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The role of habit loop formation and social norms in promoting eco-friendly behavior: A study on reusable bag usage post plastic tax abolition

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Abstract

This study investigated the influence of habit strength and perceived social norms on Swedish residents continued use of reusable bags following the removal of the plastic bag tax. A cross-sectional survey (N = 93) measured participants' habit strength, perception of social norms, and frequency of reusable bag usage. Descriptive statistics indicated variability in habit and social norm scores, and skewness within acceptable limits for parametric analysis. Pearson's correlations showed strong positive associations between habit strength and reusable bag usage, and moderate positive associations between social norms and usage. A multiple regression analysis revealed that habit strength ($\beta = .66$, $p < .001$) and social norms ($\beta = 0.52$, $p = .013$) were significant positive predictors of reusable bag usage, while their interaction had a significant negative effect ($\beta = –0.83$, $p = .019$), suggesting that social norms are less influential when habits are strong. The overall model explained 54% of the variance in reusable bag usage. Findings support the view that habits may override social influence once established, highlighting the importance of habit formation in sustaining pro-environmental behaviors. Limitations include reliance on self-report data, cross-sectional design, convenience sampling, multicollinearity, and minor violations of regression assumptions. Future research should employ longitudinal or experimental designs, larger samples, and more precise habit measures to further examine the interplay between habits and social norms in sustainable behavior.

Keywords: Habit strength, social norms, reusable bags, plastic bag tax, pro-environmental behavior, Sweden, sustainable behavior

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Introduction

General introduction and rationale

Climate change and the rise in global temperature are together looking to be one of our future's most important and biggest challenges. According to the Intergovernmental Panel on Climate Change, human-caused warming was estimated at 1.31°C, with global temperatures rapidly nearing the climate agreement goal of 1.5°C (Forster et al., 2023). Plastic and microplastic particles are two key contributors, estimated to contribute to about 13% of our planet's total carbon budget (Sharma et al., 2023). Keeping global warming to a safe level requires swift and ambitious changes in the way we use our fuel, land, and natural resources. This requires a big change in our behavior and the policies we push for (Forster et al., 2023). Plastic bag habits are one of many important factors in reducing our carbon footprint. Understanding the underlying psychological mechanisms behind plastic bag usage will help policymakers make motivated and effective policies that promote and encourage sustainable behavior.

In an article by Clapp & Swanston (2009) they discuss the global movement against plastic bags that started in developing countries in the global south. They found that even without strong policy support, social norms can spread locally, creating action against the use of plastic bags even banning it in some countries (Clapp & Swanston, 2009). However, it is worth noting that the plastic industry and waste management is weaker in the global south and policies have thus not been met with much resistance (Knoblauch et al., 2018). Comparatively in the global north due to the strong hold the plastic industry campaigns, and public pressure have been more influential. These findings indicate that social norms may effectively drive change in the global south; however, in the global north, such norms frequently require reinforcement through global public pressure, including NGO campaigns, media attention, and organized civil society activism (Knoblauch et al., 2018).

Since the introduction of a plastic tax in Sweden, there has been a significant reduction in plastic bag usage. The European Union's goal was to reduce the 15-50 micrometer thick plastic bags to 90 by 2019 and 40 by 2025. The plastic tax introduced in 2020 showed a reduction of plastic bags of this kind per person a year in Sweden from 74 to 55, followed by a reduction to 14 the next year. Since 2021, the plastic bag consumption has then been under 20 the following years (Naturvårdsverket, 2024).

These findings are in line with previous research indicating that taxes are an effective way of reducing plastic bag usage. After the introduction of a plastic tax of just 7 cents, in Chicago the usage of plastic bags dropped by 33 percentage points. Additionally, reusable bag usage increased by 20 percentage points (Ideas 42, NYU Wagner School of Public Service & University of Chicago Energy & Environment Lab, 2017). In Ireland a tax of €0.15 per plastic bag led to a reduction of plastic bag consumption of 90% per capita (Convery et al. 2007). Despite the clearly documented short-term effect of a plastic bag tax, there is still an uncertainty about the long-term effects, with some studies seeing a plastic bag rebound in countries such as South Africa and Botswana, suggesting a decline in effectiveness (Adeyanju et al., 2021). Furthermore, there is no research on whether these behaviors persist post-tax removal. Given the recent abolishment of the plastic taxes in Sweden, this raises concerns about the behavioral changes when economic incentives are removed. Will the usage of plastic bags remain low, and how can we explain the behavior observed?

Theoretical framework

Two key psychological concepts that might help explain this are social norms and habit formation.

Social norms offer an insight into how behaviors can be influenced and have proven to be an important factor in various interventions, including climate change interventions (Cialdini & Jacobson, 2021). The key to social norms functioning is our underlying human need for belonging and working towards a common goal. This can be used to help create or highlight necessary changes in, for example, behavior and policymaking (Sparkman et al., 2020). Social norms can be defined as the predominant behaviors, attitudes, beliefs, and codes of conduct of a group and can be divided into descriptive norms, injunctive norms, dynamic norms, and personal norms (Cialdini & Jacobson, 2021). Descriptive norms are behaviors that most people in a group or population are doing. People follow these norms based on what they perceive others are doing. Injunctive norms are based on what people in a group believe should be done. People follow these norms based on what they think others expect or believe is the right thing to do. Dynamic norms are about how we notice people's behaviors or beliefs changing over time (Constantino et al., 2022). Lastly, personal norms are personal beliefs about what is right and wrong; these are based on your own values and moral responsibility and are not influenced by what others think or do (Cialdini & Jacobson, 2021).

Another way we can interpret the change in behavior could be habit formation. Habits can be defined as "learned sequences of acts that have become automatic responses to specific cues and are functional in obtaining certain goals or end states." This means that the more we repeat an action, the more likely it is to become a habit (Verplanken & Orbell, 2003). Research by Lally et al. (2010) indicates that automaticity of behavior forms over time, fitting in an asymptotic curve, meaning rapid early gains until the habit is formed. On average automaticity was formed after 66 days, however, this varied greatly from 18 to 254 days (Lally et al., 2010). With this in mind, it is possible that during the 4 years of plastic taxes, new habits around shopping bags could have formed.

Previous research

Social norms

Previous research on social norms indicates its function in promoting environmentally friendly behavior. In a critical review by Cialdini & Jacobson (2021), they found that the interactive effect suggests that descriptive and injunctive norms influence behavior differently. Nonetheless, descriptive and injunctive norms were found to be the most effective when aligned, leading to improved outcomes over varied behavior such as energy conservation, littering, and water use (Cialdini & Jacobson, 2021). This highlights the importance of balancing descriptive and injunctive norms in research.

