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Charges for plastic bags: Motivational and behavioral effects

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ABSTRACT

Two field studies tested the effects of a charge for single-use plastic bags recently implemented in Buenos Aires City, Argentina. Study 1 showed a greater increase in consumers' own bag use after the charge was introduced in supermarkets where the policy was introduced, in comparison to control supermarkets where the charge was not introduced, or was introduced later in time. The effects were even stronger two months later. Study 2 analyzed factors underlying policy support and own bag use six month after the charge was introduced. Policy supporters highlighted environmental benefits of the charge, while opponents stressed the financial costs. Moreover, most consumers indicated that they carried their own bags to protect the environment, suggesting that intrinsic rather than extrinsic motivations caused behavioral changes. The theoretical and practical implications of the findings are discussed.

1. Introduction

Free of charge plastic carrier bags have practical advantages for consumers but they also involve adverse environmental impacts. For example, plastic bags are made of non-renewable resources (i.e., petroleum), it takes hundreds of years to degrade plastic bags, and plastic bags usually contain additives that pollute the ground and water when released by action of humidity and ultraviolet radiation (Muthu, Li, Hu, & Mok, 2011; Teuten et al., 2009). As a consequence, over the last ten years a remarkable shift in policies associated with plastic carrier bags has taken place in different countries across the world. Many governments have started to ban or to put restrictions on the sale or free distribution of plastic carrier bags in countries all over the world, including Africa (Dikgang, Leiman, & Visser, 2012; Dikgang & Visser, 2012; Hasson, Leiman, & Visser, 2007), Asia (He, 2010; Lam & Chen, 2006; Safitri Zen, Ahamad, & Omar, 2013; Zhu, 2011), Australia (Sharp, Høj, & Wheeler, 2010), Europe (Convery, McDonnell, & Ferreira, 2007; Poortinga, Whitmarsh, & Suffolk, 2013) and North America (Miller, 2011). Research indicates that plastic bag charges had positive effects on consumers' behavior, resulting in a reduction of the use of plastic bags. However, little is known about the underlying processes, which is key to understand why and under which conditions these types of policies can be effective, and how to improve these policies. Hence, we studied the effects of the introduction of a carrier bag charge in Ciudad Autónoma de Buenos Aires (CABA), Argentina as a natural experiment to examine: (a) the effectiveness of a pricing policy to change plastic bag use behavior, extending previous literature by the inclusion of two different control conditions, objective behavioral measures as well as immediate and long term policy effects (Study 1) and (b) the motivational basis of behavioral changes, by studying the reasons why consumers support the pricing policy and by examining to what extent they changed their plastic bag use behavior in order to protect the environment (Study 2).

1.1. Behavioral mechanisms underlying the effects of pricing policies

According to learning theory (Skinner, 1953) when the consequences that follow a behavior are positive, the probability of occurrence of this behavior increases, while if results are negative, its probability of occurrence decreases. In turn, consequences that are soon and certain are more powerful to elicit behavior change

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than consequences that are distant and uncertain (Geller, 2002). This offers a simple explanation to the widespread use of free plastic bags: to accept the free-of-charge bag has soon and certain positive consequences (i.e., comfort, ease), while its negative outcomes (i.e., environmental damage) are uncertain and distant in time.

Hence, alternative behaviors to plastic bag use (e.g., use of trolleys or reusable bags) might be promoted by changing the outcomes. Adding negative consequences or eliminating the positive outcomes from undesirable behavior (in this case the use of plastic bags) are known as *push measures* and aimed at increasing desirable behavior. The available evidence suggests that adding extra negative (financial) consequences to plastic bag use can indeed be effective to modify this behavior, although the underlying process is not clear so we do not know for sure whether effects can be explained by learning theory; we come back to this issue in Section 1.2 (e.g., Convery et al., 2007; Dikgang & Visser, 2012; He, 2010). Also, unfortunately, most evidence comes from studies that rely on self-reported behavioral measures or lack adequate experimental controls. For instance, some research relied on subjective measures (e.g., self-reported plastic bag use; He, 2010; Sharp et al., 2010) that can be affected by undesired factors as social desirability or a misperception about one's own behavior. On the other hand, studies that used objective measures typically only measured behavior on an aggregate level (i.e., number of plastic bags divided by retail sales index adjusted for inflation; Dikgang & Visser, 2012; Dikgang et al., 2012; Hasson et al., 2007), so there is no information about the effects of incentives on individual performance. Also, many studies evaluated the effectiveness of pricing policies by comparing plastic bag use before and after the implementation of the charge but without including adequate control groups (Dikgang et al., 2012; Dikgang & Visser, 2012; Hasson et al., 2007; Sharp et al., 2010). Therefore, we cannot be completely sure whether effects are caused by the implementation of the charge, or to another factor not taken into account and thus not under control of the researcher. A recent study conducted in Wales that included a control group of comparable shoppers from England where the policy had not been implemented (Poortinga et al., 2013) relied on subjective measures (i.e., self-reported plastic bag use as indicated in telephonic interviews with shoppers). From a behavioral analysis standpoint, a comprehensive evaluation of a behavioral intervention can best be based on objective measures such as observable behaviors (Geller, 2002), and should include adequate control groups to be able to conclude whether the reduction in plastic bag use is due to systematic variations in changes in the external outcomes (in this case the price incentive), or to some other event.

