



**INREV**



# **THE VALUE EFFECTS OF SUSTAINABLE REAL ESTATE INVESTMENT: INTERNATIONAL EVIDENCE**

## **PRESENTATION OF THE 2017 NICK TYRRELL RESEARCH PRIZE-WINNING PAPER**

### **Chair:**

Dr Paul McNamara, Chair, Nick Tyrrell Research Prize Judging Panel

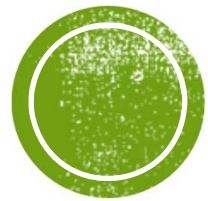
### **Speakers:**

Dr Avis Devine, Schulich School of Business, York University, Toronto

Dr Erkan Yonder, Ozyegin University, Istanbul

### **Panellist:**

Mathieu Elshout, Senior Director Private Real Estate, PGGM



# Decomposing the Value Effects of Sustainable Investment: International Evidence

Avis Devine

Erkan Yönder

# Motivation

*Real estate is a contributor to the environmental problem.*

- Buildings are the largest energy-using sector:
  - 41% of all energy
  - 73% of electricity
- Real Estate construction accounts for:
  - 38% all CO2 emissions
  - 40% of natural resource usage
- One solution for environmental issues: “Labelled” sustainable and energy efficient (SEE) buildings
  - LEED and Energy Star certifications
    - Consume less energy, create less waste, put off fewer emissions



# What We Know

## Property-Level Findings – well researched

- Rental & occupancy rate, asset **value premiums**
  - (EKQ 2010, 2013, Fuerst & McAllister, 2011, Miller, Spivey & Florance, 2008, Wiley, Benefield & Johnson, 2008, Bond & Devine, 2015)
- Lower obsolescence rates, greater **tenant satisfaction** & higher propensity of re-leasing, lower mortgage default rates
  - (Kok & Jennen, 2012; Devine & Kok, 2015, An & Pivo, 2015)

## Portfolio-Level Findings – thinner findings

- **Higher corporate valuations**, improved accounting measures for REITs with SEE in their portfolios
  - (Sah, Miller & Ghosh, 2013, Eichholtz, Kok & Yonder, 2012)
- REITs with SEE in their portfolios have less volatile returns, **lower risk**, lower cost of debt
  - (Fuerst, 2015, Eichholtz, Kok & Yonder, 2012)



# What We Don't Know

- While we observe the corporate-level value benefits of SEE to REITs, we don't yet know how, where these benefits accrue.

## RESEARCH QUESTIONS:

***How do property-level SEE benefits accrue to the corporate owner?***

***Does it differ by country / demand source for green buildings?***

- First to decompose SEE value effects into corporate operational and financial characteristics
- Bridges the gap, connecting the property and portfolio-level literatures



# Decomposition of Benefits

- If a product has a CSR characteristic, consumers might prefer such a product over a similar product without CSR (McWilliams and Siegel, 2001).
  - Firm can also benefit from reputation at the corporate level
  - Hybrid cars, REITs with SEE
- Although we observe the corporate-level value benefits of SEE to REITs, we don't yet know how, where these benefits accrue.
  - Pro forma level and corporate-level valuation analysis
  - P/NAV ratio
    - compares the market value of the stock of a REIT (P) to the market value of properties within a REIT portfolio (NAV).
    - Reputational benefits should be more reflected in P than NAV.
- In this paper, we aim to decompose the two channels.



# Methodology: Green Share

- Using GIS software, we geocode and match address from certification bodies, SNL Financial (Eichholtz, Kok, and Yönder, 2012)
  - We use the following measure of portfolio greenness:

$$Green\_Share_{it}^g = \frac{\sum_l Sqft\_of\_Certified\_Property_{ilt}^g}{\sum_l Sqft\_of\_Property_{ilt}^g}$$

- Relate green share (Area) to operational and value measures
  - Interact green share with assets, net asset value
  - Measure marginal impact of green share (a la Capozza and Seguin, 1999)



# Methodology: Operational Model

- What are the operational effects of the property portfolio on the corporate level?
  - Dependent Variable Definitions: Rental Revenue; Rental Operating Expense; Property-level Cash Flows; Interest Expense; G&A Expense; Corporate-level Cash Flows available for distribution

