

Building Codes and Energy Policy

Making Strides to Improve Energy Efficiency

Improving energy efficiency in the built environment is now seen as a growing policy priority. Buildings account for 72 percent of electricity consumption, 39 percent of energy use, and 38 percent of carbon dioxide emissions. Energy codes are the most common policy tool used to affect the energy efficiency of both residential and commercial buildings. Most existing codes were first put in place after the 1973 oil embargo. Codes vary by state but they generally establish a minimum energy efficiency standard for new and remodeled construction.

Congress is at a standstill regarding climate legislation, but energy codes are a central part of two bills that have directly shaped the terms of the current debate. The Waxman-Markey bill (HR 2454) would require that, by 2014, all states enact residential building codes that are 30 percent more stringent than the 2006 International Energy Conservation Code, the prevailing standard. The target increases to 50 percent more efficient in 2017, and a 5 percent increase every three years until 2029. The Boxer-Kerry bill (S 1733) would also mandate increased stringency, requiring the U.S. Department of Energy to establish building code energy efficiency targets by January 1, 2014. It also includes provisions for state adoption of a national building-code standard.

Energy Code Effectiveness

It is important to understand how effective energy codes are at saving energy and reducing emissions. The existing evidence comes from engineering simulation models.



Although this approach is useful for making predictions, it fails to account for actual enforcement and compliance, changes in building practices, and the behavioral responses of building occupants. One such response is the “rebound effect,” whereby consumers in more energy-efficient residences might heat their homes more because it is less costly. Evidence also shows that the realized returns of energy efficiency investments sometimes fall below those indicated by engineers and product manufacturers. To complement the engineering approach, a few recent studies provide new evidence on energy code effectiveness by looking at actual energy consumption.

We conducted a study of the increased stringency of Florida’s residential energy code that occurred in 2002, by focusing on the city of Gainesville. By comparing utility bills for homes constructed within three years of the code change—before and after—we were able to estimate how the energy code’s increased stringency affects energy consumption. After controlling for

building characteristics, those built after the code change used 4 percent less electricity and 6 percent less natural gas. We also examined how residences built under the stricter code differ in their responsiveness to weather fluctuations.

Together, our results are consistent with reduced consumption of electricity for air-conditioning in the summer and reduced consumption of natural gas for heating in the winter. Our estimates are statistically comparable to engineering simulations of Florida's energy code change, lending validity to both approaches for evaluating the effectiveness of energy codes.

We also estimated the economic costs and benefits and found that the payback period of the energy code change for the average residence is 6.4 years, the length of time for the additional construction costs imposed by the more stringent building code pay for themselves. The social payback period is 3.5 years, a lower number because it accounts for the avoided costs of emissions that do not occur because of the more stringent building code.

However, that the social payback calculation assumes that emissions reductions in one area are not offset by emissions increases in another, which may well be the case if reductions are sufficiently large to affect behavior in existing or potential cap-and-trade programs. This possibility underscores the importance of considering the interaction of multiple policy instruments in order to evaluate the true effectiveness of any one.

The results from our Florida study are likely to be representative of many regions of the United States. Additional studies provide further evidence: one recent study used aggregated data to evaluate the relationship between implementation of a state

energy code and state residential electricity consumption. The results showed that states with energy codes experienced decreases in aggregate consumption in the range of 3 to 5 percent and even more in states with stricter codes and better enforcement. Another study used a billing data methodology similar to the one we applied in Florida to examine the effectiveness of energy codes in California and achieved similar results.

Policy Implications

These findings do not imply that energy codes are the most effective policy to promote energy conservation and a reduction in greenhouse gas emissions.

The alternatives—a comprehensive cap-and-trade policy on emissions or a carbon tax—would increase the price of energy and provide an economic incentive for conservation. Economic theory suggests that price-based mechanisms are likely to be more efficient than direct mandates such as energy codes, because they exploit a broader range of possibilities for emissions reductions.

Political support for these price-based policies is not very strong and recently has been eroding even further. In this context, energy codes offer a politically feasible alternative in the meantime. And even if a price-based policy is eventually implemented, building codes may still be a worthwhile component of national energy policy.

Given that consumers often overlook the long-term benefits of investments in energy efficiency even when the investments make economic sense, the energy-efficiency paradox. Therefore, mandatory requirements like energy codes may be advisable to include among the strategies for addressing energy and climate challenges. ● — GRANT D. JACOBSEN

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