ESG Integration: Value, Growth and Momentum

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Keywords: Value, Growth, Momentum, Morningstar Style Box, Sustainable performance, ESG integration, ESG materiality, Risk-mitigation hypothesis.

JEL classification: G11, G17

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Abstract

We provide finer-grained results about the financial effectiveness of ESG integration when combined with mainstream active investment styles. Specifically, we demonstrate that U.S. and European value, growth and momentum investors can raise their portfolio's sustainability performance without sacrificing financial performance. By constructing size and industry-adjusted sustainability ratings, we provide the basis for a successful ESG integration and contribute to the evidence on ESG materiality from a risk perspective. Findings add to the growing demand for sustainable products in the traditional investment industry and overcome the notion of sustainability being a burden to classical investment practices.

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"We are increasingly responding to calls from fund managers asking us for ways to analyze Environment Social and Governance (ESG) factors and how to incorporate that analysis into their existing methods of valuing stocks."[1]

1 Introduction

The status of sustainability issues for corporate management and the investment management industry is ever increasing. While only 20% of S&P 500 listed companies published sustainability reports in 2011 the number has increased to 81% as we entered 2016 (Coppola, 2016). The increased awareness to account for the sustainability performance of a firm partially rests on the empirical evidence that the relation between ESG – the three central factors for measuring the sustainability of an investment: environmental, social and governance – and corporate financial performance is largely positive and stable over time, as documented in a recent meta-analysis of over 2000 empirical studies by Friede et al. (2015). Their study concludes, that *"the orientation toward long-term responsible investing should be important for all kinds of rational investors...[and] requires a detailed and profound understanding of how to integrate ESG criteria into investment processes in order to harvest the full potential of value-enhancing ESG factors."* (Friede et al., 2015, p.227). However, they also recognize the fact that both the aggregation of ESG sub-criteria, as well as the universal application across countries and industries is difficult and not likely to result in a clear picture. In this fashion, Warren Buffet – arguably one of the most prominent and successful fundamental value investors of our time – supports this notion by stating that there is no easy way to attaining a sustainable competitive advantage, thus businesses must invest in the three key components of profitability: its people, communities and the environment (Arbex, 2012).

We address the impact of ESG integration on value, growth and momentum strategies. For this purpose, we rely on multi-dimensional passive screens in order to identify value, growth and momentum stocks. On the other hand, we categorize stocks along their

[1] Jessica Alsford, Head of Morgan Stanley's Sustainable and Responsible Equity Research Group

sustainability characteristics by means of ESG ratings and separately account for their degree of environmental, social and corporate governance performance. We closely follow the methodology by Asness et al. (2013), who conduct an analysis of value and momentum returns across alternative asset classes. Besides a close alignment of the theoretical underpinnings of value and sustainable investing, which will be discussed in more detail in the course of this paper, both styles also show commonalities in their implementation through screening procedures and more recently though shareholder activism. Furthermore, the term sustainable – meaning to be able to continue over a long period of time – is a central concept for value investors with regard to businesses' long-term success. Thereon, we examine this proclaimed entanglement in more detail.

The alignment of concepts between value investors and sustainable investing on its own account should not come as a surprise. Hanson and Fraser (2013) state that non-financial issues including governance, corporate culture and employee satisfaction play an integral part for fundamental investors to determine the value of a business and derive an investment decision. In their view, the ESG framework might be new, however the underlying concept and issues addressed are well known to business value investors. Nevertheless, the debate on sustainability in investment management often seems decoupled from traditional investment practices. In that respect, van Duuren et al. (2016) document that the practical implementation of ESG criteria is generally not on the basis of a distinct investment strategy, as most academic studies implicitly assume in their set up, but rather acts as an add-on for conventional fund managers by adopting criteria of responsible investing to their existing investment process. Yet, the expectations from investing sustainable (short- vs. long-term returns, risk reduction, diversification, etc.), the strategic implementation (screening, best-in-class, activism, engagement, etc.) and the factors identified as relevant (social, environmental and corporate governance) vary strongly. In particular, U.S. investment managers are more skeptical about the benefits of sustainable investing with respect to the financial performance compared to European or U.K. managers and consequently less determined to incorporate ESG criteria in their investment process. Thereon, the consensus between fundamental (value) investors and

ESG investors is prevalent in Europe and the U.K. with respect to: (i) a low rebalancing frequency of portfolios, (ii) preference for individual firm over industry analysis, (iii) long-term investment horizon, and (iv) an active management understanding of their investment approach in terms of generating excess return over passive benchmarks (van Duuren et al., 2016).

As for the case of an alignment between momentum and ESG investing, we build on the demand driven growth of sustainable investments in the asset management industry. According to a report by Morgan Stanley (2016) the dominant drivers for an adoption of sustainable investment practices on behalf of asset management firms are: client demand (29%), financial return potential (15%) and personal values of leadership (10%). Segmenting client demand reviles the driving forces to be millennials with 81% of respondent being interested in ESG investing and 76% of women, whereas slightly over 60% of the financial advisors express "little or no interest" in ESG investing (Hale, 2016). Based on this current gap in demand and supply, we can expect stark buying pressure from institutional investors going forward as to meet their clients demand. As such, the current impressive growth figures for sustainable products may just be the beginning of a longer journey. Consequently, if we are currently only at the begging of this sustainable growth path, then highly rated ESG stocks may still show low levels of price-return momentum and consequently make an alignment more challenging for momentum investors. Hence, referring back to the findings by van Duuren et al. (2016) on the higher adoption rate of ESG criteria among European compared to U.S. investors, this should be reflected in higher average levels of aggregated sustainability ratings of momentum portfolios in the case of the European market.

Evidence provided in this study, on the impact of ESG integration on mainstream active investment styles, yields valuable insights for both investors, portfolio managers and firms a like. In fact, the corporate relevance is not to be neglected. Businesses in general and in particular firms with the aim of improving their sustainability performance seek long-term shareholders, such as value investors, given relatively high short-term sustainability innovation costs vis-à-vis long-term benefits (Whelan and Fink, 2016). Thereon,

understanding the impact of a firms sustainable performance on valuation metrics commonly considered by value-based investors can have a material impact on the shareholder structure. At the same time, the increased attention by private and institutional investors towards ESG criteria is likely to results in a momentum effect for stocks fulfilling a high ESG standard. However, based on the documented negative relation between value and momentum stocks (Asness et al., 2013) the beneficial inclusion of ESG criteria should be mutually exclusive to either value or momentum investors.

The paper proceeds as follows. Section 2 outlines our data and portfolio construction. Section 3 examines the performance of style, momentum and ESG-based portfolios, their respective sustainability ratings and industry allocation. Section 3.2 investigates the combined portfolio strategies, where sustainability aspects are integrated into classical style and momentum portfolios. Section 5 concludes.

2 Data and Portfolio Construction

2.1 Sample and Setting

Our initial sample comprises all European (Mnemonic: LA4RGNEU) and U.S. (Mnemonic: LA4CTYUS) firms included in the Asset4 database provided by Thomson Reuters between January 2002 and December 2015, which corresponds to 1,072 European and 1,756 U.S. firms. This includes firms for which sustainability ratings are available over the full period, as well as joiners and leavers. Thereby, we avoid the issue of a potential survivorship bias, which is well documented in the mutual fund literature. The sample consist of 10'379 European and 11,368 U.S. annual ratings for each of the social, environmental and corporate governance pillars.[2] In order to avoid that our results are driven by outliers, we trim our sample at the 1% level with respect to all fundamental variables. This reduces our sample to 965 European and 1,620 U.S. firms.

For the European dataset we observe a good fit relative to the STOXX EUROPE 600 index with a correlation of 0.97. The good fit of the STOXX Europe 600 for the case

[2]Although the cross-section of firms is larger for the U.S. sample, the number of sustainability ratings is on average smaller for U.S. firms resulting in relatively fewer annual observations.

of the European Asset4 sample was previously reported by Sassen et al. (2016). As for the representation of firms by country, the three largest countries in Europe – namely Germany (87 firms), France (96 firms) and the UK (388 firms) – account for 53.3% of our sample and the ten countries best represented in our sample account for 82.5% of the firms. For the European sample we take the perspective of a Euro investor and thereon convert all values to Euros, which is consistent with the natural denotation of the majority of countries in our sample.

As for the U.S. sample, we test for the best fit regarding common U.S. benchmark indices and the Fama-French CRSP-based market factor. We observe the best match for the S&P 500 with a correlation of 0.987. For the case of the U.S. sample all returns are denoted in USD and as such we take a U.S. investor perspective. Whilst this results in limited comparability between both regional samples with respect to the level of returns, the underlying characteristics in terms of an alignment of traditional investment approaches and ESG characteristics is nevertheless provided. We deem it more relevant to analyze the impact for these two investor groups in their respective home currency, rather than focusing on a comparability of levels of returns across the two samples.

2.2 Value, Growth and Momentum Measures

To measure value, the simplest and most common value signals are the book-to-market ratio (BTMV) and the price-to-earnings ratio (PE) of a stock (Fama and French, 1992, 1993; Asness et al., 2013). As Lakonishok et al. (1994, p.1541) state, value investing refers to *"buying stocks that have low prices relative to earnings, dividends, historical prices, book assets, or other measures of value"*. However, this purely quantitative, ratio-based approach is in contrast to the original concept by Graham and Dodd (1934), who advocate a thorough analysis as to identify undervalued firms. In this respect, Kok et al. (2017) have recently issued a critic towards the simplification of value investing and show that such one-dimensional ratio-based investment strategies (i) show limited evidence of delivering superior performance and (ii) do not actually identify undervalued stocks, but rather firms whose accounting numbers are temporarily inflated.

Based on these findings and the fact that we aim to disentangle the characteristic overlap between the style and sustainability component of a stock, we consider a more comprehensive approach to categorize stocks along the style dimension, whilst still keeping it transparent and easy to replicate. Therefore, we closely follow the Morningstar Style Box Methodology (2008), which was introduced in 1992 to support money managers in identifying the investment style of a fund.[3] Consistent with this methodology, and presented in Table 1, we apply the following five value rating components: (1) Price/Prospective Earnings, (2) Price/book, (3) Price/sales, (4) Price/cash flow, and (5) Dividend yield. This criterion selection is consistent with the literature on forming value-based investment portfolios (e.g. Bird and Whitaker (2003)). On the other hand, the growth rating includes: (1) Long-term projected earnings growth, (2) Historical earnings growth, (3) Sales growth, (3) Cash flow growth, and (5) Book value growth. Subsequently, we calculate percentile ratings for each value and growth component and take the average rating across all category components to determine the equal-weighted value and growth rating of a firm i in year t. In order to determine whether a firm is categorized as being a value or growth stock, we deduct the growth rating from the value rating and sort stocks from small to large. Thereon, stocks with a negative style rating (difference between value and growth rating) are defined as being more value and a positive style rating indicates a larger degree of growth characteristics. Stocks with a neutral exposure – corresponding to a style rating close to zero – are classified as 'core'.

[Place Table 1 about here.]

The methodology in its original form involves a weighting of the single components, where the previously listed first value and growth components (forward looking measures) carry the highest weighting of 50% and the remaining four components are assigned a weight of 12.5% each. Due to restricted data availability of *long-term projected earnings growth*, we replace this measure by the proportional increase of current year earnings per share to I/B/E/S 12-month forward earnings per share and equally-weight all components

[3] A detailed paper providing the methodological details of the Morningstar Style Box is available under: Morningstart Style Box Factsheet

of each rating.[4] All accounting related data is gathered from Worldscope.

The momentum measure is standard in its construction, by taking the past 12-month cumulative raw return on a stock and skipping the most recent month's return. The last month is generally excluded from the momentum measure, given the short-term 1-month reversal effect (Jegadeesh and Titman, 1993; Grinblatt and Moskowitz, 2004; Asness et al., 2013).

2.3 Sustainability Measures

We build on aggregated ratings for the sustainability pillars: social, environmental and corporate governance. Aggregated ratings are derived from a subset of 15 key indicators. We present the categorization of key indicators towards the three pillars in Table 2. These substantive sustainability ratings provided by Asset4 take on values between 0 and 100 by construction and, therefore can be easily compared.

