

Green Investments in a Real Estate Context and How it Affects Investment Horizon

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Abstract

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Marion Croteau

There is an ongoing debate about the financial outcomes of investing in green properties and any associated considerations on operating measures of profitability and/or attractiveness of such investments. Building on previous literature, we investigate the impact of the level of greenness of a given REIT portfolio over time and the relationship with the investment horizon. Additionally, we analyzed the presence of women on the board and the association with the portfolio's level of greenness.

This paper focuses on two main questions such as: Does green property investment is characterized by a longer investment horizon? Statistically significant at 5% we found that larger the proportion to green investment in a REIT portfolio is, longer the duration of the investment will be. The second central question is associated with gender presence. Does the level of green percentage in a given REIT portfolio is positively associated with the presence of women on the board? Statistically significant at 5% we found that the presence of at least one woman on a board is positively associated with a higher presence of green investments in a portfolio.

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Introduction

The relationship between REITs financial performance and green and socially responsible investments is a relatively recent topic of interest in academia.

Real estate has been increasingly influenced by what has been described as green initiatives such as an increasing level of commercial property being developed under LEED (Leadership in energy and Environmental Design) or ENERGY STAR certifications. According to the U.S. Green Building Council, LEED has grown to become the world's most widely used green building certification system. The latest version of LEED designation is called the LEED V4 and started in November 2014 with additional focus on positive life cycle construction initiatives. LEED V4 projects registration from 2014 to 2015 increased by 2% demonstrating an increase in green construction initiatives in the United States.

Widely spread misconceptions that green building constructions are less cost-effective and generate lower return on investments has been proven to be wrong by recent literature. Eichholtz, Kok & Yönder (2012) investigated effects of energy efficiency commercial properties and the operating and stock performance of a sample of U.S. REITs. They discovered that the greenness of REITs is positively correlated to three specific measures of financial performance such as return on assets, return on equity and the ratio of funds from operations to total revenue.

Another way to look at the green and socially responsible trend in real estate would be to look at the increasing demand from institutional investors for such products. Over our sample period from 2005 to 2019, the total REITs average market capitalization increased by 252%. Investment in REITs has significantly increased past 1990 as per Chan, Leung & Wang (1998) which ties with

the rising demand from institutional investors for REITs and for green and sociably responsible investments. Our observations are consistent with a recent study by Schrand, Ascherl and Schaefer (2018) who investigated the financial performance of U.S. REITs and gender diversity and discovered a positive correlation. However, there is no mention of green investments. Their paper focus exclusively on influence of gender diversity on REITs board of directors and their financial performance.

This paper contributes to the literature by discovering a positive relationship between REITs portfolio green investment percentage and property investment horizon. It is among the very few papers analyzing the impact of gender diversity on green initiatives and investment horizon in real estate not from a financial performance angle.

As a first step, using three different databases, we merged data from FactSet, the U.S. Green Building Council and SNL Financial. We obtained a final sample of 2,820 observations across 188 different REITs in the United States. Using an asset-level analysis approach and controlling for time, location and property types, we discovered a positive relationship between the level of green investment in each portfolio and the duration of the investments statistically significant at 5%.

On a second step, statistically significant at 5%, the presence of at least one woman on a board is positively associated with a higher percentage of the portfolio being invested in green properties. It is our understanding that previous research on gender diversity and real estate is relatively new and deserves more attention from the academic community.

For robustness, we used three different statistical indicators to obtain the best model composition possible: the Schwarz Bayesian criterion (SBC), the Akaike information criterion (AIC) and the Bayesian information criterion (BIC). In all three cases, they predicted the relative

quality of our statistical model with respective results of 6571.1, -6696.8 and -6692.82. Finally, following Eichholtz, P., Holtermans, R., Kok, N. & Yonder, E. (2019), we address for endogeneity of greenness in a REIT portfolio.

This paper is structured in four sections, starting with looking over previous literature on four related subjects such as investment horizon, green initiatives, board of directors and gender influence. The second section will explain in detail our data sourcing and model used. The third section will describe our descriptive statistics, empirical results and robustness tests performed. The fourth and last section will conclude our studies and will reveal our foreseen implications for future research.

1. Literature Review

1.1 Green REITs and Financial Performance

In the last decade, there has been a significant emphasis on green initiative in real estate developments. A broad amount of research has been performed in this area in academia using different approaches. The widely spread misconceptions that green building constructions are less cost-effective and generate lower return on investments has been proven to be wrong by recent literature. (Eichholtz, Kok, and Quigley, 2008; Fuerst and McAllister, 2008; Miller, Spivey, and Florance, 2008.)

More recently, Eichholtz, Kok & Yönder (2012) investigated effects of energy efficiency from commercial properties and the operating and stock performance of a sample of U.S. REITs. They discovered that the greenness of REITs is positively correlated to three specific measures of financial performance such as return on assets, return on equity and the ratio of funds from operations to total revenue.

Using an investor's perspective, Sah, Miller and Ghosh (2013) investigated the return on investment level for green REITs investment versus nongreen REITs. Using Tobin's Q as a proxy of the firm valuation, they discovered a positive relationship between performance of green REITs and firm valuation. They also found REITs that become ENERGY STAR partners have higher return on assets by 5.68% in comparison with nongreen peers.

1.2 Investment Horizon in Real Estate

Performance metrics and investment horizon diverge significantly in private real estate from traditional investments for various reasons. Information inefficiency, illiquidity and higher transaction costs, among others, have been identified to be significant influencers of mispricing from fundamental value in private real estate (Clayton, Ling and Naranjo [2008]).

Inefficient market leaves room for emotion-based decisions cause by absence of proper information availability. The housing market investment horizon is a good representation of this phenomenon. It is influenced by the loss aversion which translates into transaction decision to be based on emotional criteria and ultimately a longer holding period. (Genesove, Mayer [2001]). Without looking specifically at the housing market, it has been demonstrated through previous research that real estate investors typically have a longer investment horizon in comparison with other asset classes. Coën, Lecompte and Abdelmoula (2018) explain that direct commercial real estate investment horizon period has been observed to be around 10 years. In the same vein, Fisher and Young (2000) found the median holding period for properties in the NCREIF database to be around 11 years.

The relationship between investment horizon and financial performance in real estate has been a topic of choice in academia over the past 20 years. In concordance with other research, a positive

correlation between property investment horizon and holding period return has been demonstrated by Ciochetti and Fisher (2002). Interestingly, the length of the investment horizon has been found to affect the holding period performance, with properties held for periods of shorter than 3 years and greater than 16 outperforming properties held for intermediate periods. Ciochetti and Fisher (2002) found this relationship to be caused by properties age, geographic location, size, property type and manager expertise to name only a few.

More recently, green investments have taken an interesting place in real estate research. Besides traditional factors such as the one described previously; green initiatives play an interesting role in the investment horizon decision. A review of the existing literature on this subject will follow.

1.3 Green Initiatives in a Real Estate Context

Going green has taken an exponential place in corporations' program since the birth of the movement in 1960 as per Circo, C. J. (2007). Following construction boom, dramatic oil price increases and rising green awareness, the path for federal agencies has been layout to give birth to the green building movement, the USGBC and the LEED rating system that we know today.

ENERGY STAR and LEED certifications are two rating programs well known for their green certification providing information on the level of environmental sustainability of the building certified. In contrast to the common belief that green building is not necessarily a good investment, Miller, Spivey and Florance (2008) demonstrated that event without higher rents, higher occupancy rates and faster absorption translates into value that exceed the cost of going green.

Nowadays, green buildings are becoming increasingly common in the industry and the trend is set to continue as per Ditta (2010). Despite higher cost associated with the construction of a

green building, Miller, Spivey and Florance (2008) confirm the observations made by Bowmar and Wireman (2007), which are that considering the reduction of operational cost associated with the structure, the price differential in comparison with a nongreen building can be offset in just one year.

Additionally, considering a rising demand in green building, Devine, Steiner and Yönder (2018), corporate tenants are accepting the rent differential. Taking into account a higher degree of tenant satisfaction, Devine and Kok (2015) discovered a higher probability of renewable rent. This could be associated with lower general and administrative expenses (G&A) which could also explain a positive investment thesis described by Bowmar and Wireman (2007).

Previous literature on green investment in real estate is, to our understanding, mainly focus on financial performance. We were unable to find any literature analyzing the relationship between investment horizon and green building investments made by REITs.

1.4 Board of Directors

Before investigating the influence of women on boards of directors, a clarification of board members' roles and responsibilities is required. To get this clarification, we need to observe what directors do through descriptive studies which can be achieved by field work. Several studies have been published over time and we will go over a few notorious ones enumerate by Adams, R. B., Hermalin, B. E. & Weisbach, M. S. (2010).

Directors represent a source of discipline and act during special situations such as crisis condition as explained by Mace (1971). The nature of their advice and participation is unclear. As per Mace, the participation of board members is occasionally one of expert counselling for the CEO and top management.

According to Demb and Neubauer (1992) survey results, they found approximately two thirds of directors agreeing to the fact that setting the strategic direction of the company was part of their role. The Majority of survey respondent agreed that their job is more related to setting the strategy, mission and vision of the company whereas monitoring top management decisions. It is important to notice that only 4.2% of Demb and Neubauer sample is composed of American directors. However, 43.7% of their respondents come from common-law countries.

A few years later, MacAvoy and Millstein (1999) explain how board members have evolved from passive actors to independent and active participants. They proved the existence of a statistically significant relation between firm board procedure and accounting-based measure of firm performance.

In the context that interests us, considering that board actions do have an impact on firm financial performance, can we measure women's influence on a board and ultimately on the firm financial metrics?

In the gender influence section, we will review previous literature on the subject transition toward the relationship between women and green initiatives.

