en haar verwachte financiële prestaties naast traditionele selectiecriteria, strategie, en management ook duurzaamheidsaspecten steeds meer in beschouwing nemen, worden er zowel binnen academische kringen als in de praktijk kanttekeningen geplaatst bij deze ontwikkeling. Zo twijfelen critici aan de geldigheid van de financiële onderbouwingen van duurzaam beleggen en duurzaam ondernemen. De eerste associatie bij veel sceptische beleggers is dat portefeuilles geconstrueerd op basis van sociale-, ethische- of milieufactoren bovenmatig onderhevig zijn aan beleggingsrestricties, ten nadele van het uiteindelijke financiële rendement. Op een soortgelijke wijze beschouwen critici duurzaam ondernemen als een kostbare activiteit zonder concrete positieve effecten op financiële bedrijfsprestaties.

Aanhangers van duurzaam beleggen beargumenteren dat het merendeel van de markt de waarde van duurzaam ondernemen onderschat, zodat duurzame beleggers een informatievoordeel genieten ten opzichte van hun conventionele tegenhangers. Sommige hanteren de visie dat beleggers gericht op korte termijn rendementen de economische voordelen van duurzaam ondernemen, zoals reputatievoordelen, risicobeperkingen, en operationele efficiencyverbetering, over het hoofd zien omdat deze effecten zich meestal pas op de lange termijn manifesteren. Dit onderwaarderingsargument, ook bekend als "mispricing", illustreert waarom sommige beleggers verwachten dat duurzame portefeuilles beter zullen renderen dan normale portefeuilles.

In de discussie omtrent de relatie tussen duurzaamheid en de financiële prestaties van beleggers en ondernemingen is er tot op heden geen sprake van enige consensus. Deze dissertatie bundelt zes empirische studies die meer inzichten moeten bieden. De empirische studies geven antwoorden op vragen die relevant zijn voor zowel beleggers in ondernemingen als de ondernemingen zelf. Welke consequenties – in termen van beleggingsrendement en -risico - heeft een beleid dat expliciet informatie op het gebied van duurzaamheid meeweegt in beleggingsbeslissingen? Hoe manifesteert duurzaam ondernemen zich in traditionele financiële maatstaven als winst, marktwaardering en de kostenvoet van het vermogen? Zijn financiële markten in staat de meerwaarde van duurzaam ondernemen correct in te schatten, of bestaan er mogelijkheden voor beleggers om "mispricing" van duurzaamheidsinformatie uit te buiten?

Hoofdstuk 1 biedt een uitgebreide analyse van de prestaties van - actief en passief beheerde - duurzame beleggingsfondsen. In de steekproef van maandelijkse rendementen, vanaf 1987 worden alle duurzame en conventionele fondsen in de Verenigde Staten, Canada, het Verenigd Koninkrijk, Duitsland, Frankrijk, Nederland, België en Zwitserland betrokken. Omdat duurzaam beleggen in verschillende landen inmiddels een aanzienlijke historie kent, biedt de studie in dit hoofdstuk de mogelijkheid om uitsluitsel te geven over de rendementen van duurzame fondsen op langere termijn. Om de prestatie van een fonds te meten maken we gebruik van verschillende performance attributie analyses die in staat zijn om de rendementseffecten van duurzaamheidsscreens te onderscheiden van bekende nevenfactoren, zoals het stijl- en risicoprofiel van het fonds. De resultaten leveren het vrijwel onomstotelijke bewijs dat beleggingsfondsen met het label "SRI", "ethical" of "sustainable", niet systematisch beter of slechter presteren dan hun conventionele tegenhangers. Tevens vinden we bewijs dat de prestatie van een duurzaam beleggingsfonds redelijk onafhankelijk is van het type duurzaamheidsscreen dat het fonds hanteert. Tot slot levert dit hoofdstuk bewijs dat de jaarlijkse rendementen op duurzame aandelenfondsen voorspelbaar zijn. Duurzame fondsen die in het recente jaar relatief slecht presteren blijven dat doen in het daaropvolgende jaar. Voor duurzame beleggers loont het dus om duurzame beleggingsfondsen met teleurstellende jaarcijfers systematisch te mijden.

