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Promoting discount schemes as a nudge strategy to enhance environmental behaviour

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Abstract:

This paper presents the effects of nudging and of direct instruments on the consumer choice for reusable cups instead of disposable cups. The instruments include a financial incentive (discount schemes for consumers bringing their own cup) and communication about the scheme. The required conditions for the shop policy to be effective (i.e. induce a change in consumer behaviour through direct and indirect communication) are also evaluated. An original database was compiled from structured observations over 223 Hong Kong coffee shops, where 522 data points were collected. The research questions are answered using two strategies. First, logistic econometric approaches estimate the effects of the policies on consumer behaviour. Secondly, a qualitative comparative analysis identifies the required conditions for the consumers to use reusable cups. The results show no significant effect of the financial incentive on the targeted consumers but positive and significant effects on the other consumers who switch to in-shop reusable cups instead of disposable cups. Through effective communication about the "environment-friendly" shop policy, coffee shops affect the consumer behaviour towards reusable cups positively. I observe that nudges have higher effects than financial instruments on consumer behavioural change even when the settings account for strong conservative behaviours. The analysis of coffee shop typologies reports that coffee shops targeting a wealthier audience are more likely to achieve policy goals through nudge strategy.

Keywords: Hong Kong; Qualitative Comparative Analysis (QCA); consumer behaviour; nudge; willingness to pay; discrete choice model, financial incentives

JEL classification: C99, D83, D89, Q53, Q56, Q58

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1. Introduction

Disposable cups are a burden for the environment. In September 2019, a whale washed up on a beach with 115 ingested disposable plastic cups in its stomach². Such anecdotes have alas become increasingly commonplace, news is brimmed with reports of wild animals and ecosystems negatively affected by disposable plastic tableware (e.g., plastic ups, straws). Disposable cups are difficult to recycle, which explains the lack of innovative management in many countries, where disposable cups eventually end-up as garbage, at best. In Hong Kong, the consumption of disposable tableware (including cups) has tripled in five years, reaching a daily average of 154 tonnes³⁴. Disposable cups are estimated to represent 2.2 tonnes of daily waste in Hong Kong, or put differently, about 75 000 (27 million) cups are consumed daily (yearly)⁵⁶. When the plastic waste, emanated from the disposable cups, is properly collected, it is landfilled, as this alternative is the only waste management solution available in Hong Kong. However, the modest size of disposable cups and the lack of financial incentive for its recycling lead to large quantities of plastic waste leaking into the environment.

To date, markets have failed to provide internalization of this negative externality induced by mismanagement of disposable plastic cups. While the need for policy intervention is pressing, the type of policy design to be efficient is not yet evident. To correct for this externality, various states, (e.g., California (US)⁷, Germany⁸, United Kingdom⁹, France¹⁰) are implementing bans of disposable cups. Another less stringent policy to modify consumer behaviour is through financial incentives. Regarding disposable cups, financial incentives (i.e. discount schemes) are set to encourage consumers to bring their own reusable cups to coffee shops, instead of using disposable options. Such policies have the potential to entail various benefits to the different actors. For the community, the benefits of such policies include the reduction of the amount of waste, and thus pollution and other negative externalities linked with the damage of ecosystems. For the individual consumers, the discount scheme provides the additional advantage of saving money. For the shops, this saved money can potentially be employed to conduct additional purchases in the coffee shop – bringing indirect benefits to the coffee shop. Additionally, such a discount might attract a new kind of consumers and label the shop's brand as being environment-friendly. Such eco-friendly branding of the shop might indirectly lead to an increase in the shop revenue (Ambec and Lanoie 2008). If the coffee shop is selling reusable cups, it might also be to their advantage to offer a discount to invite people to buy their branded product.

While financial incentives depict, in theory, clear economic advantages for the consumer, the effectiveness of financial instruments to modify consumer behaviour towards the use of reusable cups is still to be assessed (Brekke, Kverndokk, and Nyborg 2003). When the incentive is not substantial, its effect is significantly lessened (Kinzig et al., 2013). Similarly, Camerer and Fehr (2006) emphasised the importance of a high incentive to modify social behaviour, when information about the social norm is known. The information on the social

² (Dead whale that washed ashore in Indonesia had 115 plastic cups in stomach n.d.)

³ Comparison of daily average of both styrofoam and plastic tableware between 2012 and 2016.

⁴ (Monitoring of Solid Waste in Hong Kong - Waste Statistics for 2017 2017)

⁵ (Monitoring of Solid Waste in Hong Kong - Waste Statistics for 2017 2017)

⁶ Considering an average weight bound of a 30 g for a disposable plastic cup

⁷ (Gentile and SFGATE 2019)

^{8 (}Frisse 2019)

⁹ (The UK throws away 2.5 billion disposable coffee cups every year 2018)

¹⁰ (France becomes first country to ban all plastic cups and plates to save environment 2016)

norm plays an important role in the effectiveness of financial incentives (Bowles and Polania-Reyes, 2012). Bowles and Polania-Reyes (2012) mentioned the counter-productivity of financial incentives to modify individual behaviour towards the enhancement (reduction) of positive (negative) externalities (e.g. environment, reduction of waste) when no information on the social norm is shared. Kinzig et al. (2013) have highlighted the need for further research to better understand the mechanism and effectiveness of financial incentives aiming at modifying social behaviours. Eraydin and Schwirplies (2019) found no effect of financial incentives on modifying consumer habits to use reusable cups instead of disposable cups. However, information on the social norm positively affected consumer behaviour towards reusable cups (Eraydin and Schwirplies, 2019).

Alternatively, the recent policy instrument literature on consumer choice tends to favour nudge strategies over financial incentives (Banerjee 2018; Cadario and Chandon 2019; Hagmann et al. 2018; Saulais et al. 2019). Nudges are instruments to implement policy without restricting the consumer freedom. Nudges provide indirect suggestions to affect consumer choice. Nudge policies¹¹ are designed to prompt individuals toward better choices without limiting their freedom (Egebark and Ekström 2016; Kallbekken and Sælen 2013; Leonard 2008; Mylan 2017). The literature is increasingly focusing on green nudges targeting environmental behaviour (Schubert 2017). Most authors studying (green) nudges compare the indirect strategy with financial incentives (Cadario and Chandon 2019; Hagmann et al. 2018; Saulais et al. 2019). Few studies compare how promoting financial incentives in one group affects the nontargeted group. Baneriee (2018) provides evidence in a setting of spatial agriculture decision (i.e. crops choice). When there is no financial risk nor payoff, and consumers are informed about others choices, consumers are willing to modify their behaviour to follow a social norm (identify by the choice of the other group). Banerjee (2018)'s results show that non-strategic information on decisions taken by one group influences the consumer choices taken by another group. Schubert (2017) sorted the responses to green nudges in different categories, highlighting the importance of information on social norm, but also of the default option.

The effects and the success conditions of the nudging strategies still need to be evaluated empirically case-by-case, as they vary depending on various factors such as cultural, social and educational background (Farrow et al. 2017; Kinzig et al. 2013; Schubert 2017). Especially, more focus should be placed on the interaction between nudge and non-strategic information of financial incentives (Farrow et al. 2017; Frey and Jegen 2001). This paper addresses this gap by assessing the effect of non-strategic financial information used as a nudge to enhance environmental consumer behaviour.

In this paper, I analyse how information about a financial incentive targeting one group, affects the other group of consumers. This paper differs from Eraydin and Schwirplies (2019) which studied strategic financial incentive and strategic nudge targeting the same group. In this paper, the nudge materializes as the effect of the communication of the financial incentive (i.e. a discount for the consumers bringing their own cup), on consumers who do not have their own cup but require a "to-stay" reusable cup instead of a disposable cups.

¹¹ Nudge policies mainly include industrial and consumer actions not governmental regulations.

This information about the presence of a discount is not relevant for consumers not having brought their own cup, and does not change the financial incentive (namely the discount) for any group of consumers. Consumers who brought their cup keep on receiving the discount, and consumers who did not bring their own cup will not receive a discount. Thus, the communication on the discount can be considered as a nudge for consumers not having brought their own cup. In this paper, I study the nudge's ability to influence consumer behaviour. The difference of impact and effectiveness between the nudge and the financial strategy (namely the discount) on consumer environmental behaviour are studied. More specifically, I analyse how the two strategies enhance consumers' willingness to reduce their consumption of disposable cups (namely choose reusable cups instead of disposable ones).

