Reducing Plastic Bag Use in Indonesia

by

Roger Spranz

a Thesis submitted in partial fulfillment
of the requirements for the degree of

Doctor of Philosophy
in Economics

ZMT
LEIBNIZ CENTRE
for Tropical Marine Research

JACOBS
UNIVERSITY

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Abstract

How can plastic bag use in Indonesia be reduced? This dissertation attempts to answer this question applying two approaches:

(1) Utilizing qualitative and quantitative research to investigate crucial factors explaining plastic bag use;
(2) Conducting natural field experiments to identify effective behavioral interventions reducing the use of plastic bags in Indonesia.

The pollution of the oceans by plastic waste is a growing threat to marine life, ecosystems, livelihoods of coastal communities and the health of human beings in general. Indonesia is the world's second largest source of marine plastic pollution. Regulations and policies have shown to be effective in the reduction of the use of and pollution by plastic bags in a number of countries. But for the Indonesian Government and many other governments the feasibility of implementing and enforcing such measures is limited. Given this situation, there is an urgent need to investigate and find effective alternative approaches to reduce plastic bag use. Such alternative approaches include non-governmental organizations, environmental groups and social enterprises.

This research aims to explain plastic bag use with the help of research methods from cultural anthropology. Qualitative and quantitative methods were applied along with different types of triangulation to examine people's concepts of nature, the perceived benefits and disadvantages of plastic bag use, and promising local initiatives.

To find effective behavioral interventions for reducing plastic bag use we conducted natural field experiments. These tested normative and economic interventions in combination with ecofriendly reusable shopping bags. Specific interventions ranged from social norms and different societal authorities to indirect monetary incentives and bonus schemes. In this context we also analyzed socio-economic factors and environmental awareness in relation to frequency of plastic bag use.

The results of this research offer explanations for plastic bag use and we identify a number of specific implications ending with recommendations for behavioral interventions. By scrutinizing interventions from past studies in the context of this research along with the analysis of the effectiveness of slightly modified or new interventions we aim to contribute to the growing body of empirical evidence in the field of pro-environmental behavior. We encourage future research on the interventions we investigated, in regard to the replicability of our results in a similar setting, but also in other target groups and targeted behavior.

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1. General Introduction

1.1 Aim and Relevance of Research

The goal of this PhD research has been to address an urgent environmental problem in the marine realm. From our professional experience, we have developed a strong conviction about the value of combining qualitative and quantitative methods of Cultural Anthropology with Behavioral Economics' method of natural field experiments. In terms of broader research concepts, we used an *empirically-based characterization of a phenomenon* and followed up with a *demonstration of a concept* or *implementation of theoretical principles*.

As a research location, we decided for Indonesia. First, because Indonesia is facing several pressing environmental and marine challenges and corresponds with the mission of our academic institutions background (Leibniz Centre for Tropical Marine Research). Second, due to our regional knowledge based on previous studies and field research in the region along with the relevant language skills. Third, during our first field trip we looked for a collaboration partner that fulfilled the complex requirements to conduct field experiments. Among these requirements are access to skilled research assistants, good local knowledge, networks and a variety of logistic capacities. We eventually decided for ecoBali, a local social enterprise active across Bali in the fields of waste management and recycling, environmental education and providing solutions to reduce waste. Together we identified a pressing environmental issue to the local environment and to oceans worldwide: the pollution by plastic bags.

Plastic bags make up 9.4% of the world's coastal litter. More than a million birds, marine mammals and turtles die from ingesting plastics each year (Jeftic et al. 2009). Jambeck et al. (2015) estimate the annual plastic debris that entered the oceans worldwide in 2010 was in between 4.8 and 12.7 million tons and that the cumulative amount ending up in the oceans by 2025 is going to be 225 million tons. Indonesia is the second largest contributor to marine plastic waste.

It takes around 80 million years for oil to form. It takes a lot of energy to transform oil into plastic bags. Plastic bags are often used for minutes, not even an hour. Then, huge amounts of

plastic bags end up in the natural environment where it takes again hundreds of years for the plastic material to dissolve. In the meantime, plastic waste endangers the health of humanity and the ecosystem. Unlike many other challenging environmental problems, in this case alternatives - such as reusable shopping bags - are available. What is it that we can contribute from a cultural anthropology and environmental behavior perspective to help reduce plastic bag use in Indonesia?

1.2 Research Approach

This dissertation is based on two different but complimentary approaches aimed at exploring how Indonesian plastic bag consumption can be reduced. The first approach aims at a better understanding of people's shopping-bag choice. The kind of scientific endeavor is an *empirically-based characterization of a phenomenon*. As environmental values in other parts of the world have shown to influence people's consumption choices it was considered promising to understand how environmentally relevant values shape people's attitudes and behavior in Indonesia. Which are the decisive factors explaining the choice of plastic bags for most people? To ensure capturing the most significant factors I used a combination of the explorative and conceptual strength of qualitative methods, and quantitative methods. In particular, these were used to analyze the relative dominance of factors relevant to people's shopping bag choice, their perception of the natural environment and its problems. Eventually I explored actual and potential efforts to reduce plastic bag use in Bali.

The second approach is an evaluation of pro-environmental behavior interventions aimed at people adopting the use of reusable shopping bags. This type of scientific work can be characterized as a *demonstration of a concept* or *implementation of theoretical principles.* I wanted to find out to what degree concepts and theories from behavioral economics and environmental psychology are applicable interventions that could effectively move people from plastic bag use towards the use of reusable shopping bags. To test different interventions we conducted two natural field experiments. In the first experiment (Chapter 3), we targeted shop owners as facilitators for selling reusable shopping bags and encouraging customers to use less plastic bags. As behavioral interventions, we chose *Social Norms*, *Indirect Monetary Incentives* and *Authority Instruction* with the aim of finding the most effective one for distributing reusable bags. In the second experiment (Chapter 4), we focused on shop customers. We tested a set of economic and normative interventions to find the most effective

tool to reduce plastic bag use. The economic interventions we tested are distributing reusable shopping bags for *Free*, along a *PWYW* (Pay-What-You-Want)-scheme, sold at *Cost* price, or according to a *Bonus* scheme. The normative interventions in terms of societal authorities are in the form of printed and signed quotes on the reusable bags we distributed. As the three societal authorities we selected for a comparative analysis are the director of an *Environmental NGO*, the director of a C*ommercial Brand* and a Hindu Priest as *Religious Authority*.

Behavioral interventions are promising and suitable approaches especially for developing countries. There has been extensive research on environmental policies. In many countries, such policies have been implemented successfully, also in the field of plastic bags. Either people have to pay fees for receiving plastic bags, or as in some states plastic bags are prohibited by bans. However, these policies require an effective legal system and especially reliable law enforcement. According to Transparency International (2013), comparing countries' performance in this sector across the globe, Indonesia ranges in the bottom half. There is no doubt about the importance of continuously putting effort into improving this situation. In the meantime, the urgent environmental situation requires a search for other promising opportunities to attain behavioral change. Knowing about the most effective behavioral interventions that are not primarily relying on governmental institutions using laws and regulations is important. These interventions can be organized and implemented by non-governmental organizations, social businesses or environmental groups, and are therefore a valuable contribution our research aims to provide. Furthermore, we hope to add insights, beyond the topic of reducing plastic bag use, from the natural field experiments. These would be in the area of inspiring behavioral intervention tools for supporting pro-environmental behavior in other contexts.

1.3 Research Methods and Process

1.3.1 Cultural Anthropology

If one seeks a better understanding of people's plastic bags use, the complexity of the phenomena requires an approach that uses multiple perspectives and multiple methods. Despite the valuable contributions from other disciplines, such as economics, politics, sociology or psychology, the holistic approach offered by the methods of cultural anthropology help researchers grasp the bigger picture. In order to characterize the "plastic

bag use – phenomena" empirically, the explorative strength of cultural anthropology's key methods, such as participant observation, informal talks and semi-structured interviews, ensures that important factors and concepts are not omitted. A weakness of many studies is the blind spot of a phenomenon which will not be addressed by many of the rather specific research methods (e.g. surveys without categories for open questions) because the research design and potential questions are being created with knowledge limited to what is already known about the research topic. It is an important quality of the anthropological methods to look and consider matters beyond the often narrow borders of discipline specific topics and theories, and beyond the general scope of what is known about the phenomenon. (Cf. Reiter 2013)

During several extensive research stays in between 2013 and 2015 I used participant observation in many different settings. One of the first and continuous situations had been grocery shopping. Whether in small local shops, so-called *warungs*, at traditional markets, but also in large national and international supermarkets, I could observe whether customers used plastic bags, how goods were packaged, whether customers had to ask for it, and whether people did not use plastic bags. Fulfilling my own shopping needs and attempts to shop plastic bag free often required an active refusal and rejection of putting my groceries in plastic bags. Sometimes I was asked why I do not want plastic bags; other times I asked the shop owner or employee why they think I do not want a plastic bag. These situations gave me plenty of insights into the every-day shopping habits, how plastic bags are used, and how they were perceived. Do environmental considerations play any role?

The central reasons for people, governments and businesses to move away from using plastic bags are based on environmental concerns. This is why I wanted to learn more about people's perceptions of nature and the environment, as well as the underlying concepts. I collected data mainly with the help of semi-structured and expert interviews, some with photo-based interviews and group discussions. All together I talked to around 80 informants. Across different ages and gender, I interviewed shop-customers, -employees, -owners, business owners, schools and university students, farmers, vendors of food and drinks on the beaches and streets, teachers, an office manager and a business manager, environmental activists, a university lecturer, a Hindu priest, and others. I frequently applied different triangulation methods by switching the role of the interviewer to assistants with different backgrounds of

age, gender and nationality. This allowed me to alter the influence of the interviewer on responses and thereby increase the potential variety of perspectives and perceptions.

With the same approach capturing the variety of perceptions and conceptualizations of the environment, I looked at the plastic bag use itself. With the help of Indonesian student assistants, we further conducted a quantitative survey with 60 more people. Among other questions, a major part revolved around the benefits and disadvantages of plastic bag use. Despite not being able to fulfill criteria for generalizations, the survey allows a better assessment of the importance of different answers by knowing which ideas and opinions more or fewer people shared.

Not long after I started my field research I came across different environmental initiatives one of which became a central topic of interest for the following years of my research. An initiative led by schoolchildren to ban plastic bags on Bali. What is the background of the initiative, what is their approach and how effective is it? Based on these questions I joined their first meetings and continued my participant observation until the end of my research phase. My role in the initiative was often a silent observer, but because they knew about my background and research interest, I was often asked for my opinion during discussions, such as ideas on how to solve challenges they were facing, and sometimes I actively participated in topics they discussed. I presented preliminary results of my research and during a larger conference organized by the initiative and I co-moderated a workshop with government officials. Participating in the meetings and events beyond a silent observer allowed me, not only get access to a larger network and variety of people and perspectives, but I could also bring back some of the concepts into discussion and present ideas based on the research so far. It also enabled me to use the feedback in my iterative research process of finding categories and concepts to my research questions. This process is an integral part of the *Grounded Theory* by Glaser and Strauss (1967), which I chose as the central instrument to analyze and interpret the data collected.

Once the categories and concepts emerged from applying *Grounded Theory*, I contextualized the findings by means of *thick description* (Geertz 1973). By including details and context about the data collected, I hope to increase the transparency and understanding to the reader, and at the same time the validity of my interpretations (cf. Lincoln and Guba 1985).

1.3.2 Natural Field Experiments

Aside from the qualitative research that allowed me to explore in detail and context the use of plastic bags in Bali, I aimed to test promising behavioral interventions based on previous empirical studies and theoretical considerations. To scrutinize the effectiveness of interventions in a specific and realistic setting, natural field experiments are a powerful empirical method. In comparison to lab experiments, data in natural field experiments is collected not in a lab but in the field, where the behavior occurs, and with subjects not knowing that they are part of it: "Such an exercise represents an approach that combines the most attractive elements of the laboratory and naturally occurring data – randomization and realism" (List 2008). In contrast to field experiments, which analyses naturally occurring behavior, in natural field experiments (also referred to as framed field experiment) the researcher has the possibility to target the specific behavior of interest by framing the setting. (List 2008)

We chose to create the realistic setting of a local environmental organization implementing a reusable bag program, which is a common activity by NGOs, social enterprises or governmental institutions. We did so by working together with local social enterprise ecoBali. Together we selected, developed and implemented the specific interventions.

Economic and normative interventions were chosen based on previous empirical studies and theoretical considerations that include the weighing of costs and benefits informing a reasoned choice as one of the most widely and successfully used concepts to explain behavior. Although monetary or material concerns can be part of the cost-benefit consideration, it is not restricted to a narrow economic perspective. Costs and benefits also need to be seen against the background of effort and social approval (Steg and Vlek 2009). In other words, behavior is influenced by an individual's evaluation of positive versus negative expected consequences: the subjective expected utility. Economic and normative interventions can alter the subjective expected utility. Another important consideration in selecting and developing the interventions were the cultural qualities of the Indonesian and Balinese context. Especially normative interventions need to recognize and adapt to local culture in which the behavior is embedded.

A major challenge in natural field experiments is measuring the output variable of interest. Depending on the respective output variable, behavior can be measured more directly than in

surveys. Surveys reporting about behavior can be biased compared to direct observation or measuring of behavior. Due to this methodological advantage we looked into possibilities to measure a potentially important output variable in our studies: the use of the reusable bags, which we distributed to the customers. The idea we developed was based on RFID (Radio-frequency identification). The technology is most known by tags often found attached to e.g. clothing in stores to prevent theft, when passing a RFID reader at the exit of the shop, setting off an alarm if not removed. Another frequent use of RFID technology is in large inventory systems, tracking the flow of goods in and out of stock. RFID tags can contain individual ID codes, which are scanned when remotely passing a RFID reader device. We planned to attach individual RFID tags to each bag distributed, matched with an anonymized customer number that would allow us to relate the customer and bag to the specific interventions and surveys. A RFID reader was to be installed at the local shop where the bags have been distributed. This would allow us to see how often customers used their reusable bag when shopping at the local store.

Unfortunately, we could not successfully apply the approach. In particular, problems arose from power cuts at several shops that caused irregularities with recording the data. Furthermore, we could see from preliminary data that the reading frequency of several RFID readers slowed down significantly over time, potentially causing to miss reporting about reusable bags brought and used in the store for shopping. Both factors significantly affected the reliability and validity of data recorded. We continued to focus our data collection on reported plastic bag use, data we obtained from customers through surveys at the end of the intervention period. We further want to emphasize the importance on consulting an ethical committee when conducting natural field experiments. It is often essential in behavioral experiments to avoid communicating with the participants before and during data collection about certain aspects that are affecting the framing and therefore targeted external validity of results. We therefore made sure that our experimental design was carefully assessed and received approval from the ethics committee of University of Innsbruck. We believe that there is an opportunity in future research to use RFID technology in behavioral experiments, and we want to encourage scholars to develop such approaches to a stage in which reliable and accurate data on observed behavior can be produced.

1.4 Summary

The first contribution (Chapter 2) based on a cultural anthropological approach "The Plastic Bag Habit on Bali: From Banana Leaf Wrappings to Reusable Bags." investigated the topic by exploring the different concepts of nature in the perceptions of local Balinese. Second, the reasons for the widespread and high use of plastic bags along with its disadvantages were questioned. In the third part the focus is on the analysis of a local youth initiative, which is working towards a plastic bag free Bali.

Analyzing the data collected throughout two years, a number of different conceptualizations of the natural environment by Balinese people have come to the fore. The labels were given to the categories corresponding to the different social institutions and spheres they originated from. They are summed up as follows: *History* – for concepts with a strong emphasis on past understandings and practices. *Education* – which describes perceptions mainly formed through the formal educational system, often similar to "Western" environmental views. *Religion* - for the religious system of beliefs giving meaning and explanations in regard to nature, in many cases facilitated by attributing human like qualities to natural phenomena. In different ways, "Western" environmental concepts are increasingly part of understanding nature, but they rarely directly compete against other concepts. Instead, they are often comprehended in a parallel or complementary way.

The aim to understand the widespread and high use of plastic bags is rooted in the rather "Western" environmental viewpoint of seeing it as a problem. This directly leads to an important finding. For a number of reasons – many of them become apparent in Balinese people's concepts of nature – plastic bags are in large parts not perceived as problematic. Traditional practices of burning waste or disposing it in rivers used to be a well-adapted solution to manage waste. Until few decades ago, all waste was organic and burning it served to fertilize the soil, avoid hygienic problems, regain space and after all was also convenient and easy.

Most pollution concepts inherent to "Western" views are difficult to directly observe: Toxins from burning plastic bags, negative health effects to fish and human health via micro plastic particles in the sea. This difficulty of directly experiencing "Western" ideas of pollution may help to understand why the most frequently expressed concern in regard to plastic bags is in the context of flooding caused by plastic bags' clogging of waterways. People experience and

can visually see the consequences. Along with this rather technical observation, natural disasters and phenomena are often perceived by a certain behavior or reaction of nature in the context of religious beliefs. Like human beings, *Ibu Pertiwi* (*Mother Earth*) can get hurt and react angry. However, in most interpretations the reasons for *Ibu Pertiwi's* "behaviour" are less originating from ecological considerations but mainly political and moral failures. Despite relating some negative effects to plastic bags, I found that most Balinese value several positive features of plastic bags. Plastic Bags are perceived as cheap, convenient and with a sense of modernity.

The local youth initiative Bye Bye Plastic Bags has shown a promising approach by attaining large media attention through public talks, from presentation in schools and communities, to conferences and coverage by global media outlets. Along with other activities on a grassroots level, their campaigning approach paved the way to meet with the governor of Bali. During their meeting the governor committed to a plastic bag free Bali by 2018. Despite this not being a legally binding regulation, the government is more responsive to the topic. This also shows the introduction of a pilot project in selected cities and retail partners to charge a fee on plastic bags across Indonesia.

In Chapter 3, I present our research targeting shop owners distributing reusable bags. Shop owners can act as valuable multipliers increasing outreach to spread pro-environmental behavior among customers. We selected and tested *Social Norms*, *Indirect Monetary Incentives* and *Authority Instruction* to find the most effective intervention for shop owner to sell environmentally friendly reusable bags at a subsidized price. Sixty shop owners agreed to participate in the project.

We found that shop owners in the intervention group *Authority Endorsement* significantly increased the sale of bags compared to the other two intervention groups. Part of this treatment was the endorsement by the local village head to the shop owner to sell the reusable bags. Referring to local social norms protecting the environment in treatment *Social Norms* was less effective, and so was explaining to the shop owner the financial advantage of selling bags - *Indirect Monetary Incentive*.

Beyond the analysis of the interventions we found evidence that wealthier shop-owners sold more reusable bags. The data further showed that shop owners reporting higher priorities of

religious values and completing higher levels of formal education were not only more likely to agree to participation in the project, but also sold more reusable bags.

We also collected data on customers' use of reusable bags sold to them, as well as changes in using plastic bags. Relying on reported behavior by the shop owners, customers who bought a reusable bag, frequently came back using the bag with half of them also reducing their plastic bag use. This finding was confirmed across all three interventions. For customers exposed to our informational poster, but not purchasing a reusable bag, no reduction of plastic bag use was reported.

In our natural field experiment testing *Economic* and *Normative Interventions* to reduce plastic bag use (Chapter 4), a total of 580 customers participated across 20 local villages of Gianyar district in Bali. All participating customers were part of an *Economic* and a *Normative Intervention* or the baseline survey group.

We found evidence suggesting that participants in the *Bonus* treatment – receiving a reusable bag for free and a monetary reward after frequent use in the following weeks – report a significantly lower plastic bag use than customers in the other *Economic Interventions* and the baseline survey group. Customers paying a voluntary amount to receive a reusable bag (*PWYW*) and those paying a fixed low price (*Cost*) are associated with using less plastic bags than customers in the baseline survey. However, there is surprising evidence suggesting that customers who received a reusable bag for free and without a bonus (*Free*), are reporting no reduction in plastic bag use compared to the baseline survey group.

In the *Normative Interventions* we tested the influence of societal authorities – by including a message printed on the reusable bags discouraging people from polluting the environment through plastic bag use. Appended to this message on the bag was an additional print indicating who the message was from: a local *Religious Authority*, a popular *Commercial Brand* or an *Environmental NGO*. We also included a *Plain Bag* without any print. The analysis supports our hypothesis that customers in the societal authorities' intervention groups reported less plastic bag use than customers in the baseline survey. However, controlling for several socio-economic variables, results show a high effectiveness towards reduced plastic bag use only for customers who received a bag signed by the local *Religious Authority*. Furthermore, customers in the *Plain Bag* intervention group did not as expected use more

plastic bags than customers that were part of the interventions by societal authorities. In line with our hypothesis, *Plain Bag* customers nevertheless used less plastic bags than those part of the baseline survey.

We also scrutinized the effect of socio-economic variables on reported plastic bag use. We did not find evidence that *Age*, *Gender* or *Economic Assets* significantly affects the use of plastic bags. For higher educated customers we found a lower use of plastic bags. In addition, more environmentally aware customers reported to use less plastic bags.

In the last part of our study, we analyzed correlations for the *General Environmental Awareness* variable across the interventions and socio-economic variables. In respect to the experiment's interventions, we only found a higher *General Environmental Awareness* correlating with customers in *Bonus*, which is likely to be the result of the *Bonus* intervention. We also found significant correlations of environmental awareness with *Education* and *Economic Assets*.

1.5 Concluding Remarks and Policy Implications

A major factor explaining plastic bag use in Indonesia is the popularity of single-use plastic bags. Customers value not only the convenient, practical and economic qualities in bringing home their groceries, but plastic bags represent a more modern and therefore desirable feature of everyday life. Despite still far from disappearing, traditional ways to carry and package groceries, such as baskets and leaves, are losing its appeal. When testing different kinds of reusable bags for our natural field experiments, we also had to change our previous plan to use canvas bags and instead use less environmentally friendly spunbond shopping bags. Canvas bags were seen as too valuable for the daily grocery shopping. From these insights, we learn that an alternative to plastic bags, which is crucial to facilitate a behavioral change, needs to consider being convenient, economical, modern and at the same time not too valuable as a tool for daily shopping.

Beyond these technical requirements for alternatives, there a number of lessons learnt from behavioral interventions applicable by government institutions, environmental NGOs and groups or social enterprises. Based on our findings, the distribution of free reusable bags is not effective in reducing reported plastic bag use. Offering reusable bags for a voluntary price

or low cost price, however, suggest a reduction in use of plastic bags. Even more effective is the tested bonus scheme rewarding the frequent use of reusable bags distributed. For practitioners it is important to have a look at the cost effectiveness of reusable bag distribution options in terms of the *economic interventions* in our study. Costs are higher for interventions *Free* and *Bonus*, since no money is charged, and in case of *Bonus* there are additional monetary rewards paid out. Along with higher costs, the lacking effectiveness in reducing plastic bag use, distributing reusable bags for free puts it as the least favorable option. *Bonus* is most costly, but also associated with being the most effective intervention to reduce plastic bag use, while *Cost* and *PWYW* are less costly but also less effective. Whether the cost-effectiveness of *Bonus* is to favor over *Cost* and *PWYW* will need to be assessed for the specific cost structure of actors implementing the schemes.

An additional finding in regard to *economic interventions* from the other natural field experiment of our study is that the *Indirect Monetary Incentive* – explaining the potential of saving money on distributing free plastic bags – did not significantly encourage shop owners to sell more reusable bags. In this experiment, we also find further evidence that offering of cost priced reusable bags by shop owners did reduce plastic bag use. We can therefore recommend the distribution of cost priced reusable bags, whether by actors in the environmental field or shop owners themselves.

Our studies also show valuable benefits to reduce plastic bag use through *normative interventions* using endorsements by *societal authorities*. The local village heads endorsing shop owners to sell more reusable bags significantly improved their sales of reusable bags, which then again reduced plastic bag use as reported by shop owners. An environmental message encouraging to not hurt "mother earth" printed along with the name of a local religious authority also showed a significant reduction in plastic bag use reported by customers. In conclusion, it seems to be worthwhile for environmental actors to team up with trusted local authorities to promote pro-environmental behavior as in our case the reduction of plastic bag use.

The important role of religion in many Indonesians' normative considerations is not only relevant in regard to authorities. We also found that more religious shop owners were more likely to participate and sell reusable bags. The analysis of further socio-economic variables showed that more educated shop owners had higher participation rates in the project and also

sold more reusable bags, so did wealthier shop owners. Environmental actors targeting these characteristics in shop owners can therefore increase the effectiveness of similar interventions promoting to sell reusable bags. In regard to shop customers, we found that higher education levels were significantly reducing plastic bag use. To target more educated customers and increasing education level in general can thus support a decrease in plastic bag use.