Het is opvallend dat de rendementen van duurzame beleggingen voornamelijk zijn getoetst met behulp van informatie over fondsen die louter handelen in aandelen. De inzichten die deze toetsen bieden zijn beperkt voor beleggers die een mix van aandelen en andere vermogenstitels beheren, zoals vastrentende waarden. Hoofdstuk 2 zet een eerste stap in de richting van duurzaam beleggen in obligaties. Hier wordt een blik geworpen op de prestaties van duurzame (investment-grade en high-yield) obligatiefondsen en mixfondsen ("balanced funds") ten opzichte van de prestaties van hun conventionele tegenhangers. Uit maanddata over de periode 1987-2003 blijkt dat het voor risico gecorrigeerde rendement op duurzame obligatiefondsen niet significant verschilt van het rendement op conventionele fondsen. Het gemiddelde, voor risico gecorrigeerde, rendement op duurzame mixfondsen ligt ongeveer 1.3 procent hoger dan dat van conventionele mixfondsen.

Hoewel duurzame beleggingsfondsen een goede indruk geven van in praktijk uitgevoerde duurzame beleggingsstrategieën, kent onderzoek naar dit soort fondsen haar beperkingen vanuit een academisch perspectief. Het feit dat duurzame en conventionele beleggingsfondsen aandelen selecteren uit een universum dat sterk overlappend is, maakt het moeilijk om verbanden te leggen tussen de duurzaamheidsprestaties van bedrijven en hun aandelenrendementen. Zo kan de vraag of de markt een risicopremie koppelt aan een bepaald bedrijfsattribuut, bijvoorbeeld de duurzaamheidsprestaties van een onderneming, doorgaans concreter worden beantwoord door middel van onderzoek naar rendementsverschillen tussen niet-overlappende portefeuilles, bijvoorbeeld een duurzame en een niet-duurzame portefeuille. Op een soortgelijke wijze wordt onderzocht of de markt dit attribuut wellicht verkeerd prijst, wat voor actieve beleggers kansen biedt.

Hoofdstuk 3 wijkt met concrete bedoelingen af van onderzoek naar beleggingsfondsen en richt zich op een specifieke dimensie binnen het concept duurzaamheid: eco-efficiency. Grofweg kunnen we de eco-efficiency van een bedrijf omschrijven als de mate waarin de onderneming competitieve kwaliteitsproducten en diensten kan leveren zonder daarbij de voorraad van grondstoffen en het ecologische systeem als geheel aan te tasten. Geïnspireerd door asset-pricing studies uit de traditionele financieringsliteratuur vergelijken we de rendementen van portefeuilles van ondernemingen die hoog scoren op het gebied van eco-efficiency met rendementen van portefeuilles die laag scoren. Het universum bestaat uit ondernemingen die periodiek worden gescreend door een bekende leverancier van duurzaamheidsinformatie voor institutionele beleggers. De meeste ondernemingen maken deel uit van bekende Amerikaanse aandelenindices.

Uit de empirische toetsen in dit hoofdstuk blijkt dat aandelenportefeuilles van Amerikaanse ondernemingen met hoge scores op het gebied van eco-efficiency beter presteren dan portefeuilles van ondernemingen met lage scores. Het rendementsverschil tussen deze portefeuilles is significant na correctie voor marktrisico, beleggingsstijlen en sectoreffecten. Een best-in-class strategie gericht op het aankopen van aandelen van eco-efficiënte bedrijven, oftewel een “long” positie, leverde historisch een gecorrigeerd rendement op van meer dan 4 procent per jaar. Een strategie gericht op een “long” positie in bedrijven met hoge eco-efficiency scores and een “short” positie in bedrijven met lage scores leverde circa 6 procent op. Hoewel transactiekosten een dempend effect uitoefenen op de prestaties van dergelijke duurzame beleggingsstrategieën blijven de waargenomen rendementen zowel economisch als statistisch gezien significant in verschillende transactiekostenscenario’s.

