Sustainability Disclosure and Financial Performance

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Sustainability Disclosure and Financial Performance:
The Case of Private and Public Real Estate

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KEY FINDINGS

- Public and private real estate firms make different decisions regarding sustainability commitment and disclosure.

- In terms of sustainability performance, public real estate firms have historically outperformed private real estate funds, but that gap is narrowing.

- In terms of firm financial performance, REITs that voluntarily report to GRESB outperform REITs that do not, after controlling for other performance drivers.

ABSTRACT

The built environment carries an outsized environmental footprint, and aspects such as energy consumption impact the bottom line of commercial real estate (CRE) investors. A large portion of CRE assets are owned and operated by both private equity real estate (PERE) funds and listed property companies (REITs). Therefore, the extent to which these public and private entities integrate sustainability considerations into their investment and operating decisions may impact both the environmental and financial performance for the organizations as well as the environmental performance of the broader market. We provide a comprehensive analysis comparing the sustainability performance of REIT and PERE firms/funds, as well as an analysis of the relationship between sustainability and the financial performance of REITs. Results indicate that private and public CRE entities now seem on par in their integration of sustainability into firm/fund management and policies. However, the performance aspect of sustainability is stronger for REITs. Examination of REIT financial performance indicates that higher levels of sustainability disclosure are associated with enhanced operating performance and firm valuation, as well as a higher propensity for holding environmentally certified buildings.

S hocks to energy markets, such as the 2023 spike in energy prices following the Russian invasion of Ukraine, have made it painfully clear that both the residential and commercial real estate (CRE) markets are strongly dependent on the provision of affordable electricity, gas, and other natural resources. Indeed, buildings in the United States consume about 71% of electricity and 39% of total

energy used.[1] Beyond the financial impact, the production and consumption of energy leads to emission of greenhouse gases, or carbon emissions. Given the association between carbon emissions and climate change, the past decade has seen the emergence of both regulatory focus and investor attention to reducing energy consumption in buildings through enhancing investment in energy efficiency and "green" buildings.

Energy efficiency is often bundled with the broader term "sustainability" or the more politically fraught acronym "ESG," which refers to environmental, social, and governance issues. Given that most capital providers are indirect real estate investors (see Carlo, Eichholtz, and Kok 2021 for an overview of institutional capital flows into the real estate sector), investor attention is often focused primarily on the disclosure of sustainability considerations at the level of the private equity real estate (PERE) fund or the real estate investment trust (REIT) listed firm. This top-down approach to measuring and managing sustainability broadly, and environmental performance specifically, is supposed to lead to reductions in the energy consumption of individual real estate assets, while staying true to the fiduciary duty of investment managers and property companies, which is to optimize the risk–return profile of their real estate investments.

The fast-growing literature on sustainability issues in real estate mostly involves studies focusing on the impact of environmental credentials, such as Energy Star and LEED building certifications, on the financial performance of individual assets. At the asset level, research convincingly shows that energy efficiency is reflected in rents and occupancy rates and ultimately capitalized into asset prices (see, for example, Eichholtz, Kok, and Quigley 2010, 2013; Devine and Kok 2015). At the portfolio level, research on sustainability within the firm/fund is skewed toward publicly listed firms due to data availability. These studies overwhelmingly focus on financial performance, with less work examining the sustainability performance of listed property companies. For example, Eichholtz, Kok, and Yönder (2012) document that REITs with a larger fraction of "green" assets have enhanced operational performance and lower stock market risk but do not display abnormal returns. These results are supported by Devine and Yönder (2023). A recent study by Devine, Sanderford, and Wang (2022) is among the few studies that assess the sustainability performance of PERE funds as it also relates to financial performance. The authors find that both participation and performance in GRESB, a sustainability benchmarking framework, are significant predictors of cross-sectional fund returns; GRESB participation and performance are associated with the price appreciation component of fund total returns but not with the income component.

This study aims to provide a deeper understanding of sustainability disclosure in the real estate investment industry, both at the extensive and intensive margin (i.e., whether sustainability is disclosed and at what level).[2] Importantly, we distinguish and compare PERE funds and publicly traded REITs. These vehicles both provide exposure to underlying real estate assets but employ a fundamentally different structure, where the latter is organized as a publicly traded company and the former are closed-end or open-ended private entities with more limited regulation and disclosure requirements. Indeed, research on the private equity real estate sector is scant, mostly due to data limitations. Arnold, Ling, and Naranjo (2021) recently

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[1] Statistics are available through the Energy Information Agency: https://www.eia.gov/totalenergy/data/browser/index.php?tbl=T02.01A#/?f=M&start=200001.

[2] Henriksson et al. (2019) highlight the importance of investigating sustainability issues material to each industry.

studied the performance of PERE funds relative to REITs, documenting that private equity generally underperforms publicly listed property companies from an investment performance perspective. Given the public nature of REITs, there are comparable questions around the sustainability disclosure and performance of private funds versus their public counterparts.

We also study the association between the extent and level of sustainability disclosure and subsequent financial performance. We focus on the operating performance and stock market valuation of REITs only, given the limited availability of such data for private real estate companies. Finally, we investigate the uptake of green building certification in REIT portfolios as a tangible measure of environmental performance. Green buildings use about 20% less energy than nongreen assets (Kahn, Kok, and Quigley 2014) and as such can be used as a proxy for the *actual* energy consumption of property companies, which remains elusively hard to obtain and analyze (Eichholtz, Holtermans, and Kok 2019).

