Applying Insights from Behavioral Economics to Supermarket Policies to Reduce Plastic Consumption in India

Arjun Kumar *†

October 20, 2021

Abstract

This paper applies knowledge from behavioral economics to the eco-friendly goal of reducing plastic consumption in India. It does so by zooming into one of the roots of the problem: the consumption of plastic bags in supermarkets. The paper designs three supermarket policies that aim to reduce plastic bag consumption by incentivizing consumption of its eco-friendly substitute: paper products. The policies discussed in this paper are all derived from knowledge of three of the most prevalent psychological heuristics, namely, the endowment effect, the status-quo bias, and the availability bias. The discussions will explain the bias involved, the connection between each policy and its corresponding bias, and an evaluation of each policy's advantages and disadvantages.

1 Introduction

Common scientific knowledge dictates that plastic is harmful to the environment. It uses an estimated 8% of global oil production. This number is expected to reach 20% by 2050. Despite being aware of the adverse implications of the consumption of plastic, the amount produced annually has increased from 1 million tons in 1950 to 407 million tons in 2015 and continues on a steep upwards trend. Until 2015, scientists estimated that nearly 8.3 billion tons of plastic had been produced globally. That is more than 1 ton per person in 2021. 76% of this value (6.3 billion tons) lay in landfills, releasing toxic chemicals. Much of this also ends up in oceans, threatening wildlife [CR19].

Amongst the most common uses of plastic is that of plastic shopping bags. Globally, 5 trillion plastic bags are consumed every year. This equates to 160,000 bags per second. Of this, only 1% is reused. Moreover, although a plastic

*Advised by: Edoardo Gallo, Assistant Professor and Director of Studies (Economics) at University of Cambridge

†The International School, Bangalore

shopping bag is used for only 12 minutes on average, it takes up to 1,000 years to break down [TWC]. Despite being easily replaceable, plastic bags' extremely low costs of purchase still make them the most popular option. Numerous efforts to decrease its consumption have also been futile due to its price benefits. Thus, in this scenario, it may be best to design policies that use external factors, other than price, to influence consumer behavior.

Over the years, behavioral economists have repeatedly provided insights into the dramatic influence of well-designed nudges. Recent studies have divided the motivations involved in social behavior into two types. The first is behavioral intention, referring to conscious deliberation which leads to intended behavior. The second is behavioral willingness which is a reaction to situational factors, leading to unintended behavior. The latter is elicited by particular circumstances that cause a spontaneous reaction [GGBR98].

Ohtomo and Hirose (2007) extended the knowledge on consumption behavior by focusing on the effects of these contrary motivations on environmental behavior in the act of recycling and revealed the intention-behavior gap. The research concluded that recycling behavior was largely affected by both, behavioral intention towards eco-friendly behavior, and situational behavioral willingness, which contextually afforded eco-unfriendly behavior [OH07].

From a behavioral economic point of view, policies can be designed to counter the unintentional behavioral willingness that tends to cause eco-unfriendly behavior. Furthermore, policies can also be designed to exploit heuristics and create situational incentives that influence behavioral willingness towards eco-friendly behavior. This paper will use behavioral economic insights to design policies that work towards sustainable development and will analyze the effectiveness of these policies.

The first policy that this paper will examine will reference the endowment effect. The policy obligates supermarket customers to buy a paper bag/carton that they will place on their trolly and use to collect their groceries. The paper bag/carton can later be used to carry the items after purchase, or it can be returned for the money initially paid, or it can be exchanged for plastic bags and the difference would be refunded. The policy hopes that consumers place more value on the bag when at the counter, than when they bought it and are thus unwilling to return or exchange it.

The second policy uses insights from the status quo bias. Essentially, the primary objective of the policy is to counter the existing default option in Indian supermarkets, which is to provide plastic bags to customers unless specifically asked not to do so. This can be done by simply presenting all the options and asking the consumer what they would prefer, through a voice prompt. The effectiveness of this policy can also be increased by creating a new default - paper bags and cartons. Thus, paper carrying goods (bags and cartons) can be given unless explicitly refused by the customer. Furthermore, for single purchases, the default option can be to not offer a bag, incentivizing shoppers to carry products by hand instead.