1.5 Gender Influence

Previous literature is largely exposing differences of behaviour toward investing when it comes to women. When looking at the stock market, there is a gender difference as it comes to potential financial losses such as described by Hibbert et al. (2016). As expressed in their research, women are more cautious and have a tendency to be more risk averse. The heterogenous model based on gender belief and loss aversion is relatively new in academia. Studies on gender diversity toward

risk aversion blossomed in the early 2000 with, for example, Bernasek and Shwiff (2001), Agnew, Balduzzi and Sunden (2003) and Watson and McNaughton (2007) to name only a few.

The increasing presence of women in the workforce and their constant growing occurrence in the corporate world has advance literature on their impact on decision makes the process and relationship with financial performance. Empirical studies are looking at the situation from various angles. Gender diversity on boards and executive committees has been one exploration avenue.

Researchers have recently started to expose short-terms and long-term impact of having an increasing percentage of women on a situation of power or capacity to influence decisions. The corporate culture is slowly changing worldwide and women are gradually incorporating what used to be a male-dominated environment. For instance, the percentage of women holding a directorship position in the United States increased from 16.9% in 2013 to 19.2% in 2014 (Catalyst 2014).

Considering the relatively recent interest toward gender influence and financial performance, we are obtaining mixed results on the subject. According to Carter et al. (2010), previous research and human capital theory predict no link between board diversity and financial performance of a firm. However, their findings suggest a positive relationship.

Carter et al. (2010) found mixed results while analyzing the presence of women and ethnic minorities on boards of directors. Their results on estimation of fixed effects regression indicate a positive and significant relationship between the number of women on the board and the return on assets of a firm. Nevertheless, some portion of their results are in line with previous literature. While using Tobin's Q as the measure of financial performance, they found no relationship to gender or ethnic minority diversity.

Another route to look at the impact of gender diversity would be through one of the most notorious responsibilities of a board, which is a fiduciary duty. Parmeter (2017) is exposing the importance to stay away from boardroom homogeneity and how it is related to poor economic strategy. According to Parmeter (2017), having a male-dominated executive committee have led to financial underperformance when compared with return on equity, return on sales and return on invested capital. One expressed reason why women on boards of directors would result in more effective monitoring is related to the fact that women are further incline to ask questions. Diversity also brings a broader perspective and understanding of the industry or marketplace. Like previously exposed by Catalyst database, the industry is slowly changing. As of 2015, only 28% of Fortune 500 firms have on their board one female director or more.

Real estate investment trust (REIT) has a unique list of attributes as previously exposed under section 2.1 Investment Horizon in Real Estate. Given the level of corporate governance mechanism in a REIT context and the investment appealing this asset class represents for institutional investors, Schrand, Ascherl and Schaefer (2018) investigated the place of gender diversity on REIT boards and the relationship with financial performance. As per the Responsible Investment Association (2017), increasing demand from institutional investors for impact investing products is slowly putting pressure on institutions. Having an increasing number of women and ethnic minorities on executive committees and boards has been perceived as one avenue to satisfy such demand. Among other factors, perception that women positively contribute to enhancing internal monitoring has been also identified as a positive variable for institutional clients which is consistent with Parmeter (2017). Schrand, Ascherl and Schaefer (2018) concluded that REIT's likelihood of having women on the board is strongly influenced by board attributes such as the two enumerate above. Their findings demonstrate a positive relationship

between gender diversity and market performance but, consistent with Carter et al. (2010), they found no relationship with operating performance.

In the situation that concerns us, financial performance of a firm in association with the level of women on the board is less of a focus. We are interested in understanding the relationship between women and their sensitivity related to green investment.

A recent study performed by Fok et al. (2013) find few relationships between employee perceptions of organizational green orientation, individual green orientation and the impacts of green movement. Fok et al. (2013) second research question answers the differences between male and female subjects toward green movement through different angles. They found that female subject takes greater individual green action in comparison with male. Such actions could be translated into recycling paper, plastic or buy organic to name a few. This sensitivity toward green movement is consistent with O'Shaughnessy and Huddart-Kennedy's (2010) findings.

O'Shaughnessy and Huddart-Kennedy (2010) studied the social implication of women versus men via what they call relational activism. They use this term to describe a set of activities of importance (from the author's perspective) to the environmental movement. Their results demonstrate that women, who are strongly concerned with the environment, express their concern individually and by using their household. As comparison, man would get more involve publicly and be part of relational activism more often.

Since women tend to have a sensitive bias to green movement and take actions on a more individual basis, what does previous literature say about green initiatives within corporations? The following section will go over our data cleaning procedure and methodology.

2. Data and Methodology

2.1 Data Sourcing

For the empirical analyses, which is the core of this paper, we combine data from SNL Financial, FactSet and the U.S. Green Building Council. This section explains how we combined and used the datasets.

Our company-level analysis starts with SNL Financial. SNL Financial provides financial information on assets own by U.S. REITs including acquisition and disposition date, location, property name, property status and REIT name to name a few. Our entire dataset is comprised of 654 different REITs with complete information on asset holdings for a total of 119,542 observations located entirely in the United States. The whole dataset is comprised of property transactions over time starting with the first purchase date as 1902 to 2019.

Our gender dataset is provided by FactSet and covers executive boards and committee members of 292 REITs in 2019. For each institution, we obtained the number of members with their name, gender and title. Since each institution holds a unique number of executive committee members from 1 to 17, we proceed by calculating the percentage of women on the committee, allowing us to understand the level of gender diversity on the executive board.

Our REIT financial characteristic dataset comes from SNL Financial and is composed of 12,560 observations across 791 different REITs over a period from 2004 to 2019. Each observation represents a REIT with five financial characteristics such as total level of assets, total level of debt, market capitalization, return on average equity (ROAE) and common equity.

Our green portfolio percentage dataset is provided by the U.S. Green Building Council and contains 211 REITs portfolio weights invested or non-invested in green buildings per year from 2000 to 2014 for a total of 3,165 observations.

Table 1 under Appendix A lists all variables with their associated definition and source. It is divided in six different panels such as portfolio percentage of green investments, investment horizon, gender diversity, firm control, REIT financial and financial performance variables.

[Insert Table 1]

Some variables listed in Table 1 has been obtained directly from the database source and others have been calculated by us. Under the next section *Sample Construction*, we will detail the variable constructions and provide descriptive data.

2.2 Sample Construction

As a first step, for a window of 15 years (from 2000 to 2014), we matched by institution name our company-level data from SNL Financial with the dataset from the U.S. Green Building Council and obtained a sample of 3,008 observations across 188 different REITs. For each institution, we obtained the average investment horizon period per year and the total portfolio level allocated to green investments. As a second step, we matched our gender and financial data from FactSet using the REIT name and obtained a sample of 1,101 observations across 103 different REITs.

Following previous literature on green investment and financial performance (Eichholtz, Kok, and Quigley, [2008]; Fuerst and McAllister, [2008]; Miller, Spivey, and Florance, [2008]), we identified 11 variables for our analysis including three fixed effects (location, time and property types).

Out of those eight variables, three have been calculated by us (LEVERAGE, FIRMSIZE, PRICE TO BOOK RATIO and ROA). We obtained the FIRMSIZE variable by using the natural logarithm of total assets over time (from 2000 to 2014). The LEVERAGE variable was computed by calculating the ratio of total debts to total assets (from 2000 to 2014). Finally, for the PRICE TO BOOK RATIO, we took the company stock price and divided it by the book value per share (from 2000 to 2014).

Under the next section, we will expand on the variables described above and elaborate further prior to model construction.

2.3 Observations Prior to Model Construction and Analysis

From the 11 variables that interest us the most for this research (GREEN, HORIZON, WOMEN, AGE, LOCATION, LEVERAGE, FIRMSIZE, ROAE, ROA, PRICE TO BOOK RATIO, PROPERTY TYPE), we believe five of them demonstrate interesting patterns to observe. As a first robustness step, this visual analysis allows us to assess if our sample variables are behaving in accordance with previous literature.

Figure 1 represents the average investment horizon per year for the entire sample. The sample start at 2.22 years in 2000 and increase slowly to reach 2.90 years before experiencing a sharp decrease in 2007 until 2008 to reduce at 2.40 years before recovering. We believe this sudden drop in our sample is most likely related to the financial crisis. From 2008 the investment horizon slowly increases to reach a final point in 2014 at 3.37 years.

[Insert Figure 1]

Figure 2 represents the time series of average REIT portfolio level invested in green properties between 2000 and 2014. In agreement with Eichholtz et al. (2019), the observation starts

in 2000 at 0.01% and remains stable to slightly positive until 2010 where we notice a sharp positive change and reach 1.52%. From 2010 to the end of our sample window in 2014, we observe a strong positive increase in average green percentage investment until the final point at 4.94%.

[Insert Figure 2]

Figure 3 represents the average REIT leverage level between 2000 and 2014. As previously explained, LEVERAGE has been obtained by calculating the ratio of total debts to total assets for each REIT each year. From 2000 to 2005, the average leverage ratio is consistently increasing from 0.52 to 0.57 before sharply decreasing starting in 2006 and ending at 0.49 in 2014.

[Insert Figure 3]

Figure 4 represents the average price to book value ratio per year for the same period used for previous variables. From 2000 to 2004, we notice a sharp increase from 1.58 to 8.66 and almost an immediate decrease from 2004 to 2014. We believe this is partly explained by an extreme observation in our final sample.

[Insert Figure 4]

Figure 5 indicates the average return on assets (ROA) in percentage over time (2000-2014). The figure displays the average ROA ending each year for our sample of 188 different REIT for a total of 2,280 observations. ROA experienced a significant drop starting at the beginning of our window at 3.81%. The drop reached its lowest in 2008 at 0% and slowly recovered to finish in 2014 below 2000.

