Magnetic Appeal: Understanding the Forces Behind California's Induction Cooking Technology Adoption

Julia Mycek, Evergreen Economics, Portland, OR
Isaac Johnson, Evergreen Economics, Portland, OR
Blake Killingsworth, Evergreen Economics, Portland, OR
Jesse Emge, Cadmus, June Lake, CA

ABSTRACT

The increased focus on all electric homes has elevated induction cooking appliances as a key technology for decarbonization. This paper evaluates market adoption of induction cooktops and ranges in California, identifies drivers of uptake, and forecasts future trends. Funded by Pacific Gas and Electric Company, the analysis draws on time-series sales data from 2020 to 2023, supplemented with economic, energy, and policy variables. We developed regression models using Designated Market Area (DMA)-level and statewide data to isolate the influence of variables – including electricity and gas prices, Gross Domestic Product (GDP), appliance incentives, and local reach codes promoting electrification – on induction cooktop and range purchases.

Findings show that financial incentives and electrification-oriented reach codes significantly increase adoption of induction appliances, while higher electricity prices are associated with reduced uptake. GDP also has a positive association, suggesting that broader economic conditions affect appliance purchasing decisions. Forecasts estimate that induction cooktops and ranges will continue to gain market share through 2030, though at a slower rate than electric non-induction models unless incentives expand.

This research offers a replicable model for evaluating market transformation in the appliance sector and highlights policy levers that can accelerate electrification. By quantifying market effects and forecasting adoption trends, the study provides a roadmap for utilities and regulators aiming to scale induction technology. These insights are timely as agencies seek to measure and manage long-term shifts in appliance markets to meet climate goals.

Introduction

The growing interest in electrification has brought increased attention to induction cooking technology as a viable replacement for traditional gas and electric resistance appliances. Induction cooktops and ranges offer several advantages, including energy efficiency, faster heating, enhanced indoor air quality, and compatibility with decarbonization goals. As California continues its push toward climate-aligned building policies, understanding the dynamics of induction appliance adoption has become increasingly important for utilities, regulators, and market actors.

This paper presents the findings of a study conducted by Evergreen Economics on behalf of Pacific Gas and Electric Company (PG&E). The study assessed market adoption trends for induction cooking appliances in California, identified key drivers of uptake, and developed a forecast of natural market growth through 2030. Using a combination of sales data, economic indicators, energy rates, and local policy measures, we created statistical models to quantify the influence of each factor on the adoption of induction, non-induction electric, and gas cooking appliances. The results provide actionable insights for utilities and policymakers aiming to design effective programs to support residential electrification.

Background

Evergreen Economics was tasked with examining how adoption of induction cooking appliances has evolved over time and what factors are shaping current and future market behavior. The analysis relied primarily on sales data purchased from Circana, a market intelligence firm that tracks appliance purchases across retail channels. These data covered the period from January 2020 through December 2023 and included monthly records of cooktop and range purchases, disaggregated by fuel type and technology (induction, non-induction electric, and gas), and further segmented by Designated Market Area (DMA).

In addition to tracking unit sales, the study incorporated several external datasets to account for economic and policy influences. These included:

- Annual gross domestic product (GDP) data by DMA from the U.S. Bureau of Economic Analysis;
- Monthly average residential electricity and gas rates by utility service area from the U.S. Energy Information Administration;
- Local reach codes requiring or incentivizing all-electric new construction, sourced from California's Codes and Standards program;
- Available incentive amounts for induction appliances, compiled from BayREN, Redwood Coast Energy Authority, SMUD, and SVCE websites.

Combining these variables allowed for a robust assessment of the factors influencing appliance adoption at both the state and regional levels. The resulting models were used not only to identify current drivers of induction technology uptake but also to forecast future market trends under existing conditions.

