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## THE IMPACT OF PUBLIC POLICY ON THE CIRCULAR ECONOMY AND ENVIRONMENTAL SECURITY

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**Abstract.** *To target a negative trend of people polluting the environment, governments around the globe are actively introducing legislations to discourage usage of damaging products and encourage citizens towards more environmentally friendly behavior. However, it is still not clear how and if such policies affect citizens' behavior in other domains – whether there exists any positive/negative spillover effect from governmental sustainable policies on consumers' purchasing patterns. In this article, we explored this issue using the example of Western European countries, where a ban on the use of free plastic bags has been introduced since 2016. We implemented difference-in-difference analysis between two groups of citizens: those who live in provinces where local government takes an active environmental role and those – where local government does not. In addition, we differentiated on the citizens' environmental motivation: whether they are concerned about environmental issue and claim to actively take actions in reducing harm towards the planet or not. By comparing the monthly shares of products in plastic packaging sales before and after the ban, we found that spillover happened only among low environmentally oriented consumers. The spillover showed to be negative, indicating that, on contrary to the intended goal, introduction of governmental ban increased the purchases of plastic products. In addition, we found a clear spillover evidence only for flavored drinks category, confirming that the spillover does not take place beyond products/actions which are closely associated with the ban.*

**Keywords:** *Behavior, circular economy, environmental security, plastic.*

### Introduction

People's behavior and their consumption patterns have a direct impact on the surrounding natural environment (Stern, 2000). A trending emphasis on convenience, constant overconsumption, and increased usage of single-use products for the past decade brought to one of the most pressing issues nowadays – plastic pollution. With more than 8 million tons of plastic ending up yearly in the oceans (Jambeck et al., 2015), the damage caused by this pollution is ubiquitous: from clogging drains and causing floods during rains (United Nations, 2018) to decaying into toxic microplastics and penetrating people through food, water, and air (Dris et al., 2015). With an estimated yearly cost of 8 billion USD due to plastic pollution (Jambeck et al., 2015), actions targeting to change consumer behavior are needed to be taken.

One of the pivotal players in shaping consumption patterns is the government (Pape, Rau, Fahy & Davies, 2011; Dawkins et al., 2019). With an access to wide array of tools such as informational campaigns, research grants, restrictions on manufacturing, and taxation and bans, governments can contribute significantly to the resolution of plastic pollution topic. Starting from the 2000s, governmental focus has been actively targeted on reduction of plastic bags - one of the three most important sources of plastic pollution (United nations, 2018). With more

than 125 countries having implemented diverse plastic-bags-related policies, its effectiveness in reducing targeted behavior is undoubtful. For instance, introduction of plastic bag charge has led to 70% reduction in plastic-bags usage in Wales (Poortinga, Whitmarsh, and Suffolk, 2013), 94% usage reduction in Ireland (Convery, McDonnell & Ferreira, 2007), and 71% in the Netherlands (Government of the Netherlands, 2017). However, this picture does not explain the interconnectedness of actions and possible spillover effects underlying consumers' behaviors in following government interventions. The question of how and if such sustainable policies influence other consumers' actions remains open.

A behavioral spillover effect is an activation of pro-environmental behaviors not targeted by the specific policy (Poortinga et al., 2013), which is actively entering discussion of pro-environmental literature. Current research brings mixed conclusions on the possibility of spillover effect of sustainable policies on pro-environmental behaviors, with some studies finding a spillover effect (Thomas, Poortinga & Sautkina, 2016; Truelove & Nugent, 2020), and others not (Poortinga et al., 2013; Martinho, Balaia & Pires, 2017).