SUSTAINABILITY DISCLOSURE: PERE FUNDS VERSUS REITs

Data and Nonparametric Analysis

Our main source of data is the Global Real Estate Sustainability Benchmark, or GRESB, a voluntary sustainability performance reporting framework for real assets. The assessment framework measures firm/fund-level sustainability performance, with the goal of providing standardized and validated data to the capital markets. The annual assessments run by GRESB are dynamic and undergo continuous review to ensure the materiality of content. There are two GRESB real estate datasets, both used in this study.[3]

The GRESB Real Estate Assessment is an annual survey, validated and compiled to track firm/fund performance both within the organization, year-over-year, and in comparison with peer organizations (benchmarking). The reporting of sustainability data is often an explicit request by limited partners or shareholders, making reporting not necessarily "voluntary" and taking away some of the concerns of selection bias. The assessment is divided into three components: management; performance; and, development. The first two components address standing investments and are the focus of this study. Within the portfolio of standing investments, GRESB measures various aspects of sustainability, but on a weighted basis, about 62% of the assessment is focused on environmental issues, 18% is focused on social elements, and 20% encompasses governance. As such, GRESB is mostly focused on environmental sustainability. The absolute GRESB Score translates into the GRESB Rating, which is on a one-to-five star basis.

As can be seen in Exhibit 1, over the seven years of the study period, the adoption of GRESB has more than doubled, both in terms of firms/funds and in terms of gross asset value (GAV) under management by reporting firms/funds. Notably, the adoption of GRESB among PERE funds was stronger in the earlier years, but recent years have seen substantial adoption by REITs. Today, more than 1,500 real estate firms/funds report to GRESB, of which 80% are private equity, yet the GAV is fairly balanced between PERE funds and REITs, highlighting the relative size difference between public and private entities reporting to GRESB.

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[3] For more information on GRESB, please visit http://documents.gresb.com/.

EXHIBIT 1

GRESB Real Estate Assessment Adoption
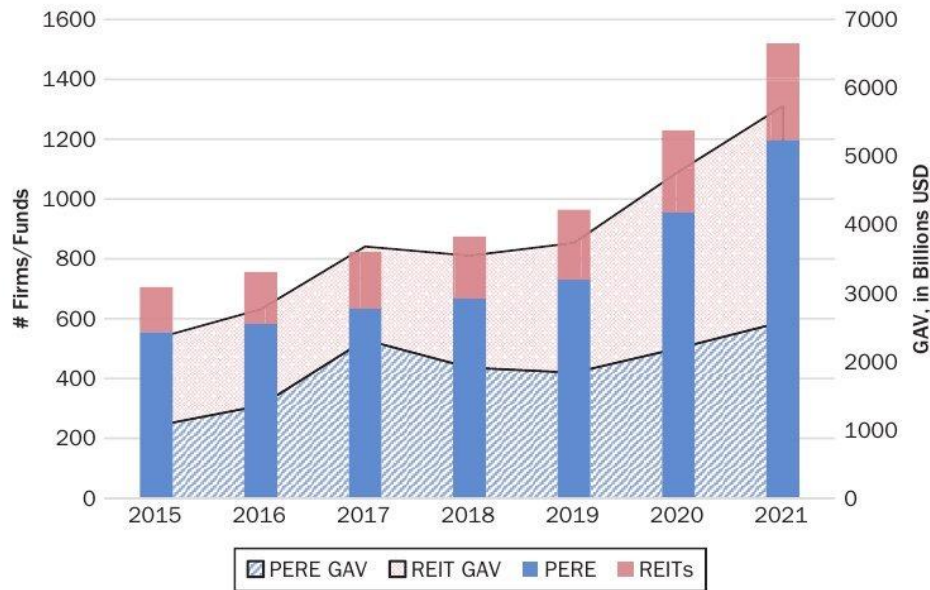
NOTES: This exhibit highlights the adoption of the GRESB Real Estate Assessment by REITs and PERE funds over the study period (GRESB years 2015–2021, representing fiscal years 2014–2020). The bars, anchored to the left axis, represent the number of firms/funds reporting each year, and the shaded areas, anchored to the right axis, represent the gross asset value of firms/funds, in billions of USD, reporting each year.

Exhibit 2 presents selected summary statistics for the GRESB Real Estate Assessment. Panel A shows the sector allocations for REITs versus PERE funds that report to the GRESB Real Estate Assessment. While generally similar in distribution, a substantially larger portion of PERE funds are characterized as diversified vehicles, as compared with REITs. In light of this differential, we will estimate some of the analyses in this article using the NCREIF ODCE fund universe, which represents a set of real estate funds considered the most liquid, diversified PERE funds.[4] Given their focus (i.e., exposure to office, industrial, multifamily housing, and retail real estate), we construct a comparable sample of REITs, consisting of diversified and office REITs.

Panel B presents the mean values of sustainability performance data (collected from the GRESB Real Estate Assessment) across all REIT-years and PERE-fund-years during the study period. The final column presents the difference between the REIT (Total) and PERE (Total) samples for each variable, along with indications of statistical significance. This analysis shows consistent outperformance of REITs over PERE in each sustainability category, with that outperformance proving statistically significant with respect to the GRESB Real Estate Assessment scores for Management and Performance, as well as the measure of Green Building Certification activity (a sub-component of Performance).

In addition to the aggregate GRESB Scores, two high-level REIT versus PERE fund comparison points exist for those firms/funds completing the GRESB Real Estate Assessment: public commitment to sustainability leadership; and, sustainability reporting. The former measure captures whether a firm/fund has publicly committed to the dominant sustainability reporting frameworks, such as the United

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[4] See https://www.ncreif.org/data-products/funds/ for more information on the NCREIF ODCE fund universe.