[Place Table 2 about here.]

Existing – primarily accounting-based – studies are concerned with the association between firms environmental and social sustainability performance, shareholders return and firm value. In contrast, we explicitly include the corporate governance aspect in this study, rather than defining sustainability performance solely on the basis of environmental and socials actions. Our motivation is to account for the documented difference between institutional and retail investors when it comes to ESG integration in their investment process. Whilst Berry and Junkus (2013) report that retail investors primarily focus on environmental and social aspects of ESG criteria to derive investment decisions, professional money managers place more importance on corporate governance aspect, as documented by van Duuren et al. (2016). Thereon, we consider the corporate governance pillar as well as environmental and social actions with respect to analyzing commonalities between stocks categorized as entailing value, growth, momentum and/or sustainable ESG characteristics.

[4] Given the nature of I/B/E/S 12-month forward earnings per share, we set all negative values to NA, in order to avoid a distortion of the style measure.

2.3.1 Industry, Year and Size Adjusted ESG Ratings

Levels of ESG ratings are most likely heterogeneous across industries. On a very intuitive basis, a utility company will likely show higher CO^2 emission compared to a bank or IT firm. Figure 1 includes four subplots: heterogeneity across industries and years for the European sample (Subplots 1 and 3) and for the US sample (Subplots 2 and 4). We observe stark differences between the industries in both samples. Furthermore, we observe a close alignmnet of average ENV and SOC ratings across both samples, as well as on average higher (lower) ENV and SOC ratings compared to CGV ratings in Europe (U.S.). Besides, we observe a decrease in average ENV ratings for 2015 and 2016, indicating the inclusion of additional firms with lower average sustainability ratings.

[Place Figure 1 about here.]

Furthermore, it is well documented that a firms sustainability performance is positively related to firm size. Artiach et al. (2010) and Subramanian (2016) show that the strong link between a firms sustainability rating and its size can, among other factors, be attributed to an increasing investor demand and pressure by shareholders, the general public and media rather than being the results of a genuine internal beliefs-based decision. Thereon, small firms with a genuine interest in increasing their sustainability performance – but restricted by financial and human resources – are in a disadvantageous position when considering the absolute level of the ESG rating.

Consequently, we follow Chemmanur et al. (2015) and run our fixed-effects panel regression of ESG ratings on firm size, the square of firm size – in order account for non-linearity – as well as an industry and year dummy variable:

$$Rating_{i,t}^{esg} = \ln\left(firm\_size\right)_{i,t} + \left[\ln\left(firm\_size\right)_{i,t}\right]^2 + D\_industry_i + D\_year_t + \epsilon_{i,t} \quad (1)$$

where i indexes the firms and t indexes the year of observations. $\text{Rating}_{i,t}^{esg}$ are the absolute environmental (ENV), social (SOC) and corporate governance (CGV) ratings, $\log(firm\_size)$ and $[\log(firm\_size)]^2$ are based on firms book value of assets and the industry and year dummy variables. We consider the book value of assets (BVA) as a

common measure in the accounting literature to scale/normalize firm specific characteristics.[5]

Tables 3 and 4 present the regression results and confirm the hypothesis of a positive relation between firm size and sustainability performance. We make four central observations: (i) firm size is positively related to sustainable performance across all measures and both markets, except for corporate governance in Europe, (ii) industry fixed effects are strong across sustainability measures and markets, (iii) size coefficients stay significant even after accounting for industry and year effects, (iv) firm size square is significant and negative for all case but CGV in Europe.

[Place Tables 3 and 4 about here.]

For both the US and Europe we observe a two digit increase in ESG ratings for a one unit increase in their log(BVA), although at a decreasing rate given that the square of firm size is negative and significant for ENV and SOC in Europe and CGV in the US. The exception is CGV in Europe, for which we observe significantly negative coefficients and not industry dependent, indicating a lower effectiveness of board activities and functions for large European firms.[6] Accounting for industry effects, we observe strong industry dependencies, presented as the difference between the respective industry and the benchmark (Oil and Gas). We document a stark reduction in the size coefficient for ENV and SOC once accounting for industry effects. More specifically, we observe negative and significant coefficients for Telecom and Financials in the U.S. and Financials in Europe with respect to all sustainability measures. As for CGV, we show consistent patterns across industries in Europe and mixed results for the US, where Consumer Services, Telecoms and Financials load negatively and the other industries positive and significant. These

[5]Whilst, total assets (*assets*), total sales (*sales*), and market value of equity (*mve*) appear as the most prominent firm size proxies in empirical finance (Dang et al., 2018, p.161), we apart from *mve* as the empirical findings by Dang et al. (2018) indicate that *mve* is not a good/relevant proxy for firm size with respect to corporate governance. Furthermore, their results show that total sales is not a good choice with respect to investment policy (including firm risk), which in turns is a central aspect regarding the consideration of ESG ratings. Thereon, we chose BVA as a component of total assets minus intangible assets and liabilities, in order to avoid mechanical correlation between ESG ratings (material non-financial data) and the intangible assets component in total assets.

[6]Given the diversity of countries in Europe we might find country effects to be dominant, however we do not explicitly test for country fixed effects.

strong industry effects are somewhat surprising, given that Thomson Reuters already conducts industry adjustments when transforming their KPI scores to ratings.

Thereon, we consider firm-size and industry-adjusted ESG ratings, for the benefit of integrating pure(r) measures of sustainability into traditional investment approaches. As such, we consider regression residuals ($\epsilon_{i,t}$) from Formula 2 as revised (pure) ESG ratings going forward. Whilst this implicit large-cap tilt of unadjusted ESG ratings is not bad per se – consider generally higher liquidity, lower spreads and lower transactions costs – it should not slip in on the basis of an implicit rating bias, but rather explicitly and at the discretion of the investment manager, for example through the application of an equal- or market capitalization-weighted approach as to aggregate stock returns. Same holds true for overweighting certain industries, this should also be an explicit decision by the asset manager and not a consequence of integrating sustainability aspects.

2.4 Combined Measures

We apply an integration method by considering the rank of both the rating for each asset i of strategy k and for each ESG-based measure in the initial portfolio sorting procedure at time t, as illustrated in Table 1. Once more, we form market-capitalization weighted quintile portfolios (q) and select stocks with the highest combined average rank across both measures. Thereon, we allow for an entanglement between the tradition style and momentum measures, as well as the three categories of ESG-based ratings. Whilst the application of ranks for the benefit of combining investment strategies is in line with Asness et al. (2013), we deviate by restricting the combinations to long-only portfolios for the benefit of a broader application across investment managers, whereas they construct zero-investment factor portfolios. Consequently, the resulting portfolios select stocks that rate highest on the respective style and momentum dimension and demonstrate superior sustainability performance.

2.5 Portfolio Formation

Every year in June, we rebalance our portfolios based on lagged 6 month accounting, price and sustainability data to ensure data availability to investors at the time of revising the portfolio composition (Asness et al., 2013). Therefore, our results are conservative throughout and in particular with respect to sustainability information, which are commonly available as of January every year and not subject to revisions as can be the case for financial statement figures. For the case of market-capitalization weighted quintile portfolios, we apply contemporaneous market capitalization data, which is once more consistent with Asness et al. (2013). At each point of rebalancing, we consider all stocks for which we hold sustainability ratings and fundamental metrics for year $t-1$ and return data for the subsequent 12-month after rebalancing.

3 Empirical Findings

3.1 Value, Growth, Momentum and ESG Portfolios

Panels A1 and B1 of Table 5 report the annualized return premium and standard deviation (in parenthesis) for one dimensional portfolio sorts according to style, momentum and unadjusted (standard) ESG ratings in the block to the left, as well as for stocks sorted according to the industry and size-adjusted ESG measure on the right hand side. We also report the mean return and t-statistics (in parenthesis) of the corresponding high minus low portfolios. Consistent with the literature we observe positive value and momentum premia for the U.S. and European (in parenthesis) sample between 07/2003 and 06/2016 of 1.99% (0.21%) and 3.26% (6.69%) p.a., respectively. For European markets the value premium is strongly dependent on the observation period, underlying criterion to sort stocks into value and growth categories as well as the different national European markets in their own respect (Fama and French, 1998; Bird and Whitaker, 2003; Fama and French, 2012). As such the statistical insignificance of the value premium is routed in a high time-series variation, whilst the multi-dimensional Morningstar value rating reduces sensitivity

towards the value criterion selection.[7] The benefits of creating a composite average index of multiple value measures in order to reduce measurement error and noise across variables was previously documented by Israel and Moskowitz (2013) and Asness et al. (2013).

[Place Figure 1 about here.]

Next, we consider portfolios sorted on environmental (ENV), social (SOC) and corporate governance (CGV) ratings and observe overall negative sustainability premiums for the high minus low portfolio in the U.S. (Europe) of -1.01% (-2.66%), -1.91% (-1.96%) and +0.81% (-4.21%) p.a., respectively. As such, we observe a tendency where higher sustainability performance is related to lower future returns, however differences in H-L portfolio returns are not statistically significant. The literature on the connection between a firms sustainability performance and shareholder's return is mixed. Most prominently, Friede et al. (2015) conduct a large scale review and report the following summary for portfolio-based studies on ESG and corporate financial performance (CFP): 15.5% positive, 11.0% negative, 36.1% neutral and 37.4% mixed. However, regional differences, particularly between North America and developed Europe, yield a somewhat clearer picture in that 42.7% of the studies report a positive ESG-CFP relation in the U.S. compared to 26.1% positive in developed Europe.

On the other hand, considering the relation between sustainability performance and risk, our finding are in line with the risk-mitigation hypothesis, in that firms with a high sustainability rating provide lower returns but are beneficial in terms of their levels of risk. As such, accounting for ESG metrics by money managers focuses more on risk and long-term value creation rather than short-term return performance (Amel-Zadeh and Serafeim, 2017). Consistent with these findings, we observe a close to monotonic decrease in standard deviation as we move from low to high sustainability rated equity portfolios in both the U.S. and European sample.

In addition, we provide findings for portfolio sorts based on firm-size and industry-adjusted ESG ratings on the right hand side. We report closer to zero high minus low

[7] As a reference we approximate the value premium based on the *EURO STOXX TMI Value* minus *EURO STOXX TMI Growth* and get a negative premium of -1.64% p.a. over the same period.

premia in the U.S. (Europe) of +0.88% (-0.77%), -0.89% (-0.77%) and +1.50% (-1.63%) p.a. for the case of ENV, SOC and CGV, respectively. At the same time the risk reducing feature of incorporating ESG information into the portfolio formation process is retained. This finding suggest that the difference in returns from ESG sorted portfolios can partially attributed to the size premium, as we have previously documented a positive link between firm size and sustainability performance.

Panels A2 and B2 of Table 5 report the weighted average combined environmental and social (ENV+SOC) rating and corporate governance rating (CGV, in brackets) for one dimensional portfolio sorts according to style, momentum and raw EGS ratings in the block to the left, as well as the sustainability ratings for stocks sorted according to adjusted ESG scores on the right-hand block.[8] We examine corporate governance separately from the combined environmental and social ratings due to previously documented differences in the alignment of these three categories. More specifically, Amel-Zadeh and Serafeim (2017) show that materiality of the three ESG criteria varies strongly across industries. We consider, a portfolios resulting weighted aggregated sustainability rating, a necessary measure to evaluate the appropriateness of ESG related portfolio strategies, given that this is the general point of reference for fund managers to demonstrate the effectiveness of the corresponding portfolio implementation. In this respect, the ESG momentum approach, which is receiving increasing attention by the investment industry, is one example of a strategy that is based on ESG information but does not result in portfolios scoring high on the absolute level of sustainability (Nagy et al., 2016; Bos, 2017).