Hoofdstuk 4 geeft verdere inzichten in het concept van eco-efficiency door de resultaten op portefeuilleniveau te koppelen aan de waarde van eco-efficiency gemeten op bedrijfsniveau. Het hoofdstuk verbindt inzichten uit de managementliteratuur met de laatste stand van zaken op het gebied van performance- en risicometing uit de financieringsliteratuur. Vervolgens staan vier empirische vraagstukken centraal in dit hoofdstuk: is er een verband waar te nemen tussen de mate van eco-efficiency en de winstgevendheid van een bedrijf? Hoe wordt eco-efficiency op waarde geschat door financiële markten? Is er een tijdtrend waarneembaar in de mate waarop beleggers eco-efficiency zien als een bron van (immateriële) ondernemingswaarde? Zijn beleggers in staat om de effecten van eco-efficiënt ondernemen te vertalen naar toekomstige bedrijfswinsten? Op basis van de eco-efficiency scores van Amerikaanse bedrijven over de periode 1997-2004 stellen we vast dat bedrijven met een relatief hogere eco-efficiency score tevens relatief winstgevender zijn (in termen van rendement op assets) en hoger gewaard zijn (in termen van Tobin's q).

Op het eerste gezicht lijkt het laatstgenoemde positieve verband tussen eco-efficiency en waardering in strijd met het in Hoofdstuk 3 waargenomen positieve abnormale rendement op een eco-efficiënte aandelenportefeuille. De traditionele financiële markttheorie voorspelt namelijk dat de markt een aandeel hoger waardeert wanneer het niet-diversifieerbare risico van dit aandeel lager is, zodat beleggers een lagere premie eisen voor het dragen van dit risico. Volgens de efficiënte markttheorie en de daarbij behorende marktevenwichtmodellen is het gerealiseerde aandelenrendement op de lange termijn conform het vereiste rendement.

Om aan te tonen dat eco-efficiënte bedrijven niet alleen relatief hoger zijn gewaardeerd maar ook beter hebben gerendeerd, wijken we af van het idee dat de markt eco-efficiency op juiste waarde heeft geschat. Ten eerste blijkt dat de relatie tussen de eco-efficiency van een bedrijf en de marktwaarde (Tobin's q) van deze onderneming door de tijd heen is toegenomen. De toenemende waarde die beleggers toekennen aan eco-efficiency is consistent met het historische rendementspatroon van eco-efficiënte portefeuilles. Ten tweede vinden we bewijs dat de markt positief verrast is door de winstresultaten die we kunnen associëren met een eco- efficiënte bedrijfsvoering. De uiteindelijk gerealiseerde winsten van ondernemingen die een eco-efficiënt beleid implementeren, blijken systematisch hoger dan de winstvoorspellingen van beleggingsanalisten. Wanneer we veronderstellen dat de verwachtingen van analisten representatief zijn voor die van de uiteindelijke beleggers, dan kunnen we concluderen dat deze positieve "earnings surprises" ten grondslag liggen aan de eerder genoemde positieve abnormale aandelenrendementen.

Hoofstuk 5 past de in vorige hoofdstukken voorgestelde methoden toe om de meerwaarde van een alternatief concept binnen het containerbegrip duurzaamheid te toetsen: human capital management (HCM). Verschillende theorieën voorspellen dat de kosten verbonden aan het management van menselijk kapitaal in een organisatie in schril contrast staan met de baten, zoals een verbetering van de arbeidsproductiviteit van werknemers en operationele efficiency. Het is echter onduidelijk wat de (duurzame) belegger bereikt met het meewegen van informatie omtrent het human capital beleid van bedrijven, en welke vormen van HCM daadwerkelijk relevant zijn voor deze beleggers. Aan de hand van een unieke wereldwijde dataset met gegevens over de human capital systemen van meer dan 600 beursgenoteerde ondernemingen toetsen we de relatie tussen HCM en respectievelijk, return on assets, Tobin's q, aandelenrendementen, en earnings surprises. De empirische resultaten duiden sterk op een positief verband tussen de mate van human capital development (m.a.w., de mate waarin het bedrijf gebruik maakt van training en evaluatie van werknemers, skill-gap assessment uitvoert, en gebruik maakt van formele human resources succesmaatstaven) en de financiële prestaties van de onderneming. Bedrijven die hoog scoren op het gebied van human capital development genieten een relatief hogere winstgevendheid en hogere waardering in financiële markten. Opvallend is dat een talent attraction en retention systeem geen cross-sectioneel verband vertoont met de deze prestatiemaatstaven. Verder is, in tegenstelling tot de effecten van human capital management op winstgevendheid en marktwaardering, de relevantie van HCM informatie bij het genereren van abnormale beleggingsrendementen onduidelijk. In het algemeen geven de onderzoeksresultaten in dit hoofdstuk geen aanleiding te veronderstellen dat markten systematisch de waarde gecreëerd door human capital management onderschatten, hetgeen het behalen van buitengewone beleggingsrendementen mogelijk zou hebben gemaakt.