EXHIBIT 2
Summary Statistics and Sustainability Performance Data

Panel A: Sample Sector Allocation

Asset Class	REITs (total)	PERE (total)	REITs (D/O)	PERE (ODCE)
Diversified	30%	43%	52%	99%
Office	24%	20%	48%	1%
Retail	19%	13%	–	–
Residential	9%	12%	–	–
Industrial	8%	8%	–	–
Other	6%	2%	–	–

Panel B: Sustainability Performance Data (REITs and PERE)

	REITs (total)	PERE (total)	REITs (D/O)	PERE (ODCE)	Diff (REITs – PERE)
GRESB Score	3.19	2.95	3.43	3.32	0.11
(Scale: 1 to 5)	(1.43)	(1.41)	(1.37)	(1.32)	
GRESB Rank	467.79	515.18	411.95	385.50	26.45
(smaller = better)	(332.26)	(322.87)	(310.43)	(249.53)	
Management	78.95	78.34	81.26	77.86	3.41**
(%; larger = better)	(18.30)	(20.25)	(15.81)	(19.80)	
Performance	65.34	61.76	68.62	64.78	3.83**
(%; larger = better)	(18.38)	(19.21)	(16.50)	(16.93)	
Building Certification	51.88	49.40	56.67	50.65	6.02**
(%; larger = better)	(30.80)	(32.31)	(29.63)	(25.95)	
GAV	7,791	2,553	6,096	8,204	–2,108**
(millions, USD)	(11,473)	(15,044)	(7,892)	(6,949)	

NOTES: Summary statistics are from firms/funds reporting to the GRESB Real Estate Assessment during the study period. Panel A presents the dominant asset class type breakdown for REITs and PERE funds reporting to GRESB during the study period (GRESB years 2015–2021, representing fiscal years 2014–2020), as well as for the subsamples of diversified and office REITs and NCREIF ODCE PERE funds. The full sample is broken into two subsamples: REITs and PERE funds, with additional reporting provided for further subsamples of diversified and office REITs and the NCREIF ODCE PERE funds. Panel B reports average values (standard errors), along with differences and indications of their statistical significance; *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels of analysis, respectively.

Nations Sustainable Development Goals (SDGs), the Taskforce for Climate-Related Financial Disclosure (TCFD), and so on. The data indicate that in early years, PERE funds made such public commitments in a far greater proportion than REITs (68% vs. 52% as of year-end 2017), yet adoption has continued to improve, especially for REITs, and now balances out, with both groups at 86% adoption of public sustainability commitment as of year-end 2020. Exhibit 3, Panel A provides data on the breakdown of which of the leading programs are most commonly adopted by each organization type in 2019 and 2020. This reveals that REITs and PERE funds are generally adopting the same subset of reporting frameworks (notably, the UN SDGs, Global Compact, and TCFD), with one distinction: while few REITs have become PRI signatories, it is the single most popular tool for public commitment to sustainability among PERE funds.

GRESB-reporting PERE funds led REITs in terms of public sustainability commitment, but the opposite is true of sustainability reporting behavior. By year-end 2015, more than 95% of REITs were already disclosing their sustainability actions and performance, while it took PERE funds until year-end 2018 to clear the same hurdle. As of year-end 2020, fully 99% of the REITs and 97% of the PERE funds reporting to GRESB

also reported publicly on their sustainability performance. The initially higher level of reporting amongst the publicly traded firms is to be expected, given increasing share-holder demands to report on material sustainability issues. However, pressure from the market for sustainability disclosure may be creeping into the private investment realm as well, given their recent increase in reporting activity. An examination of the different forms of reporting behavior indicates similar paths taken by both REITs and PERE. Exhibit 3, Panel B highlights that corporate websites prove the most popular disclosure venue while integrated reporting is still early in its adoption curve.

EXHIBIT 3
Public Sustainability Commitment and Sustainability Disclosure

Panel A: Sustainability Leadership Commitments

Panel B: Sustainability Disclosure Venues

REIT   PERE
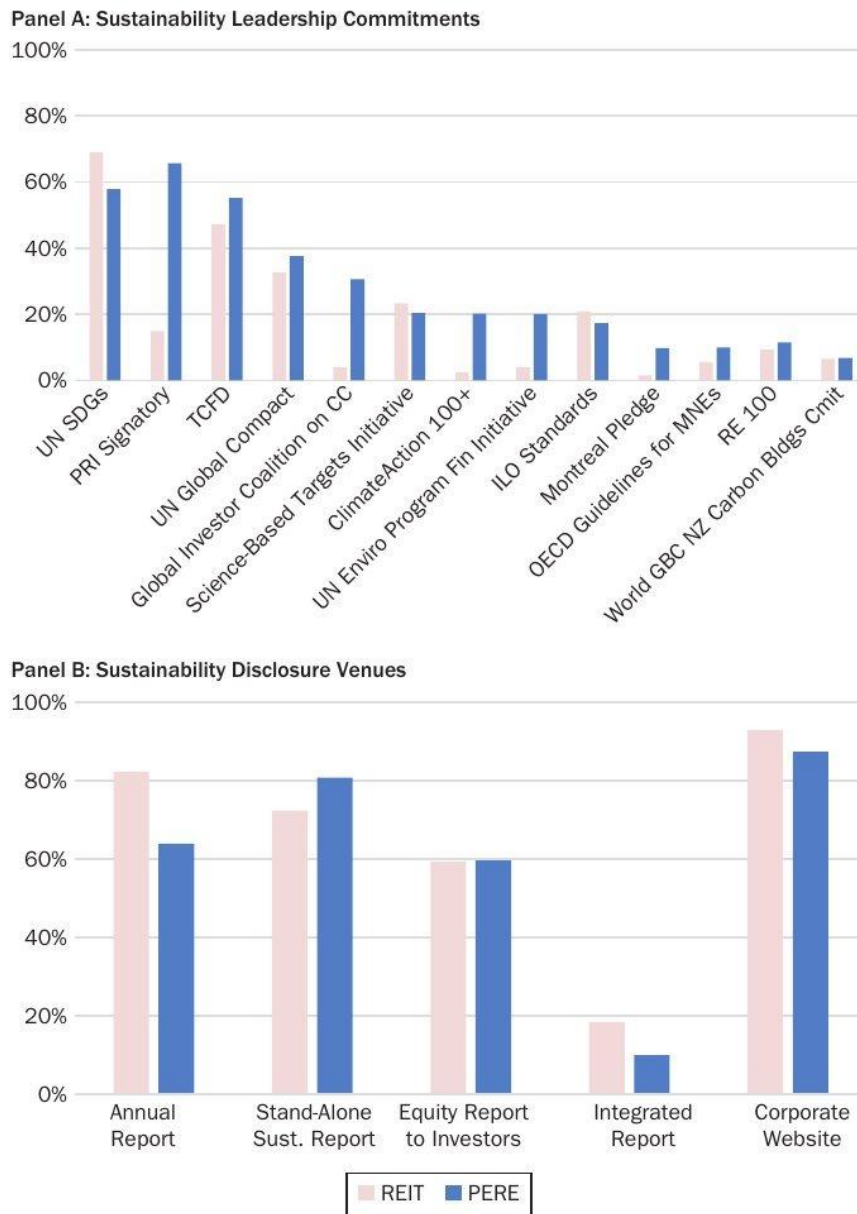
NOTES: This exhibit discloses the sustainability commitment and disclosure behavior of firms/funds reporting to the GRESB Real Estate Assessment for GRESB years 2020 and 2021 (fiscal years 2019 and 2020). Panel A highlights to which globally dominant sustainability reporting frameworks firms/funds report, and Panel B highlights in what manner firms/funds disclose their material sustainable policies and actions.

