Decomposing the value effects of sustainable investment

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Abstract

We provide the first systematic, international decomposition of possible financial benefits of sustainable real estate investment on corporate performance metrics across the two leading country-markets in terms of sustainable property certifications. In the UK, where a baseline level of environmental reporting is mandatory, listed property companies benefit somewhat from investments in sustainability-certified properties through higher cash flow and valuation outcomes. In the US, which features no requisite reporting, the benefits of sustainable investment are stronger and comprise distinct cash flow, risk, information and corporate valuation effects. Our results suggest benefits of improved transparency and benchmarking from environmental performance reporting.

Key words: Real estate investment trusts; sustainability; energy efficiency

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1 Introduction

Real estate investment firms around the globe increasingly commit to ever more ambitious sustainability practices. [1] Since 2010, the number of real estate investment firms agreeing to have their businesses scrutinized for the Global Real Estate Sustainability Benchmark (GRESB) has increased from 198 to 759, representing a gross asset value of US$2.8 trillion. [2] Research now suggests that strong sustainability practices are also associated with superior investment performance on the individual property level. [3] Pivo (2008) finds that real estate investment trusts (REITs) have taken notice of the evidence for these property-level benefits, but that the primary concern of REIT managers in relation to sustainability efforts is the impact on financial outcomes of the firm. This begs the question: Do possible financial benefits to sustainable properties filter through to the corporate performance of the firms investing in them? If so, what are the underlying economic mechanisms driving these performance effects?

Two features of the literature on sustainable real estate investment to date motivate our analysis. First, there is ambiguity in the empirical evidence for the relationship between sustainable real estate investments and improved corporate financial performance of real estate investment firms. Focusing on accounting measures, Ho, Rengarajan, and Lum (2013) examine the effects of sustainable investments on operational firm performance in Singaporean REITs but find mixed results. Focusing on stock market performance instead, Fuerst (2015) finds that REITs with a higher GRESB ranking fail to achieve higher stock returns than their lower-ranking peers. Similarly, Eichholtz, Kok, and Yönder (2012) find that US REITs with a larger proportion of sustainable properties in their portfolio do not earn positive abnormal stock returns.

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[1] The pursuit of environmentally-sensitive buildings is commonly attributed to the observation that real estate is associated with more than 40% of total energy consumption, and more than 80% of electricity use, the highest of all use sectors (see `http://www.eia.gov`).

[2] See: `https://www.gresb.com/2016/global`.

[3] There is evidence of rental value, occupancy-rate, and asset value premiums for environmentally-certified office buildings (Eichholtz, Kok, and Quigley, 2013, 2010; Fuerst and McAllister, 2011; Miller, Spivey, and Florance, 2008; Wiley, Benefield, and Johnson, 2008), with similar findings for multifamily rental rates (Bond and Devine, 2016). Sustainable properties are subject to lower rates of obsolescence (Kok and Jennen, 2012), and improve intangible outcomes such as tenant satisfaction and lease renewal rates (Devine and Kok, 2015). Furthermore, sustainable properties are less likely to be associated with residential mortgage delinquency (Kaza, Quercia, and Tian, 2014) and commercial mortgage default (An and Pivo, 2015).

Second, where the literature documents a positive effect of sustainability practices on firm-level financial outcomes, the underlying mechanisms are insufficiently understood. Sah, Miller, and Ghosh (2013) find higher corporate valuations for US REITs that participate in the Energy Star program. Eichholtz, Kok, and Yönder (2012) find that accounting-based measures of operational performance improve for US REITs which hold more sustainable properties. Fuerst (2015) finds that REITs with a higher GRESB ranking achieve higher risk-adjusted returns. However, these studies stop short of identifying the fundamental economic mechanisms responsible for these improvements.

As a result, research is unable to offer insights for managers into the amount of resources they should optimally allocate to generating "green value", or to provide guidance for investors on what might be the price of a "green conscience". In order to address this gap in the literature, we systematically decompose the effects of sustainability practices on the value and performance of listed real estate investment firms.

Listed real estate investment firms offer a useful opportunity to study these effects for two reasons. First, we observe value and performance on the individual asset as well as aggregate corporate level, namely property portfolio-level cash flows, driven by rents and operating costs, and corporate-level cash flows after the expenses for managing and financing the portfolio. Second, real estate assets are actively traded in a secondary market, allowing us to measure firm value above and beyond the market value of the underlying real estate assets. As a result, we are able to decompose any valuation effects into a component driven by cash flows available for distribution to investors, changes in the discount rate, or a "halo" effect of corporate reputation for sustainability. Our first contribution is to isolate these different empirical effects of sustainability practices.

Furthermore, efforts to achieve corporate environmental sustainability may be motivated by increased market demand for stronger sustainability practices in the real estate investment industry, or top-down through environmental regulation imposed by governments. These potential local idiosyncrasies may have significant implications for the empirical links between sustainability practices and firm value across international markets. However, existing research is often limited to a single country-market and lacks international

comparisons. Our second contribution is to compare the empirical links between sustainability practices and firm value and performance across the US and the UK. These two countries are home to the leading global environmental certification programs. They also differ significantly in the institutional environment for sustainability reporting of investment property. While the UK requires a baseline level of environmental performance disclosure for investment property, no such requisite reporting exists in the US.

We begin our analysis by outlining a conceptual framework that systematically links sustainability practices to property performance and firm value to inform our testable hypotheses and empirical approach. We then compile a data set of listed equity REITs in the US and REITs as well as listed property companies the UK. For the sample firms, we hand-collect and match information on ownership of properties with data on the environmental certification of those properties from the leading certification programs in the US and the UK (LEED, Energy Star, and BREEAM). This matching exercise allows to calculate the share of each firm's portfolio that corresponds to environmentally sustainable buildings relative to conventional buildings, and to track the evolution of this 'metric through time. We then relate this panel of green share data to the panel of property portfolio-level and corporate-level performance and value outcomes.

We find evidence that rental value premiums of sustainable properties carry over to the rental revenue of US REITs, holding assets, liabilities and unobservable firm and time effects constant. On that basis, we also find that sustainable investment is associated with higher operating expenses for US firms, as green buildings often feature more sophisticated technology and utilize more electricity in exchange for greater ambient control. In sum, we find that the rental revenue premium fully compensates for any increase in operating expenses, resulting in stable net operating income for the US sample.

On the corporate expense level, we find lower interest expenses associated with investment in more sustainable properties in the US, consistent with recent findings of lower spreads on debt collateralized against sustainable properties (Eichholtz, Holtermans, Kok, and Yönder, 2015). Our findings suggest that higher property-level cash flows and lower corporate-level expenses increase funds available for distribution to shareholders.

