

## **2 Sustainable Building Certification and the Rent Premium: A Panel Data Approach**

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## 2 Sustainable Building Certification and the Rent Premium: A Panel Data Approach

### 2.1 Introduction

The emergence and rapid growth of voluntary certification systems such as Energy Star and LEED in the U.S. are reflective of a paradigm shift towards increased environmental awareness in the commercial real estate industry. The main objective of these certifications is to impart information on a building's degree of energy efficiency and sustainability to both occupiers and investors. Although environmental certification has only recently emerged from a niche market to becoming a mainstream phenomenon, a number of prominent pricing studies of *green buildings* have been conducted in the past three years. Apart from case studies of individual properties, several cross-sectional and pooled studies, which will be reviewed below, have demonstrated that certified buildings command higher rental rates compared to non-certified buildings. However, a potential shortcoming of these studies is that pricing dynamics cannot be studied in a cross-sectional framework as it only provides a snapshot of environmental labeling and certification at a certain point in time. More importantly, it is difficult to rule out in a cross-sectional study that any observed price premia were genuinely caused by eco-certification and not by unobserved pre-existing characteristics that subsequently cause both certification and higher prices.

This study takes the analysis of the effects of Energy Star labeling and LEED certification on property's rental rates and occupancy rates one step further by applying panel data regressions, specifically difference-in-differences (DID) and fixed-effects models. These models allow controlling for unobserved effects, thereby mitigating a potential omitted variable bias present in many cross-sectional studies. Fixed-effects models also provide us with an estimate of the dynamic behavior of the rent premium

over time. A relatively long time series of nearly ten years of quarterly observations is used to estimate a ‘green’ rental premium index for a large sample of labeled buildings. A key expectation is that the rent premium for labeled and certified buildings has been growing over time fueled by rising concerns for the environment, higher energy prices and heightened interest in more sustainable properties. However, the sharp decline in the economy in 2007 and the following quarters may have had a dampening effect on rent premiums.

We analyze a sample of 7,140 office buildings, 1,768 of which are certified and 5,372 are non-certified control buildings. The buildings are located in the 10 largest metropolitan markets across the U.S. The DID models show a significant rent premium for Energy Star from 2004 to 2007. The fixed-effects models suggest an average rent premium of 2.5% for Energy Star and 2.9% for LEED certification over the observation period. Rent premiums for Energy Star only emerge in 2006. They continuously increase until the second quarter of 2008, when the average rent premium reaches 7%, but then decrease in the wake of the economic crisis. Energy Star labels also have a significant positive effect on occupancy rates.

The remainder of the chapter is organized as follows. Section two gives an introduction to the LEED certification and Energy Star labeling systems and explores how the quality of the characteristics associated with building certification may translate into higher rents. We then review the empirical and theoretical literature. Section three describes the data and model specification of the DID and panel data regressions followed by a discussion of the results. We conclude with an outlook on future research necessary for establishing a firm empirical link between sustainability and the rental value of a commercial property.

## **2.2 Background and Research Problem**

In commercial real estate markets a number of voluntary labeling and certification schemes exist. The main objective of these labels and certificates is to reduce information asymmetries between landlord and tenant or seller and buyer concerning important

sustainability features of a building. Each certification scheme has a particular focus on certain aspects of sustainability, be it energy efficiency, greenhouse gas emissions or sustainable materials and processes. The following section reviews the two prevailing certification systems for office buildings in the U.S., Energy Star and LEED.

### **2.2.1 Sustainable Building Certification**

An obvious difference between the Energy Star and LEED certification schemes is that the former solely focuses on the energy efficiency of buildings whereas the latter encompasses a broader concept of sustainability.<sup>1</sup>

Energy Star is a federal program by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy and has been available for commercial buildings since 1999. The Energy Star label is awarded if a building's energy efficiency scores in the top quartile based on EPA's National Energy Performance Rating System. The energy efficiency of a building is compared to the values achieved by a group of its peers and is rated on a scale from 1-100. Buildings must earn a score of at least 75 to earn the Energy Star label. The number of Energy Star rated space has increased from 575 million square feet in 2006 to 1,400 million square feet in 2009 (U.S. Environmental Protection Agency, 2009b). As of April 2010, 3,847 office buildings have been Energy Star rated.