To address these issues, we conducted a field study (Study 1) in which we observed plastic bag use before and after a charge for single-use plastic bags was implemented in supermarkets. We compared consumers' plastic bag use in supermarkets where the charge was implemented with plastic bag use in supermarkets where the charge was not implemented and plastic bag use in supermarkets where the charge was implemented later in time, while all consumers were similarly exposed to media news announcing and explaining the charge. Moreover, differently from previous studies we analyzed immediate as well as long-term behavioral effects of the policy, to assess how stable changes in behavior are after a change in reinforcement contingencies.

1.2. Motivational mechanisms underlying effects of pricing policies

In addition to testing the effectiveness of a plastic bag charge, it is relevant to know why people may change their carrier bag use behavior. As stated above, according to learning theory, push policies might force people to change their behavior by adding extra negative consequences. This implies that a plastic bag charge draws upon an extrinsic motive to change behavior. Yet, extrinsic motives may set up an unstable basis for durable behavior change. Indeed, studies showed that although monetary incentives are able to initiate environmentally-friendly behavior, they seem to be less effective in producing durable behavior change as behavior may well return to baseline levels after the reinforcement is terminated (e.g., Bolderdijk, Knockaert, Steg, & Verhoef, 2011; Dwyer, Leeming, Cobern, Porter, & Jackson, 1993; Katzev & Johnson, 1987; McClelland & Cook, 1980; Slavin, Wodanski, & Blackburn, 1981). Also, in the plastic bag use domain, Dikgang and Visser (2012) showed that when the plastic bag price was reduced after the introduction of a charge, plastic bag use increased again. Thus, bringing your own bags to shopping just to save money can inhibit engagement in this behavior once the incentive is removed.

Yet, besides merely acting upon changes in the incentive structure as proposed by learning theory, different processes may explain the effects of a plastic bag charge, which may yield more durable behavior changes. For example, a plastic bag charge may disrupt automated choices of accepting plastic bags, making it more likely that consumers consciously think about whether and why they would like to use a plastic bag (Poortinga et al., 2013). Notably, the charge may remind them of their environmental considerations, making it more likely that they act upon these considerations. Also, it has been argued that financial incentives may communicate norms and responsibilities and, as such, enhance internalized or intrinsic motivation to act pro-environmentally (e.g., Bolderdijk & Steg, in press; De Young, 2000; Thøgersen, 2003). For instance, Thøgersen (2003) showed that a pay-by-weight scheme induced citizens to recycle by enhancing their internalized motivation (i.e., moral norms) to do so. So, for those who think protecting the environment is an important aim, the pricing policy can remind them to behave on their pre-existing environmental attitudes (Bolderdijk & Steg, in press; Thøgersen, 2003). Hence, consumers may bring their own bags when shopping because they are reminded of the fact that this is the right thing to do and matches their intrinsic motivations, and not because of the economic value. Research suggests that those who are intrinsically motivated tend to sustain their environmental behavior longer in time (Werner & Makela, 1998), probably as they obtain an intrinsic satisfaction to do so (De Young, 2000; see also De Groot & Steg, 2009).

In sum, if a plastic bag charge motivates people to reduce their plastic bag use because of the monetary incentive, durable behavior changes may be less likely because people are likely to act like they did before as soon as the incentive would be removed. Yet, when a plastic bag charge motivates people to reduce plastic bag use because it activates or strengthens their intrinsic motivation to do so, behavior changes may be more durable because intrinsic motives provide a more stable basis for behavior change (De Groot & Steg, 2009; De Young, 2000; Steg, Bolderdijk, Keizer, & Perlaviciute, 2014). Therefore, it is important to understand the processes that underlie the effects of a plastic bag charge. We hypothesized that a plastic bag charge will not only encourage own bag use because of extrinsic motivation (e.g., to save money), but that intrinsic motives can play a role as well (e.g., to protect the environment).

The type of motivation underlying the effects of the plastic bag charge may also have implications for the acceptability of the policy. If people are concerned with the environment, they may be more likely to support the charge and act accordingly, that is, use their own bags when they believe that this charge will reduce environmental problems. Hence, their pro-environmental attitudes will be reflected in a positive association between policy support and pro-environmental behavior (i.e., own bag use). In contrast, if

people are focused on personal costs they will be more likely to oppose the charge. In this case, consumers who change their behavior will probably mainly do so for extrinsic motives. As a consequence, the association between policy support and plastic bag use behavior would be weak, as many opponents would also bring their own bags to shopping.[1] On the basis of our reasoning above, we hypothesized a positive association between policy support and own bag use behavior. Understanding the relationship between acceptability of a plastic charge and actual own bag use is an important addition to the literature, as most studies examining this issue relied on self-reported behavior (which may not always reflect their actual behavior).

Evidence indicates that public support of plastic bag charges tends to be high (Convery et al., 2007; Poortinga et al., 2013; Sharp et al., 2010), and that customers who support the policy use their own bag more frequently (Sharp et al., 2010) and consume less new plastic bags per week (He, 2010) than non-supporters. These results suggest that the plastic bag charges might be acting on consumers' previous pro-environmental attitudes (reflecting intrinsic motivation), as most consumers seem to support plastic bag charges and behave in line with the policy aims. However, previous studies did not assess whether policy support was indeed rooted in environmental considerations and whether lack of support was mainly rooted in financial considerations. Therefore, we studied consumers' main reasons to support versus oppose the plastic bag charge. We hypothesized that those who support the plastic bag charge mainly do so for environmental reasons, while those who oppose the charge mainly do so for financial reasons.[2]

Therefore, a second study was conducted to examine the motivational basis of reduced use of plastic bags after the implementation of a plastic bag charge. Specifically we explored: (a) to what extent the pricing policy was supported by consumers and importantly, the reasons underlying their agreement or disagreement with the plastic bag charge; (b) the association between policy support and observable carrier bag use behavior and (c) the prevalence of intrinsic (i.e., protecting the environment, convenience) versus extrinsic (saving money) motives for carrying own bags to shopping once the policy was implemented. This provides us some initial insights in whether the plastic bag charge acted upon extrinsic versus intrinsic motivations to reduce plastic bag use, that is, whether the charge activated existing green attitudes or mainly coerced consumers.

