An exploration of ecolabels and operating financial metrics

A first look at the multifamily rental sector

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Abstract

Purpose – As the green economic bottom line is a strong motivating force when deciding to build, manage and/or operate green, this study aims to examine the financial impacts of green certifications on multifamily rental communities.

Design/methodology/approach – Using a multiple regression methodology, operating financial variables are examined.

Findings – Multifamily rental green buildings garner not only higher rental collections but also higher total expenses. When applying these higher rates to properties, the overall increase in rents outweighs the increases in total expenses.

Originality/value – While multiple studies have focused on the office sector, this study begins to fill the literature gap within the multifamily rental sector regarding the economic impacts of green-certified buildings. The outcomes of this study have positive implications for the multifamily real estate industry by providing developers, owners, managers and related parties with a better understanding of the financial impacts of multifamily rental green buildings; however, more research is needed.

Keywords Green building, Sustainability, Multifamily rental sector, Apartments, Economic impacts, Property operations

Paper type Research paper

1. Introduction

Green building, a major driver of sustainability in the real estate industry, has recently proliferated as a solution to mitigate negative environmental externalities. With investment in global green building continuing to double every three years, it is clear that sustainable development remains and will remain a significant issue in the real estate industry worldwide (Dodge Research and Analytics, 2016). Globally, 27 per cent of firms have done more than 60 per cent of their projects green as of 2018 and this figure is expected to jump to 47 per cent of firms by 2021 (Dodge Research and Analytics, 2018). When reviewing this information, the following question presents itself:

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Q1. What is driving this increase in green building?

Numerous researchers have studied what drives the adoption of green buildings from various stakeholder perspectives. Falkenbach *et al.* (2010), looking through the lens of a real estate investor stakeholder, conducted a review based on existing research and found that increased rental income, decreased property costs and increased property value are primary drivers. Darko *et al.* (2017), by conducting a review of the existing literature for green building drivers among various stakeholders, identified 64 green building drivers and discovered that reduced whole lifecycle costs is one of the top three identified drivers in the literature. From these literature reviews, it is clear that the green economic bottom line is a strong motivating force when deciding to build green. Because financial metrics are a clear driver, existing literature regarding green building economics is reviewed across the building lifecycle as well as across building types.

1.1 The green bottom line

Building strategies that demarcate a green and conventional building include sustainable site design, water quality and conservation, energy and environment, indoor environmental quality and materials and resources (NcNeill, 2019). The issue of accounting for these green building strategies arises as the economic bottom line must be addressed. The green bottom line, a managerial accounting technique for incorporating environmental costs and benefits, is one strategy to monetize these building strategies (Bennett and James, 2017). A building life cycle cost–benefit analysis is one way to incorporate the green building bottom line. While many studies have shown that green buildings cost more upfront to build (D'Antonio, 2007; Hopkins, 2015; Kats *et al.*, 2010; Kats, 2006; Kats *et al.*, 2003; Livaich, 2010; Nyikos *et al.*, 2012; Stegall and Dzombak, 2004), the operating financial metrics should also be analyzed to account for a more holistic view of the building lifecycle. When taking into account both the cost to build a green building and its financial operating metrics, multiple researchers have found an overall positive financial picture in many cases (Hopkins, 2015; Kats *et al.*, 2010; Kats, 2006; Kats *et al.*, 2003; Livaich, 2010).

1.2 Office buildings

Considering the financial metrics of green office buildings, rents are typically higher as evidenced by much of the academic literature. Devine and Kok (2015) find rents to be 3.7 per cent higher in LEED-certified buildings and 2.7 per cent higher in ENERGY STAR-certified buildings. Eichholtz *et al.* (2010) discovered an approximately 3 per cent rent premium for Energy STAR-certified buildings, although there is no statistically significant difference in LEED-certified buildings. Fuerst and McAllister (2011) found an even higher rent premium of approximately 5 per cent higher for LEED-certified buildings and 4 per cent for ENERGY STAR-certified buildings. Pivo and Fisher (2010) found similar results with a 5.2 per cent rent premium for ENERGY STAR-certified properties. The largest rent premiums have been found by Wiley *et al.* (2010) with the premium being 7.3-8.9 per cent higher for ENERGY STAR-certified buildings and 15.2-17.3 per cent higher for LEED-certified buildings.

Higher occupancy among green-certified office buildings is also consistent among the literature with varying impacts. Pivo and Fisher (2010) found occupancy to be 1.3 per cent higher for ENERGY STAR-certified buildings, while Devine and Kok (2015) discover 4 per cent higher occupancy for LEED-certified buildings and 9.5 per cent higher occupancy for ENERGY STAR-certified buildings. Fuerst and McAllister (2009) found even higher occupancy rates among green buildings, with 8 percent higher occupancy for LEED-certified buildings and approximately 3 percent higher occupancy for ENERGY STAR certified buildings, whereas Wiley *et al.* (2010) found the highest occupancy increases with 10-11 percent higher occupancy for ENERGY STAR-certified buildings and 16.2-17.9 percent percent higher occupancy for LEED-certified buildings.

