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Analysis

Eco-labeling in commercial office markets: Do LEED and Energy Star offices obtain multiple premiums?

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ABSTRACT

This paper investigates the effect of eco-labeling on rental rates, sale prices and occupancy rates. The consensus emerging from previous studies appears to be that investors in and occupiers of eco-labeled buildings obtain a bundle of benefits related to lower operating costs, reputation benefits and productivity higher. In this study, a hedonic model is used to test whether the presence of an eco-label has a significantly positive effect on rental rates, sale prices and occupancy rates of commercial office buildings in the US. The results suggest that office buildings with Energy Star or LEED eco-labels obtain rental premia of approximately 3–5%. Dual certification produces an additive effect with rental premia estimated at 9%. Respective sale price premia for Energy Star and LEED labeled office buildings are 18% and 25%. The sale price premium for dual certification is estimated at 28–29%. An occupancy premium could not be confirmed for LEED labeled office buildings and only a small positive occupancy premium was found for Energy Star.

1. Introduction

Environmental labels are one of a number of alternative and complementary policy or market-based instruments that aim to alter patterns of demand for products in order to reduce their environmental impact. Within commercial real estate markets, a blend of compulsory and voluntary environmental labels is evolving. Indeed, as more and more local regulatory bodies make the attainment of a voluntary environmental label a requirement for regulatory approval, labels such as LEED are becoming quasi-compulsory in some jurisdictions. The central objective of environmental labels is to change supply and demand through the pricing mechanism. Given that they constitute the terms on which products are exchanged, prices are the fundamental instrument of markets. It is well established that costly information concerning prices and quality can affect allocational efficiency. When the market price of a product is higher than its cost of production, increasing production is profitable and new producers have incentives to enter the market. Thus, resources are allocated to sectors where willingness-to-pay is highest.

This paper investigates the extent to which the growth of environmental labeling (LEED and Energy Star) in US office markets is having expected price effects in occupier and investment markets. The envisaged contributions of the paper are threefold. First, compared to previous research, this study draws upon a much larger sample of price observations. Second, it applies alternative regression procedures to data analysis in order to control for issues related to outliers, measurement errors and use of proportions as a dependent variable. Finally, the paper identifies the growing group of buildings which have dual certification and estimates the price effects separately for this distinct subgroup.

The remainder of the paper is organized as follows. Following this introduction, the aims and expected price effects associated with the introduction of eco-labels are discussed. This is followed by an analysis of the transmission mechanisms by which eco-labels may influence the financial performance of commercial real estate assets and a critical review of previous empirical research on the price effects of eco-labels in commercial real estate markets. Next, the data and econometric procedures are outlined. This is then followed by a discussion of the results of the hedonic modeling. Finally, the wider implications of this research are discussed in the conclusions.

2. Environmental Labeling

The direct aim of environmental labels is to provide information to consumers or users about the environmental performance of a product with the indirect objective of influencing their consumption choices, suppliers' production outputs and, as a result, the level of environmentally harmful emissions. While the presence of an environmental label and superior environmental performance are not necessarily synonymous, environmental labels can be particularly important for credence products, where the costs to the consumer of monitoring (environmental in this instance) performance can be prohibitive both before and after procurement. Due to these high

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monitoring costs, it is common for third parties to emerge in order to provide independent verification. As such, the rapid growth of environmental labels can be interpreted as a method of reducing the negative externality produced by Akerlofian information asymmetry. In other words, eco-labeling may mitigate the adverse selection problem arising from information asymmetry as well as the ensuing inefficient pricing of desirable credence attributes and sub-optimal consumption and production. In order to remedy potential market failure, environmental labels must provide a credible signal of the attributes of superior environmental performance.

As discussed above, the mechanism by which environmental labels can produce a net environmental improvement is by changes to the relative demand and supply of labeled and non-labeled goods. Assuming that environmental performance is a salient attribute for consumers, environmental labeling enables consumers to discriminate between products according to their environmental impact. Given the presence of a group of eco-consumers, the result is increased demand for products with reduced environmental impact and price differentials for labeled products. A number of empirical studies support this proposition. For instance, Schumacher (2010) found in a stated-preference empirical framework that consumers with both environmental and quality preferences buy significantly more eco-labeled products than purely price-oriented consumers. A host of further studies have confirmed higher WTP for eco-labeled products, at least among certain types of consumers, for a range of products including apples (Loureiro et al., 2002), baby food (Maguire et al., 2004) and forest products (Thompson et al., 2010). Turning to supply, the price premia typically associated with eco-labeled products provide an economic incentive for producers to innovate and offset at least partially any additional production costs associated with obtaining the environmental label.