[Insert Figure 5]

We can comfortably say those five variables are behaving as expected in accordance with previous literature. Subsequently, on the next section, we will go over the hypothesis which will lead us to model construction.

2.4 Hypothesis

Consistent with Eichholtz, Kok & Yönder (2012), we believe that a higher percentage of REITs portfolio invested in green properties will generate higher return on investment. Consequently, our first hypothesis is that green property investments generate higher revenues.

H_A¹: Green property investment generates higher revenue.

This could be explained by higher cap rate required considering higher initial investment to comply with LEED and/or ENERGY STAR. Additionally, a cost synergy could lead to higher return on investment and be another source of explanations.

In the same vein, considering higher capital requirements at initiation and assuming superior financial performance generated by green property investment, our second hypothesis below reflects our belief that higher revenue is partly explained by the property investment horizon. We believe a longer investment horizon would generate a higher return, therefore, mixed with our first hypothesis, we expect a positive correlation between the level of green investment in a portfolio and the average property investment horizon.

H_A²: Higher revenue is partly explained by a longer property investment horizon.

In relationship with the previous two hypotheses, we believe green property investments are characterized by a longer investment horizon. Thus, our third hypothesis below reflects this theory

and will be investigated using a calculated average investment horizon in years per year for each REIT in the United States.

H_A³: Green property investment is characterized by a longer investment horizon.

Consistent with O'Shaughnessy and Huddart-Kennedy (2010), we believe women have a positive bias for environmental initiatives which should translate into a higher proportion of green property investments if they are in influential positions. Therefore, our fourth and last hypothesis consists of analyzing the level of green portfolio property investments and the relationship with gender diversity. Consequently, we believe the presence of women has a positive effect on sustainable investments.

H_A⁴: The level of green property investment is partly explained by the presence of women on the executive board of committees.

Additionally, as per Schrand, Ascherl and Schaefer (2018), considering the attractiveness of REITs as an asset class for institutional investors and the increasing demand from such investors for sustainable and socially responsible investments, we believe the presence of women on executive boards or committees should generate a higher level of green property investment.

Under the next section, we will go over the model used to test all four hypotheses.

2.5 Model

First, we analyzed the financial performance level in relation with the level of investment in green properties for the first three models. These models have been constructed to answer the first and second hypothesis (H_A^1 and H_A^2) expressed under the section 3. 2. (In all analysis, we control for REIT state location, time and REIT type-fixed effects denoted by respectively τ_t, γ_i and δ_i .)

$$ROAE_{it} = \beta HORIZON_{it} + \beta REIT\ AGE_{it} + \beta PRICE\ TO\ BOOK\ RATIO_{it} + \beta LEVERAGE_{it} + \beta FIRMSIZE_{it} + \tau_t + \gamma_i + \delta_i + \varepsilon_{it} \quad (1)$$

$$ROA_{it} = \beta HORIZON_{it} + \beta REIT\ AGE_{it} + \beta PRICE\ TO\ BOOK\ RATIO_{it} + \beta LEVERAGE_{it} + \beta FIRMSIZE_{it} + \tau_t + \gamma_i + \delta_i + \varepsilon_{it} \quad (2)$$

The second section is attributed to models in order to answer the third and fourth hypotheses (H_A^3 and H_A^4). In other words, if green properties generate higher revenues and higher revenues are triggered in part by a longer investment horizon than we should observe a longer investment period with green properties.

$$GREEN_{it} = \alpha_i + \beta HORIZON_{it} + \beta WOMEN_{it} + \beta LEVERAGE_{it} + \beta FIRMSIZE_{it} + \beta REIT\ AGE_{it} + \beta PRICE\ TO\ BOOK\ RATIO_{it} + \tau_t + \gamma_i + \varepsilon_{it} \quad (3)$$

In all three models, i denotes the firm and t the year (2000–2014). $Green_{it}$ represents the average percentage of green properties in a given REIT portfolio for a given year. $ROAE_{it}$ represents the return on average equity. This is another financial ratio that measures the profitability of a company in relationship with the average shareholder equity level. Similarly, ROA_{it} is the third and last financial performance variable used here. The objective is also to confirm the first two hypotheses and being used additionally as robustness since we calculated the return on assets (ROA) whereas the return on average equity (ROAE) was extracted for the SNL Financial directly. $HORIZON_{it}$ represents the average property investment horizon period in years per REIT per year. $WOMEN_{it}$ denotes the presence or absence of women on a board of directors of the executive committee. It is presented by 1 if positive observation or 0 to the contrary. $LEVERAGE_{it}$ denotes the ratio of total debt to total assets and is being used as a firm control variable. $FIRMSIZE_{it}$ represents the sum of total assets and is being used as a firm control variable as well.

3. Empirical Results

3.1 Descriptive Statistics

Table 2 lists all 188 REITs used in this study and separates them into two distinct categories (with and without green investments). We have exactly 109 REITs with at least one green investment in their portfolio versus 79 REITs with no green investments.

[Insert Table 2 here]

Table 3 provides an overview of descriptive statistics for the whole sample. The Variables are sorted by “Horizon Variables”, “Gender Diversity Variables”, “Firm Control Variables”, “Financial Performance Variables” and “Portfolio Percentage of Green Investments”.

For the HORIZON variable, the arithmetic mean is 3.856 years of investment horizon of a property with a standard deviation of 3.216 years. WOMEN is a binary variable, 1 for presence of at least one woman and 0 if absence. In this context, it is more relevant to look at the percentage of the board constituent of women. On average, we observe in our sample that 19% of all boards are composed of women with a maximum of 55% and a minimum of 0%. As per Schrand, Ascherl and Schaefer (2018), a percentage of women present on executive board or committee is important to avoid tokenism.

Under the firm control variables, we have respectively FIRMSIZE, LEVERAGE and REIT AGE. Their respective arithmetic mean is on the same order, 14.780, 0.511 and 34.039. Consistent with Giacomini, Ling and Naranjo (2017), REITs has a higher leverage level in comparison with industrial firms and retail firms.

Additionally, Giacomini, E., Ling, D. C. & Naranjo, A. (2015), studied leverage ratios across countries around the world and the relationship between leverage and financial performance. Looking at their summary statistics for all leverage ratios from 2002 to 2011, their sample mean for U.S. was 0.456 with a maximum of 0.985 and a minimum of 0.000. Our result is similar with a mean value of 0.511.

When we look at our financial performance metrics, we have a mean ROAE of 7.089 with a standard deviation of 21.286, a mean PRICE TO BOOK RATIO of 3.339 with a standard deviation of 20.457 and finally a mean ROA of 2.323 with a standard deviation of 3.951.

Beracha, E., Feng, Z. & Hardin, W. G. (2019) studied REIT operational efficiency and its relationship with performance, risk and stock return. They used in their research, among other variables, return in equity and return on assets. Looking at their summary statistics, their sample is composed of data from 1995 to 2016 and they obtained an average ROA of 6.036 with a standard deviation of 3.920. Our sample has a lower ROA in comparison. However, we have a shorter sample period due to issues associated with green data accessibility. Nevertheless, we remain confident with the validity of our calculation.

Finally, on average each REIT portfolio has 2.1% of their portfolio invested in what would be considered as been a green investment with a maximum of 58.3% and a minimum of 0.

[Insert Table 3 here]

Table 4 describes the full sample descriptive statistics across our 103 different REITs divided in two categories (with or without green investments). In average, REITs owning at least one green investment will maintain their investment twice as long compared to REIT without green investment in their portfolio. This observation is consistent with our third hypothesis (H_A^3).

For the green portfolio section, on average 97.1% of all boards have at least one woman. In contrast, 90.6% for the nongreen portfolio section. This observation is consistent with our fourth hypothesis (H_A^4). Additionally, the FIRMSIZE and REIT AGE, in both cases for the REITs owning green properties, the number is higher. Meaning, on average the REIT age is 35 years versus 33 for nongreen properties and the firm is larger for REIT with green investments. Under the financial performance variables, only the return on average equity (ROAE) is higher for the REITs with at least one green investment, the other variable such as ROA and PRICE TO BOOK RATIO are all slightly higher for REITs without green investments. This is not consistent with previous literature (Eichholtz, Kok & Yönder [2012])

[Insert Table 4 here]

The following section will describe the results obtained from our various analyses.

4.2 Analysis

4.2.1 Correlation Matrix

With regard to the correlation matrix, Table 5 represents the correlation coefficients of the independent variables. As performed by Schrand, Ascherl and Schaefer (2018), we tested for multicollinearity using a widely used threshold of 0.8 (absolute value) or above. The highest correlation coefficient of 0.250 is reported between HORIZON and LEVERAGE. This is not a problem since 0.250 is well below our 0.8 threshold.

The second highest correlation coefficient of 0.202 is between REIT AGE and HORIZON. This does not pose any problem since 0.202 is again, well below our threshold of 0.8.

[Insert Table 5]

4.2.2 Financial Performance

Our first analysis starts with the financial performance using Table 6 which provides the multilinear regression results for equations 2 and 3 respectively. For equation 1, ROAE is regressed against five explanatory variables and three fixed effects, namely HORIZON, REIT AGE, PRICE TO BOOK RATIO, LEVERAGE and FIRMSIZE. To avoid potential interference in our analysis, we used time, location and REITs type fixed effects. The model explains 31 to 32 percent of the relationship variation in return on average equity.