Relating to higher rents and occupancies, higher sales prices have also been garnered by green-certified office properties. Miller *et al.* (2008) determine sales prices to be approximately 10 per cent higher for LEED-certified buildings and approximately 6 per cent higher for ENERGY STAR-certified buildings. Eichholtz *et al.* (2010) found sales prices to be approximately 16 per cent higher for green-certified buildings, but when broken out between LEED and ENERGY STAR certification, LEED certification is not statistically significant. Fuerst and McAllister (2011) discovered large price premiums of 25 per cent for LEED-certified buildings and 26 per cent for ENERGY STAR-certified buildings. Wiley *et al.* (2010) also discovered large price premiums of approximately $30 per square foot for ENERGY STAR-certified buildings and approximately $130 per square foot for LEED-certified buildings.

When examining the operating expenses of an office property, the results are mixed. For example, Reichardt (2014) found that operating expenses are 5.4 per cent lower for LEED-certified buildings and 3.9 per cent higher for ENERGY STAR-certified buildings, whereas Szumilo and Fuerst (2014) reported operating expenses to be 11.2 per cent higher for green-certified (LEED and ENERGY STAR) buildings. Other research shows no statistical significance but even these results are mixed with Miller *et al.* (2010) finding approximately 4 per cent higher operating expenses for ENERGY STAR-certified buildings and Pivo and Fisher (2010) putting forth that ENERGY STAR-certified buildings have lower total operating expenses. Moreover, only net operating income has been addressed in one study showing a 2.7 per cent increase for ENERGY STAR-certified buildings (Pivo and Fisher, 2010).

1.3 Housing

As this study focuses on housing, it is important to review the current literature in this field. On the single-family side, price premiums between 2.07 and 2.43 per cent are found for homes with green features and/or green certifications in Texas (Aroul and Hansz, 2012), whereas a 5 per cent premium is found for green-certified single-family homes in California (Kahn and Kok, 2014). While there are no studies found focusing on the impact of green certification on operating revenues or total expenses within the single-family sector, this can be explained by considering that commercial real estate is typically held and evaluated on operating metrics by firms to determine property value. If this is the case, it would be reasonable to think that the multifamily sector would be explored to consider the impacts of green certifications on operating metrics.

However, the multifamily rental sector literature is sparse when considering sustainability. And although it has been found that the majority of large third-party property managers are promoting sustainability in the multifamily property management industry, only one study has examined apartment rents (Bond and Devine, 2016; Hopkins *et al.*, 2017). Bond and Devine (2016) took a first look at the impact of green certification on apartment rents and found an 8.9 per cent rent premium for LEED-certified apartment communities and a 7.6 per cent rent premium for properties that market themselves green but have no certification. To date, no studies were found which examine the impact of green certification on operating expenses or net operating income in the multifamily rental sector.

The need for 4.6 million new apartments in the USA by 2030, coupled with the lack of studies focusing on the financial impacts of green building practices and certifications within the multifamily rental sector, makes this asset class ripe for examination (We Are Apartments, 2019). Because economic forces are a major driver in the implementation of green buildings, it is imperative to understand any operating expense and revenue side impacts of green building on the multifamily rental sector. The research put forward in this manuscript begins to fill the gap on apartment operation financial metrics by providing real estate practitioners and policymakers alike with a better understanding of the influence of green building certifications on multifamily revenue and operating expense components such as net operating income (NOI), apartment rents, concessions, utilities, property insurance and maintenance and repairs as green building becomes increasingly common. The objective will be achieved by performing a data comparison and a regression analysis using the Institute of Real Estate Management's (IREM®) Income/Expense database, a leading collector of multifamily data. Understanding if multifamily green buildings affect revenue and operating expense components can help the real estate industry make more informed decisions when deciding on green certifications.

2. Data

The data provided for this study were obtained from the Institute of Real Estate Management's (IREM®) 2016 Income/Expense Analysis® report for Conventional Apartments. The Conventional Apartment report, compiled by soliciting information through surveys of IREM® members and other managers and operators of investment real estate portfolios, represents approximately 4,000 buildings nationwide with 12 or more units. The building survey is broken down into general building information, income, expenses and going green categories. For this study, the presence of a green certification within the going green category was the independent variable of interest and used as a proxy for a green building. Two property management firms that hold green buildings within their portfolios agreed to share their Income/Expense Analysis® report data for this study. These two companies, listed on the National Multifamily Housing Council's (NMHC) 2016 50 Largest Apartment Managers listing, are very large operators that hold the Accredited Management Organization (AMO®) credential (National Multifamily Housing Council, 2017).