Further, we find that US REITs with a larger share of sustainable properties in their portfolio benefit from lower systematic risk and higher valuations. These valuation gains are above and beyond any gains in the market value of the underlying properties, hence we interpret them as pure valuation gains based on corporate reputation effects.

In the UK, where a baseline level of environmental reporting is mandatory, we find that listed property companies benefit somewhat from investments in sustainability-certified properties through higher cash flow and valuation outcomes. However, the results are less nuanced than in the US. The compulsory environmental disclosure for investment property may reveal environmental underperformance and thus gradually improve the average level of environmental sustainability of the local building stock, attenuating the effect from voluntary sustainability labels in the UK. Our results suggest that while the primary effect of certification in the US, a market without requisite baseline reporting, is to improve transparency and thus reduce the amount of uninformed trading in the market, certifications against the benchmark of baseline environmental performance reporting in the UK provide a signal of particularly high environmental quality of the firms portfolio.

In summary, this study contributes to our understanding of the value and performance effects of corporate sustainability practices in three main ways. First, we clarify the relative value and performance effects of sustainability practices on the property-level, the operating and financing level of the firm, and the corporate level from the shareholder's point of view. Second, the existing literature mostly focuses on individual countries. However, real estate investment is a global industry and concerns around sustainability are global in nature, too. We contribute to filling this gap in the literature by comparing the value and performance effects of sustainability practices in different international markets. Finally, we are able to clarify, for investors and managers alike, the economic channels through which sustainability practices contribute to firm value and performance.

2 Conceptual framework

Our empirical work is based on the fundamental dividend-discount relationship of corporate valuation. The study that is closest to ours in using this relationship to motivate empirical tests is Capozza and Seguin (1999). The dividend discount model defines firm value V at time t as the present value of future dividends D_t, discounted at a rate r:

$$V_t = \int_t^T D_t e^{-rt} dt \tag{1}$$

Table 1 shows a standard pro forma REIT income statement.

[Insert Table 1 about here.]

According to this pro forma, the corporate cash flow available for distribution to shareholders, C_t, is the cash flow obtained from the properties owned and operated by the REIT, Y_t, minus any interest expense, I_t, and minus corporate level overheads, G_t:

$$C_t = Y_t - I_t - G_t \tag{2}$$

If REITs pay out 100% of cash flows available, then, following (1), firm value becomes:

$$V_t = \int_t^T (Y_t - I_t - G_t)_t e^{-rt} dt \tag{3}$$

Assuming constant rates of growth in property cash flows, g^y, and corporate overheads, g^g, (3) may be simplified, in perpetuity, to the following expression:

$$V_t = \frac{Y_t}{r - g^y} - \frac{I_t}{r} - \frac{G_t}{r - g^g} \tag{4}$$

The REIT regulation requires qualifying firms to pay out at least 90% of taxable earnings as dividends. REITs regularly pay out significantly more than that (Boudry, 2011; Hardin and Hill, 2008; Wang, Erickson, and Gau, 1993). This policy creates a close correlation between REIT dividends and cash flows for distribution; the valuation of REITs is then driven by the present value of future corporate cash flows (Capozza and Seguin, 1999).

If a corporate policy to invest in sustainable properties affects REIT firm value, then it must do so via one or more of the valuation components identified above. In this study, we trace the effects of sustainable property investment through the REIT valuation process and its constituent components.

2.1 Cash flow effects

A corporate policy of investing in sustainable properties may affect the numerator of the dividend (cash flow) discount valuation through a number of different economic channels. The following section outlines our specific hypotheses in relation to those channels. Several of our hypotheses are the first attempts to examine such questions. However, where possible, each hypothesis is rooted in the relevant existing literature.

Property-level cash flows: Property level cash flows are a function of rental revenues and operating expenses. Research on the individual building level suggests that properties with sustainability certifications achieve higher rental rates (Bond and Devine, 2016; Eichholtz, Kok, and Quigley, 2013, 2010; Fuerst and McAllister, 2011; Kahn and Kok, 2014; Miller, Spivey, and Florance, 2008; Wiley, Benefield, and Johnson, 2008). As a consequence, we expect that REITs with a larger proportion of sustainable properties in their portfolio realize higher rental revenues.

In terms of operating expenses, a major goal of sustainable building is to decrease resource usage, theoretically translating into lower energy-related operating costs (Kats, 2003; Newsham, Mancini, and Birt, 2009; Scofield, 2009, 2013). However, studies find a positive relationship between environmental certification and energy use, particularly in technologically sophisticated "smart buildings" (Fullbrook, Jackson, and Finlay, 2006; Kats, 2010). On the other hand, Devine and Kok (2015) find that sustainable buildings are linked to improved tenant satisfaction and a higher likelihood of renewing a lease, suggesting lower tenant incentives and re-leasing costs over time. At this juncture, the most consistent result from this nascent literature is the call for more research. To our knowledge, we are the first to test whether REITs with a larger share of sustainable properties realize higher or lower operating expenses.

Net operating income: As NOI, the bottom-line property level cash flow measure, is impacted by both, rental income and operating expenses, it is an empirical question as to which effect dominates on the portfolio level.

General and administrative (G&A) expenses: After net operating income, corporate level cash flows are driven by corporate level overheads. As noted, environmentally-certified properties are often technologically advanced "smart" buildings with higher tenant satisfaction, thus possibly requiring less intense asset management. REITs with a larger share of sustainable properties in their portfolio may therefore incur lower G&A or management expenses. To the best of our knowledge, we are the first to explore this possible effect of sustainable investment on corporate management expenses.

Interest expenses: Corporate level cash flows are further affected by interest expenses. Eichholtz, Holtermans, Kok, and Yönder (2015) find lower spreads on corporate debt issuances collateralized against sustainable properties. Building on those results for interest rate spreads at issuance, and holding the level of corporate debt constant, we expect REITs with a larger share of sustainable investments to incur lower interest expenses.

Funds from operations: Funds from operations (a US REIT-specific measure of accounting earnings or cash flow available for distribution to shareholders) are the overall product of net operating income after G&A (management) expenses and corporate interest expenses. These funds represent a key cash-flow metric in the valuation of real estate firms. Having examined the different categories of firm-level income and expense items separately, it is an empirical question how these individual effects combine to influence the bottom line of funds from operations.

2.2 Discount rate and valuation effects

A corporate policy of investing in sustainable properties may, in addition to affecting the numerator of the dividend (cash flow) discount valuation, also have an impact on the denominator, the discount rate. The discount rate applied to the firm's dividends (cash flows) in the valuation reflects the required rate of return on the firm's equity.