2. Study 1

2.1. Background

Annually 1050 million plastic bags are delivered in CABA (Sanchez, 2012). This means that its use is extremely widespread. Given their negative environmental impact and that landfills where they were usually disposed were close to reach its filling capacity, the Environmental Protection Agency (EPA) of CABA established that since October 9th 2012 on, supermarkets located in CABA would only be allowed to deliver larger and stronger plastic bags. At the same time EPA launched an informational campaign emphasizing the importance of using own bags to reduce pollution produced by plastic bags in the environment, but without mentioning the charge. Because the new bags represented higher production costs, the Association of United Supermarkets that joins the largest supermarket chains of the country stated that supermarkets located in the city would start charging the bags in customer counts (about .025 US dollars for medium size bags and .04 dollars for big size bags) from October 9th 2012. The supermarkets communicated that consumers would now have to pay to obtain new plastic bags. Their advertisement emphasized that new bags were bigger and stronger and will help consumers to protect the environment. Although supermarkets also employed an environmental frame, their message did not clearly encourage consumers to decrease plastic bag consumption. Other smaller associations, such as the Chamber of Self-service and Supermarkets belonging to Chinese Residents, reported that they would accomplish to the EPA requirements and charge the new plastic bags two months later (i.e., December 10th 2012), when they had finished their stock of old carrier bags. Hence, plastic bag charge in CABA was implemented in two phases: from October 9th and from December 10th 2012, respectively. Yet, the pricing policy was not implemented in the metropolitan area that surrounds CABA, Gran Buenos Aires (GBA). As a consequence, residents from GBA were exposed to the same media campaigns (announcing that EPA banned traditional carrier plastic bags, that some supermarkets will charge the new bags, and the environmental benefits of reduced plastic bag use) than CABA citizens, but they still could get the bags for free in their nearby shops for two more months.

In sum, (a) plastic bag charge was introduced gradually in CABA (i.e., shops started to charge at different points in time) and (b) supermarkets in nearby areas to CABA never charged the bags. However, all consumers (including those from CABA and GBA) were exposed to a media campaign announcing the ban, the charge, and the environmental benefits of reduced plastic bag use. This enabled us to set up a natural experiment to test the behavioral effects of this pricing policy. As we were able to observe the behavior of control groups where the charge was not implemented yet or even was not implemented at all, we could control for confounding factors related to the main effect of the informative campaign, previous behavioral tendencies as well as time effects. Specifically, observations of consumers' behavior were performed in three groups of supermarkets: CABA 1, supermarkets located in CABA that started to charge on October 9th; CABA 2, supermarkets also located in CABA that started to charge on December 10th, and GBA, supermarkets located in GBA that never charged the bags (see Table 1). Besides, data collection was conducted at four points in time: (1) one pre measure before October 9th (2) the first post measure, one day on the weekend after the charge was implemented (3) a post measure during a weekend day four weeks after the charge was implemented and (4) a post measure during a weekend day nine weeks after the implementation of the charge. So, during times 1, 2 and 3 CABA 1 acted as an experimental group

Table 1
Schema of the experimental design.

Bag charge	Observation time	CABA 1 ($n = 162$)	CABA 2 ($n = 145$)	GBA ($n = 150$)
	1 (Oct 6th–7th)	Free	Free	Free
Oct 9th				
	2 (Oct 14th–15th)	$	Free	Free
	3 (Nov 4th–5th)	$	Free	Free
Dec 10th				
	4 (Dec 15th–16th)	$	$	Free

Note: the cell show whether the charge was implemented ($) or not (Free).

[1] Alternatively, those who oppose the policy may show reactance and thus not change their behavior. This would also imply a positive association between policy support and own bag use, but importantly, in this case behavior will not change, implying that the charge is not effective.

[2] Please note that people who care about the environment could also oppose a plastic bag charge, for example if they think that the charge will not be effective to mitigate environmental problems associated with plastic bags use. Besides, people may oppose the charge because they believe it threatens their freedom of choice (rather than merely because of the financial costs involved).

while CABA 2 and GBA as control groups. However, in the transition from time 3 to time 4, CABA 2 was considered as an additional experimental group while GBA remained a control group.

As indicated earlier, if the pricing policy is effective to change plastic bag use behavior we can expect that: (a) in the transition from time 1 to time 2 and 3, own bag use will increase more in CABA 1 in comparison to CABA 2 and GBA, so CABA 1 will significantly differ from CABA 2 and GBA during time 2 and 3 (Hypothesis 1) and (b) during time 4, own bag use would remain stable in CABA1 as no new incentives are introduced, but it will increase in CABA 2. As a consequence, CABA 1 and CABA 2 will show a similar frequency of own bag use behavior, which will be significantly higher than in GBA (Hypothesis 2).

2.2. Method

2.2.1. Participants

A total of 457 consumers were observed in six supermarkets (i.e., shops devoted to sell predominantly food products and beverages with an area up to 300 m^2). Four supermarkets were located in CABA: two of them introduced the charge in October 9th (CABA 1) while the other two introduced the charge in December 10th (CABA 2). The remaining supermarkets were located in GBA, in Villa Bosch Municipality, where the charge was not introduced (GBA). All supermarkets were located in areas of middle to low socioeconomic level (DGEyC, 2010; INDEC, 2010). In total, we observed 162 consumers in CABA 1, 145 consumers in CABA 2 and 150 consumers in GBA.