While Eraydin and Schwirplies (2019) data originated from a lab experiment, this analyse was a field experiment conducted over Hong Kong (Special Administrative Region of China), adding rational to the existing literature. Hong Kong is a liberal region with little market intervention related to consumer rights, and thus sets a perfect field for this study. Indeed, libertarian paternalist government such as Hong Kong government are propitious to nudge strategies (Leggett 2014; Lodge and Wegrich 2016; Pykett et al. 2011). This paper estimates the effects of the discount schemes on Hong Kong's consumer behaviour and sets the required conditions for the nudging to be effective (i.e. induce a change in consumer behaviour through indirect communication). The study design is presented in the second section. Structured observations were sampled using a form composed of seventeen questions, over 223 Hong Kong coffee shops, from January 2018 until September 2019. The observations also include information on the name of the coffee shop (to identify the brand), location of the coffee shop, consumer behaviour and timing. A sample of 556 data points was collected (522 exploitable). The default option in all these shops is to serve disposable cups to consumers. Consumers can ask for a reusable cup¹² or bring their own cup.

The third section details the two strategies developed, firstly, to build the consumer choice model and evaluate the effect of both the financial and the nudge strategy on consumers' choices. Logistic and linear econometric approaches were implemented to estimate the impact of the coffee shop's characteristics on consumer behaviour. Secondly, a qualitative comparative analysis (QCA) identifies the necessary and sufficient conditions for the consumers to use reusable cups. This second method offers a novel approach in the shop marketing to enhance consumer environmental behaviour.

The fourth section provides details of the two results of this study. First, the insignificant effect of the discount scheme on consumer behavioural change is discussed. This first result was expected and concurs with the results from Eraydin and Schwirplies (2019). The consumer choice is pre-determined, and the amount of the discount is lower than the consumer willingness to bring his own cup. Second, the communication signalling a discount scheme is acting as a nudge on the consumers not having brought their own cup. This nudge strategy significantly affects the consumers to use a reusable cup.

¹² Reusable cup refers to any cup owned by the coffee shops. There is no distinction made between porcelain, metal, glass, etc. cups. The only cup characteristics considered here are that (1) the cup belongs to the coffee shop, (2) it needs to be washed to be reused, (3) it needs to be stored, and (4) it can be reused by other consumers.

The results show that nudging consumers through effective communication about the "environment-friendly" policy of a coffee shop affects the consumer behaviour towards reusable cups positively. This second result holds even in the case where the consumers are highly conservative regarding the use of reusable (washable) cups. In this case, price incentives are less effective than a visual nudge to modify consumer behaviour towards non-priced environmental choices. The analysis of coffee shop typologies reports that wealthy consumers were more influenced by the communication. Coffee shops targeting a wealthier audience are more likely to achieve policy goals through nudge strategies.

The last section concludes on policy recommendations to achieve consumer behavioural changes. The present study does not provide any evidence on the effectiveness of financial incentives towards environmental consumer behaviour. However, there is evidence on the positive impacts of nudging to enhance environmental choice. The analysis confirms the effect of promoting discount schemes to drive a change in consumer decision when the consumers are not affected by the discount itself. Promoting financial incentives for one group to the non-targeted group affect the decision of the non-targeted group and can generate positive spillover effects. The results are of strong potential for policy design beyond the presented case of reusable cups.

2. Study design: Structured observations of consumer preferences depending of coffee shop characteristics

To conduct the study, a database was developed for the sole need of this research. The original database was built on structured observations. A form was designed, and used by volunteers to collect the structured observations. This form captures self-social management and social norm biases through the total number of people in the shop (namely, the affluence), available in Appendix 1. The structured observations reported 17 different characteristics of the coffee shops. The observations report the name of the coffee shop (to identify the brand), localization of the coffee shop, consumer behaviour and timing.

The structured observations were gather in Hong Kong (Special Administrative Region of China) over 223 coffee shops randomly selected by volunteers. The shops were sampled randomly over all parts of Hong Kong, without distinction (consideration) between districts¹³, periods sampled, presence of the discount and of communication material. This strategy allows to consider the sample as an accurate representation of the full set of coffee shops available in Hong Kong¹⁴.

From January 2018 until September 2019 a sample of 556 data points was collected (only 522 exploitable). The data statistics are reported in Table 1 and in Table 5. Volunteers were assigned to report structured observations from a dedicated area (among the five districts represented in Figure 1). The volunteers were selected through an official platform dedicated to volunteering jobs and were rewarded by certificates of volunteering. The volunteers completed the structured observations' form based on their observations at a time t in a shop i. The volunteers are thus called observers.

¹³ A preference for 11 districts is explained in the section 0

¹⁴ Shop data points were excluded for the final data set due to mis-completion of the survey by the observers. Additionally, Only brands that were sampled more than 3 times and in different district were kept.



Figure 1 - Districts where the structured observations study was conducted

2.1 Three option of cups: disposable, to-stay, bring your own

All coffee shops observed offer the three options of cups, namely, a disposable cup, a to-stay cup and a cup brought by their consumers (BYOC), as illustrate by Figure 2. The default option in all the coffee shops observed, is to serve disposable cups to consumers. Alternatively, consumers can ask for a reusable cup or bring their own cup. The shop can set different strategies to influence consumers' habit of choosing a disposable cup, as depicted in Figure 2. The shop can apply a discount scheme to reward consumers bringing their reusable own coffee cup. Additionally, the shop can promote the available discount scheme through visual communication. Thus the dataset contains three types of shops. First, the shops not offering any discount. Second, the shops offering a discount but without communication on this discount. Third, shops applying both a discount and a communication strategy about this discount. We expect that consumers tend to use their own coffee cup more often in shops applying both a discount and a communication scheme. Only data on consumers ordering drinks to be consumed in the coffee shops, in either disposable or reusable cups, was reported. The consumers ordering "take-away" drinks are not included in the dataset. Coffee shops' characteristics

The focus was on six particular brands (common brands of Hong Kong) offering the possibility of using reusable cups. All the brands are represented and evenly distributed over Hong Kong (except for one brand which is only observed in the "South" (as depicted in Figure 1 and Table 4). The brands have different characteristics and attract different categories of consumers. This difference is due to price, interior design and overall branding strategy of the coffee shops. The differences between brands are reported in Table 1. Starbucksand PacificCoffee have higher than average coffee prices. This price' observation leads us to assume that the two brands attract consumers from higher than average social and educational background. Contrary, for McCafé, with the lowest price for coffee, one explanation can be that this brand of coffee shop attracts consumers from a lower category in term of social and educational background.

Brand	Mean	Std. Dev.	Freq.
Delifrance	27.571	1.574	28
McCafé	17.753	4.333	97
PacificCoffee	30.310	0.924	142
Pret-à-Manger	26.94	0.423	50
Starbuck	32.273	0.865	187
UncleRuss	24	0	18
Total	27.992	5.686	522

Table 1 - Statistics of price per brand of coffee shops

Price (HK\$)

Note: The difference in price for a same coffee brand is due to the franchise system, which applies for most of the coffee shops observed. Indeed, coffee shops can decide to set their own price of coffee. The variable "Price" captures the price for a regular size of either black coffee or Americano depending on the shop's offer.



Figure 2 - Different shop strategies to modify consumer's choice

The structured observations study was conducted across Hong Kong with an initial focus on the most populated eleven districts. For the need of the study, the eleven initial districts were united into five districts. This association was based on the socioeconomic similarities (i.e. average household's income, type of buildings and economic activities, density), observed among the initial eleven districts. The eleven (respectively 5) districts cover different socio economic characteristics of the consumers (e.g., wealth, ethnicity) capturing the diversity of Hong Kong. Figure 1 depicts the five districts where the structured observations study was conducted (Forrest, La Grange, and Yip 2004; Kühner et al. 2019). The districts of Central and Kowloon have the highest price for coffee on average, South of Hong Kong has the lowest. However, note that in the South of Hong Kong the average consumer is wealthier than in the other districts. The districts of Kowloon, Mong Kok and Central are a mix of business, commercial and residential areas with a mix of expats and local residents. The South is mainly residential with a higher rate of expats on average. The outside is both commercial and residential areas with a higher rate of locals on average (Forrest, La Grange, and Yip 2004; Kühner et al. 2019).