The last policy exploits the availability bias. Essentially, segments of the population can be targeted to de-incentivize the consumption of plastic bags via

printed illustrations on these bags. The policy will target parents by printing infographics of children and the negative implications that plastic consumption could have on their future. This policy aims to remind the parents of their family's well-being and future, leading them to opt out of the consumption of plastic bags.

The following section will briefly contextualize the situation of supermarkets and plastic consumption in India. Sections 3, 4, and 5 will individually explain and evaluate each policy. Lastly, section 6 will conclude the developments provided in this paper.

2 Description of the Situation

Despite its undesirable consequences, plastic consumption is still very common in India. It is estimated that nearly 3.3 million metric tons of plastic waste was generated in India in 2018-2019 [Eara]. Furthermore, as a developing country, a large segment of India's population is poor. The United Nations estimated that roughly 364 million people were below the poverty line in India in 2020 [Earb]. This number alone is larger than the entire American population, the third-largest in the world. This implies that Indians tend to look past the environmental implications of their decisions when given price incentives. Thus, it can be inferred that the use of plastic carry bags in India is large relative to those of other countries. Hence if nudges work to reduce the consumption of these bags by even a small margin, the resulting difference in terms of the actual amount would still be immense.

One of the policies discussed in this paper has already been tested in Japan and has been proved to reduce the consumption of plastic bags by 5% in supermarkets [OO14]. Having designed two additional policies of a similar caliber, and considering the fact that there are over 435,000 supermarkets in India [Eas], these policies hold the potential to create a colossal impact on consumers' behavior and plastic consumption.

It should also be noted that nudges on their own rarely create significant changes in behavior. However, when these nudges are combined with larger and more direct policies, they tend to amplify its impact numerous times over. Thus, the 'larger policy' that this paper will take into consideration is that all supermarkets are compelled to offer paper bags, for smaller purchases, and cardboard cartons, for larger ones, as a substitute for plastic bags. These supermarkets are also very likely to offer plastic bags due to cost benefits. All three policies in this paper will aid the 'larger policy' in its attempt to reduce the consumption of plastic carry bags.

3 Endowment Effect

Standard economic assumptions imply that when the income effect is small, the difference between an individual's maximum willingness to pay (WTP) and

minimum compensation demanded (Willingness to accept [WTA]) for the same good, should be negligible. However, experiments conducted by Kahneman, Knetsch, and Thaler (1990) contradicted this assumption.

Previous experiments had shown that there was a significant disparity between buyers' WTP for a good, and a seller's WTA for the same good. Another experiment was conducted to clarify the results from these previous experiments (to find out whether the low volume of trading is produced by a reluctance to buy or a reluctance to sell). The subjects were 77 students at Simon Fraser University (SFU) and the goods to be traded were SFU mugs. The subjects were divided into Buyers (subjects who could decide how much they are willing to pay for the mug) and Sellers (subjects who were given the mug and asked how much they were willing to accept in return for it). The Buyers were asked whether they would buy, and Sellers were asked whether they would sell, the mugs at prices ranging from \$0.25 to \$9.25. The main distinction in this experiment from previous ones was that there was a third group participating in the experiment who were not given a mug but were made to choose between cash and the mug over the range of prices. This group helped identify if the abnormality was caused by the buyers or sellers. The resulting median reservation prices were: Sellers, \$7.12; Choosers, \$3.12; Buyers, \$2.87. This indicated that the low volume of trade was produced primarily by the owners' reluctance to part with their endowment, rather than by the buyers' unwillingness to part with their cash [KKT90]. These results led to the working definition of the endowment effect. According to Kahneman, Kneutsch, and Thaler (1990), "this bias occurs when we overvalue something that we own, regardless of its objective market value."

