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***Pro-environmental spillover in consumer behavior:
existence and drivers***

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Introduction to the dissertation

The dissertation deals with pro-environmental consumer behaviour and the phenomenon referred to as “behavioural spillover”. A positive spillover exists when acting in a pro-environmental way in one domain makes it more likely that the consumer will also act in a pro-environmental way in other domains. The topic is of great interest for marketing as well as for consumer and environmental policy. However, several aspects related to whether and when positive spillover of pro-environmental behaviour occurs need to be explored more in depth to determine if and when the phenomenon can be counted on in practice and to fine-tune its implications for marketing and policy.

The dissertation consists of three essays. Propaedeutic to the whole work, Essay 1 provides basic insight on the phenomenon of spillover, by reporting key results from a two-wave experimental field-study with a sample of students ($n = 194$) at Aarhus University in Denmark. The study, among the first to document the existence of positive spillover in a field experimental setting, focused on whether or not positive spillover occurs. Using a differences-in-differences approach, it was found that positive spillover exists, yet it is limited to easy-to-perform behaviours.

Essay 2 deals with habits as a possible, but until now un-researched moderator of the found spillover effect. The survey included a well-validated instrument for measuring habits with regard to a specific behaviour in the domain of recycling. It was studied whether general recycling habits moderated the spillover from (experimentally promoted) “green” shopping behaviour to the (specific) recycling of batteries. Somewhat surprisingly, the intentions to recycle batteries became relatively more favourable among participants with strong vs. participants with weak recycling habits between the pre- and the post-survey. In the discussion section, three possible explanations of this effect are scrutinized. This result has relevant practical implications, but most importantly it is the first study to establish empirically that habits play an important role as moderator for positive spillover.

Essay 3 investigates the importance of different types of rewards (monetary and praise) for spillover – an issue that has played a prominent role in the pertinent literature for decades, but which still suffers from a lack of empirical research. This is a contested issue with some studies finding that monetary rewards undermine intrinsic motivation, whereas praise does not, while others find the opposite. The results did not reveal a significant effect of the type of reward on spillover, as the strength of the latter is similar in individuals treated with different types of incentives.

Pro-environmental spillover, or the quest for *the magic button*

The study focuses on the so-called spillover effect in the environmental domain, or the tendency of individuals adopting a specific green behavior to behave environment-friendly even in other, not related contexts. Different psychological mechanisms underlying this process have been singled out in literature (e.g.: Self Perception Theory, Cognitive Dissonance Theory, etc). However, there is no general agreement neither on the strength nor on the drivers of spillover. In autumn 2012, 194 undergraduate students from the University of Århus (Denmark) have been recruited and participated in a panel study based on online surveys filled in twice: before and after the experimental intervention. The latter consisted in encouraging the uptake of a specific green behavior (purchase of sustainable products) for a period of 6 weeks, investigating the effects on different behavioral domains. Results show that there is a positive spillover from the source behavior to other, non-correlated domains, albeit the effect is limited to easy to perform and not costly behaviors.

Keywords: Pro-environmental Spillover, Consumer Behavior, Self Perception Theory, Cognitive Dissonance Theory

Introduction

Spillover between pro-environmental behaviors represents a stream of research that gained broad attention in recent years, given both the interest it bears for scholars and the relevant implications it has for policy makers and marketing campaigners. We refer to *spillover* as to the phenomenon (and related mechanisms) for which adopting an environmentally sound behavior in one domain *spills over* in different environmental domains. The literature on the issue is big and growing, but despite the range of empirical studies carried out, the evidence is not conclusive and

no general agreement on the very nature of spillover, its drivers and actual relevance has been reached so far.

The article contributes to the literature by adding evidence on the existence of positive spillover across pro-environmental behaviors, providing at once the building-block for further analyses focusing on the role played by specific variables and drivers in spurring/hindering spillover itself. To this end, the article is organized as follows: the first section reviews evidence in literature on environmental spillover. Then, the hypotheses to be tested empirically are specified and a paragraph is specifically devoted to a description of the methodology used in the study, as regards both research design and data collection. The results emerging from such analysis are reported, and a discussion of evidence with concluding remarks on the limitations of the study and ideas for further research represent the final section of the article.

Literature review

Empirical evidence on spillover in the environmental domain is growing. Some authors are skeptical about the possibility of either positive or negative spillover among behaviors to happen, as behaviors themselves are viewed as unique, not correlated and determined by the specificities of the situation and the individual behavior, alone. For example, in reviewing existing evidence on the issue, Gray concluded that there is very little evidence of transfer from the target behavior to other behaviors (Gray 1985). Pickett et al (1993) found weak to non-existent correlation between pro-environmental behaviors in a southwest USA community. Their study is consistent with Balderjahn's assumption that a general picture of a green consumer may not exist, as each specific behavioral pattern has its own cluster of predictors (Balderjahn 1988). Other scholars dismiss the perspective of an integrated theory of conservation behavior and the possibility to use a common set of variables to predict a wide range of pro-environmental behaviors, supporting the idea that behaviors are not correlated and no spillover can therefore have occurred among them (see McKenzie-Mohr et al 1995).

On the other hand, there is robust empirical evidence that suggests pro-environmental behaviors are indeed correlated. Different authors diverge in predicting whether the correlation is positive, negative or depending on the specificity of single cases. Whereas most of the evidence supports the existence of a positive spillover across behaviors (Berger 1997, Scott 1977, Thøgersen 1999, Kals et al 1999, Maiteny 2002, De Young 2000, Frey 1993), some authors suggest that negative spillovers might occur as well, with people acting pro-environmentally in a domain perhaps taking

this as an excuse to avoid other (and more costly) virtuous behaviors (Diekmann and Preisendorfer 1998, Schahn 1993, Wenke 1993). Van Raaij (1995) recognizes this behavioral pattern, suggesting that it signals individuals being aware of the need to change their own behaviors, and such *partial yielding* can be regarded as a facilitating element in persuading people to adopt more sustainable behaviors.

Several theories can be read in the light of the present perspective of analysis, as spillover effects are intrinsic to a broad range of consumer psychology models such as self-perception theories, consistency theories or knowledge theories.

Self-perception theory (Bem 1972) states that people often infer their attitudes from observing own past behaviors, and the contexts in which such behaviors took place. These self-perception effects have been observed in a broad range of domains, including environmental behavior (see Chaiken and Baldwin 1981). If behaviors are used by individuals as cues to their own dispositions, they bear the potential to affect broader behavioral patterns, and to spark a positive spillover among environmental domains. Not only could behaving pro-environmentally in a given domain change the attitude towards the behavior (Holland et al, 2002), but even activate a general disposition in the individual, which might be more likely to influence future behavior (Cornellissen et al 2008).

Self-perception explanation of spillover is consistent with the so-called *foot-in-the-door* paradigm. Freedman and Fraser (1966) conducted two experiments asking individuals to carry out a small request, and later a larger one. The difference between experiments referred to whether the person asking the two requests was the same or not, and whether such requests were similar (except for their size) or different. The results show that, in all cases, people carrying out a small request are more likely to accept carrying out a larger request later. The foot-in-the-door strategy is effective, according to self-perception theory, because individuals use their own behavior as a cue for their attitudinal dispositions (Scott 1977). Such strategy has been applied and tested in several fields and contexts since, often showing positive effect (Baron 1973, Cann et al. 1975, Pliner et al. 1974, Reingen and Kernan 1977, Scott 1976, Snyder and Cunningham 1975, Uranowitz 1975, Burger 1999, Cialdini et al. 2004, Beaman et al. 1993, DeJong 1979, Dillard 1991, Schwarzwald et al. 1983).

The self-perception explanation of the foot-in-the-door effect, however, is still disputed: while some authors (DeJong 1979, Snyder and Cunningham 1975) believe in the self-perception theory explanation of the phenomenon, however, others challenge such view (Beaman et al. 1983, Dillard et al. 1984, Gorassini and Olson 1995), asserting that either self-perception is not

correlated with foot-in-the-door effect, or that it can account only partially for the variance of the investigations. In a study conducting a number of meta-analyses to single out psychological processes influencing people's response to foot-in-the-door manipulation, Berger found that self-perception is indeed one of such processes, but not the only one (Berger 1999). It has been noted, moreover, that "researchers have failed to find direct evidence for a shift in participants' self-concepts following a foot-in-the-door manipulation" (Burger and Caldwell 2003), and "although the general pattern of results is consistent with the notion that foot-in-the-door participants often alter the way they think of themselves, there is no direct assessment of self-concept to back up this interpretation".

Cognitive dissonance theory (Festinger 1957) focuses on the discomfort caused by inconsistent behaviors, suggesting that individuals desire to be consistent in their attitudes and behaviors (Eagly and Chaiken 1993, Feldman 1966, Cialdini 1989). When two values of same priority and sustained by strong beliefs are in contrast, a discomfort arises, leading to complications when it comes to choosing the right behavior to adopt and action to take. There is a vast empirical literature providing findings consistent with this theory, also with specific reference to the environmental domain (Dickerson et al. 1992, Aitken et al. 1994).

Acting consistently, leading to positive spillover from one environmental behavior to another, may be a way to avoid cognitive dissonance and the uneasiness it bears (Thøgersen 2004). The desire to behave consistently should lead to environmentally responsible behaviors being positively correlated (Thøgersen 2004), unless behaviors are substitutes or there are specific constraints, either personal or contextual, on a behavior (e.g. Guagnano et al. 1995, Ölander and Thøgersen 1995). The latter partly because inconsistencies attributed to forces outside of individual control do not lead to cognitive dissonance (Festinger and Carlsmith 1959, Collins and Hoyt 1972).

Some inconsistencies are perceived as more disturbing than others, thus more prone to cause cognitive dissonance and spur the subsequent quest for consistency. According to Aronson's self-consistency revision of cognitive dissonance theory, the most disturbing inconsistencies are those threatening important elements of self-concept as a competent, moral, reliable person (Aronson 1997, Aronson and Carlsmith 1962, Dickerson et al 1992, Thibodeau and Aronson 1992). Moral standards hence play a role in determining whether an inconsistency is perceived as disturbing by an individual (Thøgersen 2004). Moreover, not all individuals react similarly to a given perceived inconsistency, as there are personality traits that play a role in how much people tolerate inconsistencies, or feel the urge to settle them. Cialdini and colleagues (1995) developed a

Preference For Consistency (PFC) scale, measuring people variation in the desire to be consistent. People scoring high on the PFC scale value personal consistency highly, and put great effort into aligning behaviors with previous actions and attitudes. Accordingly, only high-PFC scorers were found to fit with consistency phenomena like the foot-in-the-door effect (Cialdini et al. 1995). The authors suggest that preference for consistency moderates consistency-based behavior, and this assumption is backed by a number of different studies on the issue (Council et al. 1997, Bator et al. 1996, Council 2000, Smith 1998). Guadagno and colleagues (2001) found that an inadequate delay between the requests undermines the foot-in-the-door phenomenon, but this hindering effect is overridden by people with high preference for consistency. Further, inconsistencies alone are usually not able to spur a virtuous circle so that environmentally sound attitudes spill over from one behavior to another. The performance of the green task should be as easy as possible, since behavioral shifts requiring great efforts are usually avoided by individuals choosing other routes to decrease dissonance, or simply living on with their perceived behavioral inconsistencies (Festinger 1957, Abelson 1968).