Additionally to the district affiliation, the structured observations study provides background information about the location (i.e. exact address). Detailed temporal information (i.e. time and date of the structured observations study form occurrence) was also reported in Table 2. For each of the three periods of the day (morning: 8-11:30, noon: 11:30-2pm, and afternoon: 2-7pm) and for several days of the week, each brand was surveyed at least once, as reported in Table 3.

		weekday							
		1	2	3	4	5	6	7	Total
	AM	28	26	21	49	32	30	11	197
time	Noon	37	13	21	24	19	14	7	135
	PM	27	33	25	24	37	25	19	190
	Total	92	72	67	97	88	69	37	522

Table 2 - Details on temporal information

Table 3	- Temporal	and geogra	aphical in	formation	on the sl	hop observations
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				District			
		Central	Outside	Kowloon	Mong Kok	South	Total
	AM	53	31	46	41	26	197
time	Noon	28	25	20	42	20	135
	PM	43	29	42	39	37	190
	1	1	11	2	65	13	92
	2	16	13	16	9	18	72
	3	19	8	14	8	18	67
weekday	4	36	21	23	12	5	97
	5	22	16	25	17	8	88
	6	19	12	20	8	10	69
	7	11	4	8	3	11	37
	Delifrance	3	0	13	12	0	28
	McCafe	18	20	17	26	16	97
Pronde	PacificCoffee	26	26	32	30	28	142
Brands	Pret	11	11	6	22	0	50
	Starbuck	66	28	40	32	21	187
	UncleRuss	0	0	0	0	18	18
	Total	124	85	108	122	83	522

The number of consumers and their choices were observed for a discrete time, which corresponds to one point in the data set. The number of consumers using disposable coffee cups or using reusable cups (either their own cup or a cup from the coffee shop) was reported. Only cups (both reusable and disposable) containing hot drinks were taken into account by the structured observations study.

	Price (HK\$)				
District	Mean	Std. Dev.	Freq.		
Central	29.073	5.347	124		
Outside	27.023	7.2837	85		
Kowloon	29.157	3.259	108		
Mong Kok	27.393	4.886	122		
South	26.735	7.242	83		
Total	27.992	5.686	522		

Variable	Mean	Std. Dev.	Min	Max
Observer behaviour				
Disposable cup	10.067	10.855	0	68
Reusable cups BYO	0.522	0.996	0	9
Reusable cups to-stay	4.339	6.325	0	52
Total reusable cups	4.854	6.471	0	52
Total of consumers	14.927	13.117	0	79
Discount details				
Amount of the Discount (HK\$)	2.944	1.677	0	5
Background details				
Price of a regular coffee (HK\$)	27.992	5.686	14	35
Ν		522		

2.2 Discount schemes and communication

The presence of a discount scheme to encourage consumers to bring their own reusable cup was sampled in the standardized observation by qualitative means (existence of a discount scheme or not) and quantitative means (amount of the discount). The presence of the communication material to indicate the scheme (e.g. a sign) was also evaluated in two steps – first the existence (e.g. the presence of a visual communication), then the visibility of the communication material (e.g., front of the counter, easily visible, hidden behind cups, small font). Both the existence (here after called sign) and visibility (here after called visibility and

visible interchangeably) of the communication material were sampled as binary data and the descriptive of the data is reported in Table 6. While the existence of the discount and the sign were verified post-surveillance, only the observer (volunteer) assessed the visibility of the communication material. Figure 3 and Figure 4 illustrate different communication material signalling a discount scheme.

		sign		visible		
		No=0	Yes=1	No=0	Yes=1	Total
discount	No=0	115	0	115	0	115
discount	Yes=1	256	151	291	116	407
	Total	371	151	406	116	522

Table 6 - Frequency of discount and communication scheme

Table 5 of descriptive statistics shows that, in Hong Kong, the average discount is below HK\$3. This discount represents a rebate of on average 13% on the original price of a regular black coffee. 77.8% of the coffee shops observed have a discount scheme to encourage the use of reusable coffee cups. However, only 28% of the coffee shops communicated on this discount scheme. Over all 223 Hong Kong coffee shops observed, on average, only one third of the consumers used reusable cups. Assumptions explaining this low rate are on the lack of encouragement for consumers to bring their own cup and on the fear of infection while using a shop branded reusable cups influenced the consumer towards the use of disposable cups (ING 2020).

2.3 Why is disposable cups the default option

The shops' lack of encouragement for the use of reusable cups brought by consumers, can be explained with the following rational that a during peak hours there is a high demand and the expected efficiency is very high. This peak demand forces coffee shops to be highly productive. When using a disposable cup, the distribution of coffee can be streamlined and systematized while this process is troublesome with reusable cups. The cups brought by consumers are often of different shapes, sizes and weights, leading to a loss of efficiency when the coffee shop workers need to prepare the drink. This need for efficiency can explain the low visibility of the communication material but also the low use of reusable cups in the Central district (see Table 7 column 1). Both coffee shop workers and consumers require efficiency while drinking coffee.

The fear of infection from using a reusable cup (and considering this cup is not well washed) might be explain from the societal trauma caused by the severe acute respiratory syndrome (SARS) contamination episode of 2003 (Lai et al. 2004). The memory of this episode is still present in most of Hong Kong consumers (Almanza 2019; Jung and Sung 2017; Lee and Chan 2017). Some Hong Kong consumers (often with low educational background) fear contamination using reusable cutlery (Almanza 2019; Jung and Sung 2017; Lai et al. 2004; Lee and Chan 2017). This social behaviour leads to an increased use of disposable coffee cups (Almanza 2019; Jung and Sung 2017; Lai et al. 2004; Lee and Chan 2017). Figure 5 illustrates the areas of Hong Kong which experienced a high SARS infection rate. The areas matched with the districts where people are less willing to use reusable coffee cups, confirming the assumption that the SARS episode of 2003, affects current consumer behaviour towards the use of reusable cups.





Figure 4 - Another coffee shop in Hong Kong with communication material on the discount scheme

Figure 3 - Coffee shop in Hong Kong with communication material on the discount scheme

Table 7 reports that the presence of a discount scheme and the visibility of the communication, but also the use of reusable cups vary over the different brands and districts. The data show differences depending on district and coffee shop characteristics.



Figure 5 - SARS infection rates over Hong Kong in 2003 (data from Lai et al. 2004)

	Reusable cup rate			Discount Rate		
	Mean	Std. Dev.	Freq.	Mean	Std. Dev.	Freq.
District						
Central	0.282	0.286	116	0.142	0.030	114
Outside	0.418	0.293	83	0.122	0.028	62
Kowloon	0.313	0.311	107	0.121	0.018	97
Mong Kok	0.2893	0.266	120	0.131	0.031	108
South	0.404	0.298	83	0.119	0.007	25
Brand						
Delifrance	0.741	0.300	28	0.143	0	26
McCafé	0.368	0.285	91	0.155	0.049	30
PacificCoffee	0.3218	0.287	140	0.107	0.015	113
Pret-à- Manger	0.193	0.256	47	0.178	0.015	50
Starbuck	0.281	0.251	185	0.124	0.003	187
UncleRuss	0.488	0.305	18	0	0	18
Overall	0.332	0.294	509/522	0.130	0.029	406/522

Table 7 - Statistics regarding consumers' preferences and coffee shop characteristics by brand and by district

3. Method: Discrete choice model of consumption and conditions enhancing reusable cup use in Hong Kong

This study uses Hong Kong data at shop level to investigate two research questions. Firstly, the effects of a discount scheme and its communication visibility are examined. Secondly, I analyse the characteristics needed for shops to have efficient scheme and communication response. The occurrence of consumers making the choice to use a reusable cup over a disposable one was addressed using two strategies, following Yinger's approach (Yinger 1998). First, logistic and linear econometric approaches estimate the impact of the coffee shop characteristics on consumer behaviour. Secondly, a qualitative comparative analysis (QCA) identifies the required conditions for the consumers to use reusable cups. Following Meuer and Rupietta, (2017), statistical analysis is used to capture differences of consumer choices across the shops, while QCA uses set theory to capture patterns in strategies between the shops. Combining both approaches strengthens the results of the analysis.

3.1 A model of consumer choice of reusable cups

The database built for the study gathers different characteristics of coffee shops (see section 2). The dependent variable is the occurrence of consumers using a reusable cup (either the consumers bring and use their own cup or use a to-stay cup when available) instead of a disposable cup offered by the coffee shop, per shop during an observation window. The occurrence of consumer choices was captured with structured observations among 223 Hong Kong coffee shops (Ando et al. 2019; Zhang 2006). The shop's characteristics are tested over the consumer's observed behaviour.

To estimate the impact of the coffee shop policy decisions on the probability of consumers to choose reusable cups over disposable ones, I use three kinds of approximation methods. First, to estimate the impacts of coffee shop's discount schemes, I conducted an ordinary linear regression (Carpenter and Lawler 2019; Kallbekken and Sælen 2013; Mylan 2017; Yinger 1998). However, the ordinary linear regression shows some restrictions due to the properties of the data (i.e. categorical data). The data gathered from the structured observations is mainly discrete, binary and categorical as the data is collected from multi-choice questions. Secondly, logistic and multinomial logistic regressions were applied using logistic and normal distribution of the error term (Zhang 2006). These logistic models allow for both preference and scale heterogeneity in choice behaviour. Lastly, I conduct an analysis of the variance (Mylan 2017).

