

UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Single-Use Items Reduction: Disposable Cups

Mina Sidhu, Karan Mehrotra, Kaiwen Hu

University of British Columbia

ECON 492

Themes: Finance, Food, Waste

December 2018

Disclaimer: "UBC SEEDS Sustainability Program provides students with the opportunity to share the findings of their studies, as well as their opinions, conclusions and recommendations with the UBC community. The reader should bear in mind that this is a student research project/report and is not an official document of UBC. Furthermore, readers should bear in mind that these reports may not reflect the current status of activities at UBC. We urge you to contact the research persons mentioned in a report or the SEEDS Sustainability Program representative about the current status of the subject matter of a project/report".

Single-Use Items Reduction: Disposable Cups

MOVING TOWARDS ZERO WASTE IN FOODWARE

Mina Sidhu, Karan Mehrotra, Kaiwen Hu
ECON 492E | SEEDS SUSTAINABILITY

Table of Contents

Executive Summary	2
Introduction and Background	3
Literature Review	5
Methods	
Reusable cup proportions	7
Sales changes.....	9
Findings	
Reusable cup proportions	10
Sales changes.....	13
Extension: Marketing	18
Recommendations	22
Limitations	23
Future Research	24
References	25
Appendix	26

Executive Summary

Prior to September 2018, UBC Food Services offered a 15-cent discount to consumers bringing reusable cups for hot beverages. Implemented in September 2018, a new pricing strategy was introduced: menus at UBC Food Services outlets now display a 25-cent charge for disposable cups in addition to the price of each drink.

The strategy was implemented in alignment with UBC's Zero Waste Action Plan, for the purpose of encouraging consumers to switch from disposable to reusable cups. Many disposable cups end up improperly recycled due to the required separation of the cup components (lid, sleeve, cup) and those that do end up recycled are difficult to process due to the plastic liner inside each disposable cup. The success of the new pricing model would mean less disposable cups in bins and landfills, reducing their environmental impact and the associated financial costs of disposal and separation.

The intent of this SEEDS project is to determine the effectiveness of the new pricing strategy in encouraging sustainable behaviour through a reduction in disposable cup quantities. Additionally, we determine any secondary impacts of the pricing strategy on beverage sales across UBC Food Services' outlets. To further encourage a switch to reusable cups, we tested the implementation of targeted marketing and reusable cups for sale at high-traffic coffee outlets to determine which strategies would best complement the 25 cent cup charge and decrease disposable cup usage by consumers.

Key findings of our analysis include a substantial increase in the number of reusable cups brought in by consumers for the months of September, October and November 2018; more than 11000 reusable cups were used at six coffee outlets in September, compared to less than 2500 reusable cups at the same outlets in September 2017. The increase in reusable cups has grown to nearly 30% of all hot beverage sales. The effect of the new pricing model on sales is ambiguous due to significant environmental differences over October and November that distorted sales targets, but sales data from September indicate the impact of the pricing model is small.

Residence dining halls were the most successful in switching consumers from disposable to reusable cups, followed by coffee-focused locations. Locations where coffee is a secondary offering in addition to a food menu saw the highest drop in coffee sales and smallest switch to reusable cups. The implementation of marketing providing encouragement to reusable cup users in addition to selling reusable cups in-store was able to increase the proportion of reusable cups brought in by 3% on average. At little to no cost of implementation and upkeep, the use of marketing was an effective contributor to encouraging reusable cup usage.

We recommend that UBC Food Services retain the 25-cent cup charge for future months to determine if further effects on sales will follow low-impact September trends, and concentrate future efforts to reduce disposable cup usage at their coffee-focused and residence locations.

Introduction

UBC Food Services plays a fundamental role in campus life at UBC, operating more than 30 food outlets and three residence dining halls. Of all their offerings, coffee plays no small role; more than 10 retail outlets are dedicated coffee shops, in addition to hot beverages being on the menu of many more food-focused locations.

Prior to September 2018, coffee outlets run by UBC Food Services offered a 15 cent beverage discount to all users that brought a reusable mug. The incentive saw some effect, with two high traffic locations, Ike's Café and Stir It Up, and the Totem Park Dining Hall seeing between 3% and 7% of their patrons bring in their own cup, but substantial room for improvement remained.

Beginning in September 2018, a new pricing strategy was implemented in an effort to reduce the number of disposable cups being used: UBC Food Services outlets now charge 25 cents per disposable cup, and the price is visible on menus as a separate cost from each beverage.

This report analyzes the new pricing strategy for disposable cups, focusing on three key questions:

- 1. Does the pricing strategy incentivize consumers switching from disposable to reusable cups, and what is the magnitude of the switch?**
- 2. Does the pricing strategy affect UBC Food Services' sales?**
- 3. Based on the impacts of the pricing strategy, what other incentives or disincentives can promote sustainable behaviour?**

Background

Campus

UBC's Zero Waste Action Plan (2014) focuses on immediate initiatives to increase landfill diversion through waste sorting stations in place of trash cans and the separate collection of both organics and paper towels. Long term initiatives include further replacement of paper towel dispensers for hand dryers in restrooms, phasing out water bottles for sale on campus, and periodically updating the minimum construction diversion targets for REAP and LEED certified buildings.

Focusing specifically on the issue of waste in food and dining, the UBC Zero Waste Food Ware Strategy (2018) highlights the role of disposable cups in slowing UBC from reaching its goal of 80% waste diversion by the year 2020. An audit of the composition of materials found in food scrap collection bins found that disposable cups are the most frequent contamination item, and their quantity multiplied by the size of each cup makes disposable cups the highest volume item in garbage and recycling bins. UBC's plan for the reduction of single-use items, including disposable cups, plastic straws and takeout containers, involves implementing a cup exchange program and placing fees on single-use items.

Municipality

The City of Vancouver's Zero Waste 2040 Action Plan (2018) outlines Vancouver's vision to become a zero-waste city by 2040 through introducing zero-waste policies at the manufacturing level, decreasing construction waste and normalizing item repair to extend their lives.