Our research has shown that higher *General Environment Awareness* is significantly reducing reported plastic bag use implying that policies and campaigns raising environmental awareness are effective tools. Our data also supports evidence that improving education levels and raising economic status of customers positively affects *General Environmental Awareness* and as indirect policy measures also support a reduction in use of plastic bags.

The qualitative part of my research has pointed out that pollution by waste such as plastic bags is not widely perceived as problematic among many people in Bali. Efforts to raise awareness on negative aspects of plastic pollution need to recognize the specific environmental concepts prevailing in the views of Balinese. Among a variety of different conceptualizations, Balinese have explained to me the environment as *Ibu Pertiwi* (*Mother Earth*) who can suffer from immoral behavior by humans. It seems promising to build on existing problematizations for the design of successful environmental campaigns. The most common concern in regard to plastic bags among Indonesians – flooding causing plastic bags to clog waterways – can link to the existing discourses and therefore provides a promising connecting point as part of increasing plastic bag pollution awareness.

Behavioral interventions are a valuable tool available to environmental actors especially in the absence of effective governmental policies. However, actors aiming towards reducing plastic bag pollution can support the process of governments implementing policies, such as bans, fees or taxes on plastic bags, which have proven to be effective in a number of cities, districts and countries across the globe. My analysis of the social initiative Bye Bye Plastic Bags showed how the young environmental activists – with the help of grassroots community work, public talks and media campaigning – have initiated steps by the Balinese government to aim at reducing plastic bag pollution, and as part of a wider national effort piloting fees on plastic bags in selected regions.

The results of the research need to be considered against the following limitations. By following the principles of triangulation (Denzin 1977) and e.g. including a number of different – also local – interviewers in the field I was able to reduce the interviewer bias in the qualitative parts of the research. Conclusions from the quantitative results of the anthropological research, however, need to be carefully interpreted, since the sample size was relatively small. Despite our effort towards measuring the output variable as observed behavior of using the distributed reusable bag in our natural field experiment, technical difficulties caused us to use reported weekly plastic bag use as our main output variable. Reported behavior can be biased especially when the question is identified by the informant as desirable or less desirable behavior. That plastic bag use is an undesired behavior could have been understood by the informants participating in our interventions being exposed to information on negative impact of plastic bag pollution. This bias could vary according to the specific type of intervention and therefore weaken over- or underreport plastic bag use in relation to the interventions.

Another limitation arises from participation in the *economic interventions* which included the distribution of bags via *Bonus*, *Free*, *PWYW* and *Cost* interventions. Customers knew in which treatment group they were going to be, before they decided to participate. This could not be avoided in the experimental design. Participation is therefore possibly influenced by the type of the intervention which can cause a biased self-selection into the specific treatment group. Difference in reported plastic bag use may hence result from differences in participants, rather than the interventions themselves. However, the high participation rate along with strongest reduction in plastic bag use suggests that Bonus is most effective.

As with other experimental studies in specific regional contexts, future research needs to show whether results can be replicated beyond the southern districts of Bali, where the research has been conducted. Whether results apply to other areas of Indonesia or the Asian region remains to be addressed by respective studies. Especially the difference in religion, Bali is predominantly Hindu, while most parts of Indonesia are predominantly Muslim, could alter results for *Religious Authority* interventions. The important role of religion across Indonesia suggests nevertheless that similar results can be expected.

It is important to stress that there is potentially a considerable variation in the specific design of an intervention category that can affect the effectiveness of an intervention as well: Reward

payments, such as in Bonus, could be much higher, but also lower. The environmental information shared with customers or shop owners can be phrased in many different ways. The specific quote on a bag or its design may affect sales of reusable bags by shop owners. When labels for interventions are the same, e.g. Bonus, Cost, Indirect Monetary Incentive, it is crucial for comparing results that the design of the category of interventions is the same, or at least reduced to a minimum in variation.

The work presented in my dissertation approaches the topic of "Reducing plastic bag pollution in Indonesia" with different methods and focus on different approaches, from technical, to behavioral to policy aspects. In this respect, it represents the variety of actors and efforts necessary to effectively reduce plastic bag pollution in Indonesia. I hope the conducted studies can support efforts to reduce plastic bag use and inspire further research, also on supporting other pro-environmental behavior.

References

Denzin, Norman K. 1977. *The research act. A theoretically introduction to sociological methods.* New York; Düsseldorf: McGraw-Hill.

Geertz, Clifford. 1973. *The interpretation of cultures: Selected essays.* New York: Basic Books.

Glaser, Barney, and Anselm Strauss. 1967. "The discovery of grounded theory. 1967." *Weidenfield & Nicolson, London*.

Jambeck, J. R., R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan, and K. L. Law. 2015. "Plastic waste inputs from land into the ocean." *Science* 347 (6223): 768–71.

Jeftic, L., Seba B. Sheavly, Ellik Adler, and Nikki Meith. 2009. *Marine litter: A global challenge.* Nairobi, Kenya: Regional Seas, United Nations Environment Programme.

Lincoln, Yvonna S., and Egon G. Guba. 1985. *Naturalistic inquiry.* Beverly Hills, California: Sage Publications.

List, John. 2008. "Introduction to field experiments in economics with applications to the economics of charity." *Experimental Economics* 11 (3): 203–12. http://EconPapers.repec.org/RePEc:kap:expeco:v:11:y:2008:i:3:p:203-212.

Reiter, Bernd. 2013. *The dialectics of citizenship: Exploring privilege, exclusion, and racialization.* East Lansing: Michigan State University Press. Paper 1 - Chapter 1.

Steg, Linda, and Charles Vlek. 2009. "Encouraging pro-environmental behaviour: An integrative review and research agenda." *Journal of Environmental Psychology* 29 (3): 309–17.

Transparency International. 2010. "Indonesia." http://www.transparency.org/country#IDN.

2. The Plastic Bag Habit on Bali: From Banana Leaf Wrappings to Reusable Bags

Abstract: The amount of plastic bags distributed and disposed on Bali each day is extraordinary. The pollution of the environment in Indonesia is an increasing threat to the health of its people, ecosystem and surrounding oceans. In this study I explore the reasons for the high consumption and pollution by plastic bags and locally adapted solutions. The data was collected from interviews and surveys with shop owners and customers, religious leaders, students, lecturers and activists during the past three years of research in the region. The analysis is structured in three parts: first, understanding the relevant concepts that inform people's perception of the natural environment on Bali; second, analysing the popularity and aversions among local Balinese in regard to plastic bags; third, investigating a local initiative working towards a ban of plastic bags. Based on these three parts I identified promising approaches that can effectively support local initiatives and awareness campaigns.

Keywords: Environmental Anthropology, Indonesia, Plastic Bags, Pollution, Bali

2.1 Introduction

Plastic bags make up 9.4% of the world's coastal litter. More than a million birds, marine mammals and turtles die from ingesting plastics each year (Jeftic et al. 2009). Indonesia is the second largest source of plastic marine pollution (Jambeck et al. 2015). There is a growing number of studies suggesting that plastic particles taken up by marine life (Desforges, Galbraith and Ross 2015) causes adverse health effects in a number of creatures ranging from nano-organisms to whales to human beings (cf. Andrady 2001, Thompson et al. 2009). Most of the Balinese people that have contributed to this research have little knowledge of this. Their understanding of nature and potential damage to it is largely based on concepts and perceptions that are different. The variety and differences are examined in this study.

The approach of the study at hand is similar to other recent studies contributing to the growing field of environmental anthropology. Sponsel (2007) notes how these new studies extend the former focus of ecological anthropology from local to now global considerations. Whether identity related factors for example in connection to the increasing role of transnational media or migration, or whether aspects of natural phenomena, such as climate

change, the relation of humans with their natural environment can better be understood by looking beyond a narrow local and a more holistic approach. The pollution of the seas by plastic bags is a phenomenon that cannot be understood without its local and global dimensions. The fact that Balinese use plastic bags is a direct result from its global connectedness. Whether the use, disposal and pollution by plastic bags are perceived as a problem depends on local and global discourses and the identities and the interpretation of their specific components.

Considering this, it is useful to examine the so called 'Western' and 'Non-Western' concepts of nature to better appreciate an important difference in understanding the natural environment. Despite its strong oversimplification and potential for misleading geographically (cf. Dove et al. 2003), these two distinctive concepts help to understand the construction of perception to analyse in this study: The 'Non-Western' Balinese understanding of the environment and the 'Western' concept of nature; the latter which is likely to be the dominant source of comprehending the environment for the readers of this article. The 'Western' concept sees nature as the antithesis of culture, nature vs. man, the material as opposed to spiritual (cf. Hviding 2003). Nature in the 'West' is hence largely understood as an autonomous category with its own set of rules. This is in contrast to the 'Non-Western' conceptualizations of the environment in which culture and nature are not separate units. In the Asian context one can see it as a kind of moral unity of human and nature (Bruun and Kalland 1995). The anthropomorphisation of natural objects and phenomena are an expression of this idea. Nature becomes more understandable, accessible and manageable. Many rituals and offerings can be seen as such interactions with the aim to influence proceedings in the environmental realm. In this study we will learn how the anthropomorphisation and interconnectedness of nature with other spheres in life, such as religion, helps us to understand the meaning and perceptions of nature as it presents itself to many Balinese.

A central aspect in 'Western' separation of human and environment is the elevation of humans to control and manipulate the environment. It is often that this kind of manipulation has led to environmental destruction. For example Ramseyer, Tisna and Surya (2001) perceive that the rise of materialism and consumerism induced from abroad serves as a vehicle for attitudes favouring exploitive behaviour. Materialistic and consumptive values are increasing all over Indonesia (see e.g. Gerke 2001; Spranz, Lenger and Goldschmidt 2012).

Further, they play an important role in the constitution of people's social status and identity (see e.g. Douglas 1976, 1997; Jackson 2005). Since these aspects are at the core of consumption behaviour, and consumption behaviour is linked to all kinds of environmental problems in general, particularly the consumption of plastic bags, I will analyse factors that influence shopping bag choice.

2.2 Method

I have collected the data for this study in between 2013 and 2016 during which I spent most of my time on Bali conducting different research projects. Data was collected using a variety of research methods ranging from qualitative interviews to quantitative surveys. The research consisted of expert interviews, semi-structured interviews, group discussions and informal talks with more than 80 informants. Participant observation was a big part in the research as well. From grocery shopping with and without plastic bags and different everyday life situations that involve interaction with the environment, waste, especially plastic bag waste, I have been able to further approach an emic perspective. I also participated at community gatherings and meetings of local initiatives concerned with reducing plastic bag waste. With the help of research assistants we have been able to conduct surveys with another 60 informants, all of which were owners of little grocery shops.

The data has been analysed using an inductive approach based on principles of the *Grounded Theory* by Glaser and Strauss (1967). An iterative process of data collection, analysis and interpretation was ongoing throughout the two years of the research. As a result of this different categories and concepts have emerged and been constructed from this process. These categories and concepts represent hybrid points of where the 'Western' and 'Balinese' concepts meet. They are intended to serve as translational bridges. It is expected that the readers perspectives are mainly rooted in Western concepts therefore the headings in this section are on rather 'Western' categories while the emic perspective emerges within, across and in between these concepts.

The article aims to contextualize the research by means of thick description (Geertz 1973) using categories and concepts of environmental knowledge, attitudes and behavior as well as the motivations and adversities for plastic bag use. To describe details about the data

collected, I hope to increase the understanding and at the same time validity of my interpretations (cf. Lincoln and Guba 1985).

2.3 Local Environmental Knowledge in Bali

In this section I present the views of nature by Balinese people in different categories: History, Education and Religion. I developed and employed these categories by departing from familiar 'Western' categories, which also represent the starting points of questions I often asked in interviews and informal conversations. Within, across and in between those categories 'Non-Western' concepts of nature come to the front. However, we will learn that 'Western' and 'Balinese' concepts are not mutually exclusive and people may interconnect or constitute them in parallel ways.

2.3.1 History

Less than half a century ago environmental pollution by waste was not a problem on and around the island of Bali. Buying food at the market, taking it home or to work had been done using sustainable practices. As found in several talks with Balinese - but also are still often seen - baskets carried on top of the head have served to carry larger amounts of shopping goods for a long time. These are fine for carrying unprocessed fresh vegetables or fruits. In the case of meat, fish or processed food (Tofu, Tempe[1] etc.), they were first wrapped in coconut or banana leaves. As plates a coconut shell or wooden plate worked well. This practice has existed for many centuries, 'before the era of plastic began in Bali' (Hindu Priest).

To the Balinese Hindu the daily offerings prepared and placed to the different manifestations of God appear as important as the provision of food to themselves. This together with around 50 more ceremonies throughout the year, requiring even larger amount of offerings, has always produced a substantial amount of abandoned resources. However, the traditional content of offerings, such as flowers, fruits, rice, along with the baskets, disposed banana and coconut leaf wrappings, have been more of a fertilizer than a source of risk for people's health or the ecosystem. 'The offerings used in the ceremony (…) will degrade over time, such as leaves, coconut shell, it can decay so that the old offerings - after the completion of the

[1] Fermented soybean patty

ceremony - are used as organic fertilizer.' (Hindu Priest). To dispose the organic matter into rivers or burn the waste to regain space and also for fertilizing the soil showed to be rather well adapted waste management practices through time.

2.3.2 Education

As with many other areas of life in Bali, there are strong dynamics underlying people's perceptions and concepts of the natural environment. There are some indications that Balinese with higher education and those living in urban areas share views of nature similar to 'Western' concepts. The most significant difference can be seen between generations. However there are no clear cut lines, and younger Balinese very much share traditional 'Non-Western' Balinese concepts of nature and at the same time they refer to 'Western' concepts. This is not surprising acknowledging the increasing exposure of young Balinese to different Western media and many Western tourists coming to their island. But there is another important factor changing the way young Balinese think about environmental issues including eco-systems, pollution, waste, climate change and health: Their education in schools. 'The perspective of environmental education in the curriculum 2013 is packed with the expectations that learners gain awareness and sensitivity, gain a variety of experience and a basic understanding of the environment' (Prihantoro 2015: 83).

Prihantoro (2015) shows the important role of environmental education in Indonesian school curriculum today. I learnt about different environmental initiatives in collaboration with schools. These ranged from education on waste management to holistic social, cultural and environmental approaches as represented by the Adiwiyata Mandala program by the Indonesian Ministry of Environment (cf. KLH 2012). I visited four schools in Bali throughout 2014 and 2015. It was very clear that the students knew about many concepts part of 'Western' environmental discourses. We had discussions on recycling, degradable and non-degradable waste, waste separation, pollution of the sea and climate change. Since the students were part of specific environmental programs, on-site waste separation, as well as composting was part of their daily practices.

The Directorate General of Primary and Secondary Education included environmental education into national curriculum already in 1984 (KLH 2012). Since then the subject has grown to be a more important part of education in Indonesia (cf. Kusmawan et al. 2009). In

interviews and discussions with parents of young Balinese on environmental topics such as pollution by plastic bags and waste separation, the parents often referred to their children and how their children learned about these things in schools. 'Western' concepts of nature and the environment – including the vulnerability of the ecosystem – as taught in Indonesian schools, are of increasing relevance to the way Balinese think about nature, as well as their respective behaviour.

2.3.3 Religion

While around 90% of all Indonesians are Muslims, around 90% of the Balinese are Hindu (BPS 2010). Common to the vast majority of Indonesians is the important role of religion in their lives. Perceptions, understanding and interaction with the natural environment are largely influenced by religious beliefs and practices. Hindu-Dharmaism, the Balinese form of Hinduism, has been explained to me emphasizing different aspects. One is the concept of *Tri Hita Karana*, the harmonic relationship in between God, society and the environment. At different points in my interviews with and talks to Balinese they returned to their God's trinity of Shiva, Brahma and Vishnu as a starting point to clarify to me what (not only) the environment is about.

'So there is like Shiva for wind, Brahma for fire and Vishnu for water […]. When Shiva gets angry there will be a tornado. When Vishnu gets angry there will be a tsunami, and when Brahma gets angry there will be fire, like forest fires, also without people making the fire. It also happens when people destroy the environment, like Lapindo [Indonesian gas company][2]. That's why in Bali there is no drilling. There was a demonstration that, if they need to drill in order to produce electricity, it is better to go back to life without electricity.'

Male Balinese teacher

This quote serves as an example on how the belief of many Balinese Hindus is connected to animistic ideas of nature or rather natural 'elements', which are perceived as emotional beings. The animistic or anthropomorphic quality of nature is a central concept to their understanding of their relationship with the environment and also how to understand it. Natural disasters are angry outbreaks by nature due to misbehaviour on behalf of individuals

[2] He refers to a gas drilling accident in 2006 also known as the Sidoarjo mud flow. After drilling for gas an ongoing mud flow has inundated several nearby villages. Thousands of people had to be permanently evacuated. To this day mud continues to come out of the drilling hole.

or the society at large. 'There is no eruption of volcanoes because we make a ceremony every year' a Balinese woman told me. 'Why is there always water on Bali? Even in dry season? Because we pray at the temples close to the lake.' another young man explained to me. Central to maintaining a healthy and balanced relationship to nature are religious practices such as ceremonies, including offerings and prayers to one of the many manifestations of God. Beyond purely religious activities other behaviour towards the environment can upset its spirits and provoke environmental problems or disasters in return. 'I believe that the problem of dryness is because people are not praying and there is no balance in between construction and trees.' a teacher told me. Several of the people I talked to were worried about a land reclamation project, which is currently planned for the south of Bali. They fear 'the sea will get angry' and strike back with a tsunami. Whether it is drilling for gas, excess construction or land reclamation, many are expecting an environmental crisis as a consequence.

Ibu Pertiwi - which translates to *Mother Earth* - is another central religious and mythological concept showing in Balinese people's perceptions, ideas and actions involving the natural environment. 'Ibu Pertiwi is the entire world. This is Ibu Pertiwi. So don't hurt her.' A male merchant in his late thirties explained. During the socialization of an environmental program in a local community, the village head also referred to the environment by talking about *Ibu Pertiwi*. A locally well-known religious leader emphasized to me 'We really respect the earth. We call her mother, like our mother, *Ibu Pertiwi'*.

So if the earth, with its trees, rivers, lakes and sea is so respected and often seen as holy, from a 'Western' perspective we tend to wonder, how come it is being polluted and littered so badly? Besides the lack of proper waste management services, I believe that the answer to this has to be mainly seen in the perception of many Balinese that polluting and littering is not understood as disrespectful or irreverently behaviour. Again, Balinese frequently view environmental disasters and crisis are not necessarily caused by environmentally adverse behaviour, often it is a general moral misconduct. Views based on 'Western' environmentalist concepts may be on the rise but are rather rare. One of the few people who connected an environmentalist view with a Hindu-Balinese concept of nature was a shop owner who believed that littering may also provoke anger in *Ibu Pertiwi:* 'There are many problems for Ibu Pertiwi.[…] Everybody put some rubbish in the river, everywhere, put it in the ocean, to Ibu Pertiwi. […] So when Ibu Pertiwi gets angry, maybe there will be an earthquake'. What most tourists on the island see as an overwhelming and disturbing problem, when they spot

plastic bags and other waste at the side of the roads, in rivers, on beaches and in the sea, may not irritate Balinese residents in the same way. The waste and littering seems to not interfere with the principles guiding Balinese towards respecting nature as a sacred environment. Another revealing perspective was shared by the Hindu priest I talked to about the problem of plastic bag waste. He explained:

'Actually Balinese Hindu believe that anything that can go to the market and be purchased is considered holy. For example, there are eggs after the ceremony washed and then sold to the market again, to be purchased and considered holy, because they believe in the god of the market, Dewi Melanting. Same with plastic becoming holy, with them not knowing about the plastic and its effects. So their actions do not make them realize that they suffer from their own actions.'

Hindu Priest

As the priest further argued, these beliefs and practices stem from the times when fruits, vegetables and other unprocessed food and spices were traded at the market. All were seen as blessings from nature. The temple next to each local market makes sure everything coming to the market is blessed. What has formerly been the banana or coconut palm leaf, a blessed material from *Ibu Pertiwi*, to carry shopping goods and eventually returned to nature behind the house or in a river, has within a short time switched to being a plastic bag. The way to handle plastic and the way it is culturally seen is very much the same as any other blessed organic material originating from *Mother Earth*.

2.4 Plastic Bag Use

So far we have discussed the concepts shaping Balinese people's understanding and behaviour in relation to the environment. We also know more about what issues are perceived as problematic towards the environment or not, and the cultural reasons for that. As much as the use or non-use of plastic bags needs to be viewed in connection to its negative effects on the environment we also need to go beyond the environmental context. In this section we will explore the reasons for the frequent use of plastic bags by Balinese, and why – in the view of Balinese – plastic bags may not be a good choice.

2.4.1 Reasons for Plastic Bags Use

For several interviews on the advantages and disadvantages of plastic bag use, I instructed university and high school students to ask shoppers about their views. Analysing the data of around 20 interviews showed three major benefits to shoppers: Using plastic bags is practical, easy and cheap. These were the terms the shoppers told us, but they also serve as categories for other advantages people mentioned, the use of plastic bags bring to them. It is 'practical' to shoppers that plastic bags are foldable, hygienic, durable, reusable, multi-functional and water-proof. All of these had been mentioned more than twice to us. Related to the concept of being practical was the reason of being easy to use. 'Easy' was the second most often answer to us and in this category we also find answers that point out that plastic bags are readily available, lightweight and easy to dispose of. Somewhat of a different aspect is being highlighted in answers that state using plastic bags is modern. Using baskets or banana leaf wrappings as in the former days makes people embarrassed. To explain this further, one person gave this example to illustrate: 'When they come to the cities first, they also wear sarong[3]. But when they come a second time, they may start to get embarrassed.' Just as choosing what dress to wear, the shopping bag they use is a fashion and status statement of modernity.

So while some appear to be taking identity and status concerns into account and change towards the new, there are others arguing that using plastic bags has just become their habit: 'It's normal'. In the survey with 60 shop owners, I also included a question of why they use plastic bags. Similar to the data above, almost two thirds argued that plastic bags are the most practical solution to carry shopping home. Due to their different role as shop owner in the shopping process, other motives were added. From shop owners' perspective providing the purchase of the customer directly in a plastic bag is good for the sales – good and cheap customer service. Plastic bags compare to other carrying devices also have the advantage that the purchase can be seen, one shop owner added.

Based on my observations of people's use of plastic bags in everyday life, it shows how widely plastic bags are being used. There are many situations well beyond the grocery shopping. Small plastic bags are being used as food packaging for the popular small crackers which are often produced by home-business and wrapped piece by piece. Parts of the many offerings which are placed at the Hindu temples every day are often wrapped in plastic bags.

[3] traditional lower garment worn by people on Bali and other parts of South-East Asia

Often the big fruit basket offerings are also entirely wrapped in plastic bags. You find plastic bags also along the rice fields attached to poles in order to scare away birds picking the seeds. Shirts and dresses in fashion stores in some cases have each piece hanging sealed in large plastic bags. Something that got my attention during previous visits to Indonesia before: Whether keyboards from computers, frames of TVs, cushions on chairs, entire sofas, and many other objects in Indonesia are sealed into plastic. Among the reasons for that may certainly be the protection against dust and dirt, but in some cases the plastic represents the new, a recent purchase, something beyond the practical, more towards the status partially based on wealth, spending money, partially taking care properly, keeping it clean, being a good household.

2.4.2 Disadvantages of Plastic Bags

Many people enjoy the benefits from using plastic bags, not only in Bali and the rest of Indonesia, but in many other parts of the world. But there are also reasons for avoiding plastic bags. In the 'West' the negative environmental effects from using, producing and disposing or dumping plastic bags has created a critical attitude towards them. Do Balinese share these critical attitudes, and what are reasons to them to avoid plastic bags or choose alternatives?

Asking about disadvantages of plastic bags the most frequent answer we heard was the problem of flooding caused by plastic bags. The ditches and drainages in between roads and houses are often clogged by waste, especially plastic bags. In case of heavy rains, as during rainy season, the clogged waterway in front of your house may result in inundation of your home. Plastic bags causing flooding is therefore among the biggest concerns many Balinese people have with plastic bags. Other negative qualities of the plastic bag use, explained shop owners, are that they are expensive, but as customers ask for them so they need to provide. Almost a quarter of the 60 shop owners surveyed mentioned this. Other comments were that they break easily, get dirty and quickly smell. The problem that plastic bags are contributing to the amount of waste and causing air and soil pollution have nevertheless been mentioned by several people. During a socialization event of a local anti-plastic bag initiative, the village leader pointed out: 'Plastic bags are objects very dangerous for our lives on this earth, for all living creatures. Plastic is one of the most dangerous killers, but we do not realize, we do not know how dangerous plastic is'. And a religious leader I talked to said: 'In the villages they are regretful about the plastic, because the soil is becoming less productive.' These quotes

represent very strong convictions and perspectives. As local leaders they are eloquent and it is noteworthy to find this environmental awareness similar to 'Western' views. But these views are not widely spread. Although many people express concern about the waste problem, insights on the polluting mechanism and risks, such as a potential decrease of soil fertility, are not shared among the majority of people.

