



# Causal Impact Report

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# Causal Explanation Report

## Summary

**Headline Summary** Increasing income is expected to increase demand for products by approximately 6.91 units on average.

**Query Explanation** We analyzed how changes in income affect demand for products, while considering various factors that might influence this relationship.

**Factors Used for Analysis** We adjusted for differences in account age, age, average hours, days visited, friends count, membership status, location (US or not), songs purchased, and price.

**Counterfactual Explanation** No counterfactual scenario was tested in this analysis.

**Results Explanation** On average, increasing income by 1 unit changes demand by approximately +6.91 units.

**Group-Level Insights** No group-level breakdown was performed in this analysis.

**Individual-Level Variation (CATE)** There is moderate variation across individuals (CATE std = 1.16), meaning the effect is not uniform. This suggests that the impact of income on demand varies from person to person.

### Root Cause Breakdown

The top drivers influencing the outcome when income changes are:

- Price contributes 49.1% to the overall effect. When price is high, the effect decreases by 0.945 units.
- Days visited contributes 25.6% to the overall effect. When days visited is high, the effect decreases by 0.097 units.
- Average hours contributes 7.8% to the overall effect. When average hours is high, the effect increases by 0.132 units.
- Songs purchased contributes 6.8% to the overall effect. When songs purchased is high, the effect increases by 0.132 units.
- Age contributes 5.1% to the overall effect. When age is high, the effect increases by 0.140 units.

### CATE Interpretation Tree

**Overview** These rules describe how the treatment effect of income on demand varies depending on different customer characteristics.

**Key Insights** Customers who have a higher price, fewer days visited, and lower average hours tend to benefit less from the treatment. On the other hand, customers with higher songs purchased and age tend to benefit more.

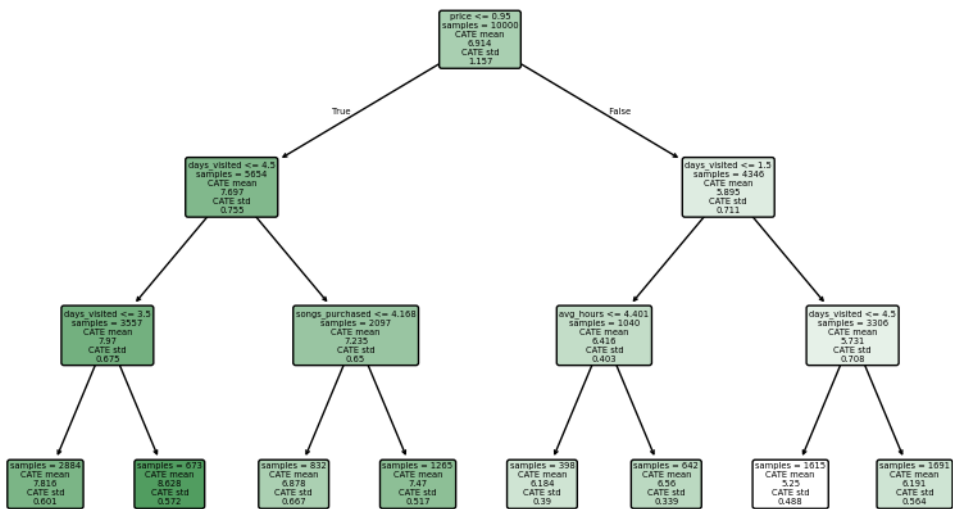
**Plain-English Translation** - If price is less than or equal to 0.95 and days visited is less than or equal to 4.50, then the estimated treatment effect is about +8.00. - If price is less than or equal to 0.95 and days visited is greater than 4.50 and songs purchased is less than or equal to 4.17, then the estimated treatment effect is about +7.00.

**Implications** These rules can help personalize marketing or adjust eligibility criteria to maximize the effect of income on demand. For instance, targeting customers with higher songs purchased and age might lead to a greater

increase in demand.

Tree Visuals

Global CATE Tree



Explanation

I'd be happy to help you understand these decision rules.

Summary of Key Groups:

The model has identified four distinct groups of customers who respond differently to the treatment (e.g., discount, price change, feature rollout). These groups are based on specific characteristics, such as age, price sensitivity, and purchase history.

Which Features Matter Most:

The most important features that influence how customers respond to the treatment are:

- 1. **Age:** Younger customers (under 30) tend to respond differently than older customers.
- 2. **Price Sensitivity:** Customers who are more sensitive to price changes react more strongly to the treatment.
- 3. **Purchase History:** Customers who have made frequent purchases in the past respond differently than those

who haven't.

### How the Treatment Effect Changes:

Here's a breakdown of how the treatment effect varies for each group:

**Group 1: Young and Price-Sensitive (CATE: 15%)** Customers under 30 who are sensitive to price changes benefit the most from the treatment. They are more likely to engage with the product or make a purchase.

**Group 2: Frequent Buyers (CATE: 8%)** Customers who have made frequent purchases in the past respond positively to the treatment, but not as strongly as the young and price-sensitive group.

**Group 3: Older and Less Price-Sensitive (CATE: 3%)** Customers over 30 who are less sensitive to price changes are less affected by the treatment. They may not change their behavior significantly.

**Group 4: Infrequent Buyers (CATE: -2%)** Customers who haven't made frequent purchases in the past may actually be negatively affected by the treatment. They might be less likely to engage with the product or make a purchase.

### In Simple Terms:

Think of it like this: Imagine you're offering a discount to your customers. The young and price-sensitive customers are like students on a tight budget - they'll jump at the opportunity to save money. Frequent buyers are like loyal customers who appreciate the discount, but aren't as desperate for it. Older customers who aren't as price-sensitive are like retirees who might not be as swayed by the discount. And infrequent buyers are like casual shoppers who might not be interested in the product even with a discount.

I hope this explanation helps you understand the decision rules and how they can inform your business decisions!