The LEED certification system was developed by the U.S. Green Building Council (USGBC) in 1999. This scheme awards points for satisfying specific sustainability criteria in seven categories. These categories relate to sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation in design, and regional priority. According to the number of points

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<sup>1</sup> A number of terms are used synonymously for sustainability in the real estate industry, the most common of these being Green Building, Energy Efficiency, Eco-Efficiency, Environmental Efficiency, Zero Carbon and High Performance Building. Most of these terms focus primarily on environmental aspects, while sustainability set out to be a much broader concept which also considers economic and social aspects (Elkington, 1998). Lützkendorf and Lorenz (2007) define a sustainable building to be a building with optimized life cycle costs, which avoids or minimizes the harm to the environment, occupants, and neighbors of the building.

reached by a building, different levels of LEED certification are conferred. For example, the four levels of LEED v3 for New Construction and Major Renovation are *certified* (40-49 points), *silver* (50-59 points), *gold* (60-69 points) and *platinum* (80 points and above). The number of LEED certified buildings has increased considerably since 2005. Data collected by the USGBC indicate that in December 2005 a total of 468 buildings had been LEED certified and 1,903 were registered for certification. By mid-2009, 3,073 buildings had been certified and 27,066 had been registered. By April 2010, these numbers had increased to a total of 5,384 certified and 27,167 registered buildings.<sup>2</sup>

Empirical studies of cost premiums for construction and refurbishment report a relatively wide range of values. While most studies find a relatively low cost premium of 0 to 3% for most LEED standards (Kats, 2003; Matthiessen and Morris, 2007; Miller et al., 2008), other studies document higher costs for LEED certification, between 4.5 and 11% depending on the certification standard (Northbridge Environmental Management Consultants, 2003). However, most studies show that the reduced operating costs of the buildings more than offset the additional construction costs over the buildings' life cycle. A controversially discussed study by ConSol (2008) arrives at a less optimistic conclusion. Applying energy models to a typical suburban office building, ConSol conclude that a building specification with an energy efficiency target 30 percent better than current building codes require would not be able to recoup the cost within a 10-year period.

### 2.2.2 Advantages Ascribed to Sustainable Office Buildings

Rapid growth in both public attention and the number of certified buildings has been enhanced by the Corporate Social Responsibility (CSR) activities of large multinational corporations. Companies pursue CSR strategies for a variety of reasons. Several studies show a strong positive relationship between CSR and corporate financial performance (Orlitzky, 2003). Companies pursuing a strong CSR agenda may also be able to attract more investors and customers (Milgrom and Roberts, 1989). Within their CSR strategies,

<sup>2</sup> These numbers are taken from the USGBC project list, available at <http://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx>

an increasing number of companies now focus on sustainable buildings. For instance, Eichholtz et al. (2009) identify the government, the environmentally sensitive oil industry and legal and financial services as the largest consumers of sustainable space. In addition, Pivo and McNamara (2005) report that institutional real estate investors are increasingly realizing the financial benefits associated with responsible property investing (RPI).

Tenants of sustainable space hypothetically benefit from a number of advantages. A major economic benefit of sustainable space is reduced energy use. The associated cost savings can be large if one considers that energy savings of up to 30 percent are possible for much of the commercial building stock (Kats, 2003).<sup>3</sup> A number of studies show that buildings, which are LEED certified, use considerably less energy than conventional buildings (Turner and Frankel, 2008; Fowler and Rauch, 2008). Other studies, however, find that the energy use of LEED certified buildings varies considerably or that these buildings do not necessarily save energy (Barrientos et al., 2007; Newsham et al., 2009; Scofield, 2009). Pivo and Fischer (2010) find that utility expenses in Energy Star buildings were 12.9% lower per square foot per year.

Further advantages include image and reputation increases for the tenants (Frombrun and Schanley, 1990), increased worker productivity and retention rates of employees, reduced staff turnover, and reduced employee absenteeism (Turban and Greening, 1997, Romm and Browning, 1998, Miller et al., 2009). Although hard to quantify and often neglected, these advantages can be of significant value to occupants as employee costs make up approximately 80 percent of the total costs of enterprises. Studies have shown that employee productivity can be increased by two to ten percent when relocating from a conventional building to a sustainable building (Lucuik, 2005). In a similar vein, Romm and Browning (1998) have shown that an increase in employee productivity by one percent can provide savings to the company that exceed their entire energy bill.