Scope and Limitations

This study was designed to evaluate the current state of induction cooking appliance adoption in California, quantify the strength of market factors influencing consumer decisions, and forecast baseline adoption through the end of the decade. The primary focus was on cooktops and ranges, segmented by fuel type: gas, electric non-induction, and electric induction. The study aimed to isolate the natural market trajectory of induction cooking appliances, as measured by units sold, in the absence of additional programmatic or regulatory interventions beyond those already in place.

The geographic scope of the analysis covered all major California Designated Market Areas (DMAs), excluding a small number of peripheral DMAs that include areas outside of California. Specifically, data for the Reno, Medford-Klamath Falls, and Yuma-El Centro DMAs were excluded to avoid confounding influences from bordering states.

The study period spanned from January 2020 through December 2023. This timeframe was chosen to reflect recent market activity but also presented challenges due to the irregularities in consumer purchasing behavior and supply chain disruptions during and after the COVID-19 pandemic. In particular, appliance shipments and product availability were constrained during parts of this period. As a result, some observed trends may reflect short-term anomalies rather than stable long-term patterns.

The analysis was limited to appliances captured in the Circana dataset, which includes many—but not all—major retail channels. Notably, Home Depot was not included, which may result in an undercount of total appliance sales. Despite these limitations, the study provides a consistent and structured view of market dynamics, suitable for developing baseline forecasts and understanding policy levers influencing adoption.

Methodology

Our analytical approach consisted of developing two complementary sets of regression models to identify drivers of induction appliance adoption and generate baseline forecasts. Models were estimated using Ordinary Least Squares (OLS) regression and met the necessary assumptions for inference and forecasting.[1] The model equations and explanations are provided below for the two models.

Baseline Model

We developed a statewide baseline model to estimate total monthly unit sales across all cooktop and range fuel and technology types in California. This model included categorical controls for **technology type** and **fuel type**, with a linear time trend and time-varying predictors:

Equation 1: Baseline Model

$$TotalUnits_{\{it\}} = \beta_0 + \beta_1 Date_t + \beta_2 TechnologyType_{\{it\}} + \beta_3 FuelType_{\{it\}} + \beta_4 GDP_t + \beta_5 AvgkWh_t + \beta_6 AveragePrice_{\{it\}} + \varepsilon_{\{it\}}$$

Where:
$TotalUnits_{\{it\}}$ = Total number of units sold for observation i at time t.
$Date_t$ = The date corresponding to time t.
$TechnologyType_{\{it\}}$ = Categorizes the type of cooking technology for observation i.
$FuelType_{\{it\}}$ = Specifies the type of fuel used for observation i.
GDP_t = The Gross Domestic Product for California at time t.
$AvgkWh_t$ = Denotes the average kilowatt-hour price at time t.
$AveragePrice_{\{it\}}$ = Reflects the average price of the units sold for observation i.
β_0 = The intercept of the model, representing the baseline level of unit sales.
$\beta_{1,2,3,4,5,6}$ = Coefficients estimated by the model.
$\varepsilon_{\{it\}}$ = Random error for observation i at time t, assumed to be normally distributed.

The baseline model captures the relationship between total units sold and various predictors at the statewide level. The coefficients (β) indicate the average incremental change in the total number of units sold associated with a one-unit change in each predictor variable, assuming all other variables are held constant. This model helped us understand the factors influencing the adoption of induction technology at the state level.

Fuel-Type Model

The fuel type model focused on comparing the coefficients of various fuel types to understand their individual impacts on the adoption of induction technology. By examining each fuel type individually, we were able to discern how different fuel types influenced the total number of units sold. Compared to the baseline model, this model included the additional variables of average therm rate, code count, and incentive amount.