The provided data contain 50 buildings possessing a green certification prior to 2016. Thirty-five properties within the data set received a green certification in 2016 or 2017, but only properties certified prior to 2016 were designated as green certified buildings. This ensured that parameters were equally applied among buildings by including a full year of data with the green certification in place. Similar to Eichholtz *et al.* (2010), radius criteria is used to identify comparable non-green certified buildings. In this study, a three-mile radius criteria was established because of the importance of location in determining operational financial outcomes in real estate as well as taking into account the small data set. Furthermore, the International Council of Shopping Centers (ICSC) categorizes a neighborhood center trade area size to be three miles (International Council of Shopping Centers, 2017). Once this three-mile radius criteria was implemented, 15 of the green-certified buildings did not have any non-green building comparables and were thus removed from the data set. The 35 remaining green-certified buildings had 118 non-green building comparables, creating a total sample size of 153.

When comparing the green-certified properties to the non-green comparables, they appear rather similar as evidenced in Figure 1. The average unit size difference between the two groups is only 28 square feet while the average number of units at an apartment property differs by only 31 units. The Walk score is almost identical at 73 and 74, whereas the age difference is eight years. It is not surprising that the green-certified properties are on average newer as green certifications are relatively new in the marketplace. Age may be a factor in green-certified properties offering more amenities as newer properties tend to offer a more comprehensive amenity package. In the sample, more green-certified properties offer

Figure 1.
Green-certified properties compared to non-green properties

a pool, fitness center, outdoor common area and some type of mixed-use such as an on-site restaurant to their residents.

The various green certification programs represented in the data set include 3 Austin Green Building Program certified buildings, 1 Florida Green Building Coalition certified building, four GreenPoint Rated certified buildings, 16 Leadership in Energy and Environmental Design (LEED) certified buildings, 1 ENERGY STAR® certified building and 11 National Green Building Standard (NGBS) certified buildings (36 certifications in total as 1 building is both LEED and ENERGY STAR certified). The Austin Green Building Program multifamily certification, developed in 1991 and specific to the City of Austin, TX, works on a point system with one star level representing only fulfillment of the basic requirements all the way up to a five-star level which requires the most amount of points (Austin Energy Green Building, 2019). The categories for this certification include basic requirements, team, site, energy, water, indoor environmental quality, materials and resources, education and equity and innovation. The Florida Green Building Coalition, established in 2000 and specific to the State of Florida, also operates using a point and tier system, with bronze requiring the lowest number of points and platinum requiring the highest number points. Categories for this certification include prerequisites, energy, water, lot choice, site, health, materials, disaster mitigation and general (Florida Green Building Coalition, 2019). GreenPoint Rated certification is applicable to the residential sector in the State of California and again works on a point system with certified level requiring the least amount of points and platinum requiring the most amount of points. The categories for this ecolabel include community, energy efficiency, indoor air quality and health, resource conservation and water conservation (Build It Green, 2019).

LEED certification, arguably the most popular, is an ecolabel used globally that also works on a points system with levels ranging from certified to platinum depending on the number of points. Categories for this certification include location and transportation, sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation and regional priority (LEED, 2019). ENERGY STAR certification is available across the USA and focuses only on energy. Buildings can become certified if they have a score of 75 or higher, which signifies the building is performing better than 75 per cent of similar buildings nationwide (Energy Star, 2019). The last ecolabel represented in the sample is the National Green Building Standard, a nationwide program in the USA which offers point achievement in site design, resource efficiency, water efficiency, energy efficiency, indoor environmental quality and building operation and maintenance categories (Home Innovation, 2019). Their certification levels range from bronze to emerald, with bronze requiring the least amount of points and emerald requiring the most amount of points. From reviewing the various categories among ecolabels, it can be seen that there are more similarities than differences.

Although these certifications vary in rigor, they are not able to be analyzed separately because of the limitation of the sample size. Furthermore, specific green features addressed within each ecolabel were not available for this study. Reliability of the presence of these certifications in the data set was ensured by both IREM® staff through certification websites and by the two participating property management firms.

Nineteen cities are represented in this study and the number of green-certified and non-green properties in each city is illustrated in Figure 2. Individual non-green buildings could be used as a comparable for multiple green buildings when the green buildings are situated close to each other; however, each non-green building was considered only once to ensure statistical validity of the model. In other words, including the non-green building more than once in the sample would make it appear as if there is more information and higher precision than is actually present. This means it would be possible to find significant effects when they are not actually significant.

3. Model and methodology

The conceptual model, illustrated in Figure 3, suggests that green certification is a significant factor in explaining the following 11 financial indicator-dependent variables:

(1) total rents collected;
(2) concessions;
(3) vacancy and rent loss;
(4) total collections;
(5) total utilities;
(6) maintenance and repairs;
(7) subtotal maintenance;
(8) property insurance;
(9) management fee;
(10) total all expenses; and
(11) NOI.