The article shows the effect of the recent introduction of a ban on free plastic bags in the Netherlands (Government of the Netherlands, 2016); that is, whether such policy can affect consumers' shift towards more sustainable consumption. Using longitudinal data over four years (two years before and two years after ban introduction), we investigate if there is any spillover effect from a decreased usage of plastic bags on purchase of other unsustainable products. When analyzing the behaviors, we moderate relations with customers' environmental motivation (high, moderate-high, moderate-low, low) and similarity of products to plastic bag (flavored drinks – closely associated with plastic waste, and packaged pasta – remotely associated with plastic waste). Thus, the general research question is: How do governmental sustainable policies affect non-targeted consumer behaviors, based on the consumers' environmental motivation and product's similarity to the policy? From an academic standpoint, this research contributes to the further understanding of spillover effect in governmental policy field and expands literature on person's motivation influence on pro-environmental actions. This research is also beneficial from a managerial perspective, as it provides insights not only on how governmental actions can shift consumer behaviors towards (un)sustainable products but also on how these behavioral shifts may differ between diverse subsets of consumers.

### **The main body of the paper**

The term behavioral spillover (also referred to as response generalization, Ludwig, 2002) has been actively used in the existing psychology literature (e.g., Brügger & Höchli, 2019; Poortinga et al., 2013). In general terms, Truelove et al. (2014, p.127) define behavioral spillover as “the effects of an intervention on subsequent behaviors not directly targeted by the intervention”. This definition can be applied to the environmental context as well, where an intervention refers to any governmental action aimed to encourage pro-environmental behavior (i.e., regulatory policies, taxation, educational campaigns), and subsequent behaviors refers to citizens' response to it (Thøgersen & Crompton, 2009). One example of pro-environmental behavioral spillover is a reduction of overall consumer-generated waste resulting from an electronic waste (e-waste) policy introduction (Dhanorkar & Muthulingam, 2020).

The spillover effect can take two forms: positive and negative. A positive spillover occurs when there is a positive relationship between two events: an increase (decrease) in one behavior leads to an increase (decrease) in another one (Thøgersen and Crompton, 2009). As in Dhanorkar and Muthulingam's (2020) example, a decrease in the level of e-waste led to a decrease in the overall level of waste. On the contrary, negative spillover has a negative

relationship between two events: an increase (decrease) in one behavior leads to a decrease (increase) in another one (Thøgersen & Crompton, 2009). For instance, a decrease in energy prices led to an increase in energy use (Truelove et al., 2014). For brevity, in this paper, we refer to the term behavioral spillover as an all-encompassing term for both negative and positive spillover in environmental settings.

Several psychological mechanisms have been proposed to explain the drivers of behavioral spillover. For instance, both Thøgersen and Crompton (2009) and Nilsson, Bergquist, and Schultz (2017) appeal to cognitive dissonance, self-perception theories (in particular, foot-in-the-door effect), and action-based learning to explain positive spillover. In explaining the possible drivers of a negative spillover, Lanzini and Thøgersen (2014) refer to moral licensing and single-action bias as the underlying mechanisms. In an overview of environmental and psychological literature, Truelove et al. (2014) summarize behavioral spillover mechanisms under the following categories: positive spillover being driven by an identity effect and a motivation to behave consistently, while negative spillover is driven by single-action bias, rebound, and moral licensing effects. In the following paragraphs, we expand on what the literature has established in relation to spillover-driving mechanisms.

Current research of possible behavioral spillover from plastic policies on other behaviors is rather scarce and brings ambiguous results. One example is Poortinga et al., (2013) research on introduction of single-carrier bag charge of 5 cents in Wales. This policy, the same as numerous similar policies around the world (Plastic Bags Laws, 2021), showed to be a success in terms of plastic-bags usage reduction in Wales by 70%. At the same time, Poortinga et al. (2013) found only a slight support of behavioral spillover brought by this policy: researchers found only occurrence of change in self-reported environmental identity, which they assumed might lead to positive spillover in the future. The absence of possible spillover was hypothesized to be explained by a short period of observation as well as national-level rather than individual-level data aggregation. In a similar vein, Martinho et al., (2017) showed that an introduction of plastic carrier tax in Portugal lowered the plastic bags consumption by 74% but did not change the perception of marine litter or plastic bags' impact on environment and health. A further investigation of single-carrier bag charge policies in Wales though showed that increase in bringing own bags to stores led to a slight increase in other behaviors (turning off the tap when brushing teeth, wearing warmer clothes indoors, and using public transport), indicating a positive behavioral spillover effect (Thomas et al., 2016). The presence of only weak spill over effect is consistent with what has been found in previous literature (Austin, Cox, Barnett & Thomas, 2011; Thøgersen & Crompton, 2009).

