

Results of a field experiment to reduce coffee cup waste

Summary report to Bewley's Tea & Coffee UK Ltd.

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Background

It is estimated that about 2.5bn disposable coffee cups are used in the UK each year. Most of these cups end up in landfill, as the majority of poly-coated paper cups are not recyclable. This creates about 25,000 tonnes of waste each year.

The promotion of reusable cups can help to reduce the volume and weight of waste being sent to landfill. However, it may be difficult to persuade consumers to change their behaviour with regard to their daily coffee or tea. Disposable cups are very convenient, and there are multiple other barriers to the uptake of reusable coffee cups.

Bewley's Tea and Coffee UK Ltd and Cardiff University conducted a field experiment to explore how the use of reusable coffee cups could be encouraged through easily implementable measures. This was done in collaboration with four universities and a contract caterer.¹

The Study

The study took place between September and December 2016, and involved twelve business and university café sites. Each site received a different intervention, combining environmental messages, providing reusable alternatives, and financial incentive to encourage the use of reusable coffee cups (see Table 1).

All twelve sites displayed a showcard and/or a poster with an environmental message on the number of cups ending up in landfill, and asking customers to bring their own cup. The showcards and posters were designed by Bewley's and provided free of charge. At one site, additional messages were distributed via intranet and social media.

Eight of the twelve sites sold reusable coffee cups within the café. The cups were sourced by the sites themselves, or supplied by Bewley's at cost for the experiment.

At four of the twelve sites free reusable coffee cups were distributed to customers at the start of the intervention. Two hundred unbranded reusable cups were provided free of charge for the purpose of the study. The site managers distributed the cups via their methods of choice.

Four of the twelve sites introduced a financial incentive to encourage the use of reusable cups: three sites provided a discount of between 15-25 pence for customers using a reusable cup; and one site introduced a 25 pence charge on disposable coffee cups. New menu boards were provided free of charge for the purpose of the study.

Café managers were asked to capture their daily sales of hot drinks for four consecutive weeks, typically 25 days of sales, both before and after the intervention, as well as how many customers used disposable or reusable cups.²

¹ The study was conducted with the help of Cardiff University, the University of South Wales, University of Winchester, Imperial College and Contract Caterer Bartlett Mitchell.

² The baseline period lasted from the 3rd of October to the 6th of November 2017 and the follow up period lasted from the 7th of November to the 9th of December 2017. At one site the intervention took place between the 12th of September and the 20th of November 2017, and at another from the 10th of October to the 16th of December 2016.

The data was analysed using multilevel interrupted time series regression analysis, with the daily proportion of hot drink sales with reusable cups as the dependent variable. The independent (predictor) variables can be found in Table 2.³

Results

Table 1 shows the percentage of hot drink sales with reusable cups at the twelve business and university sites before and after the intervention. Table 2 shows the results of the statistical analysis.

The study found that, overall, the proportion of hot drink sales with reusable coffee cups increased from 3.3% in the pre-intervention period to 7.6% in the post-intervention period (see Table 1). There were no statistically significant differences between university and business sites (-0.039 [SE=0.040], $p=0.165$)

The results suggest that an environmental message on its own can increase the use of reusable coffee cups by 2.3%, and that having reusable alternatives available within the café can increase the use of reusable coffee cups a further 2.5%. The distribution of free reusable coffee cups can increase their use by another 4.3% (see Table 2).

While a discount on reusable cups did not make any difference for reusable cup sales ($B=0.005$ [SE=0.008], $p=0.266$), a charge on disposable cups increased the use of reusable coffee cups by 3.4% (see Table 2).

The study found that the provision of free reusable alternatives in combination with a financial incentive is particularly effective: the site that distributed free reusable coffee cups in combination with a charge on disposable cups saw an increase in the use of reusable cups from 5.1% to 17.4%; and the site that distributed free reusable coffee cups in combination with a discount on reusable cups saw an increase in the use of reusable cups from 1.8% to 12.4% (see Table 1).

³ Interrupted time series regression analysis involves the analysis of repeated measurements (in this case: daily sales) that can be used to evaluate interventions (Lopez Bernal et al., 2016). It allows the effects of the intervention to be separated from other, secular trends within the data. A 'multilevel' version of an interrupted time series regression analysis was conducted, with the daily sales nested within the twelve intervention sites.