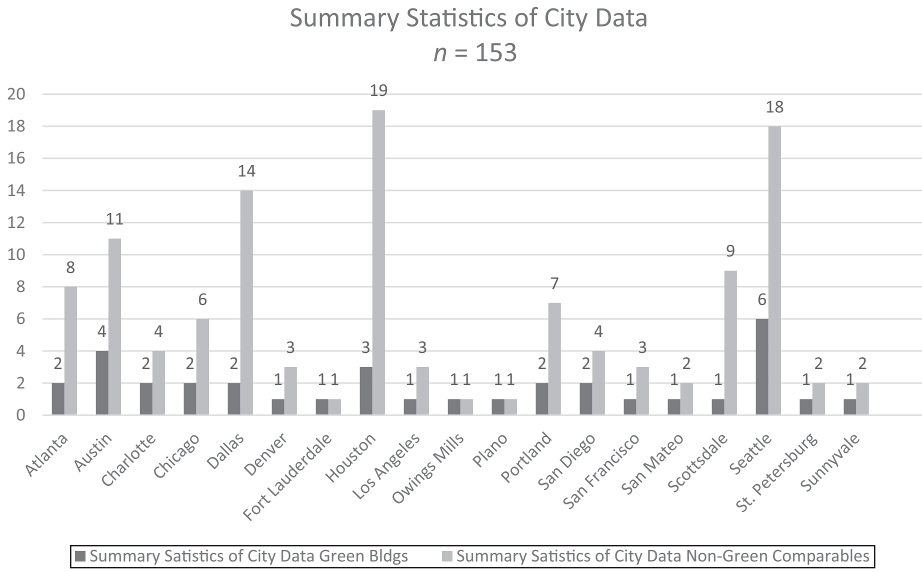

Figure 2.
Green-certified and non-green properties by US city

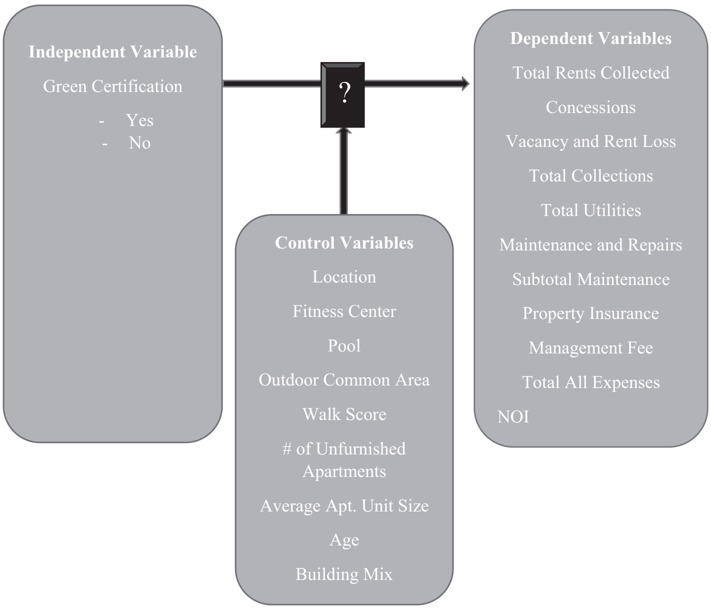

Figure 3.
Conceptual model

Table I provides definitions for the dependent variables of interest provided by IREM® on the income/expense survey. These dependent variables were chosen as the existing literature illustrates the importance of financial metrics as drivers of green buildings. Furthermore, because no studies were found to date which examine the impact of green certification on operating expenses or net operating income and only one found which examines rents in the multifamily rental sector, a plethora of operating financial metrics were chosen as dependent variables to test any impact of green-certified buildings. All dependent variables are converted to dollars per rentable square foot to account for building size differences.

The independent variable of interest is green building certification. Controlling for location- and property-specific factors is important to take into account other variable predictors of the various dependent variables. These control variables include location, fitness center, pool, outdoor common area, walk score, apartment community size, average apartment unit size, age and building mix. These controls are similar to the control variables incorporated by Bond and Devine (2016) when examining multifamily rental rates.

A dichotomous variable was created for green certification status (0 = no certification, 1 = green certified). The age variable was created as a control by subtracting the year of construction from calendar year 2016 (the year of the data set). The average apartment unit size variable was created as a control by dividing the apartments total rental floor area by the number of unfurnished apartments. A dichotomous variable was created to control for building mix (0 = multifamily, 1 = mixed-use).