On the other hand, several studies showed the occurrence of a positive spillover effect from pro-environmental activity to the environmental policy support, indicating a possible relation between behaviors. For instance, Truelove et al. (2016) showed that engaging people into recycling, led to stronger support for a pro-environmental campus green fund. At the same time, Truelove and Nugent (2020) found that encouraging people to reduce straw usage (a similar idea to encouraging people to reduce plastic bags usage) had a positive spillover effect on other pro-environmental behaviors. To sum up, despite previous research of environmental spillover from policies into behaviors (or reverse) being rather limited, it gives insights on possibility of spillover occurrence from governmental policies.

Introduction of single-use plastic bags policies in numerous countries around the world (e.g., the Netherlands, Wales, Portugal, China) showed positive results, lowering single-use plastic bags usage on average by 70% (Poortinga et al., 2013; Martinho et al, 2017; Government of the Netherlands, 2017). However, these policies might not only have played direct role in reducing the number of single-use carrier bags but have also created a spillover effect on other

pro-environmental behaviors, as was supported by findings of Thomas et al. (2016), Truelove et al. (2016), and Truelove and Nugent (2020) studies.

The underlying mechanism of spillover occurrence from introduction of single-use plastic bags charge might be explained from two sides: economic and psychological (Poortinga et al., 2013). From economic perspective, by bringing their own reusable shopping bags to the store, citizens have additional disposable income saved, and thus can spend it on other products or activities. This process is supported by the indirect rebound effect literature (Gillingham, Rapson & Wagner, 2016). From psychological perspective though, the mechanism is more complex. By introducing the single-use plastic bags charge, governments create an additional step in consumers' minds –whether to bring own bag or buy a bag in the store – which was not part of the consumers' decision journey before. This, in turn, discontinues a previous (possibly unconscious) habit of 'grabbing the bag on the way out of the store' and activates citizens' self-environmental perception (Verplanken, Walker, Davis, & Jurasek, 2008). Based on the activated self-perception, citizens start thinking of other actions beyond plastic bags purchases, and alter them according to their attitudes (Bem, 1972) and goals. Thus, by introducing plastic bags charge, governments bring consumers to the new 'shopping' context, making them think of their actions beyond plastic bags purchases and act differently. This makes us hypothesize:

H1: There is a behavioral spillover effect from introduction of governmental sustainable policy to other areas of sustainable consumption.

H2: There is a higher positive (negative) spillover effect for environmentally motivated (unmotivated) people than for environmentally neutral and unmotivated (motivated) people.

For this articles, we used data provided by AiMark foundation: the center for advanced international marketing knowledge, supporting researchers with an access to consumer behavior data mainly in FMCG market across 54 countries (AiMark, 2021). Out of the data available, we used two secondary data datasets as main means of analysis: 1) a 2019- year survey of Dutch households on their attitudes towards sustainability, and 2) international households scanner data from 2008 to 2018.

To understand what types of products Dutch consumers were purchasing with our scanner data, and to select dependent variables for spillover effect, we used a supplementary barcodes dataset. The dataset contained a total of 925 003 of diverse barcodes for products within 717 different categories. While selecting the product category for the dependent variable, we used the following criteria:

1) there should be substantial number of respondents as well as observations (i.e., the total number of purchases per respondent) made within a product category to observe trends and conduct analysis;

2) the product should be related to environmental concerns (e.g., causing damage by plastic packaging);

3) there should be (i) substitutes of the products available on the market that are visible within the dataset (e.g., glass/paper substitutes for plastic) or that it is plausible that an increase/decrease in purchase behavior is attributed to a spillover effect from the intervention, and (ii) that the product demand is not inelastic in its current form, as this will simply reflect the (lack of) sensitivity to price;

4) products within the category as well as a product's harm to the environment should be easily compared with each other (i.e., have a comparable unit of measurement) to be able to quantify the spillover effect;

5) the product should be used by all demographic segments (for instance, make-up would automatically exclude almost all males from the selection, which skews findings towards

females only, while oysters (or other exotic category) analysis will be limited to high-income consumers).

