Sustainable Packaging with Cason Couture

w241: Experiments and Causality
Spring 2021 - Section 97

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I. __Abstract__

The global pandemic, Covid-19, has confined most of the world's population to their homes, leading to an increase in ecommerce purchases. As online shopping grew exponentially, so did the resulting packaging waste. Everyday, our planet's dire health is made more apparent to us, but how much do ecommerce shoppers really care? Would shoppers be more inclined to support a business if they exercised environmentally friendly packaging practices?

Our experiment aims to assess this idea through causal inference. We worked together with a small ecommerce women's clothing company called Cason Couture to bring results to the experiment. After sending out email advertisements regarding Cason Couture's switch to sustainable packaging, our findings suggest that customers who receive the sustainable packaging advertisement did not spend more money but navigated to the website more.

II. __Background__

Over the course of 2020 and 2021, the world has been immersed in struggle. Two of the most prominent themes that have emerged from this struggle include the Covid-19 pandemic and climate change. Covid-19 has shifted customer behavior by moving away from in-store business to online shopping.

As the world continues to destroy our planet, we ask ourselves how we can reduce our carbon footprint. There are many ways every single person can decrease their impact on the environment- from taking shorter showers to riding your bike to work. While many businesses have already completed the transition to environmentally conscious packaging choices, many

companies are reluctant to make the change because sustainable packaging options are expensive. To offer a comparison- 100 packaging bags that are sustainable are on average $160, while 100 packaging bags that are made with single-use plastic packaging are half the price, $80. The difference per unit in these two options is $1.60 and 80¢; long term, these costs add up. Companies do not want to make the move to sustainable packaging because they will have to build it into their cost- decreasing their profit margin.

Cason Couture

The company we chose to work with is a small retail ecommerce women's clothing store in Huntington Beach, California. Cason Couture's customer segment ranges from highschool age to middle age women buying anything from loungewear and homegoods to professional clothing and prom dresses.

Because of the location of the shop in Orange County, a predominantly conservative thinking community, it is important to consider that many of Cason Couture's customers' beliefs about climate change align with the conservative agenda. This consideration might play a role in how our subjects interact with the treatment of the sustainable packaging blurb.

Additionally, due to the global pandemic, Cason Couture has reported sales down by 75%. We anticipated that this decrease in sales would continue throughout the course of the experiment.

III.   Research Question

Our experimental aim is to infer whether or not customers are more likely to give a company their business if they switch from one-time use plastic packaging to compostable/eco-conscious packaging options.

Definitively, our research question is,

"Does transitioning to sustainable packaging methods impact how customers interact with the business?"

where interaction, in terms of our experiment, is defined as total amount spent on orders and email advertisement click through rate.

IV.   Hypotheses

We predict if a company transitions to environmentally conscious packaging materials[A], customers will view them as socially responsible and ethical. As a result, customers will be more inclined to support that company and buy their products. Our hypothesis is that Cason Couture customers who are made aware of the company's shift to compostable packaging will make more purchases.

A. Click Through Rate

Null Hypothesis

H_0 = *Sustainable packaging email advertisements have no effect on increasing click through rates*

Alternative Hypothesis

H_a = *Sustainable packaging email advertisements have an effect on increasing click through rates*

B. **Revenue**

Null Hypothesis

H_0 = *Sustainable packaging email advertisements have no effect on increasing revenue*

Alternative Hypothesis

H_a = *Sustainable packaging email advertisements have an effect on increasing revenue*

V. **Research Design**

Our research design is broken up into four main processes: conducting a Qualtrics survey, randomizing the Cason Couture email lists into treatment and control, administering treatment and control emails, and analyzing our results.

Qualtrics Survey

We first conducted a Qualtrics survey[B] to better understand what language would be most effectively used in the treatment and control emails. The list of questions in the survey include (the response options are in the sub-sections):

1. How old are you?

   a. text response

2. Gender: how do you identify?

   a. female, male, non-binary, prefer not to say

3. How concerned are you about single-use plastic from ecommerce packaging?

   a. 1 to 5 scale of "not at all" to "very concerned"

4. How concerned are you about carbon emissions in the atmosphere?

   a. 1 to 5 scale of "not at all" to "very concerned"

5. If your packaging could be eco-friendly, which of the following characteristics is most important to you?

   a. the packaging is recyclable, the packaging is compostable, as long as it is environmentally friendly

6. Do you care if a company is focused on decreasing their environmental impact? (decreasing energy use, sustainable packaging, reducing their carbon footprint)

   a. yes, doesn't matter, no

7. If any... what effect would a company's transition towards more eco-friendly processes have on your willingness to support them?

   a. It doesn't have an effect, I would be willing to purchase more frequently, I would be willing to spend more money, I would be willing to check out their products, I

would rather give that company business over a different company with the same products.

