UCLA ECONOMIC LETTER

REAL ESTATE AND THE MACROECONOMY

MAY 2017

Monthly condensed analyses of crucial real estate and economic issues offered by the UCLA Anderson Forecast and UCLA Ziman Center for Real Estate. Here, Georgia Institute of Technology Assistant Professor of Public Policy Omar Isaac Asensio, and UCLA Anderson School of Management and Institute of the Environment Professor Magali A. Delmas unveil large-scale research on energy-efficiency ratings in the building industry. Their full research paper is published in the journal *Nature Energy*.

'Green' Building Ratings and the Implications for Global Carbon Reductions

By Omar Isaac Asensio and Magali A. Delmas

The Trump administration's recently proposed budget would defund energy-efficiency programs, including the Environmental Protection Agency's (EPA) Energy Star Program and the Energy Department's Better Buildings Challenge. These programs, along with U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) program, are the three most popular used by the building industry to save money and energy, and to hedge against climate change. Our new study – using comprehensive data on Los Angeles commercial buildings – finds that such "green" buildings lead to energy savings of up to 30%. However, participation and investments are primarily observed in larger commercial buildings. Small and medium-sized buildings, which form two-thirds of the sector's emissions, are left behind.

"'Green' buildings in Los Angeles alone are avoiding about 145,000 metric tons in carbon dioxide equivalents yearly."

In this research, we used matching algorithms to analyze monthly electricity consumption data for 178,777 commercial buildings in Los Angeles between 2005 and 2012. We observed energy savings from 18% to 30% for green buildings– a reduction of 210 million kilowatt-hours or 145 kilotons of carbon dioxide equivalent (CO_2e) emissions per year - and that these savings are especially likely to be found in larger, more energy-intensive buildings.

BUILDINGS ARE KEY TO CARBON REDUCTION

This holds implications for all efforts to reduce CO_2e. Energy to buildings represents about a third of total global energy consumption, or 8.8 metric gigatons of carbon emissions. The United Nations Environment Program (UNEP) and many energy experts argue that the buildings sector has the largest potential for delivering long-term and cost-effective emissions reductions in both developing and developed countries. And a recent analysis by the National Research Council contends that the full development of cost-effective energy-efficiency technologies in buildings could eliminate the need to construct new electricity-generating plants in the United States.

The informational value of these programs is crucial given the current lack of global carbon regulation. The US programs we studied aim to encourage private investment in energy efficiency, such as structural upgrades for indoor heating, ventilating and air conditioning (HVAC); smart-energy management systems; and efficient lighting, sensors and other controls.

Information programs reduce barriers to investment and encourage efficiency through two main mechanisms. The first lowers search and information costs for energy-planning decisions. This often includes building audits informing about savings through technologies, and benchmarking of best practices through a network of peers. This is a main focus of the DOE Better Buildings Challenge. A recent meta-analysis of peer-reviewed studies found that such technical audits also effectively reduced energy consumption in the residential sector.

The second informational mechanism includes signals to the building market through energy-efficiency labels. Labeling is the focus of both LEED and Energy Star, which provide third-party certification for efficient buildings. Only those buildings that receive an Energy Star score of 75 (75th percentile or better) compared to similar buildings nationwide are eligible to apply for the Energy Star or LEED certification label in a given year. The USGBC rates LEED buildings according to energy use, plus improvements such as water use, materials and resources, indoor environmental quality, and other sustainable designs.

Building owners and managers who participate in these programs may experience benefits from the real-estate market including increased asset prices and tenant rents. These economic returns reflect expectations of lower energy costs for building occupants.

SMALL AND MEDIUM-SIZED BUILDINGS SLIP THROUGH THE CRACKS

Due to the long lifespan of buildings and retrofits, these savings are likely to persist, particularly in larger, more energy-intensive buildings. However, due to eligibility rules and participant self-selection, we find that current information programs do not substantially target emissions reductions in small- and medium-sized buildings, particularly in the 75th percentile and below by consumption, which represents up to 2/3 of commercial sector building emissions and the long tail for greenhouse gas mitigation efforts from building efficiency improvements.

Our research benefitted from new availability of data through the LA Energy Atlas. Our study observed 178,777 buildings with 16.5 million kilowatt-hour panel observations. This is the universe of all commercial buildings in the Los Angeles Department of Water and Power service territory from 2005-2012. It includes the City of Los Angeles and 56 neighboring cities. We also acquired detailed building stock characteristics from CoStar, the commercial real estate database.

We used matching techniques based on a search algorithm and propensity scores to compare buildings participating in an energy efficiency program with nonparticipating, but otherwise similar, buildings. This allows more accurate comparisons of energy performance and reduces the bias due to systematic differences between participating and non-participating buildings, which affect evaluation outcomes.

Los Angeles is an ideal setting to study energy efficiency for three reasons. First, unlike many other cities that may be at earlier stages of adoption, we can already observe significant participation in these three programs simultaneously during this period. Our study group was large: 192 million square feet of commercial floor space in 254 buildings. Second, Los Angeles is the largest market in the U.S. for green building investments and is often considered a model for other cities. Third, we had access to high-resolution data at the building level, which allowed us to go beyond simulations or predictive modeling to assess emissions reductions.

Our study shows how to more accurately track energy and emissions reductions using these three energy-label programs. Without such careful research, we cannot be sure whether efficiency investments are the result of strategic community policies, or merely come from private considerations and individual projects. While energy savings are a primary outcome of building energy labels, we suggest further research into other outcomes, such as rental prices, vacancies and contracts. This will help clarify strategies that support long-run benefits, which could help broaden participation.

—

The link to the authors' original peer-reviewed article is: http://dx.doi.org/10.1038/nenergy.2017.33.

UCLA ZIMAN
CENTER *for* REAL ESTATE

UCLAAnderson
FORECAST

THE UCLA GILBERT PROGRAM