Equation 22: Fuel Type Model

[1] These assumptions include linearity, independence of errors, homoscedasticity, and normality of residuals. Multicollinearity was also assessed using VIF.

$$TotalUnits_{\{it\}} = \beta_0 + \beta_1 Date_t + \beta_2 TechnologyType_{\{it\}} + \beta_3 GDP_t + \beta_4 AvgkWh_t + \beta_5 AvgTherm_t + \beta_6 CodeCount_{\{it\}} + \beta_7 IncentiveAmt_{\{it\}} + \beta_8 AveragePrice_{\{it\}} + \varepsilon_{\{it\}}$$

Where:
$TotalUnits_{\{it\}}$ = Total number of units sold for observation i in the given DMA at time t.
$Date_t$ = The date corresponding to time t.
$TechnologyType_{\{it\}}$ = Categorizes the type of cooking technology for observation i.
GDP_t = The Gross Domestic Product data for the given DMA at time t.
$AvgkWh_t$ = Denotes the average kilowatt-hour price in the given DMA at time t.
$AvgTherm_t$ = Denotes the average therm price in the given DMA at time t.
$CodeCount_{\{it\}}$ = The count of reach codes relevant to electrification for observation i.
$IncentiveAmt_{\{it\}}$ = The cumulative incentive amount provided for observation i.
$AveragePrice_{\{it\}}$ = Reflects the average price of the units sold for observation i.
β_0 = The intercept of the model, representing the baseline level of unit sales.
$\beta_{1,2,3,4,5,6,7,8}$ = Coefficients estimated by the model.
$\varepsilon_{\{it\}}$ = Random error for observation i at time t, assumed to be normally distributed.

We ran the model for each fuel type (electric induction, electric non-induction, and gas) to analyze the effect of fuel type on the total number of units sold. This approach provided insights into the unique contribution of each fuel type to the adoption of cooking technology.

Diagnostic Tests and Model Fit

To assess model validity and fit, we conducted a series of standard regression diagnostics on both the baseline and fuel-type models.

The baseline model yielded an R^2 of 0.79, indicating a strong overall fit to the statewide sales data. The fuel-type models—estimated separately for gas, electric, and induction units—had R^2 values ranging from 0.79 to 0.95, depending on the technology and DMA-specific variation.

We evaluated heteroskedasticity through statistical tests and visual inspection of residual plots, finding no significant patterns in the residuals and consistent variance across fitted values, suggesting that the assumption of homoskedasticity was met. This means the model's estimates are reliable and standard errors are not biased due to unequal variance.

To assess multicollinearity, we calculated Variance Inflation Factors (VIFs) for all independent variables. Most predictors showed acceptable levels of multicollinearity, though some minor inflation was observed between GDP and electricity prices in a few DMA-specific models. These relationships were retained due to their theoretical relevance and acceptable diagnostic thresholds.

Forecasting Approach

The fuel-type models served as the basis for forecasting monthly induction appliance sales through 2030. Predictor values were extrapolated using historical trends or known policy parameters:

- **GDP**: Projected using a linear trend based on historical annual growth.
- **kWh and Therm Rates**: Extended using average annual changes from 2020–2023 (3.7% and 1.8%, respectively).
- **Reach Code Counts**: Assumed to grow linearly at the average annual rate observed in the study period.
- **Incentives**: Set to increase by $840 in 2025 based on IRA guidance.

- **Appliance Prices**: Held constant in real terms.

All forecasts represent a natural-growth scenario, absent additional policy or market interventions.

Results

This section presents the results from our market data summary, regression analyses, and visual comparisons across fuel types. We first summarize observed market trends in cooktop and range sales across fuel types, then report the results of the two main regression models. Finally, we provide comparative visuals to illustrate the influence of key drivers such as energy prices, reach codes, and incentives.

Market Trends and Observations

Between 2020 and 2023, sales of gas and electric non-induction cooktops declined, while sales of electric induction cooktops increased. A similar but more nuanced trend was observed for ranges. Sales of gas ranges decreased, while sales of electric non-induction ranges increased at a faster rate than electric induction ranges. These patterns suggest that electric induction cooktops are gaining market share from both gas and electric non-induction cooktops, while electric non-induction ranges are primarily replacing gas ranges.