Liquidity: The required rate of return is partly a function of liquidity (Amihud and Mendelson, 1988). Liquidity may be affected by corporate investment policies if these policies affect informational asymmetries (Harris, Kriebel, and Raviv, 1982) or the cost of collecting value-relevant information (Ippolito, 1989). The valuation of real estate requires intricate knowledge of the assets and their characteristics, which is costly to acquire (Han, 2006). Environmental certification improves transparency by providing a considerable amount of information on the fundamentals of properties. Higher liquidity (stock turnover) may signal a higher proportion of uninformed traders in the market (Baker and Stein, 2004). To the extent that better information about the fundamentals of a REIT's portfolio reduces uninformed trading, we expect that REITs with a larger share of sustainable properties in their portfolio experience lower ratios of stock turnover.

Systematic Risk: The required rate of return is also a function of the systematic risk of the equity, measured by the CAPM beta. Sustainable property investment is often associated with the goal of making a portfolio more resilient. This resiliency may manifest itself in higher and more stable occupancy rates and/or less variation in operating expenses (Devine and Kok, 2015). To the extent that sustainable properties are a more stable source of rental income and subject to less volatile expenses, a portfolio with a higher exposure to sustainable buildings may generate more stable performance that is less sensitive to variation in the economic environment. Thus we expect that REITs with a higher share of sustainable properties have lower systematic risk.

Valuation: On balance, the effects above may combine to produce higher market valuations for REITs with a larger share of sustainable properties in their portfolio. This comprehensive assessment allows us to evaluate the relative magnitude of the effects of sustainable investments on corporate performance, and establish the extent to which any positive value effects are driven by cash flow factors or discount rate factors, that is, systematic risk and liquidity. In addition, the fact that real estate assets are actively traded in a secondary market affords us with an opportunity to measure the contribution of sustainable investments to the value of the firm above and beyond any contributions to the value of the underlying properties as determined by cash flow and discount rate factors, possibly reflecting a reputation or "halo" effect of sustainable investment.

3 Empirical method

3.1 Basic regression set-up

In order to explore the effects of sustainable investment empirically, we specify a set of regression models, similar to Capozza and Seguin (1999). First, we focus on the different components of cash flow effects. The dependent variables in our models correspond to the cash flow elements of REIT value and performance discussed above. They include: (i) rental revenue, (ii) rental operating expense, (iii) property-level cash flows (NOI), (iv) interest expense, (v) general and administrative expense, (vi) corporate level cash flows available for distribution (FFO or earnings). For instance, consider the following baseline model for rental revenue, RR:

$$RR_{it} = \beta_0 + \beta_1 L.AT_{it} + \beta_2 L.AT_{it}^2 + \beta_3 L.LT_{it} + \beta_4 L.LT_{it}^2 + f_i + d_t + u_{it} \tag{5}$$

where AT_{it} is the depreciated book value of total assets, and LT_{it} is the book value of total liabilities. In order to address potential endogeneity in the relationships of interest, we lag all right-hand side variables, where $L.$ denotes the lag operator. [4]

In this specification, the coefficient β_1 may be interpreted as a baseline property rental yield. In order to account for possible non-linearity, we include squared terms of total assets and liabilities. We include firm fixed effects, f_i, to control for time-invariant unobservable firm-specific characteristics. These controls allow us to isolate the effect of investments in environmentally sustainable properties after accounting for the general characteristics of the firm's asset base. We also include time fixed effects, d_t, to account for market-wide factors that vary through time but affect all firms, such as investor sentiment or a preference for certain investment styles. Lastly, u_{it} is the residual.

[4] Bellemare, Masaki, and Pepinsky (2015) note that lagged explanatory variables address endogeneity when there is (i) serial correlation in the potentially endogenous explanatory variable, and (ii) no serial correlation among the unobserved sources of endogeneity.

3.2 Effect of sustainable investments

We assess the influence of sustainable property investment by augmenting the model in (5) by allowing the baseline rental yield to vary with the degree of sustainable investment. Consistent with Eichholtz, Kok, and Yönder (2012), we define the degree to which a REIT follows a sustainable investment policy as the $GreenShare$ of firm i at time t:

$$GreenShare_{it} = \frac{\sum_n^N Area_{it}^{Certified}}{\sum_m^M Area_{it}} \tag{6}$$

where the numerator sums the area (square footage) of all N certified properties held by firm i at time t and the denominator sums the area of all M properties held in total by firm i at time t, so that the $GreenShare$ is a ratio in $[0, 1]$. As a result, we estimate the following model:

$$RR_{it} = \beta_0 + \beta_1(L.GreenShare \times L.AT) + \beta_2 \mathbf{x}_{it} + f_i + d_t + u_{it} \tag{7}$$

where $\mathbf{x}$ is the same vector of observable covariates included in (5), and firm as well as time fixed effects are included as before. In order to account for heteroskedasticity, we estimate (7) using weighted least squares (WLS) with the inverse of the book value of total assets as weights. In subsequent variants of the model, we replace the dependent variable with the other components of REIT cash flow performance outlined above.

3.3 Extension to discount rate and valuation effects

Discount rate or required rate of return effects may be reflected in one or more of the following variables: (i) liquidity, (ii) systematic risk, and finally, (iii) overall valuation effects. Next, we examine the link between sustainability and stock liquidity. Consider the following specification:

$$VT_{it} = \beta_0 + \beta_1 L.CSHO_{it} + \beta_2 L.CSHO_{it}^2 + \beta_3 L.LT_{it} + \beta_4 L.LT_{it}^2 + f_i + d_t + u_{it} \tag{8}$$

where variables are defined as in (5), except VT_{it} is the total number of common shares traded (trading volume) for firm i over a period t and $CSHO_{it}$ is the number of common

shares outstanding at the end of the period. In this specification, the coefficient β_1 may be interpreted as a baseline turnover ratio for the sample firms. Following the same logic as before, we augment this model as follows:

$$VT_{it} = \beta_0 + \beta_1(L.GreenShare \times L.CSHO) + \beta_2 \mathbf{x}_{it} + f_i + d_t + u_{it} \tag{9}$$

where $\mathbf{x}$ is the same vector of observable covariates included in (8), and firm as well as time fixed effects are included as before. Equation (9) is estimated using WLS with the inverse of the number of common shares outstanding as weights.

Sustainability practices may also make the portfolio of a REIT more resilient to market-wide shocks, reducing systematic risk. In order to explore this relationship, we estimate the following regression analogous to (7), only the dependent variable is the series of the individual firms' CAPM β coefficients, obtained from annual regressions of monthly firm returns on the S&P500 stock market index in the US and the FTSE 100 in the UK:

$$Beta_{it} = \beta_0 + \beta_1(L.GreenShare \times L.AT) + \beta_2 \mathbf{x}_{it} + f_i + d_t + u_{it} \tag{10}$$

where all variables are defined as in (7). Note that for scaling purposes, we multiply the firm's beta coefficient for a given year by the book value of its assets. WLS, with the inverse of the firm's book value of assets as weights, is applied as before.

