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Different Routes to Explain Pro-Environmental Behavior: an Overview and Assessment*

Abstract: A variety of theoretical approaches have been taken in an attempt to understand, explain, and promote pro-environmental behavior. The present article gives an overview, including specific applications, and identifies and discusses various strategies used by researchers to deal with the availability of different approaches. The overview includes elementary rational choice theory, the theory of planned behavior, norm-activation theory, theories of habitual behavior, and theories within a social dilemma framework. Strategies identified are ‘extending existing theories by single explanatory factors’, ‘comparing theories’ in a competitive manner, and ‘combining theories’ in an integrative manner. It is argued that research would benefit from more standardization in empirical applications, from more competitive theory testing as opposed to integrative theory testing, and from an evaluation of approaches on theoretical grounds as opposed to focusing solely on empirical performance.

1. Introduction

Since understanding, explaining and promoting pro-environmental behavior is an important issue in many societies, there are a wide range variety of studies that attempt to shed more light on this subject. Most of these studies do not consider environmental behavior as a ‘global concept’; instead, they focus on specific behaviors such as consumer behavior, recycling behavior, travel mode choice or environmental activism (e.g., Diekmann/Preisendörfer 1998, 80, for arguments supporting this perspective). Moreover, forms of pro-environmental behavior at the level of households differ in their degree of positive impacts on the environment and, hence, in their relevance for environmental protection. In Germany, for example, “[t]he total resource requirement of only three clusters, construction and housing, food and nutrition, and transport and mobility makes up for nearly 70% of material extraction and energy consumption and more than 90% of land use” (Spangenberg/Lorek 2002, 135). Here, private households can make a considerable difference when they show environmentally sustainable consumption patterns, whereas the clusters “hygiene”, “clothing”, “cleaning”, and

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“recreation without transport” have a much lower impact (Spangenberg/Lorek 2002, 135).

On the one hand, it might be argued that the various forms of pro-environmental behavior have different causes and that behavior-specific explanations are needed (e.g., Stern 2000). However, on the other hand, there is an identifiable set of theoretical approaches, belonging to the class of general theories of social action, when it comes to investigating specific forms of pro-environmental behavior. These approaches make different behavioral assumptions and highlight different key explanatory variables. Whereas some theories focus on deliberative behavior, others point to automatic behavior. Some consider behavioral costs and benefits as key determinants, while others focus on moral norms.

The present article aims to give an overview of theoretical approaches used in research on pro-environmental behavior. This overview includes elementary rational choice theory and ‘sociological’ subjective utility theory, the theory of planned behavior as a variant of the latter, norm-activation theory, theories of habitual behavior, and theories within a social dilemma framework. It can fairly safely be said that the theory of planned behavior and norm-activation theory are used most often in research on pro-environmental behavior. We describe these and the other approaches and give examples of empirical applications (*section 2*). It has to be stressed that, although pointing to the most important theoretical approaches, the present overview is not comprehensive, that is, there might be further approaches such as those focusing on general values (e.g., Inglehart 1990; Schwartz 1994) and further theoretical variants within the approaches considered here (e.g., Kollmuss/Agyeman 2002; Stern 2000; Bamberg/Möser 2007; Steg/Vlek 2009 for other overviews). One of the main goals is to identify different strategies in the existing literature of how researchers deal with the availability of various theories. In addition to the frequently used strategy of testing a single theory, we identify the strategies of extending theories by single factors, of comparing theories, and of combining theories. For each of these strategies, specific examples are provided (*section 3*). Finally, after identifying theoretical approaches as well as strategies for dealing with these approaches, we are able to discuss some problems and shortcomings of current research on pro-environmental behavior and suggest areas for further research (*section 4*).