A linear mixed model is fitted and all of the dependent variables are logged with the exception of concessions, as concessions had multiple zero cases. The mixed model contains a random effect for city to account for the "clustering." A three-mile radius criteria effect is not statistically feasible to include as the model lacks the degrees of freedom needed to

Dependent variables	Definition
Revenue variables	
Total rents collected	Rents collected from apartments, parking, stores and offices, and rental value of apartments given to employees as part of compensation
Concessions	Economic incentive granted by an owner to encourage the leasing of space or the renewal of a lease
Vacancy and rent loss	Subtract total rents collected from gross possible income and concessions
Total collections	Sum of total rents collected and miscellaneous income
Operating expense variables	
Total utilities	Sum of heating expense, other electricity, water and sewer, other gas and oil
Maintenance and repairs	All items of general maintenance and repairs, both interior and exterior
Subtotal maintenance	Security, grounds maintenance, maintenance and repairs: interior and exterior, painting and decorating-interior only
Property insurance	One year charges for fire, liability, theft, boiler explosion, rent fidelity bonds and all insurance premiums except those paid to FHA for mortgage insurance or employee workmen's compensation and benefit plans
Management fee	The agency fee paid directly by the building owner
Total all expenses	Sum of management fee, other administrative costs, supplies, heating expense, electricity, water and sewer, gas, building services, other operating expenses, security, grounds maintenance, maintenance and repairs (interior and exterior, painting and decorating-interior only), real estate taxes, other taxes, fees and permits, insurance, recreational amenities, other payroll
NOI	Total collections minus total all expenses

Note: FAH = Federal Housing Administration

Table I.
IREM® definitions of dependent variables

estimate location effects with regard to both city and radius for the entire data set as there are cities included with only one three-miles radius criteria within them. The green building effect and all the other covariates, including fitness center, pool, outdoor common area, walk score, number of unfurnished apartments, average apartment unit size, age and building mix, are included in the model. These independent variables were chosen as quality, location, amenities and size influence property operating revenue and expenses. Although building class information is not directly available for each building, it is indirectly taken into account because factors such as building quality, location and amenities influence building class classification.

Multiple regression is then performed to analyze the relationship between green certifications and multifamily property income statement components. The multiple regression equation is shown below where log(y) is the natural logarithm of the dependent variable (with the exception of the dependent variable concessions), X corresponds to the fixed effects, β are estimated coefficients, Z corresponds to the random effects, u are random effects coefficients, and ε is an error term:

$$\log(\mathrm{y}) = \mathrm{X}\beta + \mathrm{Zu} + \varepsilon$$

Additionally, estimated financial impacts are calculated to determine property value implications.

4. Results

Green certification is not significant for 7 out of the 11 dependent variables of interest as listed below (regression results for these dependent variables can be found in the Appendix):

(1) log vacancy and rent loss/rentable square feet (SF);
(2) log total actual collections/rentable SF;
(3) log management fee/rentable SF;
(4) log total utilities/rentable SF;
(5) log M&R/rentable SF;
(6) log NOI/rentable SF; and
(7) concessions/rentable SF.

Tables II-V show the regression results for the four variables where green certification is significant. These variables include:

(1) log total rents collected/rentable SF;
(2) log subtotal maintenance/rentable SF;
(3) log property insurance/rentable SF; and
(4) log total all expenses/rentable SF.

Holding all other variables constant, green certification leads to a significant increase in the four dependent variables of interest listed above. Total rents collected/rentable SF and subtotal maintenance/rentable SF are statistically significant at the 10 per cent level of analysis, whereas property insurance/rentable SF and total all expenses/rentable SF are statistically significant at the 5 per cent level of analysis. Walk score and number of unfurnished apartments are statistically significant for all four dependent variables. Age and building mix are also statistically significant for subtotal maintenance/rentable SF,

Table II. Log(total rents collected/rentable SF)

Independent variable	Estimate	Std error	Practical interpretation	Prob>|t|
Green certified	0.0996	0.0591	0.1047	0.0941*
Fitness center	0.0684	0.0962	0.0708	0.4783
Pool	0.0089	0.0916	0.0089	0.9231
Outdoor common area	−0.0837	0.1126	−0.0803	0.4587
Walk score	0.0065	0.0028	0.0065	0.0218**
# of unfurnished apartments	−0.0009	0.0004	−0.0009	0.0290**
Average apartment unit size	−0.0002	0.0003	−0.0002	0.5298
Age	0.0008	0.0037	0.0008	0.8237
Building mix	0.0043	0.0695	0.0043	0.9507

Note: R^2 = 33.18 %; ***indicates significance at the 1 per cent level; **indicates significance at the 5 per cent level; *indicates significance at the 10 per cent level

Table III. Log(subtotal maintenance/rentable SF)

