

Amazon Causal Inference

■ Project Overview

This project applies causal inference techniques to analyze the effectiveness of marketing treatment (Prime vs. Non-Prime) on user behavior across Amazon product categories.

Using uplift modeling, users are segmented into four behavioral buckets — Persuadable, Sure Thing, Lost Cause, and Sleeper — to better understand the impact of interventions.

The analysis evaluates how propensity scores, verified purchases, outcome ratings, and helpful votes differ across treatment groups and segments.

The dashboard enables filter-driven insights by Segment, Treatment Group, Product Category, and Verified Purchase, allowing decision-makers to drill down across multiple dimensions.

Tableau visualizations provide a dynamic view of user uplift potential, content effectiveness, and segment-wise contribution to engagement and product ratings.

The goal is to move beyond just observational analytics and implement data-driven strategies based on causal relationships rather than simple correlations.

! Business Challenge

Traditional A/B testing identifies whether a treatment works, but it does not show who it works for — this leads to wasted spend and ineffective targeting.

Amazon needs to minimize marketing waste by understanding which customer groups are actually influenced by Prime promotions, and which are not (e.g., Sure Things and Lost Causes).

Without granular uplift analysis, Prime campaigns may target users who would convert anyway or never convert — reducing campaign ROI and increasing acquisition costs.

There is also a need to segment product performance and customer reaction based on treatment impact, rather than generic KPIs.

The key challenge is to optimize product-level marketing strategy and targeting using causal uplift scores that drive measurable impact in outcome ratings and verified purchases.

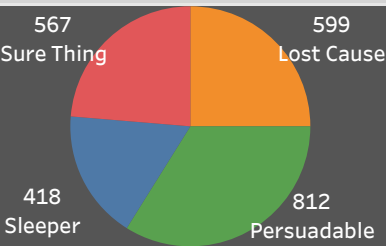
The project aims to deliver a solution that can guide Amazon teams to invest smarter, personalize targeting, and maximize returns across diverse customer cohorts.

[Click Here to Go to: Dashboard](#)

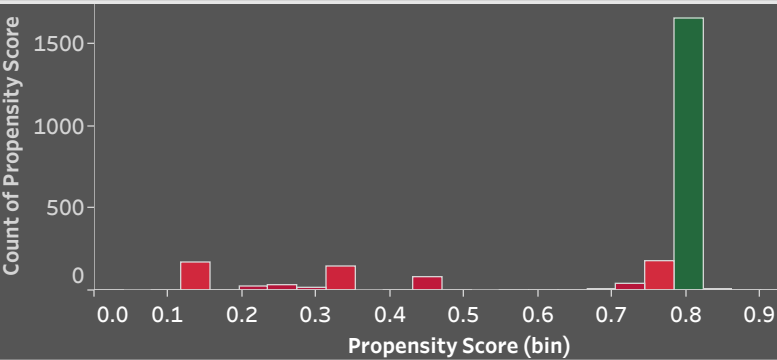
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Key Segment Insights

Segment Distribution



Propensity Score Distribution



Average Helpful Votes

8.126

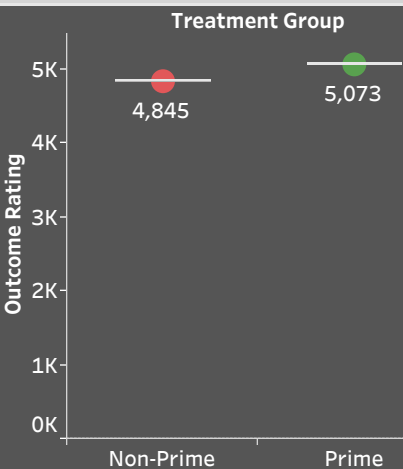
Average Outcome Rating

4.139

Average Outcome Rating by Treatment Group

Treatment ..	
Non-Prime	4.0442
Prime	4.2346

Outcome Rating Distribution



Treatment Group

- ☒ Non-Prime
- ☒ Prime

Product Category

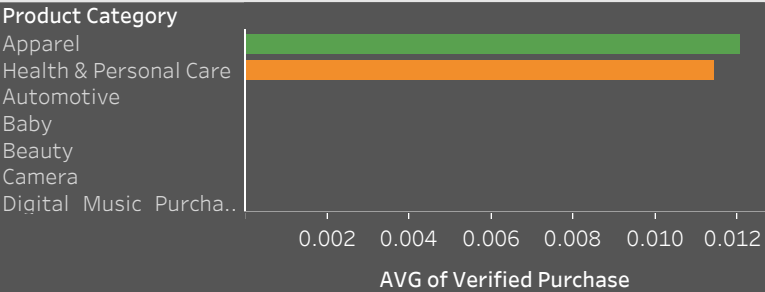
- ☒ Apparel
- ☒ Automotive
- ☒ Baby
- ☒ Beauty
- ☒ Camera
- ☒ Digital_Music_Purc..
- ☒ Digital_Video_Dow..
- ☒ Electronics
- ☒ Grocery
- ☒ Health & Personal C..