Lastly, strong sustainability practices may improve corporate reputation and desirability of the stock for investors, thus inducing a corporate valuation premium. Common measures of corporate value rely on the ratio of the market value of the firm's assets relative to their depreciated book value, commonly referred to as q. However, to the extent the improvements in the operational performance of sustainable properties are reflected in the market value of those assets, and given that we would like to examine corporate valuation effects above and beyond those potentially higher market values of the underlying assets, we use the price to NAV ratio as our measure of value. The price to NAV ratio incorporates variation in the market value of the underlying REIT properties, and thus the ratio of the firm's stock price to the net asset value of its properties can provide better insight into the pure valuation effects of sustainable investments.

As a final specification, we use market value of the firm's equity as the dependent variable, with the net asset value (NAV) on the right-hand side, so that the coefficient on the interaction between NAV and the variable *GreenShare* captures pure valuation effects reflected in the price/NAV ratio. Consider the following specification:

$$MCap_{it} = \beta_0 + \beta_1 L.NAV_{it} + \beta_2 L.NAV_{it}^2 + \beta_3 L.LT_{it} + \beta_4 L.LT_{it}^2 + f_i + d_t + u_{it} \qquad (11)$$

where variables are defined as in (5), except $MCap_{it}$ is the total market capitalization for firm i in period t and NAV_{it} is the net asset value at the end of the period. In this specification, the coefficient β_1 may be interpreted as a baseline price to NAV multiple. We then estimate the following augmented model:

$$MCap_{it} = \beta_0 + \beta_1 (L.GreenShare \times L.NAV) + \beta_2 \mathbf{x}_{it} + f_i + d_t + u_{it} \qquad (12)$$

where $\mathbf{x}$ is the same vector of observable covariates included in (11), and firm as well as time fixed effects are included as before. Equation (12) is estimated using WLS with the inverse of the firm's net asset value as weights.

4 Data

In order to estimate the models outlined above, we employ financial reporting and property portfolio data on listed US equity REITs as well as UK REITs and property companies from the *SNL Financial* database. [5] For the calculation of the *GreenShare*, we first identify the addresses of the buildings owned by the sample firms at any given point in time from *SNL*. We then collect the addresses of all sustainability-certified properties in the US and the UK directly from the certification providers, including the certification date. Lastly, we employ GIS techniques to match the addresses of the properties held by the sample firms with the addresses of certified properties. This matching exercise produces a list of certified properties held by the sample firms through time.

[5] In addition to the SNL net asset value figures, we also considered Green Street Advisors net asset value estimates. The two datasets are 97.3 percent correlated for the US data and 99.7 percent correlated for the UK data, however the SNL data was more extensive. Therefore, we use the SNL NAV data in our regression analysis.

There are two leading sustainability and energy efficiency building certification programs in the US (Energy Star and LEED), and one in the UK (BREEAM). Each of these programs originated in their respective countries and dominates their local as well as international markets, supporting our choice of these two countries for our analysis. [6]

The study period begins in 2000 for the US (when comprehensive certification data is first available), and in 2009 for the UK (following a BREEAM scheme update), with the final sample covering 2001–2014 and 2009–2014, respectively, taking into account the lagged specifications and the most recent data available. Throughout these sample periods, we adopt an unbalanced panel approach to mitigate survivorship bias (Baum, 2006). Firms enter the sample when they first appear on SNL and meet the data requirements, and exit when they become inactive (acquired/defunct). Our final sample contains 956 and 297 firm-year observations in the US and UK, respectively.

Table 2 presents key ratios on the financial characteristics of the sample firms during the study period. In order to mitigate any undue influence of outliers, all variables are winsorized at the 1^{st} and 99^{th} percentiles. Table 3 presents pairwise correlation coefficients between the key financial ratios and the sustainability measures in our study. We find some significant but not excessive correlations between the financial ratios and sustainability measures, alleviating concerns surrounding multicollinearity.

[Insert Tables 2 and 3 about here.]

Figure 1 highlights the evolution of the sustainability measures in our sample. Since the start of the study period, green properties have developed into a significant proportion of US REIT portfolios. In 2014, the final year in our sample, green properties on average account for c. 15% of US REIT assets and more than 6% of portfolio square footage. In the UK sample, the share of sustainable properties is lower, reaching an average of 2% by area in 2014, but shows an upward trend similar to the US sample.

[Insert Figure 1 about here.]

[6] The majority of sample firms with a positive *GreenShare* hold a mix of different environmentally certified properties. Our *GreenShare* metric captures properties certified under any of the three certification programs.

5 Results

5.1 Cash flow effects

Tables 4 and 5 show the regression results for the operational effects of sustainable investment in the US equity REITs and the UK listed property companies, respectively, in our sample. Note that all of our findings are established after controlling for firm and time fixed effects to account for unobservable firm-specific factors such as firm quality and market-wide influences such as sentiment.

[Insert Tables 4 and 5 about here.]

Column (1) of Table 4 presents the effects of sustainable investment on rental revenue relative to total assets for US REITs. The estimated conditional average rental yield is 13.3%. The positive significant coefficient on the (Assets) × (Certified share) variable suggests that a larger share of certified sustainable properties is associated with a higher rental yield. Economically, a REIT with a share of sustainable assets equal to the sample mean of 2% (based on area) plus one standard deviation, resulting in a green share of 8%, has an expected rental yield of 13.7% [=0.133+(0.053×0.08)]. This positive effect of environmental certification on rental values is consistent with the existing literature on the building level, but further shows that these positive effects on rental levels carry through from the property level to the portfolio level.

Column (2) shows the effects of sustainability on rental operating expenses and reveals contrasting results for the two subgroups. We find that investment in sustainable properties unfavorably affects the operating costs of US REITs. While the overall conditional average ratio of operating expenses to total assets is 3.8%, this measure increases to 4% for a REIT with a share of sustainable assets equal to the sample mean plus one standard deviation. To our knowledge, we are the first to document this effect of sustainable investment on the operating cost of a REIT. Our finding is consistent with the notion that the technological sophistication of sustainable properties increases operating costs as compared to conventional properties.

Next, we explore the net effect of sustainable investment on rental revenue and operating expense by considering property-level cash flows (NOI) in Column (3). In the US, we find that the NOI remains unaffected as the balance of higher rental revenue and higher operating costs for sustainable buildings cancel each other out. Our finding suggests that the increase in rental revenue fully compensates for the higher operating costs associated with the ownership of sustainable properties.