Vancouver sees 2.6 million disposable cups thrown into the trash every week and spends nearly \$2.5 million annually in cleaning up disposable cups and takeout containers from bins and public areas. Vancouver's Single-Use Item Reduction Strategy (2018) is expected to be completed by 2025 and focuses on phasing out items like disposable cups, plastic shopping bags and straws. The City of Vancouver is currently implementing the first part of its plan in which methods to reduce the cost of collecting disposable cups are being investigated, in addition to promoting behavior change programs to reduce usage. Reduction targets are set in place and are to be evaluated in 2019, and a by-law is proposed for implementation in 2019 that requires businesses to have reduction plans for disposable cups.

Literature Review

Institutions prior to UBC have made efforts to reduce their usage of disposable cups. Poortinga and Whitaker (2018) conducted a field experiment on 2016 in twelve university and business sites in the United Kingdom to examine whether there were effective methods to promote the use of reusable cups.

Within the experiment environmental messaging and the provision of reusable cups together were the most effective in promoting reusable cup usage. Financial incentives to induce sustainable behaviour were also explored, and they found that a surcharge pricing strategy was more effective than a discount pricing strategy. Of the most successful strategies found through the study, none had a negative effect on beverage sales.

For environmental marketing, the researchers found differences in behavior change based on message content. The provision of environmental impact statistics in marketing was ineffective in translating to a behaviour change, whereas normative messages that directly appealed to morality saw greater success.

Poortinga and Whitaker found that each incentive and disincentive they tested had a minor effect on use of reusable cups. Rather than the use of individual methods to promote the use of reusable cups, methods in combination yielded greater results. A participant university implemented a visible surcharge for disposable cups in addition to each beverage price, and distributed reusable cups for free to students in the beginning of term; these two strategies together boosted the use of reusable cups by 33.7% across three of their café units.

The findings of this study have significant implications for the outcome of the new pricing strategy at UBC; surcharges were found to be the most successful tactic, which align with UBC's strategy. The combination of methods across incentive systems, alternatives and appealing to morality had a much greater impact than any individual method in encouraging sustainable behaviour, making the addition of these strategies to UBC's a worthwhile area of exploration.

The new pricing strategy at UBC is a switch from a drink discount, a reward, to a cup surcharge, which is presented as a punishment. Research has been done on the effect of punishment vs. reward systems in modifying behaviour.

A study conducted in a hospital in New York (Armellino et. al, 2012) explored the use of immediate positive feedback, in the form of a sign that flashed messages such as "Good Job!" when the task was completed, in increasing hand sanitization rates by medical professionals. The sanitization rate prior to the study was 10%, and after four weeks of intervention the rate reached nearly 90%. Tali Sharot, a professor of cognitive neuroscience, discussed the high results in an article for the Harvard Business Review (2017). She explains that the immediate positive feedback triggers a reward signal in the brain that reinforces the action and makes it more likely to become repeated behaviour. This is due to the norm of rewards coming from action, and the brain being accommodating of that

connection in situations like the experiment. Conversely, a connection exists between the avoidance of punishment and a lack of action; the best way to avoid punishment is to inhibit action.

The finding focused on punishments and the inhibition of action could contribute to a drop in sales as a result of UBC Food Services' punishment oriented system, if patrons avoid the cup charge by forgoing their entire drink purchase. However, this is at odds with Poortinga and Whitaker's finding that a surcharge on cups is more effective than a discount.

A potential area of exploration out of this study is the use of positive feedback in promoting sustainable behaviour, through positivity in marketing or an additional reward to consumers who bring a reusable cup.

Methods

1. Does the pricing strategy incentivize sustainable behaviour in the form of consumers switching from disposable to reusable cups?

To understand this, we will observe the number of disposable cups used in UBC Food Services' outlets from 2015 to 2018. We will analyze the trend from 2015 to 2017 on consumers' usage of disposable cups and compare that to any changes we can observe between 2017 and 2018.

Furthermore, we will analyze how effective our client's new pricing strategy promotes sustainable behavior by hot beverage consumers. In order to disentangle this, we will compute the relationship between the relative change in price of the disposable cup and the relative change in proportion of hot beverage consumers that use disposable cups. Rather than looking at how the change in price is related to the change in nominal number of disposable cups, we decided to analyze the proportion for two reasons: first, nominal number of disposable cups could be hugely affected by a potential change in hot beverage sales. In order to avoid this, we will use the proportion of disposable cups used by hot beverage consumers. Second, the proportion value will provide us with the likelihood of an average consumer purchasing a disposable cup.

The key data required to calculate these are the following:

1. Number of hot beverage sales for 2015, 2016, 2017 and 2018
2. Number of disposable cups used for 2015, 2016, 2017 and 2018

Our datasets will consist of sales and cup sales from the months of September, October and November between the years of 2015 and 2018 and will be obtained from the same group of coffee outlets. We will examine the time effect of 2017 to 2018 as our treatment group, as we are interested in how the new pricing strategy introduced by UBC Food Services in September 2018 has affected consumers' behavior towards purchasing disposable cups.

First, we will calculate the total number of disposable cups used each year from 2015 to 2018 for Ike's, Stir It Up, Mercante, and the Totem Park Dining Hall. If there is a decrease in disposable cups used from 2017 to 2018, it implies that the pricing strategy is successful in motivating consumers to replace disposable cups with reusable cups.

Second, we will find the percentage change in disposable cups used in each year for each coffee outlet; this will determine which outlets experienced the greatest reduction in disposable cup usage.

Next, we will calculate the proportion of disposable cups used out of all sales. This will capture the likelihood of an average consumer purchasing a disposable cup. Lastly, we will take the natural logarithms of these values and the natural logarithm of the coffee cup price to find the elasticities for each year.

When calculating the relationship between the relative change in proportion and relative change in cup price, we will take the natural logs of the proportion and the cup price. Then we will take the differences in the natural log of proportion from 2017 and 2018, and the natural log of proportion from 2017 to 2018. The ratio of the two figures will represent the relative relationship between proportion of hot beverage consumers using disposable cups and disposable cup price.