2. Different Theoretical Approaches

Systematizing the theories used in research on pro-environmental behavior is a quite difficult task. Some authors differentiate between approaches working with the assumption of self-interest on the one hand and approaches based on pro-social motivations on the other hand (e.g., Bamberg/Möser 2007). Others additionally point to theories assuming reasoned choices as opposed to theories assuming automatic behavioral responses (e.g., Steg/Vlek 2009). Following these categories, the theory of planned behavior would be classified as an approach based on self-interest and reasoned action, norm-activation theory includes pro-social motivations, and theories of habitual behavior typically repre-

sent approaches of automatic behavioral responses. However, as will be pointed out, there are also theoretical approaches of habitual behavior within the framework of utility maximization and reasoned action. Further, some approaches within sociological subjective utility theory and the social dilemma framework work with both the assumption of self-interest and the assumption of pro-social motivations. Finally, there are also approaches that include the possibility of reasoned decisions as well as automatic behavioral responses (e.g., in the context of dual-process models such as the one proposed by Fazio 1986; 1990). Against this background, the present article does not offer a typology or categorization but briefly summarizes the main theoretical approaches to studying pro-environmental behavior and points to specific examples of empirical tests of these theories.

Elementary Rational Choice Theory and 'Sociological' SEU Theory

Elementary rational choice approaches to explaining pro-environmental behavior assume selfish actors who are endowed with preferences that fulfill certain rationality postulates and who maximize their utility. Preferences are taken as given, and the focus is primarily on the effects of incentives on behavior or, to put it more generally, on the effects of changes in restrictions on behavior. For example, assuming otherwise identical preferences, recycling behavior should be affected by the distance between the residence and the recycling container (e.g., Guagnano et al. 1995 for an empirical confirmation).

An illustrative example of the effect of incentives is given by Diekmann and Preisendörfer (1991; 1998). Their study on environmental behavior in the cities of Bern (Switzerland) and Munich (Germany) found that, although citizens in both cities do not differ much in the level of environmental concern, only 23 percent of the respondents in Bern compared to 69 percent of the respondents in Munich stated that they turn off the heating during longer absences. This finding is quite surprising initially, but it can be explained by the procedures for calculating heating costs. In Bern, 39 percent of the respondents have an 'individual heating bill' (costs according to the household's consumption level) and 61 percent have a 'collective heating bill' (costs depend on consumption in the whole apartment block) whereas in Munich 81 percent have an individual bill and 19 percent a collective bill. The use of 'collective heating bills' in Bern means that people there have a greater incentive to take a free ride on the heating payments made by others.

Economic incentives, however, do not necessarily have positive, that is, pro-environmental consequences. It might also be that such incentives crowd out intrinsic motivation (Frey 1992). For example, tradable permits with regard to environmental pollution might be perceived as a "license to pollute" and "may even be perceived to imply that those who, for reasons of environmental ethics, do not pollute as much as the permits allow, are irrational" (Frey 1992, 171).

An elementary rational choice approach is applied, for example, in a study by Brüderl and Preisendörfer (1995) on transportation mode choice with respect to travel to the workplace (alternatives are car, public transportation and bicycle/walking). Their data cover 811 telephone interviews conducted in the

German city of Munich in 1993. From a rational choice perspective, they identify three key determinants of transportation mode choices: travel time, comfort, and monetary costs. These determinants are operationalized as subjectively perceived cost attributes of behavioral alternatives. A conditional logit model for the decision to use public transportation rather than taking the car reveals that comfort is the most important choice attribute, followed by travel time and financial costs of the transportation mode.¹ This in turn means that an improvement of the infrastructure with respect to public transportation is more likely to encourage pro-environmental behavior than economic measures such as lowering prices for public transportation.

In situations that involve risks and uncertainty in the form that each outcome is realized with a given and known probability (known as lotteries), actors are assumed to maximize their expected utility. If probabilities are not (objectively) given, rational choice researchers rely on the concept of subjective expected utility (SEU theory, see Schoemaker 1982 for a survey of this). *SEU models*, as used in sociological and social psychological research implicitly assume that actors are able to assign subjective probabilities and utilities to outcomes of actions and to compare the subjective expected utilities of different alternatives. (These ‘sociological and social-psychological variants’ of SEU theory do not have an axiomatic foundation as, for example, proposed by Savage 1954.) For an action alternative, the SEU is the sum of the perceived probability of each outcome multiplied by the utility of that outcome. Facing different actions, actors choose the alternative with the highest SEU value.