Coefficients for the control variables are in line with expectations and consistent across nonlinearity in the relationship. Consistent with Hin Ho, Rengarajan & Han Lum (2013), Eichholtz et al. (2013) and Hart and Ahuja (1996), variable at firm level such as FIRMSIZE, LEVERAGE, REIT AGE and PRICE TO BOOK RATIO have been used. We observe that a positive price to book ratio has a positive impact on returns. The value 0.066 implies that for 1% increase in the price to book ratio, it will result in a 6.6% increase in ROAE. This is in line with expectations since Fama and French (1995) indicate that firms with high price to book ratio are considered typically as growth stocks and should therefore generate higher than average returns.

As for leverage, traditionally we would expect to observe a higher level of debt in real estate. However, as per Gerlach, Obaydin & Zurbruegg (2015), a higher level of idiosyncratic risk or leverage generates a lower expected return in contrast with REITs with a lower debt level measured through debt-to-equity ratio. In our results, we do observe a negative influence of leverage on average return of equity. Therefore, our negative relationship observed between leverage and return on average equity is consistent despite the lack of statistical significance.

A longer period of underlying investment horizon by REITs has a positive impact on financial returns which is in line with our second hypothesis (H_A^2). This positive relationship is statistically significant at 1% and in line with expectations. Longer holding period for equity and bonds have been historically associated with a higher transaction cost. In the real estate context, illiquidity is an important factor when it comes to holding periods. As per Collett, Lizieri & Ward (2003), the holding period varies according to the characteristics of the asset and the market conditions. Additionally, as previously mentioned under the literature review section, a positive correlation between property investment horizon and holding period return has been demonstrated by Ciochetti and Fisher (2002).

For equation 2, the model explains 48 to 50 percent of the variation of return on assets. ROA is regressed against five explanatory variables and three fixed effects the same way it has been performed with the previous two analyses exposed in table 6. HORIZON, LEVERAGE and REIT AGE provide results at 1% level of significance. FIRMSIZE is at 5% significance whereas the constant and PRICE TO BOOK RATIO are significant at 10%.

Again, consistent with previous literature (Ciochetti and Fisher [2002]), Collett, Lizieri & Ward [2003]), statistically significant at 1% and similar to results obtained with equations 1 and 2, a longer period of underlying investment horizon by REITs has a positive impact on financial returns which is in line with our second hypothesis (H_A^2).

[Insert table 6]

Table 7 shows the results of our multilinear regressions panel of equation 3 used to answer hypotheses 3 and 4. To avoid potential interference in our analysis, we used time and REITs type fixed effects the same way we did previously for the financial performance analysis.

This model explains between 42.3 and 44.2 percent of the relationship using three different fixed effects such as time, location and property types to avoid any unwanted noise in our analysis. As per our results obtained from equations 4 and 5 of Table 7, we can confirm our third and fourth hypothesis (H_A^3 and H_A^4) which are respectively that green properties are characterized by a longer investment horizon and the level of greenness to a REIT portfolio is partly explained by the presence of women on their board of directors.

Statistically significant at 5%, if we are in the presence of green properties in a given REIT portfolio, the overall investment horizon will be longer. Using our sample described previously under the section *Data and Methodology*, we obtained a value of 0.004 for a 1% increase in green properties in each REIT portfolio.

Statistically significant at 5% as well, the presence of at least one woman on a REIT board has a positive relationship with the level of greenness of a REIT portfolio. The value obtained under the fifth equation is 0.037 for each 1% of GREEN level. This is consistent with hypothesis 4 and the current industry trend previously mentioned under the *Literature Review* section. As per the Responsible Investment Association (2017) increasing demand from institutional investors for impact investing products is slowly putting pressure on institutions. Having an increasing number of women and ethnic minorities on executive committees and boards has been perceived has one avenue to satisfy such demand. In other words, if a real estate investment trust is concerned about attracting institutional capitals and management is making ESG initiatives, it is of our opinion that gender diversity on the boards and green investments are not completely unrelated initiatives.

Examining control variables, LEVERAGE has a negative relationship on all four regressions. This is consistent with Cajias, M., Geiger, P. & Bienert, S. (2012) results. In their 2012 research paper, they studied the effect of a sustainable agenda on a company level and

identified potential financial benefits. They obtained a negative relationship between financial performance and the leverage in all nine models. One of their explanations was the influence of the financial crisis in their sample considering the time period used. Similarly, our sample has also been impacted by the financial crisis of 2008 which, without limiting ourselves to one explanation, could partly explain our results.

As for REIT AGE and PRICE TO BOOK RATIO, none are statistically significant as demonstrated under Table 7. As per our last variable used, FIRMSIZE, a negative relationship is observed with the level of greenness of a REIT portfolio but only statistically significant at 10% under the fourth and the fifth model on Table 7. This observation suggests that smaller firm would have a tendency towards green investments which is consistent with Hin Ho, Rengarajan & Han Lum (2013).

[Insert Table 7]

Under the last section of our analysis, we go over robustness and detail our approach.

4.3 Robustness Tests

For robustness we decided as a first step to regress our sample on financial variables and use similar control variables used on previous literature to test if our sample is behaving as expected (Hin Ho, Rengarajan & Han Lum [2013], Eichholtz et al. [2013] and Hart and Ahuja [1996]). As exposed in detail under section *Financial Performance* above, we obtained similar results and are confident in our sample construction.

In a second step, we used three different statistical indicators in order to obtain the best model composition possible and compare with the ones used in Table 7.

The first information indication is the Schwarz Bayesian criterion (SBC):

$$SBC_p = n \ln SSE_p - n \ln n + [\ln n]p$$

Using the Schwarz Bayesian criterion, we evaluated what was the most appropriate independent variable combination to explain the percentage level of green property investment in a REIT portfolio. As demonstrated under Table 8, the Schwarz Bayesian criterion (SBC) obtained is -6405.965 and indicates that the model selected is the optimal one. Part of the most relevant variables are respectively HORIZON and WOMEN which are essential variables for testing hypotheses 3 and 4. Additionally, we have FIRMSIZE and LEVERAGE which are two variables used on previous literature. The R-Squared of the model is very similar to the one obtained under the fifth model of Table 7 which was 0.442.

The second indicator is the Akaike information criterion (AIC):

$$AIC_i = -2\log L_i + 2p_i$$

The AIC obtained here is -6531.065 and predicts the relative quality of a statistical model. It is generally accepted that a small AIC would indicate a better model fit. In a similar way, we also observed the Bayesian information criterion (BIC) as a third indicator.

$$BIC_i = -2\log L_i + p_i \log n$$

We obtained a value of -6527.048 which is similar to the one previously observed with the AIC predictor.

[Insert Table 8]

As a third and final robustness step, we address for endogeneity of greenness in a REIT portfolio. Eichholtz, P., Holtermans, R., Kok, N. & Yonder, E. (2019) used the asset-level analysis as a way to reduce endogeneity concerns previously exposed in literature (Hermalin and Weisbach [1998,2003]). By using asset-level value, it implies that firm characteristics cannot explain the cross-sectional effects, therefore reducing endogeneity. We acknowledge that endogeneity is preoccupying in non-experimental, cross-sectional studies. As mentioned by Eichholtz, P., Holtermans, R., Kok, N. & Yonder, E. (2019), environmentally certified buildings are not randomly assigned to portfolios and building owners do not randomly invest in the environmental performance buildings. Without being able to completely erase endogeneity potential, for the multilinear regression to yield consistent estimates, we must assume that our variables are uncorrelated with other explanatory variables.

5 Conclusions

Private real estate is probably one of the most popular investment in the private asset world and one of the most studied as well, partly because of the accessibility of data and the obligation to communicate information on assets from real estate investment trusts (REITs). There is an ongoing debate about the financial outcomes from green properties and any associated considerations on operating measures of profitability and/or attractiveness of such investments.

Building on previous literature (Eichholtz, P., Holtermans, R., Kok, N. & Yonder, E. [2019]), Devine, A. and E. Yönder [2018], Cajias, M., Geiger, P., & Bienert, S. [2012], Eichholtz, P., Kok, N. & Yonder, E. [2012]), we believe this paper is among the first to investigate the impact of the level of greenness of a given REIT portfolio over time and the investment horizon. Additionally,

previous literature, such as Schrand, Ascherl and Schaefers (2018), investigated the place of gender diversity on REIT boards and the relationship with financial performance. However, to our knowledge, the presence of women on a board and the association with the level of greenness of the portfolio has not been investigated before.

This paper aims to answer two main questions using four central hypotheses. In order to address those two central questions, we started by following Eichholtz, Kok & Yönder (2012) methodology and analyzed the financial performance of REIT containing green property in their respective portfolios regarding green property investments and its association with higher revenues (H_A^1). We unfortunately did not obtain as expected a positive correlation. However, with the second hypothesis, our results were in line with previous literature on the subject (Gerlach, Obaydin & Zurbruegg [2015], Collett, Lizieri & Ward [2003], Hin Ho, Rengarajan & Han Lum [2013]). Statistically significant at 1%, a longer period of underlying investment horizon by REITs has a positive impact on financial returns which is in line with our second hypothesis (H_A^2).

These results lead us to the two main questions starting with: Does green property investment is characterized by a longer investment horizon? To this question (H_A^3), we answer yes. Statistically significant at 5%, larger the proportion to green investment in a REIT portfolio is, longer the duration of the investment will be. The second central question is associated with gender presence and is, to our knowledge, a relatively new area of research in real estate. Does the level of green percentage in a given REIT portfolio is positively associated with the presence of women on the board? To this question (H_A^4), we answer yes. Statistically significant at 5%, the presence of at least one woman on a board is positively associated with a higher presence of green investments in a portfolio.

The gender component remains, as mentioned, relatively new in academia and has not been researched the way we did in this paper. Partly because of data accessibility and also because women in finance has only recently started to reach key decision levels in organizations making empirical research less intuitive. For future mitigation, this area of research deserves more attention and has become more relevant with recent institutional investor appetite for ESG associated investments.