2.2.2. Procedure

An observer located at the shops' main exit registered customers' bag use behavior as they went out of the shop. To be considered as a customer, they had to have made a purchase before leaving the shop. Although the observer may have been visible, shoppers were not likely to understand what he or she was doing; importantly, the position of the observer remained constant at all observation times and was similar across groups. Bag use behavior was coded as follows: (a) Plastic bags: exclusive use of plastic bags acquired from the supermarket during the present purchase; (b) Own bags: exclusive use of reusable bags and trolleys. Those who did not use a bag and carried the products in their hands were also included in this category; (c) Mixed use of plastic bags and own bags; (d) Other: behaviors that cannot be classified in the previous categories (e.g., a closed trolley that prevented to see if there were plastic bags in the inside, or carrying items that did not fit in a plastic bag due to its great size or weight). When two or more individuals had made the purchase together they were classified as a single customer. Four observers registered consumers' behavior. Each observer was in charge of collecting data in the same supermarkets during all observation periods. So each of them observed different customers, except for two periods where two independent observers collected data together in the same place and time. We used the latter data to assess inter-observer reliability dividing the number of agreements by the total number of observations. The percentage of agreement between observers was 100% in both periods suggesting that the behavior observations were reliable.

Data collection took place during the following dates: Time 1 (T1) was set on October 6th or 7th when plastic bags were free of charge in all shops of CABA and GBA; Time 2 (T2) was on October 14th or 15th, the first weekend after the charge was implemented in CABA 1; Time 3 (T3) was during November 4th or 5th, four weeks after the charge was implemented in CABA 1 and Time 4 (T4) was on December 15th or 16th, nine weeks after the charge was implemented in CABA 1. During T4, CABA 2 also started charging plastic bags (See Table 1 for a schema of the design). So, four observation periods were scheduled in each supermarket (24 in total). Each session lasted for 20 min or the time needed to reach a minimum of 20 records (i.e., in case there were few customers). In each shop the four observation periods were set up in weekends and at the same moment of the day (between 12 p.m. and 4 p.m.). During weekends consumers' flow is lower than during weekdays thus reducing the possibility that observers can be confused and make a mistake when counting. Additionally, during weekends it is less likely than consumers from other neighborhoods (and thus from different socio-economic levels) come to shop, as people commute less on weekends. Supermarkets were selected by means of a convenience sampling method (i.e., they were placed in accessible locations for the observers).

2.2.3. Data analyses

From the 457 behavioral observations, 71% were categorized as (a) plastic bags, 23% as (b) own bag, 4% as (c) mixed use and 3% as (d) others. Since the aim of the study was to evaluate the effect of a change in reinforcement contingencies over own bag use behavior, only behavioral categories (a) and (b) were considered for further analyses, so the dependent variable was dichotomous. Thereby, the final sample consisted of 427 observations (94% of total observations).

Pricing policy effects on bag use behavior were analyzed via a mixed method approach. That is, a qualitative approach was employed to analyze own bag use changes across time, while a quantitative approach by means of Chi square tests was employed to compare groups at each time. When more than 20% of the cells had expected frequencies lower than five, Fisher's exact test was used. Effect size was analyzed by means of Phi coefficient. In all cases alpha level was set on .05.

2.3. Results

2.3.1. Own bag use before and after the first wave of the introduction of the charge

Fig. 1 depicts the percentage of consumers that carried reusable bags in each group across time. First, it can be observed that reusable bag use is similarly low across the three groups at the baseline level, 7% for CABA 1 and 6% for CABA2 and GBA. This suggests that all groups had a similar level of own bag use before

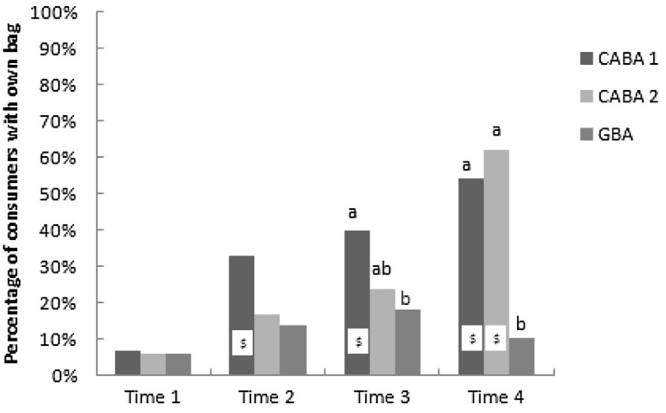

Fig. 1. Percentage of consumers who carried their own bag to shop in supermarkets in the three areas, before and after the implementation of the plastic bag charge. Note. CABA 1: supermarkets located in CABA where the measure was implemented in October 2012; CABA 2: supermarkets located in CABA where the measure was implemented in December 2012; GBA: supermarkets located in GBA where the measure was not implemented. $ indicates supermarkets charging plastic bags. Different letters indicate that the relevant groups significantly differ; Chi square tests ($p < .05$).

the charge was implemented and thus a priori differences in reusable bag use in the three groups seems unlikely.