Knowledge theories stress the relevance of skills, awareness and knowledge that can be developed by a learning-by-doing process, so that engaging in a green behavior supports the uptake of other consistent behaviors by means of increased capacities in the environmental field, as well as strengthened awareness and overall knowledge of the issues at stake. The relevance of skills and competence for the adoption of an environmental behavior has been stressed by a number of scholars.

For instance, De Young (2000) criticizes the traditional dichotomy on the drivers of green behaviors, which focuses on incentives on the one hand (Geller 1987, 1992), and on altruism on the other hand (Schwartz 1970). He supports instead the concept of a *multiple determination of behavior*, which is consistent with a large body of empirical evidence (Stern and Dietz 1994, Stern et al. 1995, Thompson and Barton 1994, Cook and Berrenberg 1981, Oskamp et al. 1991), with concepts such as competence playing a key role in the adoption of environmentally sound behaviors. Spillover across environmental domains has been pointed out as a possible outcome of increased environmental concern deriving from individuals performing green activities. Maiteny (2002) for instance stresses how direct experience is relevant in driving long-lasting and broadening pro-environmental behavioral changes, whereas shifts driven by means of incentives or regulations are more superficial, and bound to fade and revert back to old habits. Kals and colleagues (1999), on the other hand, focus on the role played by present and past experiences in natural environments in spurring the adoption of pro-environmental behavior, stressing the relevance of both increased knowledge and what they call *the emotional affinity with nature*.

However, many authors stress how the role of knowledge in shaping environmental behavior (and even more, in spurring spillover between different behaviors) should not be over-emphasized (for a review of analytical frameworks to assess the environmental awareness-behavior relationship, see Kollmuss and Agyeman 2002). Indeed, *the track record of increased awareness of environmental problems leading to pro-environmental behaviour change is notoriously poor* (Thøgersen and Crompton 2008).

Most of the literature on spillover in the environmental domain can be ascribed to one of the above-mentioned theoretical frameworks; however, it is worth noting that there are empirical studies on the issue where the underlying theory on spillover is *implicit*, and doesn't fit with any existing framework in scientific literature (Diekmann and Preisendörfer 1998). Moreover, whereas self-perception, quest for consistency and environmental awareness are elements of paramount importance in addressing the topic of spillover between environmental behaviors, the literature encompasses a broad range of further elements supposed to have a relevant role in the spillover process. Personal features of individuals (such as values and norms, as well as the above-mentioned preference for consistency) are among these factors.

There is evidence that personal norms have a strong influence on people propensity to adopt pro-environmental behaviors (Harland et al. 1999, Thøgersen 1999a, b). Furthermore, Thøgersen and Ölander (2003) found that *the likelihood of spillover is higher if the value domain that Schwartz (1994) termed universalism is given high priority or if a person possesses strong personal norms for environmental-friendly behaviour* (Thøgersen and Ölander 2003). The ease and costs of environmental behaviors also affect spillover patterns. For instance, norm activation theory (Schwartz 1977) predicts that when we perceive the costs of behaviors benefitting society at large to be too high, we tend to erect psychological barriers like denying personal responsibilities or ignoring the difference that our own behavior can make. The similarity of behaviors is yet another variable to be taken into consideration when analyzing the likelihood of spillover between pro-environmental behaviors, as for behaviors perceived as distant and loosely related, spillover is less likely to occur (Thøgersen and Ölander 2003, Thøgersen 2004).

Some of the theories on spillover and their underlying psychological mechanisms can contradict each other. For instance, Thøgersen and Crompton (2009) argue that the synergic effects of self-deceptive bias and human tendency to perform small tasks first decrease the likelihood that once people perform a small and easy task they will later perform a more demanding one; an effect that goes against the effect predicted by the foot-in-the-door paradigm. Individuals consider it rational to start with simple tasks, but once they have done so, they may believe that they

provided a fair contribution, often subconsciously exaggerating the objective value of such contribution. The belief that a person is (only) obliged to make a fair contribution is referred to as a *contribution ethics* (Guagnano et al 1994, Kahneman et al 1993; Thøgersen & Crompton, 2009). Thøgersen (1999b) found that people feel less obliged to perform a specific task in the environmental domain the more they already addressed the same problem by doing something else. Moreover, people tend to exaggerate their performance, and subsequently their contribution to environmental protection; this psychological mechanism is well documented (see Pieters et al. 1998) and brings people to infer they are taking steps for environmental protection that are more significant than what they effectively are.

The implications of a tendency to *rest on our laurels* are significant, and may affect both citizens feeling they have done their bit thus not engaging in more relevant and ambitious environmental behaviors, and policy makers who believe they did their job by encouraging citizens to adopt *simple and painless* behavioral changes (Thøgersen and Crompton 2009).

Research question and methods

Most of the evidence in the literature supports the idea that pro-environmental behaviors can positively spill over from one domain to another (self-perception theory, cognitive dissonance theory, knowledge theories, etc). However, there is no general agreement on the issue, as some scholars suggest that behaviors in the environmental domain are not correlated and do not influence each other, or even that there exists a negative spillover (due to contribution ethics and moral licensing) among them. A preliminary objective of the project is to shed light on the issue, providing an empirical answer to the question:

Does acting pro-environmentally in a behavioral domain have a positive impact (i.e. positive spillover) on other, non-correlated behavioral domains?

As the aim of the study is to shed light on the variation over time of consumer behavioral intentions within the domain of sustainability, the study employs a panel study consisting of two waves of online surveys (pre and post intervention).

Participants have been recruited via email in June and October 2012 among students of the School of Business and Social Sciences at Aarhus University (Denmark). The recruiting message asked students about their willingness to participate in a study on consumer behavior, which might imply the purchase of specific products for a limited period of time. Of the 260 students

enrolling, 54 dropped out at different stages of the study; moreover 12 participants have been dropped from the analysis for incomplete and/or random replies to the online surveys. Surveys were considered incomplete if they had more than 20% of missing answers; they were considered to be unreliable (random filling) if for more than 20% of the questions the respondent replied to all items in the battery with the same value, even when control-items would make this unreasonable. This is the case, for instance, of participants showing high agreement for both the sentences *I like to do the same old things rather than try new and different ones* and *Whenever my life forms a stable routine, I look for ways to change it*. The final sample is hence composed of 194 participants (N=194), with a mean age of 23.8. 123 participants are female and 71 are male. Descriptive statistics on the sample are presented in table 1.

Participants were randomly assigned to the experimental (105) and the control (89) condition and a questionnaire was administered twice: before and after the intervention. The intervention consisted of a specific promotion of a pro-environmental behavior (buying green products) by means of both financial and non-financial incentives.

The questionnaire was developed in English and then translated to Danish. Both versions were pre-tested on a small sample of students to check the clarity of the questions and avoid misunderstandings or multiple interpretations. It begins with some introductory questions on demographics and general background of participants, including an assessment of acceptance of both *green taxes* and policies restricting consumers' behaviors in environment-sensitive domains. Moreover, involvement-concern for environmental issues is investigated through the revised New Ecological Paradigm (NEP) scale (Dunlap et al. 2000).

The questionnaire is then divided into three main sections, focusing on intrinsic motivation, pro-environmental behaviors and habits, respectively. Intentions to act in a pro-environmental way is assessed with respect to a battery of environment friendly behaviors, using the format: *How likely do you think you will do "X" in the next occasion, if you have the chance to do so?* (where "X" stands for each behavior), rated on a 7-point scale ranging from 1 = *very unlikely* to 7 = *very likely*. The behaviors cover the domains of transport mode, recycling, energy/water conservation and green purchasing, which are the main macro-categories in most research on pro-environmental behavior and spillover (see Thøgersen and Olander, 2003).

Next, respondents were asked to state how often they perform each behavior, rated on a seven-point scale, from 1 = *never* to 7 = *always* and the center score 4 being *half the time*. We also included a more occasional behavior (volunteering as an activist in environmental campaigns) for which we used different labels for possible answers.

Participants received the link to the online survey (using Qualtrics) by email and they could choose between a Danish and an English version. After filling out the first questionnaire, establishing the baseline, experimental interventions were deployed.

Participants were encouraged to buy organic food and other eco-labeled products for a period of 6 weeks. I choose this as the source behavior because it represents a class of behaviors where money is naturally involved and the consumer typically needs to bear extra costs, like the premium-price required for the purchase of such products. For 6 weeks, participants were asked to record their purchases within a specified set of product categories in a shopping diary, specifying whether they opted for an environment-friendly version (e.g: organic milk vs traditional milk, etc). Receipts had to be kept to allow crosschecking at the end of the experiment. Participants failing to show such proof of purchase were supposed to not have complied with the requirements of the experiment, and were subsequently dropped from the analysis.

Once the six weeks elapsed, a second questionnaire (exact replication of the first) was mailed to participants. This allows us to gain insights into the effects of the intervention and possible spillover between behaviors. Incentives were terminated at this point and participants were debriefed thanking them for their participation in the study and informing them that they might be contacted in the upcoming weeks for some follow-up questions.

Results

The data analysis was done with SPSS19. Before proceeding with the analysis, incomplete and inaccurate responses were deleted from the dataset and reverse coding techniques were deployed whenever necessary. For instance, in the question assessing environmental awareness/concern (through the NEP scale), higher scores (that is, higher agreement with the proposed statements) would indicate high environmental concern for some items, and low environmental concern for others. Codes were reversed accordingly, so that for all specific items the scale would go from low to high environmental awareness/concern.

It appears that participants encouraged by the experimental intervention to purchase green products were more willing, at the end of the six-week period, to behave consistently (hence to adopt green behaviors) also in other domains. The change over time of behavioral intentions for the experimental relative to the control group, that is, using a differences-in-differences approach (Allers & Hoeben, 2010), is reported in table 2 ($\Delta exp - \Delta cont$). Positive numbers mean that, on average, participants spurred to purchase green products (experimental group) increased more (or decreased less) their intention to adopt the other specific pro-environmental behaviors, after

the 6-week treatment. This is the case of 8 behaviors out of 9, the only exception being *recycling paper*. The difference appears to be consistent for behaviors like *turning off water while soaping* (.61) or *recycling batteries* (.37). To test the significance of the results a one-way between-groups analysis of covariance (ANCOVA) was conducted. ANCOVA allows exploring differences between groups while controlling for an additional continuous variable. In my analysis, the independent variable is the group of participants (control vs experimental condition), while the dependent variable consists of participants' scores on behavioral intentions, administered after completion of the intervention. Participants' scores on the same question administered before the intervention are used as the covariate in the analysis.

After controlling for pre-intervention scores, there is a significant difference between the experimental and the control group on post-intervention scores on intentions to *turn off water while soaping* [$F=7.747$, $p<.01$, $partial\ eta\ squared=.039$]. The pattern is similar (with significance at the $p<.05$ level) for other behavioral items in the domain: in the case of *turning off lights when exiting as last person*, there is a significant difference between the two groups on post-intervention scores [$F=4.103$, $p<.05$, $partial\ eta\ squared=.021$], as in the case of *turning off water while brushing teeth* [$F=3.929$, $p<.05$, $partial\ eta\ squared=.020$]. With regard to the domain of recycling, there is a significant effect of the intervention as regards the *battery recycling* behavioral item [$F=4.542$, $p<.05$, $partial\ eta\ squared=.023$], while the difference between the two groups is not significant with reference to the recycling of paper and glass. On the other hand, the experimental intervention has no significant effect on the intention of participants to adopt virtuous behaviors in more demanding and costly domains, such as that of mobility and transport mode. The results of the ANCOVA are summarized in Table 2.