We constructed a consumer choice mode to assess the likelihood of consumer choice for disposable and for reusable cups. The linear reduced-form of this model can be written like this:

$$Y_i = \rho + \beta_p P_i + \beta_D D_i + \beta_s S_i + \beta_B B_i + \beta_A A_i + \beta_x X_i + \epsilon_i$$

$$1$$

where Y denotes the number of people using reusable cups for one point in the data set. Different simulations were regressed where Y is either (a) the number of people using their own cup, or (b) the number of people using reusable cups (both to-stay and their own). P denotes the observed price of a regular size black coffee (or Americano depending of the coffee shop's offer). D is the indicator variable for the presence of a discount program and can be assimilated to the treatment for the financial incentive presence. D=0 if there is no discount programme and 1 if there is a discount programme. Similarly, S is the indicator for the visibility of the communication material (e.g. a sign). S=0 if the communication material was reported

as not visible or if the observer (volunteer filling the study form) reported no discount while the coffee shop actually has a discount programme. S=1 if the observer reported a visible communication on the discount scheme. The nudge is represented by the cross term between discount and visibility of the sign. However, as intuitively there was no observation with a sign and no discount, the variable visibility alone capture for the presence of the nudge. B is a categorical variable from one to six and represents the brand of the coffee shop. A is a categorical variable from one to five representing the districts where the coffee shop is located. The vector X includes the variable capturing affluence (if the coffee shop is full or empty) and temporal variables such as the day of the week and the period of the day (i.e.: morning, noon, afternoon). ρ is the average intercept. The ambiance (loud, quiet, etc.), the friendliness of the staff, the weather, are such unobserved variables captured by the error terms.

I assume that the error terms and the independent variables are not correlated. There is not rationale justifying the fact that the price of the coffee, the existence of the discount and of the sign would be correlated with the weather. As the ambiance (loud, quiet, etc.) is highly dependent on the affluence, this unobservable variable might fluctuated with the time of day, supporting its unlikely correlation with the coffee price, which is fixed. A stochastic error component ϵ_i is included to account for unobservable characteristics impacting the consumer choice. The error terms are specific deviations from the average and are assumed to be conditionally independent and identically distributed.

Estimates of β_i with $j = \{P; D; S; B; A\}$ are used to interpret the effects of the different variables. The estimates would be biased however, if P, D, S, D, B and A are endogenous. The endogeneity assumption can be rejected as there is little chance that any independent variable was correlated with the error term. The self-selection of customers into specific coffee shops (based on price, atmosphere, brand, and maybe policy with regard to disposable cups etc.) which was likely to occur and create bias in the results could not captured in the data. There is no observed tendency that could explain why consumers would chose a certain brand of coffee shop due to the environment-friendly scheme of this peculiar shop. In fact, all brands have some coffee shops with discount scheme and some without. The management of the shop takes the decision on the type of policy implemented in each coffee shop (namely the availability of a discount scheme for reusable cups and communicating about the scheme). This decision can be influenced by several endogenous factors. Firstly, the brand of the shop could explain the policy choice. One counter argument is the fact that shops are franchised. Secondly, the policy decision might be influence by the characteristics of the consumers. While individual characteristics of consumer were not observed, the model control for the aggregated characteristics of the consumers through the socio-demographic variables districts (A) and affluence $(X)^{15}$. The correlation table, reported in Appendix 2 – Correlation table, confirms the assumption that the policy choice and both the shop and the customers characteristics to be considered exogeneous.

Additionally, the summary descriptive statistics reported in Table 1 show that none of the explanatory variables can be explained by the dependent variable. The even repartition of the coffee shops in different districts, and their random selection, reflecting the actual and

¹⁵ This argument control for any potential selection problem of the policy decision

homogeneous profusion of Hong Kong coffee shops¹⁶, and the statistics confirm the rejection of endogeneity.

When a logistic method is used, the reduced-form of the problem (equation (1)) becomes:

$$f(k,i) = \beta_k \aleph_i + g(\epsilon_i)$$

where β_k is the set of regression coefficients associated with outcome k, and \aleph_i (a row vector) is the set of explanatory variables associated with observation i. k captures the average consumer choice to use a reusable cup over a disposable cup for each data point (in a certain shop from a certain brand, at a certain time for a certain day). k equals 0 if there are more people using disposable than either (a) the number of people using their own cup, or (b) the number of people using reusable cups (both to-stay and their own). k equals 1 if there are less people using disposable than either (a) or (b).

The vector \aleph_i contains the same explanatory variables than the vector X and the vectors *P*, *D*, *S*, *B* and *A*

3.2 Conditions required for the consumers to choose reusable cups

To capture within shops patterns of strategies which might change consumer choices, and to control for causal ambiguity, a Quantitative Comparative Analysis (QCA) was conducted (Meuer and Rupietta 2017). QCA is based on set-theory method, which uses set relations, instead of correlation, to explain causality. All conditions and their relations in between variables are analysed together instead of independently. QCA determines the best sets of variables (i.e. the best patterns) allowing the realisation of a particular outcome (Rihoux and Lobe 2015; Rihoux and Ragin 2008).

Table 8	- Catego	orization	of co	ffee shop	characteristic	s for the	OCA ana	lysis
							`	. <u>_</u>

Type of category	Name	Abbreviation for Truth table
Policy Success	0	[0;1] – 0 +disposable, 1 + BYO/Reusable
Price	Р	[0;1] - 0 cheap, 1 expensive
Discount	D	[0;1] – 0 No discount, 1 high discount
Visibility	V	{0;1} (crisp)
Fashionable	F	[0;1] – 0 not "in", 1 "very in"
Wealth	W	[0;1] - 0 poor area, 1 wealthy area
Ethnicity	E	[0;1] - 0 only local, 1 only expat
SARS	S	[0;1] - 0 Not affected, 1 affected

QCA was used in this study to identify the characteristics of the coffee shop is most likely to have consumers using a reusable cup over a disposable cup. The data first needed to be calibrated into category types. Once this step was done, the category types were sorted into a truth table. The truth table organises observed combinations of category types (the observed

¹⁶ (The Rise of Hong Kong in The Specialty Coffee World | Perfect Daily Grind n.d.)

cases i.e. the characteristics of every coffee shop observed) based on their membership to certain category types and on the observed outcomes. The truth table identifies the presence (and absence) of combinations of category types and the number of observed cases belonging to each combination. The truth table is logically minimised to extract the "best fit" of category type combinations, allowing a coffee shop to encourage (through direct – discount – strategy and through indirect – nudge - policy) their consumers to use reusable cups over disposable ones. Typologies of coffee shops using this discount scheme as nudge strategy were identified (Longest and Vaisey 2008).

The data was calibrated into different categories reported in Table 8¹⁷. The sets include fuzzy (i.e. decimal number between 0 and 1) and one crisp (i.e. binary) categories. In Boolean terms, used for QCA, a category K indicates the case (i.e. coffee shop observed) to belong and ~K not to belong to this K category. If a coffee shop has an efficient communication method (i.e. a visible sign) V will be reported, otherwise ~V will be reported.

Categories were created from the raw data of the structured observations. The category "price" was calibrated with the condition holding when a coffee shop offers a regular black coffee differing the average price observed (i.e. HK\$28). "P" ranges from 0 to 0.4 if the price is below the average price and from 0.6 to 1, for coffee price above the average price. Similarly, the category "Discount" identifies coffee shops offering a discount, with "D" ranging from 0 to 0.4 for discount lower than the average discount observed (i.e. HK\$3) and from 0.5 to 1 otherwise. The category SARS was built similarly based on the degree of contamination in the neighbourhood where the shop is established. Other categories report the wealth and the ethnicity of the consumers in the neighbourhood where the shop is established. These categories were built from socioeconomic data, details can be found in appendix. The variable "fashionable" capture the reputation of the shop extracted from a local dining app, where consumers can rate food and beverage shops. The cases were then sorted in the truth table to identify all of the typologies allowing nudge strategies towards the use of reusable coffee cups, truth tables are available in Appendix 3 - Truth tables.

4. Results: impact of the characteristics of the coffee shop on the consumer choice to use reusable cups

This study investigates two research questions. Firstly, the effects of a discount scheme and its communication are examined in two sub-sections, respectively the sections 4.1 and 4.2. The characteristics needed for shops to have efficient scheme and communication response are analysed. In the two first sections, shops without discount and communication form the control group. Secondly, features typologies of coffee shops performing efficient policy in inciting consumers to use reusable cups. The results identify configurational characteristics of coffee shops that are successful in getting consumers to use reusable cups. The results of the two research questions are presented and discussed in this section.