As a result of barcodes dataset analysis, we selected the sales of two categories as dependent variables: flavored drinks (consists of three subcategories: soft drinks, iced tea, and juices), and packaged pasta (consists of three subcategories: pasta in different shapes, pasta spaghetti, pasta macaroni).

Observing sales of packaged pasta showed how the free plastic bags ban affects the sales of other plastic-related products rather than bottles (flavored drinks), which is one of the most directly associated categories with plastic waste (Becerril-Arreola & Bucklin, 2021). Worth mentioning that we did not include ‘mineral water’ category, which is even closer associated with plastic waste than flavored drinks, since on average 98% of mineral water sales were in plastic. Thus, the variance of monthly share changes was not big enough to spot the differences.

This is explained by the fact that, on contrast to the selected categories, there is not a lot of mineral water products available in non-plastic bottles yet.

The selected categories flavored drinks and packaged pasta satisfy all criteria mentioned:

1) flavored drinks and packaged pasta categories had 3 955 and 869 barcodes respectively, which upon merging of all datasets and data cleaning resulted in 288 590 sales of flavored drinks made by 4 277 respondents, and 42 554 of packaged pasta drinks made by 3688 respondents per selected period from 2014 to 2017;

2) all products have plastic packaging, which causes harm to the environment;

3) flavored drinks have substitutes available in terms of aluminum “metaal/aluminium”, carton “karton” or glass “glas” cans, while packaged pasta is available in carton “karton/papier” boxes.

4) flavored drinks can be easily compared within categories by using the same size of bottles in ml, and packaged pasta has the same size of packaging in grams. Moreover, it can be assumed that the environmental harm caused by each product corresponds to the size of its bottle/packaging, making the products’ damage to the environment comparable within each category;

5) selected categories are equally purchased by all genders and widely available for diverse income and geographical segments.

To investigate a possible spillover effect, we were interested to see how the sales of items in plastic packaging changed over time in comparison with the sales of items in non-plastic packaging for the selected product categories. The best representation of this measure is the percentage of sales of items in plastic packaging (further referred to as plastic sales) in the total volume of sales. To extract these values, we calculated total monthly sales per respondent (total volume sales) and total monthly plastic sales per respondent (i.e., total volume sales of items with plastic packaging only) and divided the second value over the first one. Thus, the final dependent variable of the research is the share of plastic sales per respondent  $i$  at month  $t$ , which ranges from 0 to 1 (i.e., 0% to 100%). We expect that this value will decrease in case of a positive spillover effect and increase in case of a negative spillover effect

After joining all datasets and fixing missing values and outliers, the working datasets flavored drinks and packaged pasta, aggregated on monthly sales per respondent, contained a total of 102 289 and 32 689 rows respectively. Minimum and maximum values of the dependent variable (share of items in plastic packaging sales) were 0% and 100% (i.e., did not purchase products in plastic at all and purchased only products in plastic) for both datasets. Mean values were 60% of products in plastic packaging for flavored drinks and 81% for packaged pasta. Statistics on the main variables are given in Table 1.



**Table 1. Summary of main numerical variables from datasets**

Category	Mean	Min	Max	Sd
<b>Flavored drinks</b>				
Total unit sales (units)	2.38	1	36	2.36
Total volume sales (liter)	2.68	0.15	54	2.62
Price per unit (EUR/liter)	0.85	0.3	8.45	0.45
<b>Packaged pasta</b>				
Total unit sales (units)	1.24	1	10	0.57
Total volume sales (kg)	0.63	0.15	5	0.329
Price per unit (EUR/kg)	2.05	0.28	17	1.62

Observing time trends of the share of products in plastic packaging shows that on the general level there was a slight dip in the shares around the time of the introduction of the plastic ban intervention, with a subsequent increase in shares of sales several months later. However, the shares of sales for flavored drinks in plastic packaging constantly increased over time, while the shares of sales of packaged pasta in plastic packaging deviate around the same mean, making the analysis of differences interesting. The picture becomes more intriguing as we look at different environmental segments, described in the following parts.