In a study by Borg et al. (2020), they looked at the effect of social norms on plastic avoidance. They found that descriptive norms strongly predicted plastic avoidance among a group of plastic items (bags, straws, coffee cups, and takeaway containers). These found effects were improved by moderators, such as when individuals also believe that avoidance is approved by others, is easy to do, and brings personal or environmental benefits, but are weakened by perceived costs or inconvenience. They also found that even when the reference group is broad (e.g., the wider society), descriptive norms still influence behavior. This suggests how powerful descriptive norms can be as a lever for encouraging eco-friendly behavior (Borg et al., 2020). Similarly, in a study by Mundt et al. (2024), they conducted five experiments testing the effectiveness of a humorous social norm nudge. They found that this intervention worked well in four out five experiments. For example, it successfully reduced paper towel consumption and voluntary mask use but failed to influence plastic lid use for coffee cups at a train station. This result could be argued to be the cause of contextual factors such as time pressure, stress, attentional overload or risk of spilling coffee. This suggests that

the effectiveness of social norms can be highly context dependent (Mundt et al., 2024). In another study by Cialdini et al. (2006), they tested the effectiveness of descriptive and injunctive norms in preventing theft of petrified wood in a national park in Arizona. To examine this, they left signs with messages conveying descriptive or injunctive norms. The result found that negatively worded injunctive messages were the most effective in preventing theft. Additionally, they also found that descriptive norm-based messages backfired leading to more theft (Cialdini et al. 2006). These studies highlight another common critique of social norm studies: that they are context dependent. As we can see from these studies, descriptive and injunctive norms may be differently effective depending on the context. In fact, the wrong kind of messaging might even backfire, leading to the undesired effects of increasing the behavior we hope to reduce. This effect of social norms backfiring is another common critique that has been found in social norm research. It was highlighted in an article by Schultz et al. (2007) where they labeled this effect the boomerang effect. They found that by adding injunctive messages to the descriptive messages the boomerang effect was eliminated (Schultz et al., 2007). Taken together this highlights the mixed results in social norm studies and motivates the importance of evaluating both descriptive and injunctive norms in my research.

In a study by Putnam-Farr et al. (2023), nudges in the form of messages successfully changed behavior, and these effects persisted even after the nudges were removed, suggesting a shift toward more sustainable behavior. However, the study did not track participants over an extended period, so evidence of long-term effects remains uncertain (Putnam-Farr et al., 2023). This highlights one of the main criticisms against social norm studies, that they rarely show any long-term effects. In a Cochrane review they looked at 70 studies on social norms and drinking and found that after a follow-up after four months of there were only small effects from social norms still (Foxcroft et al., 2015). Similar effects have been found in social norm studies within environmental contexts, with effects of social norm interventions fading over time (e.g. Ling et al., 2023). Additionally, many studies have found effect of their interventions being effective without doing a follow-up study to see the effects of their intervention, post-intervention (e.g. Ramli, 2021; Cuadrado et al., 2024; Mundt et al., 2024).

However, some studies have found effects to be stable long-term post intervention. For example, Ferraro et al. (2011) found that simple prosocial appeals to reduce household water use had only temporary effects, but when households received social comparison messages (i.e., information about how their consumption compared to their neighbors), the reductions in

water use persisted for more than two years after the intervention. This suggests that certain types of social norms can produce lasting behavior change, highlighting their potential role in sustaining environmentally friendly practices even beyond policy interventions. Furthermore, In a study by Burns and Savan (2018) they found effects of their "start green" social norm-based intervention program seven month after their program ended. These effects can likely be contributed to behavioral momentum creating habit-like persistence, social influence (e.g. peer monitoring) and perceived feasibility. After trying it they found the change to be easy and manageable (Burns & Savan, 2018).

Habits

Indeed, some research indicates that habits can help explain certain behavior. In a study by Liu et al. (2020), they found that habitual behaviors have a stronger influence on behavior than attitudes or intention alone. This suggests that habit forming can be a powerful tool in creating and sustaining eco-friendly behaviors. The study discusses the potential of the habit formation framework in the form of cue-routine-reward as an important tool in creating sustainable behavior (Liu et al., 2020). Habits can be created through stable contexts, such as, for example, the availability and promotion of reusable bags. By creating new contexts, we might create new habits. For example, by increasing the plastic tax, we create a new context where it is favorable to bring your own reusable bags. Over time this can become a habit (Linder et al., 2020).

A study in Indonesia indicates that established consumer habits can play a crucial role in sustaining green choices such as choosing paper bags over plastic bags. They found a significant positive correlation between consumers' existing paper bag habits and their behavior. (Ardhiyansyah & Iskandar, 2023). In theory the same should be applicable to consumers' habits of using reusable bags. However, some research has found contradictory findings. In a South African study, they found that consumers' habit strength did not weaken the link between intention and behavior. Instead, the study found that consumers' attitudes, descriptive norms, and personal norms were the strongest predictors of their intention to use non-plastic reusable bags. However, the study goes on to discuss that it is likely that they did not find a habit to affect the intention-behavior link due to the low frequency of shopping behavior among their respondents (Muposhi et al., 2021).

A core critique in habit research is the lack of a universally accepted definitions of habit. Defining habits is tricky because, as De Houwer (2019) argues, many studies assume

that habits are either stimulus–response links or inherently automatic. This makes habits difficult to test empirically and can limit the flexibility of theoretical explanations. For example, focusing too heavily on the stimulus–response link may lead researchers to overlook alternative explanations of how habits function. A possible solution is to define habits in terms of observable behavior and treat the reasons why they occur as explanatory mechanisms rather than part of the definition (De Houwer, 2019). In line with this, empirical research has also struggled to capture habits in practice. The main issue is that it is difficult to say if someone repeats a behavior because it is a habit, or because their goal-directed system simply doesn't work well. For example, goal-directed systems can break down under stress, time pressure, or distraction, which can create a behavior that looks like a habit but isn't a true habit. This highlights a need for new ways to measure habits that are more realistic to everyday life (Watson & de Wit, 2018).

Yet it is still important to study habits in environmental research, as they often shape everyday climate behaviors (e.g., energy use, transportation, food, and waste). Kurz et al. (2014) argue that integrating the psychological perspective—which sees habits as cue-based, repeated actions—with the social practices' perspective—which emphasizes the role of social norms, material infrastructures, and shared routines—can provide a more complete understanding of how habits are formed and maintained (Kurz et al., 2014). Building on this, research shows that different environmental behaviors are differently likely to become habitual. Continuous behaviors that are low-cost and easier to do (e.g., recycling) are more likely to become habitual than dynamic behaviors that are higher effort and harder to maintain (e.g., switching to renewable energy). These findings have some implications on how to form policies. Continuous behaviors can be supported with education, pro-environmental attitudes, and social norms, while dynamic behaviors require stronger interventions such as subsidies and long-term support (Moore & Boldero, 2017). Overall, this highlights the importance of habit research in distinguishing between behaviors that can be sustained through habit formation and those that need stronger policy interventions.