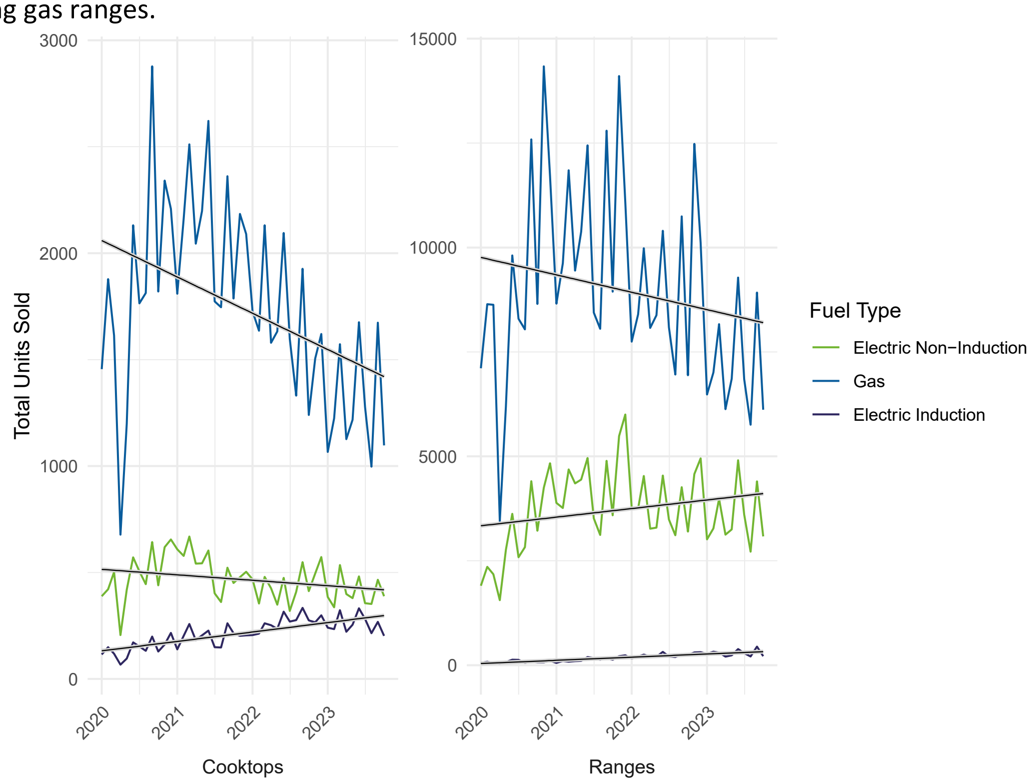

Figure 1: Total Units of Cooking Appliances Sold in California by Fuel Type, 2020-2023

A more detailed view by region shows differences in adoption trends across the four leading DMAs in California. Purchases of electric induction appliances per household increased in all four DMAs from 2020 to 2023, with San Diego leading in per-household adoption, followed by the San Francisco Bay Area, Sacramento, and Los Angeles.