We firstly establish the reasons of low consumer choice towards the use of their own cup. One hypothesis is that the amount of the discount scheme is low compare to the consumers' willingness of bringing their own cup. This hypothesis is the main argument supporting the

¹⁷ The categories in Table 1 have different and independent abbreviations than the ones provided in section 3.1.

lack of effect of both communication management and discount scheme on the consumer choice. The effects of the same characteristics is secondly analysed for the consumer choice of using a reusable cup. Efficient communication methods show evidences of positive effects on the consumer choice to use reusable cups. While the consumers do not benefit from the discount, they prefer using to-stay cups rather than disposable ones. In Table 10 and Table 11, I presented the different estimates of the impact of the characteristics of the coffee shops on the consumer choices. Table 10 presents the estimates for the dependent variable "consumers bring their own cup", while Table 11 presents the estimates for the consumer choice of choosing a reusable option (either bring their own or a to-stay coffee cup). The column (a) and (b) (respectively, (a) considering the exact number of consumers and (b) the share of consumers over the total number of consumers in the coffee shop i) present different and separate regressions of the model specified in equation (1). The estimates provided by ordinary least square (first two columns of Table 10 and Table 11) are less relevant than the estimates from logistic methods due the data properties.

4.1 Consumer comfort is expensive

The results in Table 10 do not provide evidence that the presence of a discount scheme modifies the consumer choice into bringing their own cup. The non-significance of the estimates can be explained by the assumption made on the low discount scheme offered. The willingness of the consumers to bring and carry their own cup might be lower than the discount they get from the discount scheme. Coffee shops willing to increase the number of consumers bringing their own cup should probably raise the discount rate significantly. The estimates capturing the effects of the amount of the discount rate confirm this hypothesis. For the data collected, the space (e.g., to store the cup in the bag, to store it at home), the time (e.g., coffee shop workers are less efficient handling cup they do not know, the time needed to clean and dry the cup) and the effort (e.g., the thought of bringing a cup, the action of cleaning a cup) of bringing their own cup seem higher than the HK\$2-5 offered by the current discount schemes. The analysis of the variance (Table 10 anova' columns) depicts a strong effect of the amount of the discount confirming the above mentioned hypothesis.

The effect of an efficient communication method cannot be interpreted as significant for the consumer choice. While this hypothesis could appear counterintuitive, the reason behind lays in the premeditation of the consumer choice. The consumers should already know before entering the coffee shop if he/she can benefit from the discount in order to bring their own cup. The decision of bringing a cup needs to be premeditated. A high discount (higher than the consumer threshold of bringing their own cup) could incentivize more consumers to bring their own cup. With a high discount and a communication, the consumer choice might change towards the use of their own cup.

The brand estimates show significant positive impacts on the consumer choice in all models except the model analysing the variance (Anova). The positive effect of brand on the consumer choice can be explained by the brand's own characteristics. While the coffee shops studied are independently managed (i.e. every coffee shop can decide on their pricing, discount and communication policy), the brand gives them certain features attracting a certain type of consumers.

	Reusa	ble cup	Bring ye	our own
	(a)	(b)	(a)	(b)
Sensitivity Pr(+ D)	92.37	91.04	0	0
Specificity Pr(- ~D)	37.01	34.42	100	100
Correctly classified	76.01	74.28	91.17	91.17
Hosmer-Lemeshow				
Chi ²	11.68	13.47	3.66	4.92
Prob>Chi ²	0.166	0.096	0.886	0.766

Table 9 - Results from logistic regressions

Note: D here refers to the success resulting in more consumers using reusable cups than disposable ones. ~D refers to a non-achievement, i.e. there are more consumers using disposable cups than reusable ones. The regressions were passing the Hosmer-Lemeshow (i.e. Prob>Chi² being above 0.05, confirming the statistical validity of the results)

Table 9 shows that the logistic model cannot classify any success when the effect of the scheme and the communication method are studied for the use of consumer' own cup. The model is not able to identify any significant effects of a discount and its communication on consumer choice.

4.2 Efficient communication method performs as nudge

The effects of the discount and its communication scheme are secondly analysed for the consumer choice of using a reusable cup. The ordinary least square estimates cannot be used to significantly analyse the effects due to the data characteristics.

The logistic methods shows a significant effect of the presence of a discount scheme with an efficient communication method indicating its presence. The estimates support the hypothesis that consumers are sensitized by communication methods promoting coffee shop' discount scheme. Figure 6 illustrates the results. For equal discounts, consumers of a coffee shop with effective (visible) communication on the discount will be more predisposed to choose a reusable cup. Efficient communication methods show higher and more significant evidence of a positive effect on the consumer choice to use reusable cups than the existence and amount of discount. Even though the consumers do not benefit from the discount, they prefer using tostay cups over disposable ones.

The rationale behind these results can be explained by the following: when consumers identify the coffee shop as environment-friendly (due to the communication method indicating the discount scheme for consumers bringing their own cup) he/she becomes more incline to participate in the coffee shop line of conduct. The consumers would have a higher chance to modify their consumer choice towards a reusable option when their are sensitized by the coffee shop.



Figure 6- Probability of consumers choosing reusable cup depending on the communication method and the amount of discount

Dependent variable:	(DLS	Aı	nova	L	ogit	Mul	ti Logit	Probit		
Bring its own cup"	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	
Price	0.289***	0.004	0.555	10.989	0.219	-0.044	0.219	-0.044	0.107	-0.022	
	0.109	0.010	0.740	1.480	0.478	0.047	0.478	0.047	0.226	0.022	
Discount	0.125	0.619**	0.007	0.330	0.282	0.800	0.281	0.800	0.127	0.386	
	0.353	0.313	0.01	0.44	0.578	0.652	0.578	0.652	0.279	0.308	
Amount discount	-3.259*	-6.048***	2.452***	3.733***	-0.603	-0.889	-0.602	-0.889	-0.305	-0.437	
	1.955	1.682	3.25	5.01	0.625	0.597	0.625	0.597	0.288	0.273	
Communication visibility	0.030	-0.003	0.015	0.054	0.021	-0.053	0.021	-0.053	-0.001	-0.042	
	0.105	0.103	0.02	0.07	0.408	0.427	0.408	0.427	0.206	0.210	
Brand	0.121***	0.123***	6.42	3.862	0.376***	0.438***	0.376***	0.438***	0.190***	0.223***	
	0.027	0.031	1.7	1.3	0.141	0.159	0.141	0.159	0.067	0.079	
District	-0.005	-0.016	18.484	2.8***	-0.084	-0.081	-0.084	-0.081	-0.033	-0.034	
	0.023	0.022	3.060	0.005	0.130	0.140	0.130	0.140	0.064	0.068	
N	522	522	521	521	521	521	522	522	521	521	
R ²	0.094	0.087	0.366	0.385	0.075	0.077	0.076	0.077	0.075	0.077	
ROOT MSE			0.868	0.863							
Log pseudolikelihood					-143.900	-143.656	-143.900	-143.656	-143.892	-143.610	
Wald chi2(25)					22.49***	21.86***	180.7***	150.79***	23.38***	22.55***	

Table 10 - Regression results when considering the consumer choice of using their own cup

Note: Standard errors and F statistics are reported in italic bellow the estimates. The significance levels are indicated such as * p < 0.10, ** p < 0.05, *** p < 0.01

Donondont vowichlos	0	LS	A	nova]	Logit	Mul	Multi Logit		robit
Reusable coffee cup	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Price	1.318*	0.246***	230.52***	1673.09***	-0.0201	-0.0155	0.0200	0.0155	-0.0216	-0.0105
	0.784	0.073	13.470	10.610	0.274	0.024	0.274	0.024	0.164	0.015
discount	-6.109***	-7.672***	0.553	15.936	0.578*	0.683**	0.578*	0.682**	0.365*	0.431**
	1.81	1.668	0.030	1.010	0.352	0.341	0.352	0.341	0.211	0.207
Amount discount	33.37***	38.60***	12.730	7.605	-0.326	-0.351	0.326	0.351	-0.204	-0.219
	12.09	10.5	0.740	0.480	0.298	0.280	0.298	0.280	0.179	0.166
Communication visibility	-1.001	-0.89	17.549	14.534	0.820***	0.794***	0.820***	0.795***	0.480***	0.467***
	0.691	0.674	1.030	0.920	0.320	0.307	0.320	0.307	0.176	0.171
brand	-0.678***	-1.070***	1382.822	1095.25***	0.361***	0.386***	0.361***	0.386***	0.213***	0.230***
	0.228	0.287	16.160	17.360	0.089	0.101	0.089	0.101	0.052	0.058
district	0.245**	0.239**	288.15**	586.22***	0.015	0.022	0.015	0.022	0.012	0.016
	0.12	0.119	2.1	4.65	0.086	0.086	0.086	0.086	0.049	0.050
Ν	522	522	521	521	521	521	522	522	521	521
R ²	0.365	0.378	0.6588	0.6914	0.104	0.105	0.105	0.106	0.104	0.105
root MSE			4.1374	3.9718						
Log pseudolikelihood					-283.415	-283.214	-283.415	-283.214	-283.373	-283.131
Wald Chi ² (25)					60.22***	60.64***	211.29***	205.48***	63.6***	64.14***

Table 11 - Regression results when considering the consumer choice of using a reusable cup (both bring your own and reusable from the shop)

Note: Standard errors and F statistics are reported in italic bellow the estimates. The significance levels are indicated such as p < 0.10, p < 0.05, p < 0.01. The dependent variable gather both consumers bringing their own cups and consumers using to-stay reusable cups from the shop.