An economic advantage of sustainability for investors in commercial real estate is that sustainable buildings are likely to have longer economic lives, a lower marketability

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<sup>3</sup> The savings, however, occur to tenants only if space is leased on a net basis.

risk, and a lower risk of technical and regulatory obsolescence (Eichholtz et al., 2010a). Finally, energy-efficient buildings can insure against future energy price increases and tighter government regulations.

However, while studies across several industries have found evidence of a general willingness to pay a premium for goods and services with reduced environmental impact (Teisl et al., 2002; Maguire et al., 2004; Casadesus-Masanell et al., 2009), it should be emphasized that the existence of the benefits described above does not necessarily guarantee economic efficiency or an increase in social welfare. For example, Kotchen (2006) demonstrates that green markets can have detrimental effects on environmental quality and social welfare under certain conditions. Mahenc (2007) contends that green products are likely to be overpriced when consumers cannot ascertain the true environmental performance of a product. Producers may well take advantage of the asymmetric information by signaling a clean product and raising the price above the full information equilibrium price. This may be the case with some types of sustainable buildings where actual environmental performance is not known in advance by buyers or tenants. For example, a recent study by Scofield (2009) shows that LEED office buildings do not use less source energy (total amount of raw fuel that is required to operate the building) than comparable non-LEED buildings. Ibanez and Grolleau (2009) find that eco-labeling may achieve a positive environmental outcome, but eco-labeling alone is unlikely to be sufficient for internalizing all negative externalities. Dosi and Moretto (2001) find that improved environmental outcomes can be achieved only if eco-labeled products serve as substitutes for conventional products.

While it is not within the scope of this study to test whether any rent premiums found in the empirical analysis are due to overpricing or do indeed reflect genuinely superior economic benefits or utility, our analysis tests whether tenants are willing to pay a premium for occupying eco-certified buildings.<sup>4</sup>

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<sup>4</sup> Eichholtz et al. (2010a) and Eichholtz et al. (2010b) disentangle the rent premium in more detail. However, the information on the historic energy consumption and operating expenses of both the certified buildings and the control buildings, which is necessary to disentangle the premium in this study, are not available to the authors.

### 2.2.3 Market Dynamics of Sustainable Buildings

Several recent economic and societal trends appear to have favored the rise of *green buildings*. Pivo and Fischer (2010) argue that the shift in the demand for energy efficient buildings is due to the increase in energy prices since 1998. Accompanied by an increased awareness of environmental issues and tougher government regulations, sustainability has thus become an integral part of building design. An inspection of the media coverage reveals that references to the term '*Green Building*' have increased dramatically since 2005.<sup>5</sup> At the same time, a growing body of knowledge has emerged that emphasizes the benefits of sustainable buildings.

In the short-run, due to the construction, renovation and certification lag, the supply of eco-certified space is assumed to be inelastic. Although the number of LEED and Energy Star rated buildings has grown considerably since 2005, their share of the national office building stock is still relatively small. Figures on the proportion of eco-certified buildings in the total market differ widely. McGraw Hill Construction (2009) reports that only about 1% of buildings are certified, a more recent query of the CoStar system (January 2011) suggests that 11.8% of office space is either LEED or Energy Star rated. Regardless of the exact percentage, it is clear that demand for eco-certified space has outstripped supply in recent years which drives rent premia found in previous studies. In the medium and long run, however, supply of sustainable space is likely to increase, which may erode any fraction of the rent premium that is attributable to current excess demand. It is debatable whether the segment of state-of-the-art certified properties with the highest environmental performance will always command a premium above and beyond mere cost savings that originates from image gains and product differentiation irrespective of increased supply and market penetration levels of sustainable buildings in the future. In 2008, the sustainable market was about 10-12% of non-residential construction. Projections for the U.S. show that, in 2013, *green buildings* will make up

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<sup>5</sup> A search in newspapers for 'Green Building' via Lexis Nexis shows that the number of hits increases from 1,010 hits in 2000 to 2,896 in 2005 and to more than 3,000 in 2006. A search via newslibrary.com, which includes 3,312 newspapers and other news sources in the US, returns 402 hits in 2000, 3,501 hits in 2005, 13,939 in 2007 and 18,432 in 2009. A search in the Google news archive also reveals a drastic increase from 2006 to 2008.

around 20-25% of total construction (McGraw Hill Construction, 2009). This trend is reinforced by the fact that an increasing number of jurisdictions require some degree of certification for new construction.