Methods

2. Does the pricing strategy affect UBC Food Services' sales?

To understand the effect of the new policy on sales we compare sales data for the months of September, October and half of November from 2015 to 2018. This sales analysis is done by observing the sales trend over the four years for the 2.5-month period at five coffee outlets, Ike's, Stir it up, Mercante, Totem Park Dining Hall and Hero Coffee and Market, and noting whether sales have increased or decreased after implementation of the new pricing strategy. Due to a lack of data over the 4-year period, Perugia is excluded from the analysis. To make the analysis more meaningful, we further divide the five outlets into two segments. One is for stand alone outlets such as Ike's cafe, Stir it up and Mercante and the other is for first-year residence outlets such as Totem Dining and Hero's cafe. Comparing between these two segments will give us meaningful results.

Additionally, actual sales figures for 2018 are compared to the forecasted sales figures which represent the predicted sales levels that would have been achieved in the absence of the new pricing strategy. These forecasted sales figures are achieved using a Time-series analysis method, we predict the sales for 2018 based on the previous sales trend. This contributes to us conducting a partial difference-in-differences analysis. Instead of simply relying on whether sales have fallen or risen compared to 2017, a more meaningful approach is to compare current sales to the sales predicted for the current period based on the sales growth trend of the previous pricing strategy. This provides a better picture of how the new strategy has affected sales. For example, it is possible that the sales have fallen as compared to last year for a location, but that particular location was already facing a negative sales growth. In that case, we can measure whether the sales drop was due to the new strategy or due to the prevailing negative sales growth trend.

Finally, we calculate the price elasticity of sales for each location to understand the different impacts of the policy change at different locations. This is done by taking the percentage change in sales for the 2.5-month period in 2017 and 2018, with respect to the percentage change in the cup price from \$0.15 to \$0.25. In this part, we also calculate elasticity using a logarithms, in which case we convert the sales figures and the prices to logs. Then we divide the difference between log of the sales for 2018 and 2017 by the difference between the log of the prices. To conduct this price elasticity analysis, we do not take the entire cost of hot beverages because they remain constant from 2017 to 2018. Since we want to analyse the effect of the psychological price change that people perceive due to the different pricing method, we only use the change in the cup price.

Findings

1. Does the pricing strategy incentivize sustainable behavior in the form of consumers switching from disposable to reusable cups?

In Figure 1 and Figure 2, we see that from 2017 to 2018 all coffee outlets experienced a decrease in the number of disposable cups used. Ike's and Stir It Up saw a 23% decrease, Mercante had a 32% decrease, and Totem Park Dining Hall had a 59% decrease. In aggregate, the four outlets experienced a 29% decrease in disposable cups used. If we consider Totem Park Dining Hall's results as an outlier and exclude it from our analysis, the remaining three outlets experienced a 25% decrease overall. Thus, the pricing strategy is successful in motivating UBC Food Services' consumers to stop using disposable cups.

Figure 1: Yearly Disposable Cups Used



Figure 1 depicts the number of disposable cups used at each outlet over the period of September 1 to November 15 for the years 2015-2018.

Figure 2: Yearly Percentage Change in Disposable Cups Used

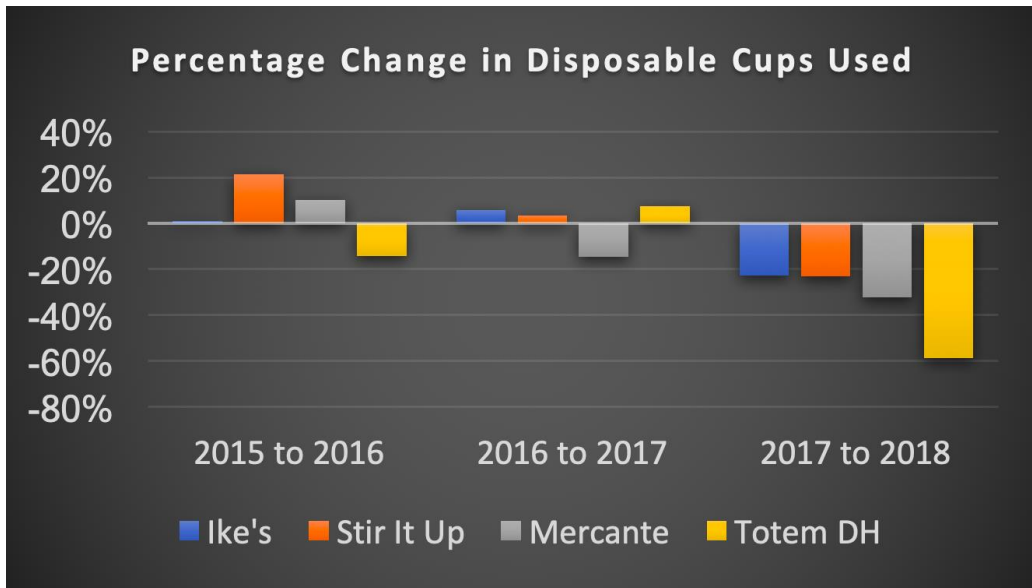


Figure 2 depicts the percentage change of disposable cups used at each outlet over the period of September 1 to November 15 for the years 2015-2018.

In Figure 3, we see that each outlet’s average consumer’s likelihood to use disposable cups has decreased from 2017 to 2018. We can deduce that UBC Food Services’ new pricing strategy has decreased the likelihood of a consumer using a disposable cup.