The basic statistical model included two 'time' variables, indicating the time elapsed since the start of the study and since the start of the post-intervention period respectively, a dummy variable indicating the period of the study (i.e. post intervention versus the pre-intervention period), as well as dummy variables indicating whether the sites sold reusable coffee cups within the café, distributed free reusable coffee cups, or introduced a discount or a charge as part of the intervention. As all sites displayed a showcard and/or a poster with an environmental message, the results show how much the different measures can increase the use of reusable cups as compared to providing an environmental message alone. For more technical detail regarding the statistical analysis, please contact PoortingaW@cardiff.ac.uk.

Lopez Bernal, J., Cummins, S., & Gasparrini, A. (2016). Interrupted time series regression for the evaluation of public health interventions: a tutorial. *International Journal of Epidemiology*, *dyw098*, 1–8. <http://doi.org/10.1093/ije/dyw098>

Conclusion

This field experiment explored how the use of reusable coffee cups could be encouraged by easily implementable measures. It found that through clear messaging, the provision of reusable alternatives, and financial incentives, the use of reusable coffee cups can be increased by (on average) 2.3 to 12.5%.

The study suggests that a charge may be more effective than a discount. These results are in line with *prospect theory*, which suggests that people are more sensitive to losses than to gains when making decisions. A charge on disposable cups (a loss) is therefore more likely to produce behaviour change than a discount on a reusable cup (a gain).⁴

While the increases for the individual measures were modest, greater behaviour change was achieved when multiple measures were combined. The study suggests that in particular the provision of free reusable alternatives in combination with a financial incentive are effective.

However, the experiment was small in scale and introduced at a limited number of sites. While the research has shown that coffee cup waste can be reduced through a number of measures, the results should be used as indicative only. More research is needed to examine the impacts of a wider introduction of a coffee cup charge or other measures.

Based on the results of this research, we estimate that a reduction of broadly 50-300 million disposable coffee cups per year could be achieved if the measures were rolled out across the UK. It is likely that the reduction would be even greater with a mandatory charge on disposable coffee cups at the national level. It then becomes more worthwhile for consumers to adapt to the widespread introduction of the charge by using reusable alternatives.

⁴ Kahneman, D., & Tversky, A. (1979). Prospect theory: an analysis of decision under risk. *Econometrica*, 47 (2), 263-292.

Table 1: The percentage of hot drink sales with reusable cups at the twelve business and university sites for the before and after periods

Number	Study site University or Business	Messaging Environmental message	Reusable cup provision		Financial incentive		Hot drink sales with reusable cups	
			Cups for sale	Free cups provided	Charge	Discount	Before, in % M (SD)	After, in % M (SD)
1	University	Y	Y	Y	Y	N	5.1 (1.7)	17.4 (5.5)
2	Business	Y	Y	Y	N	Y	1.8 (0.5)	12.4 (3.4)
3	Business	Y	Y	N	N	Y	4.9 (0.8)	6.0 (0.6)
4	University	Y	Y	N	N	N	0.0 (0.0)	9.0 (3.0)
5	University	Y	Y	N	N	N	0.4 (0.3)	1.1 (0.6)
6	University	Y	Y	N	N	N	1.4 (0.4)	1.3 (0.5)
7	University	Y	Y	N	N	N	0.7 (1.3)	0.3 (0.5)
8	Business	Y	Y	N	N	N	7.5 (2.7)	24.0 (4.6)
9	University	Y	N	N	N	Y	13.7 (6.4)	17.5 (3.3)
10	University	Y	N	Y	N	N	0.3 (0.7)	4.4 (9.1)
11	University	Y	N	Y	N	N	0.9 (1.7)	7.1 (6.1)
12	Business	Y	N	N	N	N	4.4 (1.6)	5.7 (2.4)
Overall							3.3 (4.4)	7.6 (8.1)

Note: Y=Yes, N=No; M= Mean, SD= Standard Deviation.

Table 2: Results of the interrupted time series regression analysis.

Site characteristic	B (SE)
After (versus before)	0.023 (0.009)*
Reusable cups for sale	0.025 (0.007)***
Free reusable cups provided	0.043 (0.008)***
Discount	0.005 (0.008) ^{n.s.}
Charge	0.034 (0.014)*
Constant	0.062 (0.034) ^{n.s.}
Time since start of study (in weeks)	0.002 (0.002) ^{n.s.}
Time since intervention (in weeks)	-0.006 (0.002)**
University (versus business)	-0.039 (0.040) ^{n.s.}

Note: B= regression coefficient, SE=standard error; n.s. non-significant, * p<0.05, ** p<0.01, *** , p<0.001