The data are consistent with the spillover hypothesis as the general pattern emerging suggests that, to some extent, individuals spurred to adopt a pro-environmental behavior (in our case to increase their purchases of ecological products) tend to be more willing to adopt green behaviors also in other domains. However, this spillover effect seems to be significant only for a subset of behaviors, all of which require little effort to comply with. People tend to be willing to be more careful in turning off water and light to save energy and resources, as these behaviors can be easily adopted without much effort or the need to change long established behavioral patterns. The same individuals, however, seem much less willing to adopt further steps where more demanding tasks are required, like for instance changing their habitual transport mode and shifting towards sustainable alternatives like cycling

Discussion

The results of the study corroborate the findings of the literature suggesting that pro-environmental behaviors are connected in the sense that undertaking environmentally conscious behaviors in a domain can, under given circumstances, spillover and have positive effects on other behaviors in different domains. Whereas there is broad evidence in literature that individuals are more likely to adopt new pro-environmental behaviors that are *painless* (Thøgersen and Crompton, 2009), the driver of such mechanism is still disputed.

The low-cost hypothesis proposed by Diekmann and Preisendorfer (2003) suggests that environmental concern (triggered in our case by spillover effects) has stronger effects *in situations and under conditions connected with low costs and little inconvenience for individual actors*. This is consistent with prior research on consumer behavior in the environmental field. In the domain of energy consumption, Stern and colleagues (Stern and Aronson 1984, Black et al. 1985, Stern 1992, Gardner and Stern 1996) found that inexpensive and easy to perform actions such as switching off lights are easier to be affected by attitudinal changes. According to the so-called Campbell paradigm (Kaiser and Wilson, 2004), broad goals such as the protection of the environment can be pursued by means of a wide range of interrelated behaviors, with different degrees of financial, physical and psychological costs. Individuals motivated to attain a specific goal tend to implement easy behaviors towards that goal first, compared to more costly and inconvenient behaviors connected to the same goal.

Littig (1995) suggests that easy recycling behaviors are dominated by environmental considerations, which seemingly have no or little effect on more complex behaviors, such as those regarding mobility. Moreover even within the domain of recycling, Derksen and Gartrell (1993) show how green considerations display a greater effect in case of *easy to perform* recycling activities. This evidence is corroborated by the results of my study, as the triggering of psychological mechanisms making salient environmental considerations has significant effects on easy to perform behaviors such as switching off the lights, turning off water or recycling batteries, much less so as regards more complex tasks as those involving mobility.

My interpretation of the results adopts a dynamic perspective, considering positive spillover a process that builds over time, trespassing the static boundaries of a *snapshot* on individual intentions and behaviors. Since most everyday behaviors tend to be pretty stable over time (Thøgersen 2006; Thøgersen and Ölander 2003), one should not expect radical changes to develop over the six-week time-span of the experiment. Yet, a significant increase in intentions for at least some behaviors was observed. If spillover acts like a ladder, so that you first need to

break the ice and trigger a virtuous circle, which can be done by adopting easy and convenient behaviors, individuals may not yet have developed an environmental conscience strong enough to induce them to adopt more costly behaviors at this early stage. As they might believe that they have *done their fair share*, as suggested by the *contribution ethics* hypothesis (Guagnano et al 1994, Kahneman et al 1993; Thøgersen & Crompton 2009). This fair contribution is often limited to small incremental steps towards sustainable behavioral patterns, and self-serving biases may have exaggerated the contribution individuals are making in their own eyes. However, it is possible (and future research should address the issue, by following individuals over a larger time-span) that this *foot-in-the-door* approach might eventually push people to adopt even more relevant behavioral changes, consistently with the broad goal of preserving the environment. Once the first small steps sediment and get internalized, becoming the new baseline rather than something *more* you do for the environment, you might be ready to make a further step up the ladder.

Limitations and future research

The study suffers some limitations that should be addressed and overcome in future research. First and foremost, the sample consists of students. Besides an obviously overwhelming overrepresentation of a narrow age-group, students have peculiar features making them scarcely representative of the overall population. They usually have very strict budgets (which might hinder the adoption of costly pro-environmental behaviors) and very specific behavioral patterns heavily influenced by the situational conditions typical of that period of their lives, like living in campuses or eating often in canteens and cafeterias. A sample representative of the overall adult population would clearly address such limitation, providing more reliable data for the analysis of the spillover effect thus better tools for all players involved (marketing experts, policy makers and the academic community). A second limitation refers to the time-span of the project. 6 weeks represent a very limited time period to trigger behavioral changes for long established routines. Yet, the study revealed promising shifts as regards some specific behaviors. Future research should cover longer time periods, as to study whether this might lead to even bigger leaps and spillover effects, trespassing the boundaries of *small and painless* steps.

Table 1 – Sample: descriptive statistics

	Total (N=194)	Males (N ^M =71)	Females (N ^F =123)
Age	Mean 23.8 (18-44)	Mean 24.1 (19-36)	Mean 23.6 (18-44)
Member of env. association?	11	2	9
Yes	177	67	110
No, never	6	2	4
Not anymore			
Living with:			
alone	51	21	30
partner	65	21	44
parents	2	1	1
other students	61	20	41
other	15	8	7
Distance home-university:			
<2km	61	31	30
2km-5km	88	57	31
5km-15km	34	25	9
>15km	11	10	1

Table 2 – Statistical analysis

<i>Item</i>	$\Delta exp-\Delta cont^{1,2}$	<i>F</i>	<i>Sig</i> ³	<i>Partial η^2</i>
<i>Biking to University</i>	.22	.725		.004
<i>Biking to shopping</i>	.31	2.091		.011
<i>Turning off light when exiting as last person</i>	.20	4.103	*	.021
<i>Turning off water while brushing teeth</i>	.26	3.929	*	.020
<i>Turning off water while soaping</i>	.61	7.747	**	.039
<i>Recycling paper</i>	(.34)	.457		.005
<i>Recycling glass</i>	.07	1.681		.009

<i>Recycling batteries</i>	.37	4.542	*	.023
<i>Carpooling</i>	.08	.048		.000

1 - it represents the difference between the mean variations (before to post experiment) in experimental and control group participants (on a 1 to 7 scale). Positive values indicate that the willingness to uptake the specific green behavior increased more (decreased less) in the experimental group

2 negative numbers in brackets

3 - *=significant at .05 level; **= significant at .01 level

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Positive spillover in the environmental domain: the role of habits

The study investigates the role of habits as moderators of the spillover effect between pro-environmental behaviors. The methodology consists of a panel study on a sample of 105 students from the University of Århus (Denmark), based on two waves of online surveys (pre and post experimental manipulation). Habit strength is assessed by means of the Self-Reported Habit Index scale. Results show how habits represent a relevant factor in shaping spillover trajectories: people holding deeply rooted habits in the target behavior are likely to experience stronger spillover. In the discussion section, three possible explanations of this effect are scrutinized.

Keywords: Spillover, Habits, SRHI, Theory of Planned Behavior

Introduction

This study builds on the assumption that a positive spillover exists between pro-environmental behaviors, so that acting pro-environmentally in one domain increases the uptake of other green behaviors in different and not correlated domains. This assumption is corroborated by the empirical evidence emerging from Study 1, which is specifically focused on the existence and strength of pro-environmental spillover. The next step is analyzing the role played by different variables in spurring or hindering spillover. Study 2 focuses on habits, which have been the object of a vast literature. However, both theoretical and empirical works address the role played by habits in shaping a specific behavior, while to our knowledge only a few works focus on the role of habits in shaping spillover *across* behaviors. There have been speculations that spillover is

influenced by how habitually the target behaviors are performed (Ronis et al. 1989, Verplanken and Aarts 1999), yet there is the need to test empirically such assumptions (Verplanken et al. 2013, *work in progress*). This paper aims at filling the gap by providing empirical evidence on the role played by habits in shaping spillover trajectories.

Scholars in the field of consumer behavior have long disputed over the role played by habits in shaping behavioral patterns. The debate is still open, as there is still disagreement's about the relevance of repeated behavior and its interplay with behavioral intentions, as predictors of future behavior (e.g., Ajzen, 2002; Ouellette & Wood, 1998). Since many activities having relevant impacts on the environment consist of habitual acts frequently performed in stable contexts, the strength of habits *could* play a relevant role in the environmental domain, leading to the need for further evidence to shed light on the issue.

In this paper, we adopt a new perspective, testing whether habits exert an influence not only on the adoption of a new pro-environmental behavior, but also on the positive spillover to other pro-environmental domains. To this end, the paper is organized as follows: first, a preliminary clarification of the concept of habits, specifying which are the features making repeated behavior develop into a genuine habit. The literature review section on habits begins with an overview of mainstream theories on the antecedents of behavior, which relegates habits to a marginal role (Theory of Reasoned Action, Theory of Planned Behavior). Both the original model (focusing on attitudes, subjective norms and perceived behavioral control) and later extensions encompassing the introduction of further elements are presented. The focus then narrows down to models and theories angled towards the specific role played by past behavior and habits in influencing later behavior, with specific reference to the literature in the environmental domain (e.g. transport mode, recycling). The subsequent paragraph is devoted to a presentation of the research hypotheses that are tested in the study, explaining the theoretical background they build on and the added value they provide to the ongoing debate on the topic. The methodology section describes both the experimental design tailored to address the research questions and to test the hypotheses, and the procedure to elaborate data. The results provide an overview on the evidence emerging from data analysis, while the conclusive section illustrates some limitations of the research and further ideas for future research.

Operationalization of habits

In common parlance, habit is usually referred to as a behavior that is repeated in a stable context. Indeed, habits have arguably their roots in behaviors that are frequently repeated over time, with little evaluation of available alternatives. Some authors focus on the frequency of the behaviors, suggesting specific threshold that, if met, highlight the presence of a genuine habit. Ronis and colleagues (1989), for instance, suggest that habits develop when behaviors are repeated at least twice a month and extensively (at least 10 times), whereas Ouellette and Wood (1998) refer to habits as relatively frequent behaviors performed daily or weekly. The stability of the context is also thought to play a relevant role in facilitating the emergence of a habit: the more stable a context, the more likely habits to develop and to have a direct impact on future behaviors (Aarts and Dijksterhuis 2000a, Bargh 1990, Sheeran et al. 2005, Verplanken and Aarts 1999, Wood et al. 2005). When context changes, people are more inclined to consider further information on alternatives, social beliefs and evaluations needed to determine the proper course of action in the new situation at hand. Stable contexts become strongly linked to the mental representation of repeated behavior in that context, so that contextually cued behavior can be carried out automatically with little or no conscious intent (Ouellette and Wood 1998). Moreover, positive reinforcements (i.e., rewarding consequences) are required for a repetitive behavior to develop into a habit gaining strength over time (that is, the same activity is likely to be repeated if the outcome is considered satisfactory) (Ouellette & Wood, 1998).

Whereas frequency, context stability and rewarding consequences determine whether a habit develops, it is *how* choices are made that characterizes a genuine habit: *habits refer to the way behavioural choices are made, and not to the frequency of behaviour* (Steg and Vlek 2009). Aarts and colleagues (1998) argue that habits comprise a goal-directed type of automaticity so that the habitual behavior response is triggered sub-consciously in the presence of a specific goal, activated many times before in the same context.

Most authors in the field agree that automaticity is a defining feature of habitual behavior. For Triandis (1980), the concept of habit is very similar to that of past behavior; however, he adds qualifiers such as *routinized* and *automatic*, and defines habits as *situation-behavior sequences that are or have become automatic, so that they occur without self-instruction*. Aarts and Dijksterhuis (2000a) define an established habit as *automatic activation of a goal directed behavior*, which is able to restrict the behavioral alternatives to be considered when planning an activity.