This heuristic can inspire pro-environmental supermarket policies that strive to reduce the consumption of plastic bags by increasing the consumption of its direct substitute, paper bags. Essentially the policy could oblige shoppers to rent paper bags when entering a supermarket for its normal price. These bags could then be switched for a plastic bag at the purchase counter and the individual who chooses to replace the bag would be compensated with the cost difference. This policy aims to exploit the endowment heuristic by creating a sense of ownership of the paper bag while collecting goods in the supermarket. As per the definition of this bias, this would result in the shopper valuing the paper bag at a price higher than what they initially paid. Thus, the paper carry bags would act as the mugs from the experiments. This implies that while deciding whether or not to exchange their paper goods for plastic ones, the shopper should be de-incentivized from acting on this opportunity because they would be less inclined to settle for receiving the same value for the paper bag that they initially paid.

While this seems to work theoretically, numerous issues may arise when implementing this policy. Firstly, since repeat shoppers are aware that they will be given an option to exchange their paper bags at the end, they may view the ownership of the paper carrying goods as only temporary, nullifying the overvaluation that is caused by genuine ownership of the goods. Furthermore, the shoppers may even account for depreciation in the quality of their carry

bag over their shopping trip and hence, may prefer a new plastic bag over a used paper bag, even if they lose the increased value that they attributed to the product. Loss aversion could also minimize the impact of this policy since if the shopper is not accustomed to recycling behavior, they may prioritize reducing costs and may therefore opt for the cheaper option - plastic bags. Lastly, if these barriers reduce the effectiveness of the policy and more people choose to exchange the paper bags than those who do not, this may lead to major losses for the supermarket who may have to discard or find other ways to recycle the exchanged paper bags.

4 Status-Quo Bias

The status quo bias has been presented in an exploration into the effects of a default option [JG03]. In the experiment, the effect of defaults was shown in terms of organ donation agreement rates. An online survey was conducted with 161 respondents. The participants were divided into three groups and were all asked the same question - whether they would be willing to be organ donors. However, the independent variable was the default option. The first was the opt-in condition in which participants were made to assume that they were in a state where the default option was not to be an organ donor. The opt-out condition made the subjects assume that they were in a state where the default option was to be an organ donor. The last was the neutral group who were given no such condition. The results showed a significant influence of the default option: 42% of the opt-in condition subjects, 82% of the opt-out condition, and 79% of the neutral condition had given consent to being registered as an organ donor.

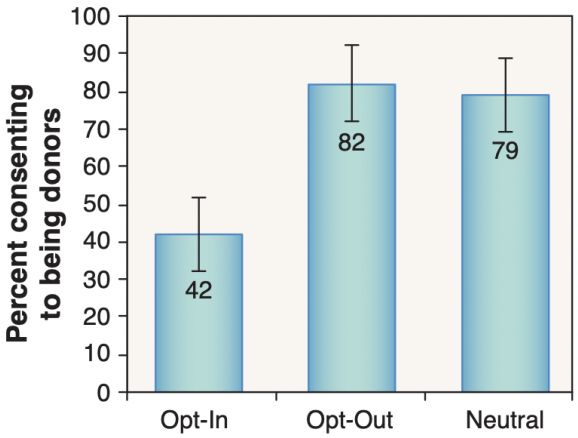

Figure 1: Results of the Default Option Experiment [JG03]

Currently, in most Indian supermarkets, plastic bags are given automatically

to the customers upon purchase. Hence, Indian supermarkets unintentionally exploit cognitive biases in their policies that cause behavioral willingness to promote eco-unfriendly behavior by increasing the consumption of plastic bags. Ohtomo and Hirose (2007) found that the difference between people's intentions of achieving sustainable development and their actual actions, which tend to counter sustainable development goals, is caused by situational factors [OH07]. In this case, the situational factor is the supermarket policy that involves the status-quo bias as it presents the option of using a plastic bag as the default option, similar to the opt-in and opt-out conditions in the organ donor experiment. The policy designed to nullify this effect, and thus, promote eco-friendly behavior, would simply involve using a voice prompt, similar to the one tested by Ohtomo and Ohnuma (2014), to present the customer with a question asking whether they would like to purchase a bag or not and if so, whether they would want a paper one or a plastic one.