Next, we take a closer look at the aggregated sustainability ratings of traditional and ESG-based investment strategies. First, we report a close to monotonic increase in the aggregated environmental and social ratings for the U.S. and Europe as we move from growth to value and a reverse pattern with respect to corporate governance. Once more, this points towards an alternative treatment of corporate governance aspects on behalf of U.S. and European investors. For the case of Europe, a closer look at the

[8]Besides the weighted average ES-G ratings, we also consider the median and find close to identical results with a low degree of negative skewness for portfolios sustainability ratings.

single components – results are not separately reported – of the corporate governance pillar yields an inconsistent within category pattern. We observe value stocks to show lower ratings than growth stocks with respect to board functions, board structure and compensation policy, whereas they show beneficial properties for vision and strategy. For the U.S. we observe similar results in that values stocks show on average lower ratings for compensation policy, however a positive relation not only for vision and strategy but also – although at much lower levels – for board functions and board structure. One potential reason for the differences in relation to board structure and functions could be the ownership landscape, which, in continental Europe, is one of large blockholders. In contrast, a more disperse and fractioned ownership structure in the U.S. provides the board with a higher degree of power over the future direction of the company and thereon increases importance for value stock in the U.S. as to maneuvering the firm out of the state of depressed market valuation (Mendez, 2003).

In contrast, the positive link between value and strategy & vision aligns well with the activist approach – with traditional activists essentially being value investors – in that they favor firms with a clear vision & strategy and a long-term sustainable business model. In kind, Glenn Welling – Principal Chief Investment Officer at Engaged Capital – stated in an interview with Activist Insight that there is a strong correlation between poor governance standards and activism, with research indicating that approximately 40% of activist objectives to be related to changes in board personnel (Hedge Fund Insight, 2013). These findings are also consistent with previous empirical evidence on the role of corporate governance on firm value, whereby Gombers et al. (2003) show that stronger shareholder rights results in higher firm valuations (Tobin's Q), higher profits, higher sales growth and lower capital expenditures. Since value investors buy undervalued stocks, represented by a low Tobin's Q ratio, these companies indeed are associated with less favorable governance structures. At the other end of the style spectrum, growth investors favor stocks with strong sales growth and as such implicitly buy firms with better governance provisions in place.

On the subject of momentum, we report consistent findings for both samples in terms of a universally lower rating for high momentum stocks according to the combined environmental and social rating (ES) and corporate governance rating (CGV). One potential explanation for this pattern is the fact that momentum is related to strong media coverage (Hillert et al., 2014). As such stocks that are currently experiencing an upward trend in returns are less concerned with their sustainability performance, whereas stocks that are currently showing a downward trend in returns increase their sustainability performance to benefit from the positive signal to market participants.

3.2 ESG Integrated Portfolios

This subsection evaluates the impact of ESG integration on value, growth and momentum portfolios in the U.S. (Panel A) and for the European sample (Panel B). We are particularly interested in the potential of increasing the portfolio level ESG rating and the consequences on portfolio risk and risk-adjusted returns. We make three central observations: (i) integration of ESG criteria reduces portfolio (downside) risk across both markets and all investment strategies for all three ESG pillars, except for European value portfolios, (ii) in the U.S. all strategies improve their risk-adjusted returns, whereas in Europe only growth investors can benefit, and (iii) U.S investors can increase their portfolio ENV+SOC (CGV) rating by 30-70% (18-43%) and European investors by 25-40% (40-60%) depending on the investment approach, without a statistically significant decrease in performance. These findings document, that value, growth and momentum investors can starkly raise there strategies ESG rating without significantly sacrificing performance, although somewhat more difficult for momentum strategies

[Place Table 6 about here.]

Besides, our results indicate that value strategies benefit more from tilting towards firms with higher corporate governance standards, whereas growth investors should pay more attention to firms environmental and social ratings. As Bassen et al. (2006, p.129) state, growth firms are generally characterized by *"the exploitation of new opportunities,*

high capital requirements, scarce resources, a high degree of intangible assets, a short history, a high dependence on the managers, a high internal and external dynamic and low diversification". Thus, the authors argue that corporate governance is particularly important for growth companies given their higher levels of business and agency risk. As a result, shareholders of growth firms have a particular interest in raising the standards when it comes to corporate governance issues, which is reflected in a higher rating for this type of firms; whereas resource-intensive improvements in their environmental and social contribution are pending rear. Thereon, accounting for ENV and SOC aspects with respect to growth companies still offers potential benefits to investors.

Moreover, we observe that in the U.S. value investors can in fact significantly increase their portfolios risk-adjusted returns by incorporating ESG components, whereas same is true for growth investors in Europe. We contribute this to varying degrees of attention payed to sustainability issues in both markets, where European firms and investors have been and still are more concerned with ENV and SOC factors compared to the U.S. From a U.S. value perspective one can argue that a firms sustainability performance is not accounted for by the broad set of market participants and therefore not yet fully incorporated in stocks prices, which allows for the identification of undervalued stocks with a high sustainability performance and a long-term positive outlook with respect to managing social and environmental risks. In Figure 2 we provide indicative support of this thesis by showing the 12-month moving average of the Google Search Volume Index for the keywords "corporate governance", "ESG" and "environmental sustainability", as well as their respective counterparts for Germany – as a representative sample of Europe.[9]

[Place Figure 2 about here.]

A similar effect was previously documented for the correlation of governance indices and abnormal returns, as Bebchuk et al. (2013) state: *"[...] market participants' [...] appreciate the difference between good-governance and poor-governance firms. Consistent*

[9]As the Google Search Volume is very sensitive to the choice of the keyword and given that this would require multiple languages for Europe, we take Germany as a representative sample. The data was retrieved as a direct comparison between the three time-series.

with learning, the correlation's disappearance was associated with increases in market participants' attention to governance [...]". On the other hand, growth investors can take a favorable stand on highly sustainable firms, as they have experienced lower earnings in the past due to the costly transformation of becoming sustainable, but show a positive outlook in terms of future earnings growth and thereby capitalizing on the initial investment outlay.

As for the link between momentum and sustainability performance, one can build on the fact that both investors and the investment industry as a whole is experiencing a gradual shift towards sustainable investment products. Consequently, as sustainability is moving center stage, so should firms that shift their focus towards managing ESG risks and, thereon prices of firms improving their sustainability performance are likely to show a strong price appreciation going forward. At the the same time firms with currently low absolute ESG ratings show the largest potential for improvement and as such stock receiving large attention and price appreciation on the basis of their ESG improvement are likely to show lower absolute ESG rating for the time being. Consequently, momentum portfolios show low absolute ESG ratings.

In our opinion, the correlation between stocks showing strong momentum patterns and a high sustainability performance is likely to increase due to the stark demand for such firms to be included in investor portfolios. In support of this argument, Eccles and Serafeim (2013) take a closer look at the German software firm SAP and analyze their quarterly earnings call in relation to their ESG Briefing Call and identify two separate interest groups with respect to the audience. Findings document, that quarterly earnings calls are mainly attended by sell-side analyst, whereas their first ESG Briefing Call in 2012 was predominantly attended by buy-side analysts, with the ESG briefing call being *"designed to improve company-investor communications on material environmental, social and corporate governance (ESG) information"* (Eccles and Serafeim, 2013, p.16). They conclude, once sustainability issues are directly integrated into the core business concept, rather than being part of a separate sustainability report or call, than the two audiences, namely short term sell-side analysts and long-term investors, will become one.

Given that sustainability is receiving more attention in Europe, we would expect to see stronger momentum effects among high ESG stocks, especially after the financial crisis during which highly rated firms demonstrated lower levels of risk.

3.3 Impact of ESG Integration

So far we have shown that the integration of ESG criteria into value, growth and momentum portfolios results in an increase in strategies overall sustainability ratings without a statistically significant negative impact on performance. To shed more light on the differential return on traditional strategies versus their ESG integrated counterparts, we run multi factor regressions on the basis of the Fama-French 5-factor model and Carhart 4-factor model. This allows us to analyze the impact of integrating ESG criteria on investors traditional portfolios with respect to changes in the exposure towards common risk factors. Specifically, we run the following regression model:

$$\begin{aligned} R_{k/ESG,t} - R_{k,t} = \; & \alpha_{i,t} + \beta_1 \left(R_{M,t} - R_{f,t}\right) + \beta_2 SMB_t + ... \\ & \beta_3 HML_t + \beta_4 MOM_t + \beta_5 RMW_t + \beta_6 CMA_t + \varepsilon_{i,t} \end{aligned} \tag{2}$$

Table 7 presents the estimated coefficients of our six-factor model for difference returns. We find a significant reduction in portfolios systematic risk across the full spectrum, except for value portfolios, as well as a large-cap tilt even though we apply size and industry-adjusted ESG ratings. However, additional test not reported, document that the large-cap tilt based on unadjusted ESG ratings would be significantly higher with coefficient ranging from -0.2 to -0.3. In a similar fashion we observe negative coefficients with respect to the value (HML) factor, although not statistically significant in the majority of cases, and insignificant momentum factor loadings. More interestingly, we observe a negative exposure in the European sample for the profitability factor (RMW) and a positive exposure towards the investment factor (CMA). A potential explanation for these findings is that the implementation of a sustainable business practice, resulting in higher ESG ratings, is costly and as such reduces profitability in the short-run, whilst the tilt towards conservative (low investment-to-assets) firms is also associated with value firms

(high book-to-market), as discussed by Hou et al. (2015), which is, as we have previously documented, positively related to ESG ratings. This notion is supported in an alternative specification, where RMW and CMA are dropped. In this case difference returns of European growth strategies load significantly positive on HML.

[Place Table 7 about here.]

Building on the documented reduction in systematic risk from an integration of ESG aspects, we take a closer look at the time-variation of these favorable characteristics. Figure 3 presents the rolling 36-month market beta coefficients from Formula 2. For the U.S. sample (plots in the left column) we observe throughout favorable risk characteristics from integrating ESG aspects in form of a reduction in portfolio systematic risk. Whilst this observation also holds for the case of momentum portfolios in the European sample, the results with respect to European value and growth portfolios are mixed. In this respect, we once more observe strong differences between ENV and SOC-based integration versus CGV in that latter is favorable from a risk perspective for value investors, whereas ENV and SOC show positive and consistent risk reducing characteristics for growth investors. Again, this supports the necessity for a disentangled understanding of ESG components, in particular with respect to the corporate governance pillar.

[Place Figure 3 about here.]

Given the documented time-variation in systematic risk reducing features of ESG components, suggest that ESG integration will result in suboptimal allocations during certain market phases and that a more efficient integration can be achieved by accounting for varying degrees of ESG materiality. Thereon, we test for industry specific and time-varying ESG materiality on the basis of the KPIs underlying the three ESG pillars in order to derive more granular results and favorable grounds for integrating ESG criteria into traditional investment approaches.

3.4 ESG Risk Materiality Assessment

Khan et al. (2016) build on the ESG materiality map by Sustainability Accounting Standards Board (SASB) and contribute to the inconclusive literature on the relation between sustainability performance and future financial performance by providing evidence on the importance of differentiating between industry specific material and non-material sustainability issues. Their findings document that investment decisions with respect to sustainable aspects can only be successfully implemented if materiality is accounted for on an industry-by-industry basis. In this case, material sustainability issues can be value-enhancing, whereas immaterial aspects are value-destroying.[10]

Building on the evidence of industry-specific materiality of sustainability KPI's, but carrying forward the systematic (quantitative) approach of this paper, we build on the risk concept of sustainability aspects and adopt the methodology by Sassen et al. (2016). Their study analysis the impact of ESG factors on firm risk in Europe and provides evidence on the potential of corporate social performance to increase firm value through lower firm risk, measured in terms of systematic, idiosyncratic and total risk. More importantly, their robustness checks indicate that this risk reducing feature is also significant for future firm risk, at least with respect to total and systematic risk. Whilst their argument for the non-significance of CSR on future idiosyncratic risk rests on the notion of CSP having an immediate impact on company specific returns that are not explained by the market, we challenge their reasoning and suggest heterogeneous effects within aggregated ESG ratings to cancel each other out when looking at firm-specific risk on a market aggregate. Thereon, we adopt their methodology by analyzing the impact of 15 standalone KPI's (3×ENV, 7×SOC and 5×CGV) and their impact on future idiosyncratic firm risk for 10 industries separately.