The second layer of possible operational effects relates to corporate-level costs. Column (4) presents the effect of sustainable investment on general and administrative expenses. We find that higher shares of sustainable investment are not associated with any significant changes G&A expenses, suggesting that sustainable property portfolios require the same level of management expenses as conventional properties. Again, to our knowledge we are the first to explore this effect of sustainable investment on corporate-level (management) expenses, as distinct from property-level operating costs.

Column (5) shows that higher shares of sustainable investment are associated with lower interest expenses, holding firm size as well as liabilities (i.e. the level of indebtedness of the firm) constant. Our finding is consistent with Eichholtz, Holtermans, Kok, and Yönder (2015) who document lower spreads on debt securities collateralized against sustainable properties. However, we add to this line of inquiry by quantifying the effect of sustainable investment on the overall level of corporate interest expenses in REITs, rather than the cost of individual debt security issuances. In economic terms, a firm with an average share of sustainable assets of 2% has an expected conditional interest expense ratio of 0.50%, dropping to 0.47% for a REIT with a share of sustainable assets equal to the sample mean plus one standard deviation.

The net effect of property level and corporate level revenue and expenses can be summarized in corporate-level cash flow available for distribution to shareholders. For US REITs that is measured as funds from operations (FFO). As per Column (6) of Table 4, we find a statistically significant positive effect of sustainable investment for US REITs. In economic terms, while the average conditional FFO yield is 6.2%, this figure increases to 6.5% for a REIT with a green share of one standard deviation above the sample mean.

In Column (1) of Table 5, we document insignificant findings for the UK firms in terms of rental revenue and operating expenses. Yet, we find a positive and significant effect of sustainable investment on NOI. We also find insignificant coefficients of sustainable investments on SG&A and interest expenses. Nevertheless, the improved NOI levels seem to carry through to earnings, as we find a significantly higher earnings yield for a UK firm with a higher share of sustainable investments relative to conventional property.

We interpret the lack of significance of a number of the UK findings relative to the US findings as follows: In the UK, Energy Performance Certificates (EPCs) are required for any property being leased or sold, with fees in place for properties which fail to comply. It is already known that beginning on April 1, 2018, properties must additionally meet at least a grade E (scale: A to G, A being best) in order to be leased to a private party. [7] This compulsory environmental disclosure for actively managed investment property may lay bare any significant environmental underperformance and thereby gradually improve the average level of environmental sustainability of the local building stock. This effect may in turn attenuate the strength of differentiation from voluntary sustainability labels in the UK relative to a market without requisite reporting, such as the US.

5.2 Discount rate and valuation effects

Tables 6 and 7 show the regression results for the valuation effects in the US and the UK respectively, as a function of sustainable investment and the control variables.

[Insert Tables 6 and 7 about here.]

First, we explore the notion that sustainable investment improves transparency and thus reduces uninformed trading, lowering stock turnover. Column (1) of Table 6 shows that a higher share of certified sustainable properties in a US REIT's portfolio is associated with a lower turnover ratio for that firm's stock. According to our estimates, the expected turnover ratio for a REIT with an average share of sustainable properties is 12.2%. Our results suggest that this value drops to 11.5% for a REIT with a share of sustainable properties one standard deviation above the mean.

[7] See: `https://www.gov.uk/energy-performance-certificate-commercial-property/overview`.

Column (2) of Table 6 shows that US REIT stock returns with a larger share of sustainable investments carry less systematic risk; in other words, they are less sensitive to variation in the returns on a broad stock market index (in our analysis, the S&P500). In economic terms, the risk-reducing effect of sustainable investment is the largest influence on firm value and performance we identify. An average REIT in our sample has an expected beta of approximately 1. Our results suggest that a REIT with share of sustainable properties of 8% (one standard deviation above the sample mean) has an expected beta of 0.80, a reduction of 20 basis points.

We find that a higher share of sustainable investment is associated with a significant improvement in the price to NAV ratio for US REITs (Column 3). Our results suggest that a REIT with an average share of sustainable properties has an expected P/NAV ratio of 0.912. If the share of sustainable investments increases by one standard deviation, we expect the P/NAV ratio to increase to 0.972. Our findings suggest that a higher share of sustainable investment is accretive to firm value above and beyond any improvement in the market value of the underlying assets of the firm. This result implies that, in addition to tangible improvements in cash flows from sustainable properties, and in addition to lower required rates of return, firm market value benefits from a larger share of sustainable investments. We interpret this finding as a reputation effect.

We find no statistically significant effect of sustainable investment in terms of liquidity and systematic risk for UK firms. Consistent with the US results, we find a positive effect on the P/NAV ratios of the UK sample firms that is associated with a larger share of sustainable investments.

In the US, there is no requisite environmental performance reporting with regards to investment property. Therefore, environmental certification programs such as LEED and Energy Star are the only source of information on the environmental performance of property available to US investors. When more information about the environmental performance of a firm's portfolio becomes available in the form of sustainability certifications, information asymmetries are reduced and the proportion of uninformed traders in the market declines, reducing stock turnover, consistent with Baker and Stein (2004).

In the UK on the other hand, environmental certifications are not the only source of information about the environmental performance of investment property, as environmental performance certificates are mandatory for any property being leased or sold. As a result, environmental certifications may not only inform investors about the environmental performance of the firm's portfolio, but may additionally include a benchmarking mechanism against other firms with no certified properties. Our findings are consistent with the notion that in the UK, certifications not only inform about environmental performance but are also a signal of high-quality environmental performance of the firm's portfolio.

5.3 Robustness tests

In the regressions exploring cash flow effects, we replace the book value of assets with the firm's gross asset value as a current market-based metric of the firm's asset value instead of historical cost which reflects stale information. Our findings are robust to using gross asset value: all statistically significant variables of interest retain their significance and sign for both the US and the UK samples.

SNL also provides net book value figures for assets held over time by US firms. For robustness, we estimate the US results with the *GreenShare* based on net book value instead of area. Our findings are robust to using net book value instead of square footage for calculating the *GreenShare*.

Lastly, we control for the quality of property portfolio of a REIT or a listed property company. The *GreenShare* may capture the impact of portfolio quality as green properties are of higher quality. We create two measures of portfolio quality, the weighted average age of the properties and a weighted count of those properties in the firms' portfolios that have been renovated. Our findings are robust to including these proxies for portfolio quality. The results of all of our robustness tests are available upon request.