4.3 Efficient nudge coffee shop' typologies

This section features typologies of coffee shops performing efficient nudging in inciting consumers to use reusable cups. Using qualitative comparative methods, configurational characteristics of coffee shops that are successful in getting consumers to use reusable cups were determined. The identified characteristics positively correlated with consumers using reusable cups, are reported in Table 12 and Table 13.

Table 12, which shows the results for consumers to bring their own cup, provides low coverage and less consistency than the results estimated for the consumer choice to use reusable cups. Nonetheless, the lack of significance of the results in Table 12 can be explained by the low discount compared to the threshold of bringing a personal cup to a coffee shop. Places where coffee is expensive are more likely to observe consumers bringing their own cups. The results confirm that consumers willing to pay a higher price for coffee have higher willingness to bring their own cup. This result can be explained by the following reasoning. First, let's assume that wealthier consumers are more likely to have positive environmental attitudes and that wealthier consumers have more resources available. Wealthier consumers can afford to buy their own cups, to store them in their bags and in their house, and thus wealthier consumers are more likely to bring their own cups. Second, it is reasonable to think that wealthier consumers are more willing to pay a higher price for coffee shops with higher than average coffee price will attract wealthier consumers who can afford to pay additional prices for coffee. This reasoning leads to the same conclusion that the statistical analysis. Coffee shops with higher than average coffee price will attract consumers with higher possibility to bring their own cups.

	Raw	Unique	Solution
Set	Coverage	Coverage	consistency
D*P*~v*F*W*E	0.503	0.092	0.16
~d*~p*~v*~s*E	0.341	0.024	0.299
~d*S*~f*~w*~e	0.542	0	0.178
D*P*V*S*F	0.178	0	0.135
~d*~v*~s*~w	0.408	0	0.299
P*S*~e	0.684	0.024	0.129
~d*~p*~v*~f*~e	0.365	0	0.216
Total Coverage			0.904
Solution Consisten	су		0.127

Table 12 - Reduction sets table identifying best coffee shop typologies for consumers
choosing their own cups

Table 13 provides consistent typologies identifying the coffee shop characteristics allowing the consumer choice to be likely towards reusable cups. The QCA analysis complements and strengthens the results obtained from the analysis of the effects using regressions methods, by shedding light on three major results. First, wealthy consumers encountering efficient communication method signalising a discount scheme are more likely to choose a reusable cup. For a coffee shop situated in a wealthy neighbourhood, I observe (Table 13, Lines 1-3) high likelihood of consumer choice towards reusable cups, either if the shop is "Fashionable" (well rated) or, if the shop has an efficient communication on the discount scheme and was not highly affected by the SARS.

Secondly, shops situated in sectors that experienced a low contamination from SARS are also more likely to observe an above average likelihood of consumers choosing reusing cups. From Table 13 (Lines 3-4), one can observed a higher likelihood towards reusable cups for shops located in a sector with low SARS contamination, either when an efficient communication strategy (visibility) is used and the consumers are from a wealthy neighbourhood or, when the shop is highly rated (fashionable).

Lastly, the rating (fashionable) and the communication strategy (visibility) of the shops seem to be substitute characteristic for each other. In all successful case, either the shop is well rated (fashionable) or has a visible communication strategy.

	Raw	Unique	Solution
Set	Coverage	Coverage	consistency
~d*P*~v*~s*F*W*E	0.294	0.151	0.754
D*~p*~v*~s*F*W*~e	0.067	0.009	0.612
~d*~p*~v*S*~e	0.158	0.08	0.792
~d*P*~s*w*~e	0.176	0.008	0.725
P*V*~s*~f	0.022	0	0.496
P*V*S*F	0.103	0.005	0.476
D*P*V*~e	0.116	0.017	0.539
P*V*~s*~w	0.023	0	0.516
P*V*F*∼w	0.079	0	0.556
Total Coverage			0.514
Solution Consistency			0.665

Table 13 - Reduction sets table identifying best coffee shop typologies for consumers choosing reusable cups

5. Conclusion: Nudging consumers into environmental behaviour at coffee shops

This paper studies the impacts of nudge and direct strategies in a conservative setting (i.e. Hong Kong), aimed at directing consumers towards environmental behaviour (namely using reusable over disposable cups) in a structured observation study. The policies studied aim to encourage consumers to use their own cups instead of disposable cups. I conducted a structured observation study to identify the effects of such incentive policies on consumer choice. The instrument includes the use of a combination of a discount scheme and a communication regarding the scheme.

From the empirical study, three main results are established. First, I observe no significant effect of the discount scheme on consumer behaviour change. In the study design analysed, discount schemes do not change consumer behaviour. Consumers' willingness to pay for carrying their own cup might exceed the discount offered. Coffee shops desiring to increase the number of consumers bringing their own cup could raise the discount to observe significant change in consumer choice.

Second, price incentives do not affect predetermined non-priced consumer choices. The results do not depict strong impact of communication on the consumers' choice to bring their own cup. The reason lies in the premeditation of the consumer choice, which cannot be changed by

the discount. The consumers already know before entering a coffee shop if they can benefit from the discount (conditional on the discount presence). Indeed, consumers need to have brought a coffee cup to benefit from a potential scheme. Environmentally conscious consumers already carry and bring their own cup to coffee shops, and thus are not affected by a discount scheme.

Third, visual nudges affect consumers' non-priced choice. In contrast with the second result mentioned above, effective communication brings a change in non-financially targeted consumer behaviour. The consumers not carrying their own cups who encounter an effective communication are positively affected and more likely to use a reusable cup. The communication signalling a discount scheme targeting consumers bringing their own cup significantly encourages the non-targeted consumers to use a to-stay reusable cup. The consumers, willing to belong to the consumer group targeted by the shop discount, modify their behaviour to follow the social norm of the shop. From the results, nudging consumers through effective communication towards the "environment-friendly" policy of a coffee shop seems to positively affect the consumers' behaviour towards reusable cups.

The results, which demonstrated that price incentives are less effective than visual nudge strategies to modify consumer behaviour towards non-priced environmental choices, are robust for conservative behaviour regarding the use of reusable dishware. Indeed, even in the conservative setting (relative to hygiene) of Hong Kong (Almanza 2019; Jung and Sung 2017; Lai et al. 2004; Lee and Chan 2017), where consumers have strong concerns regarding hygiene, and are reluctant to use reusable dishware due to the 2003 SARS episode, we observe a change in consumer behaviour. In this conservative setting, the communication strategy shows positive results. Consumers change their choice from disposable to reusable and ask for "to-stay" cups.

The analysis of coffee shop typologies displays that the wealthier are consumers, the more influenced they are by the communication. Coffee shops targeting a wealthier audience are more likely to achieve their goals through nudge strategies. This result is explained by the difference in education as well as in habits of the Hong Kong population (Forrest, La Grange, and Yip 2004). Sanitary fears towards the contamination of reusable cups is a real barrier for Hong Kong people to use reusable cups, mainly because certain consumers remember the SARS episode of 2003. Educating people from a lower socioeconomic background towards environmental behaviour might mitigate these differences in consumer choice. To summarise the typology results, the coffee shops aiming to decrease their waste (due to disposable cups) should consider dedicating more effort to communication methods (larger signs, different languages).

Communication strategies targeting local people could ease the process with little implementation costs. Indeed, most of the communication methods use English signs as their main strategy. A communication featuring signs in Cantonese would allow local non-English speakers to be nudged towards the use of reusable cups. With low implementation costs, additional nudges could be implemented as the costs would only consist of the translation effort. Increasing the visibility of the reusable cups could be one of the nudge strategies (often the shop branded reusable cups are less visible than the disposable ones – see Figure 4).

This typology of nudge should be seen as complement to financial incentive measures to target the group of consumer not targeted by the incentive (Schubert 2017). The discount provides a "green" branding for the coffee shop, this strategy does not financially penalise the coffee shop as actually the results show that consumers do not use the discount but rather modify their choice to use reusable cups instead of disposable ones. For the coffee shop, such discount when combine with effective communication, might attract a new kind of consumers and raise their brand as an environment-friendly company. Such gains of implementing a nudge strategy could be enhanced by the fact that a coffee shop, when allowing a discount for consumers bringing their own cup, could benefit directly from this strategy as they can sell branded reusable cups. If the coffee shop is selling reusable cups, it might also be at their advantage to offer a discount to invite people to buy their branded product. Such marketing strategy (having a discount scheme and offering reusable cups to go) might enhance the effect of the discount scheme on consumer behaviour.