Consistent with Sassen et al. (2016), we estimate idiosyncratic (firm-specific) risk for each firm i in year t by calculating the annualized standard deviation of the daily residuals

[10]Meanwhile, alternative ESG materiality maps have been published by BlackRock in 2016 "Exploring ESG: A Practicioner's Perspective" and the European Federation of Financial Analysts Societies (EFFAS). These are consistent in their notion and largely inline in their outcome.

derived from the Fama and French (1993) three-factor model:

$$R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_1 \left(R_{M,t} - R_{f,t}\right) + \beta_2 SMB_t + \beta HML_t + \varepsilon_{i,t} \tag{3}$$

where ($R_{i,t}$ - $R_{f,t}$) is the excess return of firm i above the risk-free rate, ($R_{M,t}$ - $R_{f,t}$) is the market excess return, the size premium (small minus big, SMB) and the value premium (high minus low, HML). The term $\varepsilon_{i,t}$ contains the residuals form our three-factor regression based on daily returns. We take the standard deviation of daily returns for each year as the estimate of idiosyncratic risk for each firm in our sample. To derive a high level of accuracy, we apply index-based factors constructed on the basis of the STOXX EUROPE 600 and S&P500 for Europe and the U.S. and thereby follow the methodology by Cremers et al. (2012).

Subsequently, we run the following fixed-effects panel regression on all firms i of industry k in order to identify industry-specific material sustainability factors defined by a statistically significant negative coefficient, thereon indicating favorable characteristics as to reducing future firm-specific risk. Our specification looks as follows:

$$std(\varepsilon^k_{i,t+1}) = \beta_0 + \beta_1 Rating^{KPI}_{i,t} + \beta_2 (firm\_size)_{i,t} + \beta ROA_{i,t} + D\_year_t + \upsilon_{i,t} \tag{4}$$

where $std(\varepsilon^k_{i,t+1})$ is the standard deviation of idiosyncratic risk of firm i in industry k in year $t+1$, $Rating^{KPI}_{i,t}$ are the 15 KPI's underlying the aggregated ENV, SOC and CGV pillars, $(firm\_size)_{i,t}$ is a firms book value of assets (BVA) , $ROA_{i,t}$ is a firm return on assets and D_year_t is the year dummy variable. Based on Sassen et al. (2016) we only include control variables which showed up as statistically significant for future idiosyncratic risk and consequently drop the leverage measure (LEV), market to book value (MTB), dividend payment (DIV_1), volatility of ROA (SDROA_5) and stock liquidity (LIQ) from our model specification. The detailed regression results are provided in the Internet Appendix at the end of the paper, a summary of the results is presented in form a of Risk Materiality Map in Table 8. The Risk Materiality Map indicates, for the U.S. (Panel A) and European (Panel B) sample the risk relevant KPIs

in form of a gray shaded box. These gray shaded boxes represent KPIs with statistically significant negative coefficient with respect to firms next year idiosyncrating risk and thereby demonstrate risk-materiality.

[Place Table 9 about here.]

Table 9 presents the portfolio result for strategies k regarding ESG integration based on all KPIs (k/ESG) and for portfolios only accounting for risk-material KPIs (k/Material). We document equal or better risk-adjusted returns, lower downside deviation and higher excess returns whilst showing comparable levels of aggregated portfolio ratings. These findings hold in large across all strategies k and both the U.S. and European sample. As such, we support the findings by Khan et al. (2016) on the importance of ESG materiality and introduce a new concept of risk-materiality for the benefit of portfolio construction. Going forward, a possible extension would be to account for time-variation in risk-materiality by defining risk-material KPIs on a rolling window for each year rather than assuming a constant relationship as done in this study.

4 Robustness Checks

Initial tests of size and indutry-adjusted ESG ratings are based on the residuals over the full observation period from $1 \dots T$. Additionally, we implement out-of-sample (OOS) firm-size and industry-adjusted ESG ratings for the benefit of practical transferability by running panel regression based on a recursive (expanding) window and consider residuals from the most recent period t from the output of $1 \dots t$ for the construction of portfolios in $t + 1$. We refer to these measures as ESG^*_{OOS}. Results are summarized in Table 10 and our previouse findings are confirmed and close to identical.

[Place Figure 10 about here.]

Secondly, we also consider alternative specification to derive momentum portfolios based on the past 7-to 12-month returns and past 2- to 6-month returns, as proposed by Novy-Marx (2012). However, these alternative momentum measures do not alter

our results and, therefore we only report results for the most common 2- to 12-month return based measure. Thirdly, we apply an annual portfolio rebalancing frequency and once more the results do not change material. Finally, we test for an equal rather than market-capitalization weighted aggregation of stocks for portfolio construction. Again, the relative results between strategies are largely unchanged, whereas we observe overall higher portfolio returns, higher levels of portfolio risk an slightly lower levels of aggregated portfolio level ESG ratings.

5 Conclusion

We provide evidence and suggest methods for the successful integration of ESG aspects by traditional U.S. and European value, growth and momentum investors. Results demonstrate, that against the common notion, the inclusion of sustainability aspects does not inevitably result in a performance drag, however can – if done sensibly – bring about style and momentum portfolios with a higher aggregated sustainability rating and improved risk-adjusted return characteristics. Specifically, we consider U.S. and European investors of the three types (value, growth and momentum), the three dimensions of ESG sustainability and a size and industry-adjustment to mitigate correlated firm characteristics for the benefit of integrating sustainability criteria.

Findings demonstrate a consistent reduction in portfolio risk from the inclusion of ESG criteria in the portfolio formation, which supports the risk mitigation perspective for the case of ESG-based investment management. Previous discussions on the risk mitigation hypothesis in the field of corporate social performance (CSP) have provided evidence in the same direction including higher equity cost of capital for low CSP firms (Heinkel et al., 2001), a decrease in idiosyncratic risk for equities alongside an increase in CSP (Lee and Faff, 2009), a decrease in the cost of debt (Goss and Roberts, 2011) and lower capital constraints (Cheng et al., 2014). Furthermore, we demonstrate a natural alignment of value stocks and firms with high absolute environmental & social ratings and a clear vision & strategy, whereas the same stocks rating on average lower with respect to shareholders

rights and aspects related to their Board of Directors (e.g. compensation policy and board structure). Overall, the results point towards firms sustainability performance to be largely accounted for in prices of European firms, whereas in the U.S. investor attention towards environmental and social components of sustainability appears lower and is not yet fully reflected in firms market value.

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Appendix

Table 1: Morningstar Style Box Methodology and ESG Integration

Value Score Components and Weights		Growth Score Components and Weights	
Forward looking measures		**Forward looking measures**	
Price-to-projected earnings	20%	Long-term projected earnings growth*	20%
Historical based measures		**Historical based measures**	
Price-to-book	20%	Historical earnings growth	20%
Price-to-sales	20%	Sales growth	20%
Price-to-cash flow	20%	Cash flow growth	20%
Dividend yield	20%	Book value growth	20%
Value Score	100%	Growth Score	100%

*Due to data availability we approximate this measure by the proportional increase of current year earnings per share to I/B/E/S 12-month forward earnings per share.

Identification of Style Tilt:
Style Score = Growth Score - Value Score

ESG Integration
New Score = $0.5 \times$ rank(Style Score) + $0.5 \times$ rank(ESG Rating)

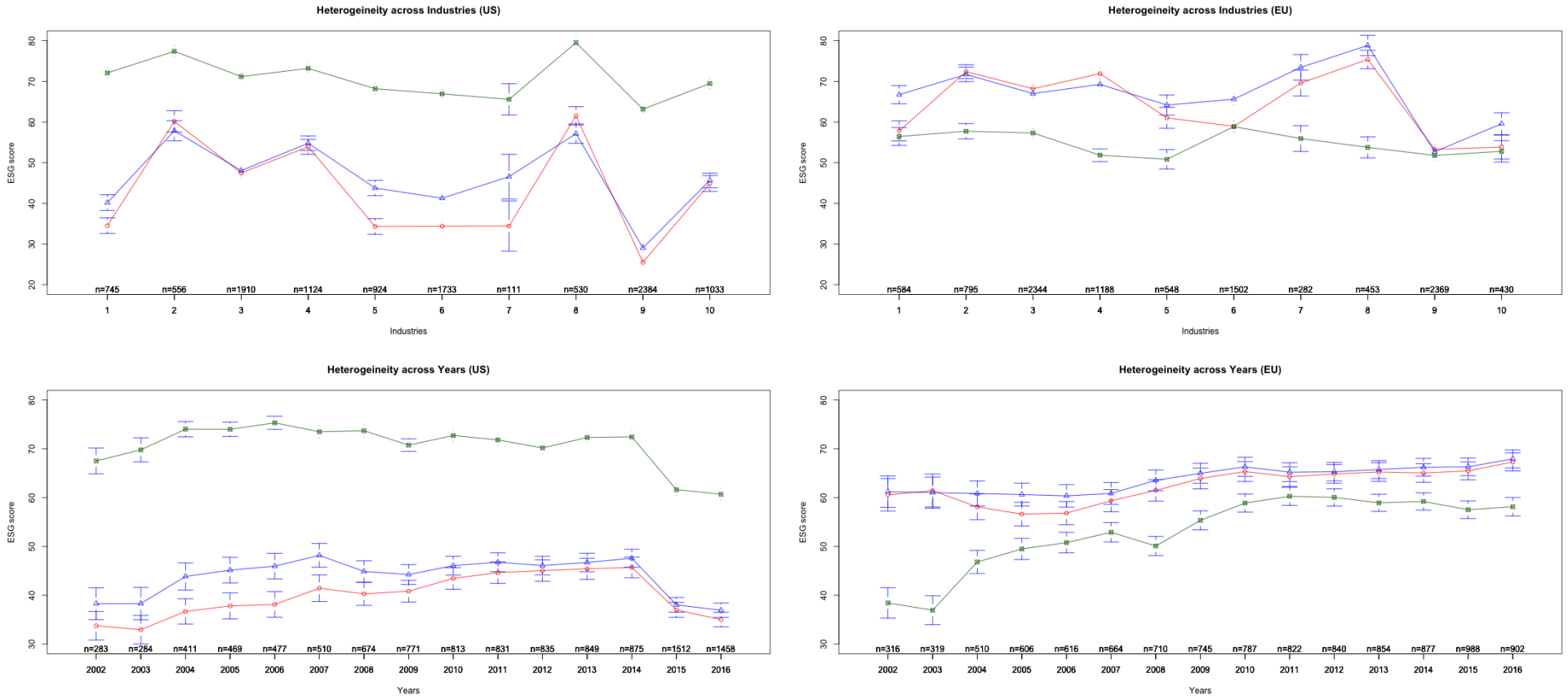
Table is based on the Morningstar Style Box Methodology and provides an overview on the methodology of sorting stocks into value and growth portfolios, as well as on the procedure of ESG integration. In this respect, the "style score" can replaced by any other characteristic (e.g.momentum) in order to derive an ESG integration for alternative investors.

Table 2: Asset4 ESG Sub-categories

Pillar	Categories	Key Indicators	Code
Social (SOC)	Customer	Product Responsibility	SOPR
	Society	Community	SOCO
		Human Rights	SOHR
	Workforce	Diversity and Opportunity	SODO
		Employment Quality	SOEQ
		Health & Safety	SOHS
		Training and Development	SOTD
Environmental (ENV)	Emission Reduction		ENER
	Product Innovation		ENPI
	Resource Reduction		ENRR
Corporate Governance (CGV)	Board of Directors	Board Functions	CGBF
		Board Structure	CGBS
		Compensation Policy	CGCP
	Integration	Vision and Strategy	CGVS
	Shareholders	Shareholder Rights	CGSR

Table presents the split-up of the social, environmental and corporate governance pillars by Thomson Reuters Asset4 into categories and key indicators for a more transparent and better understanding of the underlying drivers.

Figure 1: Heterogeneity of ESG ratings per industry and year in the U.S. and European sample



Figures show heterogeneity of ESG ratings for the U.S. (left hand side) and the European sample (right hand side) with respect to industries and years. Numbers n indicate the number of observation per industry/year. We apply the ICB industry classification: (1) Oil & Gas, (2) Basic Materials, (3) Industrials, (4) Consumer Goods, (5) Health Care, (6) Consumer Services, (7) Telecommunications, (8) Utilities, (9) Financials, (10) Technology.