6 Implications for investment

The impact of environmental certification on buildings is well researched, particularly on property-level rental and occupancy rate premiums, and associated value premiums. Due to data limitations, less research is completed on operating expenses, and that which is complete has yet to converge on a consensus. This creates a "black box" issue, where we can observe and analyze the effective income input and the value output, but know little about the other two factors involved in value (expenses and risk). Partially due to this black box issue, early research hypothesized that the increased asset value was a result of the increased effective income. Researchers noted, logically, that these energy efficient buildings should use less energy, thereby decreasing operating costs, further increasing the NOI, and that there was no reason environmentally-certified properties should experience higher capitalization rates (in some cases, noting that they may be associated with lower capitalization rates). The impact of high-tech buildings on power usage was not anticipated.

Researchers are now beginning to gain insight into that black box. Devine and Kok (2015) identify that the variance in operating costs for environmentally-certified properties is lower, and Fuerst (2015) finds similar decreased risk and volatility for green REITs. These findings of decreased risk substantiate an expectation of lower capitalization rates (and lower discount rates for REITs), however they make no steps toward evidence of decreased operating expenses. Our research provides some of the first evidence that not only may there be increased operating expenses, but that those increased expenses could be counterbalance the increased effective rent, resulting in a constant NOI. Taken alone, this is a notable result. But when paired with the evidence of increased value, our research indicates that the value premium associated with environmentally-certified property investment may partly be driven by decreased risk.

These findings are further supported by our corporate-level results, indicating that sustainable portfolios have lower interest and overhead expenses. Such results are logical for lower-risk properties. Lower corporate level expenses are then combined with the non-elevated NOIs and traded at lower betas, again likely due to their lower risk profile.

That the benefit from sustainable real estate investment may be rooted in decreased risk is good news, as that benefit may perpetuate more reliably than rental premiums. Industry research by CBRE [8] suggests that the adoption of green office buildings in the 30 largest US cities is beginning to level off. Holtermans (2016) finds that there is no premium in rental growth associated with environmentally-certified properties. As green buildings become the norm, it may follow that the associated rent premiums dissipate. However, it is less obvious that sustainable buildings should become riskier. Therefore, since the financial benefits of environmentally-certified properties appear partly rooted in risk, these benefits may persist.

Our comparison between the UK and the US suggests a number of implications for investors. We choose to compare these two countries because they are home to the leading global certification programs. In addition, they also take different approaches to sustainability. In the UK, a baseline environmental performance report (EPC) is mandatory for all properties being leased or sold. The US has no such requisite reporting. We find that the US results for the effects of investment in sustainability certified properties are generally more significant and more nuanced.

In terms of cash flow effects, our results suggest that mandatory environmental disclosure may reveal any significant environmental underperformance and thereby gradually improve the average level of environmental sustainability of local investment property. This effect may in turn attenuate the strength of differentiation from voluntary sustainability labels in the UK. In terms of transparency effects, our results suggest that certifications in the US, where they are the only information available to investors about environmental performance, primarily reduce the amount of uninformed trading in the market. In the UK on the other hand, the availability of baseline environmental performance reports seems to transform the presence of an environmental certification on a property into a signal of particularly high environmental quality, increasing the liquidity of the stock of the firm holding such properties.

[8] See `http://www.cbre.com/about/corporate-responsibility/environmental-sustainability/real-green-research-challenge`.

7 Conclusion

We provide the first systematic, international decomposition of possible financial benefits of sustainable real estate investment on corporate performance metrics across the two leading country-markets in terms of sustainable property certifications. This study provides novel insight inside the black box of sustainable property investments by REITs and listed property companies, and how possible associated costs and benefits accrue to different financial measures.

Specifically, we separately explore the operating and valuation effects. We evaluate the operational impact on property level effective rents, operating expenses, and net operating income, as well as on firm level overhead costs, interest expense, and cash flows available for distribution. For valuation, we evaluate the price to NAV ratio, reflecting a unique measure of how investors value corporations in the stock markets relative to their asset value, and explore two components of valuation: the discount rate, based on systematic risk, and liquidity. To our knowledge, this is the most complete picture of the relationship between green property investments and operating performance documented from the corporate perspective.

We find a number of significant results that differ systematically between the two country-markets we study. In the UK, where a baseline level of environmental reporting is mandatory in the form of environmental performance certificates, listed property companies benefit somewhat from investments in sustainability-certified properties through higher cash flow and valuation outcomes. In the US, which features no such requisite reporting and where environmental certifications are the only source of information about the environmental performance of property available to investors, the benefits of sustainable investment are stronger and comprise distinct cash flow, risk, information and corporate valuation effects. In summary, the international comparison we conduct also suggests benefits of improved transparency from environmental performance reporting.

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Figures and Tables

Pro forma REIT income statement and valuation schematic

PERFORMANCE LEVEL		ITEM
PROPERTY		Rental revenue
	-	Rental operating expense
	=	Property-level cash flow
CORPORATE	-	Interest expense
	-	General & administrative expense
	=	Corporate cash flows
MARKET	÷	Discount rate
		(Risk, Liquidity)
	=	Firm value

Table 1
The table presents a schematic of a typical pro forma income statement and basic corporate valuation for an equity REIT.

Firm characteristics, US and UK firms

VARIABLE	Mean	SD	P25	Median	P75	Min	Max
	Panel (a) – US Sample						
Rental revenue	0.12	0.03	0.10	0.12	0.14	0.02	0.24
Rental operating expense	0.04	0.02	0.03	0.04	0.05	0.00	0.14
NOI	0.08	0.02	0.07	0.08	0.10	0.02	0.21
G&A expense	0.01	0.01	0.01	0.01	0.01	0.00	0.06
Interest expense	0.03	0.01	0.02	0.03	0.03	0.00	0.09
Funds from operations	0.05	0.02	0.04	0.05	0.06	-0.06	0.20
Market leverage	0.47	0.15	0.37	0.46	0.57	0.01	0.99
MB ratio	1.34	0.34	1.12	1.29	1.49	0.54	3.28
Market value to NAV	1.01	0.20	0.90	1.02	1.13	0.15	3.15
Turnover	0.11	0.08	0.06	0.09	0.13	0.00	0.78
Certified (by area)	0.02	0.06	0.00	0.00	0.02	0.00	0.29
Certified (by assets)	0.05	0.12	0.00	0.00	0.04	0.00	0.54
	Panel (b) – UK Sample						
Rental revenue	0.06	0.02	0.04	0.06	0.07	0.00	0.13
Rental operating expense	0.01	0.01	0.01	0.01	0.02	0.00	0.05
NOI	0.03	0.06	0.02	0.04	0.05	-0.93	0.12
G&A expense	0.02	0.05	0.01	0.01	0.02	0.00	0.88
Interest expense	0.02	0.01	0.01	0.01	0.02	0.00	0.08
Funds from operations	0.06	0.08	0.01	0.05	0.09	-0.44	0.70
Market leverage	0.46	0.19	0.32	0.45	0.60	0.04	0.94
MB ratio	0.95	0.13	0.89	0.96	1.04	0.54	1.31
Market value to NAV	0.91	0.23	0.78	0.91	1.06	0.26	1.48
Turnover	0.36	0.27	0.15	0.34	0.50	0.00	1.89
Certified (by area)	0.01	0.03	0.00	0.00	0.00	0.00	0.12