Lüdemann (1998) applies, among others, SEU theory in a telephone survey of road users in Bremen, Germany.² The data consists of 369 interviews conducted, where 78 interviews could be used to test the theory. The respondents were asked about how they “got downtown last time they went” and about up to four behavioral alternatives (258), about the goals they pursued when deciding this, about the importance of these goals (five-point response scale), and about the subjective probability of realizing these goals (five-point response scale). SEU values for each behavioral alternative were obtained using the sum over the product of goal importance and subjective probability per goal for the alternative. This approach revealed 93 percent correct predictions on the individual level, that is, for 93 percent of the respondents the SEU value of the performed alternative is greater than the SEU value of the other alternatives.

¹ Applying a conditional logit model, the authors implicitly refer to random utility theory and the idea that characteristics of goods but not goods per se yield utility (e.g., Louviere et al. 2000). More generally, they also assume that actors are able to evaluate costs of transportation modes.

² Lüdemann 1998 also discusses and tests Lindenberg’s discrimination model which refers to the importance of frames and framing of behavioral decisions. In the more general goal-framing theory, “[t]he central idea is that goals govern or ‘frame’ what people attend to, what knowledge and attitudes become cognitively most accessible, how people evaluate various aspects of the situation, and what alternatives are being considered” (Lindenberg/Steg 2007, 119).

Theory of Planned Behavior (TOPB)

A popular approach to studying pro-environmental behavior is Ajzen's (1991) theory of planned behavior (TOPB). In the basic model, the attitude toward the behavior (e.g., taking the bus or the car), the subjective norm (normative expectations of reference individuals/groups), and the perception of behavioral control (potential impediments/obstacles) determine the behavioral intention, which in turn explains the behavior (in addition to behavioral control having a direct effect on that behavior). Since each of the three explanatory components of the intention consists of products of beliefs (subjective probabilities) and perceived consequences/outcomes, this theory lies within the rational choice framework, specifically, within the range of 'sociological' SEU models.

(An extended) TOPB was tested, for example, in a study by Bamberg et al. (1995) on transportation mode choice in the rural district of Giessen (not the city of Gießen), Germany. The data was obtained by using travel protocols. The behavior in question was the intention by car users (N=2243 trips by 1433 respondents) to travel or not to travel by bus. Respondents answered questions on occurrence probabilities regarding several attributes of the behavioral alternatives such as 'secure', 'fast', 'comfortable', 'environmentally friendly', and 'flexible'. Not surprisingly, the car users interviewed evaluated making the journey in question by bus as rather negative, unpleasant, and difficult. Almost all car users (95%) stated that it is rather unlikely that they will use the bus next time. The test of the TOPB using structural equation modeling shows that in this study the most important determinant of the behavioral intention is behavioral control, followed by the social norm, the attitude toward the behavior, and—as an additional variable—the frequency of past bus rides (an indicator of habitual behavior, see below). Further, 'flexible' and 'fast' were the two most important attributes of behavioral alternatives.

Interestingly, although a full test of the TOPB is much more complex, the study by Bamberg et al. (1995) would suggest in principle the same conclusion for political decision makers as the study by Brüderl and Preisendörfer (1995) mentioned above which applied a much more parsimonious rational choice approach. Both studies conclude that improving the infrastructure for public transportation is more important than changing the relative prices of the transportation modes (e.g., making it more expensive to take the car or cheaper to use the bus).

Norm-Activation Theory (NAT)

Schwartz's norm-activation theory (NAT, Schwartz 1977; Schwartz/Howard 1982) has been developed to explain (altruistically motivated) helping behavior. It assumes that a personal norm expressed in feelings of moral obligation regarding a specific action is only activated and transformed into behavior if certain conditions are fulfilled. Schwartz's theory is a cognitive and sequential decision model that covers the entire process from norm activation to action. The entire model is quite complex, and empirical tests are difficult to implement. Further, different specifications of the model can be found in the literature. However, most specifications include at least two of the three components

awareness of need (AN), awareness of consequences (AC), and awareness of responsibility (AR) as determinants of norm activation. Awareness of need refers to the precondition that individuals must recognize that something has to be done concerning the object in question. Awareness of consequences refers to beliefs that an individual's behavior has effects on the object in question, and awareness of responsibility means that individuals must recognize that they are responsible for doing something. Given awareness of need, awareness of consequences and awareness of responsibility, a perceived moral obligation may result in specific behavior. Taken together, all three determinants mediate the effect of a perceived moral obligation on behavior.