Based on demographic characteristics, on average, environmentally friendly people tend to be slightly younger, have lower household size, come from a higher social class (in the Table 2), the lower the number – the higher the social class), and purchase more expensive items. However, these differences do not vary significantly. Demographic characteristics for all segments are summarized in Table 2. The combination of these demographic characteristics may have a common underlying variable – that is, education. Since more educated people tend to know more about the environmental issues and are also more environmentally cautious (Meyer, 2015) and at the same time have higher income. Those on the higher spectrum of income, in turn, tend to belong to a higher social class and are more likely to purchase more expensive items.

**Table 2. Demographic description of segments**

Category \ Env.segment	Low	Moderate-low	Moderate-high	High
<b>Flavored drinks</b>	336 (6%)	1107 (22%)	1769 (35%)	1065 (22%)
Age (average)	50	52	51	49
Household size (avg)	2.6	2.5	2.4	2.1
Social class (avg)	4.2	4.2	4.0	4.0
Price per unit (avg EUR/liter)	0.83	0.85	0.83	0.88
<b>Packaged pasta</b>	268 (7%)	950 (26%)	1541 (41%)	929 (26%)
Age (average)	50	52	51	49
Household size (avg)	2.7	2.6	2.5	2.2
Social class (avg)	4.2	4.2	4.0	4.0
Price per unit (avg EUR/kg)	1.91	1.99	2.03	2.19

On a more general level, we can see from Table 2 that the data sample average age category is 50-54 y/o (which is corresponding to category 7 in the coding), household size of 2-3 people, and a social class category 4 (lower middle class).

When it comes to the share of purchases of products in plastic packaging, the environmental segments show slightly different behaviors (especially for the *packaged pasta* dataset). However, for the *packaged pasta* dataset, the picture is slightly different, where ‘moderate motivation’ segments have the lowest share of plastic sales, ‘high motivation’ segment the second biggest share of plastic sales, and ‘low motivation’ segment the highest. In addition, the shares of plastic sales for all environmental segments besides ‘low’ deviate similarly around the mean (within the 15% range), while the ‘low’ segment has a significant variation of shares of plastic sales from month to month.

Lastly, Table 2 depicts average differences in the share of plastic sales by segment before and after the introduction of the free plastic bags ban in the Netherlands. The positive sign means that the average share of plastic sales increased after the introduction of the ban. Overall, the share of plastic sales for *flavored drinks* increased on 11% (from 50% to 61%), and for *packaged pasta* by 8% (from 62% to 70%). When partitioning at the segment level (see Table 3), the highest increase was seen for ‘low’ environmentally motivated respondents, and the lowest for ‘high’ motivated respondents. It is worth noting that these numbers show an overall picture of sales without splitting respondents based on the ‘treatment’ and ‘control’ groups.

**Table 3. Difference in average plastic shares % after the ban introduction**

Env.segment Category	Low	Moderate- low	Moderate- high	High
Flavored drinks	15%	13%	11%	8%
Packaged pasta	10%	11%	7%	6%

Using difference-in-difference approach, we were able to compare two groups of respondents who had different levels of governmental involvement in tackling environmental issue, and thus to observe if spillover occurred. Based on the Wallaart & Kusse (2019, p. 28) analysis of sustainability initiatives per province, the two selected groups were five Dutch provinces with active governmental involvement in tackling environmental issues (Flevoland, Gelderland, Utrecht, Groningen, and Friesland) as a treatment group, and the rest – as control group. We also compared the magnitude of spillover effects between respondents with different levels of environmental motivation, and across two different product categories.