Some authors focus on specific dimensions of the habit concept that relate to possible measures of the concept itself. Knussen and colleagues (2004), for instance, suggest that the complexity of

the task can lead to different concepts of habitual behaviors: simple daily behaviors (such as brushing teeth before going to bed) are labeled as habits, whereas more complex behaviors are described as habitual behavioral patterns. Moreover, some authors stress how given context stability and performance frequency can lead to stronger or weaker habitual patterns according to specific subjective features of individuals. In other words, people react differently to similar external conditions as personality traits shape individual differences in *resistance to change* (Oreg 2003). This has relevant implications for studies focusing on both the role of habits in shaping behavioral patterns and the strategies to unfreeze them, reshaping a behavior that is more in line with the desired pattern and re-freezing it into a new habit. Oreg (2003) developed a 17 item resistance to change scale, which represents a useful tool to assess how much individuals tend to avoid making changes, or to devalue change generally.

Acknowledging the complexity and the multidimensionality of the concept, for the purpose of the present article we refer to habits as goal-oriented scripts based on repeated behaviors, which are carried out in stable contexts (Ouellette and Wood 1998, Verplanken and Aarts 1999). Such scripts deactivate conscious planning (Triandis 1980), norms and attitudes (Klößner et al. 2003), suppressing the consideration of alternatives and the processing of information about them.

The role of habits in shaping behavioral patterns: theory of reasoned action and theory of planned behavior

The theory of reasoned action and the theory of planned behavior, as most expectancy value models of attitudes and decision making rooted in theories of rational choice, assume that habits have little relevance as predictors of behavior (Ajzen, 1991, 2002). The theory of reasoned action (Fishbein and Ajzen 1975, Ajzen and Fishbein 1980) is a response to the frequent finding of a weak correlation between attitude measures and later behaviors in attitude-behavior research (Fishbein 1967). The theory suggests that not only attitudes, but also subjective norms are antecedents of behavioral intentions, which in turn mediates their impact and are the best predictors of behavior. Attitudes represent the personal desirability of a behavior, or the feeling of being more or less favorable towards performing the activity. Subjective norms on the other hand are the individual's perception of referents' desire for the individual to perform or not to perform a behavior, representing hence the experienced social pressure. The theory considers individuals as rational beings in the sense that they process available information as to develop an

aware and elaborated intention to act. Relevant behaviors are supposed to be under volitional control, so that individuals can freely choose whether or not to adopt them.

In many cases however both internal (skills, knowledge) and external (resources, facilitating conditions) non-motivational factors play a role in shaping the likelihood of performing a given behavior. Ajzen (1985, 1991) proposed the theory of planned behavior as an extension of the theory of reasoned action taking this into account. Perceived behavioral control is added as a third antecedent of behavioral intentions, along with attitudes and subjective norms. It represents one's perceptions of how difficult or easy it is to perform a behavior, and has both a direct and an indirect influence on behavior. The direct effect assumes that *perceived* behavioral control reflects *actual* behavioral control, and that adopting a behavior depends both on the motivation and on the person's effective capability to perform the activity. The indirect influence refers on the other hand to the effect mediated through intentions, and to the motivational implications of perceived behavioral control: if I feel I lack the skills to perform an activity, I might not try so hard to engage in such behavior, even though I might hold positive attitudes about it. The theory of planned behavior has been applied in studies covering a broad range of behaviors (Ajzen 1991, Sheppard et al 1988) and, to quote Aarts and colleagues (1998), *the predictive value of the theory is good*. Most studies found that attitudes, subjective norms and perceived behavioral control do play a relevant role as antecedents of behavioral intentions, thus shaping future behavioral patterns (Terry et al. 1999, Bamberg and Schmidt 2001, Bamberg et al. 2003, Ajzen 1991, Conner and Sparks 1996, Eagly and Chaiken 1993, Godin and Kok 1996, Jonas and Doll 1996, Manstead and Parker 1995, Sutton 1998). Some authors suggest that subjective norms contribute less to any explanation of variance, compared to attitudes and perceived behavioral control (Thøgersen 1994, Armitage and Conner 2001, Terry et al. 1999). Moreover, there is evidence that perceived behavioral control not only is an antecedent of behavioral intention, but also interacts with intentions themselves once these are formed, moderating the behavior-intention relationship (Conner and McMillan 1999, Reinecke et al. 1996, Terry and O'Leary 1995).

Criticism and extensions of the theory of planned behavior

The TPB has been exposed to criticism as well, for the limitations of its focus on attitudes, subjective norms and perceived behavioral control as the sole antecedents of intentions and behavior. Ajzen (1991) himself suggested that the theory is open to expansion: *the theory of planned behavior is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intention or behavior after the theory's current variables have been taken into account*. Accordingly, many authors proposed the inclusion of new predictors in the model, to improve its explanatory potential (see Conner and Armitage 1998 for a review).

Some scholars (Conner and McMillan 1999, Nucifora et al. 1993, Sheeran and Orbell 1999, White et al. 1994) suggest the adoption of a broader notion of norms, encompassing both injunctive and descriptive norms. Whereas injunctive norms are equivalent to what Ajzen calls subjective norms, descriptive norms describe what most individuals do in a given situation. Cialdini and colleagues (1990) state that descriptive norms play a relevant role in shaping our behavior as *evidence as to what will likely be effective and adaptive action*, and as a shortcut in processing information to choose how to behave in a given situation. Personal norms, conceptualized as personal feelings of obligation or moral responsibility (Schwartz 1968, 1977), have been singled out as a further element capable of increasing the predictive power of the theory of planned behavior in a broad set of domains (Parker et al. 1995, Harland et al. 1999, Randall and Gibson 1991, Kurland 1995, Nucifora et al. 1993). A stream of research stemming from Schwartz's (1970, 1977) norm activation theory suggests that awareness of consequences and feelings of personal responsibility are important predictors of pro-environmental behavior. The evidence in literature supporting this hypothesis is vast (Black et al. 1995, Fuhrer 1995, Guagnano 1995, Guagnano et al. 1994, Hopper and Nielsen 1991, Noe et al. 1982, Stern et al. 1986, Stern et al. 1985, Van Liere and Dunlap 1978). Moreover, specific pro-environmental values have been singled out as a relevant factor to be considered. Stern and colleagues (1995) found that such values affect individuals' willingness to take action through both a direct effect on behavioral intentions and an indirect effect through beliefs and selective attention to information shaping them. Schultz and Zelezny (1998), on the other hand, conducted a cross-Country analysis suggesting that *green* values such as self-transcendence are important variables in predicting future behavior.

A relevant criticism to the theory of planned behavior is related to the fact that it assumes relevant behaviors are guided by reasoned considerations and are the result of a rational and aware process. However, there is evidence that, for example, when behavior become habitual, a sub-conscious and automatic response is triggered so that past behaviors interact with

intentions in predicting behavior (Eagly and Chaiken 1993, Sutton 1994, Conner and Armitage 1998, Ouellette and Wood 1998). Habit is considered by Fishbein and Ajzen as a factor potentially mediating intentions and behavior, but it is relegated to a minor role and not included in their model. Ajzen (1991) recognizes that past behavior turning into a habit may influence later behavior but he argues against it being a causal factor in its own right, suggesting instead that behavior produces feedback influencing attitudes and perceptions of social norms and behavioral control. Moreover, he stresses that past behavior cannot be considered a valid measure of habit, *as it may reflect the influence of many other internal and external factors, and only when habit is defined independently of (past) behavior can it legitimately be added as an explanatory variable to the theory of planned behavior*. Other scholars agree that the frequency of past behavior does not represent the optimal measure of habit in the context of the intention-behavior relationship (Ouellette and Wood 1998, Verplanken and Aarts 1999, Knussen and Yule 2008). Aarts and colleagues (Aarts, Verplanken and Van Knippenberg 1997, 1998, Verplanken et al. 1998), for instance, developed a *response frequency measure* and tested it, for example, in the realm of travel-mode behavior, which can be quite repetitive by its nature (Thøgersen, 2006). The RF index of habit strength is represented by the number of times a given mode of transportation was mentioned as the choice across a number of travel destinations.

Different models encompassing an active role of past behaviors and habits have been proposed, some having their roots in the theories of reasoned action and planned behavior, some departing from the very assumptions underpinning such theories. In a study on recycling behavior, Thøgersen (1994) proposed a model based on the theory of reasoned action broadening the scope as to encompass factors as habits, knowledge and opportunity as predictors of behavior. The model suggests that behavior has its antecedent in the motivation to choose one specific alternative of action as to attain the target object. Values, beliefs about outcomes, attitudes and norms are captured by the intention to engage in a specific behavior, and transformed into a behavioral disposition. Motivation alone, however, is not able to explain individuals' behavior, as more dimensions have to be considered, as well. First of all, people must *be able* to carry out their intentions. Thøgersen labels this factor *ability* (see also Pieters 1991), and operationalizes it into habit and task knowledge. A further precondition for the performance of a given behavior is represented by the opportunities for carrying out intentions. Though acknowledging that subjective factors play a role in shaping how we *perceive* opportunities (Ajzen 1985, 1988), Thøgersen focuses on objective situational variables and facilitating conditions (Belk 1975, Triandis 1977). As Knussen and colleagues (2004) suggest, a feedback loop in Thøgersen's model allows for ability (habits and task knowledge) to influence the beliefs and evaluations which inform attitudes. Aarts and colleagues (1998) suggest that past behaviors and habits act as

moderators of the intention – behavior relationship, arguing that *when a behavior is performed many times, future decisions on courses of action and their subsequent execution are primarily guided by habits, rather than being based on evaluative interpretations, as is the case with attitudes or perceived control. Once established, habitual behaviors no longer require a process of reasoning or planning to occur. Instead, they are automatically evoked upon the instigation of the goal to act.* Similarly, in the so called theory of repeated behavior Ronis and colleagues (1989) suggest that the influence of habit on behaviour is independent of intentions, and *repeated behaviors may be largely determined by habits rather than by attitudinal variables, although attitudes are central to the formation and modification of habits.* In the model proposed by Triandis (1980), habit and intentions interact in predicting later behavior: intentions are labeled as a function of social, affective and cognitive factors, and the probability of performing an act is a function of intentions and habit, both multiplied by facilitating conditions. When behaviors are performed frequently over time, habit strength increases and behavior is no longer guided by intentions: *habit strength may moderate the relationship between reason-based concepts (intentions) and subsequent goal-directed behaviour. The stronger the habit, the weaker the intention-behaviour relationship* (Danner et al. 2008). Triandis intuition is consistent with broad evidence on the moderating role of habits in the intention-behavior relationship (Ferguson and Bibby 2002, Montana and Taplin 1991, Verplanken et al. 1998, Wood et al. 2005). The basic assumption is that, once habits grow in strength, the decision making process underlying goal directed behaviors either ceases to exist or significantly decreases, as activities are performed without much thought or consideration (Danner et al. 2008). Triandis acknowledges that empirical investigations assessing whether intention or habit play a bigger role in predicting behavior provide controversial evidence, and explains this with reference to the dichotomy between high and low base rate domains. Whereas intention is the most relevant predictor of behavior in low base rate domains such as blood donations, habit is the most relevant predictor in high base rate domains such as teacher behavior in classes.