In the settings explained above, both consumers and shops are better off. For consumers the discount policies present benefits for the consumers such as the money saved thanks to the discount scheme. For the shop, this saved money by the consumers can potentially be spent to purchase more in the coffee shop – bringing indirect benefits to the coffee shop. The costs saved for the shop are the costs for the provision of disposable cups and their waste treatment. Nudge strategies combine with discount scheme imply minimal costs of implementation and could reduce significantly the production of waste.

Environmental nudge could lead to waste reduction by reducing the use of disposable cups. The benefits of reducing disposable cups for the community in Hong Kong can be calculated in terms of reduction of the amount of waste, and thus pollution and other negative externalities. The structured observations study estimated that in the 556 observations, 5255 disposable cups were used at the coffee shop observed. Assuming that every day 1/100 Hong Kong citizens use a disposable cup, with 7.4 million Hong Kong inhabitants, a total of 27 million cups are consumed each year (and being landfilled in the best cases - Hong Kong having no recycling facilities for plastic). Considering a lower weight bound of a 30 g¹⁸ cup of plastics (respectively, 25 g¹⁹ for paper cups), the consumption of disposable cups would represented 810 tonnes of plastic waste per year (675 tonnes of paper waste) and 2.2 tonnes of plastic per day (1.85 ton of paper per day). Hong Kong sends to landfills 15,516 tonnes of waste per day, with 2.2 tonnes reported as plastic waste. If all the disposable cups of Hong Kong were made of plastic, the amount used per day would equal the amount of current plastic waste dumped every day in Hong Kong²⁰.

Unwanted impacts may also occur. The principal concerns regard the reductions of consumer satisfaction and coffee shop performance. Coffee shop workers might experience the downsides of using reusable cups (e. g., different shape, heavy cups, risk of damage of belongings, sanitary issues etc), potentially leading to a decrease in consumers' satisfaction. Some of the thresholds for the coffee shop are the differences in shape, weight and practicality between disposable and reusable cups. Disposable cups are lighter, can easily be stored (e. g. paper and plastic cups can be stacked) and are unlikely to degrade (e. g., plastic and paper do not break easily). The physical characteristics of the reusable cups do not favour their use.

¹⁸ (Jennie n.d.),

¹⁹ (Jennie n.d.),

 $^{^{20}}$ This is actually not the case as most of the coffee cups are made out of paper. The numbers illustrated the tremendous amount of cups used per day in Hong Kong. (Waste Data & Statistics | Waste Reduction Website n.d.)

Important questions related to consumer choice and the effect of discounts and communication still need further exploration. One limitation of the analysis is the lack of information concerning consumers, as only shops characteristics are observed. Unobserved factors such as other kind of communication on the environmental awareness of the shop could be included in future research. Further analysis of the possible downsides mentioned above should be tested through experimental methods in future research projects. To further allow consumers to positively react to discount policies, the scheme could include a penalty for the use of disposable cups. The price displayed would be the original price for using a reusable to-stay cup. Consumers requiring a disposable cup would be charged an additional fee. Contrary, consumers bringing their own reusable cup would receive a discount. In future studies, to verify the assumption that disposable cups are seen as more hygienic than reusable cups, disposable cups could be additionally priced to control for the hygienic concern of the consumers. The results might be able to identify the consumer willingness to pay for hygiene.

The conclusions on the effectiveness of discount and communication methods may be extended in two directions. First, nudges could be applied to other products and other waste reduction. Nudge strategies could be used as an instrument to broaden environmental policies to enhance consumer behaviour towards more environment-friendly choices. Second, as the results are robust under post-pandemic conditions (namely post SARS), this paper could also lead to future research on using nudge instead of financial incentives, as a more effective instrument to enhance consumer choice towards environmental behaviour. The results could be extended to public environmental policies targeting consumer choice in the post-pandemic environmental transition.

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Appendices

Appendix 1 – Structured observations study from questions

Take Action on Disposable Coffee Cups

Please help Plastic Free Seas collect data on consumer behaviour in order to decrease the number

of takeaway cups used by consumers while staying in a coffee shop. I will use this data to address

the issue with the HK government and the coffee shops to push for change.

Plastic Free Seas is a registered Hong Kong charity focusing on solutions to the problem of plastic

marine pollution through education and awareness-raising campaigns.

(Your personal data will only be used to send you project updates, if agreed below.)

*Required

1. Name of Coffee shop *

Mark only one oval.

Pacific Coffee Mac Cafe StarbucksCafe Delifrance Pret-a-manger Uncle Russ

2. District of Coffee shop *

Mark only one oval.

Central/Wan Chai/Admiralty Kowloon Tong/Kowloon Bay/TST Mong Kok/Sham Shui Po/Prince Edward HKU/Kennedy Town Discovery Bay South HK Island (Stanley, DeepWater Bay, Repulse Bay, Shek O etc...) CausewayBay/NorthPoint Shatin East HK (Chai Wan/Tsuen Kwan O) Tun Chung/Tuen Mun Sai Kung

3. Address of Coffee shop *

(street or building, and district)

4. Date of Spot Check *

Example: 15 December 2018

5. Period of day of spot check *

Mark only one oval.

Morning Midday Aft

6. Time of Spot Check *

On mobile, top character is am, bottom is pm

Example: 8.30 a.m.

7. # of guests seated using disposable hot drink cups *

8. # of guests seated using 'to-stay' hot drink cups *

9. # of guests seated using their own hot drink cups *

10. Is there a sign at the counter advertising a discount to consumers who brought their own reusable cups? *

Mark only one oval.

Yes No

11. If there is a sign - is the sign visible? *Mark only one oval.*

Yes No

12. What is the discount value to bring your own cup/take a to stay cup? (in HKD or % of the drink) *

13. What is the price of a "tall" (regular) Americano coffee in this coffee shop? (in HKD) *

14. Your Full Name *

15. Your Company/ School

16. **Your Email** If you would like to receive project updates, please leave your email

17. Comments

Appendix 2 – Correlation table

	Total cups	Reusable (BYO and tostay)	tostay	policy sucess	price	discount	sign	visible	brand	district	time	weekday
Total	1											
cups	1											
Reusable												
(BYO	0.5662	1										
anu tostav)												
tostay)	0 5455	0 9881	1									
policy	0.0100	0.0001		_								
sucess	-0.056	-0.1374	-0.1993	1								
price	-0.0036	-0.077	-0.0993	0.0925	1							
discount	-0.0152	-0.087	-0.0768	0.0443	0.3651	1						
sign	-0.0486	-0.1125	-0.1105	0.0249	0.1722	0.2976	1					
visible	0.0399	-0.0768	-0.0777	0.0109	0.0872	0.2593	0.8424	1				
brand	-0.0294	-0.1976	-0.2283	0.1615	0.5817	0.2481	0.2033	0.1233	1			
district	0.0832	0.0971	0.1027	-0.0169	-0.0412	0.041	0.3026	0.1984	-0.1598	1		
time	0.0161	-0.0556	-0.0626	0.0684	0.0294	-0.0629	-0.0525	0.0043	0.0425	-0.0549	1	
weekday	-0.2085	-0.0892	-0.0979	-0.007	0.0435	-0.0617	0.0426	-0.0117	0.0615	-0.1522	0.0044	1