It is not a rare exception to find critical – on environmental consideration based – views towards plastic bags. Critical views are often expressed by the younger school and student generation, but this 'Western' perspective is not so widely spread. Far more common is an understanding shared by what may be the majority is that the plastic bags contribute to the flooding problems in different parts of the island when heavy rainfall, together with clogged waterways, results in flooded homes and streets. The flooding issue is rarely part of 'Western' discourses, although there is a case of flash flood in L.A. being caused by clogged plastic bags having been discussed against the background of the plastic bag ban in California (San Jose Mercury News 2016). In India and Bangladesh the infrastructural conditions had caused similar problems to Bali and can be seen to have been the main driving forces there leading to regulations and bans of plastic bags, again due to flooding and subsequent health concerns (Ritch, Brennan and MacLeod 2009; Gupta 2011). Despite the mentioning of negative effects from flooding, I did not come across these arguments as a specific and sole reason for those Balinese explaining their reduction of plastic bags use. Those Balinese who avoid or reduce the plastic bag use argue – if not solely along 'Western' environmental reasons (cf. Cherrier 2006) – at least in combination with those.

2.5 Plastic Bag free

So far we have learned about the 'Western' and 'Balinese' concepts allowing the Balinese to understand and behave in a certain way towards and within the natural environment. After obtaining a better understanding of benefits and disadvantages of plastic bags to the Balinese, we will now turn towards the efforts and achievement of a local initiative to stop the use of plastic bags on Bali.

During the past two years I have been able to join the monthly meetings and participate in a number of activities by the local initiative Bye Bye Plastic Bags (BBPB). I will discuss the approach and results of their campaign in the following to learn more about effective ways of

reducing plastic bag consumptions. What could be learned from BBPB's activities, is it a successful model for replication in other parts of Indonesia or beyond?

Bye Bye Plastic Bags (BBPB) is a local initiative mainly driven by teenagers between 11-17 years of age to make Bali plastic bag free. It was founded by two Indonesian sisters in 2013, their father Indonesian, their mother Dutch. Most of the active members are teenagers from international schools, often with at least one parent being from another country. BBPB's core activity has been the collection of one million signatures – on- and off-line, to hand over to the Governor of Bali in order to ban plastic bags. BBPB have also gained the support of a local village head who offered his village as a pilot village for being plastic bag free. To follow up this opportunity there have been a number of community meetings and village days, during which the teenagers of BBPB have distributed free reusable bags and conducted surveys with shop owners and villagers. Beyond these activities there BBPB has received large attention from local, national and international media. The teenagers have started to visit more and more local Indonesian schools to spread the word and motivate new members to join. BBPB have given presentations at large conferences, as well as at INK talks in India and TED global in London. BBPB is being supported in different ways by the Rotary Club, Jane Goodall foundation and UNORCID, which Secretary General of the UN Ban Ki-moon initiated after a visit to the school of the BBPB founders.

The BBPB initiative is quite unique compared to other more traditional community based approaches and campaigns. As such to what degree can the approach of the BBPB initiative be a model for Bali, Indonesia and other countries? Tangible results are still pending, but the Governor of Bali has committed for 2018 that Bali will become plastic bag free. No legally binding regulation has been signed, but there is little doubt that BBPB's activities and public commitments by the government have been supportive towards reducing plastic bag consumption. There are several difficulties for replicating the approach, the ethnic and culturally differing background of the BBPB members is not 'accessible' to Indonesian children. Whether an initiative of Indonesian children – due to their traditionally more subordinating role in families and society – is possible and how well it will be perceived remains an open question. Mass media and nowadays social media play an increasingly decisive role. At the time this article is being written more than a million viewers have seen the TED talk by BBPB; a result which would not have been possible without sharing the video on social media. The same month the TED talk has been released - February 2016 -

several big supermarket and retail chains across Indonesia, introduced a fee for plastic bags. Among many other very committed groups, e.g. the activists Diet Kantong Plastik from Java, BBPB have surely contributed to this achievement.

2.6 Discussion and Concluding Remarks

This article has analysed the issue of plastic bag pollution on Bali and possible solutions. I approached the phenomena by attempting to understand and explain Balinese people's perceptions and concepts of the environment. Different dimensions of the environment have been presented, as they are being constructed and formed through history, in the educational system and in the religious context. The environment is not perceived to be harmed by the waste management practices of burning and dumping waste as it is a practice that has been done throughout past centuries. What has changed is that plastic bags and other sorts of waste have been added to the picture. However, when it comes to cleaning-up and disposing waste many Balinese perceive a discarded plastic bag just like the traditional banana leaf wrapping that has helped to bring some food home from the market. This view that disposed plastic waste is not problematic to the environment is supported by religious concepts that appreciate all goods –including plastic bags - traded at the market as blessed. Hence the traditional practices continue while the material − from mainly organic to more and more non-organic and plastic − is quickly changing.

When it comes to understanding Balinese people's relationship towards nature, it is important to remember that most have specific religious ideas on 'who' the environment is, and why it 'behaves' in a certain way. This anthropomorphisation of natural objects and phenomena is a concept about the environment widely and firmly held by most Balinese. Very much like other human beings, *Ibu Pertiwi* (*Mother Earth*) can get hurt and react angry, although the reasons to get upset are dominantly political and moral failures. Frequent natural disasters, like tsunamis, earthquakes, floods and volcano eruptions are therefore seen as the angry outbreaks and consequences of the moral misconduct. Environmental wrongs in the 'Western' sense are rarely taken as source of anger for *Ibu Pertiwi*. 'Western' explanations and interpretations are however increasingly added to views of Balinese people. Among younger generations the vulnerability of the ecosystem from a scientific point of view is getting acknowledged more frequently, such as the problematisation of plastic bags and other waste pollution. Nevertheless 'Western' views are hardly dominant and only rarely part of the

discourse. While there is a potential for contradicting local Balinese perspectives, 'Western' aspects are in fact often added, integrated or held in a parallel manner in complementary reference systems for understanding and interpreting the environment. This leads to what Nygren (1999) appropriately describes as 'heterogeneous knowledges'. The variety in hybridizations of environmental concepts in Balinese lives help explain the frequent surprises or seeming contradiction one comes across on the way to a better understanding of local environmental knowledge in Bali.

In conclusion of the data I have collected, and in line with research by other scholars, pollution by waste is not widely perceived as problematic (Pasang, Moore and Sitorus 2007; Tejalaksana 2012). Given the current low problematisation of (plastic) pollution, future awareness campaigns must recognize, embed and connect their approach well to the respective 'Balinese' environmental concepts. As has been pointed out to me, *Ibu Pertiwi* gets hurt from the pollution of waste and she can get angry and strike back in form of natural disasters.

In the next section we narrowed the focus from the environment in general towards the use and perceptions of plastic bags in Balinese people's views. We learnt that to most people the striking negative effect from plastic bags are floods caused by the clogging of waterways. In Bangladesh, a plastic bag ban was implemented largely based to reduce the negative effects from floods. These consequence are easy to understand and more relevant to current priorities in the views of many Balinese. It can therefore be very useful to raise awareness toward the negative effects of plastic bags by including and connecting to this existing problematisation of plastic bags in discourses in Bali and other flooding prone areas in Indonesia and beyond.
Problematic views of plastic bags by Balinese people can support more effective awareness campaigns, but it is just as important to understand the positive qualities and popularity of plastic bags to inform promising behavioural change approaches. The dominant reasons for using plastic bags in the view of Balinese shoppers and shop owners are very pragmatic. They are practical, easy and cheap, pointing all into the same direction for the vast majority. This reasoning is very much in line with findings from other studies looking at plastic shopping bag use, such as Hawkins (2001), who describes it as the 'easy convenience of plastic bags'. Gupta (2011) points to the 'easy availability' of plastic bags. But also the plastic bag's role for status and identity has come to the fore. Choosing a not-plastic shopping bag in the 'Western' context is often a conscious ethical and environmental decision, making people feel

better about themselves (cf. Cherrier 2006). In a non-Western context, the contrary may hold true. Often it is the use of plastic bags that allows people to feel better, more modern. Examples for this can be seen in what Yasmeen (2013) describes as the postmodern 'plastic bag housewives' in the case of Bangkok in Thailand. Stone (2006) points out how in the Turkish context minarets were referred to as symbols of tradition and plastic bags as symbols of modernity. Along this argument the use of plastic bags may represent a modern, a preferred attitude and identity for Balinese. When Hawkins (2001) analyses 'The object marketed for its convenience evokes a modernist asceticism and temporality (…)' he shows how both aspects – convenience and modernity - are related and play together in the choice of plastic bags. Beyond these considerations the repetitive use and mainstreaming of plastic bags lead to their normality and the habitualisation of use (Ohtomo and Ohnuma 2014). Knowing the motivations leading towards the plastic bag use habit can be helpful also in regard to creating eco-friendly alternatives to plastic bags.

In the last section of this paper we turned to finding solutions for the plastic bag problem on Bali. The analysis of the Bye Bye Plastic Bags campaign showed the power of a charismatic social initiative by teenagers in receiving the attention of local, national and international media. Jordan and van Tujil (2000) and Wright (2000) point out that the success of a campaign is crucially linked to its presence in mass media. Gritten and Kant (2007) explain the important role of local and national media in environmental campaigns and provide an example in the region of an effective campaign against an Indonesian pulp and paper company. The success of campaigns such as BBPB is often difficult to assess due its multidimensionality (Cf. Keck and Sikkink's 1998). It is therefore hardly possible to define the scope BBPB's influence on the government's decision in regard to introducing fees on plastic bags for selected commercial sectors and areas in Indonesia. A fee on plastic bags has shown to be a very effective tool to reduce plastic bag use in many countries across the globe, for example in the UK, Germany and Ireland (New York Times 2008). However, the political and societal will to implement such policies, or marketing strategies by retailers, only recently emerging in Indonesia, has to be nourished by societal change, among others fostered by initiatives like Bye Bye Plastic Bags.

The public support and media attention for BBPB also resulted in government representatives inviting the initiative for a meeting. The governor received and listened to the teenagers' request of stopping the plastic bag pollution. As a result of the meeting the governor and

environmental agency of Bali have announced to support the goal of making Bali plastic bag free within their jurisdiction and responsibilities. While there is still no legally binding document, this could be a step towards banning plastic bags, which has been the central request by BBPB. A plastic bag ban has already effectively worked in a number of countries, for example in Uganda, Kenya, and Bangladesh (Cf. Teh et al. 2014). These policies often take a long time to be applied, monitored and effectively enforced.

In the meantime and with the insights of this article I hope to contribute to the knowledge about the perception and understanding at work that contextualize and influence the use of plastic bags. To connect with the local perceptions of nature and existing problematisations of plastic bags, as I specified in this article, can inform effective approaches for awareness campaigns, local initiatives and political programs. The role of fashion, identity and convenience related factors are crucial in people's choice and use of plastic bags. Alternatives to plastic bags will have to consider these factors in order to successfully facilitate a behavioural change. There are hence opportunities not only for environmental initiatives and NGOs, but also politicians and businesses towards creating an environment free from plastic bags.

References

Andrady, Anthony L. 2011. “Microplastics in the marine environment.” *Marine Pollution Bulletin* 62 (8): 1596–605. doi: 10.1016/j.marpolbul.2011.05.030.

BPS. 2010. “Penduduk Menurut Wilayah dan Agama yang Dianut.” Accessed June 05, 2015. http://sp2010.bps.go.id/index.php/site/tabel?tid=321&wid=0.

Bruun, Ole, and Arne Kalland, eds. 1995. *Asian perceptions of nature: A critical approach.* Richmond: Curzon press.

Cherrier, Hélène. 2006. “Consumer identity and moral obligations in non-plastic bag consumption: a dialectical perspective.” *International Journal of Consumer Studies* 30 (5): 515–23. http://dx.doi.org/10.1111/j.1470-6431.2006.00531.x.

Desforges, Jean-Pierre W., Moira Galbraith, and Peter S. Ross. 2015. “Ingestion of Microplastics by Zooplankton in the Northeast Pacific Ocean.” *Archives of Environmental Contamination and Toxicology*, 1–11. doi: 10.1007/s00244-015-0172-5.

Douglas, Mary. 1976. “Relative Poverty, Relative Communication.” In *Traditions of social policy: Essays in honour of Violet Butler*. Edited by Violet Butler and A. H. Halsey. Oxford (England: Basil Blackwell.

Douglas, Mary. 1997. “In Defence of Shopping.” In *The Shopping experience*. Edited by Pasi Falk and Colin Campbell, 15–30. London [etc.]: Sage.

Dove, Michael R., Marina T. Campos, Andrew S. Mathews, Laura J. Meitzner Yoder, Anne Rademacher, Suk Bae Rhee, and Daniel S. Smith. 2003. “The Global Mobilization of Environmental Concepts: Re-Thinking the Western/Non-Western Divide.” In *Nature across cultures: Views of nature and the environment in non-western cultures*. Edited by Helaine Selin, 19–46. Science across cultures. Boston: Kluwer Academic Publishers.

Geertz, Clifford. 1973. *The interpretation of cultures: Selected essays.* New York: Basic Books.

Gerke, S. 2000. “Global Lifestyles under Local Conditions: The New Indonesian Middle Class.” In *Consumption in Asia: Lifestyles and identities*. Edited by Beng H. Chua. The new rich in Asia series. London, New York: Routledge.

Glaser, Barney, and Anselm Strauss. 1967. “The discovery of grounded theory. 1967.” *Weidenfield & Nicolson, London*.

Gritten, D., and P. Kant. 2007. “Assessing the impact of environmental campaigns against the activities of a pulp and paper company in Indonesia.” *International Forestry Review* 9 (4): 819–34. doi: 10.1505/ifor.9.4.819.

Gupta, Kanupriya. 2011. “Consumer Responses to Incentives to Reduce Plastic Bag Use: Evidence from a Field Experiment.” http://www.sandeeonline.org/uploads/documents/publication/954_PUB_WP_65_Kanupriya_Gupta.pdf.

Hawkins, Gay. 2001. “Plastic bags: Living with rubbish.” *International Journal of Cultural Studies* 4 (1): 5–23. doi: 10.1177/136787790100400101.

Hviding, Edvard. 2003. “Both Sides of the Beach: Knowledges of Nature in Oceania.” In *Nature across cultures: Views of nature and the environment in non-western cultures*. Edited by Helaine Selin, 245–75. Science across cultures. Boston: Kluwer Academic Publishers.

Jackson, Tim. 2005. “Motivating sustainable consumption: A review of evidence on consumer behaviour and behavioural change : a report to the sustainable development research network.”.

Jambeck, J. R., R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan, and K. L. Law. 2015. “Plastic waste inputs from land into the ocean.” *Science* 347 (6223): 768–71. doi: 10.1126/science.1260352.

Jeftic, L., Seba B. Sheavly, Ellik Adler, and Nikki Meith. 2009. *Marine litter: A global challenge.* Nairobi, Kenya: Regional Seas, United Nations Environment Programme.

Jordan, Lisa, and Peter v. Tuijl. 2000. “Political responsibility in transnational NGO advocacy.” *World Development*.

Keck, Margaret E., and Kathryn Sikkink. 1998. *Activists beyond borders: Advocacy networks in international politics.* Ithaca, N.Y: Cornell University Press.

KLH. 2012. “Informasi Mengenai Adiwiyata.” http://www.menlh.go.id/informasi-mengenai-adiwiyata/.

Kusmawan, Udan, John Mitchell O´Toole, Ruth Reynolds, and Sid Bourke. 2009. “Beliefs, attitudes, intentions and locality: the impact of different teaching approaches on the ecological affinity of Indonesian secondary school students.” *International Research in Geographical and Environmental Education* 18 (3).

Leslie E. Sponsel. 2007. “Ecological Anthropolgy.” Accessed November 30, 2015. http://www.eoearth.org/view/article/151926/.

Lincoln, Yvonna S., and Egon G. Guba. 1985. *Naturalistic inquiry.* Beverly Hills, California: Sage Publications.

Nygren, Anja. 1999. “Local Knowledge in the Environment-Development Discourse: From dichotomies to situated knowledges.” *Critique of Anthropology* (19): 267–88. Accessed January 25, 2016.

Pasang, Haskarlianus, Graham A. Moore, and Guntur Sitorus. 2007. “Neighbourhood-based waste management: A solution for solid waste problems in Jakarta, Indonesia.” *Waste Management* 27: 1924–38.

Prihantoro, C. R. 2015. “The perspective of curriculum in Indonesia on environmental education.” *International Journal of Research Studies in Education* 4 (1): 77–83.

Ramseyer, Urs, I. G. R. P. Tisna, and Rama Surya. 2001. *Bali: Living in two worlds : a critical self-portrait.* Basel: Museum der Kulturen Basel. http://www.maff.go.jp/j/nousin/kaigai/inwepf/i_document/pdf/sympo_sutawan.pdf.

Ritch, Elaine, Carol Brennan, and Calum MacLeod. 2009. “Plastic bag politics: modifying consumer behaviour for sustainable development.” *International Journal of Consumer Studies* 33 (2): 168–74. http://dx.doi.org/10.1111/j.1470-6431.2009.00749.x.

San Jose Mercury News. 2016. “José M. Hernández and Hans JohnsonOpinion: Plastic bag ban supported by science and conscience.” http://www.mercurynews.com/opinion/ci_29529247/jose-m-hernandez-and-hans-johnsonopinion-plastic-bag.

Spranz, Roger, Alexander Lenger, and Nils Goldschmidt. 2012. “The relation between institutional and cultural factors in economic development: the case of Indonesia.” *Journal of Institutional Economics* 8 (04): 459–88. doi: 10.1017/S1744137412000124.

Stone, Leonard. 2006. “Minarets and Plastic Bags: The Social and Global Relations of Orhan Pamuk.” *Turkish Studies* 7 (2): 191–201. doi: 10.1080/14683840600714608.

Teh, James, MihraS Taljanovic, and Johnny Monu. 2014. “International Skeletal Society outreach 2013: Rwanda.” *Skeletal Radiol* 43 (5): 563-565. doi: 10.1007/s00256-014-1822-9.

Tejalaksana, Aksa. 2012. “Water Management Pollution Policy in Indonesia.” Accessed January 20, 2016. http://www.wepa-db.net/pdf/0712forum/paper26.pdf.

Thompson, Richard C., Charles J. Moore, Frederick S. Vom Saal, and Shanna H. Swan. 2009. “Plastics, the environment and human health: current consensus and future trends.” *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1526): 2153–66. doi: 10.1098/rstb.2009.0053.

Wright, Brian G. 2000. “Environmental NGOs and the dolphin-tuna case.” *Environmental Politics* 9 (4): 82–103. doi: 10.1080/09644010008414552.

Yasmeen, Gisèle. 2013. ““Plastic-Bag Housewives” and Postmodern Restaurants? Public and Private in Bangkok's Foodscape.” *Urban Geography* 17 (6): 526–44. doi: 10.2747/0272-3638.17.6.526.

3. Morals, Money or the Master: The adoption of eco-friendly reusable bags

Abstract: Plastic pollution is rampant in oceans across the globe. Our project in Indonesia seeks to understand and measure the effectiveness of non-monetary interventions that can help to reduce plastic bag consumption. We set up a natural field experiment with 60 local shops and apply three different persuasion strategies to measure shop owners' likelihood to participate and sell them to customers. In all treatment conditions the reusable bags were offered to the shop owners at a subsidized price along with explanations about the harm plastic bags do to the environment. Additionally and according to their randomly assigned treatment, they got either information activating a pro-environmental social norm (arguing that distributing the reusable bags helps support the wellbeing of their society); Indirect monetary incentive (arguing that their business can save money by reducing the amount of free plastic bags) or; authority endorsements (the head of the village showing his support of the idea to distribute the reusable bags). Our results support the hypothesis that local leaders play an important role in the Indonesian context.

Keywords: natural field experiment; plastic pollution; environmental norms; indirect monetary incentives; authority endorsement; Indonesia

3.1 Introduction

Governmental policies and regulatory approaches have often proven to be very effective tools to encourage and ensure pro-environmental behavior. Unfortunately, many countries have failed to introduce any measure concerning the use of plastic bags, emphasizing the need for bottom-up approaches. In the context of a weak and only slowly improving policy setting, NGOs, social entrepreneurs, environmental groups and other members of civil society ask for alternative interventions to support the societal change towards more environmentally friendly behavior in their societies. Our research aims to help find such behavioral intervention tools by examining a severe environmental problem: pollution by plastic bags. Plastic bags make up 9.4% of the world's coastal litter. More than a million birds, marine mammals and turtles die from ingesting plastics each year (Jeftic et al. 2009). Indonesia is the world's second largest contributor to marine plastic pollution (Jambeck et al. 2015). Plastic waste, such as

disposed plastic bags, does not biologically degrade. They break-down into micro plastics, which often bind pesticides, or other chemicals that, when eaten by fish, enter the food chain, and can harm humans (Desforges et al. 2015). Despite the negative consequences from plastic bag pollution, alternatives such as reusable shopping bags are rarely adopted by shops or customers. To induce a behavioral change there is a need to find out more about the determinants of environmentally friendly behavior and effective low-cost interventions, especially in developing countries.

In this field experimental study in Bali (Indonesia) we tested three non-monetary information and persuasion interventions - *Social Norm*, *Indirect Monetary Incentive* and *Authority Endorsement*. The study evaluated their effectiveness towards the adoption of eco-friendly reusable shopping bags as opposed to single use plastic bags. In our experimental design we examine the circumstances under which shop owners are more likely to sell environmentally friendly shopping bags. Most studies in this field focus on the consumer. However, it is considered worthwhile to explore the promising multiplier effect that shop owners can have in spurring a behavioral change of customers. All shop owners in the random selection were confronted with explanations about the adverse effects of plastic bags towards the environment. They each received eight reusable bags on consignment that should be sold within two weeks to their customers.

Central to the study is a comparison of three promising low-cost interventions that support pro-environmental behavior. Three randomly selected groups of shop owners were addressed through one of the following interventions. First - By indicating to the shop owners that Balinese people care about the environment and reducing plastic bag use – an intervention of the category *Social Norms*, which often refers to pro-environmental behavior of others in their local peer group (Cf. Cialdini et al. 1990); Second - By explaining to the shop owner the financial benefits that arises from saving expenses on plastic bags given out for free and profiting from selling reusable bags – an intervention of the larger group of *Indirect Monetary Incentives*, a refined version of the traditional economic tool to financially reward pro-environmental behavior. Third - By the endorsement of the village head towards the shop owners to distribute the reusable bags – a type of intervention belonging to the category of *Authority Endorsement*, which aims to achieve more environmentally friendly behavior through the trust of formal or informal authorities.

The researchers found that the intervention *Authority Endorsement* significantly increased the sale of bags compared to activating *Social Norms* or explaining the shop owner the monetary advantage of selling bags. The findings of the study may be applied to other pro-environmental behavior topics, and also to related fields such as health behavior or insurance uptake.

3.2 Empirical Studies, Theory and Hypotheses

It is difficult to evaluate the effectiveness of behavioral interventions against the background of one general global context. There are too many contextual factors, including institutional, historical or cultural, which could significantly alter the outcome of behavioral interventions. Therefore the study is seen as contributing to the bigger question of what behavioral interventions work best and in what context. Beyond the two interventions of *Social Norms* and *Indirect Monetary Incentives*, which have already proven valuable in some contexts, *Authority Endorsement* is added as a third intervention to the study. Considering the Indonesian context of the research including an intervention based on authority appeared to be a promising option.

In a prominent experimental study Milgram (1974) showed early on the influence of authority on behavior. In the environmental behavior context, this is what Chong et al. (2011) analyzed by studying the influence of *Authority Endorsement* on increasing recycling rates. Although Cialdini and Goldstein (2004) have shown that authority affects and changes behavior in other contexts (Cf.), Chong et al. (2011) did not find any significant changes due to messages from authorities in their study in Peru. Obedience to authority in the environmental setting has hardly been studied with the exception of Javaid and Falk (2015) or Vollan et al. (2017). Emphasizing authority as an effective tool to attain a desired behavior is considered applicable to Balinese, Indonesian and other Asian societies (Lansing 2006, Spranz et al. 2012, Hofstede 2014) where *Authority Endorsement* would most likely have a stronger effect on shop owners than appealing to *Social Norms*. Indonesian society supports a long tradition of authoritarian paternalism in enterprise management, government, family and educational system. People expect authorities to tell them what has to be done.

> **Hypothesis 1 (H1):** *Authority Endorsement* is more effective in convincing shop owners to sell reusable bags than *Social Norm*.