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

- $AT_{it}$ : depreciated book value of total assets
  - $L$  indicates lagged operator (control for endogeneity)
- $\mathbf{x}_{it}$ : squared lagged depreciated book value of total assets, level and squared lagged book value of total liabilities
  - Squared terms account for non-linearities
- $f_i$  &  $d_t$ : time-varying & cross-sectional firm fixed effects





# Methodology: Valuation Models

- Sustainability practices are associated with increased transparency, decreasing information asymmetry
  - What is the possible impact on stock liquidity (trading volume)?
- Sustainability practices may make a portfolio more resilient, decreasing systematic risk
  - What is the impact on a REITs' CAPM  $\beta$  (measured as firm returns against S&P500)?
- Sustainability practices may improve corporate reputation, creating a market value premium in excess of operational benefits value
  - What is the relationship between market value and net asset value? (pure valuation effects in price/NAV ratio)?



# Data

- REIT financial and property data from SNL Financial database
- Matched properties using GIS techniques to identify Green Share

	U.S.	U.K.
<b><i>Sustainable Properties</i></b>	LEED, Energy Star	BREEAM
<b><i>Period of Analysis</i></b>	2000 (SEE programs first popular) – 2014	2009 (BREEAM data first available) – 2014
<b><i>Cleaned Sample</i></b>	956 firm-year obs	297 firm-year obs
<b><i>Green Share</i></b>	6% of total SF	2% of total SF



# Certification Programs

- No single way to build Green
  - Add green features
  - Certification programs to validate
- Energy Star
  - Since 1999 for buildings; more than 25,000 certified buildings in the US
  - Buildings use approximately 35% less energy than code-built buildings
  - Highly recognizable brand, but the rigor of the program has been questioned
- LEED
  - Since 1998 after 2-year pilot; 14,000+ buildings certified in the US
  - Primary focus on sustainable design; EB:OM focuses on operation
  - Considered prohibitively expensive to achieve



VARIABLE	Certified		LEED		Energy Star	
	By assets	By area	By assets	By area	By assets	By area
Rental revenue	-0.0561	-0.0830*	-0.0319	-0.0485	-0.0577	-0.0814*
Rental operating expense	0.0599	0.029	0.0794*	0.06	0.0569	0.016
NOI	-0.1472*	-0.1831*	-0.1163*	-0.1418*	-0.1329*	-0.1679*
G&A expense	-0.0276	-0.041	-0.0134	-0.0318	-0.0044	-0.0353
Interest expense	-0.1665*	-0.1865*	-0.1726*	-0.1660*	-0.1454*	-0.1614*
Funds from operations	-0.0844*	-0.0934*	-0.0623	-0.0758	-0.0639	-0.0801*
Market leverage	-0.0234	-0.0291	-0.0534	-0.0538	-0.0049	-0.019
MB ratio	-0.0488	-0.0828*	-0.0263	-0.0407	-0.0823*	-0.0845*
Market value to NAV	0.0049	0.0227	0.0076	0.026	0.0039	0.0168
Turnover	0.0261	0.0433	0.0173	0.0405	0.0269	0.0278

Correlation analysis reveals few significant relationships (decreases concerns about multicollinearity).

NOI & Interest Expense are most consistently related to Sustainability

# Operational Effects – US

*Higher CF, though higher operating expenses*

VARIABLES	(1) Rental revenue	(2) Operating expense	(3) NOI	(4) G&A expense	(5) Interest expense	(6) FFO
(Assets)	0.053**	0.029***	0.004	0.000	-0.016***	0.035**
x (Certified area)	(2.55)	(2.77)	(0.32)	(-0.01)	(-3.50)	(2.01)
Total assets	0.133*** (15.00)	0.038*** (8.36)	0.101*** (17.02)	0.004*** (3.50)	0.006*** (2.83)	0.062*** (8.36)
(Assets) <sup>2</sup>	-0.002*** (-4.56)	-0.000** (-2.34)	-0.002*** (-6.50)	0.000 (0.75)	-0.000* (-1.92)	0.000 (1.50)
Total liabilities	-0.049*** (-3.38)	-0.003 (-0.41)	-0.053*** (-5.50)	0.002 (0.89)	0.036*** (11.28)	-0.037*** (-3.05)
(Liabilities) <sup>2</sup>	0.002 (1.51)	0.000 (0.43)	0.002*** (3.36)	0.000 (0.16)	0.000 (-1.57)	-0.003*** (-3.20)
Observations	956	956	956	956	956	956
R-squared	0.974	0.952	0.973	0.920	0.976	0.914
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes