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Appendix A

Table 1: Variable Definitions

Variable names	Definitions	Sources
Panel A: Portfolio percentage of green investments		
GREEN	Percentage of REIT portfolio invested in green properties over time (2000 - 2014).	U.S. Green Building Council
Panel B: Investment Horizon		
HORIZON	Average investment horizon period in years over time (2000 - 2014).	SNL Financial
Panel C: Gender diversity		
WOMEN	Dummy variable. Equal 1 if at least one woman is on the executive board, otherwise 0 (2019).	FactSet
Panel D: Firm control		
REIT AGE	Age of individual REIT since origination of the firm	FactSet / Security Exchange Commission (SEC)
LOCATION	Head office location of each REIT	FactSet / Security Exchange Commission (SEC)
LEVERAGE	Leverage represents the ratio of total debts to total assets. We took the average per year over time (2000 - 2014).	SNL Financial
FIRMSIZE	Firmsize is the natural logarithm of total assets over time (2000 - 2014).	SNL Financial
Panel E: REIT financial variables		
ASSETS	Represent the average total assets over time (2004 - 2019).	SNL Financial
DEBTS	Represent the average total debts level over time (2004 - 2019).	SNL Financial
EQUITY	Represent the average total equity over time (2004 - 2019).	SNL Financial
ROAE	Represent the average total ROAE over time (2004 - 2019).	SNL Financial
MARKET CAPITALISATION	Represent the average total market capitalization over time (2004 - 2019).	SNL Financial
PRICE TO BOOK RATIO	Represent the company stock price divided by the book value per share (2000 - 2014)	FactSet
Panel F: Financial performance variables		
ROAE	Represent the average total return on equity over time (2004 - 2019).	SNL Financial
ROA	Represent the annual return on assets (2000 - 2014)	FactSet
PRICE TO BOOK RATIO	Represent the company stock price divided by the book value per share (2000 - 2014)	FactSet

Table 2: List of REITs With Green and Nongreen Investments as of 2014

Table 2 lists the full sample used in this study in two distinct categories. The right side represents the list of 109 REITs containing at least one green property over the period from 2000 to 2014. The left side, to the contrary, lists 79 REITs who did not invest in green properties over the same period. Each REIT property type is indicated below.

List of REITs with Green and Nongreen Investments as of 2014			
Non-Green REITS		Green REITS	
	Property type		Property type
1. ACRE Realty Investors Inc.	Multifamily	1. Acadia Realty Trust	Retail
2. AMB Property Corporation	Industrial	2. Agree Realty Corporation	Retail
3. America First Apartment Investors, Inc.	Multifamily	3. Alexander's, Inc.	Retail
4. American Homes 4 Rent	Multifamily	4. Alexandria Real Estate Equities, Inc.	Science
5. American Land Lease, Inc.	Multifamily	5. American Assets Trust, Inc.	Diversify
6. AmeriVest Properties Inc.	Office	6. American Campus Communities, Inc.	Student_Housng
7. AMLI Residential Properties Trust	Multifamily	7. American Realty Capital Healthcare Trust, Inc.	Healthcare
8. AmREIT	Retail	8. American Realty Investors, Inc.	Office
9. Archstone-Smith Trust	Multifamily	9. Arden Realty Inc.	Office
10. Ashford Hospitality Trust, Inc.	Leisure	10. Armada Hoffer Properties, Inc.	Office
11. Associated Estates Realty Corporation	Residential	11. AvalonBay Communities, Inc.	Multifamily
12. Aviv REIT, Inc.	Healthcare	12. Bedford Property Investors, Inc.	Office
13. Bluerock Residential Growth REIT, Inc.	Retail	13. BioMed Realty Trust, Inc.	Science
14. BNP Residential Properties, Inc.	Retail	14. Boston Properties, Inc.	Office
15. Camden Property Trust	Retail	15. Brandywine Realty Trust	Office
16. Campus Crest Communities, Inc.	Student_Housng	16. BRE Properties, Inc.	Multifamily
17. Capital Automotive REIT	Industrial	17. Brixmor Property Group Inc.	Retail
18. CareTrust REIT, Inc.	Healthcare	18. CapLease, Inc.	Office
19. Catellus Development Corporation	Multifamily	19. CarrAmerica Realty Corporation	Office
20. CenterPoint Properties Trust	Industrial	20. CBL & Associates Properties, Inc.	Retail
21. CentraCore Properties Trust	Government	21. Cedar Realty Trust, Inc.	Retail
22. Cogdell Spencer Inc.	Healthcare	22. Chambers Street Properties	Office
23. Columbia Equity Trust, Inc.	Office	23. City Office REIT, Inc.	Office
24. Crescent Real Estate Equities Company	Diversify	24. Cole Real Estate Investments, Inc.	Diversify
25. CRT Properties, Inc.	Office	25. Colonial Properties Trust	Diversify

List of REITs with Green and Nongreen Investments as of 2014

Non-Green REITS		Green REITS	
	Property type		Property type
26. CubeSmart	Storage	26. CoreSite Realty Corporation	Data Center
27. DuPont Fabros Technology, Inc.	Data_Center	27. Corporate Office Properties Trust	Office
28. Equity LifeStyle Properties, Inc.	Multifamily	28. Cousins Properties Incorporated	Office
29. Extra Space Storage Inc.	Storage	29. CyrusOne Inc.	Office
30. FeiCor Lodging Trust Incorporated	Leisure	30. DCT Industrial Trust Inc.	Industrial
31. Gables Residential Trust	Multifamily	31. Digital Realty Trust, Inc.	Data Center
32. GEO Group, Inc.	Healthcare	32. Douglas Emmett, Inc.	Office
33. GMH Communities Trust	Student Housing	33. Duke Realty Corporation	Industrial
34. Government Properties Trust, Inc.	Government	34. EastGroup Properties, Inc.	Office
35. Great Lakes REIT	Office	35. Education Realty Trust, Inc.	Student_Housng
36. Healthcare Realty Trust Incorporated	Healthcare	36. Empire State Realty Trust, Inc.	Retail
37. Heritage Property Investment Trust, Inc.	Retail	37. EPR Properties	Education
38. HMG/Courtland Properties, Inc.	Office	38. Equity Commonwealth	Office
39. Hospitality Properties Trust	Leisure	39. Equity Office Properties Trust	Office
40. InnSuites Hospitality Trust	Leisure	40. Equity One, Inc.	Retail
41. Iron Mountain Incorporated	Data Center	41. Equity Residential	Retail
42. Kramont Realty Trust	Retail	42. Essex Property Trust, Inc.	Retail
43. LaSalle Hotel Properties	Leisure	43. Excel Trust, Inc.	Retail
44. Longview Fibre Company	Industrial	44. Federal Realty Investment Trust	Retail
45. LTC Properties, Inc.	Healthcare	45. First Industrial Realty Trust, Inc.	Industrial
46. Malan Realty Investors, Inc.	Retail	46. First Potomac Realty Trust	Industrial
47. Maxus Realty Trust, Inc.	Multifamily	47. Gaming and Leisure Properties, Inc.	Leisure
48. Medical Properties Trust, Inc.	Healthcare	48. Gladstone Commercial Corporation	Healthcare
49. Meredith Enterprises, Inc.	Retail	49. Glenborough Realty Trust Incorporated	Diversify
50. MeriStar Hospitality Corporation	Leisure	50. Glimcher Realty Trust	Retail

List of REITs with Green and Nongreen Investments as of 2014

Non-Green REITS		Green REITS	
	Property type		Property type
51. Mills Corporation	Retail	51. HCP, Inc.	Healthcare
52. Monogram Residential Trust, Inc.	Retail	52. Healthcare Trust of America, Inc.	Healthcare
53. New Plan Excel Realty Trust, Inc.	Retail	53. Hersha Hospitality Trust	Leisure
54. Newkirk Realty Trust, Inc.	Retail	54. Highwoods Properties, Inc.	Office
55. Omega Healthcare Investors, Inc.	Healthcare	55. Home Properties, Inc.	Retail
56. Pan Pacific Retail Properties, Inc.	Retail	56. Hudson Pacific Properties, Inc.	Office
57. Paragon Real Estate Equity and Investment Trust	Office	57. Investors Real Estate Trust	Retail
58. Paramount Group, Inc.	Office	58. Kilroy Realty Corporation	Healthcare
59. Pebblebrook Hotel Trust	Leisure	59. Kimco Realty Corporation	Retail
60. Physicians Realty Trust	Healthcare	60. Kite Realty Group Trust	Retail
61. Presidential Realty Corporation	Multifamily	61. Lexington Realty Trust	Office
62. Prime Group Realty Trust	Office	62. Liberty Property Trust	Office
63. Reckson Associates Realty Corporation	Retail	63. Macerich Company	Retail
64. Republic Property Trust	Office	64. Mack-Cali Realty Corporation	Diversify
65. RLJ Lodging Trust	Leisure	65. Mid-America Apartment Communities, Inc.	Retail
66. Sabra Health Care REIT, Inc.	Healthcare	66. Mission West Properties, Inc.	Science
67. Shelbourne Properties I, Inc.	Diversify	67. Monmouth Real Estate Investment Corporation	Industrial
68. Shelbourne Properties II, Inc.	Diversify	68. MPG Office Trust, Inc.	Office
69. Shelbourne Properties III, Inc.	Diversify	69. New York REIT, Inc.	Retail
70. Shurgard Storage Centers, Inc.	Storage	70. One Liberty Properties, Inc.	Diversify
71. Silver Bay Realty Trust Corp.	Multifamily	71. Pacific Office Properties Trust, Inc.	Office
72. Sizer Property Investors, Inc.	Retail	72. Parkway Properties, Inc.	Office
73. STAG Industrial, Inc.	Industrial	73. Pennsylvania Real Estate Investment Trust	Retail
74. Sunstone Hotel Investors, Inc.	Leisure	74. Piedmont Office Realty Trust, Inc.	Office
75. Tarragon Corporation	Industrial	75. Post Properties, Inc.	Retail