Guagnano (2001) relies on NAT to explain individuals' willingness to pay for paper towels made from recycled materials. His study centers on the question of to what extent normative altruism is relevant for pro-environmental behavior in the context of markets. Empirical results are based on a telephone survey of 367 residents of Fairfax County, Virginia, USA. In this study, it is assumed that recycling participation equals altruistic behavior. Awareness of consequences, awareness/ascription of responsibility, and also personal costs were obtained on a general level, that is, with respect to environmental problems in general and not recycling products in particular. Path analyses indicate that awareness/ascription of responsibility is a direct and significant determinant of willingness to pay, whereas awareness of consequences and personal costs have indirect effects, that is, the awareness of consequences significantly affects the awareness of responsibility, and personal costs significantly affect both the awareness of consequences and the awareness of responsibility. Income does not significantly influence willingness to pay. Overall, awareness/ascription of responsibility is the most important behavioral determinant in this study. Finally, it has to be stressed that Guagnano (2001) does not directly measure the personal norm. This means that it has not been tested whether the awareness of consequences and awareness/ascription of responsibility moderate the effect of the personal norm (feelings of obligation to use recycled products) on behavior. Therefore, strictly speaking, it is questionable whether the study is a valid test of NAT when it does not include such indirect effects.

Stern et al. (1993) extended Schwartz's NAT (later known as the value-belief-norm theory, see also Stern 2000) and proposed that the motivation to act equals the sum of three types of products of "beliefs about consequences for a valued object" and "the weight or importance of the value orientation toward that object" (328). They differentiate between an egoistic, a social-altruistic, and a biospheric value orientation. The usefulness of this theory is demonstrated with data on individuals' willingness to take political action by college undergraduates at a university in northern New York State, USA.

Theories of Habitual Behavior

In contrast to theoretical approaches focusing on reasoned action, there are several studies that characterize repeated environmental behavior as habitual (e.g., Aarts et al. 1998; Aarts/Dijksterhuis 2000; Klöckner et al. 2003). For example, Aarts and Dijksterhuis (2000, 76) assume that "[...] habits are represented as

associations between goals (e.g. ‘going to the university’) and behavioural responses (e.g. ‘taking the bike’) that allow an automatic behavioural response upon activation of a goal. The strength of the association between goal and action is a function of frequency: non-habitual or less frequently performed behaviour (e.g. ‘going to a meeting in another city by train’) is not expected to be represented by such strong associations between goals and action.” Thus, behavior that occurs less frequently can be captured by theories concerning deliberate action whereas behavior that occurs frequently is best analyzed in terms of automatic behavioral responses. This is also considered in Triandis’ (1977) theory of interpersonal behavior (TIB) which suggests that the level of conscious decision processes decreases with an increasing level of habit. TIB is somewhat similar to Ajzen’s TOPB, that is, both theories are based on SEU constructs and share determinants of behavioral intentions such as normative beliefs; but TIB additionally and more strongly focuses on the role of habits and affects in explaining intentions and behavior (Bamberg/Schmidt 2003 for a brief discussion).

Aarts and Dijksterhuis (2000) conducted a laboratory experiment with 56 students of the University of Nijmegen, Netherlands, in which they demonstrate that it is hard to suppress and control habitual responses. In this study, habit is manipulated experimentally and not measured directly (although it also strongly correlates with subjective measures). Cycling was considered to be the habitual action and taking the train the non-habitual action. Participants had to name a travel mode in response to travel destinations offered to them. Manipulating the permission to respond with the typical mode (i.e. name an alternative) and manipulating the cognitive load (i.e. a secondary task) revealed that bicycle responses, the habitual action, are “automatically triggered by travel goals” and that this holds true to a lesser extent for train responses, the non-habitual action.