Statement of Purpose

The purpose of this study is to investigate to what extent habit strength and perceived social norms predict Swedish residents continued use of reusable bags since the removal of the plastic bag tax in Sweden. The tax was originally implemented to help meet the European Union's plastic reduction goals and to avoid any economic sanctions if we were to fail to meet them. In November 2024 the Swedish government abolished the tax, with the motivation that

the required quota has been met. Its removal raises the question whether sustainable bag usage, in the form of reusable bags, will persist, and to what extent that behavior could be explained by habit formation and social norm development. While prior research has investigated the immediate effects of plastic bag taxes, less is known about how sustainable behaviors are maintained once such a policy has been abolished. By addressing this gap, the present study aims to contribute to the literature on long-term behavioral outcomes of policy interventions and provide evidence-based insights to support policymakers in promoting sustainable consumer practices.

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1. To what extent does habit strength predict individuals current reusable bag usage following the removal of the plastic bag tax in Sweden?
2. To what extent does perceived social norms predict individuals current reusable bag usage following the removal of the plastic bag tax in Sweden?

3. How do habit strength and perceived social norms interact in predicting reusable bag usage following the removal of the plastic bag tax in Sweden?

Hypotheses

H_1: Higher scores on habit strength will positively predict continued reusable bag usage.
H_2: Perceived social norms will significantly positively predict continued reusable bag usage.
H_3: The interaction between habit strength and perceived social norms will predict reusable bag usage in a way that individuals with both strong habits and strong perceived social norms will be most likely to sustain this behavior.

Method

Design

The study employed a quantitative, cross-sectional design. Data were collected using online surveys to examine the role of habit strength and perceived social norms in predicting plastic bag usage following the removal of the plastic tax in Sweden. This design was chosen due to the lack of previous behavioral data prior to the implementation of plastic taxes, to capture a snapshot of plastic bag behavior post-tax removal.

Using a cross-sectional design allows for testing of correlational relationships and regression-based hypotheses while still recognizing the inherent limitations in causal inference associated with non-longitudinal, non-experimental studies.

Participants

A total of $N = 93$ Swedish speaking participants completed the survey. The sample included 47% men ($n = 44$), 48% women ($n = 45$), 2% non-binary ($n = 2$), 1% other ($n = 1$) and 1% prefer not to say ($n = 1$). The target population was adults aged 18 years or older residing in Sweden. The study employed a convenience-sampling method where participants were recruited through social media (e.g. Facebook, Instagram, and Reddit) to participate in an online survey. Inclusion criteria were that participants, for ethical reasons, had to be over 18 years old and due to relevancy, had to currently reside in Sweden. The survey was in Swedish because of its target population being Swedish residents.

Materials

The survey included five sections, an introduction page, a section measuring plastic bag usage, habit strength and perceived social norms and a concluding section thanking the participants for their participation. For the full survey see Appendix A.

Introduction section

The introduction section of the survey explained the purpose of the survey and reassured the participants of their anonymity and voluntary participation. Additionally, participants were informed of their rights to withdraw from the study at any time without consequences. It also reassured them that their data would only be used for the study. Lastly, it contained my email address and the email address of my supervisor to be able to contact us about withdrawal from the study or any questions they might have.

Demographic and general questions section

This section in the survey measured demographic questions (age and gender) as well as general questions on plastic bag habits, and environmental views. Questions included, for example, how frequently participants purchase plastic bags, if they were aware of the removal of the plastic bag tax, and if the environment is a key concern in their everyday lives.

Social norms section

This section of the survey measured perceived social norms using an adapted version of Wibowo et al.'s (2024) social norms scale. The initial scale is divided into subjective and injunctive norms. The adapted scale follows the same structure and consists of items such as "people whose opinion I respect believe that I should bring reusable bags when shopping" and "most people in Sweden think that everyone should bring reusable bags when shopping". Responses were rated on a 7-point Likert scale. The initial scale by Wibowo et al. (2024) reported high internal reliability for injunctive norms (α = .861) and descriptive norms (α = .831) with construct validity ranging from acceptable to good (factor loadings = .60–.75). The adapted full-scale demonstrated excellent internal consistency (α = .91, 95% CI [88, 94]). Removing individual items did not substantially increase alpha (range = .90 - .91) When examining injunctive norms items separately they still demonstrated excellent internal consistency (α = .89) while the injunctive norms items demonstrated good internal consistency (α = 0.82).

Habit strength section

This section of the survey measured habit strength, using the self-report habit index (SRHI) developed by Verplanken & Orbell (2003). The SRHI includes items such as "using a reusable bag is something I do without thinking" and "it would feel weird for me not to bring a reusable bag when I go shopping". Responses were rated on a 7-point Likert scale. The SRHI has shown high internal consistency (α = .88–.95) as well as strong construct validity when applied in previous research (Verplanken & Orbell, 2003).

Additionally, habit strength was also measured using a custom habit loop scale. The scale was developed for this study based on habit-learning loop theory, grounded in psychological theory and research by Wood & Neal (2007). The questions were developed to capture the stages in a habit loop, consisting of cue, response, and reinforcement. The custom habit loop scale consisted of items such as "I tend to bring reusable bags when I see them", "I plan ahead so I don't need to buy a plastic bag" and "I feel good about myself when I bring a reusable bag". The scale was translated to Swedish, and responses were rated on a 7-point Likert scale.

The full habit strength scale demonstrated excellent internal consistency (α = .93, 95% CI [91, 95]). Removing individual items did not substantially increase alpha (range = .93–.94) When examined separately the Self-Report Habit Index items demonstrated excellent internal

consistency (α = .94) while the custom habit loop items demonstrated good internal consistency (α = .80).

Procedure

Participants were recruited to a Google Forms survey over a two-week period through posts on various social media platforms. The survey stayed open for approximately 1 month. The recruitment message clarified the study's purpose, the requirements to be allowed to participate, assurance of anonymity, that participation is completely voluntary, and a link to the online survey. The first page of the survey restated the purpose of the survey and reassured them of anonymity and voluntary participation. Additionally, participants were informed of their rights to withdraw from the study at any time without consequences. No identifying information was collected, and participants were given contact information for both the researcher and the supervisor at both the beginning and end of the survey.