Figure 3: Yearly Proportion of Disposable Cups Used

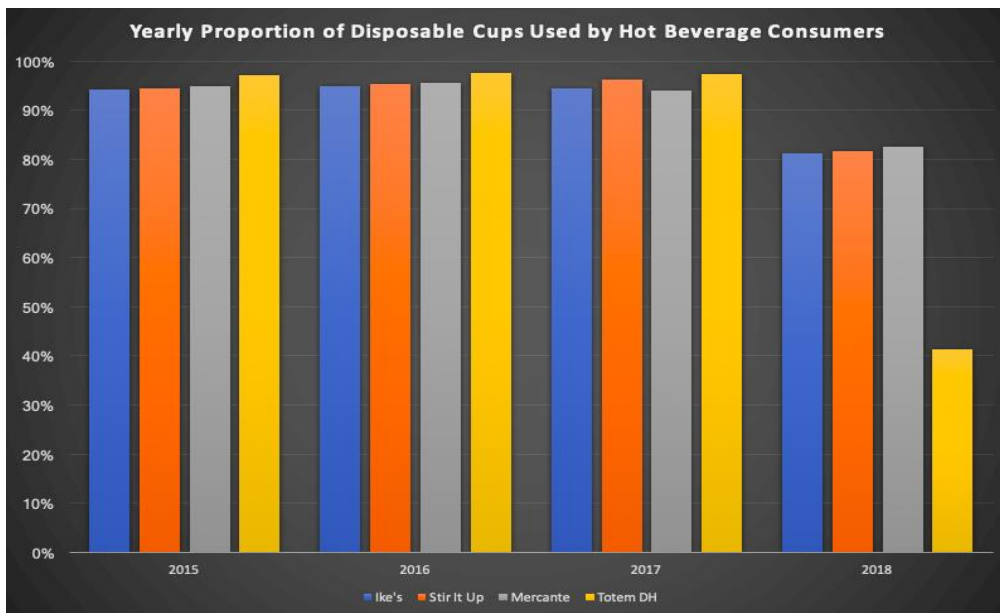


Figure 3 depicts the proportion of consumers using disposable cups at each outlet over the period of September 1 to November 15 for the years 2015-2018.

Using our framework, we computed the elasticities of relative change in proportion of disposable cups used by consumers with respect to relative change in disposable cup price for all four outlets. We did this by taking the natural logs of the coffee cup price for 2017 (15 cents) and 2018 (25 cents) and natural logs of the proportion of disposable cups used by consumers at each outlet for 2017 and 2018. Then we calculated the ratio between the change in natural logs of the price from 2017 to 2018 and change in natural logs of the proportion of disposable cups used from 2017 to 2018 at each outlet.

Figure 4: Relative Change in Price vs Relative Change in Proportion of Disposable Cups Used

	Ike's	Stir It Up	Mercante	Totem DH	Total	Total (without Totem DH)
Elasticity	-0.30	-0.32	-0.26	-1.68	-0.73	-0.63

The elasticity first shows that there is a negative relationship between relative price change and relative change in proportion of consumers using disposable cups. This mirrors our finding of consumers using less disposable cups after the price increase on disposable cups. Overall, the proportion of consumers using disposable cups decreases by 0.73 percentage points from a 1 percentage point increase in cup price.

Of our findings, the most glaring result is the elasticity for Totem Park Dining Hall; the proportion of consumers using disposable cups decreased by 1.68 percentage points from a 1 percentage point increase in cup price. Compared to other outlets, Totem Park Dining Hall consumers changed their behavior towards using disposable cups the most after the increase in disposable cup price, all else equal. This may be due to characteristics specific to Totem Park Dining Hall. The Totem Park Dining Hall caters towards students who live in the Totem Park Residence and a majority of their patrons are residents. Therefore, it is much easier for students living in their residences to bring a reusable cup from their living space with easy access to cleaning facilities and storage.

Another potential explanation for our finding is a separate strategy that the Totem Park Dining Hall has implemented. The Totem Park Dining Hall currently supplies reusable ceramic mugs that students can use while in the residence cafeteria at no charge; this severely reduces the need for consumers to purchase a disposable cup if the intention is to have the beverage while remaining at Totem Park.

Findings

2. Does the new pricing strategy lead to a change in sales?

Figure 5: Sales figures (Sept 01 - Nov 15)

Year	Ike's	Stir it up	Mercante	Totem DH	Hero's	Δ Sales
2015	28,895	20,158	16,105	10,335		
2016	29,027	24,240	17,608	8,816		5.56%
2017	30,769	24,833	15,318	9,515	16,887	0.93%
2018	27,602	22,488	11,834	9,275	20,125	-6.16%

By conducting a simple sales analysis, we see that overall sales have decreased by 6.16% from 2017 to 2018. A more practical approach to conduct this analysis is to divide the five outlets into two segments: one for residence outlets and one for standalone outlets such as Ike's, Stir It Up and Mercante.

Figure 5.5: Sales figures (Sept 01 - Nov 15)

Year	Ike's	Stir it up	Mercante	Δ Sales	Totem	Hero's	Δ Sales
2015	28,895	20,158	16,105		10,335		
2016	29,027	24,240	17,608	8.8%	8,816		-14.7%
2017	30,769	24,833	15,318	0.1%	9,515	16,887	7.9%
2018	27,602	22,488	11,834	-12.7%	9,275	20,125	11.4%

For residence outlets, we see that total sales have increased by 11.4% from last year for the 2.5-month period. Conversely, for stand alone outlets total sales have decreased by 12.7% compared to last year. A majority of this decrease in sales comes from Ike's and Mercante, both of which have faced an increase in competition recently.

Mercante has seen a decline in its sales since 2016 due to the opening of another coffee outlet, Harvest, directly across from it. Ike's, on the other hand, is likely losing its customers to the recently opened Starbucks in close proximity. Due to the centralized location of the Life building that houses the new Starbucks location and the ample study space it provides, consumers can choose to go to the Life Building to study rather than going to Irving K. Barber Learning Centre, where Ike's is located. This shift in traffic from the Irving K. Barber Learning Centre to the Life Building is expected to be matched by a shift in sales from Ike's to Starbucks.