The economists' approach to changing people's behavior is by emphasizing monetary advantages to individuals. In the majority of studies that analyze financial interventions in the environmental behavior field, monetary rewards or fines result in improved environmental behavior. However, direct monetary incentives are not provided in this study, as these are more difficult to implement on a large scale without government support. Instead we use *Indirect Monetary Incentives*. This approach is common when trying to convince customers of the long-term benefits of energy saving appliances, cars, etc. Studies using this kind of *Indirect Monetary Incentives* in a comparable way are hard to find, however, the researchers believe the indirect incentives will have a smaller impact that direct incentives. Gupta's (2011) field experiment on reducing plastic bag use conducted in 180 fruit and vegetable shops in India showed that direct positive monetary incentives reduced plastic bag use by 5.5%, while (positive) normative information resulted in only a 3.2% reduction. Gupta (2011) was testing a 2% discount for customers who shopped without using a plastic bag. This intervention yielded the highest reduction of plastic bag use in her field experiment. Given the more consistently effective results when using monetary incentives (Mizobuchi and Takeuchi 2013; Toledo 2013) instead of *Social Norms* (Schultz et al. 2007, Ferraro and Price 2011), the following hypothesis is proposed:

> **Hypothesis 2 (H2):** *Indirect Monetary Incentive* is more effective in convincing shop owners to sell reusable bags than *Social Norm*.

Little research was found on empirical studies or clear theoretical predictions for *Authority Endorsement* and *Indirect Monetary Incentives*. Although direct monetary incentives in many cases show convincing results, less is known about making long-term cost effectiveness predictions. Considering the strong hierarchical and authority oriented context in our study region Bali (Indonesia), the researchers hypothesize that shop owners within the *Authority Endorsement* intervention group will sell more reusable bags than those in the *Indirect Monetary Incentive* group.

> **Hypothesis 3 (H3):** Authority Endorsement is more effective in convincing shop owners to sell reusable bags than *Indirect Monetary Incentive*.

3.3 Material and Methods

3.3.1 Background

For Indonesia, Willoughby et al. (1997) find that 80% of the items found at the coastline of the 23 islands studied were plastic bags, polystyrene blocks, and discarded footwear. Focusing on plastic bags, the inhabitants of Indonesia are provided small, single-use plastic bags when they shop for groceries, or snacks. As in many other developing countries, in Indonesia there is an enormous number of small shops providing products for everyday life. Frequently these shops are part of the family's home and only a half a dozen or a dozen neighbors shop there each day. However, many shops have up to 100 or more customers per day. In Indonesia such a small shop is called a 'warung'. Although an increasing amount of franchising Mini-Markets and Super-Markets are taking over, traditional 'warungs' and markets still account for more than half of Indonesians grocery shopping (USDA 2013), serving the 230 Million people living on the Archipelago (Portal Nasional Republik Indonesia 2014). Hence, it is likely to be among the largest sources of the distribution of plastic bags in the country.

Since most people in developing countries live in rural areas the location chosen for the field experiment was Tabanan Regency, a local area in Bali. This regency stretches from the coast up to the mountains and represents a rural area of Western Bali away from the tourism dominated south (see Appendix A). In an attempt to ensure that the areas were rural, only villages with less than 10,000 inhabitants were selected for the sample. From this overall sample villages were randomly selected. In each selected village the two largest 'warungs' were asked to participate in the project. To prevent any spill-over effects there was only one of the three interventions implemented for both shop owners in the same village. To attain the goal of n=20 shop owners for each treatment, around 15 villages were visited per treatment. The shop owners were approached by the staff or assistants of ecoBali, a Balinese environmental organization. The staff of ecoBali informed the shop owners about the negative effects of plastic bag consumption and other appropriate details according to the respective intervention. In case of the *Authority Endorsement* ecoBali also contacted the village head. Shop owners and village heads could then decide to participate or not. The assistants presented themselves as part of an organization working for a better environment on Bali. The design of the field experiment applied has been developed by ecoBali and the authors of this study.

3.3.2 Experimental treatments

The staff explained the negative effects of plastic bags with the help of a stylized infographic (see Appendix B). It illustrates how plastic bags when disposed in rivers (a popular place for waste disposal) eventually end up in the sea and degrade into small (micro) plastic particles. These micro plastic particles often taken up by fish, which in turn are eaten by humans with a potential to damage the health of humans. A poster showing the infographic was put up at the front of the shop, visible to the people coming to the shop. All communication with and communication material for the shop owners was in Indonesian (Bahasa Indonesia).

Along with the basic intervention and depending upon which of the three intervention groups the village was selected for upon arriving at the shop the owner received either the *Social Norm*, *Indirect Monetary Incentive* or *Authority Endorsement* intervention upon arriving at the shop. Thus, the decision to take the bags as well as the effort in selling the bags was influenced by the treatments. Our three treatment interventions can be seen as best-practice approaches that can be carried out by NGOs at low cost and are not ceteris-paribus interventions in the strict sense.

As part of the *Social Norm* intervention the assistants handed out a sticker to the shop owner. This was put behind the counter as a reminder. On the sticker was written: "Balinese people care about the environment and the welfare of society. Thank you for selling reusable shopping bags and reducing plastic bags." Below the text on the sticker there was a smiling emoticon "☺". The reminder was also read out to the shop owner. This approach builds in various ways on the findings of previous studies. In the *Social Norm* intervention there is the reference to shop owners' peers: "Balinese people …", (Schultz et al 2007, Ferraro and Price 2011).[4]

If the shop owners were selected for the *Indirect Monetary Incentive* treatment, the research assistants asked the shop owner how many plastic bags were given to customers on average per day. The price of plastic bags used at most 'warungs' is around 100 IDR (approx. 1 US Cent). The assistants then helped calculate the monthly average cost of free plastic bags to the

[4] The use of a smiling emoticon "☺" (Schultz et al 2007) is meant to increase the effectiveness of the messages in all three interventions. Increasing the effectiveness across interventions is supported by providing information about negative health impacts (Gupta 2011) on posters given to the shop owners. Together with this a prompt is included as recommended by Ohtomo and Ohnuma (2014) "… Thank you for selling reusable shopping bags and reducing plastic bags use"

shop-owner . It was then pointed out that this money could be saved if customers did not use plastic bags. Thus, shop owners were instructed to explain to customers the adverse effects of plastic bag waste and encourage them to use eco-friendly reusable shopping bags. The shop owner also received a sticker for behind the counter, to remind him that "You can save money by selling reusable shopping bags and reducing plastic bags", along with the "☺" emoticon. The *Indirect Monetary Incentive* treatment differs from most studies as we did not reduce the price of the bags but made the cost effectiveness of selling re-usable bags salient to the owner hoping to activate a long-term process beyond the time of the initial subsidy.

The third intervention *Authority Endorsement* included the support by the local village authority. Before contacting a shop in a selected village, the assistants explained to the village authority the environmental harm caused by plastic bags and asked them to accompany them to the 'warung'. At the selected 'warung' the village authority should express their support for the idea of selling reusable bags and reducing plastic bags. The authority was not aware that this was part of an experiment.[5] The shop owner received a sticker as well, saying "The village authority supports selling reusable bags and reducing plastic bags ☺", which was put behind the counter but in this case only visible to the shop owner. Although this treatment has an additional component of peer pressure on the shop owner, this relates, if at all, only to the participation stage. Village leaders were not asked to follow-up on how many bags were sold. Thus, a higher participation in this treatment would rather lead to an underestimation of the effect on bags sold as unmotivated shop owners will take part.

3.3.3 Eco Friendly Reusable Bags on Consignment

Besides the three interventions and explanations on adverse effects of plastic bags, the shop owners willing to participate in the project received 8 eco-friendly reusable bags on consignment. The research assistants asked the shop owners to sell these to their customers to reduce the use of plastic bags. Shop owners were free to decide on the selling price of the reusable bags. For each bag that was not returned, they had to pay 2,000 IDR (approx. 20 US Cent). This is a subsidized price, since production cost of the bags was around 8,000 IDR (approx. 80 US Cent). After the initial visit to the 'warungs' the shop owners had 14 days to sell the bags, when the research assistants would return and collect either the remaining bags

[5] The nature of almost all field experiments is that subjects are not aware of being in an experiment in order to have unbiased measures of their behavior. We obtained approval from the IRB (Institutional Review Board) from our university, since in our case no threats are involved and any risks are very low.

or receive payment for the bags sold. At this last visit the research assistant also conducted the survey with the shop owners.

For the eco-friendly reusable bags (Appendix C) the researchers chose locally produced bags, made of polypropylene spunbonded material. Canvas bags were initially thought of but pre-testing indicated that canvas material was seen as being too expensive to use for daily grocery shopping. Although polypropylene is a less environmentally friendly fabric than canvas, the expectation of a more frequent use of the spunbondd bags as opposed to plastic bags, results in spunbonded bags to be more eco-friendly choice. The colors blue with green for the bags were also chosen based on pre-test. The size of the bag makes sure that bigger shopping items could also be carried along.

3.3.4 Participants

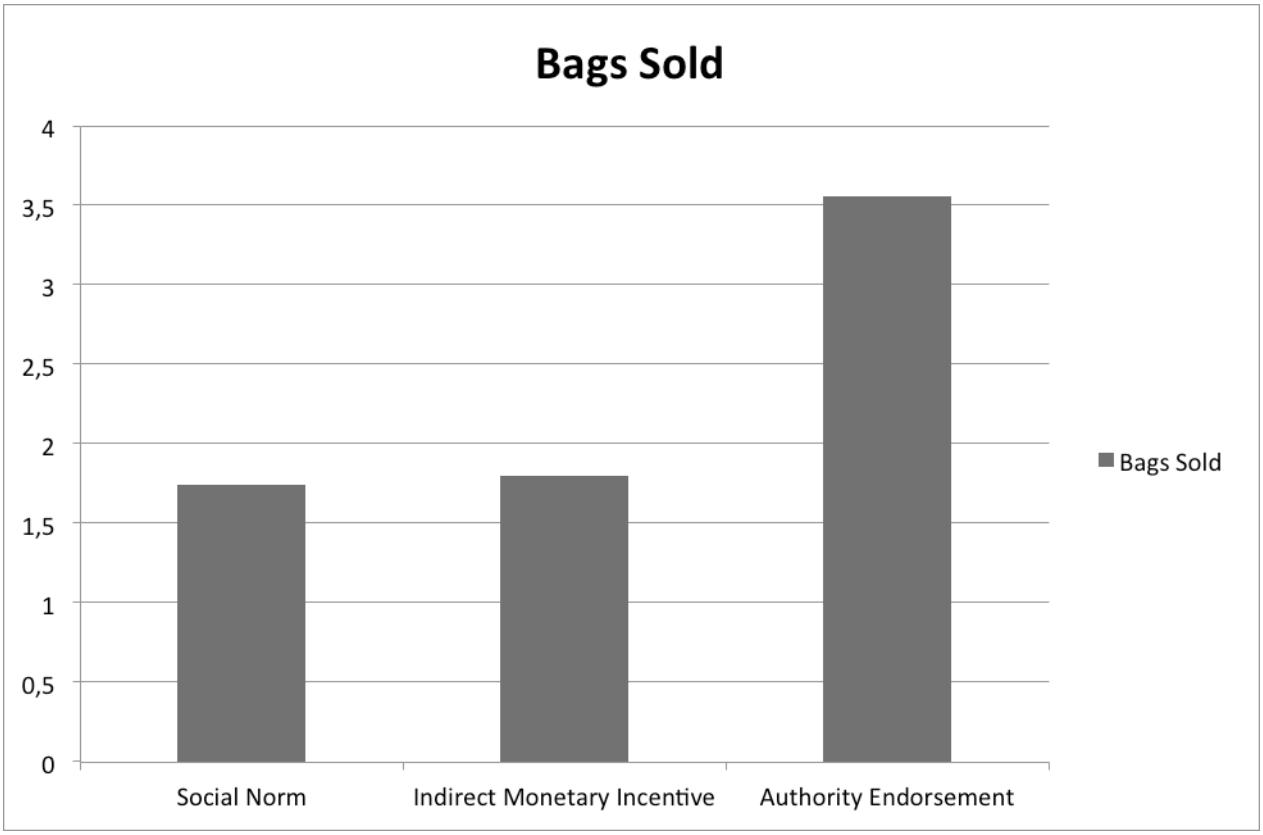
Our research assistants approached 90 ‘warungs’ in total. 60 agreed to participate in the project, 30 rejected participation. Out of the 90 approached, 82% agreed to complete the survey. 15 of those that rejected to participate in the project still filled the survey (50%), while only one out of the 60 shop owners participating in the project failed to do so. Based on the surveys completed, the average age of owners was 48 years. More than three quarters of them were women, of which 40% had not completed high school, while 10% had received higher education after high school. Their shops receive an average of 35 customers a day.

3.4 Results

3.4.1 Descriptive Statistics

The descriptive data presented in table 1 indicates a tendency of more bags being sold in the case of the treatment group *Authority Endorsement* compared to *Social Norm* and *Indirect Monetary Incentive*. With 3.56 bags sold per shop owner in the treatment group *Authority Endorsement* which shows a significant higher average number of bags sold compared to *Social Norm* (1.74 bags, p=0.009) and *Indirect Monetary Incentive* (1.80 bags, p=0.046). Figure 1 displays these results in a bar chart, visualizing the high sales of reusable bags in the *Authority Endorsement* group of shop owners.

Figure 1 Chart for reusable bags sold across the three intervention groups



There are only minor and insignificant differences in the average price shop owners charged for the bags. *Social Norm* and *Indirect Monetary Incentive* treated shop owners asked for approximately 3,200 IDR, whereas *Authority Endorsement* shop owners charged 3,000 IDR. (See Appendix S1 for a more detailed discussion of Table 1)

Table 1 Descriptive Statistics for the experiment

	Social Norm	**Indirect Monetary Incentive**	**Authority Endorsement**	**Total**
Approached	(27)	(38)	(25)	(90)
Participation (survey only)	0.93 (25)	0.74 (28)	0.84 (21)	0.82 (74)
Participation (study and survey)	0.74 (20)	0.58 (22)	0.72 (18)	0.67 (60)
No Bags Sold (0)	8 (19)	6 (19)	2 (18)	16 (56)
All Bags Sold (8)	1 (19)	1 (19)	4 (18)	6 (56)
Bags Sold Average	1.74 (19)	1.80 (19)	3.56 (18)	2.20 (56)
Average Bag Price	3167 IDR (15)	3188 IDR (16)	2971 IDR (17)	3104 IDR (48)
Average Turnover	8767 IDR (15)	5667 IDR (15)	11412 IDR (17)	8734 IDR (48)

One section of the survey for the shop owners aimed at gathering information about the use of the reusable bags that had been distributed. The first question was: "Have people who bought a bag returned with that bag for shopping?" Shop owners reported that the vast majority (87%) did. Whether getting a reusable bag was a result of the shopper being wealthier was another question. This had been completely denied (100%). Following this the shop owners were asked "Do customers use less plastic bags when buying at your shop now?" 43% of the customers who purchased a bag were reported to do so. The question "Do some customers who did not buy a reusable bag use less plastic bags?" was largely answered with "No" (91%). Also the question on whether there was a tendency to give out fewer plastic bags in that shop was rejected by the strong majority (92%) of participating shop owners.

3.4.2 Participation decision of shop owners

Since participation in the study was voluntarily there can be selection effects based on certain characteristics. A priori it is not clear which people are less likely to take part. Participation did not involve any financial risks as shop owners could return all 8 bags. Some shop owners were not present during repeated visits; only their staff. Table 2 shows no significant differences for the treatments, suggesting that there are no significant selection effects based on the way shop owners were approached by us. Thus, this information is reassuring for our subsequent analysis on which treatment was more effective in inducing bags to be sold to customers.

There are, however, significant differences between shop owners' characteristics of those who were willing to participate and those who did not want to participate. Participation in the project was more likely for shop owners who ranked religious values relatively higher to other values. This is what H3 puts forward for the case of selling reusable bags. The results indicate that female shop owners are more likely to participate in the environmental project ($p<0.1$) supports the findings of many studies relating women having a higher concern for environmental matters (e.g. Bord and O'Connor 1997, Zelezny et al. 2000 Laroche et al. 2001, Hunter et al. 2004). Furthermore, the findings indicate that higher-educated shop owners are more likely to take part in the project ($p<0.05$). This is in line with several studies showing a link between higher education and more emphasized pro-environmental behavior (e.g. Olli et al. 2001, Gatersleben et al. 2002, Franzen and Vogel 2013). Finally, there is no significant difference for Age, Economic Assets, Village Size and Village Altitude between

participants and non-participants. On the general explanatory power of this probit estimation model, the null hypothesis (all of the regression coefficients are simultaneously equal to zero) can be rejected (Prob > Chi2: 0.0551) for model 2 only. The pseudo R2 of model 2 is at 0.3227. The explanatory power of the estimations for treatments only (model 1) are weak: Prob > Chi2 is 0,3233 and R2 is 0.0200

Table 2 Marginal effects after probit regression on participation in our study.

	(1) Participants	(2) Participants
Indirect Monetary Incentive	-0.163	0.0371
	(0.121)	(0.0830)
Authority Endorsement	-0.0229	0.0955
	(0.137)	(0.0688)
Gender		0.251*
		(0.134)
Age		-0.0447
		(0.0377)
Age^2		0.000484
		(0.000374)
Education		0.143**
		(0.0556)
Economic Assets		-0.0522
		(0.0397)
Religion		0.0896**
		(0.0385)
Village Size		-2.36e-05
		(2.88e-05)
Village Altitude		-0.000157
		(0.000172)
Prob > Chi2	0.3233	0.0551
Pseudo R2	0,0200	0.3227
Observations	90	69

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

3.4.3 Number of bags sold to customers

In this section we present the results of the three treatments for the number of bags sold conditional on having participated. Although there do not seem to be treatment differences in the participation decision Table 3 shows the TSLS IV (Two Stage Least Square Instrumental Variable) regression with bags sold as the outcome variable and using the randomly allocated treatments as IV for the participation decision to estimate an unbiased treatment effect on the treated (ToT). Our results show that participating shop owners who were confronted with the

Authority Endorsement sold significantly more bags than those who participated in *Indirect Monetary Incentive* ($p<0.05$) and the *Social Norm* ($p<0.1$).

Table 3 Treatment effect on the treated (ToT) for bags sold based on IV estimation

	(1) Bags Sold	(2) Bags Sold
Participated in Indirect Monetary Incentive	-1.2778 (1.6437)	
Participated in Authority Endorsement	4.7778* (2.7257)	6.6992** (2.9583)
Participated in Social Norm		2.0752 (3.123)
Prob > Chi2	0.0284	0.0741
Observations	90	90

Notes: Standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1

In table 4 the results for the ITT (Intention-To-Treat) effect are illustrated (for further information on ITT and ToT see supplementary appendix and Angrist and Pischke 2009, Duflo et al 2008, and Fisher et al. 1990). The ITT is the treatment effect based on number of reusable bags sold for all shop owners we approached no matter whether they participated or not. Table 4 columns 1 and 2, shows a significant effect for shop owners in the treatment group *Authority Endorsement* ($p<0.05$) on average selling around three (Coeff.: 2.9) more bags to their customers than shop owners in the treatment group *Social Norm*. Compared to those treated by *Indirect Monetary Incentive* the shop owners in the *Authority Endorsement* group sell approximately four (Coeff.: 4.1) more bags ($p<0.01$). The difference of bags sold by shop owners in treatment group *Indirect Monetary Incentive* and *Social Norm* is not significant. Model (2) shows that the village size is positively correlated with the amount of reusable bags sold ($p<0.1$). Village altitude however, does not show any significant correlation.

The results for the ITT effect for all shop owners surveyed are summarized in table 4 column 3 and 4. Model 3 is similar to model 1 but is applied only to those shop owners who took part in the survey. Model 4 includes the independent variables for socio-demographic and -economic factors Gender, Age, Age^2, Education, Economic Assets and Religion. Model 4

shows significant positive correlations between Bags Sold and Education, Economic Assets and Religion.

The results of the TSLS IV and ITT analysis allow for a thorough testing of the hypotheses of this study. Table 3 and both estimation models in table 4 support H1 (*Authority Endorsement* is more effective in convincing shop owners to sell reusable bags than *Social Norm*). The hypothesis H2 stating that *Indirect Monetary Incentive* is more effective to motivate shop owners selling reusable bags than *Social Norm* is, however, not supported. H3 is supported by the results shown in column 2 of table 3, illustrating significantly more bags being sold by shop owners in the intervention group *Authority Endorsement* than *Indirect Monetary Incentive*. By controlling for other variables (table 4) there is a weakly significant correlation of village size with shop owners selling more reusable bags in larger villages.[6]

Models 3 and 4 of table 4 includes all shop owners who filled in the survey. Thus, one third of observations is lost and have to re-estimate the ITT including the independent variables for Socio-demographic and Socio-economic factors, Gender, Age, Age², Education, Economic Assets and Religion. There is a strong significant ($p<0.05$) positive relationship between the Economic Assets (Coeff.: 1.3), and Bags Sold. Similarly between Education and Bags Sold (Coeff.: 1.2) and a highly significant correlation ($p<0.01$) between Religion and Bags Sold (Coeff.: 1.1). Including these covariates (and reducing the sample) reduces the coefficients of the treatments – especially for *Indirect Monetary Incentive* where the coefficient drops by 2 bags. The treatment *Social Norms* remains statistically significant ($p<0.1$) and with a similar size as in model 1 of table 4.

[6] One possibility to explain a more environmentally friendly behavior in a more urban Indonesian context may be the greater influence of global environmental discourses, suggesting that urban areas are stronger linked to such discourses. The idea of rather rural areas, which naturally represent a living space closer linked to the natural environment, do not seem to go along with a more environmentally friendly behavior as the selling of reusable bags indicated in this study. Berenguer et al. (2005) studied the differences in environmental concerns in between rural and urban areas finding for city residents more environmental responsibility values. However, the three different scales they applied showed generally very heterogeneous results.

Table 4 Intention to treat (ITT) effect for bags sold using Tobit regressions.

	(1)	(2)	(3)	(4)
	All approached		Only completed survey	
	Bags Sold	Bags Sold	Bags Sold	Bags Sold
Indirect Monetary Incentive	-1.177	-1.336	-0.623	0.633
	(1.367)	(1.367)	(1.350)	(1.349)
Authority Endorsement	2.926**	2.657*	3.007**	2.867*
	(1.430)	(1.394)	(1.433)	(1.458)
Gender				1.429
				(1.307)
Age				-0.0838
				(0.410)
Age2				0.00136
				(0.00397)
Education				1.276**
				(0.614)
Economic Assets				1.299**
				(0.600)
Religion				1.121***
				(0.414)
Village Size		0.000709*		0.000350
		(0.000395)		(0.000354)
Village Altitude		-0.00276		-0.00262
		(0.00371)		(0.00327)
Prob > Chi2	0.0083	0.0062	0.0226	0.0028
Pseudo R2	0.0338	0.0507	0.0135	0.1115
Observations	90	90	69	69

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Column 1 and 2 are intention-to-treat effects for all shop owners we approached and columns 3 and 4 show intention-to-treat effects including all shop owners who filled in the survey.

3.5 Conclusions

After decades of unquestioned exploitation of natural resources, and unprecedented global population growth, people have started to realize the adverse effects of these developments. One of these effects is environmental pollution that harms the sensitive ecological system. Especially pollution of water resources, rivers, lakes, and oceans, through mismanaged waste disposal which is of particular concern in this study. Plastic waste, including single-use plastic bags, is one factor causing environmental degradation of organisms in regional and global water resources, the reduction of local air quality, and partly for global warming.

Comparing three different approaches to induce local shop owners in Bali to sell reusable bags, the study shows that *Authority Endorsement* is the most effective intervention tested (measured as Bags Sold). This result has important implications for environmental NGOs, eco-entrepreneurs, but also policy makers. It shows the potential impact of local leaders such as village heads towards the behavior of people. Beyond regulations or laws, this kind of authority that is manifested in the informal sphere of recommending or instructing a certain behavior is arguably based on trust and the acceptance of authorities. The opportunities of *Authority Endorsement* should be taken more seriously and appreciated for driving pro-environmental change in these contexts.

Our study shows first insights into the adoption of pro-environmental behavior through the distribution of reusable bags in Bali. Larger projects and slight changes to the experimental design used here are required to get a greater understanding for the relationships at work in the present context and to enhance the generalization of some of the findings. Pollution is an urgent threat to the environment and human health. While governments are still struggling to implement and enforce crucial environmental policies, we have shown that there are effective alternative interventions to encourage pro environmental behavior. These do not solely rely on governments, but can also be applied by NGOs, social business or committed environmental organizations.

References

Andrady, Anthony L. (2011): Microplastics in the marine environment. In: *Marine Pollution Bulletin* 62 (8), P. 1596–1605.

Angrist, Joshua D., and Jörn-Steffen Pischke. (2009): *Mostly harmless econometrics: An empiricist's companion.* Princeton: Princeton University Press.