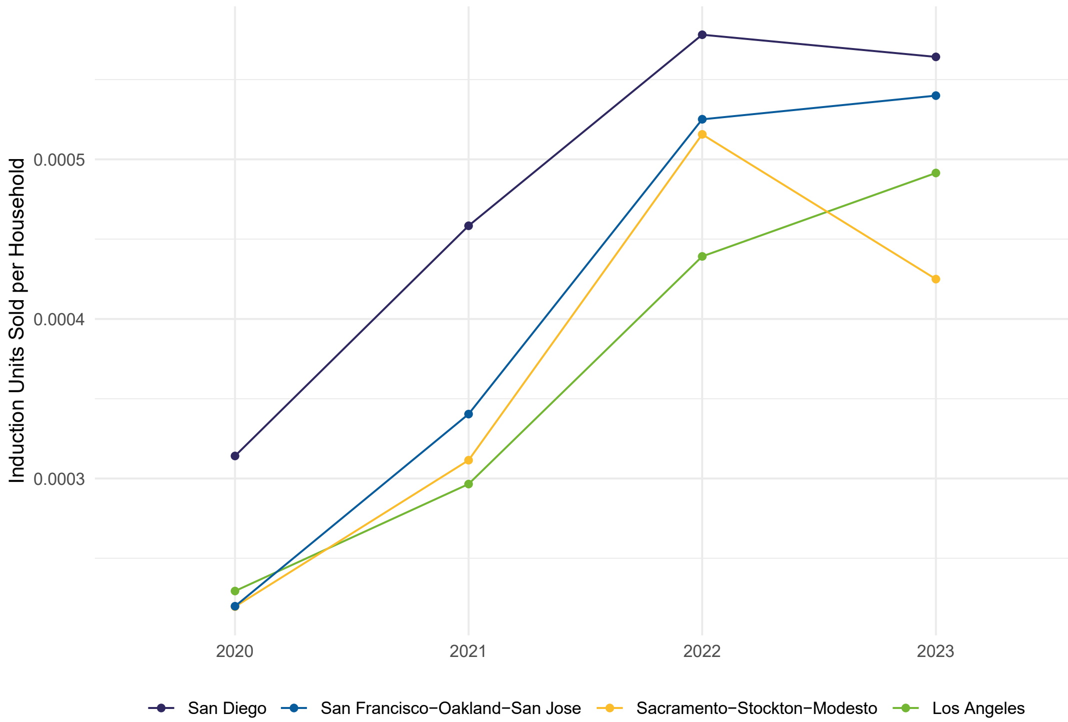

Figure 2: Induction Units Sold per Household 2020-2023, by DMA

Baseline Model Results (State-Level)

The baseline model, estimated using statewide data, included predictors for fuel type, technology type, GDP, average residential electricity price, and average appliance price. The model achieved an adjusted R-squared of 0.79, indicating strong explanatory power.

Table 1: Regression Estimates for the Baseline Model

Predictor	Estimate	Std. Error	P-value[2]
TechnologyType: Ranges	3,224	192.4	< 2e-16 ***
FuelType: Electric Non-Induction	-5,439	330.2	< 2e-16 ***
FuelType: Electric Induction	-2,035	386	3.27e-07 ***
GDP	1.853e-08	2.893e-09	9.35e-10 ***
AvgkWh	-162,800	25,180	6.64e-10 ***
AveragePrice	-4.429	0.4448	< 2e-16 ***

Significance code: *'***' 0.001*

Key findings from the baseline model:

- **Technology Type:** Ranges were associated with significantly higher unit sales than cooktops.

[2] P-value is a number that helps determine if results are statistically significant. A smaller p-value number means that there is stronger evidence that the result is real and not due to chance.

- **Fuel Type:** Both electric induction and electric non-induction fuel types had significantly lower unit sales than gas, indicating that gas remained dominant during the study period.
- **GDP:** A positive and significant coefficient indicated that economic growth supports increased appliance purchases.
- **Average kWh Rate:** Higher electricity prices were associated with lower sales across all fuel types.
- **Average Price:** As expected, higher appliance prices negatively impacted unit sales.

Fuel Type Model Results (DMA-Level)

We developed separate regression models for each fuel type using DMA-level monthly data. For the electric induction model, which is the focus of this analysis, the following results were significant:

Table 2: Regression Estimates for Electric Induction Fuel Type Model

Variable	Estimate	Std. Error	p-value
TechnologyType: Ranges	-6.406	1.305	1.29e-06 ***
GDP	9.232e-08	2.699e-09	< 2e-16 ***
AvgkWh	-55.19	19.19	0.00423 **
AvgTherm	2.119	4.462	0.63514
CodeCount	0.7939	0.1931	4.69e-05 ***
IncentiveAmt	0.01624	3.307e-03	1.28e-06 ***
AveragePrice	-1.933e-04	9.762e-04	0.8431

Significance codes: 0 '***' 0.001 '**' 0.01

Key findings:

- **GDP**: Continued to have a positive and statistically significant relationship with unit sales.
- **Reach Code Count**: Strongly positive and significant, indicating higher adoption in areas with more electrification-oriented policies.
- **Incentive Amount**: Also positive and significant, underscoring the importance of financial incentives.
- **Average kWh Rate**: Negatively associated with induction adoption, suggesting consumers are deterred by high electricity costs.
- **Technology Type**: Induction ranges sold fewer units than cooktops, implying a consumer preference for cooktops in this category.
- **Average Therm** Rate and Appliance Price: Not statistically significant in the induction model, though both showed expected directional relationships.

Comparative Visualization Across Fuel Types

To contextualize the regression results, we created a visual comparison of coefficient effects across the three fuel types.

The visualization of average appliance price effects shows that while higher appliance prices are associated with fewer gas and electric non-induction sales, induction sales remained largely unaffected. This suggests that early adopters of induction cooking appliances may be less price sensitive — possibly due to higher incomes or stronger motivations such as health, safety, or environmental concerns.

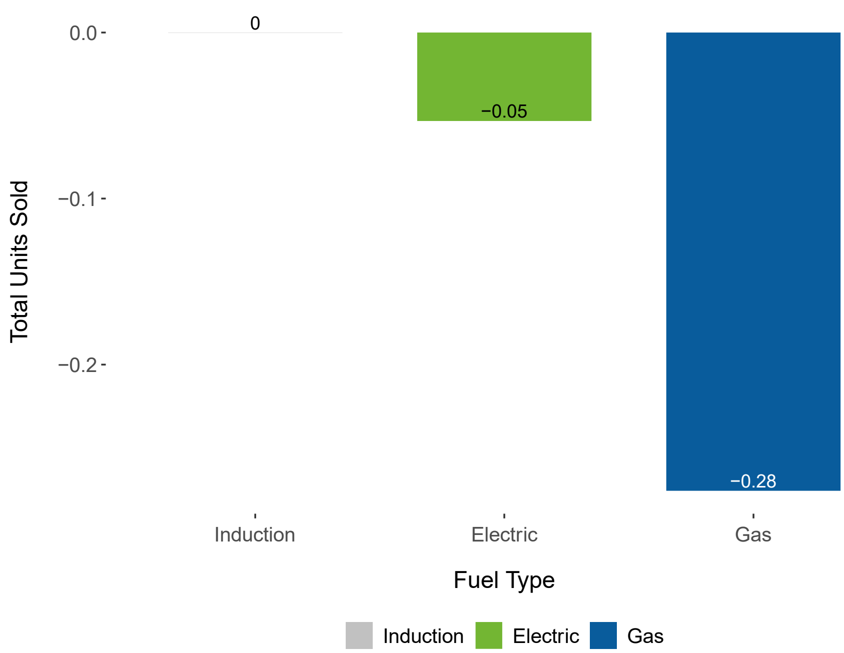

Figure 3: Average Price Comparison

Forecast

To project baseline adoption of induction cooking appliances through 2030, we leveraged the fuel type regression models developed using DMA-level data. Forecasts were generated separately for cooktops and ranges, using historical trends and reasonable forward-looking assumptions for each explanatory variable. These forecasts are intended to reflect natural market growth absent any additional interventions beyond those already enacted or scheduled.

Forecast Assumptions

We projected each of the key explanatory variables from the regression models through 2030 using the following assumptions:

- **GDP**: Forecasted using a linear trend based on the statewide average GDP growth observed from 2020–2023. We assumed continued moderate economic growth, consistent with state and national projections.
- **Average kWh and Therm Rates**: Electricity and gas prices were projected using linear monthly trends based on historical data from January 2020 through December 2023. This approach resulted in assumed annual increases of approximately 2.3% for electricity and 1.7% for gas though this has increased since the original research was completed.
- **Reach Code Count**: We assumed a steady increase in reach code adoption, continuing the trend of more jurisdictions enacting electrification policies each year. Code counts were incremented based on the average annual growth observed during the study period.
- **Incentive Amount**: Starting in 2025, we included an $840 incentive for induction appliances to reflect the impact of the Inflation Reduction Act (IRA), which provides financial support for electrification efforts. This amount was added on top of existing incentive levels for each DMA. We note that recent uncertainty regarding the IRA efforts are a current limitation to this research.