Second, all three groups showed an increase in own bag use behavior, but as expected, a much higher percentage was observed in CABA1 the first weekend after the charge was introduced as well as one month later. A between-group comparison indicated that despite the percentage of own bag use in CABA 1 was much higher than in CABA 2, they did not significantly differ at T2, X^2 (1, $n = 62$) = 2.09; $p = .15$; $\phi = .18$, or at T3, X^2 (1, $n = 94$) = 2.80; $p = .09$; $\phi = .17$. As expected, CABA1 differed from GBA; this difference was marginally significant at T2, X^2 (1, $n = 62$) = 3.21; $p = .07$; $\phi = .23$, and significant at T3, X^2 (1, $n = 82$) = 4.60; $p = .03$; $\phi = .24$. As expected, differences between CABA 2 and GBA were not significant at T2, *Fisher's Exact test* (1, $n = 58$) = .13; $p = .50$; $\phi = .05$, nor at T3, X^2 (1, $n = 90$) = .41; $p = .52$; $\phi = .07$.

In sum, own bag use behavior was highest for CABA 1 but it only significantly differed from GBA one month after the charge while the short term effect was marginally significant, thus partially supporting Hypothesis 1.

2.3.2. Own bag use before and after the second wave of the introduction of the charge

Fig. 1 also shows the percentage of own bag use after October 10th (i.e., when the charge was introduced in CABA 2). As expected a high increase in own bag use was observed in CABA 2 from T3 to T4, together with small increase in CABA 1 and a small reduction in GBA. A group comparison after the charge was introduced in CABA 2 (T4) indicated that own bag use was indeed significantly higher in CABA 1 and CABA 2 in comparison to GBA, CABA 1 vs. GBA, X^2 (1, $n = 74$) = 16.69, $p < .001$; $\phi = .48$; CABA 2 vs. GBA, X^2 (1, $n = 76$) = 22.33, $p < .001$; $\phi = .54$. Interestingly, in line with our expectations, there was no significant difference between CABA 1 and CABA 2, X^2 (1, $n = 72$) = .46, $p = .50$; $\phi = -.08$, at T4. These results fully support Hypothesis 2. Moreover, results suggest that the effects of the plastic bag charge sustain over time, and that the charge is also effective in the longer term (in CABA 1).

2.4. Discussion

Results indicated that a plastic bag use charge was effective to increase the use of own bags in CABA in comparison to GBA where the policy was not implemented. The use of own reusable bags increased more in supermarkets where the charge was introduced in comparison to supermarkets where the charge was not implemented (yet). In addition, the data of CABA 1 indicated that own bag use remained stable and that the incentive effects were shown even two month after the measure was introduced. Interestingly, own bag use also increased in control supermarkets, although to a lesser extent, thus suggesting that other factors than the incentive may also play a role. We come back to this issue in Section 4.1.

In sum, the charge was effective in increasing own bag use. However, the introduction of extra negative consequences to an undesired behavior is also likely to yield motivational effects that can eventually influence the behavioral effects further in time. In Study 2 we aimed to get more insight into the motivational mechanisms underlying the effects of the charge.

3. Study 2

In Study 2 we aimed to study what type of motivation may explain the effects of the plastic bag charge on own bag use. More specifically, we had the following three objectives: (a) to analyze plastic bag pricing policy support and particularly the reasons of support or lack of support; (b) to test the association between policy support and actual bag use behavior (c) to explore whether own bag use behavior was intrinsically or extrinsically motivated. More specifically, Study 2 aimed to test three hypotheses. First, we assumed that plastic bag charge supporters will emphasize environmental aspects as reasons for their agreement with the policy, while opponents will more strongly emphasize financial reasons as motives for their disagreement with the policy (Hypothesis 1). Second, if the policy was effective because it activated one's pro-environmental attitudes, a positive association between policy support and own bag use behavior should be observed (Hypothesis 2). Third, we expected that the charge might not only encourage own bag use because of extrinsic motives, but that intrinsic motives, notably the motivation to protect the environment will encourage own bag use as well (Hypothesis 3).

3.1. Method

3.1.1. Participants and procedure

A research assistant invited customers (inclusion criterion was the same as in Study 1) who exited the supermarket to participate in a questionnaire study about plastic bag use. Brief questionnaires were used to secure a high response rate. They were administered in seven supermarkets after the charge was implemented in different neighborhoods of CABA. All supermarkets were located in areas of middle to low socioeconomic level (DGEyC, 2010). From a total of 290 consumers approached, 65% accepted to participate. Hence, a total of 189 consumers voluntarily participated in this study (71% women; age $M = 46.44$ years, SD = 17.01, range: 8–87 years). A quota sampling method was employed, so that about half of the surveyed participants carried their purchase in their own bags or in their hands ($n = 97$), while the other half carried their purchase in plastic bags that they bought at the supermarket ($n = 92$).

Once consumers agreed to participate and before reading the questions were asked, the assistant registered how consumers carried their purchase (in new plastic bags, own bags or carrying it in hands). Only consumers who were shopping alone were approached. Data were collected in April 2013. Surveying days and time were chosen at random.

3.1.2. Measures

3.1.2.1. Policy support. Policy support was measured by asking participants whether they agreed or disagreed with the plastic bag charge. To make the questionnaire easy and quick to answer in order to guarantee a high participation rate, we decided to use single-item questions and dichotomous response options (agree versus disagree) instead of response scales.