From this survey, we received a total of 93 responses. The responses allowed us to make informed decisions about what the email advertisements should say. The survey provided us with three main takeaways. First, those who responded to our survey did not have a preference for recyclable or compostable packaging materials; respondents only cared that the materials were environmentally friendly. We also learned that respondents were concerned about companies making an effort to decrease their carbon footprint, and individuals would rather give a company business that had made the transition to more eco-conscious practices.

Randomization

We downloaded 4,000 emails from Cason Couture's email recipient list from a marketing platform- Constant Contact. Using Jupyter Notebooks and Python, we randomized this list into two separate lists- one for treatment and one for control. This resulted in 2,000 treatment emails and 2,000 control emails.

Treatment and Control Emails

We utilized the results from the Qualtrics survey to inform the language used in the sustainability blurb. The marketing team used our suggestions to construct a treatment and control email. The treatment email contained the same advertisement as the control; however, it had an additional blurb about Cason Couture's transition from single use plastic packaging to sustainable packaging.[c] Everyday that an email advertisement was sent out, the control email was manipulated to include the sustainable packaging blurb- creating the treatment email.

<u>Timeline</u>

The timeline for the processes of our experiment are attached in the appendix.[D] Working with Cason Couture, we suggested a timeline of emails to be sent out for treatment and control. However, because they were a third party, they ultimately made the decisions of when these emails would be sent.

VI.   Measurement of Variables

There are two objective metrics that we aim to calculate to carry out our analysis: average revenue and click-through rate.

Over the span of data collection, we continued to receive more orders, and at the end of the experiment we had a total of 70 purchases. Of the 70 purchases, 39 of the customers were from the treatment group and 31 of the customers were from the control group. The amount spent on purchases from the treatment group was $3402.37 and $3245.93 for the control group, resulting in an ATE of $156.44.

The second metric we calculated was the click-through rate, defined as the number of clicks that the advertisement received divided by the number of times the advertisement was shown. The average click through rate for the treatment group was 0.1042857 and was 0.08571429 for the control group. For this metric, we measured an ATE of approximately 0.01857143 between the treatment and control group.

VII.   Modeling Choices

Our experiment consisted of a random sample amongst Cason Couture's email listing. Because of the simplicity of the design, we carried an unpaired 2-sample t-test to test the difference of averages for both average revenue and average click-through analyses.

At the end of the experiment period, we received a total of 70 observations for purchases. While we had sufficient observations to run a t-test, we also carried out an inference test. We carried out the inference test because at the start of the data collection we foresaw the possibility of receiving low turnout due to the Covid-19 pandemic.

VIII.   Results

The results of our t-test analysis were mixed. With our t-test for differences in revenue[E], we yielded a non-statistically significant p-value of 0.276 at the 5% significance level, giving grounds to reject the null hypothesis that the treatment emails had an effect on the dollar amount purchases. The same analysis for click-through rate[F] yielded a statistically significant p-value of 0.0307 in the positive direction at the 5% significance level. This allowed us to reject the null hypothesis that the treatment did not have an effect on the click-through rate.

As seen in the appendix, we display a histogram of both the revenue/total amount spent and the click through rate.

Comparing the total amount[G] spent among the treatment and control, we observed a right skewed distribution for both. The overlaid histograms for revenue are very similar. This is

consistent with our findings that the p-value for revenue was not statistically significant, and that the treatment had no effect on revenue.

Comparing the click through rate[H] based on treatment or control, we observed more of a slightly normal distribution. However, in this case, the treatment had higher outcomes in click through rate. Again, this is consistent with our findings that the p-value was statistically significant for click through rate in the positive direction, and that the treatment increased click through rates.

The results of our inference tests of 1000 resamples for both the revenue, which yielded a p-value of 0.905, and click-through analyses, which yielded a p-value of 0.0186. Both of these results support the findings from the statistical tests described above.

IX.   **Conclusions**

All factors considered, we fail to reject our null hypothesis that the transition to sustainable packaging does not have an effect on the amount of revenue. We reject our null hypothesis that the transition to sustainable packaging does not have an effect on the click through rate.

It is important to note that it is unlikely that these results can be generalized, though, since the subjects are likely not representative of all businesses and all consumers. In regards to potential future research, results would be more interpretable if the company we performed the experiment on was at a larger scale and consisted of a larger range of customers. In addition, it is

important to note that Covid-19 impacted sales of Cason Couture regardless of the sustainability blurb.