- **Average Price**: We held appliance prices constant in real terms, assuming that any inflation would be offset by efficiencies in manufacturing or increased market competition.

These assumptions were applied across all California DMAs to generate monthly forecasts of induction cooktop and range unit sales.

Projected Adoption of Induction Appliances

The resulting forecast indicates steady growth in induction appliance adoption across California, with monthly sales projected to reach approximately 716 cooktops and 699 ranges by 2030. This growth trajectory reflects both the natural momentum in consumer preferences and the continued influence of reach codes and incentives.

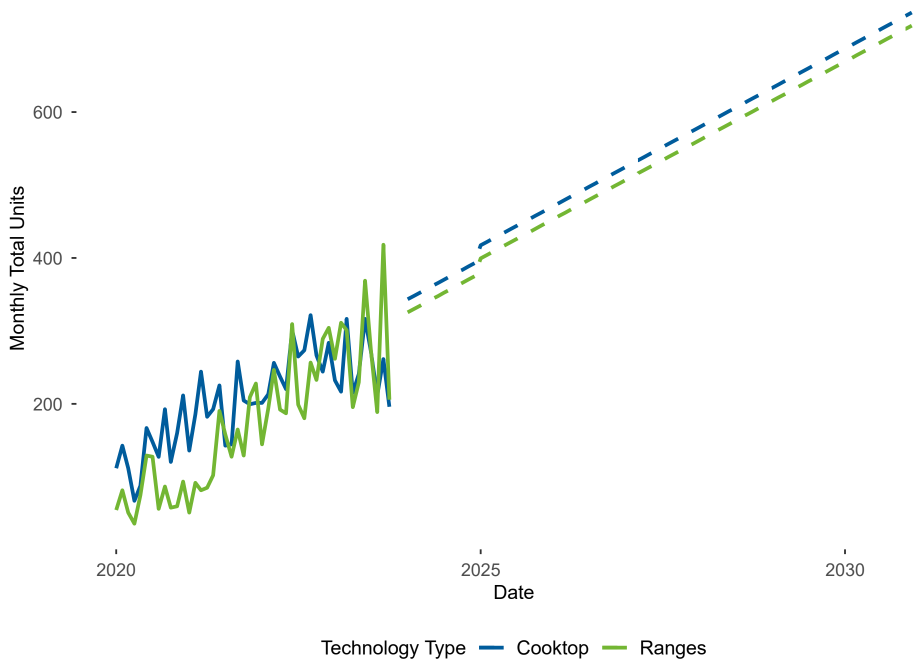

Figure 4: Forecast of Induction Cooktops and Ranges

Cumulatively, from 2024 through 2030, we estimate approximately 37,358 induction cooktops and 48,470 induction ranges will be sold in California. These forecasts suggest that, by the end of the decade, induction appliances will represent a meaningful share of the cooking appliance market—particularly for cooktops, where adoption is accelerating more rapidly.

Notably, the projected market share of induction cooktops reaches about 23% by 2030, compared to a 5% share for induction ranges. These differences align with observed consumer behavior during the study period, where induction cooktops outperformed induction ranges in relative adoption, likely due to their lower cost and ease of installation.

Limitations

While the models and forecasts presented in this paper offer useful insights into induction appliance adoption, several limitations should be noted to help interpret the results appropriately.