Method and Results

To understand the sustainability performance similarities and differences between PERE funds and publicly traded REITs, we follow a methodology akin to recent financial performance analyses of public versus private real estate entities (Arnold, Ling, and Naranjo 2021). In addition to studying this question through nonparametric analysis, we also examine the relationship between sustainability performance and firm/fund structure using more formal regression analysis:

$$GRESB_{i,t} = \alpha + \beta(REIT_{i,t-1} \times Year_t) + \gamma X_{i,t-1} + \sigma_p + \varepsilon_{i,t} \qquad (1)$$

where $GRESB_{i,t}$ equals one of the five measures of GRESB performance: GRESB Star Rating (GRESB Score); rank in the GRESB universe (GRESB Rank); scores of the Management and Performance components; and, the Building Certification subcomponent of performance. $X_{i,t-1}$ is a vector of lagged control variables, including the GAV, the number of years since an entity's first reporting to GRESB and its squared value, and three measures of asset-level sustainability: the proportion of an entity's assets with energy ratings; the proportion with green building certifications granted at the construction/design stage; and, the proportion and with operational green building certifications. Finally, fixed effects pertaining to an entity's property type focus (σ_p) are also included in the model. We include year fixed effects (τ_t) when estimating the average treatment effect using a panel regression. Standard errors are clustered at the entity level to account for serial correlation in GRESB performance over time.

$REIT_{i,t-1}$ is an indicator that equals 1 for REITs and 0 otherwise. The coefficient of interest, β, captures the time-varying effect of an entity's public entity status on the various measures of GRESB performance. Importantly, the effect of organizational structure is associated with both observable *and* unobservable characteristics. For instance, firms might alter their sustainable investment behavior when they change their listing status by going public (Dougal and Rettl 2021). In addition, public and private firms also differ in terms of size, access to capital, and agency costs. We aim to capture these differences using the control variables and fixed effects previously described.

Exhibit 4 provides graphical summaries of the regression results from Equation (1), analyzing the relative sustainability performance of REITs and PERE funds that submit to the GRESB Real Estate Assessment. Each panel presents the relative time graphs for five measures of GRESB performance. A positive coefficient (negative for the rank in the GRESB universe) on the interaction between the REIT indicator and a yearly dummy implies the outperformance of REITs relative to PERE funds in either the given year or an average over the full sample time frame (last column).[5]

Panel A plots the coefficient on the interaction of $REIT_{i,t-1}$ per year when using the GRESB Score as the dependent variable, as well as the average coefficient for the panel (a separate regression). Results suggest that, while REITs tend to outperform PERE funds in terms of GRESB Score, this performance gap narrows over time (albeit slowly). The same outperformance holds for the GRESB Rank analysis (Panel B), with the difference between PERE funds and REITs rather constant over time.
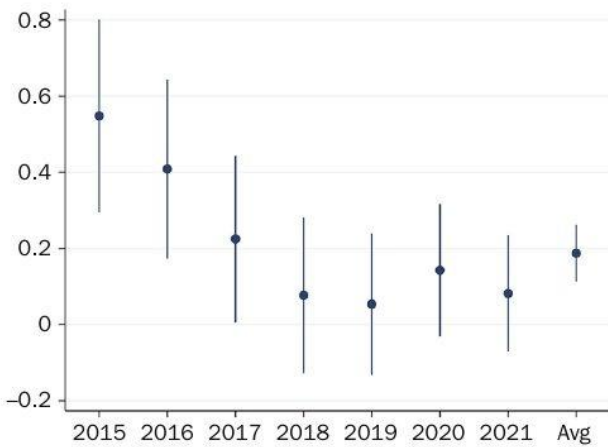
Panels C, D, and E focus on the Management and Performance components of the GRESB Score, as well as the Green Building Certification subcomponent of Performance, respectively. Results largely resemble those depicted in the former panels, suggesting that the performance gap between REITs and PERE funds narrows across all three components of the GRESB Score. Our findings are largely consistent

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[5] Our findings based on the restricted "apples-to-apples" sample, consisting of office and diversified REITs and PERE funds listed on the NCREIF ODCE index, are quite similar to the analysis presented here. Results are available upon request.
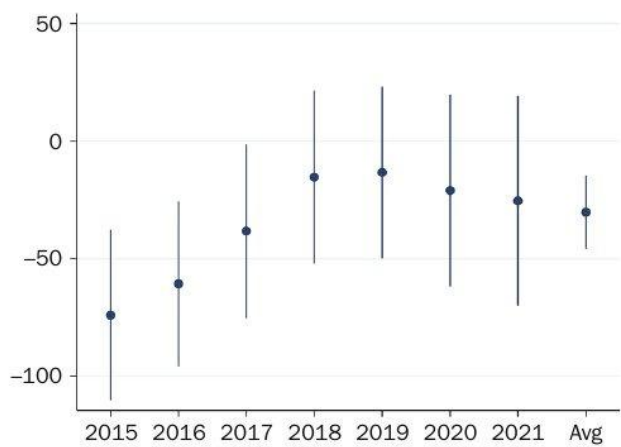
EXHIBIT 4