However, it has been argued that the introduction of environmental labels can, in certain plausible circumstances, produce a net increase in environmental harm. Dosi and Moretto (2001) analyze this point in terms of whether environmentally labeled products act as a substitute or complement to conventional products. Where there is a *complementary* relationship, the introduction of an environmental label can create image spillovers for all products made by a company increasing the return on capital from all products and producing a net increase in environmentally harmful emissions. In contrast, where the labeled product acts as a *substitute* for conventional products, the return on conventional products remains stable or falls after the introduction of an environmental label with less investment in conventional products and improved environmental outcomes. Dosi and Moretto (2001) also point to other circumstances in which the introduction of an environmental level can cause an increase in aggregate emissions. This is produced by an increase in aggregate consumption due to changing behavior as a result of the 'halo' effect of the environmental label. In a similar vein, Teisl et al. (2002) show that the introduction of the dolphin-safe label led to an overall increase in the market share of canned tuna. Essentially, although environmentally harmful emissions *per unit* decrease, this may be outweighed by the consumption of more units. For instance, office occupiers may use space less intensively in a LEED labeled building or be less concerned about switching off unused energy-efficient devices. However, there is at present no empirical evidence to support the existence of this potential rebound effect. In addition, the nature of such rebound effects is complex and contested and it is not straightforward to measure the medium and long-term effects of improvements in energy productivity (see Holm and Englund, 2009; Dimitropoulos, 2007).

The interaction of demand, supply and pricing is central to Mattoo and Singh's (1994) analysis of the effect of the introduction of environmental labels on level of aggregate production. They identify certain conditions in which the introduction of an environmental label can result in an increase in aggregate output compared to the undifferentiated market. Similarly, Kotchen (2006) shows that green markets can have detrimental effects on both environmental quality and social welfare using a general model of private provision of public goods. Grolleau et al. (2009) as well as Ibanez and Grolleau (2008) support this view by describing potentially adverse effects generated by eco-labeling and green markets. A common argument of these studies is that the introduction of the environmental label can, in some circumstances, result in price premia (relative to the prior undifferentiated price) for both labeled and non-labeled market segments, hence leading to an increase in overall supply. Excessive WTP on the part of eco-consumers may also prevent other types of consumers from buying the product. However, such an outcome is more likely to occur where environmentally responsible production has a relatively large market share prior to the introduction of environmental labeling. Mahenc (2007) takes this argument one step further and contends that overpricing of eco-labeled products is bound to occur when consumers are unable to verify the claims of superior environmental performance of a product. In such a situation of information asymmetry, non-green producers may signal a green product by raising the price above the full information equilibrium price, thereby eroding the prime *raison d'etre* of eco-labeling systems, i.e. to increase information transparency.

Notwithstanding these criticisms of eco-labeling and green markets, there appears to be broad empirical support in the extant literature for increased WTP in the consumption of certified products. Whether a stated preference for these products will actually result in a price premium depends on a number of conditions such as the share of eco-consumers in total demand, their aggregate utility function relative to that of general consumers and the anticipated payoff period of costs associated with eco-certification. Commercial real estate appears to be an interesting case in point for the broader study of these effects as eco-labeling is a relatively new phenomenon in this market and hence enables researchers to investigate the dynamics of product differentiation by labeling.

3. Environmental Labeling in Commercial Office Markets

There is a considerable body of commentary, often hortatory, suggesting that buildings with superior environmental performance deliver a bundle of benefits to occupiers and investors. A range of gains has been attributed to 'green' buildings or associated with 'green' features in buildings. Owners, developers and occupiers may profit from the diverse range of incentives (subsidies, tax reliefs and reduced regulatory barriers) that have emerged in some markets. Widely cited advantages to occupiers include reduced utility costs, improved productivity (lower staff turnover, absenteeism, and higher outputs *inter alia*) and reputational benefits. Investors may obtain higher occupancy rates, lower utility costs (especially in gross leases), decreased rates of depreciation and reduced regulatory obsolescence. As a result of the latter in particular, it is also expected that buildings with superior environmental performance should attract a lower risk premium.

The analysis above suggests that there are a number of channels through which environmental labels may influence the sale prices or capital values of commercial office buildings. In real estate pricing models for income generating assets, asset value represents the discounted sum of all future net incomes. Assuming constant growth, the value (V) can be expressed as

$$V = \sum_{t=0}^{T} \frac{(R_t - C_t)(1+g)^t}{(1+i)^t} \quad (1)$$

where V is the current capital value, R_t is rental income, C_t is the periodic costs of owning the asset (management, vacancy, refurbishment etc.—so that $R_t - C_t$ = Net Operating Income), g is a constant growth rate, i is the target rate of return (composed of the risk-free