As stated above, the click through rate was a statistically significant metric. This indicates that there was more interest in the company because of the sustainability blurb. As such, recreating this experiment with a larger company that has outreach to a more diverse population, we predict we would not only see more click throughs from email advertisements but a higher possibility of increased revenue and orders. Taking that into consideration, it would be worthwhile to carry a similar experiment during a non-Covid time to see if the results are different. Overall, this experiment remains a progressive step in bringing awareness and research to the impact sustainable packaging can have on businesses and consumers.
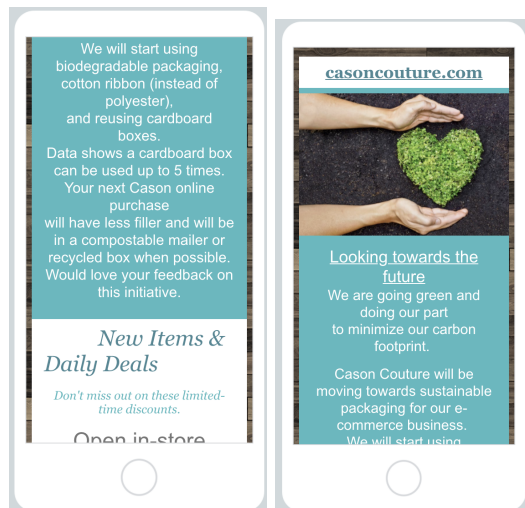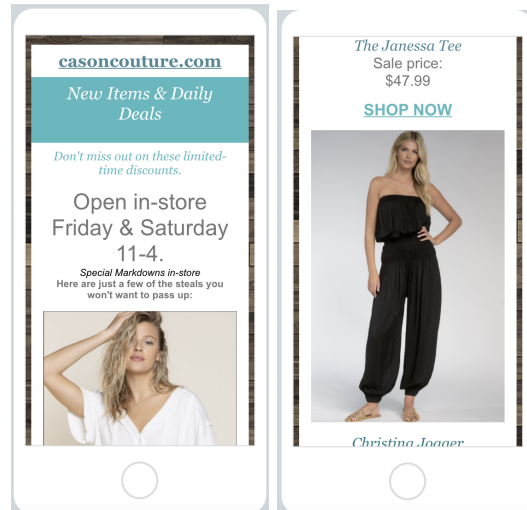
Appendix

A. Compostable packaging used by Cason Couture

B. Qualtrics Survey

C. Treatment and Control Emails
   a. Treatment

b. Control

D. Timeline of Processes

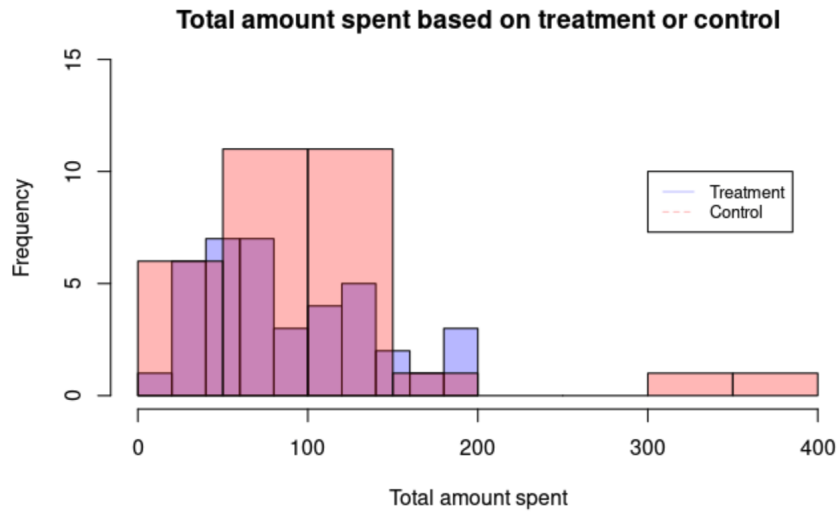| Date	Process Description
02/25/21	Qualtrics survey sent out
03/04/21	Results of the Qualtrics survey given to Cason Couture
03/08/21	Cason Couture administers first treatment and control emails
03/08/21-04/12/21	8 iterations of treatment and control emails were sent
04/12/21	Recorded last transaction of experiment

E. Total spent t-test

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        Welch Two Sample t-test

data:  shopify_orders$Total[shopify_orders$treatment == 1] and
shopify_orders$Total[shopify_orders$treatment == 0]
t = -1.101, df = 48.369, p-value = 0.2763
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -49.35893  14.42460
sample estimates:
mean of x mean of y
 87.24026 104.70742
```

F. Click-through Rate t-test

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        Welch Two Sample t-test

data:  constant_contact$click_rate[constant_contact$treat_or_control == 1] and
constant_contact$click_rate[constant_contact$treat_or_control == 0]
t = 2.4865, df = 10.747, p-value = 0.03068
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.002085457 0.035057400
sample estimates:
 mean of x  mean of y
0.10428571 0.08571429
```

G.

Total amount spent based on treatment or control

H.

Click Through Rate based on treatment or control