Relative Sustainability Performance, REITs vs. PERE Funds

Panel A: GRESB Score

Panel B: GRESB Rank

Panel C: Management
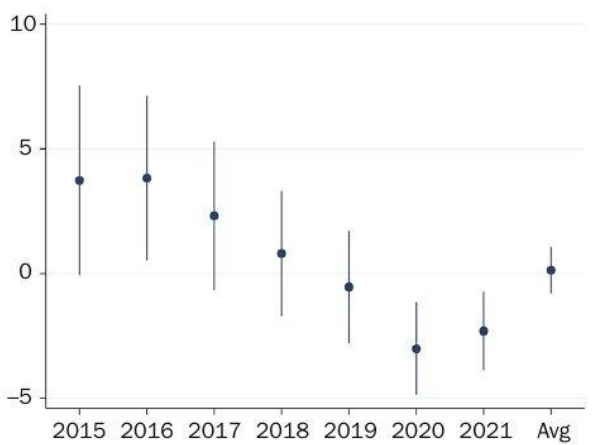
Panel D: Performance
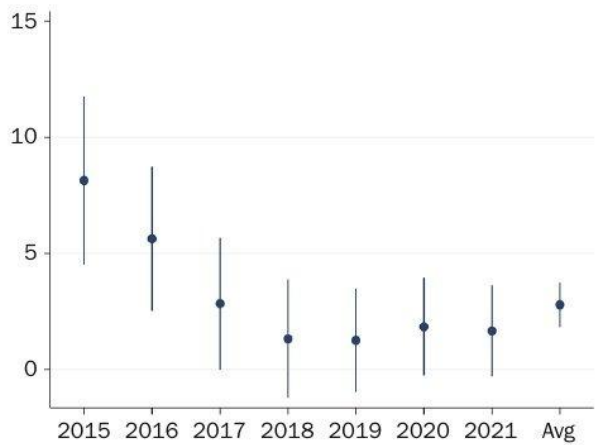
Panel E: Building Certification
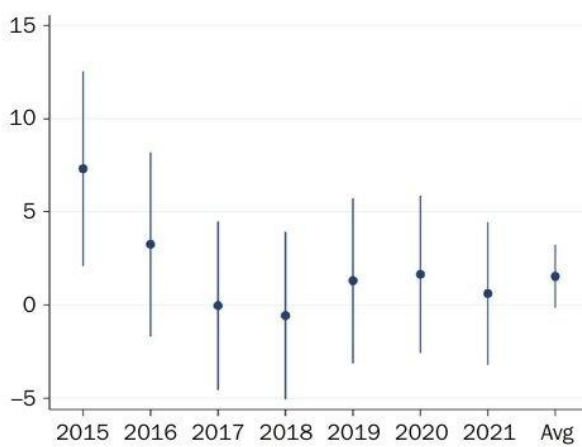
NOTES: This exhibit shows the relative time graphs for the estimated coefficients on the relationship between the REIT indicator and five measures of GRESB performance for GRESB years 2015–2021 (fiscal years 2014–2020). Panels A, B, C, D, and E correspond to an entity's GRESB stars (GRESB Score), rank in the GRESB universe (GRESB Rank), scores of the Management and Performance components, and the Green Building Certification subcomponent of performance.

with the generally improving year-over-year GRESB performance of PERE funds that constitute the NCREIF ODEC index, with GRESB performance gauged by either the composite score or its individual components (Devine, Sanderford, and Wang 2022).

SUSTAINABILITY DISCLOSURE AND THE FINANCIAL PERFORMANCE OF REITS

Data

In addition to the GRESB Real Estate Assessment dataset described previously, the second sustainability data source utilized is the GRESB Public Disclosure dataset. Each year, GRESB employees collect sustainability reporting and performance data on more than 850 publicly traded commercial real estate firms (predominantly REITs) and publish metrics of each firm's relative sustainability disclosure activity and performance. These data effectively represent the universe of publicly traded real estate firms, allowing for comparison of sustainability performance across the industry, regardless of each firm's sustainability adoption and GRESB reporting behavior. The collected data are validated and then available for review by each firm prior to publication. Available data include both a Public Disclosure Scorecard and a Disclosure Level Rating, capturing both the depth and availability of (public) firm-level sustainability data. We use this dataset in conjunction with the GRESB Real Estate Assessment dataset to examine the impact of sustainability performance on the financial performance of REITs.

REIT financial data are obtained from the S&P Global Real Estate Database. Beginning with a sample of 259 listed US equity REITs traded on the NYSE, AMEX, or Nasdaq stock exchange from 2015 to 2021, we omit observations with incomplete information, reducing the number of unique equity REITs to 212. To account for existing building certification programs at the asset level (e.g., LEED, Energy Star), we further construct a comprehensive panel dataset of historical property holdings for each REIT in the sample. After merging these data with the firm-level data, our final dataset includes 192 REITs (1,056 firm-year observations) owning 65,870 unique properties and spanning seven years. Importantly, we partition our sample into firms that do and do not report to the GRESB Real Estate Assessment, using the S&P Global GRESB Assessment Type ("Participated") indicator.

Exhibit 5 presents the average REIT-year values for firm financial performance and sustainability variables for both REITs that report to the GRESB Real Estate Assessment and those that do not. The last column presents the difference in these values, indicating strong statistical differences between firms that do and do not pursue GRESB voluntary reporting, both in terms of sustainability and financial performance metrics. However, these are simple, nonparametric comparisons and should be interpreted with caution, given the likely sorting of REITs into GRESB reporting activity.