Tot slot biedt Hoofdstuk 6 een onderzoek naar de relatie tussen duurzaamheid en het ex ante verwachte aandelenrendement, oftewel de kostenvoet van het eigen vermogen. Uit het empirische onderzoek naar meer dan 3000 bedrijven in de V.S. blijkt dat prestaties op het gebied van milieu, governance, alsmede de duurzaamheidsprestaties van producten en diensten van de onderneming negatief gecorreleerd zijn met de kostenvoet van het eigen vermogen. Om deze resultaten te verklaren kunnen we in verschillende richtingen redeneren.

Doorgaans wordt verondersteld dat de duurzaamheidsprestatie van een onderneming alleen een relatie kan vertonen met het door beleggers vereiste rendement wanneer duurzaamheidsinformatie relevant is in het vaststellen van de premie voor het dragen van niet-diversifieerbaar risico. Hoe hoger dit risico, des te hoger het vereiste rendement. Een mogelijke verklaring zou dus kunnen schuilen in een risico-element verbonden aan de duurzaamheidskarakteristieken van het bedrijf, bijvoorbeeld risico ten gevolge van tabakswetgeving, milieuwetgeving, en juridische risico's. In dit geval verdisconteert de markt duurzaamheid met dezelfde motieven als waarop het traditionele risicomaatstaven meeweegt in het "prijzen" van vermogenstitels. Tevens kunnen door beleggers toegepaste duurzaamheidfilters worden vergeleken met een boycot die "imperfecties" kan creëren in kapitaalmarkten. Voorbeelden van imperfecties die consequenties kunnen hebben voor minder duurzame bedrijven zijn: (i) beperkte liquiditeit van aandelen, (ii) beperkte aandacht van analisten die doorgaans zorgen voor een adequate informatievoorziening omtrent een bedrijf ("neglect"), en (iii) een beperking van het aantal vermogensverschaffers, wat leidt tot een beperking van de optimale verdeling van het totale investeringsrisico ("risk sharing"). De opportunity costs die deze fricties met zich meebrengen voor beleggers in minder duurzame bedrijven kunnen tot uitdrukking komen in de vermogenskostenvoet van deze bedrijven.

De verschillende theoretische verklaringen worden ondersteund door onze empirische bevinding dat betere milieuprestaties, betere corporate governance, en betere kwaliteit van producten en diensten gekoppeld kunnen worden aan een lagere risicopremie. Deze resultaten staan in contrast met onze observatie dat bedrijven die hoger scoren op het sociale vlak een hogere premie moeten betalen. De recentelijk geopperde stelling dat sociale aspecten van duurzaam ondernemen een “agency cost” kunnen zijn, waartegen beleggers zich mogelijk beschermen door een hogere premie te eisen, wordt wellicht ondersteund door dit resultaat. Omdat opvattingen over de kostenvoeteffecten van duurzaam ondernemen nog in de kinderschoenen staan kan vervolgonderzoek op dit gebied veel verhelderende inzichten bieden.