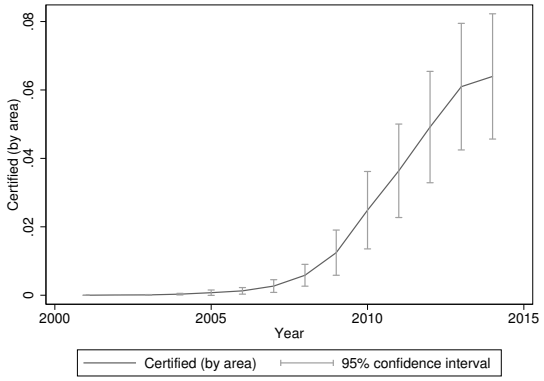
Table 2
The table presents the descriptive statistics for the firm characteristics of the US equity REITs and UK REITs as well as listed property companies in the sample on an annual basis. All firm-level accounting and portfolio information is obtained from SNL. Financial key ratios are scaled by book value of assets (defined as all assets owned by the company as of the date indicated, as carried on the balance sheet and defined under the indicated accounting principles), unless otherwise indicated. Market leverage is the ratio of total liabilities plus mezzanine items to the market value of assets. The market-to-book (MB) ratio is the market value of assets over the book value of assets. Market value of assets if book value of assets minus book value of common equity plus market value of equity (number of common shares outstanding multiplied by the end of quarter share price). The market-to-book (MB) ratio is the market value of assets over the book value of assets. The market value-to-NAV ratio is the market capitalization of the firm (market value of equity) divided by the firm's NAV (net asset value (NAV) per share multiplied by the number of shares outstanding). Turnover is the total number of shares traded in a period over the total number of shares outstanding at the beginning of the period. Sustainability characteristics are scaled as indicated, by book value of assets or area (property square footage). In the UK, the equivalent expense to G&A expenses reported is Selling, General and Administrative (SG&A) Expenses. Furthermore, we use earnings instead of FFO as listed property companies in the UK do not report FFO.

Correlation table

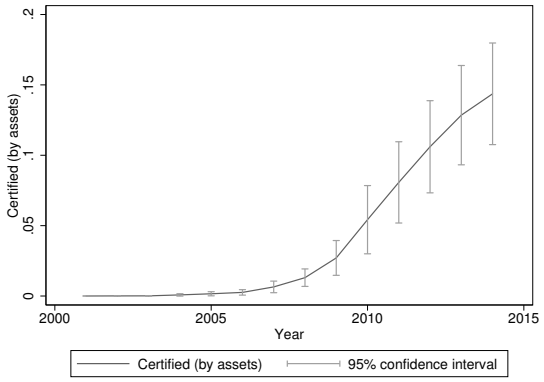
	Certified US		Certified UK
VARIABLE	By assets	By area	By area
Rental revenue	-0.0852*	-0.1169*	-0.1378
Rental operating expense	0.0491	0.0161	-0.1310
NOI	-0.1553*	-0.1909*	0.0224
G&A expense	-0.0308	-0.0439	-0.0698
Interest expense	-0.1723*	-0.1925*	-0.0180
Funds from operations	-0.0911*	-0.0995*	0.0698
Market leverage	-0.0210	-0.0273	-0.0731
MB ratio	-0.0563	-0.0902*	0.1594
Market value to NAV	0.0113	0.0297	0.1848*
Turnover	0.0254	0.0429	0.1387

Table 3
The table presents selected pairwise Pearson correlation coefficients for the financial and sustainability characteristics of the US equity REITs and UK equity REITs as well as listed property investment firms in the sample over the study period. All variables are defined as in Table 2. The asterisk denotes significance of the difference of correlation coefficients from zero at the 1% level.

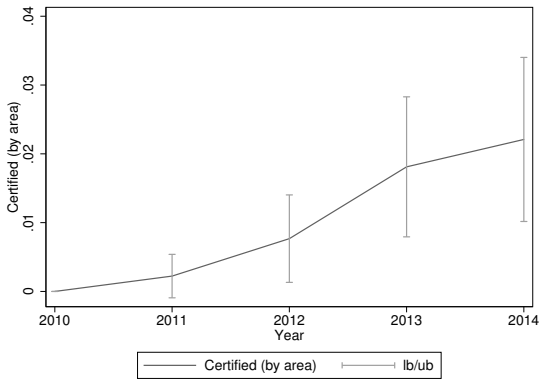
Evolution of sustainability measures in US and UK samples



(a) Mean share of certified area to total area US



(b) Mean share of certified assets to book value US



(c) Mean share of certified area to total area UK

Fig. 1. The figure shows the evolution of annual mean green shares in the US, by book value of assets (Panel (a)) and the total square footage (area) (Panel (b)), as well as in the UK, by area (Panel (c)) over the study period. The bars indicate a 95% confidence interval around the mean estimate.

Regression results for US operational effects, all certified sustainable area

VARIABLES	(1) Rental revenue	(2) Operating expense	(3) NOI	(4) G&A expense	(5) Interest expense	(6) FFO
(Assets) x (Certified area)	0.053**	0.029***	0.004	0.000	-0.016***	0.035**
	(2.55)	(2.77)	(0.32)	(-0.01)	(-3.50)	(2.01)
Total assets	0.133***	0.038***	0.101***	0.004***	0.006***	0.062***
	(15.00)	(8.36)	(17.02)	(3.50)	(2.83)	(8.36)
$(\text{Assets})^2$	-0.002***	-0.000**	-0.002***	0.000	-0.000*	0.000
	(-4.56)	(-2.34)	(-6.50)	(0.75)	(-1.92)	(1.50)
Total liabilities	-0.049***	-0.003	-0.053***	0.002	0.036***	-0.037***
	(-3.38)	(-0.41)	(-5.50)	(0.89)	(11.28)	(-3.05)
$(\text{Liabilities})^2$	0.002	0.000	0.002***	0.000	0.000	-0.003***
	(1.51)	(0.43)	(3.36)	(0.16)	(-1.57)	(-3.20)
Observations	956	956	956	956	956	956
R-squared	0.974	0.952	0.973	0.92	0.976	0.914
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 4
The table presents the regression results estimating the firm-year observations of the operational ratios for US equity REITs as a function of the share of all certified sustainable properties held by the firm, (Assets) × (Certified share), and firm characteristic control variables. Variables are defined as in Table 2. Columns (1) to (6) correspond to the results for the individual operational performance measures as indicated in the column headings. Assets squared $(Assets)^2$ and Liabilities squared $(Liabilities)^2$ are scaled by (10^{-6}). Firm and year fixed effects are included as indicated to control for time- and firm-invariant unobservables, respectively. Robust t-statistics, obtained via WLS with the inverse of the book value of the firm's assets used as weights, are shown in parentheses. Significance is indicated as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Regression results for UK operational effects, all certified sustainable area