Independent variable	Estimate	Std error	Practical interpretation	Prob>|t|
Green certified	0.1181	0.0708	0.1254	0.0976*
Fitness center	0.0409	0.1149	0.0418	0.7221
Pool	0.1516	0.1008	0.1637	0.1377
Outdoor common area	−0.0781	0.1332	−0.0751	0.5587
Walk score	0.0119	0.0033	0.0120	0.0004***
# of unfurnished apartments	−0.0008	0.0005	−0.0008	0.0838*
Average apartment unit size	0.0005	0.0004	0.0005	0.1980
Age	0.0104	0.0045	0.0105	0.0207**
Building mix	0.2440	0.0812	0.2764	0.0031***

Note: R^2 = 32.18 %; ***indicates significance at the 1 per cent level; **indicates significance at the 5 per cent level; *indicates significance at the 10 per cent level

Table IV. Log(property insurance/rentable SF)

Independent variable	Estimate	Std error	Practical interpretation	Prob>|t|
Green certified	0.1239	0.0627	0.1319	0.0503**
Fitness center	−0.0035	0.1025	−0.0035	0.9726
Pool	0.0227	0.1040	0.0230	0.8273
Outdoor common area	0.0156	0.1207	0.0157	0.8974
Walk score	0.0073	0.0030	0.0073	0.0175**
# of unfurnished apartments	−0.0010	0.0004	−0.0010	0.0180**
Average apartment unit size	−0.0006	0.0004	−0.0006	0.0739*
Age	0.0010	0.0040	0.0010	0.8091
Building mix	−0.0520	0.0749	−0.0507	0.4887

Note: R^2 = 39.02 %; ***indicates significance at the 1 per cent level; **indicates significance at the 5 per cent level; *indicates significance at the 10 per cent level

whereas average apartment unit size is also significant for property insurance/rentable SF and pool is also statistically significant for total all expenses/SF.

The financial impacts of green certification on the dependent variables of interest are then estimated on a square foot basis, apartment unit basis and property basis, as illustrated in Table VI. The average apartment size of the data set is 887 square feet and the average number of units in the data set is 252. The dollar change per square foot is calculated by multiplying the average dollar per square foot of the non-green buildings in the data set by the practical interpretation of green certification. The apartment unit basis impact is calculated by multiplying the dollar change per square foot by the average apartment unit size of the data set of 887 square feet. On an apartment unit basis, green certification increases total rents collected by $2,189, subtotal maintenance by $178, property insurance by $42 and total all expenses by $990. On a per property basis, green certification increases total rents collected by $551,683, subtotal maintenance by $44,843, property insurance by $10,601 and total expenses by $249,535.

5. Discussion

The financial impacts of green certifications on multifamily communities are significant. Although total operating expenses increase, the increase to rents collected is substantially greater. These results are encouraging, but do not take into account any upfront costs to attain the green certification status. While this upfront green premium can range from −0.4 to −21 per cent, the majority of green cost premiums range from more than 0 per cent to less than 5 per cent (Dwaikat and Ali, 2016). Moreover, some buildings in the data set may have green features, but do not have a certification because of barriers such as documentation and cost requirements. As green certified buildings continue to diffuse into the building industry, the green premium should decrease as technologies mature and more builders, architects and building owners/managers gain more experience with the various certifications.

There are also other attributes that would influence the green building's NOI which are not part of this study such as apartment unit finishes and unit mix. It should also be noted that the dataset only contains 35 green-certified apartment communities so future research

Independent variable	Estimate	Std error	Practical interpretation	Prob>|t|
Green certified	0.1232	0.0565	0.1311	0.0311**
Fitness center	0.0096	0.0919	0.0097	0.9168
Pool	0.1610	0.0847	0.1747	0.0607*
Outdoor common area	−0.0362	0.1072	−0.0355	0.7361
Walk score	0.0087	0.0026	0.0088	0.0012***
# of unfurnished apartments	−0.0009	0.0004	−0.0009	0.0216**
Average apartment unit size	−0.0002	0.0003	−0.0002	0.6220
Age	0.0016	0.0036	0.0016	0.6614
Building mix	0.0158	0.0658	0.0159	0.8106

Note: R^2 = 29.43 %; *** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; *indicates significance at the 10 per cent level

Table V. Log(total all expenses/rentable SF)

Dependent variable	Per square foot	Per apartment unit	Per property
Total rents collected	$2.47	$2,189	$551,683
Subtotal maintenance	$0.20	$178	$44,843
Property insurance	$0.05	$42	$10,601
Total expenses	$1.12	$990	$249,535

Table VI. Green certification financial impacts with a larger dataset is recommended. Furthermore, the data is based on self-reports from property management firms so accuracy of figures cannot be confirmed. Finally, the requirements and visibility vary among green certification programs and levels, which may affect the results.