List of REITs with Green and Nongreen Investments as of 2014

Non-Green REITS		Green REITS	
	Property type		Property type
76. Town and Country Trust	Multifamily	76. Preferred Apartment Communities, Inc.	Multifamily
77. Trade Street Residential, Inc.	Retail	77. Prentiss Properties Trust	Industrial
78. Trizec Properties, Inc.	Office	78. Prologis, Inc.	Industrial
79. Windrose Medical Properties Trust	Healthcare	79. PS Business Parks, Inc.	Office
		80. Public Storage	Storage
		81. QTS Realty Trust, Inc.	Data_Center
		82. Realty Income Corporation	Office
		83. Regency Centers Corporation	Retail
		84. Retail Opportunity Investments Corp.	Retail
		85. Retail Properties of America, Inc.	Retail
		86. Rexford Industrial Realty, Inc.	Industrial
		87. Rouse Properties, Inc.	Retail
		88. Saul Centers, Inc.	Retail
		89. Select Income REIT	Retail
		90. Senior Housing Properties Trust	Healthcare
		91. Simon Property Group, Inc.	Retail
		92. SL Green Realty Corp.	Office
		93. Spirit Realty Capital, Inc.	Retail
		94. Sun Communities, Inc.	Multifamily
		95. Tanger Factory Outlet Centers, Inc.	Retail
		96. Taubman Centers, Inc.	Retail
		97. Terreno Realty Corporation	Industrial
		98. Thomas Properties Group, Inc.	Diversify
		99. UDR, Inc.	Retail
		100. UMH Properties, Inc.	Multifamily
		101. Universal Health Realty Income Trust	Healthcare
		102. Urstadt Biddle Properties Inc.	Retail
		103. Ventas, Inc.	Healthcare
		104. W. P. Carey Inc.	Retail
		105. Washington Real Estate Investment Trust	Diversify
		106. Weingarten Realty Investors	Retail
		107. Wheeler Real Estate Investment Trust, Inc.	Retail
		108. Whitestone REIT	Retail
		109. Winthrop Realty Trust	Diversify

Table 3: Descriptive Statistics Full Sample

Table 3 gives an overview of the descriptive statistics for all variables. HORIZON represents the average investment horizon period of real estate investment trust properties in years. WOMEN is a binary variable equal to 1 if at least one woman is on the executive board, 0 otherwise. FIRMSIZE is the natural logarithm of total assets. LEVERAGE is the ratio of total debt to total assets. ROAE is the return on average equity representing a second financial performance measure. Return on assets (ROA), our third and final financial performance variable, has been calculated by us and represent the annual returns divided by the level of assets. Finally, the variable GREEN represents the percentage of green properties in a given REIT portfolio.

Summary Statistics					
	Obs.	Mean	Std Dev	Minimum	Maximum
<i>Panel A: Horizon Variables</i>					
HORIZON	1101	3.856	3.216	0.000	28.866
<i>Panel B: Gender Diversity Variables</i>					
WOMEN	1101	0.931	0.252	0.000	1.000
<i>Panel C: Firm Control Variables</i>					
FIRMSIZE	1101	14.780	1.331	10.010	17.340
LEVERAGE	1101	0.511	0.138	0.015	0.988
REIT AGE	1101	34.039	16.440	5.000	109.000
<i>Panel D: Financial Performance Variables</i>					
ROAE	1101	7.089	21.286	-428.685	193.180
PRICE TO BOOK RATIO	1101	3.339	20.457	0.099	650.731
ROA	1101	2.323	3.951	-14.619	79.418
<i>Panel E: Portoflio Percentage of Green Investments</i>					
GREEN	1101	0.021	0.067	0,000	0.583

Table 4: Descriptive Statistics With and Without Green Investments

Table 4 provides descriptive statistics on the sample divided in two. In other words, for the list of REITs with green properties in their portfolio and the list of REITs without green properties in their portfolio. For the section of the sample with green investments, the maximum percentage observe is 58.3%, the mean is 5.6% with a standard deviation of 9.8%. The portion of our sample with green investment is smaller with 428 observations versus 673 observations for portfolio without green investments.

Summary Statistics

Green Portfolio					
	Obs.	Mean	Std Dev	Minimum	Maximum
<i>Panel A: Horizon Variables</i>					
HORIZON	428	4.750	3.454	0.000	28.866
<i>Panel B: Gender Diversity Variables</i>					
WOMEN	428	0.971	0.165	0.000	1.000
<i>Panel C: Firm Control Variables</i>					
FIRMSIZE	428	15.305	0.926	12.874	17.340
LEVERAGE	428	0.492	0.121	0.019	0.764
REIT AGE	428	35.294	16.343	5.000	70.000
<i>Panel D: Financial Performance Variables</i>					
ROAE	428	7.236	8.938	-31.042	75.742
PRICE TO BOOK RATIO	428	2.477	2.349	0.346	32.773
ROA	428	1.792	2.484	-14.619	12.855
<i>Panel E: Portoflio Percentage of Green Investments</i>					
GREEN	428	0.056	0.098	0.000	0.583

Summary Statistics

Nongreen Portfolio					
	Obs.	Mean	Std Dev	Minimum	Maximum
<i>Panel A: Horizon Variables</i>					
HORIZON	673	3.288	2.919	0.000	21.916
<i>Panel B: Gender Diversity Variables</i>					
WOMEN	673	0.906	0.291	0.000	1.000
<i>Panel C: Firm Control Variables</i>					
FIRMSIZE	673	14.446	1.438	10.010	17.157
LEVERAGE	673	0.522	0.147	0.015	0.988
REIT AGE	673	33.242	16.463	5.000	109.000
<i>Panel D: Financial Performance Variables</i>					
ROAE	673	6.996	26.285	-428.685	193.180
PRICE TO BOOK RATIO	673	3.887	26.092	0.099	650.731
ROA	673	2.660	4.619	-9.348	79.418
<i>Panel E: Portoflio Percentage of Green Investments</i>					
GREEN	673	0.000	0.000	0.000	0.000

Table 5: Correlation Coefficients

Table 5 provides the correlation coefficients. GREEN represents the level of green investment in REITs portfolios. HORIZON represents the average investment horizon period of real estate investment trust properties in years. WOMEN is a binary variable equal to 1 if at least one woman is on the executive board, 0 otherwise. FIRMSIZE is the natural logarithm of total assets. LEVERAGE is the ratio of total debt to total assets. ROAE is the return on average equity representing a second financial performance measure. REIT AGE represents the average age of all REITs in years. PRICE TO BOOK RATIO represents the company stock price divided it by the book value per share.

Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. HORIZON	1.000								
2. WOMEN	0.039	1.000							
3. FIRMSIZE	0.035	0.574***	1.000						
4. LEVERAGE	0.250***	-0.137***	-0.027	1.000					
5. ROAE	0.137***	0.159***	0.096***	-0.056*	1.000				
6. GREEN	0.185***	0.065**	0.130***	-0.092***	-0.014	1.000			
7. REIT AGE	0.202***	-0.110***	-0.219***	0.005	0.093***	-0.086***	1.000		
8. PRICE TO BOOK RATIO	0.146***	0.013	-0.023	0.092***	0.063**	-0.019	-0.001	1.000	
9. ROA	-0.004	0.083***	-0.032	-0.136***	-0.074**	-0.106***	0.123***	0.021	1.000

. ***, ** and * denote statistical significance at p-value <0.01, p-value <0.05 and p-value <0.1, respectively. Standard deviations are shown in parentheses.

Table 6: Financial Performance Multilinear Regression Procedure

Table 6 provides the results of the OLS regression procedure for all three financial analysis. It explains the financial performance using return on assets (ROA) and return in average equity (ROAE). GREEN represents the level of green investment in REITs portfolios. HORIZON represents the average investment horizon of real estate investment trust properties in years. REIT AGE represents the average age of all REITs in years. PRICE TO BOOK RATIO represents the company stock price divided it by the book value per share. WOMEN is a binary variable equal to 1 if at least one woman is on the executive board, 0 otherwise. FIRMSIZE is the natural logarithm of total assets. LEVERAGE is the ratio of total debt to total assets. ROAE is the return on average equity representing a second financial performance measure.

REIT Financial Performance Multilinear Regressions (2000-2014).

(Heteroskedasticity-robust and REIT-clustered standard errors are in brackets.)

Variables	ROA				ROAE			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
HORIZON				0.138*** [0.030]				0.542*** [0.170]
REIT AGE			0.041*** [0.009]	0.035*** [0.009]				0.064 [0.068]
FIRMSIZE		0.206** [0.108]	0.244** [0.108]	0.228** [0.107]		1.075 [0.761]	1.157 [0.744]	1.091 [0.744]
PRICE TO BOOK RATIO	0.005** [0.002]	0.005*** [0.002]	0.006*** [0.002]	0.003* [0.002]	0.066 [0.040]	0.068* [0.040]	0.070* [0.040]	0.060 [0.039]
LEVERAGE	-4.485*** [0.789]	-4.640*** [0.781]	-4.212*** [0.783]	-5.120*** [0.789]	2.249 [6.649]	1.440 [6.484]	2.347 [6.611]	-1.221 [6.846]
Constant	-0.148 [0.564]	-2.881** [1.480]	-3.624** [1.473]	-2.842* [1.498]	10.448*** [2.906]	-3.807 [10.636]	-5.379 [10.259]	-2.307 [10.403]
REIT Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
REIT Property Type Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1101	1101	1101	1101	1101	1101	1101	1101
Number of REITS	103	103	103	103	103	103	103	103
R-squared	0.483	0.485	0.500	0.508	0.314	0.316	0.318	0.322

***, ** and * denote statistical significance at p-value <0.01, p-value <0.05 and p-value <0.1, respectively. Standard deviations are shown in parentheses.