Habits and routines can also be analyzed within processes of utility maximization; for example, Davidov (2007) discusses the implication of Stigler’s and Becker’s (1977) theoretical model which includes a possible explanation of habitual and customary behavior within the context of transportation mode choice (i.e. primarily the relation between habits and the costs of searching for information when contexts are changing). The completeness of this model has been tested in a field experiment regarding an intervention program to motivate the use of public transportation in Stuttgart, Germany.

Social Dilemma Framework

Environmental problems often include the structure of a social dilemma because environmental services (or environmental behavior) are in many cases (contributions to) public goods or have the characteristics of common pool resources. Public goods (e.g., air quality) are characterized by non-excludability from consumption and non-rivalry of consumption, whereas common pool resources (e.g., allocation of water) are characterized by non-excludability from consumption and rivalry of consumption. Then, a social dilemma such as Hardin’s (1968) well-known tragedy of the commons means, for example, that “[e]ach farmer does best by taking as much irrigation water as possible, and each fisher benefits from catching as many fish as possible, but the aggregate outcome of these

individually reasonable decisions can be disaster—groundwater exhausted and fish species depleted to the point of extinction” (Kollock 1998, 184, also provides an overview of social dilemmas and solutions to social dilemmas). A well-known game-theoretic model employed to analyze such social dilemmas is the (n-)person prisoners’ dilemma (e.g., Hardin 1971). Here defection (e.g., catching as many fish as possible) is a dominant strategy and, irrespective of what the other actors do, yields a higher payoff than cooperation (e.g., sustainable level of fishing). Following the assumption of rational actors, all actors choose defection, which results in a Nash equilibrium with a Pareto inferior outcome (‘zero contribution thesis’), but all actors would be better off choosing cooperation, resulting in a Pareto improvement. This standard assumption has been challenged both on a theoretical and an empirical level; see the excursus below.

An Excursus on Laboratory Experiments and Case Studies on Social Dilemmas

A variety of social dilemmas have been tested in laboratory experiments, including prisoners’ dilemma experiments, public good experiments, common pool resources experiments, and market experiments (Ledyard 1995; Camerer 2003; Sturm/Weimann 2006). Some striking findings are that both in one-shot and in repeated games individuals do not strictly take a free ride on the contributions made by others (higher cooperation level as predicted by standard theory), communication between individuals increases the cooperation level, and individuals use costly sanctions to punish defectors. In addition, it should be mentioned that there are mixed results concerning the group size effect in standard public good games (Sturm/Weimann 2006, 423). A group size effect would be expected according to Olson’s (1965) influential work, *The Logic of Collective Action* (Udén 1993 for a critical review of Olson’s work).

Then the key questions are why and under what conditions do individuals cooperate and find a solution to social dilemmas. Various models in the domain of behavioral game theory focusing, among other things, on fairness, reciprocity, and altruistic punishment have been proposed to answer this question (e.g., Fehr/Schmidt 1999; Fehr/Gächter 2000; 2002; Bolton/Ockenfels 2000; Rabin 2003; Falk/Fischbacher 2006). Complementary approaches such as evolutionary approaches also point out the role of different types of actors/players such as ‘conditional cooperators’ and ‘willing punishers’ in addition to ‘rational egoists’ (e.g., Ostrom 2000, 141; see also Fischbacher et al. 2001; Gächter 2007). There is a growing body of literature on the development and testing of new theoretical models and modifications of previous models. A particular advantage of behavioral game theory is that the models make clear predictions of what can be expected in a variety of games under a variety of conditions. These predictions can be easily verified or falsified in laboratory/field experiments. Of course, methodological problems, for example, concerning the design of laboratory experiments, are also discussed in the literature.