EXHIBIT 5

Summary Statistics, Sustainability, and Financial Performance of REITs

	REITs (GRESB)	REITs (Not GRESB)	Diff (GRESB– Not GRESB)
Dependent Variables			
Tobin's Q	1.58	1.38	0.21***
	(0.61)	(0.43)	
FFO/TA	5.61	4.52	1.09***
	(2.87)	(3.72)	
NOI/TA	7.95	7.59	0.36*
	(3.06)	(2.85)	
Same-Store NOI/TA	6.87	6.37	0.5**
	(2.83)	(2.66)	
Sustainability Variables of Interest			
GRESB Score	62.77	12.68	50.09***
	(32.59)	(27.19)	
Green Share	0.16	0.06	0.1***
	(0.24)	(0.16)	
Management	22.70	4.64	18.06***
	(10.43)	(9.81)	
Performance	40.65	8.03	32.62***
	(22.25)	(17.53)	

NOTES: This exhibit provides summary statistics for the GRESB Public Disclosure and financial datasets of firm-year observations utilized in the study. Data cover the universe of REITs, comparing financial and sustainability metrics for REITs that do (Column 1) and do not (Column 2) report to the GRESB Real Estate Assessment for each firm-year. Average values (standard errors) are reported (Column 3), along with differences and indications of their statistical significance. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels of analysis, respectively.

Method and Results

There is a growing literature relating sustainability criteria to firm financial performance, with particularly robust findings related to capital market pricing (e.g., Tang and Zhang 2020). Specific to real estate entities, there is evidence of sustainability-committed firms being evaluated as lower-risk entities, leading to lower betas (Eichholtz, Kok, and Yönder 2012), lower cost of debt (Eichholtz, Holtermans, and Kok 2019; An and Pivo 2020; Devine and McCollum 2022), and lower cost of equity (Eichholtz, Barron, and Yönder 2018).

We aim to understand the financial implications of sustainability disclosure, as well as its implications for the adoption of green building certification, as a tangible metric of "real world impact." We empirically assess this research question, estimating the following equation using the Fama–MacBeth method:

$$PERF_{i,t} = \alpha + \beta(GRESB_{i,t-1}) + \gamma X_{i,t-1} + \sigma_p + \xi_i \qquad (2)$$

where $PERF_{i,t}$ is one of the four measures of financial performance, including a REIT's firm value (Tobin's Q), funds from operations divided by total assets (FFO/TA), net operating income divided by total assets (NOI/TA), and NOI/TA measured on a same-store basis. $GRESB_{i,t-1}$ is defined as either an indicator variable for GRESB Real Estate Assessment adoption or the overall GRESB Real Estate Assessment Score, which a REIT obtains at the end of the prior year. $X_{i,t-1}$ is a vector of lagged REIT characteristics, including the market-to-book ratio (MTB), geographic and property-type Herfindahl indexes (Geo HHI, PropType HHI), firm size (Size), leverage ratio (LTV), and cash divided by the total assets (Cash/TA). Finally, fixed effects pertaining to an entity's property type focus (σ_p) are included in the model. Standard errors are calculated using the Newey–West method.[6]

Exhibit 6 provides the results of Equation (2), separately for each of the four dependent variables. We report a baseline model for each financial metric, followed by a binary indicator on GRESB participation, and the GRESB Score (included as a linear variable). The explanatory power of the models is in line with the literature (e.g., Devine and Yönder 2023). Column (2) shows that REITs participating in GRESB have a Tobin's Q that is, on average, 0.05 points, or 3.16% higher. This result controls for a wide range of REIT characteristics. The capital market thus seems to attribute value to (voluntary) sustainability disclosure. While this result is not necessarily causal, it is in line with extensive research on the market evaluating more sustainable investments as being lower risk (Eichholtz, Kok, and Yönder 2012).

The other three financial metrics are more operational in nature. In line with the previously noted studies, we document that firms reporting to GRESB have 1.78% higher margins (as measured by net operating income scaled by total assets) and a 4.88% stronger operational cash flow (as measured by the funds from operations scaled by total assets). Same-store NOI is higher by about 4%. Importantly, these results do not just hold at the extensive margin; operational performance is also affected at the intensive margin, that is, the extent of "greenness" as measured through the GRESB Scores (Columns 3, 6, 9, and 12). Higher GRESB Scores are associated with a stronger cash flow (FFO scaled by total assets) and a higher same-store NOI. As such, the publicly reported sustainability data collated by GRESB seem to have financial materiality, as reflected in the bottom-line results of REITs.

Robustness Tests

Sustainability reporting is voluntary and the definition of sustainability materiality is, as of yet, not formally defined. Additionally, there may exist an outsized demand for

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[6] Our findings are robust to using a panel regression approach.