Some researchers focused also on how to change habits. Based on the assumption that behaviors being frequently performed in stable contexts become automatic, so that individuals no longer go through a process of rational consideration of alternatives (Dahlstrand and Biel 1997), it follows that in order to change habits, stable contexts must be somehow disrupted (Wood et al. 2005). Verplanken and Wood (2006) suggest that it is in this temporary window that behaviors which became habitual can be reconsidered and, perhaps, changed. The habit discontinuity hypothesis (Verplanken et al. 2008) postulates that in these windows people are more willing to look for further behavior relevant information, and are more open to change. The authors suggest that disruptions and context changes also have relevant impacts on people's values, attitudes and

beliefs, making them more salient and people more attentive to them. Other scholars have investigated the process of habitual change capable of replacing old habits with new -and possibly virtuous- ones (Biel and Dahlstrand 1999, Dahlstrand and Biel 1997). Dahlstrand and Biel (1997) suggest that *people may have established a pattern of behavior that is functional but with little or no awareness of consequences for the environment*. The authors use the example of people driving the car to work or buying polluting detergents for time saving and economic reasons, respectively: behaviors that may eventually become habitual and performed automatically. Such behaviors are labeled as *frozen* by Lewin (1958). To break the habit, it is hence necessary to unfreeze the behavior, develop a new one, and “freeze” it so as to become a new habit. Dahlstrand and Biel (1997) propose a seven-step model tracing this process of changing habits. The first step consists of so-called *activation*, for example, of environmental values, to be activated through information or other interventions. The second step, *attending to present behavior*, refers to providing information about detrimental consequences of current behavioral patterns, and it is strictly linked to the third step, where alternative solutions are considered. Then, a new behavior must be planned (step 4), tested (step 5) and evaluated (step 6). If the feedback is positive, the final step of the behavioral change process towards a pro-environmental habit consists of the establishment of the new virtuous habit.

Habits in the environmental field

The issue of habits represents an important dimension in environmental behavior, as many activities with relevant environmental impacts, like travel mode choice, consumption patterns or recycling are well-practiced and habitual, perhaps started many years ago, when the protection of the environment was not an issue (Biel 2003). Attitudes and norms, which are based in deliberate reflections, can not fully explain actions that are performed frequently and in a stable environment, such as daily food choice (Thøgersen & Ölander, 2006; Verplanken and Faes, 1999), other daily consumption (Dahlstrand and Biel 1997) or travel mode choices (Aarts et al. 1997; Thøgersen, 2009; Verplanken et al. 1994), and a broad range of domains (Bagozzi 1981, Triandis 1977, Mittal 1988, Montano and Taplin 1991). Strong habits can hamper the adoption of new pro-environmental behaviors if they are at odds with long settled habits, with detrimental implications (also) for the development of positive spillover to other pro-environmental behaviors.

In the domain of paper recycling, several studies found that attitudes and intentions are relevant antecedents of behavior, but they do not exhaust the factors to be taken into consideration since habits and external conditions such as facilitating factors also play a role (Boldero, 1995; Cheung et al., 1999; Knussen et al., 2004). Knussen and Yule (2008) argue that, compared with other pro-environmental behaviors, recycling is a difficult topic to investigate from the point of view of habits: since recycling is composed of many activities taking place at different points in time (e.g. sorting different materials to be recycled, bringing empties to recycling containers, etc).

The choice of transportation mode has implications for the environment, given the extreme variation in the impact of different types of transportation on our environmental footprint. Since mobility is often characterized by context stability and behavior repetitiveness, many studies focused on the role played by habits in shaping our behaviors in this specific domain (Garling and Axhausen 2003, Klockner et al. 2004, Klockner et al. 2003, Danner et al. 2008). Verplanken and colleagues (1994) suggested a general rather than a specific measure of habit in the domain of travel mode use (that is, assessment of a generalized habit of choosing the car as the travel mode, with no reference to specific occasions like shopping trips). They find that habit is an important determinant of travel mode choice, and that there is a trade-off between attitudes and habits so that the attitude-behavior link is stronger when the habit is weak, and vice versa (see also Aarts, 1996; Verplanken et al., 1998). Bamberg and Schmidt (2003) compare the predictive power of Ajzen, Triandis and Schwartz models in the context of car use for university route, and find that role beliefs and habits have a significant effect on behaviors.

Research questions and methods

This study aims at shedding light on the influence of habits on the likelihood of a positive spillover between green behaviors. The underlying assumption is that habits are caused by behavior repetition and shaped by a set of internal (e.g. values, subjective resistance to change) and external (e.g.: context stability) factors. Among internal factors, resistance to change is rooted in personality traits spurring or undermining our predisposition to make changes in our everyday life (Oreg 2003). Resistance to change refers to overarching features affecting individuals in the broader picture of behavioral patterns. For each individual with a given resistance to change, however, some specific behaviors could be more habitual than others (as measured, for example, by Verplanken and Orbell's Self Reported Habit Index, SRHI). I might have *in general* a low

resistance to change, yet be very habitual with respect to some behaviors (due to the context, the specificities of the behavior itself, etc.).

The paper aims at investigating if habits, in addition to moderating the relationship between behavioral intentions and actual behaviors, have an impact on pro-environmental spillover, and which is the direction of such influence. I test the following hypotheses:

H1) Habits affect the strength of pro-environmental spillover across different domains

H2) Positive spillover from one (source) to another (target) pro-environmental behavior is stronger in individuals that already habitually perform the target behavior, compared to individuals with less habitual target behavior.

The methodology has been already presented in the methods section of Study 1. I will therefore limit the description to a broad overview and focusing on those aspects that assume specific relevance for the present study on habits. To analyze shifts in behavioral intentions over time, we employ a panel study consisting of two waves of online survey (pre and post intervention), with an experimental manipulation meant to increase participants' purchase of green products over a six weeks period and keeping track of their purchasing patterns by means of a shopping diary. The sample used for the present analyses is composed of 105 undergraduate students (n=105) from the University of Aarhus, Denmark.

The information required to address the research questions of the paper refers to participants' behavioral intentions and habits. Behavioral intentions are assessed in the survey with regard to a battery of environment friendly behaviors, where respondents are asked for each one of them: *How likely do you think it is you will do "X" in the next occasion, if you have the chance to do so?* (where "X" stands for each behavior). A 7-point scale ranging from *very unlikely* to *very likely* is used. Consistent with prior research on the topic, the behaviors cover the domains of transport, recycling, energy/water conservation and green purchasing (see Thøgersen and Olander, 2003).

Habit strength was measured by Verplanken and Orbell's (2003) 12-item SRHI index (see box 1). The scale has been widely used and shows high internal consistency with Cronbach alpha between .89 and .95 in the original studies. The strength of habits is measured for the specific case of recycling as a target behavior, which has been demonstrated in Study 1 to be affected by spillover from green purchasing.

Box 1: Self Reported Habit Index*

Recycling is something:

- *I do frequently*
- *I do automatically*
- *I do without having to consciously remember*
- *that makes me feel weird if I do not do it*
- *I do without thinking*
- *that would require effort not to do it*
- *that belongs to my (daily, weekly, monthly) routine*
- *I start doing before I realize I'm doing it*
- *I would find hard not to do*
- *I have no need to think about doing*
- *that's typically "me."*
- *I have been doing for a long time.*

*Answers on a 1 to 7 Likert scale (totally disagree to totally agree)

Results

As a preliminary step, I check that the 12 items of the scale are all measuring the same latent construct: habit strength. In order to do so, the items are subjected to Principal Component Analysis (PCA), using SPSS19.

All coefficients in the correlation matrix are above .6, the Kaiser-Meyer-Okin (KMO) value is .952 (well above the .6 threshold suggested in literature, see Kaiser 1970, 1974) and Bartlett's Test of Sphericity shows very high significance ($p < .001$), supporting the factorability of the correlation matrix (Bartlett 1954). The PCA reveals one component with eigenvalue greater than 1 (9.297), suggesting a one-dimensional structure with the first component explaining 77.478% of the variance. Cronbach alpha for the SRHI is .973, well above the traditional cut-off value of .7 (Nunnally 1978) thus indicating a very high internal consistency and reliability. The aggregated 12-item SRHI score could range from 12 to 84.

In order to address if and how habits strength influence positive spillover between pro-environmental behaviors, I divide the sample in groups with different SRHI scores and investigate differences by means of ANOVA (analysis of variance). Table 1 illustrates descriptive statistics on the aggregate SRHI scores, with details about percentile cut-offs that will be used in the following analyses.

Table 1: Recycling SRHI statistics

N	Valid	105
	Missing	0
Mean		51,4571
Median		52,0000
Std. Deviation		21,38701
Variance		457,404
Percentiles	10	16,0000
	20	31,0000
	50	52,0000
	80	73,0000
	90	78,4000

The mean score for the 105 participants is 51.46. Information on percentiles tells us that 10% of the sample scored 16 or less, 20% of the sample scored 31 or less, and so on.

Three different analyses are carried out: in the first one, individuals scoring respectively above and below the mean SRHI score are compared (Analysis 1: High vs Low). In the second analysis the focus shifts to more *extreme* groups, comparing individuals in the first and in the last quintiles, labeling as VERY LOW and VERY HIGH (Analysis 2: Very High vs Very Low). In the third and last analysis, individuals in the first and in the last deciles are compared, labelled as EXTREMELY LOW and EXTREMELY HIGH (Analysis 3: Extremely High vs Extremely Low). In other words, subsequent analyses focus on groups of participants diverging more and more in terms of how habitudinary they are in the target domain of recycling.

Table 2 summarizes the average scores (based on a 7-point scale) on the behavioral intention to recycle batteries before (time 1) and after (time 2) the experimental intervention, as well as the shift over time (score at time 2 – score at time 1) for individuals in the different SRHI clusters. The general pattern suggests that participants encouraged by the experiment to purchase organic food and eco-labeled products become more motivated to recycle batteries, the more habitual it is for them to recycle. If we focus on the comparison between individuals scoring high and low on the recycling SRHI (that is, comparing the 50% of the sample with an average SRHI score above

the mean with the 50% of the sample with an average SRHI score below the mean), we notice that the positive change in the behavioral intention of the two groups is .32 and .20, respectively. The differences broaden as we proceed towards the extremes of the sample, as regards scores on recycling SRHI: .40 vs .05 comparing Very High and Very Low groups, and .90 vs (.30) comparing the Extremely High vs Extremely Low groups. The more people hold deeply rooted habits in recycling, the more an intervention in a different domain (green purchasing) makes them increase their willingness to recycle batteries (that is, the stronger the spillover effect).

Table 2 – Descriptive statistics

Recycling SRHI	<i>How likely will you recycle batteries? (time1)</i>	<i>How likely will you recycle batteries? (time2)</i>	Change in intentions to recycle batteries
<i>High vs Low</i>			
High	5.84	6.16	.32
Low	4.54	4.74	.20
<i>Very High vs Very Low</i>			
Very High	5.75	6.15	.40
Very Low	3.74	3.79	.05
<i>Extremely High vs Extremely Low</i>			
Extremely High	5.50	6.40	.90
Extremely Low	3.30	3.00	(.30)*

* negative numbers in brackets

The results of the statistical comparison of groups by means of ANOVA with the fixed factor being the different groups with regard to scoring higher or lower on the recycling SRHI are summarized in table 3:

Table 3: statistical analysis results

Analysis	F	p	Partial η squared
1) High vs Low	.803	.16	.008
2) Very High vs Very Low	3.853	.057	.097
3) Extremely High vs Extremely Low	9.957	.006	.369

The results suggest that individuals with a well-established habitual pattern of recycling experience a significantly stronger positive spillover when they have been exposed to intense promotion of a different pro-environmental behavior (the source behavior), compared to individuals that have no or only a weak habit of recycling. The differences as well as their statistical significance increase if the focus shifts from groups of individuals with smaller to groups with larger differences on the SRHI score. Whereas the difference is not statistically significant in Analysis 1 (High vs Low): [$F(1,103)=.803$, $p=.168$, partial eta squared=.019], it is marginally significant [$F(1,37)=3.853$, $p=.057$, partial eta squared=.097] in Analysis 2 (Very High vs Very low). Finally, after controlling for pre-intervention scores, there is a highly significant difference between the *extremely high* and the *extremely low* groups on post-intervention scores on intentions to recycle batteries [$F(1,18)=9.957$, $p=.006$, partial eta squared=.369]. The high partial eta squared shows that there is a very strong effect size, with habit strength explaining a large portion of the variance in the intention to recycle.