3.1.2.2. Reasons underlying policy support. To assess the reasons underlying policy support or non-support, an open question was used: "*Which is the main reason why you agree or disagree with the pricing policy?*". Two independent coders classified the reasons into three categories: (a) environmental (e.g., "*diminishes waste*", "*because it helps to recycle, reuse and to create consciousness*"), (b) financial (e.g., "*the plastic bag is expensive*", "*because shops should provide the bag to you just for purchasing there*") and (c) other reasons (e.g., "*because there is no other option*", "*because they [the bags] are easily broken*"). Categories were created on the basis of the most frequent answers during a preliminary reading of all answers. Between-coders reliability was tested by means of Cohen's Kappa (κ). The result was κ (185) = .70, indicating a good reliability level (Landis & Koch, 1977).

3.1.2.3. Reasons underlying own bags use behavior. To explore motives underlying alternative behaviors to plastic bag use, only participants who carried their purchase in their own bag or hands

were asked to indicate which of the following options was their main motivation to carry their own bag to shopping or carrying the purchase on their hands: (a) to protect the environment, (b) comfort, (c) to save money or (d) other. The research assistant ticked the chosen option and assessed age and gender of the respondent.

3.1.3. Data analyses

Chi square tests were employed to analyze the association between policy support and (a) the reasons for support versus non-support (b) observable carrier bag use behavior and (c) the motives for own bag use. Phi coefficient was used to analyze effect size for dichotomous variables and V de Cramer coefficient for non-dichotomous variables. z-tests to compare column proportions were used as post hoc tests.

3.2. Results

3.2.1. Policy support and underlying reasons of support and non-support

Only 42% ($n = 78$) of the respondents indicated that they agree with the plastic bag charge, while 58% indicated to disagree with the policy. As expected, there was a significant association between policy support versus non-support and the underlying reasons for support, X^2 (2, $n = 186$) = 46.12, $p < .001$, $V = .49$. Environmental reasons were the most prevalent (69%) among policy supporters, while financial reasons were the most prevalent (60%) among policy opponents (See Table 2). A post hoc comparison confirmed that environmental reasons were significantly higher for supporters than for opponents while financial reasons were significantly higher for opponents than for supporters ($p < .05$; See Table 2). This result provides support for Hypothesis 1 and suggests that consumers who accepted the policy mainly did so for environmental reasons, while those who opposed the charge seemed to focus on personal financial costs.

3.2.2. Policy support and carrier bag use behavior

Differently from our expectations, the association between policy support and bag use behavior was not statistically significant, X^2 (2, $n = 187$) = .50, $p = .28$; $\phi = .05$. While 54% of policy supporters carried their own bags to shopping, a high percentage of opponents (49%) did so as well (See Table 2). These results do not support Hypothesis 2 and suggests that the policy might not have been effective merely because of environmental reasons.

3.2.3. Motives underlying own bag use behavior

Regarding motives underlying own bag use behavior, 42% of consumers who carried their own bags indicated that they do so to protect the environment, 36% carried their own bag because it was comfortable, 19% to save money and 3% for other reasons.[3] This supports Hypotheses 3 and suggests that among those consumers who were responsive to the charge, environmental reasons prevail over convenience and financial reasons.

To further explore motives underlying own bag use behavior among policy supporters and opponents, we tested the association between policy support versus non-support and own bag use motives (i.e., protecting the environment; comfort; saving money). Results indicated that motives for own bag use behavior significantly differed among policy supporters and opponents, X^2 (2, $n = 92$) = 7.58, $p = .02$; $V = .28$. A comparison of column proportions indicated that carrying own bags to save money was significantly lower among policy supporters (7%) than among policy opponents (30%; $p < .05$; See Table 2). However, there were no significant differences regarding environmental or convenience motives between supporters and opponents that carried their own bags ($p > .05$; See Table 2). This indicates that while environmental and hedonic (i.e., comfort) reasons were equally important reasons to carry an own bag for both groups, financial reasons were more important for opponents than for supporters.

Table 2
Frequency (column percentage) of reasons for policy support/non-support, bag use behavior and own bag use motive for supporters and opponents of the plastic bag charge.

		Policy supporters	Policy opponents
Reasons for support/non-support ($n = 186$)	Environmental	54 (69%)[a]	23 (21%)[b]
	Financial	13 (17%)[a]	65 (60%)[b]
	Others	11 (14%)[a]	20 (19%)[a]
Bag use behavior ($n = 187$)	Own bag	42 (54%)	53 (49%)
	Plastic bag	36 (46%)	56 (51%)
Own bag use motive ($n = 92$)	Protect environment	20 (48%)[a]	18 (36%)[a]
	Comfort	19 (45%)[a]	17 (34%)[a]
	Save money	3 (7%)[a]	15 (30%)[b]

Note: Different superscript letters indicate that column percentage differ significantly ($p < .05$; z-test for column proportions).

3.3. Discussion

Study 2 first revealed that a small majority of participants opposed the plastic bag charge. More importantly, while the opposition was mainly linked to financial reasons, policy support was more strongly associated with environmental considerations. This suggests that environmental motives are key to promote support and reduce opposition towards the plastic bag charge. Second, contrary to our predictions, policy support was not related to consumers' observable bag use behavior. This implies that the policy might have acted both by the activation of pre-existent pro-environmental attitudes and by a direct effect of the charge on behavior as predicted by learning theory. Third, for those who carried their own bags the most prevalent motivation to do so was to protect the environment, followed by convenience and less importantly, by financial motives. This was true for supporters as well as for opponents of the plastic bag charge. This suggests that most CABA consumers who carried their own bag to shopping after the policy was implemented were guided by intrinsic motives (environmental and hedonic) rather than extrinsic (financial) ones. Hence, they may sustain this behavior even when the incentive would no longer be available; future studies are needed to test this proposition. Last, bringing own bags to shopping to save money was a stronger motivational basis for opponents than for supporters, suggesting that just for a small group of opponents, the policy seem to have acted by coercion, as predicted by learning theory.