Table 3: Regression Analysis: U.S. Sample

	Environmental Ratings		Social Ratings		Corporate Governance Ratings	
	(1)	(2)	(3)	(4)	(5)	(6)
Size	20.742***	2.946	15.542***	2.215	20.883***	14.268***
	(3.346)	(2.955)	(3.092)	(2.771)	(2.176)	(2.124)
Size^2	−0.384***	0.269***	−0.216**	0.298***	−0.539***	−0.297***
	(0.105)	(0.093)	(0.097)	(0.087)	(0.068)	(0.067)
Materials		29.568***		21.655***		6.883***
		(1.384)		(1.297)		(0.994)
Industrials		18.949***		14.165***		2.170***
		(1.070)		(1.004)		(0.769)
Goods		24.523***		19.721***		3.255***
		(1.169)		(1.096)		(0.840)
Healthcare		6.399***		10.199***		0.060
		(1.227)		(1.150)		(0.882)
Services		4.818***		6.316***		−2.473***
		(1.085)		(1.018)		(0.780)
Telecom		−10.366***		−4.300*		−10.016***
		(2.525)		(2.368)		(1.815)
Utilities		18.612***		8.566***		3.795***
		(1.413)		(1.325)		(1.016)
Financials		−14.966***		−16.926***		−10.272***
		(1.046)		(0.981)		(0.752)
Technology		20.645***		16.025***		2.516***
		(1.199)		(1.124)		(0.862)
Observations	11,015	11,013	11,015	11,013	11,015	11,013
R^2	0.138	0.349	0.161	0.348	0.073	0.145
Adjusted R^2	0.137	0.348	0.160	0.347	0.072	0.143

Note: Industry reference with respecto to Oil & Gas. *p<0.1; **p<0.05; ***p<0.01

Table 4: Regression Analysis: European Sample

	Environmental Ratings		Social Ratings		Corporate Governance Ratings	
	(1)	(2)	(3)	(4)	(5)	(6)
Size	26.519***	12.702***	21.275***	5.828***	−16.847***	−22.261***
	(1.782)	(1.718)	(1.740)	(1.661)	(1.770)	(1.815)
Size^2	−0.651***	−0.167***	−0.494***	0.049	0.538***	0.727***
	(0.055)	(0.053)	(0.054)	(0.051)	(0.055)	(0.056)
Materials		13.164***		3.590***		1.571
		(1.378)		(1.332)		(1.456)
Industrials		14.447***		4.322***		1.885
		(1.170)		(1.132)		(1.237)
Goods		13.803***		2.264*		−4.073***
		(1.279)		(1.236)		(1.351)
Healthcare		4.775***		−0.907		−4.901***
		(1.502)		(1.452)		(1.587)
Services		5.306***		3.231***		3.923***
		(1.235)		(1.194)		(1.305)
Telecom		4.151**		−0.922		−1.444
		(1.836)		(1.775)		(1.941)
Utilities		8.403***		3.105**		−3.180*
		(1.591)		(1.538)		(1.681)
Financials		−14.152***		−24.302***		−8.162***
		(1.192)		(1.152)		(1.259)
Technology		4.834***		1.443		−3.342*
		(1.614)		(1.561)		(1.706)
Observations	10,513	10,467	10,513	10,467	10,513	10,467
R^2	0.140	0.259	0.135	0.268	0.011	0.033
Adjusted R^2	0.139	0.257	0.133	0.266	0.009	0.031

Note: Industry reference with respecto to Oil & Gas. *p<0.1; **p<0.05; ***p<0.01

Table 5: Portfolio Characteristics sorted on Value, Momentum and ESG Criteria

	Style, Momentum and ESG portfolios						Firm-size and industry-adjusted ESG portfolios					
	Low	2	3	4	High	H-L	Low	2	3	4	High	H-L
Panel A: U.S. sample												
Panel A1: Return Premia and Standard Deviation												
Style	8.41	8.28	9.80	11.10	10.41	1.99						
	(16.72)	(13.53)	(14.49)	(13.75)	(14.75)	(0.63)						
Momentum	7.92	10.32	10.37	9.79	11.18	3.26						
	(18.94)	(14.46)	(13.26)	(14.55)	(19.03)	(0.93)						
ENV	9.93	8.08	9.10	9.26	8.92	-1.01	8.68	8.41	9.77	8.58	9.56	0.88
	(15.74)	(17.04)	(17.24)	(15.38)	(12.59)	(-0.52)	(17.33)	(15.64)	(14.65)	(14.09)	(13.82)	(0.47)
SOC	10.35	9.56	10.48	9.02	8.44	-1.91	9.76	9.78	8.19	9.56	8.86	-0.89
	(17.85)	(16.94)	(16.22)	(15.73)	(12.35)	(-0.77)	(16.65)	(17.23)	(14.92)	(12.91)	(13.95)	(-0.53)
CGV	8.70	9.17	10.18	8.42	9.51	0.81	8.64	9.71	9.32	8.24	10.14	1.50
	(17.23)	(15.04)	(16.20)	(13.79)	(13.16)	(0.40)	(16.74)	(13.96)	(13.76)	(13.81)	(15.39)	(0.94)
Panel A2: Aggregated Portfolio ENV+SOC and CGV Rating (latter in parantheses)												
Style	43	55	56	57	58	15						
	(62)	(70)	(70)	(68)	(72)	(10)						
Momentum	51	56	53	52	38	-12						
	(67)	(71)	(68)	(67)	(57)	(-10)						
ENV	22	25	36	62	86	64	29	33	50	69	83	54
	(63)	(66)	(70)	(78)	(86)	(23)	(67)	(69)	(75)	(81)	(85)	(18)
SOC	15	24	40	60	84	69	26	38	55	72	80	54
	(62)	(67)	(71)	(77)	(86)	(24)	(65)	(71)	(76)	(82)	(84)	(19)
CGV	32	43	50	61	80	48	40	56	62	68	67	27
	(47)	(66)	(76)	(83)	(92)	(45)	(52)	(72)	(82)	(88)	(90)	(39)

Continued

Table 5 – *Continued*

Panel B: European sample

	Style, Momentum and ESG portfolios						Firm-size and industry-adjusted ESG portfolios					
	Low	2	3	4	High	H-L	Low	2	3	4	High	H-L
Panel B1: Return Premia and Standard Deviation												
Style	9.59	10.86	9.68	10.14	9.80	0.21						
	(13.83)	(13.85)	(14.03)	(14.63)	(16.39)	(0.07)						
Momentum	8.68	8.25	9.54	10.56	15.37	6.69						
	(19.70)	(14.73)	(13.97)	(14.58)	(17.61)	(1.63)						
ENV	10.29	11.49	9.06	10.59	7.64	-2.66	9.69	10.47	9.87	8.33	8.91	-0.77
	(16.21)	(16.56)	(14.81)	(14.74)	(14.56)	(-1.36)	(16.76)	(15.43)	(15.05)	(14.18)	(14.23)	(-0.31)
SOC	10.45	9.24	11.35	8.47	8.49	-1.96	8.74	11.75	8.14	10.47	7.97	-0.77
	(17.52)	(15.92)	(15.40)	(14.87)	(14.00)	(-0.86)	(16.98)	(15.97)	(14.94)	(13.61)	(14.46)	(-0.34)
CGV	11.59	9.87	11.69	8.16	7.38	-4.21	10.71	10.32	10.55	7.62	9.09	-1.63
	(15.36)	(14.27)	(15.06)	(15.54)	(14.60)	(-1.95)	(15.29)	(14.61)	(15.96)	(15.66)	(13.09)	(-0.74)
Panel B2: Aggregated Portfolio ENV+SOC and CGV Rating (latter in parantheses)												
Style	69	69	71	73	70	2						
	(53)	(50)	(55)	(52)	(52)	(-1)						
Momentum	71	72	73	67	59	-12						
	(54)	(54)	(54)	(50)	(43)	(-11)						
ENV	24	49	72	86	93	69	33	67	86	90	88	54
	(28)	(42)	(53)	(61)	(66)	(39)	(31)	(53)	(61)	(63)	(64)	(33)
SOC	21	48	69	86	93	72	32	70	86	90	88	56
	(23)	(40)	(51)	(64)	(66)	(42)	(28)	(53)	(63)	(64)	(65)	(36)
CGV	47	74	80	85	87	41	52	74	81	85	86	34
	(14)	(36)	(56)	(71)	(87)	(73)	(16)	(38)	(58)	(74)	(87)	(71)

Table presents the results for the U.S. sample in Panel A and the European sample in Panel B, with portfolio sorts based on standard ratings presented on the left hand side and results for size and industry-adjusted ESG ratings presented on the right. Each panel contains two sub-panels, where the first contains the returns and standard deviations (in parentheses) for portfolios along the style, momentum and the three E/S/G dimensions. The last column of each block states the average return and t-statistic (in parentheses) for the long-short portfolios (H-L). The second sub-sample provides the corresponding average sustainability ratings on the basis of the combined environmental and social rating (ENV+SOC) and the corporate governance rating (in parentheses). We provide portfolio level ratings based on standard ESG ratings as provided by Thomson Reuters. The observation period is from 2002 to 2016 and corresponds to 156 monthly returns.

Table 6: ESG Integrated Portfolios

	mean_{geo}	mean_{ari}	std	sharpe	t(sharpe)	sortino	alpha	t(alpha)	E+S	CGV
Panel A: U.S. sample										
Panel A2: Value investing										
Value	9.31	10.41	14.75	0.20	-	0.31	-	-	58	72
V/ENV	10.37	11.35	13.89	0.24	(1.58)	0.36	1.92	(2.03)	76	83
V/SOC	10.71	11.70	13.93	0.24	(2.62)	0.37	2.09	(3.00)	74	83
V/CGV	11.26	12.26	14.09	0.25	(2.57)	0.39	2.73	(3.25)	70	87
Panel A3: Growth investing										
Growth	7.00	8.41	16.72	0.15	-	0.21	-	-	43	62
G/ENV	6.92	7.94	14.25	0.16	(0.75)	0.24	0.38	(0.43)	70	80
G/SOC	7.45	8.52	14.56	0.17	(1.09)	0.25	0.78	(0.79)	68	81
G/CGV	7.23	8.39	15.12	0.16	(0.71)	0.23	0.23	(0.21)	61	85
Panel A4: Momentum investing										
Momentum	9.35	11.18	19.03	0.17	-	0.25	-	-	38	57
M/ENV	8.35	9.74	16.59	0.17	(-0.01)	0.25	-0.15	(-0.15)	67	80
M/SOC	8.38	9.70	16.18	0.17	(0.19)	0.26	0.03	(0.04)	67	80
M/CGV	8.64	10.17	17.41	0.17	(-0.05)	0.25	-0.16	(-0.16)	60	83