Figure 6: Yearly Sales for the two and a half month period

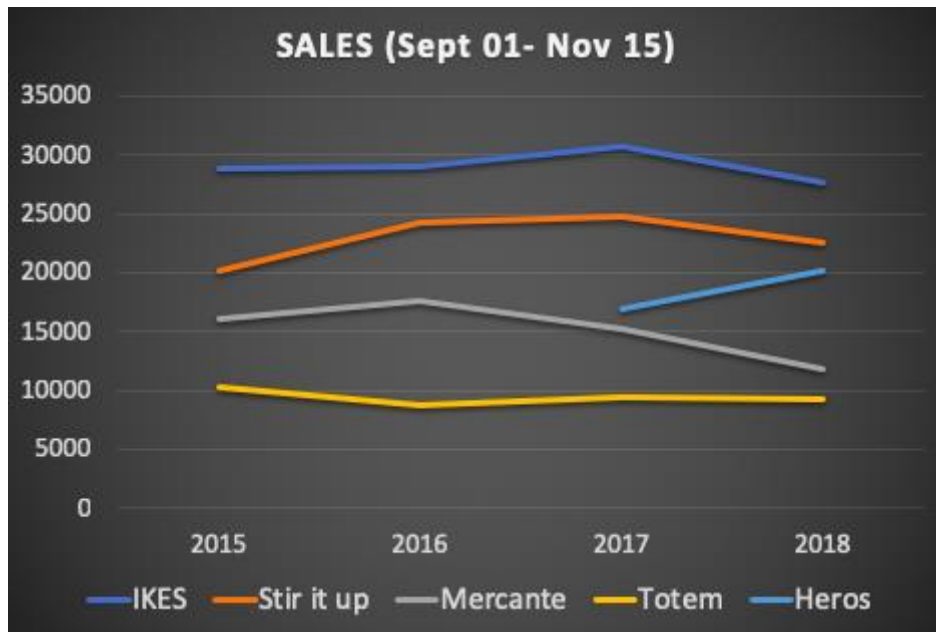


Figure 6 depicts sales figures for Ike's, Stir It Up, Mercante, Totem Dining hall and Hero's for the month of September, October and halfway through November over the years 2015-2018.

Figure 7: Percentage change in sales (2015-18):



Figure 7 depicts the percentage change in sales figures for Ike’s, Stir It Up, Mercante, Totem Dining hall and Hero’s for the month of September, October and halfway through November over the years 2015-2018.

Figure 8: Forecasted versus Actual Sales (Sept 01 - Nov 15):

Sales 2018	Ike’s	Stir It Up	Mercante	Totem DH	Total Sales
Forecasted	31,435	27,749	15,559	8,735	83,479 ⁽¹⁾
Actual	27,602	22,488	11,834	9,275	71,199

(1) Forecasted using excel based on sales trend from 2015 to 2017

(2) Hero’s not included due to lack of data

Forecasted sales here are the sales that would have been most likely achieved in the absence of the new pricing strategy and with consistent market conditions. Using a partial difference-in-differences analysis with the forecasted sales acting as a control group and the actual sales as the treatment group, we see that only Totem Park Dining Hall was able to exceed its forecasted sales figures. Apart from Totem Park Dining Hall, Ike’s, Stir It Up and Mercante were unable to meet their respective forecasted sales. This could partially be due to the new pricing strategy and partially due to other factors such as proximity to competitors, new competition, differences in weather that regularly affect hot beverage sales, or changes in student population.

Figure 9: Forecasted Sales versus Actual Sales

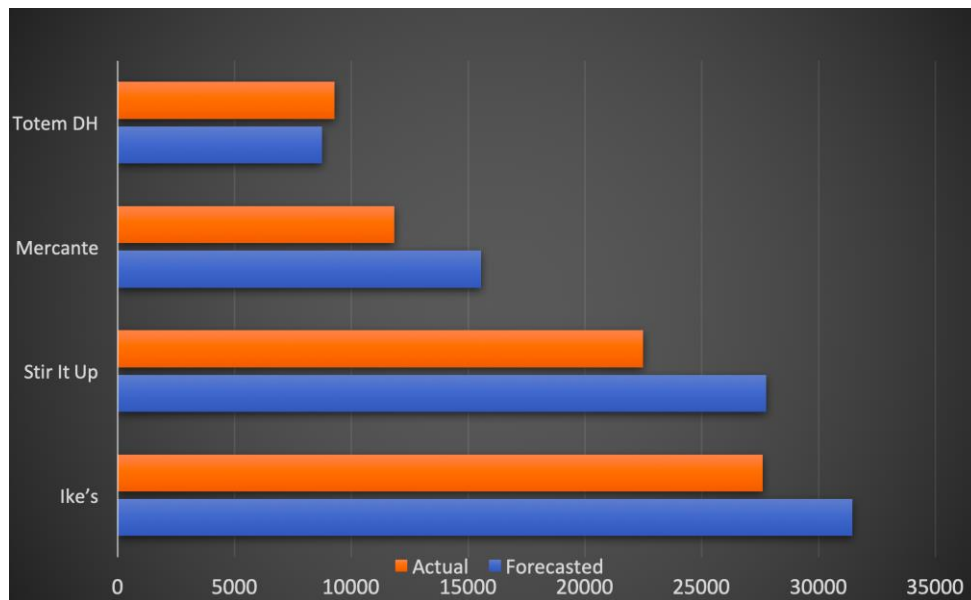


Figure 9 compares forecasted sales and actual sales from Totem Dining, Mercante, Stir It Up and Ike's Cafe for the period September 1 - November 15. Forecasted figures based on old pricing strategy.

Figure 10: Price elasticity of Sales after cup was re-priced from \$0.15 to \$0.25:

	Ike's	Stir It Up	Mercante	Totem DH	Hero's
E_d (absolute)	-0.154	-0.142	-0.341	-0.038	0.288
E_d (log)	-0.119	-0.108	-0.282	-0.028	0.191

We also conduct a price elasticity analysis to understand the magnitude of the effect that the increase in cup prices has had on sales. From this analysis, we conclude that Ike's ($E_d = 0.154$), Stir It Up ($E_d = 0.142$), Mercante ($E_d = 0.341$) and Totem Park Dining Hall ($E_d = 0.038$) have negative price elasticities. This can be interpreted as that a 1% increase in price will decrease sales by 0.15% at Ike's, 0.14% at Stir It Up, 0.34% at Mercante and 0.04% at Totem Park Dining Hall. Hero's is the only outlet that has a positive elasticity, which means that a minor increase in price will not lead to a decrease in sales at this location.

We see that the sales at Hero's and Totem Park Dining Hall are either not affected by a minor change in price (Hero's) or are affected by very little (Totem Dining). These outlets are located in first year residences, which could be a reason as to why they are more or less unaffected by the price change.