In this situation, the customer is prompted to deliberate on their choices and thus apply behavioral intention instead of behavioral willingness to go with the default option. The assumption is that a large segment of the supermarket's consumer base is considerate about the environment which would, in turn, prompt pro-environmental decision making. This policy has already been tested in Japan [OO14], without the option of a paper bag (options only between purchasing a plastic bag or not). The results showed a rough 5% increase in the number of people who declined the bags from roughly 22% to around 27%. Therefore, paired with the option of a paper bag, the number of people that decline plastic bags is very likely to increase. This policy can easily be implemented as it is relatively simple. However, the study in Japan may not yield the same results in India as there is a significant difference in the culture and in the development levels of the two countries.

To further the effect of this policy, however, the supermarket could make paper goods the default option by automatically giving paper bags to customers. This policy would reverse the consumers' anti-environmental behavioral willingness to pro-environmental behavioral willingness. This is likely to achieve better results than the voice prompt as it not only negates the initial effect of the status-quo bias but also reverses it. Moreover, as showcased in the organ donor experiment [JG03], this effect of creating an opposite default creates a greater impact than just removing the default since the difference between the opt-out and neutral conditions was just 3%, however, the difference between the opt-out and opt-in conditions was 40%. In addition, Samuelson and Zeckhauser (1988) explained that "the more options that were included in the choice set, the stronger was the relative bias for the status quo [default option]" [SZ88]. Since this policy uses an opposite default and proposes more options, it is likely to be even more successful than the policy considered in Japan. Lastly, for small purchases, the supermarket may not even need to automatically give a bag since it would be almost equally troublesome to hold a bag as it would be to hold, for example, a bottle of water. By creating a new default, the policy not only reduces the consumption of plastic bags but also that of paper bags as well. Hence, it prevents unnecessary depletion of resources.

5 Availability Bias

An experiment conducted by Tversky and Kahneman (1973) laid the foundation for the availability bias. This bias is defined as "a judgmental heuristic in which a person evaluates the frequency of classes or the probability of events by availability, i.e., by the ease with which relevant instances come to mind." The experiment in which the availability bias was introduced [TK73] used subjects who were read a list of names of 19 famous men and 20 less famous women. They were then read a list of 19 famous women and 20 less famous men. The subjects were later asked whether there were more men or women read out in each list. The results found that subjects reported that there were more men in list 1, and more women in list 2, even though the opposite was true. Presumably, the names of famous people were more easily recalled than those of the non-famous ones, resulting in an overestimate. In fact, the results also showed that subjects were able to recall roughly 50% more famous names than others.

The supermarket policy designed based on this heuristic targets the elderly and middle-aged segment of shoppers. The policy involves printing visual illustrations of babies and children, along with data about the consequences of plastic consumption on the paper bags and cartons. While shopping for large amounts of groceries, shoppers are likely to get tired and hence are more likely to think of comfort and costs rather than impacts on the environment when making decisions. Thus, this is likely to result in unethical decision-making. This is another example of the gap between environmentally friendly behavioral intention, and actual behavior, caused by situational factors [OH07]. However, an effective stimulus may be successful in countering the situational factors that lead to unethical decision-making by reminding the shopper of their behavioral intention.

Nearly 50% of the Indian population is under the age of 21 [MoHA]. Therefore, based on this statistic, on average, an adult in India is very likely to have a child. By printing images pertaining to the shoppers' children's future, associations with their welfare and living standards become available to the shopper. Thus, thinking about their families, shoppers are more likely to make decisions that correspond to sustainable development goals. Hence, they may choose to opt for paper bags and cartons instead of plastic bags. This policy works especially well when combined with the first policy discussed in Section 3 (Endowment Effect) because, if everyone in the supermarket is using paper bags to collect groceries, the distinct messages printed on the paper bags will be ubiquitous in the supermarket. Therefore, the effectiveness of the combination of these two policies would theoretically be proportional to the number of shoppers in the supermarket since this number dictates the prominence of these messages and thus, the probability of the heuristic taking effect.