Results hence corroborate the research hypothesis that habits do play a role in shaping spillover trajectories. The more individuals differ in habits strength as measured by the SRHI scale, the bigger the difference in the change in recycling behavior after the intervention, with individuals that hold deeply rooted habits in the target behavior of recycling being more affected by spillover from another pro-environmental behavior compared to individuals that are less habitual.

This is not a trivial result, as it could be speculated that people with deeply rooted habits in a given domain might experience only marginal shifts in their behavioral intentions, even more so in

the case of the intervention triggering the shift happening in a completely different domain (green purchasing, in our specific case).

Discussion

Over the past few decades, the spillover hypothesis gained broad attention being object of a large literature and an increasing number of empirical investigations. Yet it is *still far from clear why or how spill-over effects occur and whether they are due primarily to contextual factors or individual motivations* (Whitmarsh and O’Neill, 2010). Studies have focused on a wide set of possible drivers, ranging from environmental values to social norms, from behaviors’ similarities to their ease and costs, and so on. Many other dimensions have been mostly overlooked, however. Although it has long been acknowledged that habits deserve particular attention in research on the contingencies of spillover (Thøgersen and Olander, 2003), little empirical investigation has been carried out on the topic.

The results of this study add to the body of research that substantiates the claim that habits should not be ignored as antecedents of intentions and behavior. I find a significant variation in spillover from the source behavior in the domain of green purchasing to the target behavior in the domain of recycling explained by habit strength.

In the stream of literature on which role habits play as antecedents of intentions and behavior, most of the evidence suggests that the more habitual a behavior, the harder it is to disrupt it (Conner and Armitage 1998, Ronis et al. 1989, Verplanken and Aarts 1999). Adapting this framework to the debate on spillover, one might speculate that spillover should be more likely in individuals scoring low on the SRHI scale. That is, such individuals could be expected to be more flexible and prone to changing their behavioral intentions, as the path dependence with past behavior is weaker, and any experimental intervention could be better able to trigger the uptake of new behaviors. On the other hand, individuals for whom recycling is already a habitual activity might experience only minor and incremental increases in their intention to recycle, for example, batteries.

The results of this study contradicts this speculation, as people scoring high on the SRHI scale experience significantly higher spillover rates, compared to people scoring low on the same scale.

A number of possible explanations of these results are available. First of all, building on the theoretical framework of TPB as well as later developments encompassing a relevant role of habits, arguably habits are not just yet another predictor of intentions *in addition* to attitudes,

norms and perceived control; they *interact* with those elements, and *influence* them. Especially, perceived behavioral control might be affected by habits and specifically by the aspect of frequent repetition: the more I carry out an activity, the more I get familiar with it and the more behavioral control over it I perceive. Ajzen himself (1991) considers this possibility, speculating that repetition of behaviors could lead to enhanced perceptions of control. In the specific case of the experiment, it has been demonstrated that the uptake of another pro-environmental behavior (green purchasing) spills over to the domain of recycling. According to the present key of interpretation, individuals scoring higher on the SRHI perceive, *ceteris paribus*, that they have more behavioral control over recycling, so that the uptake of this target behavior is quicker and easier.

Another possible explanation refers to the finding that people holding deeply rooted habits spend less time and effort gathering information about alternatives: that is, the decision process gets attenuated (Aarts et al. 1998). Verplanken and colleagues conducted a series of experiments in the domain of travel mode choice, and found robust evidence that habit strength reduced the information about travel mode options sought by participants (Verplanken, Aarts and Van Knippenberg 1997). In details, individuals with deeply rooted biking habits disproportionately gathered information on cycling, whereas individuals with weaker habits split their attention more evenly across all available alternatives: *habit leads to increased focus on the habitually chosen option* (Aarts et al. 1998). The different patterns in information search can be linked to different strategies in decision making. An evenly distributed pattern of information search can be associated with compensatory strategies as assumed by TRA, whereas a more selective pattern might signal so-called non-compensatory strategies (Tversky 1972). Aarts and colleagues highlight such dichotomy, adding that *when habit is strong, (transport mode) decisions are guided by simple, heuristic, non-compensatory rules-(...)* and, *conversely, when habit is weak, decision makers adopt more cognitively demanding compensatory decision rules. In other words, habitual (travel mode) choices tend to follow cognitive shortcuts* (Aarts et al. 1998).

This might imply that people with deeply rooted habits for the target behavior, once a spillover is triggered, are quicker in adopting the target behavior (or, like in the case of my experiment, to increase the behavioral intention towards it) since they go through a quicker and easier decision process. These cognitive shortcuts might amplify the magnitude of spillover to the habitual behavior, once the phenomenon has been triggered, while individuals with weak habits face a longer decisional route that hinders (or at least delays) spillover itself.

A third explanation refers to the fact that people scoring low on the SRHI for recycling potentially have strong habits as regards *alternative* behaviors in the domain of recycling: that is, they might

habitually throw recyclables in the undifferentiated garbage bin. If this is the case, it might be much harder to disrupt this habit and to have the same individuals develop over a short period of time a new and more environment friendly behavioral pattern, encompassing activities of garbage sorting and bringing exhausted batteries to specific collection points. Knussen and Yule's (2008) Scotland-based study on habits in the domain of recycling, investigating the effects of habits on intentions and behaviors support this interpretation. The authors found that low scores on the recycling habits *were in fact indicative of a strong alternative habit of waste disposal (i.e. disposing of recyclables in the garbage bin)*. Translating these findings to the spillover framework, one can speculate that individuals with weak recycling habits could on the other hand hold deeply rooted habits as regards alternative waste disposal behaviors, this representing an obstacle for positive spillover from different behaviors. Unfortunately, due to the need to keep the survey as short as possible so as to avoid reducing the rate and accuracy of responses, SRHI was measured only for the green option (that is, recycling) and not for alternative, less environment-friendly behaviors (like throwing every household waste including batteries in the garbage bin). This is a shortcoming of the study that could be addressed and overcome in future research.

In conclusion, my results suggest that habits play a role in shaping spillover trajectories across pro-environmental domains; this is consistent with a transposition into the field of spillover of developments of TRA and TPB, suggesting that behavioral intentions (main predictors of actual behaviors) are indeed affected by how habitual our behavioral patterns are. Interestingly, it seems that individuals holding already strong habits in the target behavior are quicker in responding to the spillover stimulus. It may be that the uptake of a source behavior triggers a spillover stimulus that is then mediated by the effect of habits on the perceived behavioral control and the quest of information about alternatives: the more habitual the target behavior, the stronger the perceived behavioral control over it and the lesser the need to go through a structured and complex process of information gathering. Another possibility is that weak recycling habits is associated with stronger anti-recycling habits in the same behavioral domain, this representing a hindering factor for spillover effects.

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The effects of rewards on spillover in environmental behaviors: monetary vs praise rewards

The study investigates the role of different types of incentives (monetary vs praise) as moderators of the spillover effect between pro-environmental behaviors. The methodology consists of a panel study on a sample of 80 students from the University of Århus (Denmark), based on two waves of online surveys (pre and post experimental manipulation). Participants were asked to adopt a green behavior (purchasing organic and eco-labeled products) for a period of 6 weeks: the monetary group received financial incentives, while the praise group received verbal incentives. Contrarily to what could be expected according to Cognitive Evaluation Theory and the downgrading effect of extrinsic rewards on intrinsic motivation, results suggest that the nature of rewards does not play a relevant role as moderator of the spillover effect. In the discussion section, possible explanations of the results are scrutinized.

Keywords: Spillover, Rewards, Intrinsic Motivation, Cognitive Evaluation Theory

Introduction

After testing the existence of positive spillover across pro-environmental behaviors (Study 1) and the relevance of internal drivers like habits (Study 2), the focus shifts on the role played by external drivers in hindering or spurring spillover. Specifically, I investigate the effects of different types of incentives (monetary vs non-monetary) in shaping spillover trajectories. As in Study 2, the choice of the specific driver to be investigated is driven by the need to fill a gap in the literature on spillover: to my knowledge, only one empirical study assessed the role played by rewards in the spillover framework, albeit from a different perspective (Evans et al. 2012). The starting point

of the study is represented by an overview of both theoretical background and empirical evidence on the effects of rewards on intrinsic motivation and behaviors. Building on this baseline, my research investigates if such effects *spill over* to other behavioral domains, or remain restricted to the behavior directly affected by the incentives.

The effects of rewards on intrinsic motivation and behavior

Rewards represent a broad and heterogeneous family. I focus on two specific categories: monetary rewards (consisting of a financial incentive to carry out an activity) and verbal (or praise) rewards, consisting on praising the individual for an activity and providing positive performance feedback. Rewards have an impact on the motivation of individuals. By intrinsic motivation I consider *the doing of an activity for its inherent satisfactions rather than for some separable consequence* (Ryan and Deci, 2000). Extrinsic motivation, on the other hand, refers to *whenever an activity is done in order to attain some separable outcome* (Ryan and Deci, 2000), so that the carrying out of the activity is spurred by its instrumental value rather than intrinsic enjoyment.

The ultimate effect of external (monetary or praise) rewards on intrinsic motivations and behavior is still an object of debate, as it is still equivocal whether the latter can be hindered, or spurred, by the former (Cameron, Banko and Pierce; 2001; Cameron and Pierce, 1994; Deci, Koestner and Ryan, 1999, 2001). Indeed, controversy characterized the debate since the early 1970s, when decades of behaviorist dominance in motivation research (according to which reinforcements such as external rewards are the best motivators of behavior) was challenged by cognitive explanations of motivation.

Cognitive evaluation theory (Deci 1975, Deci and Ryan 1980) specifies the factors determining variability of intrinsic motivation, based on the assumption that individuals evaluate a task basing on its capability to satisfy human need to be competent and in control. Self-determination theory (Deci and Ryan 1985) incorporates cognitive evaluation theory, but is broader in scope. Self-determination theory suggests that the three core psychological needs of individuals are needs for competence (or effectance), relatedness, and autonomy. *“People are inherently motivated to feel connected to others within a social milieu (relatedness), to function effectively in that milieu (effectance), and to feel a sense of personal initiative in doing so (autonomy)”* (Deci and Ryan, 1994). Cognitive evaluation theory can hence be considered a sub-theory of self-determination theory, specifically focused on those factors hindering or spurring intrinsic motivation. It suggests that intrinsic motivation can be either increased or decreased by rewards according to two properties of the latter, namely information and control, and how they affect our self-determination and perception of competency. As regards the informational aspect of a reward, cognitive evaluation theory predicts that intrinsic motivation will be enhanced if the reward itself conveys the message that the person is competent. On the other hand, the controlling aspect may lead to the sense of uneasiness that people usually perceive when they feel being controlled from the outside. *Locus of causality* is the degree to which individuals perceive their behavior to be self-determined rather than driven from other people. If outside pressures are perceived, people may feel an external locus of causality. Rewards perceived as controlling might hence lead to an outward shift of the locus of causality, and a subsequent undermining of intrinsic motivation. It is hence important to analyze the type of reward contingency to determine whether a reward is to be perceived as informational or controlling and, if both aspects are salient, further factors have to be considered in making predictions (Deci et al. 2001).