Table 7: Green Investment Level Multilinear Procedure

Table 7 provides the results of the OLS regression procedure. It explains the level of green investment in REITs portfolios. HORIZON represents the average investment horizon of real estate investment trust properties in years. WOMEN is a binary variable equal to 1 if at least one woman is on the executive board, 0 otherwise. FIRMSIZE is the natural logarithm of total assets. LEVERAGE is the ratio of total debt to total assets. REIT AGE represents the average age of all REITs in years. PRICE TO BOOK RATIO represents the company stock price divided it by the book value per share.

REIT Total Green Investment Level Multilinear Regressions (2000-2014).
(Heteroskedasticity-robust and REIT-clustered standard errors are in brackets.)

Variables	(1)	(2)	(3)	(4)	(5)
HORIZON					0.004** [0.000]
WOMEN				0.042** [0.019]	0.037** [0.015]
REIT AGE			0.000 [0.000]	0.000 [0.000]	0.000 [0.002]
FIRMSIZE		-0.000 [0.001]	-0.000 [0.001]	-0.005* [0.003]	-0.005* [0.002]
PRICE TO BOOK RATIO	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]
LEVERAGE	-0.022 [0.027]	-0.022 [0.027]	-0.211 [0.028]	-0.011 [0.023]	-0.028 [0.030]
Constant	0.205*** [0.021]	0.216*** [0.014]	0.214*** [0.014]	0.232*** [0.013]	0.244*** [0.014]
REIT Location Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
REIT Property Type Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	1101	1101	1101	1101	1101
Number of REITS	103	103	103	103	103
R-squared	0.423	0.423	0.424	0.434	0.442

. ***, ** and * denote statistical significance at p-value <0.01, p-value <0.05 and p-value <0.1, respectively. Standard deviations are shown in parentheses

Table 8: Statistical Analysis

Table 8 provides the results of the multiple criterion. The number in the model is 24 since it refers to the fixed effects employed in this research. The R-Squared is very similar to the one obtained under the fifth model of Table 7 which is 0.422. The Akaike information criterion (AIC) obtained here is -6531.065 and predicts the relative quality of a statistical model. The Bayesian information criterion (BIC) obtained here is -6527.048 and similar to the AIC. The root-mean-square deviation (Root MSE) of the selected model is 0.050, which is positive. A small Root MSE means that the data values are centralized around the mean. There is not necessarily a wrong Root MSE value, but the smaller it is typically indicating a better fit. The Schwarz Bayesian criterion (SBC) obtained is -6405.965 and in a similar manner indicates that the model selected is the optimal one. Finally, the error sum of squares (SSE) is a measure of variation within a cluster. Here the results obtain is 2.791 mean a large variation between the data has been observed.

Number in Model	Adjusted R-Square	R-Squared	C (q)	AIC	BIC	Root MSE	SBC	SSE	Variables in Model
24	0.422	0.435	7.241	-6531.065	-6527.048	0.050	-6405.965	2.791	HORIZON, WOMEN, LEVERAGE, FIRMSIZE

Appendix B

Figure 1 Investment Horizon Period Over Time

Average investment horizon period over time (2000-2014). The figure displays the average investment horizon period ending each year for the total sample composed of 188 different REITs.

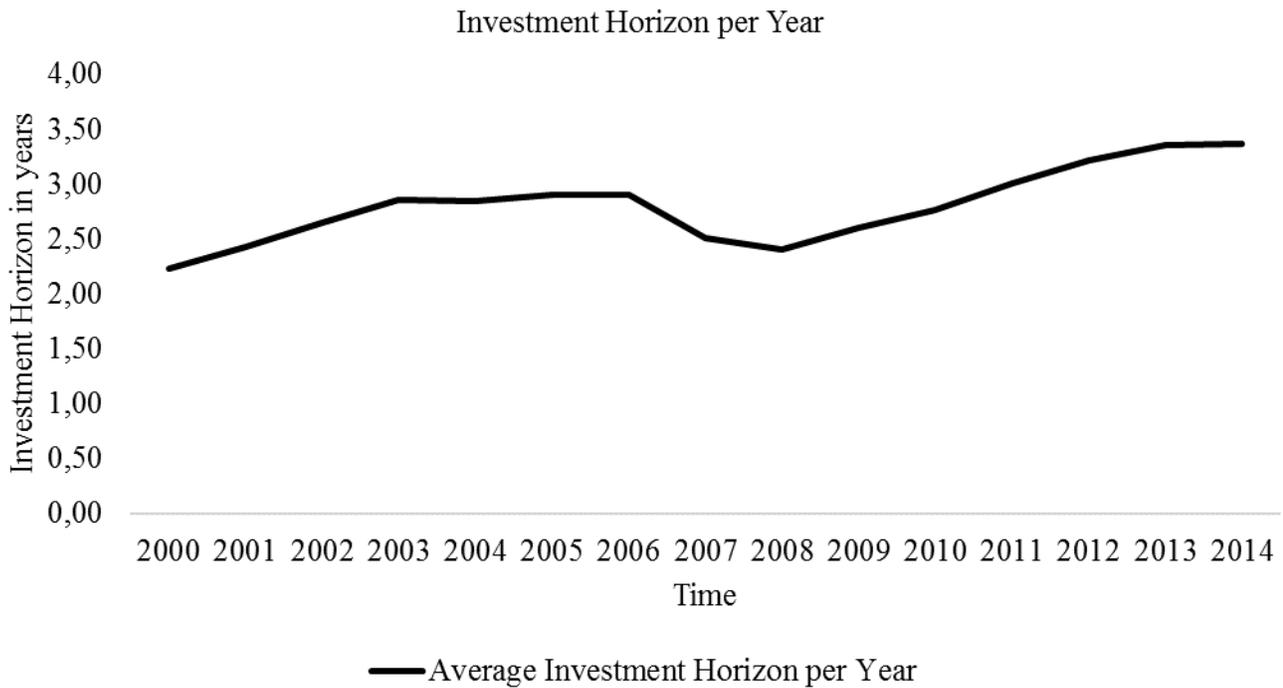


Figure 2 Portfolio Weights of Green Investment Over Time

Average portfolio weights of green investment over time (2000-2014). The figure displays the average portfolio percentage allocated to green investment buildings in REIT over time.

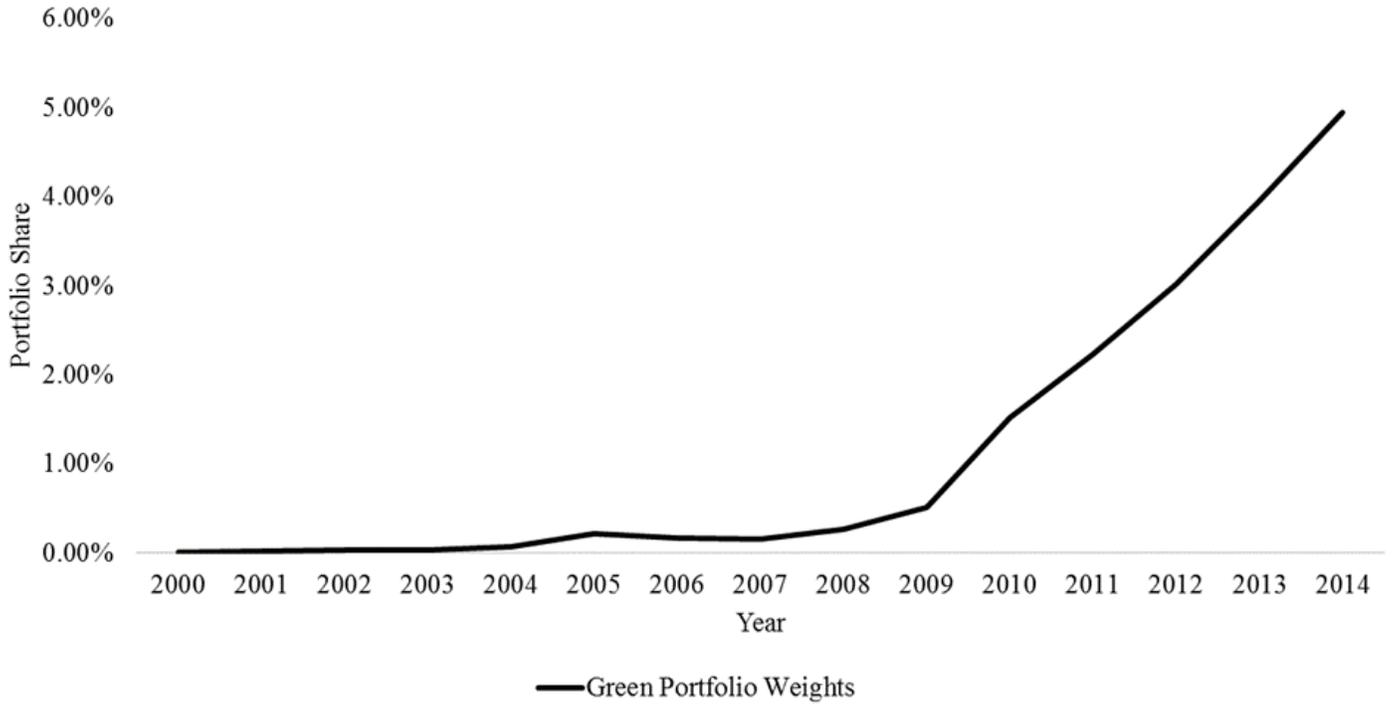


Figure 3 Leverage Over Time

Average leverage over time (2004-2019). The figure displays the average REIT leverage level per year for the total sample composed of 188 different REIT for a total of 2,280 observations.