A few reasons as to why the new policy is working in first year residences:

- No competitors in close proximity
- Existing high level of participation in reusable cup usage
- First year students less affected by the price change due to advantages of meal plan

Extension

3. Based on the impacts of the pricing strategy, what other incentives/disincentives can promote sustainable behaviour?

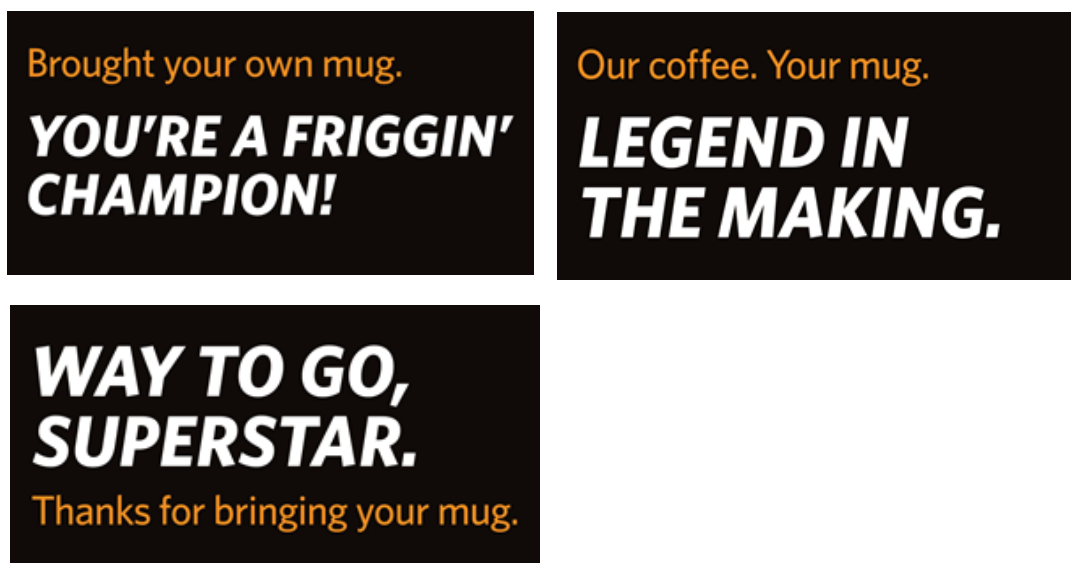
Based on the success found in the use of environmental marketing in combination with the provision of reusable cups for the purpose of decreasing disposable cup usage (Poortinga and Whitaker, 2018), and additional research supporting the relationship between positive feedback and reinforced behaviour (Armellino et al, 2012), a new marketing approach was designed on a trial basis for select UBC Food Services outlets. To determine the effectiveness of marketing in encouraging a switch to reusable cups, alone and in combination with the sale of reusable cups, we ran two marketing trials at Ike's Café and Stir It Up Café.

For a two-week period in early November, Stir It Up Café displayed three large posters and one counter sign that:

1. Delivered messages of encouragement and gratitude to reusable cup users
2. Provided statistics on environmental impact from disposable cup usage

Ike's Café displayed the same four signs, in addition to offering a collection of reusable mugs at different price points for sale beside the queue.

Overhead Signs



To determine the effect of the marketing, and the marketing in combination with selling reusable cups, we looked at the proportion of reusable cups used in the two weeks prior to the marketing

strategy, week 3 and week 4 in October, in comparison to the two weeks with the marketing strategy implemented, week 1 and week 2 in November.

Figure 11: Reusable Cups used before and after Marketing Strategy



Figure 11 compares the proportion of reusable cups used during the 2 week marketing period and the 2 week period prior to the implementation of the marketing strategy.

Figure 12: Proportion of Reusable Cups Before and After Marketing Strategy

Week	Ike's	Stir It Up
October Week 3	17.7%	16.5%
October Week 4	16.0%	16.6%
November Week 1	9.8%	15.1%
November Week 2	19.6%	18.8%

Our findings show a significant drop in reusable cups across both locations under the first week of the marketing strategies, falling by 6.2% and 1.5% respectively at Ike’s and Stir It Up compared to the week prior. For the second week under the strategy, reusable cups increased by 9.8% at Ike’s and 3.7% at Stir It Up.

A closer look at daily data within the first week of November reveals an outlier sales day. At Ike’s, the day of November 2nd shows a negative reusable cup rate; more disposable cups were purchased

than total drinks sold. This could be attributed to a rare occurrence of consumers purchasing a large number of disposable cups for other purposes than to hold hot beverages from Ike's. As the reusable cup rate on November 2nd is a factor of more than just hot beverage sales, it is removed for the purpose of adjusting the analysis. After its removal, the reusable cup rate increases to 15.9% for the first week of November at Ike's.

Stir It Up finds that November 1st, one of the two highest-volume sales days in November, is also among the lowest in the proportion of reusable cup usage for Stir it Up. In addition to November 1st falling on the first day of the marketing strategy, its significance as the day after the night of Halloween may play a role in less consumers than on average bringing reusable cups. The inclusion of this day in November Week 1 is a contributor to the lower proportion of reusable cups that can be seen in the table for Stir It Up. If removed from the analysis, the reusable cup rate for the adjusted 4-day first week of November increases to 15.8%