Praise rewards usually enhance perceived competence and subsequently motivation. If people engage in a given behavior specifically to gain praise, however, a controlling element emerges, thus decreasing intrinsic motivation (Deci et al. 2001). Tangible rewards such as monetary

incentives, on the other hand, are usually (yet not necessarily) perceived as controlling and aiming at inducing people to adopt behaviors they would not adopt in the absence of the reward, thus undermining intrinsic motivation. Moreover, tangible rewards can be either expected or unexpected (Deci et al. 2001), and task-non contingent, task-contingent and performance-contingent (Ryan et al 1983). The expected vs unexpected reward dichotomy is relevant insofar rewards have motivational implications only as long as individuals are aware they are getting them (that is, rewards are expected), so that they may engage in a behavior (also) to obtain the reward. In such a case, intrinsic motivation to perform the task could be undermined. Task non-contingent rewards do not require performing a task *per se*, as they are linked to other reasons such as experiment participation. Task contingent rewards, on the other hand, require performing the task while performance contingent rewards require not only performing an activity, but also meeting given standards, criteria or scores. Task contingent rewards can be further disaggregated in completion contingent rewards and engagement contingent rewards according to whether engagement alone in an activity is required, or also completion of the task itself.

Cognitive evaluation theory originally developed in the fields of educational research and motivation in organizations, but its insights can be easily adapted to a broad range of domains characterized by the interaction between rewards and intrinsic motivation, including environmental behaviors (Koestner et al., 2001; Pelletier, 2002; Thøgersen, 2003). Moreover, notwithstanding the relevant role played by rewards, it has to be stressed that cognitive evaluation theory applies to the effects of many other external factors as well, such as evaluations (Smith 1975), deadlines (Amabile et al. 1976), competition (Deci et al. 1981) and externally imposed goals (Mossholder 1980).

The empirical evidence supporting cognitive evaluation theory is growing. In his seminal work on the issue, Deci conducted two laboratory and one field experiment, investigating the effects of rewards on intrinsic motivation (Deci 1971). The laboratory experiments showed that different types of incentives had different effects on the intrinsic motivation of individuals: whereas

monetary incentives diminished motivation and effort, the opposite happened for non-monetary incentives such as verbal praise and positive feedback. Deci's hypothesis has been backed by the outcome of the field experiment as well, as monetary rewards proved to be counterproductive from the point of view of intrinsic motivation. Pritchard and colleagues conducted a similar study in 1977 to test Deci's hypothesis, and the results of their laboratory experiment confirmed that monetary rewards decreased the motivation to perform a given activity. Interestingly, these results are common also to studies carried out on young individuals like nursery school babies. In a 1975 experiment where children completing a simple task were divided in three groups (with expected reward, unexpected reward and no reward respectively), Lepper and Greene found that children in the expected reward condition decreased in intrinsic motivation whereas those in the other two conditions maintained it.

Since the 1970s, numerous studies on the rewards-motivation relationship have been carried out, as well as different meta-analyses on the topic. Most of these works lead to results consistent with cognitive evaluation theory, and external rewards playing a downgrading role on intrinsic motivation (Rummel and Feinberg 1988, Wiersma 1992, Tang and Hall 1995, Deci et al. 2001). The meta-analysis of Tang and Hall is the more comprehensive meta-analysis conducted, with a review of 50 studies that overcame shortcomings that limited the reliability of previous works (such as the lack of contingent-non contingent, or expected-unexpected disaggregation of rewards). It has to be pointed out that cognitive evaluation theory received critiques, as well. The work of Cameron, Pierce and colleagues (Cameron and Pierce 1994, Cameron et al. 2001) reached the conclusion that rewards seemingly have no impact on intrinsic motivation (if not enhancing it altogether), baldly suggesting the *abandoning of cognitive evaluation theory*. Many scholars argued however that such critiques are not well grounded (see Kohn 1996, Lepper et al. 1996, Ryan and Deci 1996), since the meta-analysis of Cameron and Pierce was invalid and its conclusions false. Many flaws reportedly undermined the reliability of the results, such as the emphasis on boring tasks (which by their very nature have little to no intrinsic motivation) or

failure to include studies showing negative effects of reward on performance. In light of the various flaws in these meta-analyses, Deci, Koestner and Ryan (1999) teamed up to compose the most comprehensive meta-analysis of the time on rewards, where 128 studies were examined. The results show how verbal rewards are indeed capable of increasing intrinsic motivation (see Blanck et al. 1984, Koestner et al. 1987, Ryan 1982, Sansone et al. 1989), unless they are administered in a controlling manner, in which case the opposite effect is found. Deci and colleagues also state that unexpected rewards do not decrease intrinsic motivation, probably because participants do not feel controlled from the outside, as they are not performing the task to actually get the reward. As regards tangible expected rewards, they appear to have a substantial undermining effect, which can be ascribed to both *over-justification* (our tendency to diminish motivation when we are provided with an extrinsic reason to do something we would do even in the absence of such incentive) and the uneasy feeling of being controlled deriving from incentives that thus undermine our feelings of self-determination (see Deci et al 1999, Ryan and Deci 2000, Deci and Ryan 1985).

While the latter explanation fits within the cognitive evaluation theory framework, the over-justification effect (Lepper et al. 1973, Lepper and Greene 1975) is largely based on attribution (Kelley 1967) and self-perception (Bem 1972) theories. Motivation and performance are believed to be influenced by the perceptions we hold about the inner causes of our own behavior. When external controls are present, individuals tend to ascribe their own behavior to an external agent, and this undermines their own motivation. In the case of rewards such as monetary incentives, perceptions shift from accounting behavior as self-initiated to considering it as sparked from the outside, and people feel they are facing too many reasons (or justifications) to perform an activity so that the role of intrinsic motivation gets discounted and motivation itself decreases.

Even assuming that rewards have a hindering effect on intrinsic motivation, the overall effect will depend on the relative strength of two forces operating in opposite directions: the motivating power of the incentive and the decrease in intrinsic motivation (Frey 1997). The risk of offsetting

the benefits of a reward such as financial incentives by means of decreased intrinsic motivation is relevant as far as environmentally sound behaviors are concerned. Thøgersen, in a study on differentiated garbage fees, reaches similar conclusions: monetary rewards may re-frame the environmental issue into a cost-benefit calculation sphere, so that such negative effects offset positive impacts of rewards on attitudes and behavior (Thøgersen 1994). Frey invokes the term *crowding out* to describe a scenario where extrinsic motivation involving external rewards is at odds with intrinsic, or behavioral, motivation. Crowding in, on the other hand, refers to the case when intrinsic and extrinsic motivation work in the same direction. Not only does Frey (1993) recognize that crowding out effect undermines intrinsic motivation to perform a task; he stresses how the effect could also spillover to other domains not affected by the reward, if the individual finds it hard to distinguish motivations according to such different domains. Hence policy makers in the environmental field should be careful with pricing as a strategy to shift people environmental behaviors, as this could not only hinder intrinsic motivation and undermine the behavior object of the reward, but such negative effect could spill over to other (not rewarded) environmental behaviors as well, multiplying the detrimental impacts of the policy. Conditions facilitating spillover range from similarity of domains (with respect to both material content and processes) to the social and religious incentive to adapt similar intrinsic motivation to all spheres of life.

Motivation crowding effect and motivation spillover effect represent two limits to policies encompassing extrinsic rewards that have to be carefully taken into consideration, as to avoid possible counterproductive effects. Crowding out effects contradict a traditional rational choice model (Becker 1976, Coleman 1990), according to which behavior is determined by preferences and constraints only. Extrinsic monetary rewards cause a shift in relative prices (constraints), thus resulting in changes in behavior: behavioral changes are here assumed to be extrinsically motivated. Frey suggests that also another type of behavioral incentive should be taken into consideration, and intrinsic motivation. Neoclassical economics, on the other hand, takes

preferences as given and thereby implicitly assumes that monetary rewards have no effects on intrinsic motivation.

As already mentioned, according to cognitive evaluation theory monetary incentives could under given circumstances enhance intrinsic motivation. Facilitating conditions are represented by the capability of the reward to boost individuals' perceived competence (what Bandura -1982- calls *self-efficacy*, typically achieved through feedbacks on the performance), or the reward itself being perceived as not controlling. In a 2003 study on weight dependent garbage fees (Thøgersen 2003) it was found that such rewards have a positive effect, and the result is due not only to the price effect, but also (and perhaps mostly) to an increase in perceived self-efficacy and personal norms regarding the specific environmentally desirable behavior. The author suggests that a further explanation could refer to the fact that the small incentive provided is considered as an insufficient justification to recycle, making new adopters of the behavior adjust their attitudes as to be more consistent with the new behavior.

Research questions and methods

The study aims at shedding light on the influence of incentives on behavioral patterns, at different levels of analysis. I first focus on the direct effects of financial and praise rewards on the specific behavior being incentivized, which is represented by green purchasing. I expect that monetary incentives (even if limited to very small amounts) support the purchase of green products more than praise rewards, and I test this speculation by means of the following research hypothesis:

H1) The direct effect of incentives in spurring the adoption of a pro-environmental behavior is stronger for monetary rewards compared to praise rewards.

The core of the study is represented by the role played by different types of incentives on spillover between pro-environmental behaviors; in other words, the focus shifts to the *indirect* effect of incentives on green behaviors *other* than those directly incentivized. Reading Self-Determination and Cognitive Evaluation Theory in the light of the spillover hypothesis, one could expect spillover to be stronger for praise group members, as individuals incentivized to purchase green products by means of monetary rewards have their intrinsic environmental motivation hindered, with negative repercussions on the spillover process. The second research hypothesis to be tested is hence the following:

H2) Pro-environmental spillover is stronger when triggered by praise rather than monetary incentives.

The study is based on the same methodology adopted in Studies 1 and 2: a panel study consisting of two waves of online surveys (pre and post intervention), with the experimental manipulation consisting in spurring participants to purchase green products for a period of six weeks and keeping track of their purchasing patterns by means of a shopping diary. A total of 80 complete shopping diaries with receipts were returned, so that the sample used for the present analyses is composed of 80 undergraduate students ($n=80$) from the University of Aarhus, Denmark. The qualifying methodological element is represented by a random split of the experimental group into two sub-groups. Monetary group members ($n_m=46$) were incentivized to purchase green products by means of financial incentives consisting of two elements: a sum covering the extra costs sustained for the purchase of green products and the chance to win 1000 DKK in a final lottery draw. Praise group members ($n_p=34$) received instead emails praising their effort and stressing the beneficial effects for the common good of a shift to environmentally conscious purchasing patterns. Specific attention was devoted in framing messages (in equal number and frequency for both groups) so that they were not perceived as controlling, as this would have hindered intrinsic motivation.

Results and discussion

I first consider the direct effect of different types of rewards on purchasing patterns. Table 1 illustrates the average number of items (and, in brackets, of *green* items) purchased by participants in both monetary and praise groups for each of the 10 product categories analyzed in the shopping diaries.