VARIABLES	(1) Rental revenue	(2) Operating expense	(3) NOI	(4) SG&A expense	(5) Interest expense	(6) Earnings
(Assets) x (Certified area)	0.009	-0.002	0.049**	-0.008	0.001	0.426***
	(0.47)	(-0.29)	(2.54)	(-0.91)	(0.15)	(3.27)
Total assets	0.024***	0.004*	0.009	0.014***	-0.001	0.197***
	(3.81)	(1.82)	(1.38)	(4.54)	(-0.55)	(4.54)
$(\text{Assets})^2$	-0.001	0.000	-0.001	-0.000	-0.000	-0.013***
	(-1.46)	(0.12)	(-1.25)	(-1.55)	(-1.11)	(-3.18)
Total liabilities	0.046***	0.006	0.047***	-0.014**	0.038***	-0.283***
	(4.10)	(1.55)	(4.16)	(-2.59)	(8.50)	(-3.72)
$(\text{Liabilities})^2$	-0.003	0.000	-0.003*	0.001	-0.001*	0.056***
	(-1.45)	(0.16)	(-1.71)	(0.77)	(-1.84)	(4.20)
Observations	297	297	297	297	297	297
R-squared	0.985	0.977	0.963	0.916	0.979	0.791
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 5
The table presents the regression results estimating the firm-year observations of the operational ratios for UK equity REITs and listed property companies as a function of the share of all certified sustainable properties held by the firm, (Assets) × (Certified share), and firm characteristic control variables. Variables are defined as in Table 2. Columns (1) to (6) correspond to the results for the individual operational performance measures as indicated in the column headings. Assets squared $(Assets)^2$ and Liabilities squared $(Liabilities)^2$ are scaled by (10^{-6}). Firm and year fixed effects are included as indicated to control for time- and firm-invariant unobservables, respectively. Robust t-statistics, obtained via WLS with the inverse of the book value of the firm's assets used as weights, are shown in parentheses. Significance is indicated as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Regression results for US valuation, liquidity and risk effects, all certified sustainable area

VARIABLES	(1) Liquidity	(2) Risk	(3) Valuation
(CSHO) x (Certified area)	-0.126***		
	(-2.63)		
Common shares outstanding	0.125***		
	(7.76)		
(Common shares outstanding)^2	-0.000**		
	(-2.21)		
(Assets) x (Certified area)		-2.598***	
		(-4.64)	
Total assets		1.009***	
		(3.00)	
(Assets)^2		-0.070***	
		(-4.85)	
(NAV) x (Certified area)			0.752***
			(2.82)
Net asset value			0.912***
			(15.32)
(Net asset value)^2			-0.001
			(-0.30)
Total liabilities	1.667***	0.926*	-0.016
	(4.63)	(1.71)	(-0.19)
(Liabilities)^2	-0.016	0.192***	-0.011
	(-0.62)	(4.99)	(-1.58)
Observations	956	956	956
R-squared	0.779	0.757	0.898
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Table 6
The table presents the regression results estimating the firm-year observations of the liquidity, risk, and firm value measures for US equity REITs as a function of the share of certified sustainable properties held by the firm and firm characteristic control variables. Column (1) considers the number of shares traded relative to the total number of shares outstanding (turnover) as a measure of liquidity. Column (2) considers systematic risk (CAPM beta, scaled by net book value of assets). Column (3) considers the ratio of stock price to net asset value as a proxy for firm value. Variables are defined as in Table 2. Common shares outstanding squared $(CSHO)^2$, Assets squared $(Assets)^2$, Net asset value squared $(NAV)^2$, and Liabilities squared $(Liabilities)^2$ are scaled by (10^{-6}). Firm and year fixed effects are included as indicated to control for time- and firm-invariant unobservables, respectively. Robust t-statistics, obtained via WLS, with the inverse of the total number of common shares outstanding, the net book value of assets, and the net asset value, respectively, used as weights, are shown in parentheses. Significance is indicated as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Regression results for UK valuation, liquidity and risk effects, all certified sustainable area

VARIABLES	(1) Liquidity	(2) Risk	(3) Valuation
(CSHO) x (Certified area)	0.316		
	(1.39)		
Common shares outstanding	0.331***		
	(3.78)		
(Common shares outstanding)^2	-0.000		
	(-1.09)		
(Assets) x (Certified area)		0.585	
		(0.53)	
Total assets		0.521	
		(1.42)	
(Assets)^2		-0.029	
		(-0.86)	
(NAV) x (Certified area)			1.400***
			(3.26)
Net asset value			1.497***
			(16.22)
(Net asset value)^2			-0.110***
			(-6.90)
Total liabilities	24.146	-0.096	-0.199**
	(0.90)	(-0.15)	(-2.34)
(Liabilities)^2	8.250*	0.091	0.014
	(1.88)	(0.81)	(0.73)
Observations	297	297	297
R-squared	0.954	0.848	0.975
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Table 7
The table presents the regression results estimating the firm-year observations of the liquidity, risk, and firm value measures for UK equity REITs and listed property companies as a function of the share of certified sustainable properties held by the firm and firm characteristic control variables. Column (1) considers the number of shares traded relative to the total number of shares outstanding (turnover) as a measure of liquidity. Column (2) considers systematic risk (CAPM beta, scaled by net book value of assets). Column (3) considers the ratio of stock price to net asset value as a proxy for firm value. Variables are defined as in Table 2. Common shares outstanding squared $(CSHO)^2$, Assets squared $(Assets)^2$, Net asset value squared $(NAV)^2$, and Liabilities squared $(Liabilities)^2$ are scaled by (10^{-6}). Firm and year fixed effects are included as indicated to control for time- and firm-invariant unobservables, respectively. Robust t-statistics, obtained via WLS, with the inverse of the total number of common shares outstanding, the net book value of assets, and the net asset value, respectively, used as weights, are shown in parentheses. Significance is indicated as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.