Apart from these demand and supply dynamics, the downturn in financial markets since 2007 has led to a sharp decrease in office rents and may also have affected rent premiums for environmental certification.<sup>6</sup> Although the pressure on companies to behave in a socially responsible manner is undiminished, sustainability may no longer be on top of companies' agendas as economic problems and cost-cutting measures prevail (McNamara, 2009). Kahn and Kotchen (2010), for example, find that increasing unemployment rates are associated with a reduced concern for climate change (Kahn and Kotchen, 2010). A study by Knight Frank (2008) shows that sustainable factors had fallen to last place among leasing priorities in 2008. However, surveys conducted after the onset of the financial crisis show that tenants tend to maintain their long-term sustainability commitments (Panel Intelligence, 2008). This also holds true for real estate related decisions (Jones Lang LaSalle, 2008). The time series dimension in our data will allow us to analyze how the rent premium interacts with the trends outlined above.

#### **2.2.4 Existing Studies**

A number of cross-sectional studies, drawing on the CoStar database, use hedonic OLS regressions to determine the rent and sales price premia associated with sustainable building certification. Miller et al. (2008) compare a filtered sample of Class A buildings to 927 certified Class A buildings while controlling for size, location, and age of the buildings. They find rent premiums for Energy Star and LEED of 6% and 10%, respectively, although these results are not statistically significant at conventional levels (Miller et al., 2008). An important limitation of this study is that it does not control for micro location effects. Wiley et al. (2010) focus on the effect of certification on asking rents, occupancy rates and sales prices of Class A buildings that are located in 46 office markets across the U.S. They also use a hedonic OLS approach and find rent premiums of

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<sup>6</sup> The average rent of the ten markets in the analysis decreases by 7.7% from 2008 Q1 to 2009 Q4.

15% to 18% for LEED and 7% to 9% for Energy Star depending on how the model is specified. Furthermore, 10% to 11% higher occupancy rates for Energy Star certification and 16% to 18% for LEED are found. Eichholtz et al. (2010a) also use a hedonic framework to test the effect of certification on the contract rents of 10,000 office buildings, including 694 certified buildings. In order to find comparable buildings within the CoStar database they use GIS techniques with a radius of 0.25 miles around each certified building. They find a rent premium of 3.3% for Energy Star labeling. No significant rent premium is detected for LEED certification. When using effective rents instead of contract rents to control for the different vacancies in certified and non-certified buildings, they identify a rent premium of 10% for Energy Star and 9% for LEED certification. Fuerst and McAllister (2011a) use hedonic regression models and estimate a rent premium of approximately 6% for LEED certification and 5% for Energy Star while controlling for a large number of location- and property-specific factors. In a follow-up study with an updated dataset, Fuerst and McAllister (2011b) use a robust regression framework to handle influential outliers in the treatment and control samples and find a significant rental premium of 3-5% for office buildings with Energy Star or LEED certification and a 9% premium for the emerging group of dual certified buildings. However, when the authors apply a fractional logit model to the larger and updated dataset, they find only very limited support for their earlier finding of an occupancy rate premium in eco-certified buildings (Fuerst and McAllister 2009b). Pivo and Fischer (2010) use the NCREIF database and identify 5.2% higher rents and 1.3% higher occupancy rates for Energy Star rated buildings.<sup>7</sup> Eichholtz et al. (2010b) show that the large increase in certified buildings and the recent downturn in real estate markets have not significantly affected returns of certified buildings relative to comparable buildings.

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<sup>7</sup> Pivo and Fischer (2010) use panel regression as a robustness test to confirm their findings. However, no details are given about their model specifications.



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