Figure 11.5: Adjusted reusable cup rates with removal of outlier data

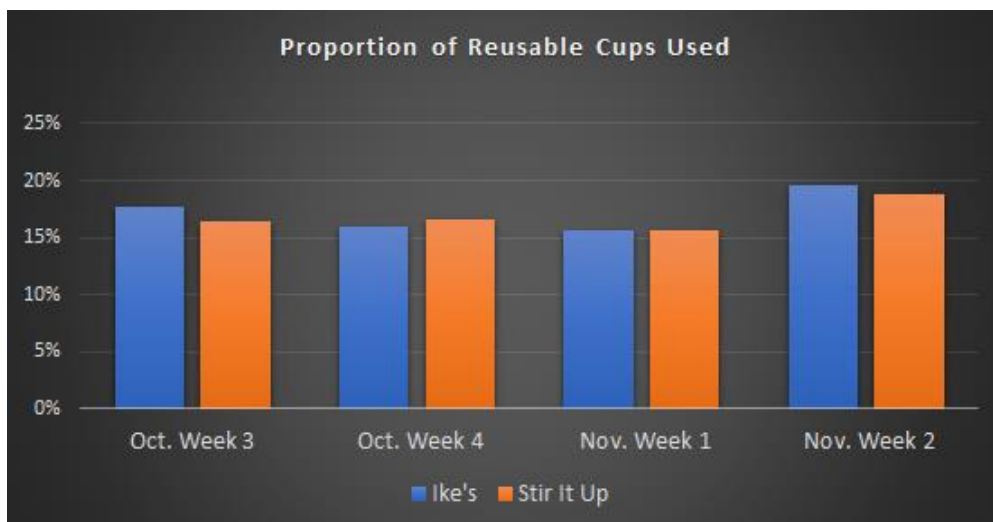


Figure 12.5: Adjusted proportion of reusable cups with removal of outlier data

Week	Ike's	Stir It Up
October Week 3	17.7%	16.5%
October Week 4	16.0%	16.6%
November Week 1	15.9%	15.8%
November Week 2	19.6%	18.8%

In comparing the week immediately before the marketing strategy and the week ending the marketing strategy, the latter featuring a complete five-day week with the strategy implemented prior and until the end of the calendar week, both locations saw an increase in the proportion of reusable cups (3.6% and 2.2% respectively).

Within Ike’s, the location presenting marketing and selling reusable cups, the increase in reusable cups is 1.4% greater than the increase seen at Stir It Up. A total of 22 reusable mugs were sold at Ike’s over the 2-week period, indicating that their placement within coffee outlets has been met with some success from consumers waiting to make a purchase. The investment made by each consumer for the cup, ranging from \$10 to \$30, is likely to contribute to future and repeated use, decreasing disposable cup rates for these consumers.

In comparing the proportion of reusable cups for each month of the analysis across all sales days at locations with complete data, a clear trend emerges: the proportion of reusable cup users fell between September and October, and again between October and November. As seen in the graph below, an intervention in the decline occurs with Ike’s and Stir It Up over the period of sales that includes the marketing trial; both see an increase in their respective reusable cup rates.

Figure 13: Change in proportion of reusable cups across duration of analysis

	Ike’s	Stir It Up	Mercante	Totem DH
Sep-Oct	-6.0%	-9.7%	-1.1%	-11%
Oct-Nov	0.3%*	2.6%*	-6.9%	-3.7%

Based on this effect, we believe that marketing is an effective tool for sustaining the rate of reusable cup users. Serving as a reminder or as a message of gratitude for consumers, the success of marketing demonstrates its ability in retaining reusable cup users who otherwise may have switched back to disposable cups or not have made the switch at all.

Recommendations

The objective of this project was to determine the impact of the new pricing strategy on reducing the number of disposable cups across UBC Food Services' coffee outlets and potentially determine a more optimal price cup price that minimizes a negative impact on sales.

The reduction of disposable cup usage has increased consistently and significantly across all outlets included in our analysis, reaching a 30% aggregate reusable cup usage rate.

The results demonstrate that the use of a surcharge pricing system has had mixed impacts on sales, with an increase in aggregate sales in September and an aggregate decrease of a larger magnitude in October and November. However, due to differences in rainfall and temperature between 2017 and 2018 over the months of our analysis, there is strong potential for these environmental differences to be the major underlying factor of a drop in hot beverage sales. We recommend that UBC Food Services retain their pricing strategy for the next several months to determine if the drop in sales over October and November is, in fact, an irregularity, as the effect on increasing reusable cup usage has otherwise been successful.

Our analysis into the changes in disposable cup sales and total sales across locations finds the greatest increases in reusable cups and the smallest drops in sales to be at locations that are more distinctly coffee shops (as opposed to locations where coffee is not the main offering and are less likely to attract regular and exclusive coffee consumers). Our recommendation for future efforts to further increase reusable cup usage through the means of campaigns or incentives is to employ these initiatives at coffee-focused outlets. The cost of implementing new initiatives is unlikely to be rewarded with a significant switch to reusable cups at coffee outlets that primarily serve irregular coffee consumers, such as Mercante.

We additionally recommend targeted marketing and the sale of reusable cups at coffee-focused outlets as an effective way to increase reusable cup usage. The results of the marketing trial saw the two initiatives increase reusable cup usage by 3% in addition to selling 22 reusable mugs. With a low cost for implementation and upkeep, the continued use of marketing and selling of alternatives shows strong potential in further reducing disposable cup sales with little drawback.

Limitations

As with any data analysis, there were several limitations faced. First, two coffee outlets had to be omitted (Hero and Perugia) from our calculation when analysing disposable cup usage as they did not have complete data on hot beverage sales and the number of disposable cups sold each year.

Additionally, we found that many of Totem Park Dining Hall's consumers switched to reusable cups compared to other coffee outlets' consumers as a result of the new pricing strategy. Although we hypothesized potential explanations for Totem Park Dining Hall's spiked reusable cup rate, there is a lack of evidence to support a single explanation.

The most significant limitation faced is with the inability to obtain sales data on cold beverages. Conducting a difference-in-differences analysis on sales between cold beverages and hot beverages could have potentially explained factors that significantly affected hot beverage sales throughout October and November.

Future Research

The time constraint faced by this project prevents further exploration into areas of different marketing strategies, alternatives and incentives in stimulating a switch to reusable cups. The University of Winchester's study (Poortinga & Whitaker, 2018) on increasing reusable cup usage found the most success in combining marketing messages that appealed to morality and the provision of free reusable cups to students in the beginning of term. Testing out similar combinations at UBC would be a potentially fruitful path to take.

The AMS Mug Share program, which provides reusable cups that can be used and returned to coffee outlets in exchange for a deposit, has the potential to play a role in reducing disposable cups. The program is currently implemented at only one coffee outlet and is using temporary, older cups (many of which are damaged). Upon growth of the program across coffee outlets, higher awareness and the new, more appealing cups being brought in, another look at disposable cup rates across campus would determine the strength of the effect that having immediate in-store alternatives can have on getting consumers to switch their cup type.