Ethical considerations

The study took several steps to be compliant with the ethical guidelines outlined by the Swedish Research Council. A declaration of ethical compliance was submitted to the Department of Psychology at Lund University. Participation in the study was voluntary, and all participants were informed that they can withdraw from the study at any point without any penalty. Informed consent was explained to all participants. All responses were collected anonymously and treated as such throughout analysis. No data was collected that could be deemed sensitive. The study posed no risk of harm to participants. All participants were required to be 18 years or older. Data of participants that were younger would have been excluded from the analysis.

Analysis

All statistical analyses were conducted in R. Descriptive statistics (means, standard deviations, minimum, maximum, and skewness) were first calculated for all study variables to assess the distributions and examine potential outliers. Habit strength and social norm scores were computed as composite variables by averaging all relevant items, including the Self-Report Habit Index (SHRI), the Custom Habit Loop Scale (CHLS), and the adapted social norm scale (Wibowo et al., 2024). Reverse-coded items were recoded prior to averaging. Reusable bag usage was measured with a single self-report item on a 1–7 Likert scale.

A Pearson correlation analysis was conducted to examine the bivariate relationships among habit strength, social norms, and reusable bag usage. To test the main hypotheses, a multiple regression analysis was performed with reusable bag usage as the dependent variable and habit strength, social norms, and their interaction as predictors. All continuous predictors were mean centered prior to computing the interaction term to reduce multicollinearity.

Assumptions for parametric analyses were checked prior to running regression models. Multicollinearity was evaluated using variance inflation factors (VIF), normality of residuals was assessed through visual inspection and the Shapiro–Wilk test, and heteroscedasticity was assessed using the Breusch–Pagan test. Variables were considered within acceptable ranges for parametric analyses if skewness values fell between -2 and +2, and VIF values were below 10. Control variables (age, gender, awareness of the plastic bag tax removal, timing of reusable bag adoption, perceived economic impact of the tax, and environmental concern) were included in supplementary analyses to evaluate the robustness of the results.

Results

Descriptive Statistics

The survey had 93 respondents, with ages ranging between 18 to 88 years (M = 33.5, Median = 29, SD = 12.89). The result of the standard deviation indicates high variability in age. Additionally, the difference between the mean and median suggests positive skewness, with some older respondents increasing the mean age

The habit score was based on all items from the Self-Report Habit Index and the custom habit loop scale together and the social norm score was based on the social norm scale. All items were rated on 1-7 Likert scale (1 = strongly disagree, 7 = strongly agree). Relevant items were reverse coded. Composite scores were then calculated for habit strength and social norms by averaging all relevant items. Higher habit scores indicated higher habitual use of reusable bags, and higher social norm scores indicated higher perceived social pressure to avoid plastic bags. Reusable bag usage was measured with a single self-report item on the same 1–7 Likert scale.

Table 1

Descriptive statistics for study variables

Variable	M	SD	Min	Max	Skewness
HabitStrength	4.68	1.49	1	7	-0.53
SocialNorms	3.82	1.07	1.5	6.5	-0.04
ReusableUsage	5.75	1.34	1	7	-1.53

Note. Higher scores indicate stronger habitual use of reusable bags, stronger perceived social norms around avoiding plastic bags, and more frequent reusable bag usage. N = 93.

Due to values being within acceptable limits for parametric analyses (skewness between -2 and +2) no transformation was applied.

Correlation analysis

A Pearson's r correlation analysis was conducted for the variables of interest. The result indicated that habit strength was strongly positively correlated with reusable bag usage ($r(91) = .71$, $p < .001$) and social norms were moderately positively correlated with reusable bag usage ($r(91) = .34$, $p = .001$). Furthermore, the result also indicated that habit strength and social norms were moderately positively correlated ($r(91) = .41$, $p < .001$). The full correlation matrix including all control variables is provided in the appendix B (see Table B1)

Multiple regression analysis

A multiple regression was conducted to test the hypotheses that habit strength, and their interaction predicts reusable bag usage. The overall model was significant ($F(3, 89) = 35.06$, $p < .001$) and explained 54.2% in reusable bag usage ($R^2 = .542$). Habit strength was a significant positive predictor ($B = 1.07$, $SE = 0.20$, $\beta = 0{,}66$, $t(89) = 5.27$, $p < .001$). Social norms were also a significant positive predictor ($B = 0.65$, $SE = 0.26$, $\beta = 0.52$, $t(89) = 2.53$, $p = .013$). Additionally, the interaction between habit strength and social norms was a significant negative predictor ($B = -0.13$, $SE = 0.05$, $\beta = -0.83$, $t(89) = -2.39$, $p = .019$). The regression coefficients are presented in Table 2.

Table 2

Regression analysis predicting reusable bag usage from habit strength, social norms and their interaction

Predictor	**B**	**SE**	**t**	**p**	**β**
Intercept	0.61	0.90	0.68	0.50	–
HabitStrength	0,88	0.20	5.27	< .001	0,66
SocialNorms	0.65	0.26	2.53	0.013	0.52

Habit x Norms	-0.13	0.05	-2.39	0.019	-0.83

Note. B = unstandardized coefficient; SE = standard error; β = standardized coefficient (N = 93)

Assumption checks

Multicollinearity diagnostics indicated moderately high VIFs for habit strength ($VIF \approx 9.98$) and social norms ($VIF \approx 8.27$) suggesting some multicollinearity. Additionally, it indicated very high VIFs for the interaction effect ($VIF \approx 23.27$) suggesting serious multicollinearity. Residuals were approximately normally distributed with minor deviations in the tails (see Figure 1 and 2). A Shapiro–Wilk test indicated a small but statistically significant deviation from normality ($W = 0.965$, $p = .014$). Furthermore, a Breusch-Pagan test indicated heteroscedasticity in the model's residuals ($BP = 11.78$, $df = 3$, $p = .008$). Visual inspection of the residuals suggested minor deviations from linearity and slight heteroscedasticity (see Figure 3). Full diagnostics are provided in Appendix C.

Control variable check

An additional regression was conducted to assess the robustness of the results when controlling for all relevant variables (age, gender, awareness of the plastic bag tax removal, when they started using reusable bags, plastic tax effect on their economy and two environmental concern factors). Inclusion of the variable plastic tax effect on their economy reduced the sample size by 12 due to missing data but lead to a better fit of the model. Inclusion of control variables did not meaningfully alter the result from the main regression model (see Appendix D for full model).

Discussion

The goal of this study was to investigate what role habit strength and perceived social norms has in predicting reusable bag usage following the abolishment of the plastic tax in Sweden. The results indicated that habit strength and social norms were both significant positive predictors of reusable bag usage. However, their interaction with reusable bag usage indicated a significant negative effect. This suggests that when habits are strong, the influence of social norms on behavior weakens. Overall, the model explained about 54% of the variance in reusable bag usage, highlighting the importance of psychological factors beyond economic incentives.