Table 1: Average number of (green) items purchased

Average n of (green) items purchased	Monetary group	Praise group	Total
Milk	8,57 (5,70)	6,18 (2,09)	7,55 (4,16)
Yoghurt	2,57 (1,39)	1,94 (0,68)	2,30 (1,09)
Eggs	2,09 (0,89)	1,94 (0,82)	2,03 (0,86)
Meat	6,33 (1,22)	4,88 (0,44)	5,71 (0,89)
Vegetables	12,52 (4,17)	10,18 (1,76)	11,53 (3,15)
Fruit	9,35 (2,52)	7,74 (1,26)	8,66 (1,99)
Det	1,09 (0,39)	0,65 (0,26)	0,90 (0,34)
Pers	2,02 (0,63)	1,59 (0,62)	1,84 (0,63)
Kitchen	0,35 (0,22)	0,35 (0,03)	0,35 (0,14)
Toilet	0,93 (0,50)	0,85 (0,24)	0,90 (0,39)

Individuals receiving monetary rewards purchase more green products than individuals receiving praise rewards: on average, each participant of the monetary group purchased 17.63 green items during the six weeks of the experiment, compared with only 8.20 of those in the praise group. Differences are large for some items (such as milk, meat, vegetables or kitchen paper) and smaller for others (such as eggs and detergents for personal hygiene). I then focus on the relative share of green products purchased, rather than on their absolute numbers. The mean percentages of green products purchased by participants in the monetary and praise groups are 35.54% and 22.06%, respectively: while over one third of products purchased by individuals spurred by financial incentives to buy green are indeed environment-friendly, the figures drop to just over one fifth in the case of individuals spurred by praise rewards. To assess the significance of these preliminary results, I carry out an analysis of variance where the dependent variable is

represented by the percentage of green products purchased by each participant and the independent variable is represented by the treatment group of pertinence (monetary vs praise). There is indeed a significant difference between the monetary and the praise group on percentages of green products purchased ($F=7.523$, $p<.01$, $partial\ eta\ squared=.088$). Monetary incentives are much more effective than praise incentives in spurring individuals to adopt a sustainable behavior like purchasing green products. These findings are consistent with a broad literature on consumer behavior and with empirical evidence gathered in a wide set of domains ranging from eating at restaurants (Jang and Mattila 2005) to responding to survey requests (Church 1993), and so on. In the domain of purchase a useful distinction has to be made between hedonic and utilitarian products (Hirschman and Holbrook 1982, Dhar and Wertenbroch 2000): *we use goods in two ways (...), as symbols of status and simultaneously as instruments to achieve some end-in-view* (Hamilton, 1987). Evidence in literature suggests that while for utilitarian goods the effect of monetary rewards is stronger, for hedonic products it is non-monetary rewards which are more effective (Liao et al. 2009). The product items that participants have been asked to purchase are not easy to be placed in either of the two categories, as they encompass features typical of both hedonic and utilitarian goods and being thus eligible for a *borderline* status. Even typical utilitarian products like detergents or kitchen paper should be handled with care before being labeled as such in this specific setting, since the overarching goal of environmental protection embodies a role trespassing the boundaries of mere functionalism and use. Future research should first investigate in depth how participants perceive the green products object of the study, and then test whether there are significant differences regarding the effects of different types of rewards on purchasing patterns.

As regards the *indirect* effects of rewards on behavioral patterns, I investigate whether monetary and praise rewards impact differently on the uptake of pro-environmental behaviors *other* than those directly incentivized (i.e. on positive pro-environmental spillover). I consider as target behaviors those for which a positive spillover was found in Study 1: *switching off the lights when*

exiting room as last person, turning off the water while soaping and while brushing teeth, and recycling batteries. Table 2 illustrates the descriptive statistics on the evolution over time in participants' behavioral intentions to carry out each of the four target behaviors.

Table 2: Evolution over time of behavioral intentions

	Monetary Group			Praise Group		
	<i>t1</i>	<i>t2</i>	$\Delta t2-t1$	<i>t1</i>	<i>t2</i>	$\Delta t2-t1$
<i>Turn off lights</i>	6,63	6,70	0,07	6,65	6,74	0,09
<i>Turn off water while brushing teeth</i>	6,46	6,59	0,13	6,74	6,71	-0,03
<i>Turn off water while soaping in the shower</i>	4,65	4,67	0,02	4,56	5,21	0,35
<i>Recycling batteries</i>	4,91	5,41	0,50	5,47	5,35	-0,12

Consistently with the results of Study 1 on the existence of positive spillover, there is a generalized trend towards an increase in behavioral intentions to behave environment-friendly with the only exceptions of behavioral items on *saving water while brushing teeth* and *recycling batteries* for praise group members. However, if we consider the differences between monetary and praise group members, there is no clear pattern emerging as in two target behaviors (*turning off water while brushing teeth* and *recycling batteries*) people treated with monetary incentives experience stronger leaps in behavioral intentions, while in other two target behaviors (*turning off the light when exiting room as last person* and *turning off water while soaping*) the opposite happens. To test the statistical significance of these differences, I conduct a one-way between-groups analysis of covariance: the independent variable is represented by the treatment group (monetary vs praise), while the dependent variable consists of participants' scores on behavioral intentions for the four target behaviors administered after completion of the intervention. Participants' scores on the same question administered before the intervention are used as the covariate in the analysis, to control for pre-existing differences between the groups. Table 3 illustrates the results of the analysis:

Table 3: Statistical analysis

Item	$\Delta_{mon}-\Delta_{pra}$¹	F	p	Partial η^2
<i>Turning off light when exiting as last person</i>	-.02	.081	.776	.001
<i>Turning off water while brushing teeth</i>	.16	.018	.894	.000
<i>Turning off water while soaping</i>	-.33	2.921	.091	.037
<i>Recycling batteries</i>	.62	1.397	.241	.018

¹ it represents the difference between the mean variations (before to post experiment) in monetary and praise group participants (on a 1 to 7 scale). Positive values indicate that the willingness to uptake the specific green behavior increased more (decreased less) in the monetary group

The picture emerging is controversial and there is no general trend on which type of incentives is more effective in triggering a positive spillover to other domains. Furthermore, the differences in leaps of behavioral intentions between participants in the monetary and praise conditions are not statistically significant as can be inferred by the high p values (with the partial exception of the behavioral item *turning off water while soaping*, showing marginally significant differences). According to my data the two groups do not differ significantly as regards changes in intentions to perform sustainable behaviors other than those directly spurred by the incentives: spillover is not affected by the type of rewards (monetary or praise) triggering it.

Scant research has been carried out on the topic, to date. Swim and Bloodhart (2013) conducted lab experiments investigating whether pro-environmental spillover is affected by praise and admonishment for acting green or not, respectively. Results show that praising participants for their pro-environmental behavior (taking the stairs instead of the elevator) only produces a modest and indirect spillover towards other, not related green behaviors (turning off lights and monitor at the end of the experiment). The authors suggest that the modest result *may be attributable to a lack of internalization of admonishment and praise, as participants may not have felt pride for taking the stairs because their decision was not based upon its environmental or social implications* (Swim and Bloodhart 2013, p.33). Evans and colleagues (2012) conducted lab

experiments investigating spillover from a source behavior represented by carpooling to a target behavior represented by recycling. Participants in two experimental conditions received environmental and financial information about the benefits of carpooling, respectively. Results suggest that the spillover to the target behavior (that is, throwing the paper with carpooling benefits'information in a recycling bin at the end of the experiment) is stronger when self-transcending reasons are made salient.

The scattered empirical evidence on the role played by different incentives on pro-environmental spillover seems to be consistent (especially in the case of Evans and colleagues) with the theoretical background suggesting that praise messages (or incentives) increase intrinsic motivation to perform other pro-environmental behaviors, while financial incentives undermine such motivation. A thorough comparison of such evidence with the results of my study is hindered by relevant differences both at the methodological and theoretical level: for instance, my experiment represents the first empirical investigation trespassing laboratory boundaries, with financial incentives being directly correlated to the degree of uptake of the source behavior. However, what emerges from my experiment seems in contrast with the results of the above-mentioned studies, as no clear pattern suggesting the relevance of the type of incentives as predictors of spillover emerges. Only for one of the four observed behaviors (*turning off water while soaping*) there is a marginally significant effect of incentives, suggesting that praise rewards indeed spur pro-environmental spillover more than monetary rewards.

In conclusion, my experiment suggests that the nature of incentives only plays a marginal role in shaping spillover trajectories, which are seemingly more affected by internal factors such as values or habits. However, this result has to be handled with care as many factors might have affected the outcome of the experiment. First and foremost, there might be an issue regarding the sample of the study. Participants in the experiment are all undergraduate students: future research should adopt a sample that is more representative of the general adult population, as to investigate whether the results are typical of a specific age group or can be generalized.

Furthermore, the study was conducted in Denmark, which is characterized as all Scandinavian Countries by a deeply rooted environmental awareness within the population. This might have undermined the effectiveness of praise messages, being participants constantly exposed to sustainability-related stimuli and having thus interiorized these. This shortcoming could be addressed by future studies conducting cross-Country comparisons focusing on diverse national and socio-cultural contexts from the point of view of environmental awareness. The adequacy of the sample is not the only factor that might undermine the generalizability of my results. For instance, as Swim and Bloodhart suggest, lack of internalization of the self-transcending vs self-interested appeal of the rewards could eliminate the effects on intrinsic motivation advocated by Self Determination and Cognitive Evaluation theories. Moreover, the specificity of the source behavior (green purchasing) suggests that future research adopting the same methodology should address the hedonic-utilitarian dichotomy as to investigate whether the effects of incentives on spillover are mediated by which feature of products (hedonic or utilitarian) is perceived as salient by participants.

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Estratto per riassunto della tesi di dottorato

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Dottorato: Economia Aziendale

Ciclo: 25

Titolo della tesi: Pro-environmental spillover in consumer behavior: existence and drivers

Estratto:

La tesi analizza il tema dello spillover fra comportamenti eco-sostenibili, e si basa su un panel study (questionari online pre e post manipolazione sperimentale) condotto su un campione di studenti dell'Università di Århus, in Danimarca. Il primo capitolo analizza l'esistenza stessa dell'effetto spillover, dimostrando che questi si verifica ma limitatamente a comportamenti semplici ed immediati. Il secondo capitolo analizza il ruolo giocato dagli habits come moderatori dell'effetto spillover. Si dimostra che le abitudini giocano un ruolo rilevante nel forgiare le traiettorie di spillover, con individui più abitudinari nel target behavior più pronti a subire contaminazioni positive di comportamenti sostenibili. Il terzo capitolo affronta il tema degli incentivi e di come questi agiscano sul processo di spillover; i risultati suggeriscono come la natura degli incentivi (monetari vs verbali) non giochi un ruolo rilevante come moderatore dello spillover.

Abstract:

The thesis focuses on pro-environmental spillover, and is based on a panel study (pre and post-intervention online surveys) on a sample of students from Århus University, Denmark. Essay 1 analyzes the existence itself of spillover, showing that this is limited to simple and painless behaviors. Essay 2 focuses on the role played by habits as moderator of the spillover effect. Results show that habits do play a relevant role in shaping spillover trajectories, with individuals holding strong habits in the target behavior being more likely to experience stronger spillover. Essay 3 deals with the role played by incentives in spurring spillover; results suggest that the nature of rewards (monetary vs praise) is not a relevant factor in moderating spillover.

Firma dello studente