With the first hypothesis (H1) we predicted that there should be an overall spillover effect from the introduction of sustainable policy. However, the analysis of the data did not show evidence to support a spillover effect from the plastic bag intervention in the Netherlands in 2016. These findings correspond with previous studies of plastic-reduction policies, such as the implementation of a charge on single-carrier bags in Wales (Poortinga et al., (2013) and Portugal (Martinho et al., 2017) A plausible explanation for this result is that different consumer segments behave in different ways; that is, one segment showed a positive spillover effect (decreased the number of purchases of products in plastic packaging after the ban introduction), whereas other segments showed the opposite effect (increased the number of purchases of products in plastic packaging after the ban introduction), leading to a null effect at the aggregate level.

However, the clear distinction between our research and previously mentioned ones is that both studies by Poortinga et al., (2013) and Martinho et al., (2017) used survey responses, whereas this thesis also uses observational data of consumers' real purchase behaviors. This made the analysis more reliable since people's claimed behavior and actual behavior might differ. For instance, while responding to a survey, respondents might be biased to respond more environmentally friendly due to societal expectations of 'correct behavior', known as a 'desirability bias'. Observing actual purchase behaviors is more likely to be a true reflection of one's attitudes and beliefs about environmental issues.

With the second hypothesis (H2) we predicted that the direction and strength of spillover would differ based on the person's environmental motivation. We tested this hypothesis with splitting respondents on four segments, based on their environmental motivation (High, Moderate-high, Moderate-low, and Low). Out of the four segments constructed in this analysis, we found the presence of a spillover effect only for the lowest environmentally motivated segment ('Low'). For this segment of respondents, the spillover effect was found to be negative: a decrease in single-use plastic bags after ban's introduction led to increase in the share of purchases of products in plastic packing. This finding goes in the opposite direction of those found in one previous study on a spillover effect from the introduction of a single-carrier bag charge policy of five cents in Wales (Thomas et al., 2016). This discrepancy might be due to differences in the measurement methods used, with respondents in the survey used in Thomas et al.'s (2016) study claiming to be more environmental than they are. Moreover, Thomas et al. (2016) measured spillover to distant behaviors such as turning off the tap when brushing teeth, wearing warmer clothes indoors, and using public transport, while we looked at behaviors closely associated with the new governmental policy. However, the spillover effect that was detected for the 'Low' segment in this study was not very strong (8%), which is consistent with previous findings (Thomas et al., 2016; Thøgersen & Crompton, 2009).

The underlying reason for the occurrence of negative spillover effect might be moral licensing or single-action bias effects. After the free plastic bags ban introduction in the Netherlands, people reduced the purchase of plastic bags by 70% (Government of the Netherlands, 2017), meaning that they started bringing more often their own shopping bags with them to the store. For the low environmentally motivated people, this action might have allowed them to feel 'morally licensed' to purchase more products in plastic packaging since they already reduced their plastic consumption by bringing their own bag to the store. This also goes in line with Gneezy et al.'s (2012) argument of moral licensing effect occurrence when the initial behavior is cheap – the price of reusable bags is not high. At the same time, for more environmentally motivated people introduction of plastic bags ban did not change their perception of plastic damage. The possible explanation for absence of spillover in that group is that environmentally motivated people were already believing in or practicing pro-environmental behaviors (e.g., were already bringing their own reusable bags to the store) before the ban introduction and thus did not experience a 'context' change.

At the same time, this research is beneficial from a managerial standpoint, since it gives insights to managers how governmental policies can influence their customers' actions. The findings show that in case with free plastics bag ban in the Netherlands, only low environmentally motivated customers changed their behavior, increasing the purchases of plastic packaged products. However, this is not a 'call to inaction' to the business since introduction of other (stricter or different type of) policies can activate the (opposite) response from the rest of customer segments as well.



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## Conclusions

In this article we investigated if the introduction of a sustainable governmental policy, has a spillover effect on consumer behavior. This thesis focused on one such example of a sustainable government policy, a ban on single-use plastic bags at supermarkets, for the Dutch market. The ban on free plastic bags was introduced on Jan 1st, 2016, where we analyzed the period before and after the introduction of the plastic bag ban to see if there was any change in consumer purchasing patterns. Of particular interest was if the plastic bag intervention led to a change in the purchases of plastic packaged products, which have alternative environmentally friendly packaging (flavored drinks and packaged pasta). For the analysis, we used panel dataset of supermarket purchases for over 4 000 respondents over the period of four years (two before and two after the introduction of the ban) and their responses to a survey seeking to understand their pro-environmental tendencies (e.g., concerns, actions, perception of who is responsible to address climate change issues) that was conducted in 2019.