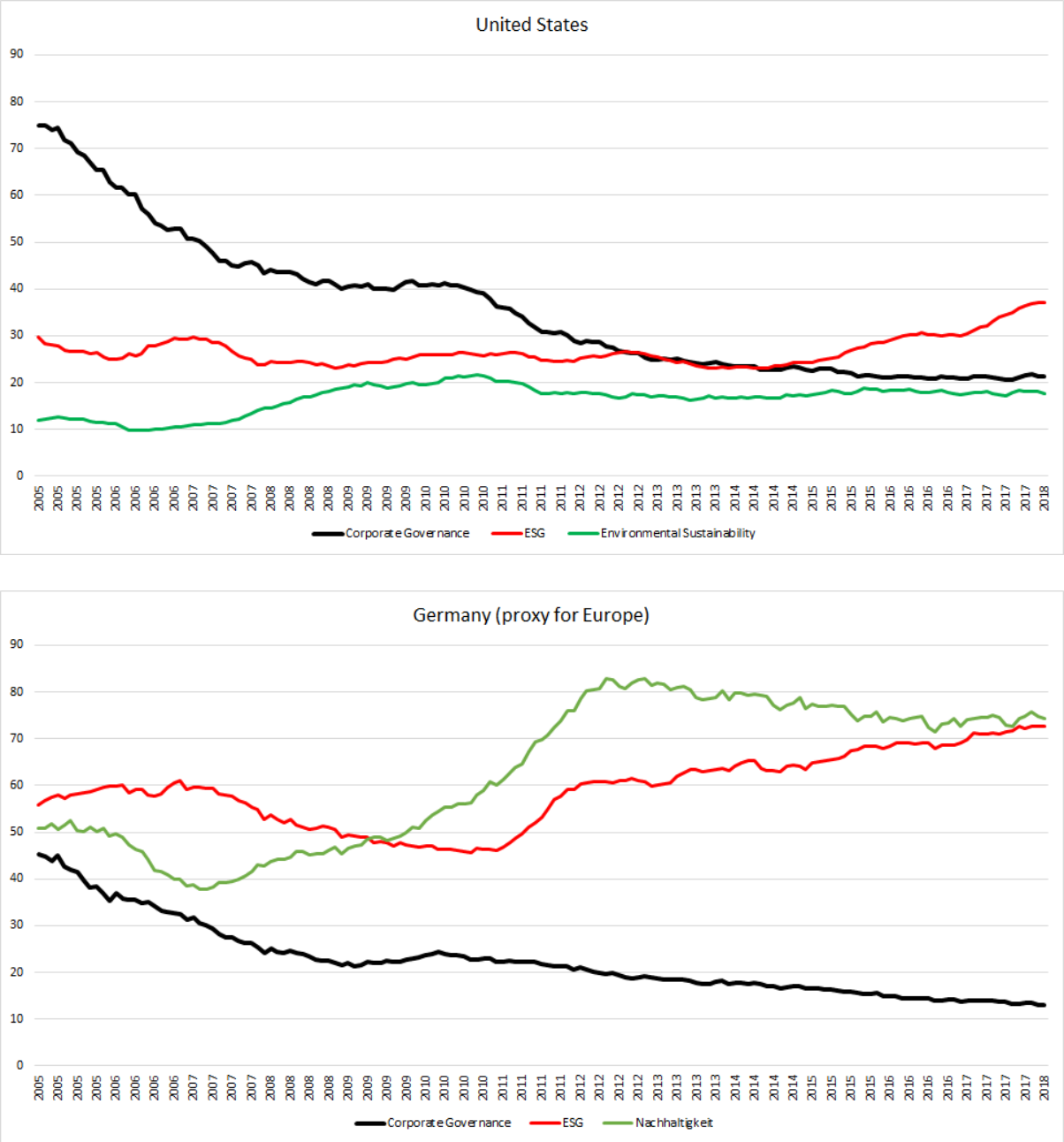
Continued

Table 6 – *Continued*

	mean$_{geo}$	mean$_{ari}$	std	sharpe	t(sharpe)	sortino	alpha	t(alpha)	E+S	CGV
Panel B: European sample										
Panel B2: Value investing										
Value	8.46	9.80	16.39	0.17	-	0.27	-	-	70	52
V/ENV	7.41	8.94	17.55	0.15	(-1.27)	0.22	-1.49	(-1.19)	89	66
V/SOC	8.66	10.26	17.87	0.17	(-0.40)	0.25	-0.33	(-0.30)	90	65
V/CGV	9.41	10.64	15.73	0.20	(1.10)	0.30	0.68	(0.72)	87	78
Panel B3: Growth investing										
Growth	8.61	9.59	13.83	0.20	-	0.28	-	-	69	53
G/ENV*	11.11	11.84	12.05	0.28	(2.34)	0.44	4.38	(3.26)	89	61
G/SOC*	11.66	12.38	11.95	0.30	(3.00)	0.47	4.88	(4.27)	88	63
G/CGV*	8.05	8.97	13.39	0.19	(-0.20)	0.27	0.24	(0.18)	83	81
Panel B4: Momentum investing										
Momentum	13.82	15.37	17.61	0.25	-	0.41	-	-	59	43
M/ENV*	10.87	12.05	15.29	0.23	(-0.91)	0.36	-0.24	(-0.19)	85	59
M/SOC*	11.99	13.15	15.20	0.25	(-0.08)	0.39	0.98	(0.98)	85	58
M/CGV*	10.83	12.10	15.85	0.22	(-1.03)	0.34	-0.33	(-0.25)	80	75

Table 6: Table presents the results for the alternative investment approach based on the U.S. sample in Panel A and the European sample in Panel B, with value-weighted market portfolio characteristics presented in the first sub-panel A1/B1, results for value strategies in sub-panel A2/B2, results for grwoth strategies in sub-panel A3/B3, results for momentum strategies in sub-panel A4/B4. Each panel contains the standard style portfolio and the two methods of integrating E/S/G criteria: (i) integration of ENV, SOC and CGV aggregated pillars, and (ii) only risk material KPIs underlying the three pillars. We provide the geometric (mean$_{geo}$), arithmetic mean (mean$_{ari}$) and standard deviation (std) in annualized percentage terms. We also report Sharpe ratios and corresponding t-stats relative to the respective standard style portfolio, based on Jobson and Korkie (1981) and accounting for adjustments made by Memmel (2003). Alphas are again provided relative to respective standard style portfolio and average weighted portfolio ratings for environmental plus social (E+S) and corporate governance (CGV). We provide portfolio level ratings based on standard ESG ratings as provided by Thomson Reuters. The observation period is from 2002 to 2016 and corresponds to 156 monthly returns.

Figure 2: Google Search Volume Index (12-month moving average)



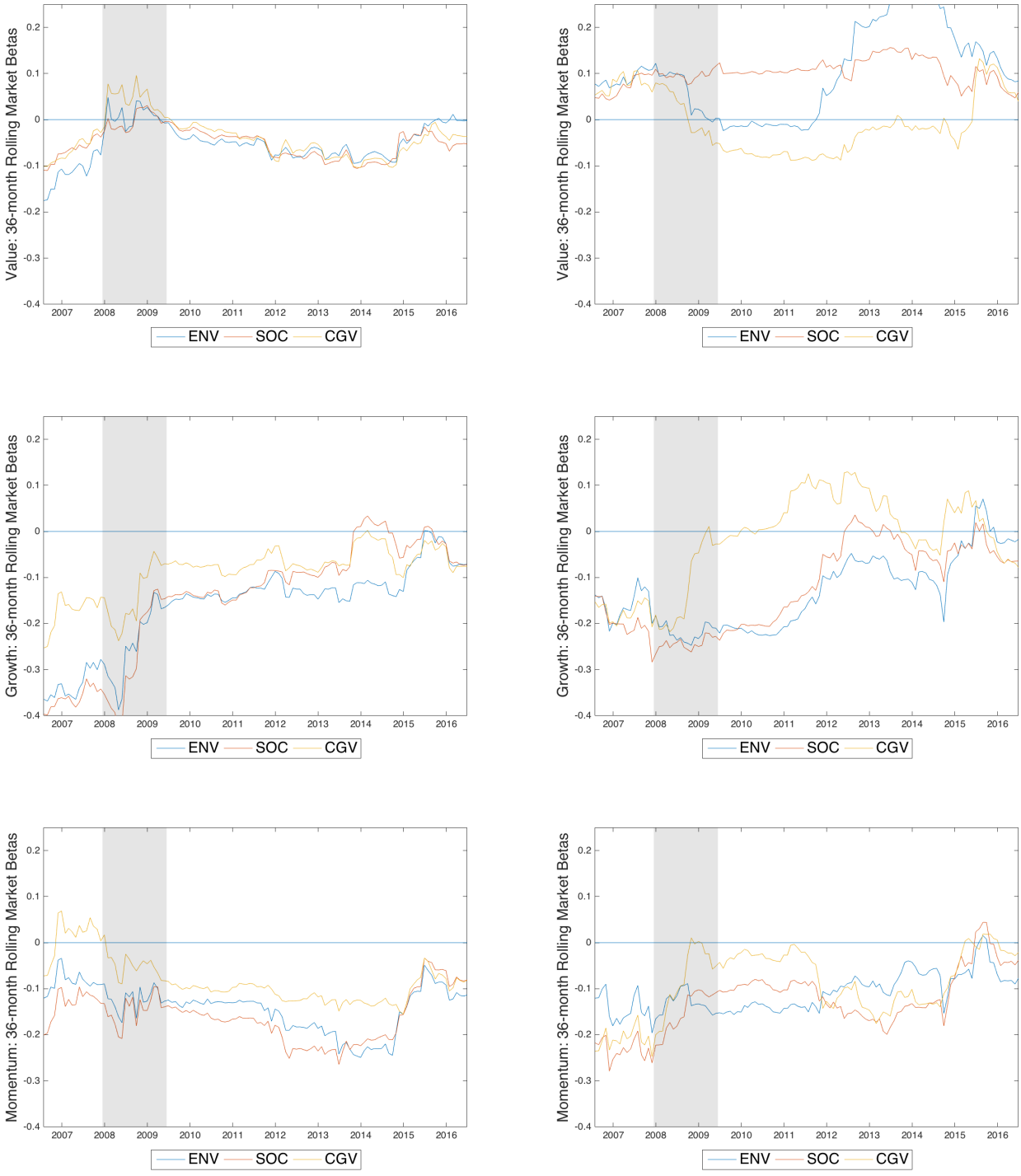
Graphs show the unadjusted 12-month rolling averages of the time-series proved by Google Trends with respect to the respective search term in the two regions. For each region the three time-series where jointly downloaded to account for the relative frequency between search terms.

Table 7: Factor Exposure of Return Differences from ESG Integration

	Intercept		MKT-RF		SMB		HML		MOM		RMW		CMA		R^2
Panel A : U.S. sample															
V/ENV–V	1.02		0.00		-0.08	*	-0.11		0.04		-0.02		-0.10		0.08
V/SOC–V	1.17		0.00		-0.05		-0.10	**	0.02		0.01		0.00		0.10
V/CGV–V	1.98	*	-0.01		-0.05		-0.11	*	0.01		0.00		-0.05		0.07
G/ENV–G	-0.11		-0.09	***	-0.07		0.03		0.00		0.03		0.19	**	0.17
G/SOC–G	1.17		-0.10	***	-0.07		0.00		-0.01		-0.03		0.02		0.11
G/CGV–G	0.38		-0.06	*	-0.05		0.04		-0.01		0.02		0.07		0.03
M/ENV–M	-0.60		-0.08	***	-0.14	***	-0.08		-0.03		0.03		0.16	*	0.18
M/SOC–M	-0.06		-0.11	***	-0.16	***	-0.09		-0.02		-0.04		0.13		0.25
M/CGV–M	-0.37		-0.07	***	-0.11	**	0.00		0.02		0.02		-0.09		0.11
Panel B : European sample															
V/ENV–V	-0.72		0.03		-0.10		0.07		0.03		-0.11		-0.03		0.07
V/SOC–V	0.62		0.07	***	-0.08		-0.02		-0.03		-0.07		0.01		0.15
V/CGV–V	0.38		0.06	***	-0.14	***	-0.26	***	0.06	***	-0.07		0.08		0.20
G/ENV–G	3.52	**	-0.09	***	-0.08		-0.10		0.01		-0.21	*	0.33	***	0.19
G/SOC–G	4.36	***	-0.08	***	-0.12	*	-0.13		-0.02		-0.22	**	0.36	***	0.22
G/CGV–G	-0.04		0.04		-0.13		-0.05		-0.06		-0.08		0.31	***	0.09
M/ENV–M	-1.30		-0.10	***	-0.18	***	-0.07		0.00		-0.23	*	0.16		0.15
M/SOC–M	0.04		-0.09	***	-0.18	***	-0.16		-0.04		-0.19		0.11		0.12
M/CGV–M	-0.91		-0.02		-0.15	*	-0.35	***	-0.09	*	-0.30	**	0.35	***	0.10

Table presents the regression output from regressing difference returns between ESG integrated strategies k and corresponding traditional strategy k portfolios on six common risk factors, namely excess market return (MKT-RF), size premium (SMB), value premium (HML), momentum factor (MOM), profitability factor (RMW) and investment factor (CMA) as provided on Kenneth french website. Intercepts are provided as annual percentages and Newey-West adjusted standard errors.