BBC (2014): California imposes first state-wide plastic bag ban. BBC. Available at http://www.bbc.com/news/world-us-canada-29435813, last update on 30.09.2014.

Bord, R. J.; O'Connor, R. E. (1997): The gender gap in environmental attitudes: The case of perceived vulnerability to risk. In: *Social Science Quarterly* 78 (4), P. 830–840.

Chong, Alberto; Karlan, Dean S.; Shapiro, Jeremy P.; Zinman, Jonathan (2011): Tried and True? The Contextual Specificity of "Proven" Approaches to Behavioral Change. Inter-American Development Bank: Department of Research and Chief Economist (IDB Working Paper Series, 265). Available at http://www.povertyactionlab.org/publication/tried-and-true-contextual-specificity-%E2%80%9Cproven%E2%80%9D-approaches-behavioral-change, last update on 23.06.2011.

Cialdini, R. B.; Goldstein, N. J. (2004): Social influence: compliance and conformity. In: *Annual Review of Psychology* 55, P. 591-621.

Cialdini, Robert B.; Reno, Raymond R.; Kallgren, Carl A. (1990): A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. In: *Journal of Personality and Social Psychology* 58 (6), P. 1015–1026.

Duflo, Esther, Rachel Glennerster, and Michael Kremer. (2008): "Using Randomization in Development Economics Research: A Toolkit." In *T. Schultz and John Strauss, eds., Handbook of Development Economics*. Vol. 4. Amsterdam and New York: North Holland.

Ferraro, Paul J.; Price, Michael K. (2013): Using non-pecuniary strategies to influence behavior. Evidence from a large scale field experiment. In: *The Review of Economics and Statistics* 95 (1), P. 64-73.

Fisher, L.D, D.O Dixon, J. Herson, R.K Frankowski, M.S Hearron, and K.E Peace. (1990): "Intention to treat in clinical trials." In *Statistical issues in drug research and development*. Edited by Karl E. Peace, 331–50. Statistics, textbooks and monographs 106. New York: M. Dekker.

Franzen, Axel; Vogl, Dominikus (2013): Two decades of measuring environmental attitudes: A comparative analysis of 33 countries. In: *Global Environmental Change* 23 (5), P. 1001–1008.

Gatersleben, Birgitta; Steg, Linda; Vlek, Charles (2002): Measurement and determinants of environmentally significant consumer behavior. In: *Environment and Behavior* 34 (3), P. 335–362.

Gerber, Alan S.; Green, Donald P.; Larimer, Christopher W. (2008): Social Pressure and Voter Turnout: Evidence from a Large-Scale Field Experiment. In: American Political Science Review 102 (01), P. 33–48.

Goldstein, Noah J.; Cialdini, Robert B.; Griskevicius, Vladas (2008): A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels. In: *Journal of Consumer Research* 35 (3), P. 472–482.

Gupta, Kanupriya (2011): Consumer Responses to Incentives to Reduce Plastic Bag Use. Evidence from a Field Experiment (SANDEE Working Paper, 65-11). Available at http://www.sandeeonline.org/uploads/documents/publication/954_PUB_WP_65_Kanupriya_Gupta.pdf.

Hofstede, Geert (2014): Indonesia. The Hofstede Centre. Available at http://geert-hofstede.com/indonesia.html.

Hunter, L. M.; Hatch, A.; Johnson, A. (2004): Cross-national gender variation in environmental behaviors. In: *Social Science Quarterly* 85 (3), P. 677–694.

Javaid, Aneeque; Falk, Thomas (2015): Incorporating local institutions in irrigation experiments: evidence from rural communities in Pakistan. In: *Ecology and Society* 20 (2): 28. Jeftic, L.; Sheavly, Seba B.; Adler, Ellik; Meith, Nikki (2009): Marine litter. A global challenge. Nairobi, Kenya: Regional Seas, United Nations Environment Programme.

Lansing, John Stephen (2006): Perfect order. Recognizing complexity in Bali. Princeton, N.J: Princeton University Press.

Laroche, M.; Bergeron, J.; Barbaro-Forleo, G. (2001): Targeting consumers who are willing to pay more for environmentally friendly products. In: *Journal of Consumer Marketing* 18 (6), P. 503–520.Milgram, Stanley (1974): Obedience to authority. An experimental view. London: Tavistock.

Mizobuchi, Kenichi; Takeuchi, Kenji (2013): The influences of financial and non-financial factors on energy-saving behaviour: A field experiment in Japan. In: *Energy Policy* 63 (0), P. 775–787.

Ohtomo, Shoji; Ohnuma, Susumu (2014): Psychological interventional approach for reduce resource consumption: Reducing plastic bag usage at supermarkets. In: *Resources, Conservation and Recycling* 84 (0), P. 57–65.

Olli, Eero; Grendstad, Gunnar; Wollebaek, Dag (2001): Correlates of environmental behaviors: Bringing back social context. In: *Environment and Behavior* 33 (2), P. 181–208.

Portal Nasional Republik Indonesia (2014): The geography of Indonesia. Available at http://www.indonesia.go.id/en/indonesia-glance/geography-indonesia.

Schlüter, Achim; Vollan, Björn (2015): Flowers and an honour box: Evidence on framing effects. In: *Journal of Behavioral and Experimental Economics* 57, P. 186–199..

Schultz, P. Wesley; Nolan, Jessica M.; Cialdini, Robert B.; Goldstein, Noah J.; Griskevicius, Vladas (2007): The Constructive, Destructive, and Reconstructive Power of Social Norms. In: *Psychological Science* 18 (5), P. 429–434.

Schwartz, Shalom H. (1977): Normative Influences on Altruism. In: Leonard Berkowitz (Hg.): Advances in Experimental Social Psychology, Bd.10: Academic Press, P. 221–279.

Spranz, Roger; Lenger, Alexander; Goldschmidt, Nils (2012): The relation between institutional and cultural factors in economic development: the case of Indonesia. In: *Journal of Institutional Economics* 8 (4), P. 459–488.

Steg, Linda, and Charles Vlek. 2009. "Encouraging pro-environmental behaviour: An integrative review and research agenda." *Journal of Environmental Psychology* 29 (3): 309–17.

Stern, P. C.; Dietz, T.; Abel, T.; Guagnano, G. A.; Kalof, L. (1999): A Value-Belief-Norm Theory of Support for Social Movements. The Case of Environmentalism. In: *Human Ecological Review* 6 (2), P. 81–97.

Thompson, Richard C.; Moore, Charles J.; Vom Saal, Frederick S.; Swan, Shanna H. (2009): Plastics, the environment and human health: current consensus and future trends. In: *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1526), P. 2153–2166.

Toledo, Chantal (2013): Do Environmental Messages Work on the Poor ? Experimental Evidence from Brazilian Favelas (Job Market Paper). Available at http://areweb.berkeley.edu/candidate/sites/areweb.berkeley.edu/files/JMP_Chantal_Toledo_01072013_0.pdf.

USDA (2013): Indonesia Retail Report Update. Available at http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Retail%20Foods_Jakarta_Indonesia_12-13-2013.pdf.

Vollan, Björn, Andreas Landmann, Yexin Zhou, Biliang Hu, and Carsten Herrmann-Pillath. (*2017*): Cooperation and Authoritarian Values: An experimental study in China. In: *European Economic Review* 9, P. 90-105.

Willoughby, N. G., Hendro Sangkoyo, and Boyke O. Lakaseru (1997): Beach litter: an increasing and changing problem for Indonesia. In: Marine Pollution Bulletin 34 (6), P. 469–478.

Wooldridge, Jeffrey M. (2002): Introductory econometrics. A modern approach. 2. Aufl. Australia, Cincinnati, Ohio: South-Western College Pub.

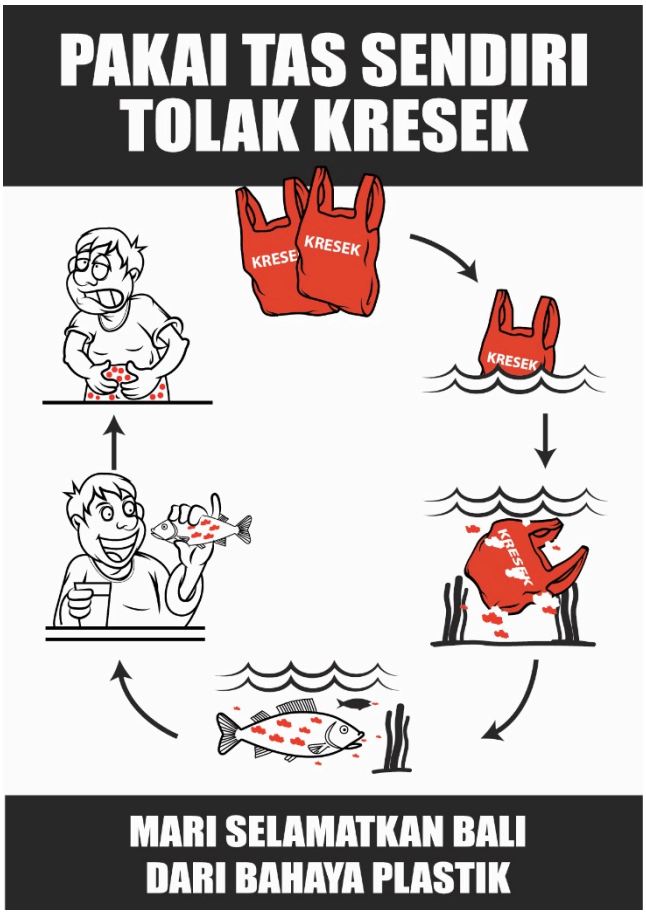
Zelezny, Lynnette C.; Chua, Poh-Pheng; Aldrich, Christina (2000): New Ways of Thinking about Environmentalism: Elaborating on Gender Differences in Environmentalism. In: *Journal of Social Issues* 56 (3), P. 443–457.

Appendix

Appendix A

Map: Tabanan Regency in Bali (Cf. https://goo.gl/maps/DxJHi)

Appendix B



Information poster:

"Bring your own bag, reject plastic bags –
Let's save Bali from the dangers of plastic"

Appendix C

Shopping Bag: Eco-friendly reusable shopping bag.

Appendix D

- Additional Analyses

There is a comprehensive amount of literature on the effect of norms and values on pro environmental behavior, Steg und Vlek (2009) provide an overview of this. Among the most prominent is the norm-activation model by Schwartz (1977). Adapted to norms in the environmental behavioral context, the value-belief-norm (VBN) theory of environmentalism focuses on moral obligations as a driver of environmental behavior. Stern et al. (1999) include consumer behavior as a sector in which biospheric moral obligations (norms) are being expressed in respective behavior. Cialdini et al. (1990: 1024 f), using the theory of normative conduct, find that salient injunctive or descriptive norms influence environmental behavior. In several studies on the issue of littering in public places they found evidence supporting their theory (Cialdini et al. 1990). The influence of social norms on behavior has extensively been

researched in different settings activating different norms (Cialdini and Goldstein 2004, Gerber et al. 2008, Schlüter and Vollan 2015).[7] In this research the treatment of *Social Norm* as the baseline for activating environmental awareness is used as it is most often implemented by NGOs. Two additional treatments are tested against this baseline: *Authority Endorsement* and *Indirect Monetary Incentive*. All three treatments do not change the incentive structure but work by conveying different sets of information. Thus, the treatments do not include any changes to monetary payoffs of shop-owners. Therefore, it can be seen that the hypotheses for the research are mainly based on related literature.

- Explanation of Statistical Methods

Participation:

In order to understand the differences between shop owners that participated in the project and those who refused to, a probit estimation model was applied. This approach allows an analysis of the independent binary variable "Participation" represented by the value 0 for No and 1 for Yes. The independent variables for Model 2 are Gender, Age, Education Economic Assets, Religion, Village Size and Village Altitude. Gender was measured binary (male/female). Age was measured in continuous years. Education was measured using the following categories: no formal education; compulsory school education; secondary general school education; basic vocational education; higher education (college, university). Economic Assets were calculated by factor composed of information on whether their HH (1) owns the house they live in, (2) owns a car, (3) owns a motor bike, (4) has a bank account, (5) has a debit or credit card, (6) owns a Smartphone capable of browsing the internet, and (7) owns a computer. The importance of religion to the shop owner was assessed by asking for a ranking of qualities, that children should be encouraged to learn at home. The ranking included following qualities: (a) religious faith, (b) help people in need, (c) hard work, (d) obedience, (e) environmental protection, (f) thrift, saving money and things. Village Size and Village Altitude was measured in capita and meters above sea level with statistical data provided by Indonesia's central statistics agency BPS.

- Distribution of Bags:

[7] Goldstein et al (2008) studied environmental behavior of hotel guests. Increasing the reuse of towels was more successful by descriptive norms such as "the majority of guests reuse their towels" than the general appeal by hotels that focused solely on environmental protection. However, this result could not be replicated in Germany pointing towards cultural effects in the effectiveness of norms.

To better understand the effect of the treatments *Social Norm*, *Indirect Monetary Incentive* and *Authority Endorsement* in the context of the project three different estimation approaches were used. Despite the random selection of shop owners, the decision whether they wanted to take the bags on consignment or not could not be based on a random selection, as it was obviously voluntary participation. As in many randomized controlled trials we have to deal with noncompliance. A solution to this problem is a statistical concept called intention-to-treat analysis (ITT). This is an unbiased way to estimate intervention effects in randomized trials for the population of all contacted (n=90) shop owners. It includes every subject who is randomized according to randomized treatment assignment and is unaffected by noncompliance, protocol deviations, withdrawal, and anything that happens after randomization. For measuring the usefulness of each treatment for an NGO, the number of approached shop owners, on which an effort has been spent is relevant. Therefore, from a policy perspective the ITT can be seen as the most relevant treatment effect since up-scaling the treatments would also lead to similar adherence and take-up. We can also make use of the random assignment of treatments to estimate a treatment effect on the treated (ToT) by using the random assignment as an instrumental variable for the likelihood to accept to take the eight bags on consignment and trying to sell them.

For the ITT Tobit estimation models were chosen. In these cases the use of Tobit is not due to erroneous measurement as the term "censored regression model" for Tobit suggests. In the application here the value for Bags Sold is likely to take 0 (lower limit) or 8 (upper limit), which is the maximum possible amount for bags being sold. In the case of 0 or 8, these values can be seen as corner solutions. As Wooldridge (2002, 517-520) points out, it is problematic to use OLS in this setting. Drawbacks of OLS for corner solution variables are possibly negative fitted values with OLS and constant partial effects.

- S1 Descriptive Statistics

The descriptive data presented in table S1 a indicates a tendency of more bags being sold in the case of treatment group "Authority Instruction" compared to "Social Norm" and "Monetary Incentive". There are higher numbers for no bags sold "Bags Sold (0)" in the case of "Social Norm" and "Monetary Incentive". 8 and 6 compared to only 2 for "Authority Instruction". Also for the highest amount of Bags Sold (8) there are 4 shops in treatment group "Authority Instruction" and only 1 in "Social Norm" as well as "Monetary Incentive". With 3.56 shop owners in treatment group "Authority Instruction" show the highest amount

of bags sold on average. The average for "Monetary Incentive" is only 1.80 and for "Social Norm" 1.74. There is only a minor difference in the average price shop owners charged for the bags. "Social Norm" and "Monetary Incentive" treated shop owner asked for approximately 3200 IDR, "Authority Instruction" shop owners charged 3000 IDR. On average the participation of the shop owners in the project is at 67%. It was 74% for "Social Norm" resulting in 20 participants, 58% for "Monetary Incentive" having 22 shop owners participating, and 72% for "Authority Instruction" with 18 participants. The difference in observations in between "Participation" and "Bags Sold" for "Social Norm" and "Monetary Incentive" results from four reporting errors. In those cases the documentation of sales did not meet the reporting standards which ensure comparability of sales across shops.

The descriptive analysis in Table S1.a already indicates certain results in regard to the hypotheses. It shows for the treatment "Authority Instruction" a lower count for zero Bags sold and a higher one for all 8 bags sold compared to the treatments "Monetary Incentive" and "Social Norm". Also the average amount of bags sold, is for "Authority Instruction" twice as much as for "Monetary Incentive" and "Social Norm". This shows support for H1 and H2, which say that "Authority Instruction" is more effective than "Social Norm" (H1) and "Monetary Incentive" (H2) in terms of spurring the sales of reusable bags.

Table S1.a

	Social Norm	**Monetary Incentive**	**Authority Instruction**	**Total**
Approached	(27)	(38)	(25)	(90)
Participation (survey only)	0.93 (25)	0.74 (28)	0.84 (21)	0.82 (74)
Participation (study and survey)	0.74 (20)	0.58 (22)	0.72 (18)	0.67 (60)
Bags Sold (0)	8 (19)	6 (19)	2 (18)	16 (56)
Bags Sold (8)	1 (19)	1 (19)	4 (18)	6 (56)
Bags Sold Average	1.74 (19)	1.80 (19)	3.56 (18)	2.20 (56)
Average Bag Price	3167 IDR (15)	3188 IDR (16)	2971 IDR (17)	3104 IDR (48)
Average Turnover	8767 IDR (15)	5667 IDR (15)	11412 IDR (17)	8734 IDR (48)

Value (No. of Observations)

Table S1.b

	Yes	**No**	**Total observations**
Have they come back to shop with the bag again?	87% (39)	13% (6)	(45)
Are the customers who are buying reusable bags wealthier than most people in the community?	0% (0)	100% (38)	(38)
Do they now use less plastic bags when buying at your shop?	43% (19)	57% (25)	(44)
Do some customers who did not buy a bag use less plastic bags now?	9% (3)	91% (32)	(35)
After starting to sell the bags, on average, did you have to give less plastic bags to your customers?	8% (3)	92% (36)	(39)

Value (No. of Observations)

Table S1 c displays descriptive statistics for the three treatment groups (columns (1), (2), and (3)) and reports p- (Fisher Exact Test) ,t-(T-test) and z-values (Mann-Whitney Test) when differences across groups are significant at the 5 percent level (columns (4),(5) and (6)).

Due to small sample correlations and potential selection into different treatments of the experiment there are a few significant differences for some characteristics in between treatment groups. With the help of the Mann-Whitney-Test we find that the level of education in the treatment group "Authority Instruction" is significantly lower compared to "Social Norm" and also compared to "Monetary Incentive". Shop owners in the treatment group "Monetary Incentive" rank "Religion" as a value higher than shop owners treated by "Social Norm".

Table S1.c

Treatment	(1) Social Norm	(2) Monetary Incentive	(3) Authority Instruction	(4) Monetary Incentive vs. Social Norm	(5) Social Norm vs. Authority Instruction	(6) Monetary Incentive vs. Authority Instruction	Test
Variable	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**				
Gender	.76 (.44)	.67 (.48)	.90 (.30)				Fisher-Exact
Age	48.38 (9.10)	45.70 (10.82)	49.55 (13.88)				T-test
Education	2.92 (.97)	2.93 (1.18)	2.15 (.88)		2.54	2.20	Mann-W-
Economic Assets	-.21 (.99)	-.06 (.99)	.36 (.98)				T-test
Religion	2.72 (1.43)	1.64 (.87)	2.45 (1.54)	2.86			Mann-W-
Village Size	2760.74 (1216.76)	3154 (1388.53)	3023.08 (1587.18)				T-test
Village Altitude	152.70 (101.48)	220.16 (224.91)	145.29 (89.36)				T-test

The effect of the informational poster and influence by the shop owners to reduce plastic bag use on customers who did not buy a reusable bag is reported as very low. A large majority of the customers, however, who bought an eco-friendly bag not only returned with the bag for the next shopping, but almost half of them reduced their plastic bag use according to self-reported measure from the shop owner. This indicates a potential effectiveness of the subsidized sale of eco-friendly reusable bags in terms of a more environmentally friendly behavior across the different interventions, at least, in the short-term.

- S2 Treatment effect on participants (naïve estimation without Instrumental variable)

In table S2.a the data of those shop owners not only approached but agreeing to participate in the project of selling reusable bags is being analyzed. The amount of observations ranges from 56 in Model (1) and (2) to 52 in Model (3) and (4). Although 60 shop owners were participating, in the case of 4 shops the distribution of bags did not fulfill our criteria securing

comparability of data across the shops. In these shops the time span for distribution and respective documentation of bag sales could not be monitored appropriately. The missing observations in model (3) and (4) stem from missing answers in the survey.

Not surprisingly the effect of the different treatments on reusable bags sold is very similar to the analysis in the ITT analysis in the previous section. The differences in significance level (only $p<0.05$ instead of $p<0.01$) and a smaller coefficient (3.1 instead of 4.1) for "Authority Instruction" vs "Monetary Incentive" are minor. So are the other results for the treatment effects on participant.

In model (3) the independent variables for socio-demographic and -economic factors "Gender", "Age", "Age2", "Education", "Economic Assets" and "Religion" are added to the model. It shows a highly significant ($p<0.01$) positive relationship in between the "Economic Assets" (Coeff.: 1.5),and "Bags Sold". There is also a weak significant ($p<0.1$) correlation in between Religion and "Bags Sold". All other variables do not show significant correlations. Furthermore, the amplitude (Coeff.: 2.7) and significance ($p<0.10$) of the treatment effects in "Authority Instruction vs. "Social Norm" has diminished in this extended model. In general the null hypothesis in this model can be rejected (Prob > Chi2: 0.0097).

In model (4) the variables "Village Altitude" and "Village Size" are added. However, they do not show any significant correlations to "Bags Sold". The results for the variables already included in model (3) do not change considerably due to the inclusion of the new variables. Only "Religion" is not significantly related to "Bag Sold" any more.

For only those shop owners participating in the project, the data supports the hypotheses H1 and H2, while there is no significant evidence for H3. "Authority Instructions" provide a more effective intervention fostering shop owners to sell eco-friendly reusable bags than "Social Norm" or "Monetary Incentive". Latter two perform equally and thereby reject hypothesis H2 which proposed "Monetary Incentive" to be more effective than "Social Norm". The significant ($p<0.1$) correlation with "Religion" in estimation model (3) supports H3. The control variable "economic assets" shows strong correlation with the sales of reusable bags. More wealthy shop owners hence sell more reusable bags. If a wealthier shop owner represents a more business skilled shop owner, and if the selling of reusable bags as argued in the intervention "Monetary incentive" is perceived as financially beneficial, this outcome

could be explained accordingly. Alternatively it can be argued along with findings from other studies that link wealth to environmental concern (e.g. Zelezny 2000, Franzen and Vogl 2013).

Table S2.a Naïve estimation of the treatment effect on participants

VARIABLES	(1) model	(2) model	(3) model	(4) model
Authority Instruction	3.017**		2.707*	2.380*
	(1.246)		(1.346)	(1.330)
Monetary Incentive	-0.109	-3.125**	0.676	0.525
	(1.229)	(1.227)	(1.255)	(1.280)
Social Norm		-3.017**		
		(1.246)		
Gender			0.565	0.530
			(1.291)	(1.267)
Age			0.171	0.122
			(0.374)	(0.371)
Age2			-0.00101	-0.000542
			(0.00362)	(0.00358)
Education			0.740	0.687
			(0.567)	(0.565)
Economic Assets			1.519***	1.603***
			(0.553)	(0.566)
Religion			0.646*	0.598
			(0.371)	(0.365)
Village Altitude				-0.000770
				(0.00301)
Village Size				0.000461
				(0.000324)
Constant	0.720	3.736***	-9.208	-8.906
	(0.892)	(0.862)	(10.33)	(10.38)
Prob > Chi2	0.0177	0.0177	0.0097	0.0123
Pseudo R2	0.0349	0.0349	0.0953	0.1068
Observations	56	56	52	52

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

- S3 Analyses for ratio of regular customer on total customer

Furthermore, the number of daily regular customers relative to the number of all daily customers should correlate positively to the number of reusable bags sold since a higher proportion of regular customers may imply a higher degree of bonding with the customer and hence a higher probability to sell a reusable bag. More importantly, from the point of view of the shop owner, a regular customer who comes with a reusable bag is more likely to reduce his expenses for plastic bags. This is in line with the Monetary Incentive intervention we implemented. Thus, in case our treatment worked as predicted we would especially expect a

positive correlation between selling of bags and the share of regular customer per total customer. Hence we estimate a Tobit regression for each treatment separately. Table S3.a confirms the expected relationship for the Monetary Incentive treatment.