Appendix 3 – Truth tables

Table 14 - truth table for O=bring your own cups

id	D	Р	V	S	F	W	E	0	Consis- tency
509, 501, 505, 498, 507, 499, 497, 508, 495, 496, 510, 500, 502, 503, 504, 513	0	0	0	0	1	1	0	1	0.295
485, 481, 482, 494, 492, 506, 483, 484, 486, 487, 488, 489, 490, 491, 493, 511, 512, 514	0	0	0	1	0	0	0	0	0.201
441, 442, 336, 332, 333, 334, 335, 337	0	1	0	0	1	1	0	1	0.245
226, 207, 218, 221, 208, 214, 205, 210, 215, 206, 209, 211, 212, 213, 228, 223, 225, 217, 216, 222, 219, 227, 224, 220, 423, 415, 416, 420, 419, 432, 424, 417, 418, 421, 431, 428, 427, 429, 430, 422, 425, 426	0	1	0	0	1	1	1	0	0.218
443, 458, 459, 462, 463, 464, 465, 466, 467, 468, 454, 440, 449, 453, 299, 303, 292, 259, 256, 253, 258, 252, 265, 234, 235, 238, 260, 261, 262, 263, 264, 266, 267, 268, 269, 270, 276, 277, 287, 293, 294, 295	0	1	0	1	0	0	0	0	0.190
448, 457, 444, 445, 446, 447, 460, 461, 455, 450, 451, 452, 456, 27, 21, 22, 23, 24, 25, 26, 29, 28, 30	0	1	0	1	0	1	0	0	0.187
257, 289, 281, 248, 249, 246, 243, 244, 242, 245, 247, 19, 273, 280, 278, 33, 34, 274, 231, 283, 279, 275, 284, 290, 297, 232, 291, 288, 254, 229, 230, 239, 272, 282, 285, 286, 296, 298, 32	0	1	0	1	1	1	0	0	0.185
233, 255	0	1	1	1	0	0	0	0	0.162
237, 241, 240, 250, 251, 301, 300, 236, 302, 271, 20	0	1	1	1	1	1	0	0	0.165
515, 516, 526, 525, 523, 517, 518, 519, 520, 521, 522, 524	1	0	0	0	1	1	0	1	0.244
304, 305, 306, 307, 308, 310, 331, 315, 327, 313, 324, 323, 328, 320, 325, 316, 311, 312, 318, 319, 321, 322, 329, 368, 390, 373, 369, 392, 396, 401, 405, 406, 407, 76, 77, 118, 134, 38, 40, 41, 42, 43, 46, 47, 54, 58, 10, 3, 18, 4, 2, 5, 6, 7, 8, 9, 11, 145, 13, 203, 197, 184, 149, 154, 12, 14, 201, 135, 122, 107, 176, 200, 204, 165, 78, 86, 69, 102, 146, 16, 15, 129, 136, 74, 180, 183, 71, 182, 75, 57, 103, 116, 128, 142, 148, 156, 161, 190, 17	1	1	0	0	1	1	1	0	0.180

id	D	Р	V	S	F	W	Ε	0	Consis- tency
338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 359	1	1	0	1	0	0	0	0	0.195
393, 394, 395, 402, 162, 50, 139, 140, 163, 137, 73, 138	1	1	0	1	0	1	0	0	0.190
364, 365, 366, 367, 381, 379, 382, 380, 385, 378, 384, 383	1	1	0	1	1	0	0	0	0.192
349, 352, 353, 354, 355, 356, 357, 363, 360, 361, 179, 125, 56, 52, 45, 35, 51, 81, 124, 174, 150, 173, 126, 168, 202, 151, 82, 113, 110, 198, 112, 79, 64, 109, 105, 171, 84, 111, 189, 120, 127, 106, 80, 61, 152, 167, 65, 88, 89, 130, 195	1	1	0	1	1	1	0	0	0.170
371, 372, 389, 400, 412, 44, 36, 39, 160, 175, 188, 143, 153, 70, 60, 59, 115, 87, 141	1	1	0	1	1	1	1	0	0.201
362	1	1	1	0	1	1	0	0	0.239
309, 314, 330, 326, 317, 101, 49, 37, 53, 164, 114, 66, 181, 83, 72, 85, 186, 144	1	1	1	0	1	1	1	0	0.200
469, 470, 472, 473, 480, 471, 479, 477, 478, 476, 475, 474	1	1	1	1	0	0	0	0	0.161
433, 434, 437, 435, 436, 438, 376, 403, 404	1	1	1	1	0	1	0	0	0.168
370, 408, 410, 374, 375, 386, 409, 377, 391, 397	1	1	1	1	1	0	0	0	0.162
350, 351, 358, 48, 55, 157, 132, 170, 92, 68, 100, 104, 196, 97, 93, 99, 67, 159, 94, 96, 119, 90, 63, 95, 199, 98, 91, 62, 108, 117, 121, 123, 131, 133, 147, 155, 158, 166, 169, 172, 178, 185, 187, 191, 193, 194	1	1	1	1	1	1	0	0	0.149
439, 387, 388, 398, 399, 411, 177, 192	1	1	1	1	1	1	1	0	0.181

Table 15 - truth table for O=to-stay and bring your own cups

id	D	Р	V	S	F	W	Ε	0	Consis- tency
509, 501, 505, 498, 507, 499, 497, 508, 495, 496, 510, 500, 502, 503, 504, 513	0	0	0	0	1	1	0	1	0.704
485, 481, 482, 494, 492, 506, 483, 484, 486, 487, 488, 489, 490, 491, 493, 511, 512, 514	0	0	0	1	0	0	0	1	0.785
441, 442, 336, 332, 333, 334, 335, 337	0	1	0	0	1	1	0	1	0.738

id	D	Р	V	S	F	W	Ε	0	Consis- tency
226, 207, 218, 221, 208, 214, 205, 210, 215, 206, 209, 211, 212, 213, 228, 223, 225, 217, 216, 222, 219, 227, 224, 220, 423, 415, 416, 420, 419, 432, 424, 417, 418, 421, 431, 428, 427, 429, 430, 422, 425, 426	0	1	0	0	1	1	1	1	0.754
443, 458, 459, 462, 463, 464, 465, 466, 467, 468, 454, 440, 449, 453, 299, 303, 292, 259, 256, 253, 258, 252, 265, 234, 235, 238, 260, 261, 262, 263, 264, 266, 267, 268, 269, 270, 276, 277, 287, 293, 294, 295	0	1	0	1	0	0	0	1	0.711
448, 457, 444, 445, 446, 447, 460, 461, 455, 450, 451, 452, 456, 27, 21, 22, 23, 24, 25, 26, 29, 28, 30	0	1	0	1	0	1	0	1	0.718
257, 289, 281, 248, 249, 246, 243, 244, 242, 245, 247, 19, 273, 280, 278, 33, 34, 274, 231, 283, 279, 275, 284, 290, 297, 232, 291, 288, 254, 229, 230, 239, 272, 282, 285, 286, 296, 298, 32	0	1	0	1	1	1	0	1	0.707
233, 255	0	1	1	1	0	0	0	0	0.644
237, 241, 240, 250, 251, 301, 300, 236, 302, 271, 20	0	1	1	1	1	1	0	0	0.602
515, 516, 526, 525, 523, 517, 518, 519, 520, 521, 522, 524	1	0	0	0	1	1	0	0	0.612
304, 305, 306, 307, 308, 310, 331, 315, 327, 313, 324, 323, 328, 320, 325, 316, 311, 312, 318, 319, 321, 322, 329, 368, 390, 373, 369, 392, 396, 401, 405, 406, 407, 76, 77, 118, 134, 38, 40, 41, 42, 43, 46, 47, 54, 58, 10, 3, 18, 4, 2, 5, 6, 7, 8, 9, 11, 145, 13, 203, 197, 184, 149, 154, 12, 14, 201, 135, 122, 107, 176, 200, 204, 165, 78, 86, 69, 102, 146, 16, 15, 129, 136, 74, 180, 183, 71, 182, 75, 57, 103, 116, 128, 142, 148, 156, 161, 190, 17	1	1	0	0	1	1	1	0	0.631
338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 359	1	1	0	1	0	0	0	0	0.673
393, 394, 395, 402, 162, 50, 139, 140, 163, 137, 73, 138	1	1	0	1	0	1	0	0	0.672
364, 365, 366, 367, 381, 379, 382, 380, 385, 378, 384, 383	1	1	0	1	1	0	0	0	0.678
349, 352, 353, 354, 355, 356, 357, 363, 360, 361, 179, 125, 56, 52, 45, 35, 51, 81, 124, 174, 150, 173, 126, 168, 202, 151, 82, 113, 110, 198, 112, 79, 64, 109, 105, 171, 84, 111, 189, 120, 127, 106, 80, 61, 152, 167, 65, 88, 89, 130, 195	1	1	0	1	1	1	0	0	0.668

id	D	Р	V	S	F	W	Ε	0	Consis- tency
371, 372, 389, 400, 412, 44, 36, 39, 160, 175, 188, 143, 153, 70, 60, 59, 115, 87, 141	1	1	0	1	1	1	1	0	0.672
362	1	1	1	0	1	1	0	0	0.561
309, 314, 330, 326, 317, 101, 49, 37, 53, 164, 114, 66, 181, 83, 72, 85, 186, 144	1	1	1	0	1	1	1	0	0.563
469, 470, 472, 473, 480, 471, 479, 477, 478, 476, 475, 474	1	1	1	1	0	0	0	0	0.606
433, 434, 437, 435, 436, 438, 376, 403, 404	1	1	1	1	0	1	0	0	0.615
370, 408, 410, 374, 375, 386, 409, 377, 391, 397	1	1	1	1	1	0	0	0	0.561
350, 351, 358, 48, 55, 157, 132, 170, 92, 68, 100, 104, 196, 97, 93, 99, 67, 159, 94, 96, 119, 90, 63, 95, 199, 98, 91, 62, 108, 117, 121, 123, 131, 133, 147, 155, 158, 166, 169, 172, 178, 185, 187, 191, 193, 194	1	1	1	1	1	1	0	0	0.544
439, 387, 388, 398, 399, 411, 177, 192	1	1	1	1	1	1	1	0	0.531