Figure 3: 36-month Rolling Beta's of Differences between Standard and ESG Integrated Portfolios



Graphs show rolling 36-month market betas for the U.S. (left hand side) and Europe (right hand side) from regressing difference returns between ESG integrated strategies k and corresponding traditional strategy k portfolios on six common risk factors, namely excess market return (MKT-RF), size premium (SMB), value premium (HML), momentum factor (MOM), profitability factor (RMW) and investment factor (CMA) as provided on Kenneth French website. Shaded areas represent NBER recession periods.

Table 8: ESG Risk-Materiality Map

		Oil & Gas	Basic Materials	Industrials	Consumer Goods	Health Care	Consumer Services	Telecom	Utilities	Financials	Technology	No.
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
Panel A: United States Sample												
ENER	Emission Reduction				■						■	2
ENPI	Product Innovation		■			■						2
ENRR	Resource Reduction				■					■		2
SOPR	Customer /Product Responsibility			■							■	2
SOCO	Society /Community				■		■		■		■	4
SOHR	Society /Human Rights				■							1
SODO	Workforce /Diversity and Opportunity					■					■	2
SOEQ	Workforce /Employment Quality				■	■						2
SOHS	Workforce /Health & Safety		■		■					■		3
SOTD	Workforce /Training and Development		■					■		■		3
CGBF	Board of Directors/Board Functions											0
CGBS	Board of Directors /Board Structure		■			■				■	■	4
CGCP	Board of Directors /Compensation Policy				■	■	■		■		■	5
CGVS	Integration /Vision and Strategy						■					1
CGSR	Shareholders /Shareholder Rights		■		■		■		■			4
Total number of relevant KPI's		0	5	1	8	5	4	1	3	4	6	
Panel B: European Sample												
ENER	Emission Reduction			■	■	■	■					4
ENPI	Product Innovation		■					■	■			3
ENRR	Resource Reduction	■	■	■		■		■			■	6
SOPR	Customer /Product Responsibility	■		■		■	■					4
SOCO	Society /Community		■					■	■			3
SOHR	Society /Human Rights		■	■	■		■			■		5
SODO	Workforce /Diversity and Opportunity		■							■		2
SOEQ	Workforce /Employment Quality	■		■		■						3
SOHS	Workforce /Health & Safety		■		■		■				■	4
SOTD	Workforce /Training and Development			■		■						2
CGBF	Board of Directors/Board Functions	■			■	■		■				4
CGBS	Board of Directors /Board Structure			■					■			2
CGCP	Board of Directors /Compensation Policy			■	■		■		■		■	5
CGVS	Integration /Vision and Strategy					■	■		■	■		4
CGSR	Shareholders /Shareholder Rights	■	■	■	■	■	■					6
Total number of relevant KPI's		5	7	9	6	8	7	4	5	3	3	

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Table 9: ESG Risk-Material Integrated Portfolios

	mean_{geo}	mean_{ari}	std	sharpe	t(sharpe)	sortino	alpha	t(alpha)	E+S	CGV
Panel A: U.S. sample										
V/ESG	10.76	11.72	13.75	0.25	(2.31)	0.37	2.35	(2.90)	76	85
V/Material	11.21	12.20	14.03	0.25	(2.19)	0.39	2.88	(3.09)	71	85
G/ESG	6.84	7.85	14.16	0.16	(0.65)	0.23	0.21	(0.22)	71	83
G/Material	7.99	9.03	14.42	0.18	(1.40)	0.28	1.36	(1.29)	64	81
M/ESG	8.43	9.74	16.11	0.17	(0.24)	0.26	0.20	(0.20)	68	82
M/Material	9.68	10.90	15.57	0.20	(1.27)	0.31	1.87	(1.69)	62	81
Panel B: European sample										
V/ESG	8.67	10.09	16.89	0.17	(-0.01)	0.26	-0.19	(-0.17)	90	74
V/Material	8.72	10.08	16.53	0.18	(0.20)	0.27	-0.07	(-0.08)	89	74
G/ESG	8.99	9.73	12.08	0.23	(0.97)	0.34	1.72	(1.52)	88	77
G/Material	9.42	10.22	12.55	0.23	(1.00)	0.34	1.70	(1.43)	86	75
M/ESG	10.85	12.00	15.16	0.23	(-0.82)	0.36	-0.09	(-0.07)	86	70
M/Material	11.13	12.39	15.82	0.23	(-0.84)	0.35	0.04	(0.03)	84	70

Table presents results for ESG risk-materiality integrated value, growth and momentum portfolios (k/Material) and portfolios integrating the aggregated ESG score (k/ESG). Results for the U.S. sample are presented in Panel A and the European sample in Panel B. All portfolios are benchmarked against their respective traditional value, growth or momentum strategy. We provide the geometric (mean_{geo}), arithmetic mean (mean_{ari}) and standard deviation (std) in annualized percentage terms. We also report Sharpe ratios and corresponding t-stats relative to the respective standard style portfolio, based on Jobson and Korkie (1981) and accounting for adjustments made by Memmel (2003). Alphas are again provided relative to respective standard style portfolio and average weighted portfolio ratings for environmental plus social (E+S) and corporate governance (CGV).

Table 10: ESG Integrated Portfolios (OOS)

	mean_{geo}	mean_{ari}	std	sharpe	t(sharpe)	sortino	alpha	t(alpha)	E+S	CGV
Panel A: U.S. sample										
V/ENV_{OOS}	10.31	11.32	14.12	0.23	(1.49)	0.35	1.70	(1.88)	76	83
V/SOC_{OOS}	11.02	11.98	13.75	0.25	(3.30)	0.38	2.46	(3.54)	74	83
V/CGV_{OOS}	10.85	11.81	13.83	0.25	(2.11)	0.38	2.53	(2.82)	71	87
G/ENV_{OOS}	6.98	7.96	13.98	0.16	(0.87)	0.24	0.46	(0.53)	71	81
G/SOC_{OOS}	7.69	8.77	14.61	0.17	(1.31)	0.26	0.99	(1.05)	68	81
G/CGV_{OOS}	7.28	8.38	14.72	0.16	(0.99)	0.24	0.51	(0.55)	63	85
M/ENV_{OOS}	8.46	9.76	16.13	0.17	(0.24)	0.26	0.04	(0.03)	68	80
M/SOC_{OOS}	9.20	10.56	16.43	0.19	(0.87)	0.28	0.75	(0.84)	66	80
M/CGV_{OOS}	9.39	10.69	16.10	0.19	(1.09)	0.29	1.08	(1.12)	62	84
Panel B: European sample										
V/ENV_{OOS}	7.45	9.04	17.88	0.15	(-1.43)	0.22	-1.44	(-1.27)	89	66
V/SOC_{OOS}	8.22	9.85	18.04	0.16	(-0.87)	0.24	-0.85	(-0.78)	89	64
V/CGV_{OOS}	9.86	11.03	15.32	0.21	(1.62)	0.32	1.25	(1.22)	87	77
G/ENV_{OOS}	11.65	12.43	12.44	0.29	(2.61)	0.45	4.66	(3.37)	88	61
G/SOC_{OOS}	11.62	12.44	12.75	0.28	(2.80)	0.43	4.06	(3.59)	87	63
G/CGV_{OOS}	8.26	9.24	13.76	0.19	(-0.19)	0.27	0.25	(0.17)	83	81
M/ENV_{OOS}	9.70	10.90	15.45	0.20	(-1.73)	0.31	-1.45	(-1.12)	84	59
M/SOC_{OOS}	11.49	12.68	15.40	0.24	(-0.54)	0.37	0.27	(0.26)	84	58
M/CGV_{OOS}	11.13	12.41	15.91	0.23	(-0.83)	0.34	0.04	(0.03)	80	74

Table presents the strict out-of-sample results for ESG integrated value, growth and momentum portfolios – based on a recursive window to derive size and industry-adjusted ESG ratings. Results for the U.S. sample are presented in Panel A and the European sample in Panel B. All portfolios are benchmarked against their respective traditional value, growth or momentum strategy. We provide the geometric (mean_{geo}), arithmetic mean (mean_{ari}) and standard deviation (std) in annualized percentage terms. We also report Sharpe ratios and corresponding t-stats relative to the respective standard style portfolio, based on Jobson and Korkie (1981) and accounting for adjustments made by Memmel (2003). Alphas are again provided relative to respective standard style portfolio and average weighted portfolio ratings for environmental plus social (ENV/SOC) and corporate governance (CGV).

Internet Appendix

The following tables present the results for the fixed-effects panel regression for idiosyncratic risk at $t+1$ on book value of assets (size_t), return of assets (ROA_t) and KPI's per category (ENV/SOC/CGV) for the European and U.S. sample. These are the results underlying the risk materiality map.

Table 11: Impact of Environmental Sustainability on Firm Risk (U.S. sample)

	Firm Idiosyncratic Risk (std_{t+1})									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
size	−4.341***	−1.597***	−3.119***	−4.145***	−3.958***	−3.914***	−3.226***	−2.024***	−0.974***	−3.042***
	(0.400)	(0.557)	(0.176)	(0.242)	(0.325)	(0.263)	(0.741)	(0.308)	(0.209)	(0.303)
ROA	−21.486***	−18.305***	−49.979***	−30.655***	−42.306***	−50.034***	−39.662***	−91.014***	−22.268***	−26.041***
	(3.153)	(3.152)	(2.138)	(2.416)	(2.432)	(2.773)	(8.909)	(12.614)	(3.026)	(2.400)
ENER	0.044	0.006	0.004	−0.084***	0.012	0.001	0.008	−0.033	0.029	−0.071**
	(0.043)	(0.060)	(0.019)	(0.028)	(0.058)	(0.036)	(0.136)	(0.028)	(0.033)	(0.035)
ENPI	0.090***	−0.270***	−0.018	0.003	−0.107***	−0.010	0.099	−0.008	−0.004	0.062***
	(0.034)	(0.033)	(0.011)	(0.015)	(0.035)	(0.026)	(0.129)	(0.021)	(0.023)	(0.023)
ENRR	−0.063	0.052	−0.002	−0.056**	0.021	−0.022	−0.173	−0.033	−0.050*	0.028
	(0.043)	(0.064)	(0.018)	(0.027)	(0.054)	(0.031)	(0.140)	(0.029)	(0.029)	(0.034)
Observations	743	552	1,901	1,101	911	1,675	99	518	2,345	1,025
R^2	0.189	0.219	0.294	0.325	0.402	0.219	0.440	0.181	0.028	0.200
Adjusted R^2	0.168	0.191	0.286	0.313	0.389	0.210	0.306	0.150	0.020	0.185

Note: *p<0.1; **p<0.05; ***p<0.01

Table 12: Impact of Social Sustainability on Firm Risk (U.S. sample)

	Firm Idiosyncratic Risk (std_{t+1})									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
size	−4.116***	−1.989***	−3.220***	−4.018***	−3.735***	−4.057***	−2.599***	−2.252***	−0.599***	−2.825***
	(0.407)	(0.604)	(0.176)	(0.247)	(0.327)	(0.261)	(0.715)	(0.313)	(0.220)	(0.299)
ROA	−19.912***	−20.925***	−50.462***	−28.742***	−42.403***	−49.472***	−41.498***	−91.829***	−23.451***	−25.246***
	(3.199)	(3.253)	(2.161)	(2.479)	(2.507)	(2.797)	(8.780)	(12.831)	(3.114)	(2.407)
SOPR	−0.027	0.045	−0.061***	0.024	0.036	0.010	0.098	−0.011	0.059***	−0.061**
	(0.034)	(0.044)	(0.013)	(0.021)	(0.039)	(0.024)	(0.098)	(0.025)	(0.020)	(0.025)
SOCO	0.023	0.003	−0.022*	−0.065***	0.024	−0.050**	0.111	−0.096***	−0.001	−0.069***
	(0.038)	(0.043)	(0.013)	(0.020)	(0.033)	(0.021)	(0.088)	(0.023)	(0.021)	(0.024)
SOHR	0.008	0.008	0.012	−0.055***	0.024	−0.023	−0.017	0.010	−0.018	0.006
	(0.027)	(0.033)	(0.011)	(0.017)	(0.030)	(0.019)	(0.068)	(0.021)	(0.016)	(0.018)
SODO	−0.036	−0.052	−0.008	−0.018	−0.050*	0.023	0.142*	0.0002	0.059**	−0.048**
	(0.032)	(0.037)	(0.010)	(0.016)	(0.028)	(0.017)	(0.075)	(0.020)	(0.027)	(0.021)
SOEQ	0.029	0.028	0.020*	−0.040**	−0.043	−0.016	−0.115	0.051**	0.059**	0.059***
	(0.029)	(0.038)	(0.011)	(0.019)	(0.031)	(0.026)	(0.088)	(0.020)	(0.025)	(0.022)
SOHS	0.021	−0.158***	−0.008	−0.039***	−0.025	0.008	−0.020	−0.010	−0.047**	0.025
	(0.024)	(0.029)	(0.009)	(0.015)	(0.028)	(0.021)	(0.083)	(0.018)	(0.019)	(0.016)
SOTD	−0.053	−0.103**	0.048***	0.042**	−0.064*	−0.029	−0.198*	0.030	−0.045**	0.062**
	(0.036)	(0.050)	(0.014)	(0.021)	(0.038)	(0.023)	(0.102)	(0.024)	(0.022)	(0.026)
Observations	743	552	1,901	1,101	911	1,675	99	518	2,345	1,025
R^2	0.184	0.184	0.304	0.323	0.404	0.227	0.522	0.207	0.039	0.215
Adjusted R^2	0.158	0.149	0.296	0.308	0.389	0.216	0.376	0.170	0.030	0.197

