A Trendy Design or Wise Business Solution? An Analysis of LEED Office Buildings in Top U.S. Cities

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Overview

Energy efficiency and sustainability of commercial buildings is one of the major focuses of the effort in environmental protection and sustainable living in the United States. The U.S. Green Building Council (USGBC) has lead this effort by organizing the Leadership in Energy & Environmental Design (LEED) certification program to recognize good sustainable practices in building design and construction. This program is open to all types of buildings – office, industrial, hotel, and even residential. So far, commercial office buildings are the main participants. Certified office buildings grew significantly all over the country in the past several years. The potential cost savings (e.g. through improved energy efficiency) of LEED certification have been well-documented (USGBC (2013)). Being energy efficient and environmentally responsible is also highly valued by the public, and corporate campaigns have begun to include "green" initiatives. However, a trendy design welcomed by the public might not be a wise business solution sustainable for the long-term economic interests of a given company. Owners of buildings should maintain LEED practices in the long run only when green design connects with the company's economic goal. Prior studies such as Eichholtz et al (2010), Fuerst and McAllister (2011), and Reichardt et. al (2012) have found rental premia in general samples of LEED buildings. However, these studies either fail to reveal the possible reason behind the premium, or ignore the heterogeneity among different types of buildings and types of cities. This study examines LEED commercial office buildings in the top 20 cities (based on gross domestic product) in the U.S. using a difference-in-differences (DiD) method with propensity-score matching (PSM). Based on our knowledge, this is the first comprehensive study focusing only on LEED office buildings using this method. The findings reveal the impact of LEED in a more-controlled environment than in previous studies.

Methods

This study focuses on a sample of large urban economic centers to reduce the heterogeneity one would expect to encounter if sampling from a wide range of cities. The commercial real estate market may differ between cities, but there would be wider variance when comparing small cities to larger ones. So, the properties included in this study's sample are from central cities in large, urban areas – specifically US cities ranked among the top 20 metropolitan gross domestic products (GDP). The cities used in this study were determined based on metropolitan area data from the US Bureau of Economic Analysis (BEA). The urban areas included in our sample also account for all of the top cities for LEED certification in the United States as of December 2012 (USGBC (2012)).

All of the property data are from the CoStar real estate database. The time period analyzed is 2008 to 2012, and the data are quarterly. The number of "green" buildings has more than tripled during this time period (USA TODAY (2013)). The LEED sample is limited to buildings which became LEED-certified within this time period. The full sample includes 273 LEED properties and 1211 non-LEED properties. The control sample properties are selected from the same city as the LEED properties in the sample based on propensity-score matching (PSM). This helps to control for unobservable characteristics at a local level. City-level economic indicators are also included as control variables. The GDP data come from the BEA, and the unemployment data come from the US Bureau of Labor Statistics.

DiD and PSM techniques were applied in the past LEED literature individually, e.g. in Reichardt, et al (2012) and Eicholtz, et al (2010). This study combines them together. The DiD and PSM combination is not perfect, but improves upon past methodologies used in the LEED literature in several ways. Typically, hedonic models have

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been employed in past analysis. An issue with hedonic models is that multicollinearity could be biasing the estimates on willingness to pay for LEED. If another variable (e.g. year built) is related to LEED, the estimated rent premium effect of LEED certification may be driven by building age. DiD is more appropriate in a dynamic setting. Cross-sectional studies do not account for many unobservable differences between the treatment and control groups. The control group could be quite different from the treatment group. Differencing can help control for these inherent incongruences between treatment and control properties. PSM further improves upon the DiD approach by developing a comparison group that, based on observable characteristics, was similarly predisposed to becoming LEED. PSM allows one to match the comparison property to the same pre/post LEED periods as its matched LEED property. This is a crucial component of the DiD strategy. By controlling for group effects and time effects, one can isolate the average policy effect (in this case, the impact of LEED certification on rent).

Results

The findings of this study show the average rental premium for LEED office buildings is around 7% per square-foot and statistically significant at the1% significance level. The size of the premium is similar to those found by earlier studies. However, the focus of this paper is on the interaction variable between LEED and time. The question is whether the change in rental rate growth for LEED properties is significantly larger than that of the control group when controlling for group and time effects. In other words, we want to know whether LEED properties have higher rents because of the policy, or because of some other unobserved factor(s) attributable to LEED buildings regardless of when they become certified. For example, if LEED was a popular social movement where rent premium was based on the signal of certification, one would expect to see a significant policy effect. The findings show that the average controlled policy effect on rent is only about 0.15% for the LEED properties compared to our comparison properties, and it is not statistically significant. Regarding observable characteristics, the findings show that the rentable square-footage of a building is positive correlated with its rental rate. They also show that the age of the building and the unemployment of a city negatively affect rental rate. There is about 0.8% decrease on rent per square-foot for a 1% increase on city unemployment.

Conclusions

In summary, this study examines LEED office building from 2008 to 2012 in top 20 U.S. cities by comparing them to non-LEED office buildings within their city. It uses PSM to pair properties at the city level, then employs a DiD approach to isolate the policy effect. The findings reveal that there is no statistically significant difference in rental rate between LEED and non-LEED properties due to policy impact. Buildings that become LEED have, on-average, higher rents before and after certification, but without a large differential trend compared to similar non-LEED buildings. Based on this study, the cause of the rent premium for LEED properties is not due to policy effects such as the signal of certification or willingness to pay for improvements to building structure. So, the business-related benefits of LEED seemingly come in forms other than rental premia (e.g. cost saving from energy efficiency). The results do imply that group effects – potentially unobservable traits common to LEED buildings (or building owners who push for LEED) – are strongly tied to the higher rents seen on-average for LEED buildings relative to similar non-LEED properties. For example, it is common that the operations of LEED buildings are not the sole business of the owners. Large corporations often have LEED buildings as part of their business portfolios, and this kind of ownership could also be related to higher rents. Investigating the potential mechanisms behind the LEED group effects is the intended purpose of a future research endeavor.

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