In conclusion, Study 2 shows that the motivational basis underlying policy support as well as own bag use behavior is mainly intrinsic, related to environmental protection, but that extrinsic (financial) motives do play a role for some consumers as well. However, important differences exist between policy supporters and opponents, as the latter oppose the charge mostly because of financial reasons and many of them use their own bags to save money, suggesting any observed changes in their behavior might be less durable. Future studies are needed to test this proposition.

[3] Due to the low frequency of category "other" ($n = 3$), we did not include this category in further analyses.

4. General discussion

The present research aimed to evaluate the effectiveness of a charge to modify consumers' plastic bag use behavior introduced in Argentina for the first time (Study 1) and to analyze the motivational basis of the behavioral change (Study 2).

4.1. Behavioral effects

The behavioral effects found in Study 1 are in line with previous research on the effectiveness of carrier plastic bag charge (e.g. Convery et al., 2007; Dikgang et al., 2012; He, 2010; Poortinga et al., 2013; Sharp et al., 2010). Yet, our results extend and strengthen previous research in several ways. First, we included adequate control groups and found that greater changes were observed in the two experimental groups at different moments in time (representing the two waves in which the incentive was introduced). Hence, the observed effect it is not likely to be merely due other factors such as the media campaign that accompanied the introduction of the charge. Second, we included objective behavioral measures, ruling out social desirability effects or inaccurate reflections on one's previous behavior. Third, for the first time we showed that plastic bag use can be easily changed, since an increase in bringing own bags to shopping was observed already a few days after the charge was introduced. Fourth, we observed behavior changes in the long-term, indicating that changes in own bag use are sustained even two month after the charge was introduced. Interestingly, the effects became even stronger over time, suggesting that old habits had to be broken before new habits could be established.

Interestingly, after the first wave a slight increase in own bag use was also observed in CABA 2 and in GBA, while shops in these areas were not charging plastic bags (yet). This increase in own bag use in the control groups may reflect the pure effect of publicity, suggesting that information alone might also have an effect on behavior. This suggests that when behavior can be changed with little inconvenience or expense, such as bag use behavior, information campaigns can be effective (Stern, 1999). Moreover, the combination of the incentive and information can have synergistic effects (Stern, 1999). As we do not have a comparison group solely exposed to the incentive we cannot draw firm conclusion on this.

The results from Study 1 indicated that own bag use in CABA 1 significantly differed from GBA but not from CABA 2 at all measurement times. This might be related to the fact that CABA 2 consumers might have had more opportunities to experience the charge (and thus to associate plastic bags with paying or polluting) than GBA consumers, as they might visit other CABA shops that did already charge for the bags. Hence, CABA shoppers might have started to carry their own bags to any shop they visit, to avoid the charge or to behave in line by their (activated) pro-environmental attitudes (Bolderdijk & Steg, in press) or moral norms (Thogersen, 2003).

Interestingly, own bag use steadily increased across time in CABA 1 after the charge was implemented. Probably, customers need to experience the bag charge a couple of times before disregarding their old habits and before remembering to bring a reusable bag the next time(s). Nonetheless, the higher increase in the percentage of own bag use in CABA 2 once the charge was implemented there strengthens the idea that changing the behavioral outcomes by introducing the monetary penalty produces stronger effects than single factors as publicity or a previous experience alone.

4.2. Motives underlying changes in bag use behavior

Study 2 results showed that policy supporters stressed environmental reasons, while opponents stressed financial reasons for their (lack of) support. This is in line with research on transport pricing policies where those who support the policy stress environmental and collective consequences, while those who find the policies less acceptable focus on the negative consequences for themselves (Schuitema, Steg, & Rothengatter, 2010; Schuitema, Steg, & Van Kruining, 2011). This suggests that environmental considerations are crucial for policy support and that stressing environmental benefits of the charge might increase public support.

Our results regarding the motivational basis of policy acceptability differ from previous literature in several points. Despite the positive effects of the charge on own bag use, most consumers disagreed with the policy. Previous studies reported higher acceptability levels in European countries (Convery et al., 2007; Poortinga et al., 2013) as well as in Australia (Sharp et al., 2010). The lower support for this policy in Argentina can be due to several reasons. First, variations may be due to differences in the strategy employed to introduce the policy. For instance in Ireland, governmental advertising campaigns stressed the environmental benefits of the plastic bag use charge several months before the charge was applied (Convery et al., 2007). Differently, in CABA, supermarkets informed the public about the bag price. In doing so, they indicated that buying the new plastic bags would be better for the environment. This may lead some consumers to oppose the charge as such more “environmental-friendly” bags were still harmful for the environment. Second, socio-economic variables may play a role. Average purchasing power of Argentine citizens is likely to be lower than in Ireland, Wales or Australia, making them more resistant to accept a pricing policy to reduce bag use. Third, environmental concern may be weaker in Argentina than in countries where environmental problems had been discussed for a longer time. Future comparative studies are needed to better understand cultural and country differences in policy support.