Note: *p<0.1; **p<0.05; ***p<0.01

Table 13: Impact of Corporate Governance Sustainability on Firm Risk (U.S. sample)

	Firm Idiosyncratic Risk (std_{t+1})									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
size	−4.096***	−1.779***	−3.140***	−4.035***	−3.883***	−3.913***	−3.296***	−1.962***	−0.990***	−3.030***
	(0.403)	(0.611)	(0.178)	(0.246)	(0.322)	(0.260)	(0.744)	(0.319)	(0.209)	(0.296)
ROA	−20.019***	−20.079***	−50.102***	−31.482***	−41.957***	−49.004***	−40.005***	−93.013***	−22.451***	−25.329***
	(3.173)	(3.346)	(2.160)	(2.442)	(2.437)	(2.787)	(9.143)	(12.684)	(3.007)	(2.400)
CGBF	0.099**	0.099	0.019	0.059**	0.048	0.025	−0.004	0.045	0.094***	0.063**
	(0.045)	(0.065)	(0.017)	(0.024)	(0.048)	(0.027)	(0.082)	(0.036)	(0.021)	(0.030)
CGBS	−0.039	−0.104*	−0.003	−0.018	−0.139***	0.001	−0.047	−0.016	−0.059***	−0.081***
	(0.034)	(0.053)	(0.016)	(0.022)	(0.042)	(0.024)	(0.087)	(0.029)	(0.020)	(0.028)
CGCP	0.006	−0.059	−0.011	−0.083***	−0.049	−0.032	0.051	−0.027	−0.003	−0.039*
	(0.034)	(0.048)	(0.014)	(0.018)	(0.031)	(0.021)	(0.073)	(0.023)	(0.018)	(0.023)
CGVS	−0.031	0.008	0.001	0.016	0.009	−0.051***	0.078	−0.002	−0.008	−0.029
	(0.026)	(0.034)	(0.011)	(0.016)	(0.028)	(0.019)	(0.058)	(0.019)	(0.014)	(0.018)
CGSR	−0.039	−0.128***	−0.014	−0.091***	−0.003	−0.038*	0.001	−0.041**	−0.022	0.007
	(0.029)	(0.035)	(0.011)	(0.014)	(0.031)	(0.020)	(0.084)	(0.019)	(0.018)	(0.019)
Observations	743	552	1,901	1,101	911	1,675	99	518	2,345	1,025
R^2	0.187	0.130	0.293	0.319	0.404	0.225	0.447	0.180	0.035	0.206
Adjusted R^2	0.163	0.095	0.286	0.306	0.390	0.215	0.296	0.145	0.026	0.189

Note: *p<0.1; **p<0.05; ***p<0.01

Table 14: Impact of Environmental Sustainability on Firm Risk (European sample)

	Firm Idiosyncratic Risk (std_{t+1})									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
size	−3.394***	−3.190***	−2.957***	−2.309***	−1.709***	−2.918***	−1.715***	−0.385	−0.245*	−3.056***
	(0.367)	(0.301)	(0.209)	(0.179)	(0.186)	(0.241)	(0.316)	(0.300)	(0.137)	(0.466)
ROA	−46.405***	−24.436***	−51.940***	−51.855***	−10.856***	−40.112***	−34.526***	−23.399***	−20.385***	−35.714***
	(5.339)	(4.421)	(3.822)	(4.156)	(2.640)	(2.767)	(7.662)	(8.838)	(3.845)	(6.043)
ENER	−0.015	0.144***	−0.106***	−0.058*	−0.060**	−0.094***	0.022	0.031	−0.026	−0.052
	(0.062)	(0.053)	(0.029)	(0.033)	(0.029)	(0.030)	(0.052)	(0.042)	(0.028)	(0.066)
ENPI	0.064*	−0.301***	0.031*	−0.009	−0.018	0.022	−0.070*	−0.103***	0.068***	0.046
	(0.038)	(0.026)	(0.019)	(0.018)	(0.020)	(0.021)	(0.039)	(0.023)	(0.020)	(0.042)
ENRR	−0.112**	−0.128***	−0.072***	−0.024	−0.067***	−0.029	−0.144***	0.019	−0.013	−0.122**
	(0.055)	(0.046)	(0.027)	(0.029)	(0.025)	(0.027)	(0.052)	(0.039)	(0.025)	(0.059)
Observations	576	783	2,324	1,163	544	1,481	278	443	2,323	429
R^2	0.267	0.291	0.138	0.213	0.317	0.188	0.185	0.068	0.016	0.197
Adjusted R^2	0.242	0.273	0.131	0.199	0.292	0.177	0.125	0.026	0.008	0.160

Note: *p<0.1; **p<0.05; ***p<0.01

Table 15: Impact of Social Sustainability on Firm Risk (European sample)

	Firm Idiosyncratic Risk (std_{t+1})									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
size	-3.528^{***}	-2.842^{***}	-3.082^{***}	-2.401^{***}	-1.736^{***}	-3.001^{***}	-1.801^{***}	-0.894^{***}	-0.359^{***}	-3.074^{***}
	(0.365)	(0.317)	(0.212)	(0.187)	(0.184)	(0.235)	(0.338)	(0.294)	(0.139)	(0.479)
ROA	-47.323^{***}	-24.567^{***}	-52.022^{***}	-50.494^{***}	-11.889^{***}	-38.379^{***}	-32.710^{***}	-17.027^{*}	-18.265^{***}	-37.238^{***}
	(5.334)	(4.528)	(3.858)	(4.122)	(2.615)	(2.718)	(8.171)	(8.721)	(3.859)	(6.111)
SOPR	-0.093^{**}	0.070^{**}	-0.056^{***}	-0.024	-0.062^{***}	-0.111^{***}	0.031	0.045	0.054^{***}	-0.012
	(0.041)	(0.032)	(0.020)	(0.020)	(0.018)	(0.021)	(0.040)	(0.029)	(0.020)	(0.045)
SOCO	-0.004	-0.165^{***}	-0.007	-0.029	0.005	-0.011	-0.110^{**}	-0.122^{***}	0.019	0.007
	(0.046)	(0.033)	(0.021)	(0.022)	(0.020)	(0.023)	(0.044)	(0.033)	(0.021)	(0.046)
SOHR	-0.002	-0.080^{**}	-0.035^{*}	-0.039^{**}	0.007	-0.074^{***}	-0.025	-0.033	-0.037^{**}	-0.028
	(0.041)	(0.032)	(0.018)	(0.018)	(0.017)	(0.019)	(0.038)	(0.028)	(0.019)	(0.040)
SODO	0.004	-0.161^{***}	0.005	-0.026	0.047^{**}	0.015	-0.052	0.006	-0.116^{***}	0.063
	(0.049)	(0.036)	(0.021)	(0.022)	(0.020)	(0.021)	(0.038)	(0.031)	(0.023)	(0.051)
SOEQ	-0.086^{*}	0.104^{***}	-0.040^{*}	0.005	-0.065^{***}	0.050^{**}	-0.003	-0.018	0.027	-0.059
	(0.051)	(0.037)	(0.021)	(0.020)	(0.019)	(0.021)	(0.043)	(0.027)	(0.021)	(0.046)
SOHS	0.038	-0.147^{***}	0.008	-0.077^{***}	0.041^{**}	-0.057^{***}	0.009	0.042	0.049^{**}	-0.143^{***}
	(0.036)	(0.029)	(0.019)	(0.019)	(0.020)	(0.021)	(0.041)	(0.026)	(0.021)	(0.048)
SOTD	-0.042	0.070^{*}	-0.071^{***}	0.043^{*}	-0.084^{***}	-0.014	0.012	0.015	0.032	-0.058
	(0.050)	(0.042)	(0.024)	(0.024)	(0.024)	(0.025)	(0.046)	(0.037)	(0.023)	(0.051)
Observations	576	783	2,324	1,163	544	1,481	278	443	2,323	429
R^2	0.280	0.268	0.140	0.232	0.354	0.228	0.167	0.083	0.033	0.213
Adjusted R^2	0.250	0.245	0.131	0.217	0.326	0.215	0.092	0.033	0.023	0.168

Note: *p<0.1; **p<0.05; ***p<0.01

Table 16: Impact of Corporate Governance Sustainability on Firm Risk (European sample)

	Firm Idiosyncratic Risk (std_{t+1})									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
size	−3.412***	−3.394***	−2.982***	−2.130***	−2.033***	−2.892***	−1.787***	−0.697**	−0.246*	−3.035***
	(0.353)	(0.325)	(0.210)	(0.177)	(0.188)	(0.240)	(0.320)	(0.278)	(0.137)	(0.484)
ROA	−45.336***	−22.034***	−52.232***	−53.153***	−12.680***	−39.206***	−30.377***	−11.684	−18.759***	−34.625***
	(5.219)	(4.776)	(3.839)	(4.028)	(2.679)	(2.818)	(8.001)	(8.221)	(3.855)	(6.087)
CGBF	−0.084**	−0.004	0.010	−0.054***	−0.042**	0.043**	−0.068***	−0.013	0.081***	−0.020
	(0.035)	(0.032)	(0.019)	(0.018)	(0.017)	(0.018)	(0.026)	(0.019)	(0.017)	(0.039)
CGBS	0.046	0.138***	−0.044**	0.032*	0.052***	0.055***	−0.047	−0.047**	−0.031*	−0.020
	(0.038)	(0.032)	(0.019)	(0.018)	(0.018)	(0.018)	(0.030)	(0.022)	(0.018)	(0.040)
CGCP	−0.054	0.026	−0.047**	−0.067***	0.021	−0.074***	−0.036	−0.065***	−0.016	−0.077*
	(0.036)	(0.031)	(0.019)	(0.018)	(0.018)	(0.020)	(0.035)	(0.020)	(0.017)	(0.043)
CGVS	0.089***	0.036	0.038***	0.041***	−0.023*	−0.044***	−0.006	−0.066***	−0.032**	0.023
	(0.031)	(0.025)	(0.015)	(0.013)	(0.013)	(0.015)	(0.025)	(0.016)	(0.014)	(0.031)
CGSR	−0.171***	−0.124***	−0.121***	−0.052**	−0.101***	−0.124***	−0.035	0.035	−0.024	−0.068
	(0.042)	(0.041)	(0.022)	(0.021)	(0.020)	(0.020)	(0.040)	(0.025)	(0.019)	(0.048)
Observations	576	783	2,324	1,163	544	1,481	278	443	2,323	429
R^2	0.306	0.183	0.144	0.247	0.327	0.212	0.195	0.178	0.022	0.198
Adjusted R^2	0.280	0.160	0.136	0.233	0.300	0.201	0.129	0.137	0.013	0.156

Note: *p<0.1; **p<0.05; ***p<0.01