Table S3.a Treatment effect on Participants

VARIABLES	(1) Social Norm	(2) Monetary Incentive	(3) Authority Instruction
Ratio regular customer/daily customer	2.761	5.255***	0.4347
	(1.799)	(1.695)	(2.684)
Pseudo R2	0.0896	0.214	0.0629
Observations	20	21	17

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4. Reducing Plastic Bag Use in Indonesia: Effective Economic and Normative Behavioral Interventions

Abstract: Indonesia is the second largest plastic polluter of the world's oceans. There are several regulatory policies for governments available, but in developing countries such as Indonesia they are often politically not feasible. We show in this article an analysis of alternative approaches available to the civil society, NGOs, and social enterprises to curb plastic bag use. 680 customers across 20 shops in 20 different rural Indonesian villages participated in our field experiment. We find in regard to our *Economic Interventions* – providing reusable bags either along a monetary *Bonus* scheme for frequent use, for *Free*, through a *Pay What You Want* (*PWYW*) scheme, or sold at *Cost* price – that reusable bags given to customers for *Free* are not suggesting a lower reported plastic bag use. Instead, the *Bonus* scheme, customers who paid the *Cost* price or a *PWYW* price, is associated with reduced plastic bag use. We further tested the influence of societal authorities – by a message encouraging to not polluting the environment through plastic bag use. This message was printed on the reusable bags and either signed by a local *Religious Authority*, a popular *Commercial Brand* or an *Environmental NGO*. Controlling for a number of socio-economic variables, results show a high effectiveness in reporting reduced plastic bag use only in the case of the bag signed by the local *Religious Authority*.

4.1 Introduction

To ensure pro environmental behavior, environmental policy instruments such as fees, taxes or bans have shown to be very effective in different countries. Among nations in Europe, Ireland introduced a tax on plastic bags in 2002 and within weeks the use of plastic bags reduced by 94% (New York Times 2008). San Francisco and Los Angeles banned the distribution of plastic bags which was recently followed by a California state-wide ban (BBC 2014). In other countries, such as, Rwanda, plastic bags have been illegal for many years (Teh et al. 2014).[8] Although these examples highlight the success of these environmental policies, they are not readily available in other policy contexts. It is not clear whether this is due to political reasons or conditions of institutional and regulatory framework and monitoring

[8] For an overview of regulations on reducing plastic bag consumption see e.g. Clapp and Swanston (2009)

capacities. The Indonesian government similarly still needs to resolve a number of environmental problems, one being the pollution of the environment by the disposing of plastic bags.

Our research looks at complementing alternative approaches or interventions for the civil society, NGOs, and social entrepreneurs with the aim to increase pro-environmental behavior. Along with explanations about the adverse effects of plastic bags towards the environment, the common basis of our interventions is the distribution of reusable bags to all customers in our field experiment. Osbaldiston and Schott (2012: 272) refer to such intervention that targets the reduction of contextual or infrastructural costs arise with changing of environmentally desired behavior as "making it easy". This category of interventions has shown to be successful in different environmental behavior situations (See e.g. Brothers et al. 1994, Ludwig et al. 1998).

We decided to analyze two groups of interventions – *Economic Interventions* and *Normative Interventions* (societal authorities) − that have shown promising results in earlier research. The aim of the study was to find out which of these interventions was the most effective in the reduction of plastic bag use in a rural Indonesian context. What would be better –a) provide reusable bags along with a monetary *Bonus* scheme for frequent use, b) *Free bags*, through a *Pay What You Want* scheme, or c) bags sold at *Cost* price? And which societal authorities[9] would be most effective in helping reduce plastic bag consumption when distributing reusable bags – a) *Environmental NGOs*, b) popular *Commercial Brand*s or c) local religious authorities? And finally, which of our interventions and basic socio-economic factors are associated with higher levels of *General Environmental Awareness*?

4.2 Empirical Studies, Theory and Hypothesis

A common approach used by economists to bring about a change in people's behavior is the provision of monetary incentives to individuals. In the majority of studies, that analyze financial interventions in the environmental behavior field, monetary or financial rewards result in improved environmental behavior (Cf. Toledo 2013, Gupta 2011). Mizobuchi and Takeuchi (2013) tested financial interventions to save electricity in Japanese households and

[9] Societal authorities need to be understood as a person or institution with the power to influence people's thinking or behavior in society.

proved their effectiveness. Gupta's (2011) field experiment on reducing plastic bags use which was conducted in 180 fruit and vegetable shops in India indicated that monetary incentives reduced plastic bag use by 5.5%. Gupta (2011) tested a bonus system by discounting 2% for customers who shopped without requesting a plastic bag. This intervention yielded the highest reduction of plastic bag use in her field experiment in Indian fruit and vegetable shops. Similarly incentives are frequently used in Payment for Ecosystem Service schemes (e.g. Engel 2016) or in (conditional) cash transfers which both have shown to be effective. Thus, as one intervention we chose to distribute bags using a *Bonus* scheme which involved one free reusable bag and small monetary rewards for their frequent use.

The other three interventions we applied were either giving a reusable bag for *Free*; providing a reusable bag based on a *Pay What You Want* scheme; or by offering one bag at *Cost* price. One question was "Does offering reusable bags for free provide a motivational effect thus increasing the use of the bag, or does it signal low value and result in a low valuation of it?" A low valuation of the bag may lead the customer to decrease the frequency of bag use? Hoffmann et al. (2009) studied the effectiveness of distributing free malaria bed nets in their article: "Do free goods stick to poor households?" They examined the problem of people reselling bed nets and the actual use of the distributed nets. They found that people neither sold the nets, nor was there any drop in the usage of the nets. In another study on the use of malaria bed nets, Cohen and Dupas (2008) found that the use of nets was the same for bed nets distributed for free and those sold at market price.

Assuming a rational economic actor, the *PWYW* mode would result in the same behavior as offering a good for free. It would not be considered rational to pay any positive price. Empirical research has shown, however, that actual behavior deviates from this assumption. Riener and Traxler (2012) give the example of a restaurant in Vienna, where food has been offered on the *PWYW* basis. They analyzed payments over a period of two years. Less than 1% of all payments were zero, the average payment was around 5€ (Riener and Traxler 2012: 476). Another case of *PWYW* has been analyzed by Gneezy et al. (2010). In a natural field experiment they offered souvenir photos at an amusement park in two different versions: At a fixed price and according to *PWYW*. Their results show that payments were the same in both cases. Concluding from these studies, a *PWYW* schemes may not be financially unsustainable after all. Another phenomenon in connection to *PWYW* is that customers apparently appreciate this form of participative pricing in a way that it attracts more customers over time

(Riener and Traxler 2012: 476), or leads to a greater intent to purchase (Chandran and Morwitz 2005) and to also use the reusable bag. A potential "warm glow" (Andreoni 1990), a term indicating the increase of one's own utility in altruistic behavior, might lead to a voluntary payment, as it could also support frequent use of the bag.

A disadvantage of the *Free* distribution mode is the high costs for the organization providing the scheme. In other words, it is not a financially sustainable approach. Offering a reusable bag at *Cost* price solves this issue. At the same time theory implies that the investment of purchasing a reusable bag is connected to the expected utility, hence a frequent use of the bag and therefore reduction of plastic bag use can be hypothesized.

From these theoretical empirical considerations we derive the following hypothesis in regard to the plastic bag use for the selected *Economic Interventions*. We believe the monetary rewards in the case of *Bonus* will be associated with significantly lower use of plastic bag than in the other *Economic Interventions* as the *Bonus* directly incentivizes not using plastic bags. Note that we conducted a baseline survey on plastic bag use with a randomized sample of customers not involved in any of our interventions. We further hypothesize, that customers in the treatment groups will use less plastic bags than those in the baseline survey control group.

Hypothesis H1:

Bonus < Cost ~ PWYW ~ Free < Baseline

The societal authorities chosen for this experiment can be attributed to the category "justifications", which aim at convincing people to change their behavior by explaining "why to do" a certain behavior (Osbaldiston and Schott 2012: 272). Other scholars speak of persuasion theory in this context (Cf. Jackson 2006: 106). Except for the treatment group *Plain Bag*, a uniform message "Don't hurt mother nature with plastic bags" was printed on all bags besides a treatment variation on *which authority* is giving that message. In a prominent experimental study Milgram (1974) showed the dramatic effect authorities can have in influencing people's behavior. Despite the questionable application of authority's power in Milgram's study, there are viable and desirable ways to promote pro environmental behavior. In the environmental behavior context, Chong et al. (2011) analyzed the influence of authority instructions on increasing recycling rates by sending SMS to the mobile phones of their

community. Authority endorsements have shown to affect and change behavior in some studies (Cf. Cialdini and Goldstein 2004). Chong et al. (2011) did not find any significant changes due to messages from authorities in their study. Considering that obedience to authority in the field of pro environmental behavior has hardly been studied so far, but knowing about its important role in the Asian, Indonesian and Balinese socio-cultural context (Cf. Lansing 2006, Spranz et al. 2012, Hofstede 2014), we choose different societal authorities – *Environmental NGO*, *Commercial Brand* and *Religious Authority* – as more promising agents for change and compared their effectiveness in persuading customers to use less plastic bags. The messages were printed on the bag and randomly distributed to participating customers. There is not much evidence yet on the relative and absolute effectiveness of these interventions. The reasons for including them are summarized below.

Environmental NGOs have often been a source for spurring pro-environmental changes not only in corporations and governments, but also in the behavior of individuals (Cf. Rootes 2013). Despite the fact that international NGOs play an important role in nature protection in Indonesia, they rarely have a large impact on individual consumption choices. However, in the context of globalization of environmental discourses, environmental NGOs might inspire people towards a more environmental friendly behavior.

The valuation of consumer goods has strongly increased since the fall of the authoritarian regime of Suharto at the end of the last century. It has become more accessible to define one's social status by material consumption patterns. Different commercial brands have therefore gained substantial influence on people's choices (Herabadi et al. 2009, Spranz et al. 2012)

The selection of a religious authority as a relevant societal authority is based on the central role of religion in the life of most Indonesians. Despite different religions across Indonesia - the majority believing in Islam – Bali is e.g. predominantly Hindu; the great importance of religion informing people's behavior is similar throughout Indonesia (Cf. Cf. Lansing 2006, Spranz et al. 2012). The relevance of religion for pro environmental and social behavior has also been supported by studies of Norenzayan and Shariff (2008) and St John et al (2011).

Hypothesis 2 therefore argues that in Indonesia the impact of *Religious Authority, Commercial Brand* and *Environmental NGO* are effective in reducing plastic bag use compared to a plain bag without any message and the customers in the baseline survey.

Hypothesis H2:

Religious Authority ~ Commercial Brand ~ Environmental NGO < Plain Bag < Baseline

We further hypothesize that customers with higher *General Environmental Awareness* use less plastic bags. There are a number of studies showing that environmental norms and concerns promote environmental behavior (see e.g. Nordlund and Garvill 2002). In the value-belief-norm (VBN) theory of environmentalism moral obligations based on environmental values are considered to be a driver of environmental behavior (Cf. Stern et al. 1999). As a result of our interventions and the additional basic information given to the customers on the negative effects of plastic bag use, we also need to consider the possibility of an effect on the environmental awareness of the customers. This will be included in our analysis.

Apart from the interventions in our experiment we include basic socio economic factors, such as *Age*, *Gender*, *Education* and *Economic Assets* as explanatory factors in our analysis. In a meta study on the influence of age on environmental behavior Van der Hertel et al. (2013) found only few results with significant effects. These studies indicated that older people behave more environmentally friendly. Women in most studies show better environmental behavior (e.g. Hunter, Hatch and Johnson 2004), although there is variation across the specific context (Dalen and Halvorsen 2011). In case of waste generation women appear to perform better (Reschovsky and Stone 1994, Berglund 2006). In terms of education evidence suggests a relationship with higher education levels of a person and more environmentally friendly behavior (e.g. Meyer 2015). In their literature review, on environmentally friendly purchase behaviors, Fisher, Bashyal and Bachman (2012) identify strong variations linked to income levels, from negative to non-significant to significant correlations. The picture becomes clearer once the broad label of environmental behavior is replaced by an analysis of specific environment related behavior. Fisher et al. (2012) found that choosing green products and separating waste for recycling is positively linked to income levels. Considering the waste related nature of the plastic bag problem we may expect a reduced plastic bag use for people with a higher economic status.

4.3 Material and Methods

4.3.1 Experimental Context

Plastic bags make up 9.4% of the world's coastal litter. Indonesia is the second largest contributor to plastic marine pollution (Jambeck et al 2015). More than a million birds, marine mammals and turtles die from ingesting plastics each year (Jeftic et al. 2009). Further research still has to clarify how micro plastics impact the health of different species, the marine food web and human health. But there are a growing number of studies suggesting that there are adverse health effects ranging from nano-organisms to whales to human beings (Cf. Andrady 2001, Thompson et al. 2009).

As in many developing countries, Indonesia has a large number of small shops providing products for everyday life to local people: Fruits, vegetables, water, snacks, rice, tobacco, sodas, coffee, sweets, shampoo etc. Frequently these shops are part of the family's home and only a couple of neighbors shop there each day. But many shops have also up to 100 customers a day. In Indonesia such a small shop is called a *warung*. Although the exact number of *warungs* that exist in Indonesia is not known it is safe to assume that there are more than 100,000 *warungs* serving the 230 Million people living on the Archipelago (Portal Nasional Republik Indonesia 2014). Even though an increasing amount of franchising in Mini-Markets and Super-Markets are taking over, traditional *warungs* and markets still account for more than half of Indonesians grocery shopping (USDA 2013). Hence *warungs* are more likely to be among the largest sources for the distribution of plastic bags in the country.

Since most people in developing countries live in rural areas the location chosen for the natural field experiment was the local area of Gianyar Regency in Bali. This area stretches from the coast up to the mountains and represents a rural area of East Bali away from the tourism dominated south of the Island (see Appendix A). In order to assure that the areas were rural, only villages with less than 10,000 inhabitants were accepted for entry into the sample. Out of this sample villages were randomly selected. In each village one of the largest *warungs* was approached and asked to participate in the project. If the shop owner rejected participation another *warung* was asked to participate if it met our participation criteria. For each of the 20 shops 35 customers were targeted to participate in receiving a reusable bag, hence a target of 700 customers. The shop owners and customers were approached by the

staff of ecoBali, a Balinese environmental organization informing them about the possibility of receiving a reusable bag and the negative effects of plastic bag consumption as part of their mission to work for a better environment on Bali. At all participating shops we put up a poster with information on the negative effects of plastic bag pollution (See Appendix B). Depending on the interventions shop owners were given further information about complying with the intervention design.

The output we focused on in our analysis is the frequency of plastic bag use as well as the participation rate in our study. However, to environmental NGOs environmental awareness is often a major goal of their work. To learn more about environmental awareness, aside from plastic bag use frequency we therefore scrutinize correlations of our interventions and socio-economic variables with *General Environmental Awareness*.

All of the data has been collected with the help of surveys. Surveys for customers and all communication with, including communication material for the shop owners was in Indonesian (Bahasa Indonesia). The design of the natural field experiment applied has been developed by the authors of this study in cooperation with ecoBali.

4.3.2 Experimental Interventions

Using a field experiment this research analyzes different interventions targeting randomly selected shop customers to reduce the use of plastic bags (main outcome variable). An important advantage of field experiments is the high external validity since outcomes are investigated in a natural setting rather than a contrived laboratory environment. The interventions of the field experiment are designed along two different types: *Economic Interventions* and *Normative Interventions* based on endorsements from societal authorities. For further analysis a baseline survey for randomly selected participants, who did not take part in any treatment had also been included at the time of distributing the bags. All other customers were surveyed after four weeks, at the end of the experiment. We followed an experimental matrix structure (see Appendix C); in which each bag was part of one economic and one normative intervention.

4.3.2.1 Economic Interventions

The four *Economic Interventions* were implemented defined the mode of distribution of the reusable bags. The treatments have been (1) *Bonus*: a scheme in which we rewarded the customer with 5,000 IDR (=40 US-Cents) for using the reusable bag at least 5 times within two weeks at the shop in which we distributed the bag. The shop owner had a list with the customer who received reusable bags to record the customer if using the reusable bag and no plastic bag for taking their purchase. The reusable bag was given for free to the customers in the *Bonus* treatment. (2) For *Free*: In this treatment group customers received the reusable bag for free. (3) *Pay What You Want* contribution: Customers were offered the bag for any price they wanted to pay. It was also possible to not pay anything. (4) At *Cost* price. In this treatment the reusable bags were sold for 2,000 IDR (=16 US-Cents). The *Economic Interventions* were applied by random selection on village/shop level. Hence in each village/shop only one economic intervention was in effect. In sum there have been 5 villages/shops for each economic treatment. It is important to note that there is a potential selection bias into the economic intervention groups. Customers were informed about whether they would receive a bag based on *Bonus*, *PWYW*, *Free* or *Cost*, before they committed to participation. Participation was targeting 175 customers per intervention group. Results show that the amount of customers approached in order to attain this participation varied significantly. Because of this, there is a chance for omitted variables and biased selection into the treatment groups. We will therefore interpret the results as suggestive evidence. Additionally, our analysis gives an unbiased estimate of the likelihood to participate in the study which is an important component of overall effectiveness of a treatment. A very effective treatment with only few volunteers may not be as "good" as a treatment which has higher acceptance but is less effective in reducing plastic bag use.

4.3.2.2 Normative Interventions

The *Normative Interventions* based on societal authorities consisted of a quote printed on the distributed reusable bags. The quote was in Indonesian language and in translation says: "Don't hurt mother nature with plastic bags". The quote was respectively signed by one of the societal authorities: (1) Director of Greenpeace Indonesia, representing the *Environmental NGO*; (2) Director of BlackBerry Indonesia, representing the Commercial Brand, and (3) Ida Pedanda Gede Made Gunung, a popular Balinese Hindu priest, representing the *Religious Authority*. All authorities approved to this experimental design. We used a reusable bag without print as a control treatment (4). Customers were given the reusable bag - after they

agreed to participate – with the help of a lottery. The customer had to take a piece of paper out of a bowl on which it then stated which bag they would get. The application of the normative intervention was hence randomized on customer level. Since customers did not know which normative treatment group they would get selected into, there is no selection bias as no one dropped out after receiving a specific bag[10], and we can interpret our results as causal relationships.

4.3.3. Eco Friendly Reusable Bags

As eco-friendly reusable bags we chose locally produced bags, made of polypropylene spunbond material. We first wanted to use canvas bags, but our pre-test showed that canvas material is being perceived as a bag material too valuable to use it for daily grocery shopping. Although being a less environmentally friendly fabric than canvas, the expectation of a more frequent use of the spunbond bags as an alternative to plastic bags, has resulted in spunbond bags to be the overall more eco-friendly choice (See Appendix D). The colors blue with green for the bags were also chosen based on pre-testing. The size of the bag makes sure that bigger shopping items could also be carried along.

4.4 Results

4.4.1 Participation

Due to the number of treatments and the estimated sample size required to identify significant differences, our target was 35 participants for each shop and village that had been randomly selected in the regency of Gianyar, Bali. We selected 20 shops from 20 different villages. This adds to a target of 700 customers overall. In order to achieve this participation we had to approach 1,141 customers. The participation in the *Economic Interventions* was decided contingent on knowing whether they would get a reusable bag for *Free, PWYW, Bonus* or *Cost*. We expect that there should not be any differences between *Free, PWYW* and *Bonus* while more people would need to be approached for *Cost* – and hence the composition of people's characteristics in the Cost treatment might be different. The participation rate for the different treatments was as follows: reusable bags through the *Bonus* treatment resulted in 175 participants for which 228 customers had to be approached (77%). The *Free* Bag needed 253

[10] If customers asked, we rationalized this approach by saying that we only had limited bags from each of our supporters and thus needed to allocate them in a fair way. According to our team of interviewers people were neither disappointed by a specific bag nor did they favor one of the bags explicitly.

customers to be approached in order to attain the target of 175 participants (69%). In the *PWYW* intervention group 328 customers were approached, 175 participated (53%). For *Cost* we could not attain the target of 175. Only 155 customers participated. 322 customers were approached (48%). Since the customers have always been part of a normative and an economic intervention in line with a matrix structure, the overall participation rate was 680 out of 1,141 customers approached (60%). Participation rates are significantly different from each other, except for the difference in between *Cost* and *PWYW* (Appendix E). The differences in the participation rate seem to be driven by the (expected) payment for the bag including a potential bonus. The different selection due to the economic treatments also triggered some difference in observable characteristics of participants.

To make sure that the observed results are due to the treatment effect and not due to sampling bias, we needed to understand first whether there are significant differences for the control variables across the baseline group and all other treatment groups (see Table 1). Based on the matrix design of economic and normative treatments the Sidak-adjusted multi comparison test method is chosen to help control for type I error. The results of Sidak analysis (see Appendix F) show significantly more female than male (*Gender*) customers in the *Cost* group than in the *Free* group (Appendix F.1). The *Education* levels significantly lower for *Bonus* customers than those in the *PWYW* treatment group (Appendix F.2). Furthermore the means of the *General Environmental Awareness* levels are significantly higher for customers in the *Bonus* Bag group compared to the Baseline (Appendix F.3). Plastic Bag Pollution Awareness is also significantly higher in *Bonus* and *Free*, compared to the Baseline (Appendix F.4).

Table 1: Mean and Std. Dev Values for independent variables across Baseline and all Treatment Groups.

Treatment	(1) Baseline Survey	(2) Plain Bag	(3) Religious Authority	(4) Environ-mental NGO	(5) Commer-cial Brand	(6) Free	(7) Bonus	(8) PWYW	(9) Cost
Variable	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**	**Mean (Std. Dev.)**
Gender	.66 (.47)	.70 (.46)	.68 (.47)	.73 (.45)	.65 (.48)	.61 (.49)	.64 (.48)	.69 (.46)	.81 (.39)
Age	37.97 (11.97)	38.06 (10.74)	37.70 (10.94)	35.86 (10.09)	36.15 (11.05)	38.49 (9.47)	34.97 (11.44)	36.76 (10.84)	37.77 (10.86)
Education	2.77 (1.00)	2.99 (.96)	2.95 (.95)	2.9 (.93)	2.92 (.99)	2.93 (.96)	2.73 (.94)	3.11 (.87)	3.00 (1.02)
Economic Assets	-.12 (.93)	-.10 (.97)	.09 (1.06)	-.03 (1.02)	-.01 (1.03)	-.02 (1.00)	-.08 (1.01)	.12 (1.00)	.13 (1.05)
Environmental Awareness	2.78 (.65)	2.97 (.49)	2.93 (.54)	2.98 (.53)	2.95 (.47)	2.96 (.44)	3.08 (.50)	2.90 (.56)	2.89 (.51)
Environmental Awareness PB	2.92 (.67)	3.12 (.44)	3.04 (.50)	3.07 (.50)	3.06 (.46)	3.15 (.36)	3.14 (.42)	2.95 (.48)	3.05 (.58)

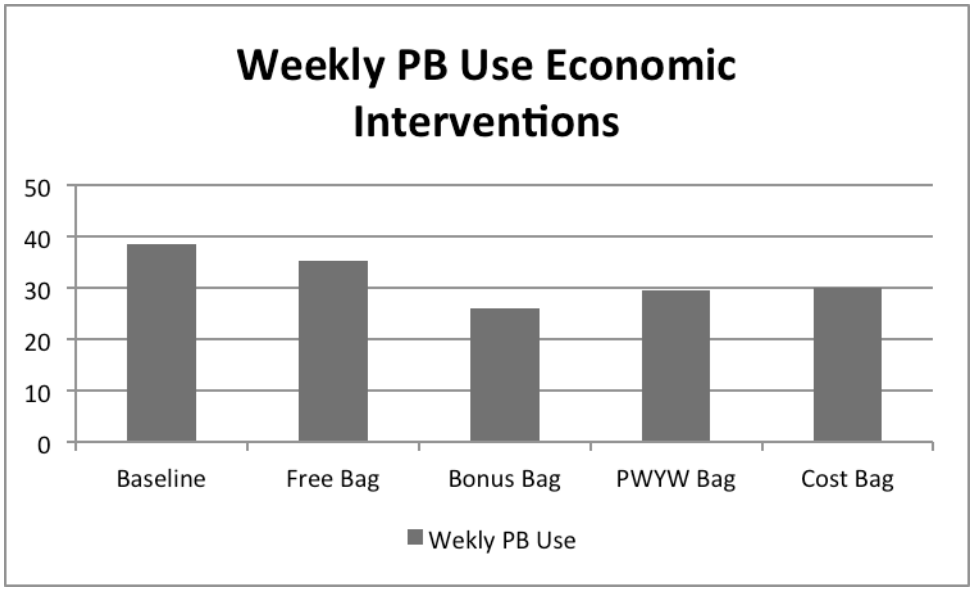
Notes: Sidak analysis (see Appendix F) shows significant differences for the composition of male and female (Gender) in between the *Cost* and *Free* group, for education levels in *Bonus* and *PWYW* treatment groups, for *General Environmental Awareness* levels in *Baseline Survey* and *Bonus*, for *Plastic Bag Pollution Awareness* in *Baseline Survey* and *Bonus* and *Baseline Survey* and the *Free* intervention group.