Nevertheless, at the end, the question remains what experimental research contributes to the solution of real world environmental problems. On the one hand, as Sturm and Weimann (2006, 447) point out, not much is known about the “transferability” of experimental results to real dilemma situations. The reasons for this are, among other things, that the “laboratory environment” might have an effect on individuals’ behavior and that communication processes in small groups in the laboratory might differ from processes in mass communication in large groups in the real world. On the other hand, experimental results “deliver important hints about how behavior in real dilemmas might be” (447) and “help us to get an intuition that improves our under-

standing of the real world" (447). Levitt and List (2007) argue that cumulative research based on conducting different laboratory experiments and using different methods such as laboratory and field experiments may help to overcome the weaknesses of each of the methods.

Most prominently Ostrom (1990) presents several case studies based on institutional approaches that show that social dilemmas such as the tragedy of the commons are successfully resolved in the real world on both local and global scale (see also Dietz et al. 2003). Examples of successful governance are communal tenure in high mountain meadows and forests in the Swiss village of Törbel, 'Huerta' irrigation institutions in the Spanish city of Valencia (Ostrom 1990), lobster fishery in the US state of Maine, and the (international) Montreal Protocol on Ozone Depletion signed in 1987 (Dietz et al. 2003). Explanations of such findings lie between two (standard theoretical) solution concepts, namely, between 'centralized government' and 'private property', and focus on institutional arrangements of self-governance. According to this perspective, (observed) principles that increase the likelihood of robust governance of environmental resources are: (1) "devise rules that are congruent with ecological conditions", (2) "clearly define the boundaries of resources and user groups", (3) "devise accountability mechanisms for monitors", (4) "apply graduated sanctions for violations", (5) "establish/use low-cost mechanisms for conflict resolution", (6) "involve interested parties in informed discussion of rules (analytic deliberation)", (7) "allocate authority to allow for adaptive governance at multiple levels from local to global (nesting)", and (8) "employ mixtures of institutional types (institutional variety)" (Dietz et al. 2003, 1910). At a more theoretical level, this 'neo-institutional approach' applies a very broad concept of rational action and is open to many assumptions. For example, with regard to individual choice of strategy, Ostrom (1989; 1990) only makes the assumption "that choice is based on benefits and costs as mediated by norms and a discount rate" (1989, 18). Assumptions about preference functions, then, differ with regard to specific situations. The general model does not finally lead to clear predictions about success and failure, also because of the variability of explanatory factors and the lack of strict assumptions.

The social-dilemma perspective is also employed in studies of personal pro-environmental behavior such as traffic mode choice or commuting (e.g., Van Vugt et al. 1996; Van Lange et al. 1998; Joireman et al. 2004). This perspective is useful because many forms of personal behavior such as car use harm the environment, which is in turn shared by all members of a society. Then pro-environmental behavior (e.g., using public transportation) may be perceived as a contribution to a public good (e.g., improved air quality). It follows that environmental behavior can also be explained by applying the social dilemma perspective. For example, using variables such as beliefs about the impact of car use on environmental pollution, proponents of the social dilemma perspective extend elementary rational choice explanations of traffic mode choice that focus on explanatory variables such as travel time.

The literature, however, reveals mixed findings with regard to the significance of pro-social orientations (individuals' concern for collective well-being) for commuting decisions (see Joireman et al. 2004, 189 for a brief overview). In a study of commuting (public transportation vs. car) in a large city in the northwestern USA (N=189), Joireman et al. (2004) conceptualize the distinction between social concerns (individual vs. collective interest) and temporal concerns (short-term individual interests vs. long-term collective interests) in a classical

and expanded social dilemma framework. While pro-social orientations in line with a classical social dilemma framework (individual vs. collective interest) did not have a significant effect on commuting decisions, Joireman et al.'s findings show that individuals with high considerations of future consequences and individuals who believe that commuting by car harms the environment have higher preferences for commuting by public transportation. Joireman et al. also found a positive interaction effect between the perceived environmental impact of cars and the tendency to consider future consequences.³