These findings are in line with previous research showing that habits and social norms are powerful drivers in shaping pro-environmental behavior (Borg et al., 2020; Cialdini & Jacobson, 2021; Liu et al 2020; Ardiyansyah & Iskandar, 2023). Notably the association between habit strength and reusable bag usage was considerably stronger than that of social norms. These findings are supported by previous research indicating that once habits are established, they often override intentions and social influence due to operating automatically in response to cues (Liu et al., 2020). These findings are also consistent with the significant negative interaction that was found between habit strength and social norms and suggest that the influence of social norms on reusable bag usage decreases as habits become stronger. In other words, individuals with well-established routines may rely more on their habits than on social expectation when bringing a reusable bag. Additionally, previous studies also suggest that norms tend to play a stronger role during the initial adoption of sustainable behaviors, but that habit is more influential in sustaining them over time (Linder et al., 2020; Cialdini & Jacobson, 2021).

It is important to note that the study has several methodological limitations that need to be addressed. First of all, the study relied on self-report data, which may be subject to social desirability and recall biases. Secondly, cross-sectional design makes it not possible to determine casual interference. This means that we cannot make any conclusions on cause and effect. Thirdly, the survey relied on a convenience sample recruited through social media, which can introduce self-selection bias which limits the representativeness of my findings. Fourthly, there were multicollinearities in the regression model, particularly between habit strength and social norms and their interaction effect. This reduces confidence in the precision of the estimated coefficients. Fifthly, inspection of the data indicated heteroscedasticity in the residuals and skewness in some variables (e.g., age), suggesting slight violations of assumptions for parametric analyses. Finally, the relatively small sample size further limits the generalizability of the results to the broader Swedish population. Together these limitations indicate that the findings should be interpreted with caution, particularly regarding causal inferences and the strength of the observed relationships.

These results may sugge**st** a potential interplay between habits and social norms in pro-environmental behavior. If replicated in future studies with more robust designs, this could indicate that interventions targeting both social norms and habit formation might support sustainable behaviors, such as reusable bag usage, particularly when policy incentives are removed (Linder et al., 2020; Liu et al., 2020).

Future research should aim to replicate these findings using longitudinal or experimental designs to establish causality and examine the durability of habit-driven behavior over time. Additionally, studies with larger, more representative samples would increase confidence in the generalizability of the results. Finally, examining other contextual and individual factors that may moderate the interplay between habits and social norms—such as convenience, perceived costs, or environmental concern—could further clarify how these psychological mechanisms operate in real-world sustainable behaviors.

Limitations

A limitation of this study is its reliance on the Self-Report Habit Index scale (SRHI; Verplanken & Orbell, 2003) for assessing habit strength. While the SRHI has demonstrated good reliability and is the most widely used habit scale, it has been criticized for mixing constructs such as past behavior, identity with automaticity (Gardner et al., 2012; Sniehotta & Presseau, 2012). This means that the SRHI scores appear to measure how often participants perform a behavior or how strongly they identify with it and not only its automaticity. In direct response to this critique, Gardner (2012) agrees that the use of self-identity items may not be central to habit but argues that repetition remains important for distinguishing habits from other automatic processes (Gardner, 2012). The overall critique of the SRHI indicates the need for caution when interpreting its scores as a definitive measure of habit formation. Future research could focus on this issue by utilizing more precise measures of habit, such as the Self-Report Behavioral Automaticity Index (SRBAI; Gardner et al., 2012), which directly isolates the automaticity aspect of habit.

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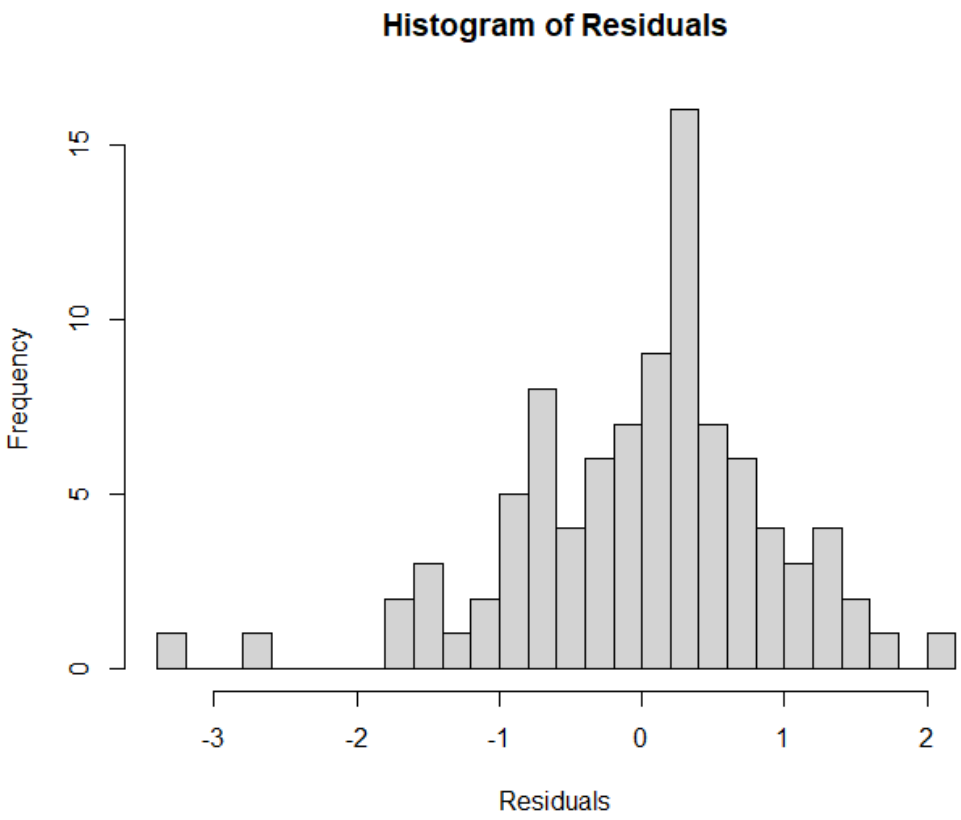
Figure 1