Our findings indicated that consumers at Mercante are the least likely to switch to reusable cups and most likely to forgo their purchase in response to the new pricing strategy, potentially because of the lack of patrons coming in solely for the purpose of purchasing coffee. The Mug Share program has strong potential to reduce the number of disposable cups used by these consumers, as it does not require them to plan on bringing their own drinkware or to return the mug at a designated time; consumers can take the mug with them and bring it back, dirty or clean, the next time they want coffee. While some effort is still required on the part of bringing the mug back, there is more flexibility and ease than initially planning on bringing a mug from home and cleaning it in a kitchen facility between each visit. Determining the impact of the Mug Share Program on reducing disposable cups purchased by irregular coffee consumers would be a valuable area to explore.

Disposable cups are a significant contributor to the costs associated with tipping and bin disposal across campus, taking up nearly 50% of bin space on average and estimated to add upwards of \$5000 in costs. Although beyond the scope of this project, a look at the change in management costs from the falling number of disposable cups would contribute to developing a cost on each disposable cup that takes into account these additional factors. A fall in sales at select locations resulted in a reduction in revenue of 6% on average, but could potentially be offset by savings associated with a major reduction in the number in disposable cups used.

References

Poortinga, Wouter, and Louise Whitaker.(2018). “Promoting the Use of Reusable Coffee Cups through Environmental Messaging, the Provision of Alternatives and Financial Incentives.” *Sustainability*, vol. 10, no. 3, p. 873.

UBC Zero Waste Food Ware Strategy. (2018). Retrieved from <https://sustain.ubc.ca/sites/sustain.ubc.ca/files/files/Zero%20Waste%20Foodware%20strategy%20info.pdf>

UBC Vancouver Campus Zero Waste Action Plan. (2014). Retrieved from https://sustain.ubc.ca/sites/sustain.ubc.ca/files/uploads/CampusSustainability/CS_PDFs/RecyclingWaste/Zero_Waste_Action_Plan%202014%2010%2003%20final.pdf

City of Vancouver Zero Waste 2040 Action Plan. (2018). Retrieved from <https://council.vancouver.ca/20180516/documents/pspc2a.pdf>

Armellino et. al. (2012). “Using High-Technology to Enforce Low-Technology Safety Measures: The Use of Third-party Remote Video Auditing and Real-time Feedback in Healthcare.” *Clinical Infectious Diseases*, Volume 54, Issue 1, 1 January 2012, Pages 1–7. Retrieved from <https://doi.org/10.1093/cid/cir773>

Sharot, Tali. (2017). “What Motivates Employees More: Rewards or Punishments?” *Harvard Business Review*. Retrieved from <https://hbr.org/2017/09/what-motivates-employees-more-rewards-or-punishments>

Appendix

Monthly Hot Beverage Sales for Month of September through 2015 to 2018

Month/Year	Ike's	Stir It Up	Mercante	Perugia	Hero's	Totem DH
09/2015	8673	6767	5827			3178
10/2015	13471	9130	6555			4605
11/2015**	6751	4261	3723			2552
09/2016	9551	8513	6644			3301
10/2016	13554	10705	7483			3675
11/2016**	5922	5022	3481			1840
09/2017	8959	8170	5571		4876	3120
10/2017	14454	11078	6927		8095	4339
11/2017**	6435	5143	2820		3916	2056
09/2018	9250	7922	4501		5809	3524
10/2018	12566	10081	4823	6448	9616	3913
11/2018**	5453	4485	2510	3059	4700	1838

**For November, sales data from the 1st to the 15th was included*

Monthly Reusable Cups for Month of September through 2015 to 2018

Month/Year	Ike's	Stir It Up	Mercante	Perugia	Hero's	Totem DH
09/2015	563	373	277	589		43
10/2015	736	508	375	643		164
11/2015**	362	221	182	299		93
09/2016	560	404	262	649		75
10/2016	652	496	325	818		73
11/2016**	302	208	178	382		57
09/2017	604	320	323	585		90
10/2017	766	426	394	707		105
11/2017**	314	208	195	347		55
09/2018	2121	1900	886	1982		2325
10/2018	2126	1443	894	1561	1948	2182
11/2018**	940	761	293	872	1095	943

** For November, sales data from the 1st to the 15th was included*

Elasticity Calculations

Relationship between Hot Beverage Sales and Disposable Cup Price

$$\text{Sale} = \alpha + \beta \text{Price}$$

$$\log(\text{Sale}) = \alpha^* + \beta^* \log(\text{Price})$$

$$\frac{\Delta \log(\text{Sale})}{\Delta \text{Price}} = \frac{\beta^*}{\text{Price}}$$

$$\frac{\Delta \log(\text{Sale})}{\Delta \text{Price}/\text{Price}} = \beta^*$$

$$\frac{\Delta \text{Sale}/\text{Sale}}{\Delta \text{Price}/\text{Price}} = \beta^*$$

$$\frac{\% \Delta \text{Sale}}{\% \Delta \text{Price}} = \beta^*$$

Relationship between Proportion of Disposable Cup Users and Disposable Cup Price

$$\text{Proportion of Disposable Cup Users} = \frac{\text{Number of Disposable Cup Used}}{\text{Sales}}$$

$$\text{Proportion of Disposable Cup Users} = \pi + \gamma \text{Price}$$

$$\log(\text{Proportion of Disposable Cup Users}) = \pi^* + \gamma^* \log(\text{Price})$$

$$\frac{\Delta \log(\text{Proportion of Disposable Cup Users})}{\Delta \text{Price}} = \frac{\gamma^*}{\text{Price}}$$

$$\frac{\Delta \log(\text{Proportion of Disposable Cup Users})}{\Delta \text{Price}/\text{Price}} = \gamma^*$$

$$\frac{\Delta \text{Proportion of Disposable Cup Users}/\text{Proportion of Disposable Cup Users}}{\Delta \text{Price}/\text{Price}} = \gamma^*$$

$$\frac{\% \Delta \text{Proportion of Disposable Cup Users}}{\% \Delta \text{Price}} = \gamma^*$$