Using difference-in-difference approach, we were able to compare two groups of respondents who had different levels of governmental involvement in tackling environmental issue, and thus to observe if spillover occurred. Based on the Wallaart & Kusse (2019, p. 28) analysis of sustainability initiatives per province, the two selected groups were five Dutch provinces with active governmental involvement in tackling environmental issues (Flevoland, Gelderland, Utrecht, Groningen, and Friesland) as a treatment group, and the rest – as control group. We also compared the magnitude of spillover effects between respondents with different levels of environmental motivation, and across two different product categories.

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However, the clear distinction between our research and previously mentioned ones is that both studies by Poortinga et al., (2013) and Martinho et al., (2017) used survey responses, whereas this thesis also uses observational data of consumers' real purchase behaviors. This made the analysis more reliable since people's claimed behavior and actual behavior might differ. For instance, while responding to a survey, respondents might be biased to respond more environmentally friendly due to societal expectations of 'correct behavior', known as a 'desirability bias'. Observing actual purchase behaviors is more likely to be a true reflection of one's attitudes and beliefs about environmental issues.

With the second hypothesis (H2) we predicted that the direction and strength of spillover would differ based on the person's environmental motivation. We tested this hypothesis with splitting respondents on four segments, based on their environmental motivation (High, Moderate-high, Moderate-low, and Low). Out of the four segments constructed in this analysis, we found the presence of a spillover effect only for the lowest environmentally motivated segment ('Low'). For this segment of respondents, the spillover effect was found to be negative: a decrease in single-use plastic bags after ban's introduction led to increase in the share of

purchases of products in plastic packing. This finding goes in the opposite direction of those found in one previous study on a spillover effect from the introduction of a single- carrier bag charge policy of five cents in Wales (Thomas et al., 2016). This discrepancy might be due to differences in the measurement methods used, with respondents in the survey used in Thomas et al.'s (2016) study claiming to be more environmental than they are. Moreover, Thomas et al. (2016) measured spillover to distant behaviors such as turning off the tap when brushing teeth, wearing warmer clothes indoors, and using public transport, while we looked at behaviors closely associated with the new governmental policy. However, the spillover effect that was detected for the 'Low' segment in this study was not very strong (8%), which is consistent with previous findings (Thomas et al., 2016; Thøgersen & Crompton, 2009).

Looking at the literature on environmental spillover effects more broadly, the presence of a negative spillover was seen in other studies related to the governmental actions. For instance, Truelove et al. (2016) found that a negative spillover effect from water bottle recycling on pro-environmental policy acceptance. In addition, both Weber (1997) and Hansen, Marx, and Weber (2004) found evidence that when farmers changed their production techniques to withstand climate change, they were later less supportive of long-term based carbon emission policies (negative spillover).

The underlying reason for the occurrence of negative spillover effect might be moral licensing or single-action bias effects. After the free plastic bags ban introduction in the Netherlands, people reduced the purchase of plastic bags by 70% (Government of the Netherlands, 2017), meaning that they started bringing more often their own shopping bags with them to the store. For the low environmentally motivated people, this action might have allowed them to feel 'morally licensed' to purchase more products in plastic packaging since they already reduced their plastic consumption by bringing their own bag to the store. This also goes in line with Gneezy et al.'s (2012) argument of moral licensing effect occurrence when the initial behavior is cheap – the price of reusable bags is not high. At the same time, for more environmentally motivated people introduction of plastic bags ban did not change their perception of plastic damage. The possible explanation for absence of spillover in that group is that environmentally motivated people were already believing in or practicing pro-environmental behaviors (e.g., were already bringing their own reusable bags to the store) before the ban introduction and thus did not experience a 'context' change.

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