# Operational Effects – US

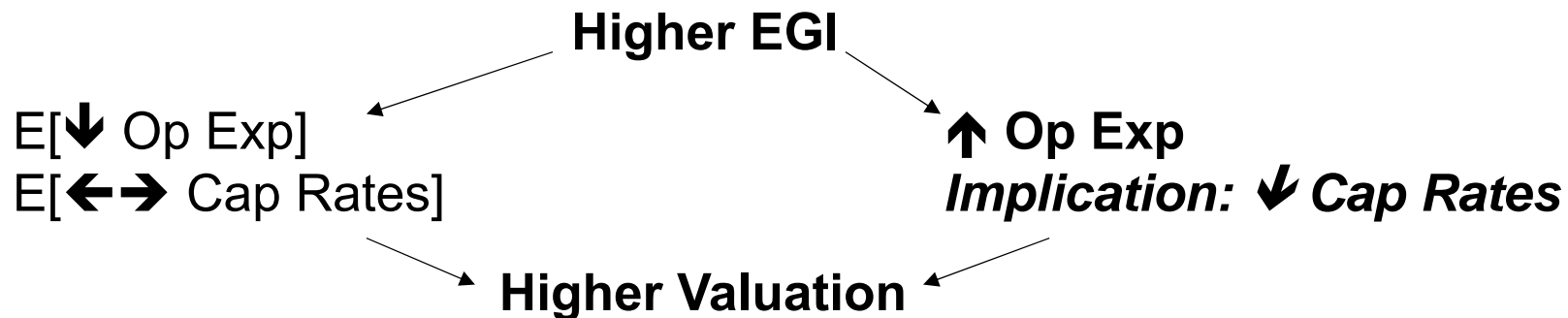
*Higher CF, though higher operating expenses*

VARIABLES	(1) Rental revenue	(2) Operating expense	(3) NOI	(4) G&A expense	(5) Interest expense	(6) FFO
(Assets)	0.053**	0.029***	0.004	0.000	-0.016***	0.035**
x (Certified area)	(2.55)	(2.77)	(0.32)	(-0.01)	(-3.50)	(2.01)
Total assets	0.138***	0.101***	0.004***	0.006***	0.062***	

Interesting Result: increased operating expenses

Original Concept:

New Evidence:



**Green buildings are *lower risk***



# Valuation Effects – US

*Higher P/NAV, lower stock trading volume*

VARIABLES	(1) Liquidity	(2) Risk	(3) Valuation
(CSHO) x (Certified area)	-0.126*** (-2.63)		
Common shares outstanding	0.125*** (7.76)		
(Assets) x (Certified area)		-2.598*** (-4.64)	
Total assets		1.009*** (3.00)	
(NAV) x (Certified area)			0.752*** (2.82)
Net asset value			0.912*** (15.32)
Observations	956	956	956
R-squared	0.779	0.757	0.898
Firm-Level Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

- Green REITs associated with lower trading volumes

- May reduce noise trading, leaving only fundamentally-informed investors

- Lower  $\beta$ s

- 1 for average, 0.8 for 8% portfolio Green Share

- Green REITs trade at a smaller discount

- Same portfolio P/NAV ratio is 0.972 vs. average 0.912





Variables	(1) Rental revenue	(2) Operating expense	(3) NOI	(4) G&A ex- pense	(5) Interest expense	(6) FFO
(Assets) × (Certified area)	0.053** (2.55)	0.029*** (2.77)	0.004 (0.32)	0.000 (-0.01)	-0.016*** (-3.50)	0.035** (2.01)
Total assets	0.133*** (15.00)	0.038*** (8.36)	0.101*** (17.02)	0.004*** (3.50)	0.006*** (2.83)	0.062*** (8.36)
(Assets) <sup>2</sup>	-0.002*** (-4.56)	-0.000** (-2.34)	-0.002*** (-6.50)	0.000 (0.75)	-0.000* (-1.92)	0.000 (1.50)
Total liabilities	-0.049*** (-3.38)	-0.003 (-0.41)	-0.053*** (-5.50)	0.002 (0.89)	0.036*** (11.28)	-0.037*** (-3.05)
(Liabilities) <sup>2</sup>	0.002 (1.51)	0.000 (0.43)	0.002*** (3.36)	0.000 (0.16)	0.000 (-1.57)	-0.003*** (-3.20)
Observations	956	956	956	956	956	956
R-squared	0.974	0.952	0.973	0.920	0.976	0.914