3. Extending, Comparing and Combining Theories

Given various theoretical approaches to studying pro-environmental behavior, there are different strategies of extending, comparing and combining theories. In the following, these strategies are discussed and specific examples are pointed out. It has to be stressed again that most studies take into account a single theoretical approach (e.g., the theory of planned behavior; examples were given in the previous section). Some studies extend existing single theories by adding one or more explanatory determinants and derive these determinants from other theoretical approaches (e.g., extending the norm-activation theory by single variables of the theory of planned behavior). Other studies directly compare and thereby provide a competitive test of theories (e.g., the theory of planned behavior and the norm-activation theory), which then mostly results in a combined model that includes the significant explanatory determinants of the theories under consideration. The last strategy focuses from the outset on combining different theories in an integrative manner (e.g., combining the theory of planned behavior and the norm-activation theory). These different, but not disjunctive, strategies are illustrated in Fig. 1.⁴

Extending Theories

For example, Harland et al. (1999) *extend the theory of planned behavior (TOPB)* by a personal norm which they derive theoretically from Schwartz's norm-activation theory (NAT). Thus, in this extended TOPB, the behavioral intention is determined by the three original constructs "attitude" (ATT), "subjective norm"

³ In general, research about time discounting and time preferences (see Frederick et al. 2002 for an overview) can be considered to be important with regard to sustainable development. Useful energy saving equipment, for example, is often not used because individuals have a strong preference for immediate consumption. Several field studies demonstrate that individuals have implicit discount rates for air conditioners, water heaters, freezers, and refrigerators that clearly exceed market interest rates (Hausman 1979; Gately 1980; Ruderman et al. 1987; Diekmann 2001). Moreover, in a recent study, Meyer and Liebe 2010 demonstrate that survey-based measured subjective discount rates can significantly influence stated willingness to pay for quasi-public environmental goods.

⁴ Of course, studies that extend theories by theoretically derived determinants do in one way or another also compare theories. Our examples in the group categorized as 'extending theories' refer to studies explicitly mentioning that they test extended theories, and those in the group headed 'comparing theories' explicitly note this. Further, in the first group, normally one or two factors from other theories are included, whereas in the second group the aim is to test full theories as far as possible.

(SN), and “perceived behavioral control” (PBC) and the additional construct “personal norm” (PN, in the sense of a perceived moral obligation to behave in an environmentally friendly manner). The extended theory has been empirically tested with data on 305 Dutch citizens who participated in a behavioral change program and considers five behavioral intentions (use unbleached paper, reduce meat consumption, use transport other than a car, use energy-saving light bulbs and turn off faucet while brushing teeth) and four behaviors (the same as the intentions except for reduction of meat consumption). When a hierarchical regression analysis was applied, the results demonstrate that the inclusion of the personal norm significantly increased the explained variance and, hence, added explanatory power to the TOPB. Moreover, when the personal norm is controlled for, the constructs of TOPB lose some of their predictive value (e.g., the attitude and subjective norm show less statistical significance).

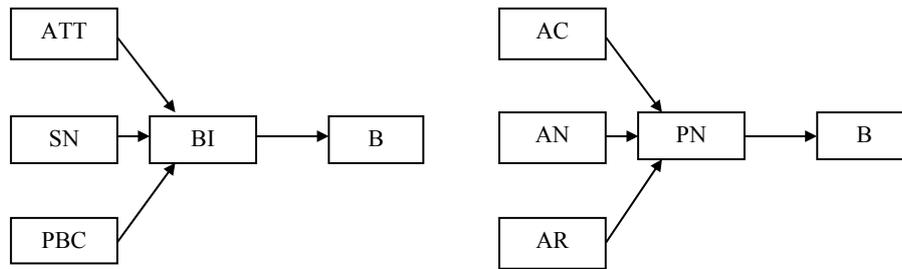
Kaiser (2006) proposes another *extension of TOPB* by a moral norm and feelings of moral regret where the effect of the moral norm on intention is moderated by the attitude, that is, the norm does not have a direct effect on intention. The moral norm is operationalized in line with Schwartz’s NAT (i.e. as a perceived moral obligation), although Kaiser does not explicitly refer to Schwartz’s work. In a study comprising data on 1,394 German citizens and employing structural equation modeling, he considers a broad variety of ecological behavior (among others, a behavior scale based on 50 behaviors) and finds that the feelings of moral regret add explanatory power to the TOPB; further, he observes a high correlation between the attitude and the moral norm that may be interpreted in such a way that both constructs are substitutes in this study.