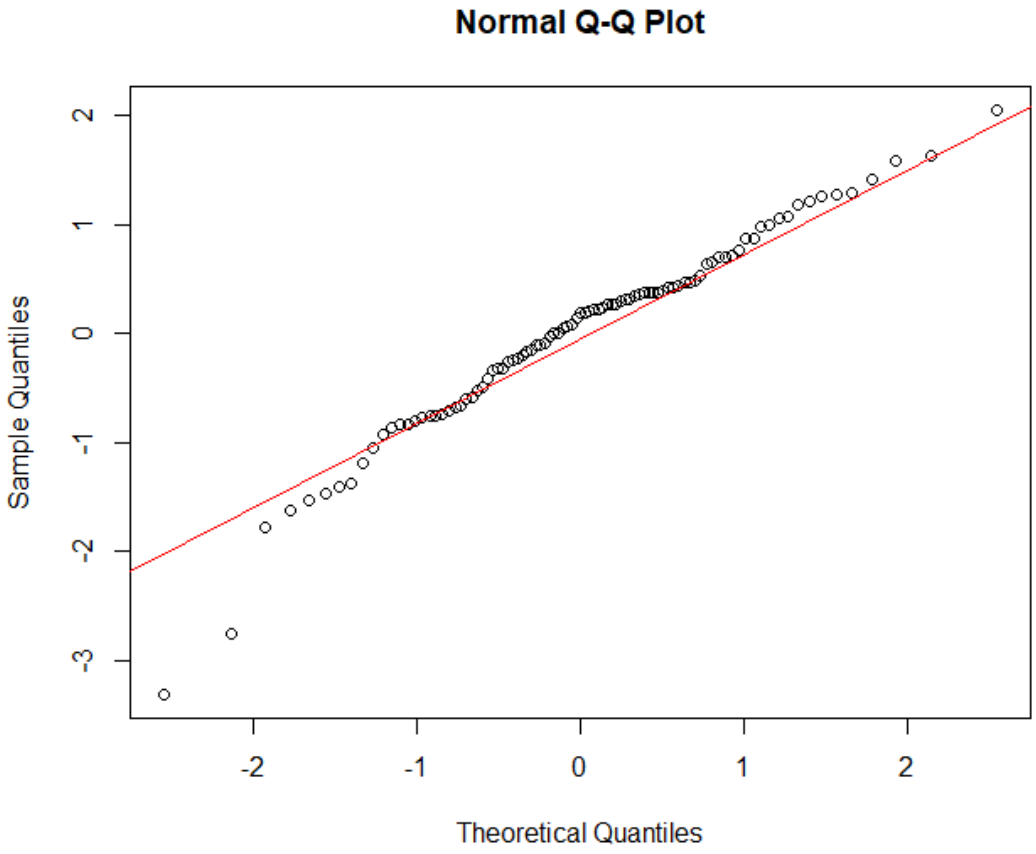
Histogram of Residuals for the Multiple Regression Model



Note. A Shapiro–Wilk test indicated a small deviation from normality ($W = 0.965$, $p = .014$)

Figure 2

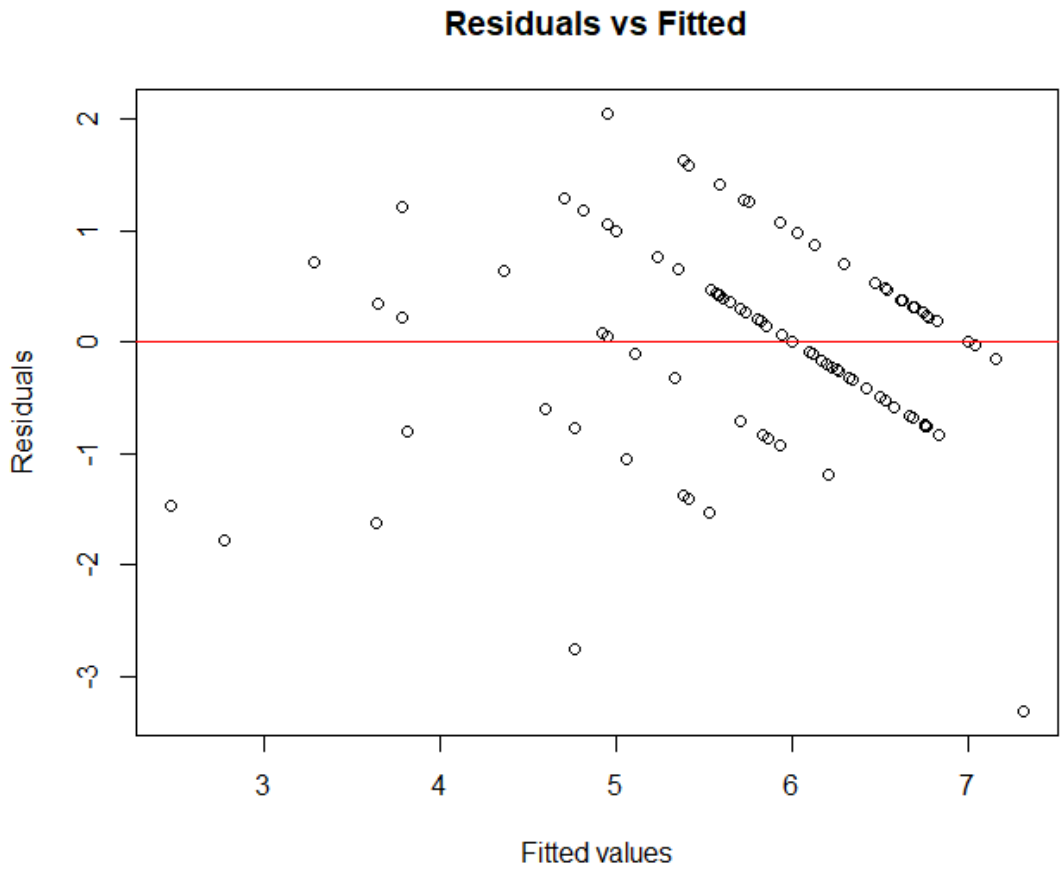
Normal Q-Q plot of the Residuals for the Multiple Regression Model



Note. A Shapiro–Wilk test indicated a small deviation from normality ($W = 0.965$, $p = .014$)

Figure 3

Residual Versus Fitted Plot for the Multiple Regression Model



Note. A Breusch-Pagan test indicated heteroscedasticity in the model's residuals ($BP = 11.78$, $df = 3$, $p = .008$)

Appendix A

Survey Questions: Plastic Bag Usage, Habit, and Social Norms English and Swedish version

*Note***.** Unless otherwise specified:

- 1 = Strongly Disagree, 7 = Strongly Agree
- Reverse-coded items are indicated with (R)
- Frequency scales: 1 = Never, 2 = Rarely, 3 = Occasionally, 4 = Often, 5 = Always