Although a bit more positive, the 10.5 per cent increase in total rents collected for green certified buildings is in line with Bond and Devine's (2016) findings of an 8.9 per cent asking rent premium. Different motivations for paying that higher rent may be in play. For example, potential residents of green-certified multifamily communities may assume that the savings in utility bills from efficient operations will offset the higher rent. Additionally, residents may also have philanthropic and prestige motives. For example, some residents may choose green-certified properties because they live environmentally conscious lifestyles, whereas others may choose to live in an eco-labeled building as a status symbol and to signal to their peers that environmentally friendly behavior is important to them. Furthermore, rents may also be higher because market-rate green-certified properties tend to be newer and in higher income areas, and newer buildings typically offer the more sought-after amenities and finishes, and higher income markets likely have higher rents.

It is surprising that the green-certified multifamily communities in this study have statistically significant higher operating expenses as many anecdotally claim green-certified buildings have lower expenses. As there has been no study done to date that focuses on the impacts of green building certifications in the multifamily rental sector, there is no study to use to truly compare these operating expense results. When comparing these results to the existing studies focusing on the office sector, they are somewhat in line with the findings of Szumilo and Fuerst (2014). Because many of the certifications represented in this study focus on the design phase of the building versus the operations and maintenance phase, perhaps there are many missed opportunities to increase operational efficiency. And although promotion of sustainability is on the rise in the multifamily housing sector, multifamily sector staff may still remain unfamiliar with the unique operations and maintenance of green buildings (Hopkins *et al.*, 2017). Additionally, perhaps it may cost more to maintain the various newer amenities and technologies typical in market-rate green properties such as a green roof. Furthermore, it was unexpected that there was no significant impact of green buildings on utilities. Perhaps, this is because of the split incentive issue commonly seen in multifamily rental housing where there is no financial incentive for the building owner to invest in energy efficiency if residents are paying their own utility bills. Therefore, other benefits, not lower operating costs, appear to be main drivers of higher rents in green-certified buildings, although many believe lower operating expenses contribute to higher rents in green-certified buildings.

6. Conclusion

With US construction spending totaling $1.25tn in 2017, there is a large opportunity for greening new buildings (Jones Lang LaSalle, 2018). This greening could significantly mitigate negative environmental impacts caused by buildings. Specific to the multifamily rental sector, huge green building opportunities can be seized, especially if they yield favorable financial outcomes as apartment homes represent $1.3tn to the US economy and there is a possibility of 5 million new rental households by 2023 (National Multifamily Housing Council, 2015). Further greening in the multifamily rental sector can have a positive impact on society in multiple ways. For example, consumers would have greater access to green buildings which can positively impact health through better indoor air quality. Furthermore, employees within the multifamily rental industry would have greater exposure to green building features which can reduce the learning curve of green buildings and bring down the cost of maintenance and operations because of familiarity. Additionally, the environment would not be as strained because materials could be sourced locally and in a more sustainable fashion. However, upfront capital constraints, regulatory issues and marketing concerns may diminish the attractiveness of multifamily green building certification if not properly managed.

The outcomes of this study have positive implications for the multifamily real estate industry decision-makers by providing developers, owners, managers and related parties with a better understanding of the operating financial impacts of multifamily rental green buildings. While encouraging environmental stewardship, multifamily rental green buildings garner higher rent collections but also higher expenses as a percentage. However, when applying these green impact percentages to an apartment community, the increase in rents collected outweighs the increase in total expenses. These results can be an opportunity for decision-makers to reconsider their policies regarding green building as the multifamily rental sector lags behind the commercial sector in green buildings.

While increased rents can be a driver for change, organizations need to consider many other factors when considering policy options related to green buildings, including the full building lifecycle, the structure and culture of the organization and the geographical markets which the organization operates. Although findings reported in this study provide the financial argument for green certification in the multifamily rental sector, more research is needed. There is optimism that this study can be the impetus for further research contributions relating to the financial, environmental and satisfaction impacts of green buildings within the multifamily rental sector.

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Further reading

Hopkins, E.A. (2018a), *Money Matters: Exploring the Financial Impacts of Green Certifications in the Multifamily Rental Sector*, Presentation, Fort Lauderdale, FL.

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Appendix. Regression results for dependent variables where green certification is not significant

Independent variable	Estimate	Std error	Practical interpretation	Prob>|t|
Green certified	−0.0318	0.0916	−0.0313	0.7289
Fitness center	0.1008	0.1480	0.1060	0.4969
Pool	0.1126	0.1133	0.1192	0.3253
Outdoor common area	0.2673	0.1691	0.3064	0.1162
Walk score	0.0102	0.0041	0.0102	0.0140
# of unfurnished apartments	−0.0003	0.0006	−0.0003	0.6769
Average apartment unit size	−0.0003	0.0005	−0.0003	0.6067
Age	−0.0026	0.0056	−0.0026	0.6428
Building mix	0.0099	0.1008	0.0099	0.9219