EXHIBIT 6
GRESB Performance and Financial Performance of REITs

	Tobin's Q			FFO/TA			NOI/TA			Same-Store NOI/TA		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GRESB = Yes	0.071*** [0.016]	0.050*** [0.019]			0.274** [0.122]			0.141*** [0.045]			0.278** [0.111]	
GRESB Score			0.001*** [0.000]			0.006** [0.002]			-0.002 [0.001]			0.006** [0.003]
MTB	0.071*** [0.016]	0.071*** [0.016]	0.071*** [0.016]	0.280*** [0.070]	0.278*** [0.060]	0.277*** [0.059]	0.307*** [0.073]	0.306*** [0.073]	0.308*** [0.074]	0.450** [0.125]	0.449*** [0.107]	0.458*** [0.111]
Geo HHI	-0.067 [0.043]	-0.071 [0.045]	-0.081 [0.043]	-1.002 [0.525]	-1.004** [0.359]	-1.114** [0.376]	-1.772*** [0.413]	-1.780*** [0.411]	-1.745*** [0.428]	-1.455*** [0.207]	-1.437*** [0.148]	-1.533*** [0.154]
PropType HHI	-0.370*** [0.082]	-0.371*** [0.082]	-0.372*** [0.077]	-1.813** [0.665]	-1.804*** [0.391]	-1.774*** [0.403]	-1.982** [0.596]	-1.983** [0.596]	-1.958** [0.604]	-2.365*** [0.630]	-2.318*** [0.500]	-2.330*** [0.541]
Size	0.074*** [0.007]	0.066*** [0.005]	0.059*** [0.006]	0.431*** [0.073]	0.388*** [0.058]	0.350*** [0.068]	0.207** [0.077]	0.185* [0.082]	0.238** [0.096]	0.243 [0.134]	0.190 [0.143]	0.103 [0.184]
LTV	-0.071 [0.080]	-0.051 [0.077]	-0.044 [0.082]	-3.346** [1.189]	-3.256*** [0.580]	-3.114*** [0.541]	3.712*** [0.553]	3.756*** [0.549]	3.645*** [0.558]	1.623*** [0.396]	1.836*** [0.230]	1.885*** [0.190]
Cash/TA	0.001 [0.002]	0.001 [0.002]	0.001 [0.002]	-0.011 [0.024]	-0.010 [0.020]	-0.009 [0.020]	-0.012 [0.018]	-0.011 [0.019]	-0.011 [0.018]	-0.056** [0.016]	-0.054*** [0.018]	-0.058*** [0.017]
Constant	0.426* [0.191]	0.324 [0.212]	1.061*** [0.271]	-0.635 [0.612]	-0.048 [0.083]	3.287** [1.053]	1.877 [1.063]	2.258 [1.179]	5.094** [1.630]	1.878** [0.721]	1.388** [0.432]	4.707*** [1.661]
Prop FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.526	0.529	0.533	0.398	0.402	0.403	0.400	0.401	0.402	0.472	0.477	0.481
# Obs	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	645	645	645

NOTES: This exhibit presents results for REITs, capturing the relationship between GRESB performance and firm financial performance using Fama–MacBeth regressions with Newey–West standard errors. Variables of interest measure the impact of firm participation and performance in the GRESB Real Estate Assessment. The financial outcome variable of interest is specified at the top of each column, with three regression results specified below. Firm controls are included, as are property fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

sustainable investment in some markets or asset classes over others. We attempt to address these causality issues in our financial performance modeling. First, we use the GRESB Public Disclosure reporting, which is completed by a single organization for the full REIT universe, mitigating the impact of selection bias.

In Exhibit 7, we replace the GRESB participation dummy and the overall GRESB Score with the GRESB Public Disclosure component scores (Management and Performance). Interestingly, the effect of the Management score is quite consistent across the specifications, with a negative sign just for the NOI metric, which turns positive when using the "same store" metric. For the Performance score, results are less consistent. A higher score on Performance (which is, for example, related to the measurement and decrease of energy consumption), leads to a marginally higher market valuation and stronger operational cash flows. But the Performance score is negatively related to the NOI metric, which may reflect higher investments needed to improve the performance score (which show up in NOI through an annual depreciation expense).

These findings are somewhat consistent with the Devine, Sanderford, and Wang (2022) study on the relationship between GRESB Real Estate Assessment reporting and financial performance for NCREIF ODCE funds. The authors find that the component driving the stronger financial performance for GRESB-reporting funds over non-GRESB-reporting funds is Management, not Performance, which they attribute to the consistent high-performance caliber required of the funds for inclusion in the ODCE universe. Observation of a similar effect is unsurprising in this study of GRESB-reporting REITs, as the average performance quality of such firms is similarly quite high when compared with the overall real estate market. Therefore, in both cases, it is not Performance aspects but rather Management aspects on which the GRESB impact associated with firm financial performance is differentiated.

Additionally, we model the analysis presented in Exhibit 6, adding controls for how long a REIT has been reporting to the GRESB Real Estate Assessment (results suppressed to conserve space). Sustainability-related behavior and performance (as well as reporting itself) may be a "learned skill" and firms with more experience may perform better. The inclusion of these GRESB vintage variables prove uninformative in shaping the GRESB Score.

EXHIBIT 7

GRESB Component Scores and Financial Performance of REITs

	Tobin's Q		FFO/TA		NOI/TA		Same-Store NOI/TA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Management	0.003***		0.009**		−0.002		0.009*	
	[0.001]		[0.004]		[0.006]		[0.006]	
Performance		0.001***		0.006**		−0.007**		0.003
		[0.000]		[0.003]		[0.003]		[0.003]
R-squared	0.530	0.528	0.400	0.400	0.402	0.404	0.478	0.477
# Obs	1,056	1,056	1,056	1,056	1,056	1,056	645	645

NOTES: This exhibit presents the relationship between REIT firm financial performance and the GRESB Public Disclosure Management and Performance components scores assigned to all firms in the REIT universe, using Fama–MacBeth regressions with Newey–West standard errors. The financial outcome variable of interest is specified at the top of each column, with two regression results specified below. Firm controls (Market-to-Book, Geographic, and Property Type HHIs, Total Assets, LTV, and Cash/Total Assets) are included, as are property fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

We also include a number of exogenous control variables that serve as proxies for the propensity of greater sustainability-related investment. Selection of these variables is consistent with the existing literature on this topic and includes measures of climate intensity (total degree days, with data collected from NOAA) and local awareness of and demand for sustainability-related investment (geographically weighted population density, proportion of bachelor's degree attainment, and the demand for electric car charging stations). We also capture firm/fund level preferences that may shape sustainable investment through controls for assets situated in the same market as an organization's headquarters and a measure of the depth of GRESB reporting assets in each asset's market.

We analyze this set of controls in two ways, replicating the analysis presented in Exhibit 6 while adding the proxy control variables both one at a time and all together. Results (suppressed to conserve space) indicate that in no case does the inclusion of the proxy control variables—individually or *en masse*—eliminate the statistical or economic significance of the GRESB variables on the financial outcomes. Additionally, each of these added control variables proves informative in the analyses of the impact of sustainability on financial performance.