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English Version

General Questions and Demographics

1. What is your age?

Open-ended answer

2. What is your gender?

□ Male □ Female □ Non-binary □ Other □ Prefer not to say

3. Are you aware that the plastic tax has been abolished

Yes / No

4. When I go shopping, I bring reusable bags

Never / Almost never / Rarely / Occasionally / Most of the time / Almost always / Alway

5. I started using reusable bags

Long before the tax / Just before the tax / Just after the tax / Long after the tax / I never use reusable bags

6. The plastic bag tax had a significant impact on me economically

7. Since the abolishment of the plastic bag tax, I am buying plastic bags

Never / Almost never / Rarely / Occasionally / Most of the time / Almost always / Alway

8. Environmental sustainability is a key concern in my daily life

9. I believe it is important to reduce plastic waste for the sake of the environment

Self-Report Habit Index (SRHI)

1. I bring reusable bags when I go shopping frequently
2. I bring reusable bags when I go shopping automatically
3. I bring reusable bags when I go shopping without having to consciously remember
4. I feel weird if I don't bring reusable bags when I go shopping
5. I bring reusable bags when I go shopping without thinking
6. It would require effort for me to not bring reusable bags when I go shopping
7. Bringing reusable bags when I go shopping is part of my regular routine
8. I start bringing reusable bags when I go shopping without realizing I'm doing it
9. I would find it hard not to bring reusable bags when I go shopping
10. I don't need to think about bringing reusable bags when I go shopping
11. Bringing reusable bags when I go shopping is typically "me"
12. I have been bringing reusable bags when shopping for a long time

---

Custom Habit Loop Scale (CHLS)

Cue

1. I tend to bring reusable bags when I see them
2. I decide to use a reusable bag based on previous shopping experiences
3. I associate grocery shopping with the need to bring reusable bags

Routine

1. I bring reusable bags with me when I shop
2. Bringing reusable bags has become part of my shopping routine
3. I plan ahead so I don't need a plastic bag

Reward

1. I feel good about myself when I bring reusable bags
2. Bringing reusable bags makes me feel more environmentally responsible
3. Avoiding the plastic bag cost motivates me to bring reusable bags

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Social Norms (Adapted from Wibowo et al., 2024)

Injunctive Norms

1. People whose opinions I respect believe I should bring reusable bags when shopping
2. My friends and family expect me to bring reusable bags when shopping
3. People whose opinions I value ask me to bring reusable bags when shopping
4. People whose opinions I value think I must bring reusable bags when shopping
5. People whose opinions I value suggest that I bring reusable bags when shopping

Descriptive Norms (General Population)

6. Most people in Sweden think that everyone should bring reusable bags when shopping
7. Most people in Sweden think that not bringing reusable bags when shopping is not a big problem (R)
8. Most people in Sweden think that it is reasonable to bring reusable bags when shopping

Descriptive Norms

9. Most people whose opinions I value bring reusable bags when shopping
10. Most of my colleagues/friends bring reusable bags when shopping
11. Most people who have a similar income to me bring reusable bags when shopping

Descriptive Norms (General Population)

12. Most people in Sweden, in general, bring reusable bags when shopping

How often do people in Sweden, in general, bring reusable bags when shopping?

Never / Almost never / Rarely / Occasionally / Most of the time / Almost always / Always

---

*Note***.** Unless otherwise specified:

- 1 = instämmer inte alls , 7 = Instämmer fullständigt
- Reverse-coded items are indicated with (R)

Swedish Version

Generella frågor och demografi

1. Hur gammal är du?

Öppet svar

2. Vad är ditt kön?

□ Man □ Kvinna □ Icke-binär □ Annat □ Föredrar att inte säga

3. Är du medveten om att plastskatten har avskaffats?

Ja / Nej

4. När jag går och handlar använder jag mig av en återanvändbar påse

Aldrig / Nästan aldrig / Sällan / Ibland / Oftast / Nästan alltid / Alltid

5. Jag började använda återanvändbara påsar

Långt innan skatten / Precis innan skatten / Precis efter skatten / Långt efter skatten / Jag använder mig aldrig av återanvändbara påsar

6. Plastskatten hade en stor påverkan på min ekonomi

7. Sedan avskaffandet av plastskatten köper jag plastpåsar

Aldrig / Nästan aldrig / Sällan / Ibland / Oftast / Nästan alltid / Alltid

8. Miljö och hållbarhet är en nyckelfråga i mitt dagliga liv

9. Jag anser att det är viktigt att reducera plastavfall för miljöns skull

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SHRI – Self-Report Habit Index

1. Jag tar ofta med mig återanvändbara påsar när jag går och handlar
2. Jag tar med mig återanvändbara påsar automatiskt
3. Jag tar med mig återanvändbara påsar utan att medvetet behöva komma ihåg det
4. Det känns underligt om jag inte har med mig återanvändbara påsar
5. Jag tar med mig återanvändbara påsar utan att behöva tänka på det
6. Det hade krävts en ansträngning för mig att inte ha med återanvändbara påsar
7. Att ha med återanvändbara påsar är en del av min rutin
8. Jag börjar packa med mig återanvändbara påsar utan att inse det
9. Det hade känts svårt att inte ta med återanvändbara påsar
10. Jag behöver inte aktivt tänka på att ta med en återanvändbar påse
11. Att ha med återanvändbara påsar är någonting som är typiskt "mig"
12. Jag har tagit med mig återanvändbara påsar under en längre tid

---

CHLS – Custom Habit Loop Scale

Cue

1. Jag tenderar att ta med mig återanvändbara påsar när jag ser dem
2. Jag bestämmer mig för att använda återanvändbara påsar baserat på tidigare shoppingupplevelser
3. Jag förknippar att handla med behovet av att ta med återanvändbara påsar

Routine

4. Jag tar med mig återanvändbara påsar när jag handlar
5. Att ha med återanvändbara påsar har blivit en del av min rutin
6. Jag planerar i förväg så att jag inte behöver köpa plastpåse

Reward

7. Jag känner mig nöjd med mig själv när jag tar med återanvändbara påsar
8. Att ta med återanvändbara påsar får mig att känna mig mer miljöansvarig

9. Att undvika kostnaden för plastpåsar motiverar mig att ta med återanvändbara påsar

---

Sociala normer (Adapted from Wibowo et al., 2024)

Injunktiva Normer

1. Personer vars åsikter jag respekterar tycker jag bör undvika att köpa plastpåsar
2. Mina vänner, familj och kollegor förväntar sig att jag undviker plastpåsar
3. Personer vars åsikter jag värdesätter ber mig undvika plastpåsar
4. Personer vars åsikter jag värdesätter anser att jag måste undvika plastpåsar
5. Personer vars åsikter jag värdesätter föreslår att jag bör undvika plastpåsar