The downside of this policy is its financial implications. Printing the messages on all paper bags and cartons may be expensive for the supermarket, which will increase the product's cost of purchase. As explained in Section 2, due to its economic and financial issues, most Indian markets tend to have price elastic demand. Thus, this increase in cost may, to some extent, nullify the effect of

the bias since, while shoppers are reminded of their ethical behavioral intention, the price increase may then counter this intention and lead to a reduction in the consumption of paper bags, and an increase in that of plastic bags. On the other hand, this disadvantage may be exaggerated since most retail stores tend to print their logos on their bags for publicity, for relatively cheap prices.

6 Conclusion

Plastic consumption remains a dangerous threat to society. A large portion of this consumption unnecessarily stems from plastic bags as they can easily be substituted. Therefore, measures need to be taken to address this colossal issue for the betterment of future generations. To suppress this problem, this paper designed and explained three potentially influential policies aimed at reducing plastic consumption in supermarkets. These policies were each derived from existing psychological heuristics. The policies either aimed to counter existing eco-unfriendly policies, or to create eco-friendly ones, or to achieve both. The analysis and evaluation of each of these policies led to the discovery of numerous advantages and setbacks of their implementation in the real world.

The first policy, based on the endowment effect, is arguably the most innovative of the three. Although intriguing, this policy seems to have more problems than benefits. Thus, its application may be extremely risky. The second policy, based on the status-quo bias, was relatively less bizarre. A segment of the proposed policy has already been tested in other countries. Hence, the expected results of this policy are more likely to actualize, making it a less risky bet. The last policy, based on the availability bias, is more targeted. The extent to which this policy is effective corresponds to the popularity of the supermarket as well as the financial implications of printing messages on the supermarket's bags, and its economic consequences on the consumers.

The present study has focused on a niche segment of the larger issue of plastic consumption. It has, therefore, only considered three of the innumerable policies that can be designed to facilitate sustainable development. Future research can build on this study via conducting experiments to depict the accuracy of the arguments presented, or by designing and analyzing novel policies.

References

[CR19] Phil Clunies-Ross. Plastics in the environment. July 2019.

[Eara] Down To Earth. Draft plastic waste management rules, 2021: Addressing the bigger problem. www.downtoearth.org.in/blog/waste/draft-plastic-waste-management-rules-2021-addressing-the-bigger-problem-75939. Accessed in September 2021.

[Earb] Down To Earth. Mass poverty is back in india. www.downtoearth.org.in/blog/governance/mass-poverty-is-back-in-india-76348. Accessed in August 2021.

[Eas] Easyleadz. List of top supermarkets in india. www.easyleadz.com/lists/List-of-Supermarkets-in-India. Accessed in August 2021.

[GGBR98] Frederick X. Gibbons, Meg Gerrard, Hart Blanton, and Daniel W. Russell. Reasoned action and social reaction: Willingness and intention as independent predictors of health risk. *Journal of Personality and Social Psychology*, 1998.

[JG03] Eric J. Johnson and Daniel Goldstein. Do defaults save lives? *Science*, 2003.

[KKT90] Daniel Kahnemen, Jack L. Knetsch, and Richard H. Thaler. Experimental tests of the endowment effect and the coase theorem. *Journal of Political Economy*, 1990.

[MoHA] Government of India Ministry of Home Affairs. Age structure and marital status. www.censusindia.gov.in/census_and_you/age_structure_and_marital_status.aspx. Accessed in August 2021.

[OH07] Shoji Ohtomo and Yukio Hirose. The dual-process of reactive and intentional decision-making involved in eco-friendly behavior. *Journal of Environmental Psychology*, 2007.

[OO14] Shoji Ohtomo and Susumu Ohnuma. Psychological interventional approach for reduce resource consumption: Reducing plastic bag usage at supermarkets. *Resources, Conservation and Recycling*, 2014.

[SZ88] William Samuelson and Richard Zeckhauser. Status quo bias in decision making. *Journal of Risk and Uncertainty*, 1988.

[TK73] Amos Tversky and Daniel Kahneman. Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, 1973.

[TWC] Plastic bags used per year. www.theworldcounts.com/challenges/planet-earth/waste/plastic-bags-used-per-year. Accessed in September 2021.