

Improving Energy Codes

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Increased concerns about climate change have recently sparked renewed interest among policymakers for more aggressive energy efficiency policies. Much attention has been paid to policies related to buildings, which are responsible for 41% of U.S. energy consumption. In particular, policymakers have increasingly employed building energy codes to regulate the energy efficiency of buildings. Federal policymakers have provided incentives for state adoption of energy codes and have included provisions for a national energy code in major legislative proposals. As of 2013, 43 states have mandatory, statewide energy codes for residential and commercial buildings and most of these energy codes have seen recent increases in stringency. The focus on building energy codes (henceforth, “energy codes”) is perhaps warranted, given their potential for energy savings. According to policy projections made by the Energy Information Administration, a nation-wide increase in the stringency of energy codes, in combination with updated efficiency standards for appliances and other equipment, would lead to a 3.6 quadrillion BTU decrease in the amount of energy used by buildings, which exceeds the projections for policy-related energy savings from other sectors (e.g. transportation).

Despite the prominence of energy codes, the current design of energy codes creates incentives that lead to sub-optimal investment in energy efficiency. In particular, energy codes do not prioritize conservation of certain energy types (e.g. electricity, natural gas, and fuel oil) even though substantial variation exists in the nature and magnitude of the negative externalities associated with different energy sources. In theory, a code could lead to conservation of a relatively benign energy while ignoring conservation of another energy associated with large social damages.

This study argues that energy codes would be improved if they were structured to provide relatively stronger incentives for conservation of energy types that are associated with greater social damages, and that such incentives could be implemented by modifying the way in which codes determine compliance. In particular, I argue that energy codes should be designed such that compliance is determined by the projected social damages associated with a building's design under normal usage patterns, as opposed to the projected private energy expenditures, as is current practice. Structuring codes such that compliance was determined by social damages would provide

relatively stronger incentives for conservation of energy types associated with greater social harm. Additionally, damage-based codes would allow codes to be responsive to regional differences in the sources used for electricity generation (e.g. coal, hydropower) because region-specific electricity damage rates could be employed based on the regional generation mix. I also argue that the concept of a damage-based code could also be applied in the context of a prescriptive code and would involve setting more stringent standards for components that were linked to consumption of more damaging energy sources. For example, the prescriptive standards for components that are strongly related to space cooling may be set more stringently in regions where electricity, which is the sole energy used for space cooling, is associated with a relatively high damage rate.

In support of my argument, I use state-level data on energy consumption, emissions rates, and energy prices, to evaluate how the outcomes under damage-based codes that are motivated primarily by climate-related concerns would differ from current practice within the residential sector of the United States. I find evidence that damage-based codes would lead to substantial welfare gains and would place greater emphasis on conservation of electricity, relative to natural gas, in most states. The relatively greater emphasis on conservation of electricity would be especially prominent in the Central Plains where electricity is typically generated through coal-fired plants.

In comparing the outcomes induced by expenditure and damage-based codes in this paper, I focused exclusively on social damages imposed through carbon emissions, and these results are directly of interest if energy codes are primarily motivated by carbon mitigation. However, policymakers could choose to employ damage rates that are calculated based on a broader array of public concerns, such as regional air pollution, energy security, or energy reliability. The general point in this paper is that codes should prioritize energy conservation based on social damages and that the damage rate associated with each energy type depends on state-specific factors such as the electricity generation mix. Consideration of other factors beyond the social cost of carbon would likely increase the benefits from damage-based codes.