Injunktiva Normer (Generella Populationen)

6. De flesta i Sverige anser att alla bör undvika plastpåsar
7. De flesta i Sverige tycker inte det är ett problem att köpa plastpåsar (R)
8. De flesta i Sverige anser det är rimligt att undvika plastpåsar

Deskriptiva Normer

9. De flesta personer vars åsikter jag värdesätter undviker plastpåsar
10. De flesta av mina vänner, familj och kollegor undviker plastpåsar
11. De flesta med liknande inkomst som jag undviker plastpåsar

Deskriptive Normer (Generella Populationen)

12. De flesta i Sverige undviker plastpåsar
13. Hur ofta undviker människor i Sverige i allmänhet plastpåsar?

Aldrig / Nästan aldrig / Sällan / Ibland / Oftast / Nästan alltid / Alltid

Appendix B

Correlational data

Table B1

Correlation Matrix for Habit Strength, Social Norms and Reusable Bag Usage

Variable	HabitStrength	SocialNorms	ReusableUsage
HabitStrength	1 —	.41**	.71**
SocialNorms	.41**	1 —	.34**
ReusableUsage	.71**	.34**	1 —

Note. N = 93, **p < .01

Table B2

Full table correlation matrix for Habit Strength, Social Norms, Reusable Bag Usage with control variables included

Variables	H	SN	Reuse	Age	Gender	P-Pur	Env-C1	Env-C2	Ec-Imp
H	1	0.41**	0.75**	0.21*	-0.11	-0.78***	0.32**	0.32**	0.03
SN		1	0.29**	-0.09	0.05	-0.37**	0.33**	0.19	-0.06
Reuse			1	0.12	0.01	-0.74***	0.29**	0.28**	0.07
Age				1	-0.17	-0.11	0.08	0.02	0.08
Gender					1	0.04	-0.14	-0.04	-0.06
P-Pur						1	-0.27*	-0.25*	-0.00
Env-C1							1	0.54***	0.24*
Env-C2								1	-0.05
Ec-Imp									1

Note. H = Habit Strength, SN = Social Norms, Reuse = Reusable Bag Usage, P-Pur = Post-Tax Plastic bag purchase Env-C1 = Environmental concern 1, Env-C2 = Environmental concern 2, Ec-Imp = Perceived Economical Impact * P < .05 ** P < .01 *** P < .001

Appendix C

Multiple regression assumption checks

Table C1

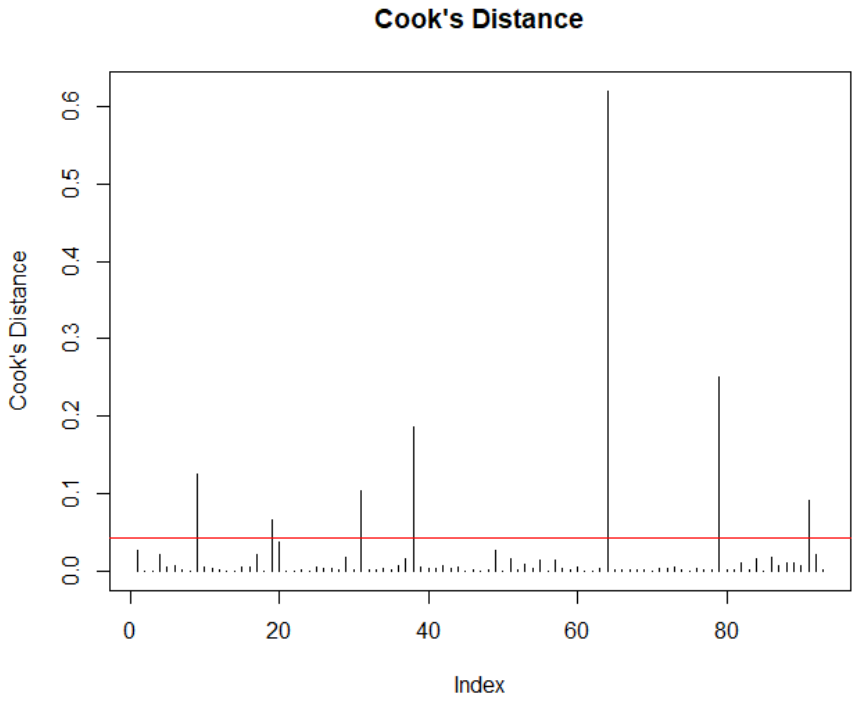
Variance Inflator Factor for the main regression model

Predictor	VIF	Tolerance
HabitStregth	9.98	0.10
SocialNorms	8.27	0.12
Habit x Norms	23.27	0.04

Note. VIF = Variance Inflator Factor. Tolerance = 1/VIF

Figure C1

Cook's Distance plot for the main regression model



Note. Cook's Distance values for each observation in the regression model. The red line represents a threshold of 4/n, which is a common cutoff for identifying influential outliers. Cases with a Cook's D value greater than this threshold may warrant further investigation.

Table C2

Influental Cases Identified by Cook's Distance

Case	Cook's Distance

9	0.126
19	0.065
31	0.104
38	0.187
64	0.620
79	0.251
91	0.090

Note. Cases with Cook's D > 4/*n* (≈ .044) were considered influential.

Appendix D

Full Regression diagnostics

Table D1

Regression model including control variables

Predictors	*B*	*SE*	*t*	*p*
Intercept	1.20	1.61	0.75	.459
HabitStrength	0.97	0.28	3.44	.001**
SocialNorms	0.55	0.31	1.78	.080
Habit x norms	-0.13	0.06	-2.11	.039*
Age	-0.00	0.01	-0.05	.959
Gender- Men	0.09	0.88	0.11	.915
Awarness of tax removal (no)	0.01	0.25	0.11	.969
Long after	1.32	0.78	1.68	.098
Long before	0.84	0.73	1.15	.254
Just after	1.12	0.74	1.52	.134
Just before	0.60	0.77	0.78	.438
Purchasing plastic bags	-0.25	0.11	-2.32	.024*
Environmental concern 1	-0.01	0.08	-0.12	.904
Environmental concern 2	0.02	0.09	0.25	.806
Economic impact	0.05	0.07	0.70	.485

*Note***.** Gender categories non-binary and "prefer not to say" (n = 3 combined) were excluded due to very small sample size. The reference group for Gender is "Women". The reference group for Awareness of plastic bag tax removal is "Yes". The reference group for reusable bags is "Never used". Model statistics: R^2 = .717, Adjusted R^2 = .640, $F(17, 63) = 9.38$, $p <$ .001, Residual *SE* = 0.824. *B* = unstandardized coefficient; *SE* = standard error.

*p < .05,

**p < .01.