4.4.2 Descriptive Statistics

Before presenting the results of the descriptive statistics for the average use of plastic bags per week (*Weekly PB Use*), we provide the results on actual amounts paid in the *PWYW* scheme compared to the *Cost* treatment. The amount paid by customers in the *PWYW* ranged from 0 IDR (37 customers) to 10,000 IDR (= 80 US-Cents; 15 customers). The mean payment of customers in the *PWYW* group was 2,866 IDR (= 23 US-Cents) which is significantly (1% level, see Appendix G) more than the amount charged for the bag in the *Cost* group (2,000 IDR = 16 US-Cent).

The descriptive data on *Weekly PB Use* was obtained with the help of our surveys. We compared these values with the Baseline Survey, before the treatments were implemented, and all Economic and Normative Treatments (see Appendix H for a table presenting the exact values). The average weekly use of PB is, in the case of all economic treatments, lower than in the baseline survey (Figure 1). The lowest use is reported in the *Bonus* Bag treatment group. The highest PB use among the treated customers is for the *Free* Bag group. The average uses for *PWYW* and *Cost* group customers are very similar and in between the *Free* and *Bonus* Bag group.

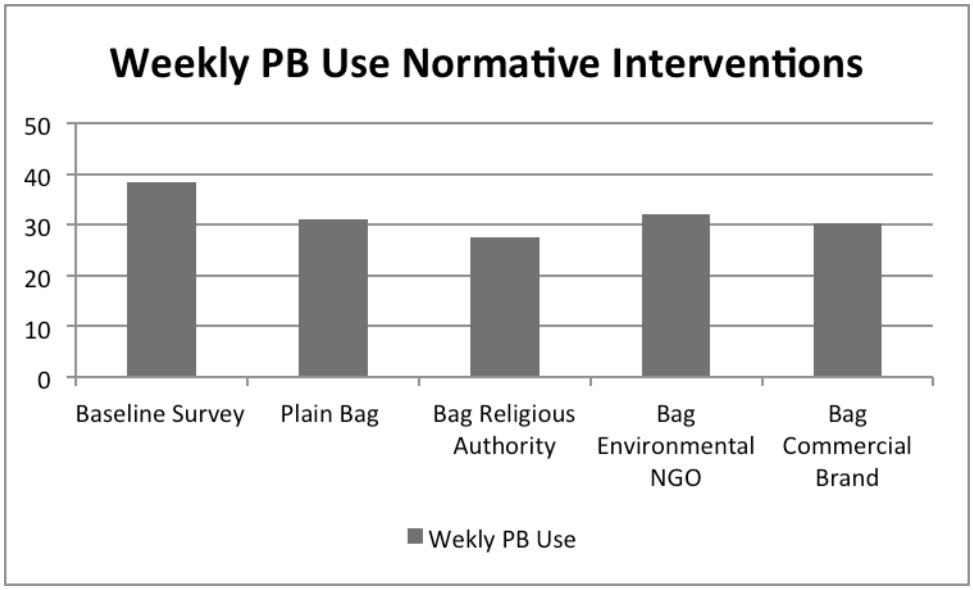
Figure 1: Weekly PB Use economic interventions



In Figure 2 the Normative Treatments show the highest use of PB per week, on average 38, for the baseline survey group. While in all other normative treatments as well as the control bag (plain bag without printed quote on the bag) the use of PB is at least 6 pcs less per week

than in the baseline survey, the biggest difference is in regard to the treatment group which received the reusable bag with the quote signed by the *Religious Authority*. These customers used on average 10 less bags.

Figure 2: Weekly PB Use for normative interventions



4.4.3 Plastic Bag Use

4.4.3.1 Economic Interventions

In the following section we present the results of the regression analysis of *Weekly PB Use* and *General Environmental Awareness* across the interventions and socio-economic factors. In Table 2 we analyze *Weekly PB Use* of the economic treatment groups against the baseline group. We find that being in *Bonus* (10 less plastic bags, significant at 1%), *PWYW* and *Cost* treatment (7 less plastic bags at the 5% and respectively 10% significance level) is significantly associated with less plastic bag usage. Furthermore, our results suggest that better educated customers and customers with a higher concern for general environmental and plastic bag pollution use significantly less plastic bags (see Table 2). Although there is an attempt to control for some observable characteristics the treatment effects are not unbiased estimates as the participation in the treatment was voluntarily. Yet, the relatively high participation rate in the bonus coupled with the strongest effects in the reduction of plastic bag use suggests that this intervention is most effective.[11]

[11] An intention-to-treat analysis would only be feasible with the additional assumption that all non-participants would use on average the same number of plastic bag as those from the baseline group. As this is too speculative we refrain from extrapolating their usage for the non-complier in our study.

Table 2: Regression results for weekly plastic bag use across *Economic Interventions*, socio-economic variables and environmental awareness.

VARIABLES	(1) Weekly PB Use	(2) Weekly PB Use	(3) Weekly PB Use
Bonus	-12.27***	-12.99***	-9.690***
	(3.384)	(3.520)	(3.546)
Free	-3.158	-3.031	-0.263
	(4.381)	(4.440)	(4.511)
PWYW	-8.964**	-7.931**	-7.354**
	(3.598)	(3.646)	(3.516)
Cost	-8.405**	-8.102**	-7.164*
	(3.781)	(3.844)	(3.749)
Gender		2.322	2.560
		(2.605)	(2.589)
Age		-0.187	-0.181
		(0.114)	(0.112)
Education		-3.459**	-3.191**
		(1.455)	(1.436)
Economic Assets		0.429	0.839
		(1.210)	(1.197)
Environmental Awareness			-5.229*
			(2.767)
Environmental Awareness PB			-6.586***
			(2.514)
Constant	38.39***	53.63***	86.38***
	(2.817)	(8.198)	(9.280)
Observations	560	550	544
R-squared	0.026	0.042	0.082

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

We also tested our Hypothesis H1 (see Appendix I.1-I.4) for *Bonus* being associated with significantly less reported plastic bag use than in the other *Economic Interventions* and the Baseline Survey. There is evidence supporting *Bonus* > Baseline Survey (Appendix I.1) and *Bonus* > *Free* (Appendix I.3), however, there is no significant evidence suggesting *Bonus* > *Cost* (Appendix G.2) or *Bonus* > *PWYW* (Appendix I.4). We further hypothesized a lower plastic bag use for customers in *PWYW*, *Cost* and *Free* than in the Baseline Survey. While we found evidence supporting a lower *Weekly PB Use* for the customers in *Cost* and *PWYW* (Appendix I.5 and I.7), there is no evidence that customers who received a bag for free used less plastic bags than customers in the baseline group (Appendix G.6).

4.4.3.2 Normative Interventions

Comparing the *Weekly PB Use* for all *Normative Interventions* after the four weeks duration to the baseline survey, we find a significant decrease of plastic bag use for all treatment groups. If socio-economic variables and environmental awareness are included only the *Religious Authority* show significantly lower plastic bag use (9 less plastic bags per week, 1% significance level. The results show further that better educated customers, as well as customers with higher concern for general pollution as well as plastic bag pollution use significantly less plastic bags (6 less plastic bags, 5% significance level). (See Table 3)

Table 3: Regression results for weekly plastic bag use across *Normative Interventions*, socio-economic variables and environmental awareness.

VARIABLES	(1) Weekly PB Use	(2) Weekly PB Use	(3) Weekly PB Use
Plain Bag	-7.334*	-6.224	-3.853
	(4.186)	(4.356)	(4.352)
Environmental NGO	-6.446*	-7.532**	-5.471
	(3.580)	(3.617)	(3.535)
Commercial Brand	-8.179**	-8.057**	-6.042
	(3.802)	(3.808)	(3.766)
Religious Authority	-10.90***	-10.44***	-9.149***
	(3.530)	(3.548)	(3.475)
Gender		2.161	2.106
		(2.606)	(2.595)
Age		-0.159	-0.161
		(0.113)	(0.111)
Education		-3.189**	-3.071**
		(1.432)	(1.423)
Economic Assets		0.373	0.787
		(1.192)	(1.181)
Environmental Awareness			-5.894**
			(2.720)
Environmental Awareness PB			-6.004**
			(2.459)
Constant	38.39***	51.95***	85.73***
	(2.817)	(8.123)	(9.371)
Observations	560	550	544
R-squared	0.018	0.033	0.074

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

From our Hypothesis H2 we expected all interventions by societal authorities – *Religious Authority*, *Environmental NGO* and *Commercial Brand* – and the *Plain Bag* to significantly

reduce plastic bag use as compared to the Baseline survey. Our analysis in Appendix I.8 - I.11 shows evidence supporting this hypothesis with significant results. However, the second part of the hypothesis – less *Weekly PB Use* for customers in intervention groups of societal authorities compared to customers in the *Plain Bag* intervention group – is rejected by our data. AppendixI.12 – I.14 shows that there are no significant differences.

4.4.4 General Environmental Awareness

In this section we examine the correlation of *General Environmental Awareness* with our interventions. Aside from the *Economic* and *Normative Interventions* we include selected socio-economic variables in our analysis.

We find that customers in the *Bonus* treatment group are associated with significantly higher *General Environmental Awareness* than those in the baseline group (see Table 4). For the other *Economic Interventions* there is no such correlation. For socio-economic variables we find evidence that customers with more valuable *Economic Assets* and higher *Education* are significantly more environmentally aware. Since those wealthier and more educated people are not more likely to select into the *Bonus* treatment we suggest that the higher awareness in the *Bonus* treatment most likely arises from the positive incentives associated with the purchases using the reusable bag.

Table 4: Correlation results for environmental awareness across *Economic Interventions, Normative Interventions* and socio-economic variables

VARIABLES	(1) Environmental Awareness
Bonus	0.1497***
Free	0.0408
PWYW	-0.137
Cost	-0.0250
Plain Bag	0.0539
Environmental NGO	0.0550
Commercial Brand	0.0325
Religious Authority	0.0109
Gender	-0.0088
Age	-0.0356
Education	0.1030**
Economic Assets	0.1297***

*** p<0.01, ** p<0.05, * p<0.1.

In regard to the *Normative Interventions* there is no significant correlation in between *General Environmental Awareness* and any of the treatments. Only *Economic Assets* and *Education* show a significant correlation with *General Environmental Awareness* at the 1% and 5% level (see Table 4).

4.5 Discussion and Conclusions

The first important finding of our research has been the participation rates for our Economic Interventions. Since customers agreed to participation only after they knew whether they would a) receive a free bag along with a bonus payment for frequent use, b) just got the bag for free, c) paid a voluntary contribution for the bag or d) had to pay its cost price; it is not surprising that participation rates were highest for *Bonus* and lowest for *Cost*. Rather

unexpected were the frequent rejections for participation despite just receiving a reusable bag for free, or even along with a potential reward payment. Around one fourth of customers approached rejected participation in the Free and Bonus interventions. Despite customers in *PWYW* being able to also receive a bag for free, participation rate was much lower and similar to the *Cost* customers. For both almost half of the customers approached rejected participation. Because of this selection into the economic treatment groups there is a potential selection bias with omitted variables. Our results hence show an analysis of customers willing to participate in the respective treatments, with only suggestive evidence on their effectiveness in plastic bag reduction.

From past research and theoretical considerations we formed the hypothesis (H1) expecting *Bonus* with monetary reward payments to be significantly associated with less plastic bag use than all other *Economic Interventions* including the customers in the baseline. This hypothesis could only partially be supported. *Bonus* customers show less plastic bag use than *Free* customers, or people in the baseline, however, there is no significant difference to *PWYW* and *Cost* in terms of *Weekly PB Use.* Yet, given the much higher participation rate in the *Bonus* treatment as well as its association with higher environmental awareness, we believe that the *Bonus* treatment is most effective in stimulating less plastic bag use in Indonesia. However, it is also more costly due to the subsidy and the administrative burden of paying the bonus.

Although we expected that the reusable bag distributed for free would have a smaller effect than *Bonus*, we did not hypothesize that it had no effect on plastic bag reduction. This is an important insight for NGOs, government bodies or enterprises who consider giving out free reusable bags in order to reduce plastic bag pollution. However, we do not want to overgeneralize, since a number of contextual factors in the distribution design may affect results. For example, giving out the reusable bag by the shop owner instead of the Balinese environmental organization ecoBali could yield higher results. Nevertheless, in light of the higher costs associated with a campaign giving out reusable bags for free, our results indicate that this is not a cost-effective way to reduce plastic bags use. Arguing from a cost-effective perspective, our results in regard to H1 also indicate that the extra money spent on *Bonus* – in terms of the bonus reward payments – may not be justified when considering results for the *Cost* and *PWYW* treatment. The income from *Cost* and *PWYW* interventions reduces costs of the interventions, there are no bonus payments hence other costs part of the intervention, and customers in both interventions show there is no significant difference in *Weekly PB Use*

compared to the *Bonus* customers. There may however be additional costs involved in terms of lower participations rate in these treatments and therefore higher costs for a similar outreach and participation as in *Bonus* or the *Free* interventions. The results provided in our analysis hence need to be combined with the specific cost of actors willing to implement a similar approach in order to find most cost-effective approaches in their context.

The results of our *Normative Interventions* – the potential of societal authorities to support the reduction in plastic bag use through environmental messages printed on reusable bags – support hypothesis that customers in *Environmental NGO*, *Commercial Brand* and *Religious Authority* treatment groups report significantly less plastic bag use than customers in the baseline survey (H2). While there is a significant decrease for all treatment groups in reported plastic bag use if only the interventions are analyzed, this effect is not confirmed if other socio-economic factors are included in the analysis. It is also surprising that the plain bag without printed message performs equally as well as the reusable bags with printed quotes by the societal authorities. Including the socio-economic and environmental awareness variables, the only effective normative intervention compared to the baseline has been the reusable bags with the printed quote by the Hindu *Religious Authority*. Customers who received a reusable bag with the printed quote by the *Religious Authority* reported a reduction of 10 plastic bags per week. We can therefore recommend environmental NGOs and social enterprises to consider working with religious authorities who share common goals. Our results confirm, what previous qualitative studies have argued. Religious authorities play an important role of reference to people's attitudes and behavior in Bali. Therefore, it seems reasonable for civil society organizations to join with religious leaders, when organizing their campaigns. From a scientific perspective it would be worthwhile to explore this opportunity of joining efforts with religious authorities in other Indonesian societies, and also other countries with a similar relevance of religion to people's lives.

Out of the basic socio-economic variables we included in our analysis we only found that higher educated customers reported a reduced plastic bag use, being independent from *General Environmental Awareness*. This corresponds to other research which finds that better educated individuals behave more environmentally friendly. Similar to other studies on environmental behavior we also did not find that *Age* affected plastic bag use. Furthermore, our results do not confirm a tendency found in other research that women behave environmentally more friendly. Also economic status did not seem to affect plastic bag use

although it is correlated with higher environmental awareness. From the results of socio-economic variables we can draw two main conclusions for environmental organizations. First, increasing education levels might reduce plastic bag use. Second, resources will be used most effectively if the approach we tested is targeted towards better educated customers.

Customers, who are more environmentally aware and especially aware about plastic bag pollution, report lower levels of plastic bag use irrespective of the specific treatment they had been exposed to. This is not too surprising and it confirms the evidence that raising environmental awareness could be a powerful tool for environmental organizations to use in Bali. To find out more about environmental awareness, we analyzed correlations of *General Environmental Awareness* with our interventions and socio-economic variables. In regard to our *Economic Interventions* we found a significant correlation to *Bonus*. A possible explanation for this is a self-selection of more environmentally aware customers into *Bonus* treatment group. This is however unlikely as the Bonus had the highest participation rate and one would rather expect that people with high environmental awareness would be willing to pay for a re-usable bag and thus that more environmental aware subjects should be found in the Cost and PWYW treatment. More likely it is that providing the reusable bag and bonus incentive has led to an increase in self-reported environmental awareness. We did not find other significant correlations to *General Environmental Awareness* neither for the other *Economic Interventions*, nor for the *Normative Interventions.* There is a significant correlation, however, to higher educated (*Education*) and wealthier (*Economic Assets*) customers. Efforts to improve education and economic status may therefore be associated with higher levels of environmental awareness, which – as our study has shown – has an effect towards customers reporting a lower use of plastic bags. Our finding that higher economic status is related to higher levels of environmental awareness is in line with the hypothesis put forward by the environmental Kuznets curve: after a tipping point an increase in income per capita is related to better environmental quality (Cf. Yandle, Vijayaraghavan and Bhattarai 2002).

Strong monetary incentives, such as the *Bonus* scheme, however not the distribution of free bags, suggest a lower amount of reported plastic bag use. Other more cost-effective options for environmental organizations are the cost-effective distribution schemes – selling bags at *Cost* price or by *PWYW*. When it comes to finding a social authority as an effective partner for the approaches tested in our research, the most significant and largest reduction in

reported plastic bag use is achieved when cooperating with the normative messages by religious authorities. We hope that these results will contribute to the design of more effective campaigns by environmental NGOs, initiatives and enterprises to significantly reduce the use and pollution by plastic bags.

References

Andrady, Anthony L. 2011. “Microplastics in the marine environment.” *Marine Pollution Bulletin* 62 (8): 1596–605.

Andreoni, James. 1990. “Impure Altruism and Donations to Public Goods: A Theory of Warm-Glow Giving.” *The Economic Journal* 100 (401): 464–77.

BBC. 2014. “California imposes first state-wide plastic bag ban.” Accessed November 04, 2014. http://www.bbc.com/news/world-us-canada-29435813.

Brothers, K. J., and P.J a. M. L. Krantz. 1994. “Office paper recycling: A function of container proximity.” *Journal of Applied Behavior Analysis* 27: 153–60.

Chandran, Sucharita, and Vicki G. Morwitz. 2005. “Effects of Participative Pricing on Consumers’ Cognitions and Actions: A Goal Theoretic Perspective.” *Journal of Consumer Research* 32 (2): 249–59.

Chong, Alberto, Dean S. Karlan, Jeremy P. Shapiro, and Jonathan Zinman. 2011. “Tried and True? The Contextual Specificity of "Proven" Approaches to Behavioral Change.” Accessed January 30, 2013. http://www.povertyactionlab.org/publication/tried-and-true-contextual-specificity-%E2%80%9Cproven%E2%80%9D-approaches-behavioral-change.

Cialdini, R. B., and N. J. Goldstein. 2004. “Social influence: compliance and conformity.” *Annu Rev Psychol* 55: 591-621.

Clapp, Jennifer, and Linda Swanston. 2009. “Doing away with plastic shopping bags: international patterns of norm emergence and policy implementation.” *Environmental Politics* 18 (3): 315–32.

Cohen, Jessica, and Pascaline Dupas. 2008. “Free Distribution or Cost-Sharing? Evidence from a Randomized Malaria Prevention Experiment.” Accessed December 18, 2012. http://ipl.econ.duke.edu/bread/papers/working/169.pdf.

Dalen, Hanne M., and Bente Halvorsen. 2011. “Gender differences in environmental related behavior.” https://www.ssb.no/a/english/publikasjoner/pdf/rapp_201138_en/rapp_201138_en.pdf.

Fisher, Caroline, Shristy Bashyal, and Bonnie Bachman. 2012. “Demographic impacts on environmentally friendly purchase behaviors.” *Journal of Targeting, Measurement and Analysis for Marketing* 20 (3): 172–84.

Gneezy, A., U. Gneezy, L. D. Nelson, and A. Brown. 2010. “Shared Social Responsibility: A Field Experiment in Pay-What-You-Want Pricing and Charitable Giving.” *Science* 329 (5989): 325–27.

Gupta, Kanupriya. 2011. “Consumer Responses to Incentives to Reduce Plastic Bag Use: Evidence from a Field Experiment.” http://www.sandeeonline.org/uploads/documents/publication/954_PUB_WP_65_Kanupriya_Gupta.pdf.

Herabadi, Astrid G., Bas Verplanken, and Ad van Knippenberg. 2009. "Consumption experience of impulse buying in Indonesia: Emotional arousal and hedonistic considerations." *Asian Journal of Social Psychology* 12 (1): 20–31.

Hoffmann, Vivian, Christopher B. Barrett, and David R. Just. 2009. "Do Free Goods Stick to Poor Households? Experimental Evidence on Insecticide Treated Bednets." *World Development* 37 (3): 607–17.

Hofstede, Geert. 2014. "Indonesia." http://geert-hofstede.com/indonesia.html.

Hunter, Lori M., Alison Hatch, and Aaron Johnson. 2004. "Cross-National Gender Variation in Environmental Behaviors*." *Social Science Q* 85 (3): 677–94.

Jackson, Tim. 2005. "Motivating sustainable consumption: A review of evidence on consumer behaviour and behavioural change : a report to the sustainable development research network.".

Jambeck, J. R., R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan, and K. L. Law. 2015. "Plastic waste inputs from land into the ocean." *Science* 347 (6223): 768–71.

Jeftic, L., Seba B. Sheavly, Ellik Adler, and Nikki Meith. 2009. *Marine litter: A global challenge.* Nairobi, Kenya: Regional Seas, United Nations Environment Program.

Lansing, John S. 2006. *Perfect order: Recognizing complexity in Bali.* Princeton, N.J: Princeton University Press.

Ludwig, T. D., T. W. Gray, and A. Rowell. 1998. "Increasing recycling in academic buildings: A systematic replication." *Journal of Applied Behavioral Analysis* 31 (4): 683–86.

Meyer, Andrew. 2015. "Does education increase pro-environmental behavior? Evidence from Europe." *Ecological Economics* 116: 108–21.

Milgram, Stanley. 1974. *Obedience to authority: An experimental view.* London: Tavistock.

Mizobuchi, Kenichi, and Kenji Takeuchi. 2013. "The influences of financial and non-financial factors on energy-saving behaviour: A field experiment in Japan." *Energy Policy* 63 (0): 775–87.

New York Times. 2008. "Motivated by a Tax, Irish Spurn Plastic Bags." http://www.nytimes.com/2008/02/02/world/europe/02bags.html?pagewanted=all.

Norenzayan, A., and A. F. Shariff. 2008. "The Origin and Evolution of Religious Prosociality." *Science* 322 (5898): 58–62.

Osbaldiston, R., and J. P. Schott. 2012. "Environmental Sustainability and Behavioral Science: Meta-Analysis of Proenvironmental Behavior Experiments." *Environment and Behavior* 44 (2): 257–99.

Portal Nasional Republik Indonesia. 2014. "The geography of Indonesia." Accessed November 12, 2014. http://www.indonesia.go.id/en/indonesia-glance/geography-indonesia.

Reschovsky, James D., and Sarah E. Stone. 1994. "Market Incentives to Encourage Household Waste Recycling: Paying for What You Throw Away." *Journal of Policy Analysis and Management* 13 (1): 120.

Riener, Gerhard, and Christian Traxler. 2012. "Norms, moods, and free lunch: Longitudinal evidence on payments from a Pay-What-You-Want restaurant." *The Journal of Socio-Economics* 41 (4): 476–83. Rootes, Christopher. 2013. "From local conflict to national issue: when and how environmental campaigns succeed in transcending the local." *Environmental Politics* 22 (1): 95–114.

Spranz, Roger, Alexander Lenger, and Nils Goldschmidt. 2012. "The relation between institutional and cultural factors in economic development: the case of Indonesia." *Journal of Institutional Economics* 8 (04): 459–88.

St John, Freya A. V., Gareth Edwards-Jones, and Julia P. G. Jones. 2010. "Conservation and human behaviour: lessons from social psychology." *Wildl. Res.* 37 (8): 658.

Stern, P. C., T. Dietz, T. Abel, G. A. Guagnano, and L. Kalof. 1999. "A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism." *Human Ecological Review* 6 (2): 81–97.

Teh, James, MihraS Taljanovic, and Johnny Monu. 2014. "International Skeletal Society outreach 2013: Rwanda." *Skeletal Radiol* 43 (5): 563-565.

Thompson, Richard C., Charles J. Moore, Frederick S. Vom Saal, and Shanna H. Swan. 2009. "Plastics, the environment and human health: current consensus and future trends." *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1526): 2153–66.

Toledo, Chantal. 2013. "Do Environmental Messages Work on the Poor ? Experimental Evidence from Brazilian Favelas." http://areweb.berkeley.edu/candidate/sites/areweb.berkeley.edu/files/JMP_Chantal_Toledo_01072013_0.pdf.

USDA. 2013. "Indonesia Retail Report Update." Accessed November 12, 2014. http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Retail%20Foods_Jakarta_Indonesia_12-13-2013.pdf.