Note: R^2 = 6.45 %

Table AI. Log(vacancies and rent loss/rentable SF)

Independent variable	Estimate	Std error	Practical interpretation	Prob > |t|
Green certified	0.0944	0.0579	0.0991	0.1052
Fitness center	0.0739	0.0942	0.0767	0.4343
Pool	0.0130	0.0886	0.0131	0.8834
Outdoor common area	−0.0794	0.1102	−0.0764	0.4721
Walk score	0.0066	0.0027	0.0066	0.0176
# of unfurnished apartments	−0.0008	0.0004	−0.0008	0.0322
Average apartment unit size	−0.0002	0.0003	−0.0002	0.5034
Age	0.0015	0.0037	0.0015	0.6799
Building mix	0.0249	0.0678	0.0252	0.7140

Note: R^2 = 32.19 %

Table AII. Log(total actual collections/rentable SF)

Independent variable	Estimate	Std error	Practical interpretation	Prob > |t|
Green certified	0.0199	0.0593	0.0201	0.7382
Fitness center	−0.0082	0.0958	−0.0082	0.9319
Pool	0.0174	0.0772	0.0176	0.8236
Outdoor common area	0.0153	0.1104	0.0154	0.8898
Walk score	0.0070	0.0028	0.0071	0.0139
# of unfurnished apartments	−0.0014	0.0004	−0.0014	0.0007
Average apartment unit size	−0.0005	0.0003	−0.0005	0.1317
Age	0.0014	0.0037	0.0014	0.7146
Building mix	−0.0674	0.0657	−0.0652	0.3066

Note: R^2 = 16.97 %

Table AIII. Log(management fee/rentable SF)

Independent variable	Estimate	Std error	Practical interpretation	Prob>|t|
Green certified	0.0873	0.0646	0.0912	0.1786
Fitness center	0.1176	0.1048	0.1248	0.2639
Pool	0.0116	0.0929	0.0116	0.9012
Outdoor common srea	0.0223	0.1217	0.0225	0.8551
Walk score	0.0069	0.0030	0.0069	0.0228
# of unfurnished apartments	−0.0007	0.0004	−0.0007	0.1153
Average apartment unit size	−0.0003	0.0004	−0.0003	0.3381
Age	0.0049	0.0041	0.0049	0.2314
Building mix	−0.1198	0.0742	−0.1129	0.1087

Note: $R^2 = 21.71$ %

Table AIV.
Log(total utilities/rentable SF)

Independent variable	Estimate	Std error	Practical interpretation	Prob>|t|
Green certified	0.0937	0.0639	0.0983	0.1447
Fitness center	0.0038	0.1036	0.0038	0.9711
Pool	0.1320	0.0887	0.1411	0.1414
Outdoor common area	−0.0522	0.1198	−0.0508	0.6639
Walk score	0.0110	0.0029	0.0111	0.0002
# of unfurnished apartments	−0.0009	0.0004	−0.0009	0.0377
Average apartment unit size	0.0001	0.0004	0.0001	0.8665
Age	0.0076	0.0040	0.0077	0.0586
Building mix	0.0598	0.0727	0.0616	0.4122

Note: $R^2 = 26.20$ %

Table AV.
Log(M&R/rentable SF)

Independent variable	Estimate	Std error	Practical interpretation	Prob>|t|
Green certified	0.0932	0.0702	0.0977	0.1863
Fitness center	0.1113	0.1144	0.1177	0.3325
Pool	−0.0609	0.1107	−0.0591	0.5838
Outdoor common area	−0.1393	0.1341	−0.1300	0.3006
Walk score	0.0045	0.0033	0.0045	0.1797
# of unfurnished apartments	−0.0007	0.0005	−0.0007	0.1306
Average apartment unit size	−0.0002	0.0004	−0.0002	0.6220
Age	0.0035	0.0045	0.0035	0.4386
Building mix	0.0489	0.0829	0.0501	0.5562

Note: $R^2 = 36.69$ %

Table AVI.
Log(NOI/rentable SF)

Table AVII.
Concessions/rentable SF

Independent variable	Estimate	Std error	Practical interpretation	Prob > |t|
Green certified	0.1111	0.1815	0.1175	0.5416
Fitness center	−0.5094	0.2955	−0.3991	0.0871
Pool	−0.0886	0.2792	−0.0848	0.7519
Outdoor common area	0.4576	0.3456	0.5803	0.1876
Walk score	0.0121	0.0086	0.0121	0.1609
# of unfurnished apartments	−0.0007	0.0012	−0.0007	0.5606
Average apartment unit size	−0.0003	0.0010	−0.0003	0.7532
Age	0.0130	0.0115	0.0131	0.2598
Building mix	−0.3720	0.2130	−0.3106	0.0828

Note: R^2 = 24.02 %

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