In contrast to earlier studies (He, 2010; Sharp et al., 2010), our results indicated that policy support was not related to actual carrier bag use behavior. Indeed, a high percentage of policy opponents (49%) carried their own bags to shopping. This indicates that the policy was effective even among opponents, ruling out possible reactance effects. Yet, our results show that only a small percentage of opponents indicated to carry their own bag to save money, suggesting that the policy acted by coercion only for a small group of consumers. In fact, many of these opponents indicated to carry their own bags to protect the environment, suggesting that they might have pro-environmental attitudes, but do not agree with the use of a monetary fine to reduce plastic bag use. If this is the case, opponents who bring their own shopping bags could agree with less coercive policies (e.g., pull measures) to reduce negative environmental consequences of plastic bags. However, consumers who oppose the policy might indicate to use their own shopping bag because of environmental reasons to rationalize their behavior, rather than admitting to be motivated by a small financial incentive. Further studies are needed to reveal which of these is the most accurate explanation.

Overall, our results suggest that the effects of the plastic bag charge cannot solely be explained by learning theory. It seems that the charge also reminded at least some consumers of their pro-environmental attitudes, making it more likely that they act upon their intrinsic motivation to protect the environment. Moreover, it is likely that the bag charge disrupted consumer's habitual choice, thus making consumers to consciously think about their need for plastics bags. Another mechanism underlying the effect of the plastic bag charge could be that changing the status quo (by introducing the plastic bag charge) changed plastic bag use (see Poortinga et al., 2013). Before the charge, customers received the plastic bags as a default (they did not have to ask for it), while after

the introduction of the plastic bag charge, customers had to explicitly approve or request to obtain a bag and pay for it. Indeed, changing the default option can have an important impact on choices (Johnson & Goldstein, 2003). Our data do not allow us to fully rule out this explanation. However, Dikgang and Visser (2012) observed a reduction in plastic bag use after the charge was introduced, but later, when plastic bag price was reduced (but not eliminated), the undesirable behavior increased again. Hence, in this case, the behavioral change was observed when the default option remained constant while the price was reduced, suggesting behavior changed because of the incentive, and not because of a change in the default option. Moreover, we observed that right after the charge many consumers carried their own reusable bags from home suggesting that they had already decided to change their behavior before entering the shop and thus before encountering a change of the default option. This implies that a different process may be at work, making the default-change explanation less likely.

4.3. Limitations of the studies

Our field studies have some clear strengths, namely a focus on actual behavior measures, pre and post measures (in short and long term) as well as experimental and control conditions, and given that we included general population samples, results are more easily generalizable to the population at large (i.e., high external validity). Yet, our studies also suffer from many of the typical limitations of field studies (see Keizer, Lindenberg, & Steg, 2014). In Study 1, participants were not randomly assigned to conditions. Consumers shopping in GBA may have differed from consumers shopping in CABA, which may have affected the results. However, we think this is not likely as baseline level of own bag use was similar for the supermarkets in the three regions, suggesting that they were comparable regarding bag use before the charge was introduced. Also, observation periods were not chosen at random. While this enabled us to test pricing policy effects with an adequate level of internal validity, it might have affected sample representativeness. However, as two different supermarkets were included in each region, the sample is more likely to include different Buenos Aires consumers, increasing external validity.

Related to this, the sample of supermarkets employed was not fully representative of all supermarkets from Buenos Aires as we used convenience samples. So, particularly Study 2 descriptive results regarding policy support as well as own bag use motives should be interpreted with caution. However, all supermarkets were located in neighborhoods of similar socio-economic level. Hence, it is not likely that specific sample characteristics strongly affected the relationships between policy support, observable bag use behavior and own bag use motives.

To secure a high response rate in the second field study, we used single-item questions and categorical responses, which may have affected its reliability and validity, and reduce statistical power. However, our results suggest this is unlikely, as the motives included in the questionnaire (environmental, comfort, saving) covered the most important motives for own bag use; only 3% of respondents indicated that they carried their own bag because of different reasons. In addition, when we assessed motives regarding policy support by means of open questions we found similar response categories, again suggesting that we included the most important motives. The use of a dichotomous response scale might have pushed respondents to take an extreme opinion that does not fully represent their attitude or opinion. This might have accounted for the lack of association between policy support and bag use behavior.

4.4. Practical implications

Our research has some important practical implications. Study 1 results suggest that introducing a financial incentive it is an adequate strategy to realize an immediate reduction in plastic bag use, as it rapidly modifies the target behavior, while the behavioral changes seem to sustain in the long term. In addition, a negative attitude towards a pricing policy does not seem to prevent behavioral change, suggesting that the charge can modify plastic bag use independently of the attitude towards the policy. However, if politicians are concerned about obtaining durable behavioral changes, they should try to link the financial incentive to environmental benefits, as positive consequences for the environment seem to be an important reason for plastic bag charge support as well as own bag use behavior. Moreover, highlighting the link between environmental protection and the charge, and thus targeting intrinsic and extrinsic motivations at once, proved to be a successful strategy in countries where the policy was highly acceptable (e.g., Convery et al., 2007; Sharp et al., 2010).

4.5. Conclusions

In conclusion, a plastic bag charge was effective to increase own bag use among Argentinean consumers: the monetary incentive resulted in an increase in own bag use that was sustained even two months after the policy was introduced. While financial motives were related to policy opposition, environmental motives promoted policy support. Yet, importantly, the motivational basis underlying policy support as well as own bag use behavior was mainly intrinsic, reflecting concerns about the environment. This suggests that the financial incentive may have activated environmental motives to bring one's own shopping bags, and that some consumers support charges that are aimed to improve environmental quality. Hence, besides processes proposed by learning theory, other processes seem to play a role. This suggests that own bag use behavior can be sustained further in time, independently of reward availability, as the behavior change is at least partly motivated by intrinsic (notably environmental) considerations. Linking the charge to environmental reasons might help to encourage durable behavioral changes. Future research could test whether this would actually be the case.

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