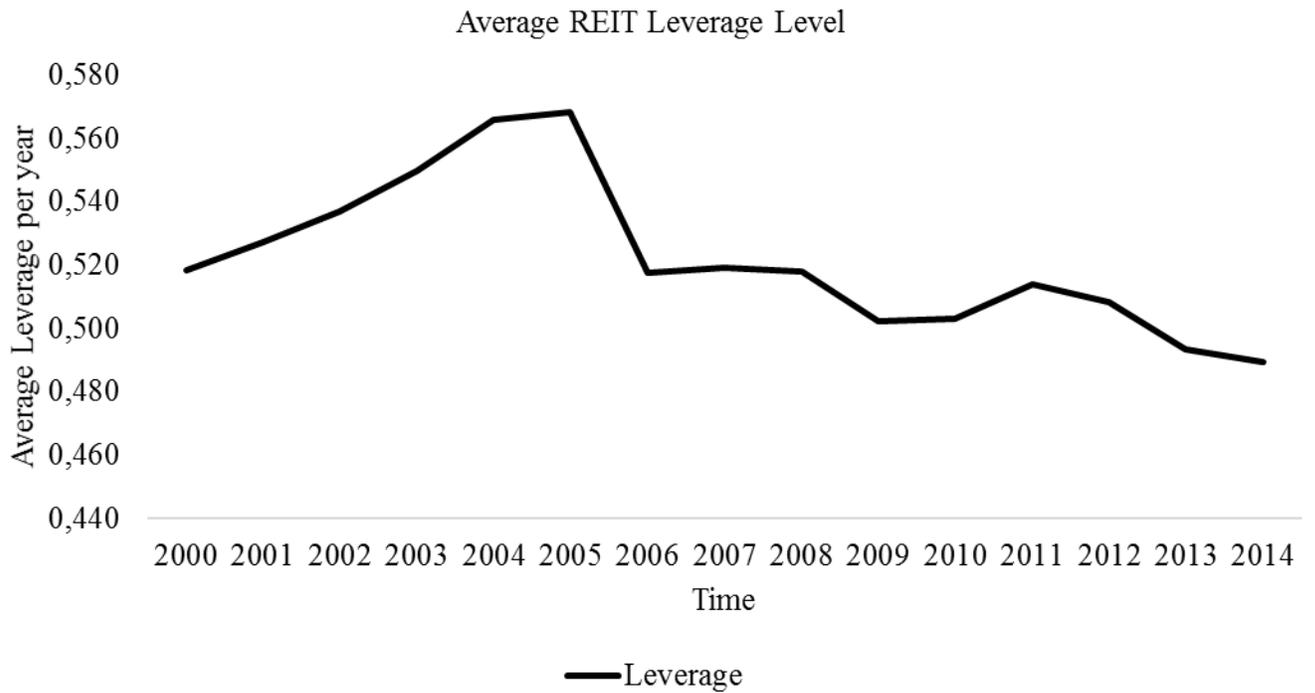


Figure 4 Price to Book Ratio Over Time

Average price to book ratio over time (2000-2014). The figure displays the average total price to book ratio per year for the total sample composed of 188 different REIT for a total of 2,280 observations.

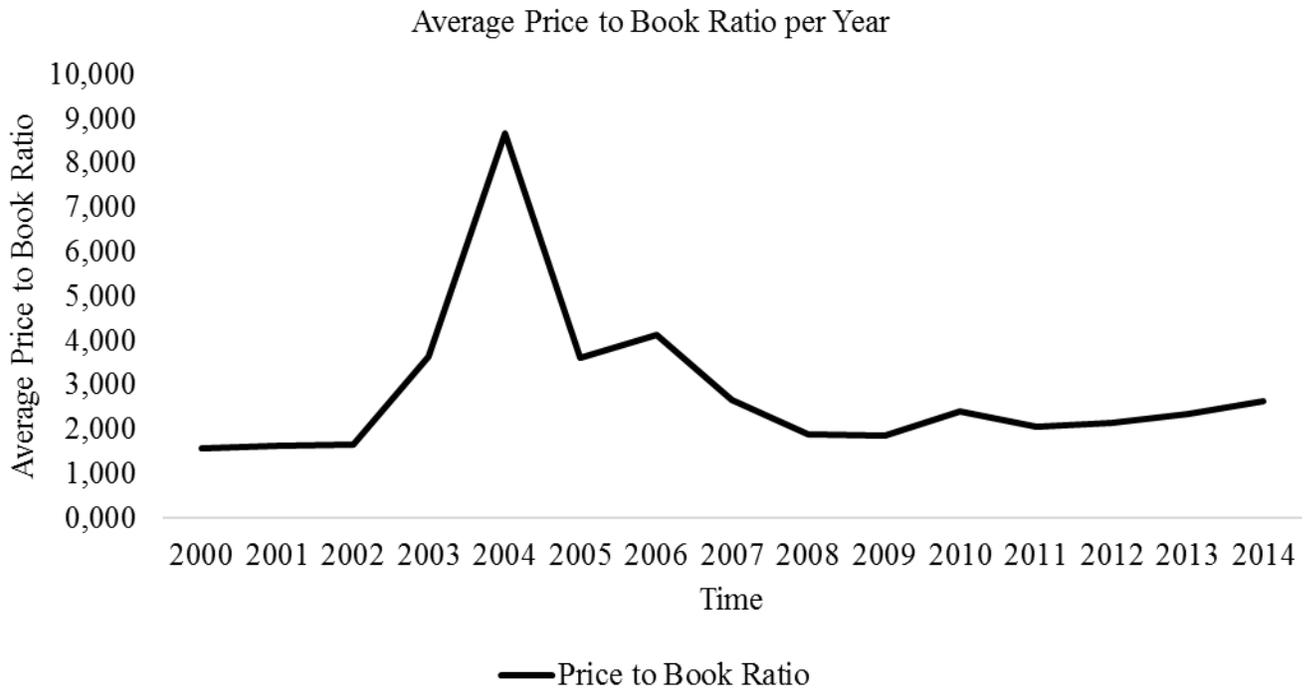


Figure 5: Return on Assets (ROA)

Average ROA for all REIT over time (2000-2014). The figure displays the average computed ROA each year for the total sample composed of 188 different REIT for a total of 2,280 observations.

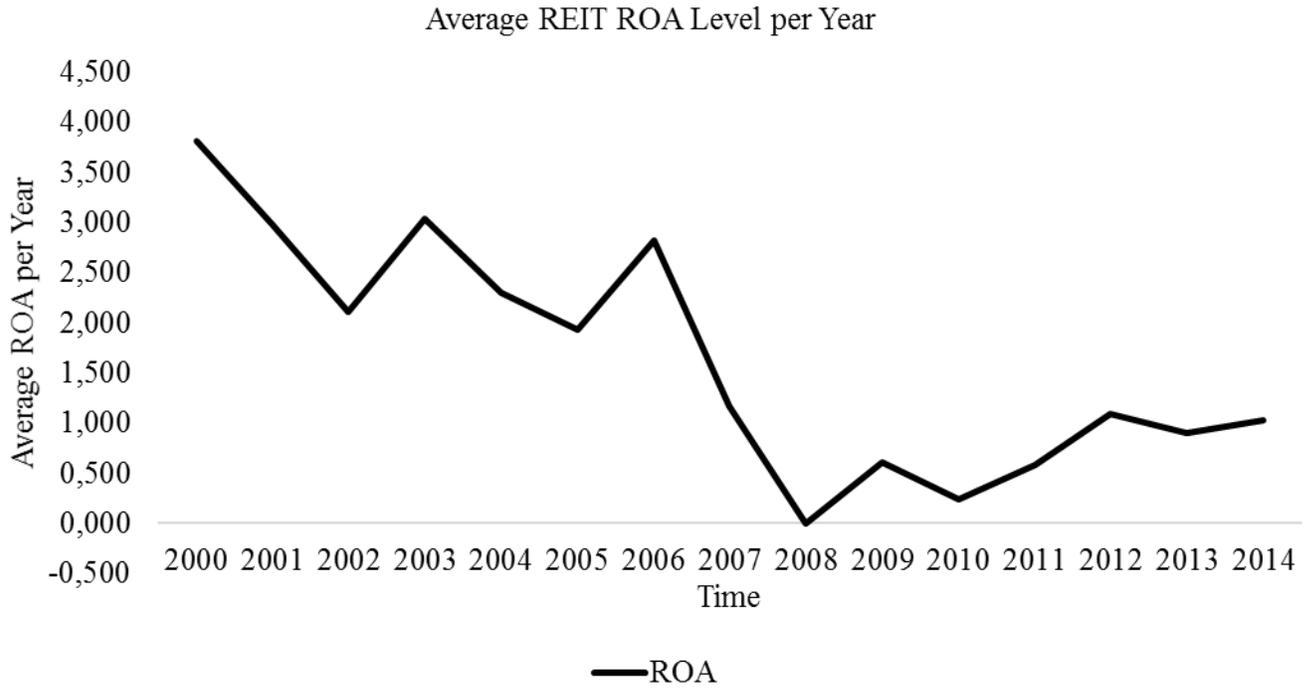


Figure 6: Firmsize Over Time

Average total firmsize over time (2000-2014). The figure displays the average total equity ending each year for the total sample composed of 188 different REIT for a total of 2,280 observations.