## Operational Effects, U.S.

Beneficial Results: Increased rental rates & FFO, decreased Interest Expenses

- Ex: Rent yield =13.3%; REIT w/avg +1SD Green Share, rent yield =13.7%

Increased Operating Costs, but not outstripping increased income



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

## Operational Effects, U.K.

### Beneficial Results: Increased NOI and Earnings

Insignificant results but with beneficial sign for rents, op ex, G&A, and interest

- Reason for weaker results? EPC requirements weaken benefit of green label

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

## Valuation Effects, U.S.

(1) Green REITs associated with lower trading volumes

- Certification ↑ transparency, may reduce noise trading, leaving only fundamentally-informed investors

(2) Green REITs have lower  $\beta$ s

- 1 for average, 0.8 for 8% portfolio Green Share

(3) Green REITs trade at a smaller discount

- Same portfolio p/NAV ratio is 0.972 vs. average 0.912



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

## Valuation Effects, U.K.

As with operational effects, limited statistical significance

(3) Indicates a nearly 4% increase in firm value

May indicate reputation benefits to the corporation



# Robustness

- Utilized SF in place of NAV
- Utilized gross asset value (GAV) in place of depreciated book value
  - Results hold
- Added instruments to control for local propensity to pursue sustainability
  - Political and environmental
  - US tested thus far, results hold
- Note: all results include firm fixed effects (as well as time FE)
  - Captures all unobservable firm-level variation, controls for quality in ways we can't measure
  - Adds tremendous strain to the model
  - Statistically and economically significant results under this model indicates great strength of the results





Operational Effects	U.S.	U.K.
Rent Revenue	↑ **	↑
Operating Exp	↑ ***	↓
NOI	↔	↑ **
G&A	↔	↓
Interest Exp	↓ ***	↔
FFO, Earnings	↑ **	↑ ***

Valuation Effects	U.S.	U.K.
Liquidity	↓ ***	↑
Systematic Risk	↓ ***	↑
Value	↑ ***	↑ ***

## Results Summary

Arrows indicate the direction of the Green Share impact on the REIT portfolio

Stars indicate the statistical strength of the result (\*, \*\*, and \*\*\* represent significance at the 10%, 5%, and 1% level of analysis)

Color indicates

**Benefit**

**Drawback**

**Varied Implications**



# Concluding Remarks

*REITs with a Green Share experience operational and value benefits.*

- Overall, higher cash flows (FFO, earnings) for both the US and the UK
  - Rental Revenue premiums are passed through to the owner in the US
  - Heightened operating expenses on average absorb the added rent premium, removing an opportunity for heightened NOI in the US
    - In the UK, we document a premium on NOI
- Corporate-level expenses are decreased (interest), resulting in increased cash flows available for distribution.
- Green REIT shares trade at a higher relative value (p/NAV).
  - Also holds for the UK.
- Green REITs experience substantially below (REIT) market betas in the US.



# Conclusion

- REITs with a Green Share experience **operational and value benefits**
  - (U.S.) Rental Revenue premiums are passed through to the owner
  - (U.S.) Heightened operating expenses on average absorb the added rent premium, removing an opportunity for heightened NOI
  - (U.S.) Corporate-level expenses are decreased (interest), resulting in increased cash flows available for distribution (U.S., U.K.)
  - (U.S., U.K.) Green REIT shares trade at a higher relative value (p/NAV)
  - (U.S.) Green REITs experience substantially below (REIT) market betas

***Property-level rental income (and operating expense) premiums are passed through to the firm-level, as are the benefits of decreased risk (presented as lower financing costs, market betas, etc.)***



# Comments & Questions

Thank You!







## **Breakfast Briefing: Sustainability Risks and Opportunities in Property Ownership & Asset Management**

### **Speaker:**

Miles Keeping, Hillbreak Ltd and Chair of the IPF Sustainability Interest Group



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