GRESB Reporting and REIT Sustainability Performance Metrics

Nearly all research completed to date relies on green building certifications as a metric of sustainability adoption or performance in real estate (i.e., as the independent variable), with a limited number of studies examining other metrics, such as GRESB reporting, as the proxy for sustainability adoption (e.g., Devine, Sanderford, and Wang 2022). Our dataset provides a unique opportunity to examine the relationship between two dominant market measures of sustainability commitment: 1) GRESB reporting and scoring; and, 2) a measure of green building certification activity in real estate firm portfolios.

To measure the environmental performance of real estate portfolios, we follow the existing literature on "green" buildings in the United States. Green buildings are those certified by the US Green Building Council's LEED program or those that have received Energy Star certification from the Environmental Protection Agency. We match asset holdings of each REIT, for each year in the sample period, with address data on LEED and Energy Star–certified buildings, creating a measure of "portfolio greenness." The summary statistics in Exhibit 5 show that, on average, REITs have certified some 16% of their portfolio using LEED and/or Energy Star. Indeed, Nareit reports that 83 out of the top 100 US equity REITs have green buildings in their portfolio.[7]

Exhibit 8 presents a boxplot distribution of portfolio greenness for REITs that do and do not voluntarily report to the GRESB Real Estate Assessment. Quite clearly, the percentage of environmentally sustainable assets owned by REITs that do not report to GRESB

EXHIBIT 8

Green Share by REIT Reporting Status on GRESB
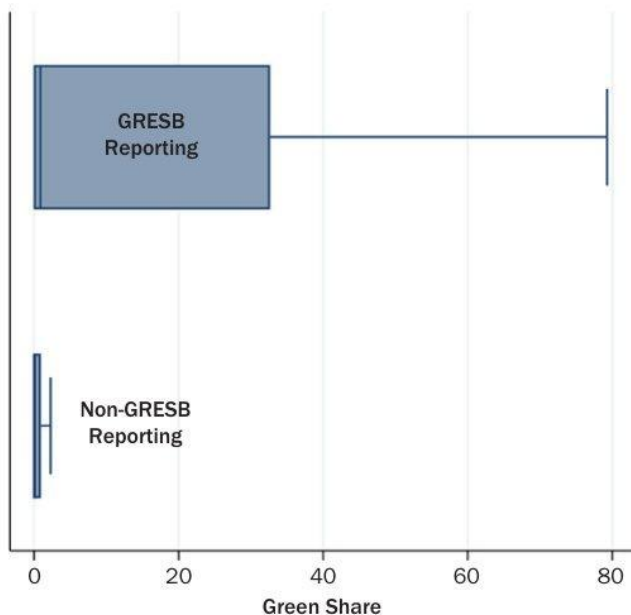
NOTES: This boxplot graph presents the green share distribution, in percentage terms, for REIT-years that are either GRESB reporting or non-GRESB reporting. The box presents values from the 25th to 75th percentiles, with the whiskers presenting the minimum and maximum values. Values exclude sample outliers.

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[7] For more information, see https://www.reit.com/investing/reits-sustainability/2022-reit-esg-report.

is close to zero, as opposed to a maximum percentage of 80% for GRESB-reporting REITs and an average of 16%.

We formally assess the impact of GRESB reporting on portfolio greenness using Equation (2), replacing the dependent variable with the portfolio greenness measure, or green share, for each REIT-year. The relationship between green building adoption and GRESB is partially mechanical, as green building certification constitutes a substantial portion of the Performance component of the GRESB Score in the Real Estate Assessment. Results (suppressed to conserve space) indicate that for REITs that report to GRESB, the average percentage of environmentally sustainable assets in the portfolio is higher by 3.43%, controlling for all covariates in Equation (2). Additionally, for each one-point increase in the GRESB Score, the percentage of green-certified buildings increases by 0.07 percentage points. While these effects are economically small, they provide the first evidence that GRESB reporting is not related to just financial performance but also seems to be associated with an increased uptake of *actual* sustainability performance in real estate portfolios.

SUMMARY AND IMPLICATIONS

The buildings in which we all work, live, and play collectively use more than 40% of global energy needs. Energy consumption influences the bottom line of both tenants and households but also affects global carbon emissions. Given that a large portion of CRE assets are owned and operated by PERE funds and REITs, the extent to which these organizations integrate sustainability considerations in their investments and operations can directly affect the energy efficiency and broader sustainability performance of the real estate sector. In this study, we provide a comprehensive analysis of the sustainability disclosure of REITs and PERE firms, using data from GRESB, the leading sustainability benchmarking program in the real estate industry.

The implications of the findings in this study are important for building owners and managers as well as for institutional investors, the ultimate providers of capital to the CRE sector. First, the results show that in making allocation choices to public real estate companies and private real estate funds, different outcomes in terms of sustainability disclosure and performance can be realized. While the difference between public and private sustainability performance has narrowed in recent years, REITs continue to score higher on GRESB, particularly on the Performance component. PERE funds are on par with REITs when it comes to the management and policy developments of sustainability within the organization. Institutional investors might consider more actively exploiting their role as capital providers, focusing on tangible sustainability implementation and outcomes (i.e. performance) rather than simply on sustainability policy and procedures.

Second, the results indicate that the level of sustainability disclosure is associated both with enhanced operating performance and REIT valuation, as well as with a higher propensity to own and manage energy-efficient, green buildings. This supports the argument for sustainability integration being part of the fiduciary responsibility of REITs and their investors—"doing well by doing good." Given the recent "ESG backlash" and politicization of ESG in some circles, the notion that real estate investors benefit from a focus on sustainability is relevant and important for investors, investment managers, and firms. The fact that a higher level of sustainability disclosure affects the extent to which REITs adopt (invest in) green buildings provides some evidence that sustainability commitment also leads to tangible environmental outcomes. Moving forward, measurement of energy consumption and/or carbon emissions is needed to further analyze the impact of sustainability disclosure on *actual* environmental outcomes.

ACKNOWLEDGMENTS

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