Kortom, in het algemeen kunnen we concluderen dat verschillende aspecten van duurzaam ondernemen en duurzaam beleggen wel degelijk relevant zijn voor managers en beleggers die streven naar het behalen van een optimaal financieel resultaat. Het bekende tegenargument dat stelt dat rekening houden met duurzaamheidsthema’s een verslechtering van financieel rendement inhoudt kan deels naar het rijk der fabeltjes worden verwezen. Met de bevestiging dat duurzaamheidsinformatie gezien kan worden als “extra-financiële” informatie, die een belegger helpt bij het managen van risico en rendement, kan duurzaam beleggen de mainstreaming fase ingaan. Zo bieden onze resultaten voor beleggersanalisten een voor de hand liggende incentive om rekening te houden met extra-financiële informatie, gezien de betekenis ervan voor het creëren van toegevoegde waarde voor de belegger. Wanneer duurzaamheidsinzichten meer worden geïntegreerd in financiële research, zal duurzaam beleggen een veel omvangrijkere groep beleggers bereiken.

Vervolgstudies kunnen aan de hand van de financiële maatstaven in deze thesis veel vernieuwende inzichten bieden in de extra-financiële waarde van duurzaamheidsthema’s, zowel op bedrijfsniveau als op beleggersniveau. Belangrijk is dat het thema duurzaamheid op een praktisch relevante en zo concreet mogelijke manier wordt belicht. Klaarblijkelijk is het essentieel dat inzichten in de meerwaarde van duurzaam beleggen en ondernemen geboden worden op een lager aggregatieniveau, waarbij het containerbegrip “duurzaamheid” word vermeden en specifiekere dimensies, zoals milieu, arbeid, en governance, nader worden getoetst. De noodzaak van disaggregeren kan ook worden teruggevonden in de beleggingscodes van diverse grote pensioenfondsen, die een duidelijke belangstelling voor de zogenoemde ESG (environmental, social, en governance) thema’s weerspiegelen.

Biography

Jeroen Derwall (1978) is an Assistant Professor of Financial Management at RSM Erasmus University, and Assistant Professor of Finance at Maastricht University, The Netherlands. He is also co-initiator of the European Centre for Corporate Engagement (ECCE). Before starting his doctoral research at ERIM, he studied at Maastricht University to obtain his Master's degree in economics. His research has been published in international journals and presented at international academic meetings. His current research interest includes sustainable investment, empirical asset pricing, and mutual funds. His work on SRI has been awarded the 2005 Moskowitz Prize, and the 2005 European Finance & Sustainability Research Award. On behalf of ECCE, he is currently involved with sustainable investment research projects for the Foundation for Strategic Environmental Research (Sweden), and with similar projects sponsored by institutional investors.

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The Economic Virtues of SRI and CSR

Financial markets and company managers are increasingly acknowledging the concepts of socially responsible investing (SRI) and corporate social responsibility (CSR), but not without reservations. These hesitations are largely attributable to ongoing debates about a potential conflict between social responsibility goals and the traditional financial objectives of investors and companies. This thesis bundles six empirical studies that deepen our understanding of the economic value of SRI and CSR. Several empirical questions underlie these studies, such as: do CSR practices improve a firm's profitability? Do financial markets value corporate social responsibility? Do SRI criteria constrain investment portfolio optimization, or do they help investors in their hunt for underpriced securities? This thesis shows that SRI and CSR can be studied in new ways to answer these questions. We examine unique SRI stock portfolios with superior return/risk profiles, and provide a fresh look at strategies for investors in SRI mutual funds. By analyzing a wide range of pathways that lead CSR to interrelated measures of corporate financial performance, we further explain whether CSR carries value-relevant information. Taken together, the six studies discuss the channels of transmission from CSR to operating performance, the cost of capital, firm value, analysts' earnings expectations, and stock return. The conclusions from this dissertation are that (i) integrating SRI criteria into portfolio construction does not negatively affect investment performance; (ii) investors can use information on firms' eco-efficiency to make investment decisions that improve the return/risk profile of their portfolios; (iii) common CSR attributes, such as corporate environmental responsibility, and human capital management, have a significant association with traditional measures of corporate performance. We recommend making CSR salient to investors in the form of extra-financial information, with an emphasis on environmental, social, and corporate governance themes.

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ISBN 90-5892-132-8

Design: B&T Ontwerp en advies www.b-en-t.nl Print: Haveka www.haveka.nl