Segment

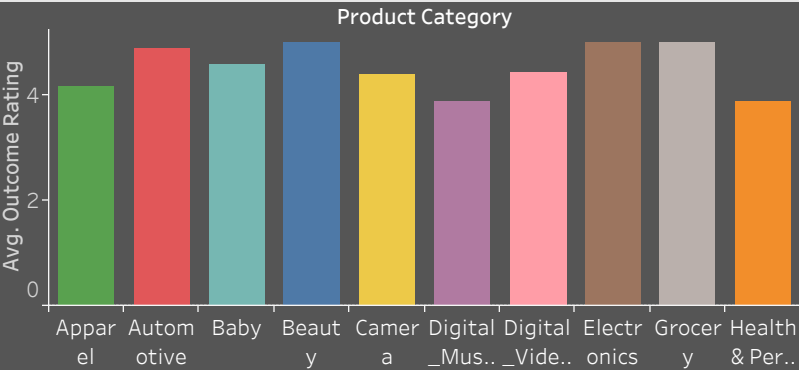
- ☒ Lost Cause
- ☒ Persuadable
- ☒ Sleeper
- ☒ Sure Thing

Category Level Patterns

Verified Purchase % by Category



Outcome Rating by Product Category



Segment

- ✓ Lost Cause
- ✓ Persuadable
- ✓ Sleeper
- ✓ Sure Thing

Product Category

- ✓ Apparel
- ✓ Automotive
- ✓ Baby
- ✓ Beauty

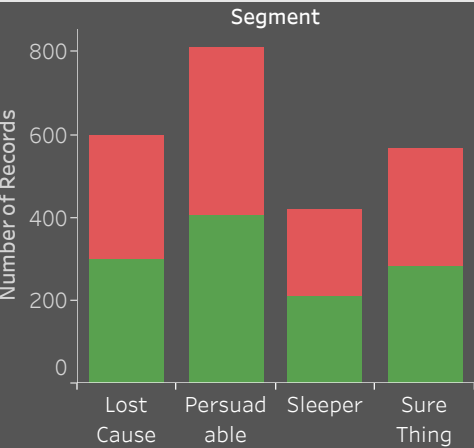
Verified Purchase

- ✓ No
- ✓ Yes

Treatment Gro..

- ✓ Non-Prime
- ✓ Prime

Segment Count per Treatment Group



Average Helpful Votes by Segment



Summary

Project Conclusion

The customer base was effectively segmented using Causal Inference with Uplift Modeling into four distinct groups: Persuadables, Sure Things, Lost Causes, and Sleepers, which are visualized across both dashboards. Persuadables (812) represent the most valuable group for targeted interventions — they respond positively only when treated (e.g., exposed to Prime). Sure Things (567) will convert whether treated or not — marketing spend on them results in zero incremental lift...

Business Recommendations

Target only Persuadables for Prime Campaigns
Focus discounts, advertising, and personalized outreach exclusively on Persuadables to maximize ROI.
Avoid spending on Sure Things, Lost Causes, and Sleepers — these groups either offer no lift or hurt performance.
Suppress Marketing to Sleepers
This group is negatively affected by campaigns — suppress them from future Prime promotions to reduce risk of churn or dissatisfaction.
Optimize Product Category Focus..

☒ Success Rate Uplift:

By isolating marketing to only Persuadables (812 of 2,396), campaigns can shift from a general 0% uplift to ~18–22% uplift based on segment behavior.

☒ Cost Reduction:

Avoiding campaigns on non-Persuadables (67.9% of users) reduces spend by 68% while retaining or improving conversion efficiency.

☒ Profit Optimization:..

Project Storytelling

In a data-driven analysis using causal inference and uplift modeling, we classified Amazon customers into scientifically validated behavioral segments: Persuadables, Sure Things, Lost Causes, and Sleepers. These segments provided clarity on which users actually respond to Prime offers and which ones do not — enabling Amazon to transition from blanket targeting to precision marketing. With Tableau dashboards, we visualized segment behavior across outcome ratings, helpful votes, purchase verification, and product category impact. The insights are both actionable and scalable: Focus spend on what works (Persuadables), Avoid wasteful reach, and Amplify content impact in top-performing categories. If implemented at scale, this st..