Decarbonizing Homes: Heat Pump Adoption under Natural Gas Restrictions in California

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Abstract

The U.S. government's push for net-zero emissions has accelerated the transition toward electrified homes, heat pump adoption, and restrictions on natural gas usage, setting a precedent for decarbonization strategies worldwide. California, at the forefront of these efforts, faces a particular challenge as natural gas remains a key source for space heating, coupled with high electricity prices. While these regulations align with environmental goals, they raise concerns about increased energy costs for consumers and potential strain on the power grid. This study develops a structural model to analyze the impact of natural gas restrictions and heat pump adoption on consumer choices, welfare, and the broader implications for effective carbon mitigation policies. I assess the impact of natural gas restrictions on household energy usage patterns, examine the policy's social costs, and evaluate the effectiveness of financial incentives in reducing potential consumer burdens. Results indicate that, although policy incentives promote heat pump adoption, they are insufficient to fully offset welfare losses. In the cooling season, a rebound effect leads to increased energy use, but the expenditures still decline due to efficiency gains. In contrast, no rebound effect is observed in the heating season, where high electricity prices cause welfare losses despite efficiency improvements and available rebates. These results offer insights for other regions and nations as they design decarbonization strategies consistent with global climate goals.

Keywords: *Net-zero; Household energy consumption; California energy policy; Energy transition.*

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