- First, the COVID-19 pandemic significantly disrupted appliance sales patterns in 2020 and early 2021. Although our regression models control for time trends, structural shifts in consumer behavior during that period may not be fully captured.
- Second, sales data from some major retailers — most notably Home Depot — were estimated and not actuals and not utilized in the final dataset. This limits the completeness of the appliance sales dataset, particularly in more rural DMAs where big-box retailers account for a larger market share.
- Third, data for three Designated Market Areas (DMAs)—Reno (NV), Medford-Klamath Falls (OR), and Yuma-El Centro (AZ)—were excluded from the models due to their partial overlap with neighboring states. These exclusions removed a small number of geographic segments within California but were necessary to ensure cleaner alignment between sales data and California-specific policies.
- Fourth, the Inflation Reduction Act (IRA) rebates were modeled as an $840 incentive available over a 10-year period beginning in 2025, for households switching to electric or induction cooking appliances. While this estimate is grounded in federal program design, it assumes full implementation across California DMAs with consistent availability and consumer awareness, which may vary in practice. Notably, the Home Electrification and Appliance Rebates (HEEHRA), which provides rebates for energy-saving appliances and equipment to eligible households, was paused in February 2025 following the Trump Administration's freeze on federal funding (Section 7, Unleashing American Energy). California resumed its HEEHRA program for home energy rebates in March 2025, and as of August 2025, no additional changes have been made to the IRA Section 50122 HEEHRA program funding. However, the volatility of this program and uncertainty about its future availability represent important considerations for the forecast's accuracy.
- Lastly, the models assume that forward-looking variables such as GDP, reach code adoption, and energy prices will continue recent trajectories. Any deviation from these trends — due to policy changes, economic shocks, or supply constraints — may affect future sales differently than projected.

Conclusions

This study identified key factors driving the adoption of induction cooking appliances in California and developed a baseline forecast of future market trends. Using a combination of market data, economic indicators, energy prices, incentives, and policy variables, we created two regression models to isolate the influence of each factor on appliance adoption by fuel type. These models were then applied to generate forward-looking forecasts through 2030.

Several clear trends emerged from the analysis:

- Electric induction cooktops are gaining market share from both gas and electric non-induction models. While gas appliances still dominate overall unit sales, the consistent year-over-year growth in induction cooktop sales suggests a transition is underway—particularly in urban and policy-active regions.
- Economic conditions and policy levers matter. Higher GDP was consistently associated with increased sales, reflecting the sensitivity of appliance purchases to broader economic health. At the same time, policy variables such as reach code counts and incentive amounts were strongly and positively associated with increased induction adoption. Areas with more electrification-oriented reach codes saw significantly higher induction sales, and the presence of financial incentives further accelerated adoption.

- Electricity prices act as a barrier. Higher average residential kWh rates were associated with decreased sales of induction appliances. While this effect was statistically significant, its magnitude was smaller than the positive effects of GDP, reach codes, and incentives.
- Price sensitivity appears lower for induction buyers. Unlike gas and electric non-induction appliances, sales of induction appliances did not significantly decline as average prices increased. This may indicate that early adopters of induction technology are less price-sensitive or are motivated by non-monetary factors such as performance, environmental impact, or health benefits.

Our forecasts suggest that by 2030, monthly induction cooktop sales in California could reach 716 units, and range sales could reach 699 units, even in the absence of additional interventions. However, natural market growth alone will not be sufficient to drive large-scale displacement of gas appliances by the end of the decade. This finding underscores the importance of continued and expanded incentive programs, as well as the strategic use of reach codes to guide market transformation.

These findings offer clear implications for program evaluators and implementers:

- Policy and incentive tracking should be embedded in future evaluations to assess ongoing market dynamics.
- Regional variation is critical—reach codes and market behavior differ substantially by DMA, requiring tailored strategies.
- Longitudinal data is essential for forecasting and course-correcting program approaches over time.

As California and other jurisdictions pursue electrification goals, evaluations like this provide a blueprint for measuring policy impacts, understanding adoption trends, and projecting future market behavior. These insights will be essential to inform future programs, optimize incentive design, and support the broader transition to a decarbonized residential sector.

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