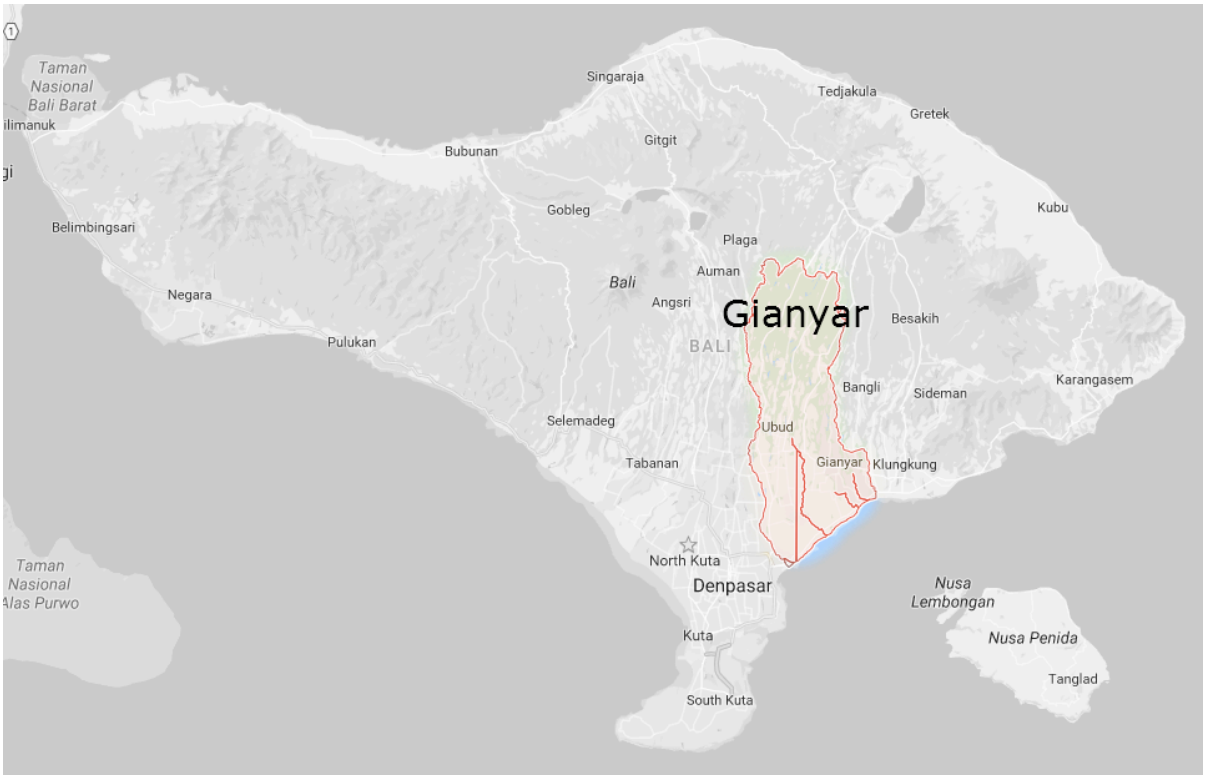
Van der Hertel, Béatrice I. H., Brenton M. Wiernik, Deniz S. Ones, and Stephan Dilchert. 2013. "Age and environmental sustainability: a meta-analysis." *Journal of Managerial Psych* 28 (7/8): 826–56.

Yandle, Bruce, Maya Vijayaraghavan, and Madhusudan Bhattarai. 2002. "The Environmental Kuznets Curve: A Primer." https://www.perc.org/articles/environmental-kuznets-curve.

Appendix

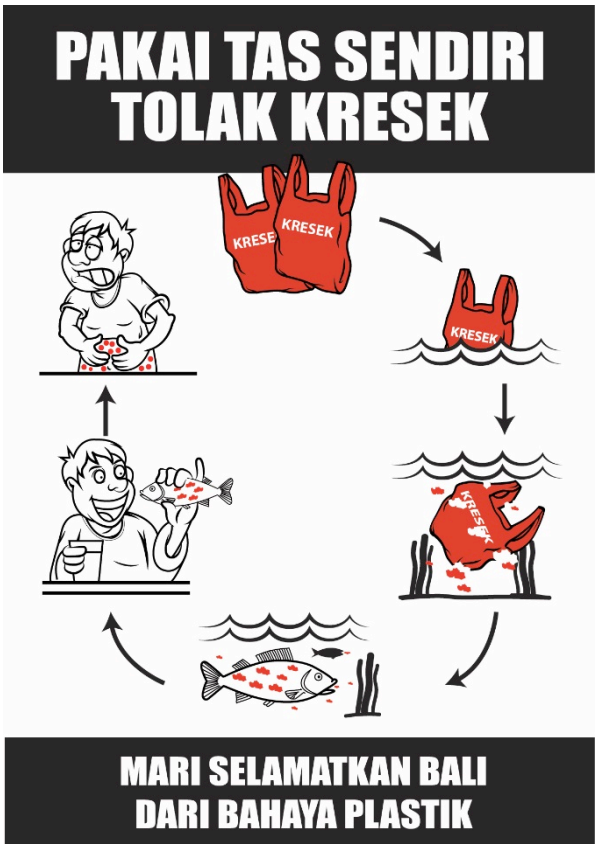
Appendix A

Map of Gianyar in Bali, Indonesia (Source: https://goo.gl/maps/7283sD2EgqF2)



Appendix B

Informational Poster:
"Bring your own bag - Reject plastic bags.
Let's save Bali from the dangers of Plastic"



Appendix C

Matrix of *Normative* and *Economic Interventions* with participating customers.

		Normative Interventions					
		Environmental NGO	Religious Authority	Commercial Brand	Plain Control Bag	Baseline Survey	**Total**
Economic Intervention	Bonus	35	35	35	35	35	**175**
	Free	35	35	35	35	35	**175**
	PWYW	35	35	35	35	35	**175**
	Cost	31	31	31	31	31	**155**
	Total	**171**	**171**	**171**	**171**	**171**	**680**

Appendix D

Eco-friendly reusable shopping bag (Plain Version). According to different treatments with respective prints.

Appendix E

Probit Analysis (probit Participation Bonus PWYW Cost):

```
Iteration 0:   log likelihood = -760.60493
Iteration 1:   log likelihood =  -728.4474
Iteration 2:   log likelihood = -728.37801
Iteration 3:   log likelihood = -728.37801

Probit regression                                 Number of obs   =       1131
                                                  LR chi2(3)      =      64.45
                                                  Prob > chi2     =     0.0000
Log likelihood = -728.37801                       Pseudo R2       =     0.0424
```

Participation	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bonus	.2602529	.1237992	2.10	0.036	.0176109	.5028949
PWYW	-.4087879	.1075188	-3.80	0.000	-.6195208	-.198055
Cost	-.5434153	.1078266	-5.04	0.000	-.7547516	-.3320791
_cons	.492951	.0822127	6.00	0.000	.331817	.6540849

Probit Analysis (probit Participation Bonus Free Cost):

```
Iteration 0:   log likelihood = -760.60493
Iteration 1:   log likelihood =  -728.4474
Iteration 2:   log likelihood = -728.37801
Iteration 3:   log likelihood = -728.37801

Probit regression                                 Number of obs   =       1131
                                                  LR chi2(3)      =      64.45
                                                  Prob > chi2     =     0.0000
Log likelihood = -728.37801                       Pseudo R2       =     0.0424
```

Participation	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bonus	.6690408	.115623	5.79	0.000	.4424239	.8956577
Free	.4087879	.1075188	3.80	0.000	.198055	.6195208
Cost	-.1346274	.0983311	-1.37	0.171	-.3273528	.058098
_cons	.084163	.0692918	1.21	0.225	-.0516465	.2199725

Probit Analysis (probit Participation PWYW Free Cost):

```
Iteration 0:   log likelihood = -760.60493
Iteration 1:   log likelihood =  -728.4474
Iteration 2:   log likelihood = -728.37801
Iteration 3:   log likelihood = -728.37801

Probit regression                                 Number of obs   =       1131
                                                  LR chi2(3)      =      64.45
                                                  Prob > chi2     =     0.0000
Log likelihood = -728.37801                       Pseudo R2       =     0.0424
```

Participation	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
PWYW	-.6690408	.115623	-5.79	0.000	-.8956577	-.4424239
Free	-.2602529	.1237992	-2.10	0.036	-.5028949	-.0176109
Cost	-.8036682	.1159093	-6.93	0.000	-1.030846	-.5764901
_cons	.7532038	.0925598	8.14	0.000	.5717899	.9346177

Appendix F

Appendix F.1
Gender in Economic Treatments:
0=Base-Line Survey; 1=Bonus; 2=Free; 3=PWYW; 4=Cost

```
. oneway Gender Economic_Treatment, sidak

                        Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups      2.59918983      4   .649797457      3.04     0.0169
 Within groups       119.79127    561   .213531675
------------------------------------------------------------------------
    Total           122.390459    565   .216620282

Bartlett's test for equal variances:  chi2(4) =   6.4909  Prob>chi2 = 0.165

                Comparison of Responden 1,01 by Economic_T~t
                                (Sidak)
Row Mean-
Col Mean |          0          1          2          3
---------+--------------------------------------------
       1 |   -.025345
         |      1.000
         |
       2 |   -.051026   -.025681
         |      0.993      1.000
         |
       3 |    .030211    .055556    .081237
         |      1.000      0.991      0.891
         |
       4 |    .148851    .174195    .199877     .11864
         |      0.121      0.057      0.017      0.463
```

Appendix F.2

Education in Economic Treatments:

0=Base-Line Survey; 1=Bonus; 2=Free; 3=PWYW; 4=Cost

```
. oneway Education Economic_Treatment, sidak

                        Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups      11.2499036      4   2.81247591      3.04     0.0171
 Within groups      520.414999    562   .926005337
------------------------------------------------------------------------
    Total           531.664903    566   .939337284

Bartlett's test for equal variances:  chi2(4) =   3.0384  Prob>chi2 = 0.551

                     Comparison of 1.06 by Economic_T~t
                                 (Sidak)
Row Mean-
Col Mean |          0          1          2          3
---------+--------------------------------------------
       1 |   -.042241
         |      1.000
         |
       2 |     .16024    .202481
         |      0.891      0.735
         |
       3 |    .336369     .37861    .176129
         |      0.065      0.038      0.863
         |
       4 |    .226277    .268519    .066038   -.110092
         |      0.510      0.344      1.000      0.994
```

Appendix F.3
General Environmental Awareness in Economic Treatments:
0=Base-Line Survey; 1=Bonus; 2=Free; 3=PWYW; 4=Cost

```
. oneway Env_Pollution Economic_Treatment, sidak

                        Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups         5.903071      4   1.47576775      5.00     0.0006
 Within groups       163.989977    556   .294946002
------------------------------------------------------------------------
    Total            169.893048    560   .303380443

Bartlett's test for equal variances:  chi2(4) =  21.0218  Prob>chi2 = 0.000

                     Comparison of 5.01a by Economic_T~t
                                   (Sidak)
Row Mean-
Col Mean |          0          1          2          3
---------+--------------------------------------------
       1 |       .3047
         |       0.000
         |
       2 |     .182127   -.122574
         |       0.098      0.658
         |
       3 |     .119671    -.18503   -.062456
         |       0.598      0.119      0.994
         |
       4 |     .106303   -.198398   -.075824   -.013368
         |       0.758      0.078      0.977      1.000
```

Appendix F.4
Plastic Bag Pollution Awareness in Economic Treatments:
0=Base-Line Survey; 1=Bonus; 2=Free; 3=PWYW; 4=Cost

```
. oneway Env_PlasticBagPollution Economic_Treatment, sidak
```

Analysis of Variance

Source	SS	df	MS	F	Prob > F
Between groups	4.97702473	4	1.24425618	4.52	0.0013
Within groups	153.238278	557	.275113605		
Total	158.215302	561	.282023712		

```
Bartlett's test for equal variances:  chi2(4) =  54.1900  Prob>chi2 = 0.000
```

Comparison of 5.01d by Economic_T~t
(Sidak)

Row Mean- Col Mean	0	1	2	3
1	.21318 0.017			
2	.226839 0.009	.013659 1.000		
3	.027121 1.000	-.186058 0.090	-.199718 0.055	
4	.120612 0.550	-.092568 0.892	-.106227 0.788	.093491 0.883

```
.
```

Appendix G

TTest for *PWYW* price and *Cost* price

```
Two-sample t test with equal variances
```

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
CostPr~e	123	2000	0	0	2000	2000
PWYWPr~e	175	2865.714	213.9314	2830.046	2443.48	3287.949
combined	298	2508.389	127.8961	2207.829	2256.692	2760.087
diff		-865.7143	255.3047		-1368.157	-363.2718

```
    diff = mean(CostPrice) - mean(PWYWPrice)                      t =  -3.3909
Ho: diff = 0                                     degrees of freedom =      296

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0004         Pr(|T| > |t|) = 0.0008          Pr(T > t) = 0.9996
```

Appendix H

Average Values (No. observations) for Economic and Normative Treatments.
The lower observation values in regard to participation are due to missing responses in the survey.

	Baseline Survey	**FreeBag**	**Bonus Bag**	**PWYW Bag**	**Cost Bag**
Weekly PB Use	38,39 (132)	35,23 (105)	26,12 (108)	29,42 (109)	29,98 (106)
	Baseline Survey	**Plain Bag Control Treatment**	**Bag Religious Authority**	**Bag Environmental NGO**	**Bag Commercial Brand**
Weekly PB Use	38,39 (132)	31,05 (114)	27,49 (108)	31,94 (100)	30,21 (106)

Appendix I

Appendix I.1
Testing part of Hypothesis H0a Bonus=Baseline

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    3.88
                                                Prob > F      =  0.0040
                                                R-squared     =  0.0257
                                                Root MSE      =  27.851
```

PBTotalWee~y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Bonus	-3.860762	3.142103	-1.23	0.220	-10.03263	2.311107
Free	5.247439	4.197279	1.25	0.212	-2.997056	13.49193
PWYW	-.5591137	3.371993	-0.17	0.868	-7.182543	6.064315
Baseline	8.405232	3.780526	2.22	0.027	.9793424	15.83112
_cons	29.98113	2.521495	11.89	0.000	25.02829	34.93397

```
.
. test Bonus = Baseline

 ( 1)  Bonus - Baseline = 0

       F(  1,   555) =   13.14
            Prob > F =    0.0003
```

Appendix I.2
Testing part of Hypothesis H1 Bonus=Cost

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    3.88
                                                Prob > F      =  0.0040
                                                R-squared     =  0.0257
                                                Root MSE      =  27.851
```

PBTotalWee~y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Bonus	-12.26599	3.383683	-3.63	0.000	-18.91238	-5.619602
Free	-3.157792	4.381056	-0.72	0.471	-11.76327	5.447687
PWYW	-8.964345	3.598171	-2.49	0.013	-16.03204	-1.896646
Cost	-8.405232	3.780526	-2.22	0.027	-15.83112	-.9793424
_cons	38.38636	2.816814	13.63	0.000	32.85344	43.91928

```
.
. test Bonus =  Cost

 ( 1)  Bonus - Cost = 0

       F(  1,   555) =    1.51
            Prob > F =    0.2197
```

Appendix I.3
Testing part of Hypothesis H1 Bonus=Free

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    3.88
                                                Prob > F      =  0.0040
                                                R-squared     =  0.0257
                                                Root MSE      =  27.851
```

PBTotalWee~y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Bonus	-12.26599	3.383683	-3.63	0.000	-18.91238	-5.619602
Free	-3.157792	4.381056	-0.72	0.471	-11.76327	5.447687
PWYW	-8.964345	3.598171	-2.49	0.013	-16.03204	-1.896646
Cost	-8.405232	3.780526	-2.22	0.027	-15.83112	-.9793424
_cons	38.38636	2.816814	13.63	0.000	32.85344	43.91928

```
.
. test Bonus =  Free

 ( 1)  Bonus - Free = 0

       F(  1,   555) =    5.62
            Prob > F =    0.0181
```

Appendix I.4
Testing part of Hypothesis H1 Bonus=PWYW

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    3.88
                                                Prob > F      =  0.0040
                                                R-squared     =  0.0257
                                                Root MSE      =  27.851
```

PBTotalWee~y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Bonus	-12.26599	3.383683	-3.63	0.000	-18.91238	-5.619602
Free	-3.157792	4.381056	-0.72	0.471	-11.76327	5.447687
PWYW	-8.964345	3.598171	-2.49	0.013	-16.03204	-1.896646
Cost	-8.405232	3.780526	-2.22	0.027	-15.83112	-.9793424
_cons	38.38636	2.816814	13.63	0.000	32.85344	43.91928

```
.
. test Bonus =  PWYW

 ( 1)  Bonus - PWYW = 0

       F(  1,   555) =    1.28
            Prob > F =    0.2587
```

Appendix I.5
Testing part of Hypothesis H1 Cost=Baseline

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    3.88
                                                Prob > F      =  0.0040
                                                R-squared     =  0.0257
                                                Root MSE      =  27.851
```

PBTotalWee~y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Bonus	-3.301648	2.920149	-1.13	0.259	-9.037544	2.434248
Free	5.806553	4.033809	1.44	0.151	-2.116846	13.72995
Cost	.5591137	3.371993	0.17	0.868	-6.064315	7.182543
Baseline	8.964345	3.598171	2.49	0.013	1.896646	16.03204
_cons	29.42202	2.238839	13.14	0.000	25.02439	33.81965

```
.
. test Cost =  Baseline

 ( 1)  Cost - Baseline = 0

       F(  1,   555) =    4.94
            Prob > F =    0.0266
```

Appendix I.6
Testing part of Hypothesis H1 Free=Baseline

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    3.88
                                                Prob > F      =  0.0040
                                                R-squared     =  0.0257
                                                Root MSE      =  27.851
```

PBTotalWee~y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Bonus	-3.860762	3.142103	-1.23	0.220	-10.03263	2.311107
Free	5.247439	4.197279	1.25	0.212	-2.997056	13.49193
PWYW	-.5591137	3.371993	-0.17	0.868	-7.182543	6.064315
Baseline	8.405232	3.780526	2.22	0.027	.9793424	15.83112
_cons	29.98113	2.521495	11.89	0.000	25.02829	34.93397

```
.
. test  Free  =  Baseline

 ( 1)  Free - Baseline = 0

       F(  1,   555) =    0.52
            Prob > F =    0.4713
```

Appendix I.7
Testing part of Hypothesis H1 PWYW=Baseline

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    3.88
                                                Prob > F      =  0.0040
                                                R-squared     =  0.0257
                                                Root MSE      =  27.851
```

PBTotalWee~y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Bonus	-3.860762	3.142103	-1.23	0.220	-10.03263	2.311107
Free	5.247439	4.197279	1.25	0.212	-2.997056	13.49193
PWYW	-.5591137	3.371993	-0.17	0.868	-7.182543	6.064315
Baseline	8.405232	3.780526	2.22	0.027	.9793424	15.83112
_cons	29.98113	2.521495	11.89	0.000	25.02829	34.93397

```
.
. test PWYW =  Baseline

 ( 1)  PWYW - Baseline = 0

       F(  1,   555) =    6.21
            Prob > F =    0.0130
```

Appendix I.8
Testing part of Hypothesis H2 ReligiousAuthority=Baseline

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    2.45
                                                Prob > F      =  0.0451
                                                R-squared     =  0.0181
                                                Root MSE      =  27.959
```

PBTotalWeekly	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ReligiousAuthority	-3.561891	3.757617	-0.95	0.344	-10.94278	3.818999
EnvironmentalNGO	.8873684	3.803882	0.23	0.816	-6.584397	8.359134
CommercialBrand	-.8450844	4.013681	-0.21	0.833	-8.728947	7.038778
Baseline	7.333732	4.186339	1.75	0.080	-.8892741	15.55674
_cons	31.05263	3.096933	10.03	0.000	24.96949	37.13578

```
.
. test  ReligiousAuthority  =  Baseline

 ( 1)  ReligiousAuthority - Baseline = 0

       F(  1,   555) =    9.53
            Prob > F =    0.0021
```

Appendix I.9
Testing part of Hypothesis H2 EnvironmentalNGO = Baseline

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    2.45
                                                Prob > F      =  0.0451
                                                R-squared     =  0.0181
                                                Root MSE      =  27.959
```

PBTotalWeekly	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ReligiousAuthority	-3.561891	3.757617	-0.95	0.344	-10.94278	3.818999
EnvironmentalNGO	.8873684	3.803882	0.23	0.816	-6.584397	8.359134
CommercialBrand	-.8450844	4.013681	-0.21	0.833	-8.728947	7.038778
Baseline	7.333732	4.186339	1.75	0.080	-.8892741	15.55674
_cons	31.05263	3.096933	10.03	0.000	24.96949	37.13578

```
.
. test  EnvironmentalNGO =  Baseline

 ( 1)  EnvironmentalNGO - Baseline = 0

       F(  1,   555) =    3.24
            Prob > F =    0.0723
```

Appendix I.10
Testing part of Hypothesis H2 CommercialBrand=Baseline

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    2.45
                                                Prob > F      =  0.0451
                                                R-squared     =  0.0181
                                                Root MSE      =  27.959
```

PBTotalWeekly	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ReligiousAuthority	-3.561891	3.757617	-0.95	0.344	-10.94278	3.818999
EnvironmentalNGO	.8873684	3.803882	0.23	0.816	-6.584397	8.359134
CommercialBrand	-.8450844	4.013681	-0.21	0.833	-8.728947	7.038778
Baseline	7.333732	4.186339	1.75	0.080	-.8892741	15.55674
_cons	31.05263	3.096933	10.03	0.000	24.96949	37.13578

```
.
. test  CommercialBrand   =  Baseline

 ( 1)  CommercialBrand - Baseline = 0

       F(  1,   555) =    4.63
            Prob > F =    0.0319
```

Appendix I.11
Testing part of Hypothesis H2 PlainBag=Baseline

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    2.45
                                                Prob > F      =  0.0451
                                                R-squared     =  0.0181
                                                Root MSE      =  27.959
```

PBTotalWeekly	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Baseline	10.89562	3.530315	3.09	0.002	3.961209	17.83004
PlainBag	3.561891	3.757617	0.95	0.344	-3.818999	10.94278
EnvironmentalNGO	4.449259	3.067118	1.45	0.147	-1.575319	10.47384
CommercialBrand	2.716806	3.323752	0.82	0.414	-3.811864	9.245477
_cons	27.49074	2.128072	12.92	0.000	23.31068	31.6708

```
.
. test  PlainBag  =  Baseline

 ( 1)  - Baseline + PlainBag = 0

       F(  1,   555) =    3.07
            Prob > F =    0.0804
```

Appendix I.12
Testing part of Hypothesis H2 PlainBag=EnvironmentalNGO

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    2.45
                                                Prob > F      =  0.0451
                                                R-squared     =  0.0181
                                                Root MSE      =  27.959
```

PBTotalWeekly	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
PlainBag	-7.333732	4.186339	-1.75	0.080	-15.55674	.8892741
EnvironmentalNGO	-6.446364	3.57952	-1.80	0.072	-13.47743	.5846991
CommercialBrand	-8.178816	3.80172	-2.15	0.032	-15.64634	-.7112973
ReligiousAuthority	-10.89562	3.530315	-3.09	0.002	-17.83004	-3.961209
_cons	38.38636	2.816814	13.63	0.000	32.85344	43.91928

```
.
. test  PlainBag  =  EnvironmentalNGO

 ( 1)  PlainBag - EnvironmentalNGO = 0

       F(  1,   555) =    0.05
            Prob > F =    0.8156
```

Appendix I.13
Testing part of Hypothesis H2 PlainBag=CommercialBrand

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    2.45
                                                Prob > F      =  0.0451
                                                R-squared     =  0.0181
                                                Root MSE      =  27.959
```

PBTotalWeekly	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
PlainBag	-7.333732	4.186339	-1.75	0.080	-15.55674	.8892741
EnvironmentalNGO	-6.446364	3.57952	-1.80	0.072	-13.47743	.5846991
CommercialBrand	-8.178816	3.80172	-2.15	0.032	-15.64634	-.7112973
ReligiousAuthority	-10.89562	3.530315	-3.09	0.002	-17.83004	-3.961209
_cons	38.38636	2.816814	13.63	0.000	32.85344	43.91928

```
.
. test  PlainBag  =  CommercialBrand

 ( 1)  PlainBag - CommercialBrand = 0

       F(  1,   555) =    0.04
            Prob > F =    0.8333
```

Appendix I.14
Testing part of Hypothesis H2 PlainBag=ReligiousAuthority

```
Linear regression                               Number of obs =     560
                                                F(  4,   555) =    2.45
                                                Prob > F      =  0.0451
                                                R-squared     =  0.0181
                                                Root MSE      =  27.959
```

PBTotalWeekly	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
PlainBag	-7.333732	4.186339	-1.75	0.080	-15.55674	.8892741
EnvironmentalNGO	-6.446364	3.57952	-1.80	0.072	-13.47743	.5846991
CommercialBrand	-8.178816	3.80172	-2.15	0.032	-15.64634	-.7112973
ReligiousAuthority	-10.89562	3.530315	-3.09	0.002	-17.83004	-3.961209
_cons	38.38636	2.816814	13.63	0.000	32.85344	43.91928

```
.
. test  PlainBag  =  ReligiousAuthority

 ( 1)  PlainBag - ReligiousAuthority = 0

       F(  1,   555) =    0.90
            Prob > F =    0.3436
```