Hunecke et al. (2001) applied *an extended (or modified) NAT* in the context of travel-mode choice (see Fig. 1). Among others, they extended NAT by incorporating the subjective norm (SN)⁵ and perceived behavioral control (PBC) derived from TOPB and external costs (EC) which are assumed to operate as a moderating variable comparable to the low-cost hypothesis proposed by Diekmann and Preisendörfer (1998; 2003) and the A-B-C model proposed by Guagnano et al. (1995). Both theoretical approaches postulate that the effects of attitudes on environmental behavior are higher when behavioral costs are low.⁶ Hunecke et al. (2001) tested the extended NAT in a field experiment where they experimentally varied the costs (free tickets vs. regular tickets) and the distance (less than 500m vs. more than 500m) of using the subway in Bochum, Germany. The experiment was carried out with 160 citizens in 1998. Their findings reveal that both the personal norm and external costs in the form of ticket price are

⁵ Note that Schwartz 1977 has also discussed the importance of social norms for altruistic behavior.

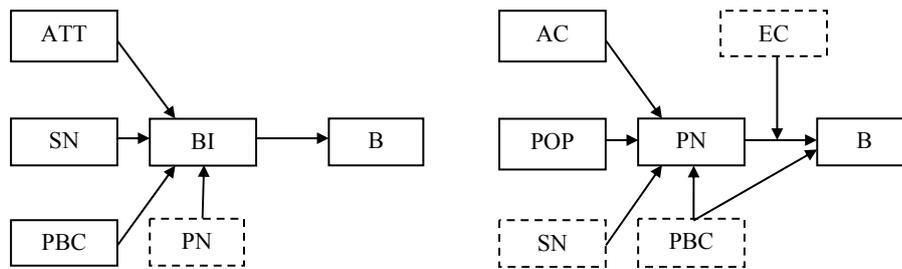
⁶ Compared to the low-cost-hypothesis, the A-B-C model makes additional predictions. It assumes that behavior (B) is determined by intrinsic factors, such as attitudes (A), and by extrinsic factors/external conditions (C), such as physical, financial, legal, or social sources. Thus, the model includes insights both from attitude theory and from elementary rational choice theory and leads to the predictions that there are: (1) the main effects of A and C on the behavior in question, and (2) an interaction effect “where the main effect of attitudes on behavior depends on external conditions, with the effect of attitude approaching zero when external conditions are very strongly positive or negative” (Guagnano et al. 1995, 704).

Theories as the Basis of Comparison (TOPB, left side; NAT, right side)



Examples of comparison: Bamberg/Schmidt 2003; Wall et al. 2007.

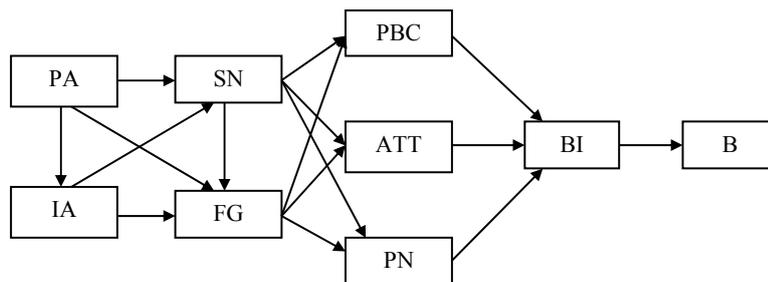
Extending Theories (TOPB, left side; NAT, right side)



Example: Harland et al. 1999.

Example: Hunecke et al. 2001.

Combining Theories (TOPB and NAT)



Example: Meta-Analysis by Bamberg/Möser 2007; not all proposed relations shown.

Notes: TOPB = theory of planned behavior; NAT = norm-activation theory; ATT = attitude toward behavior; SN = subjective/social norm; PBC = perceived behavioral control; AC = awareness of consequences; AN = awareness of need; AR = awareness of responsibility; POP = problem perception (= AN in original model); EC = external costs; FG = feeling of guilt; IA = internal attribution; PA = problem awareness; BI = behavioral intention; B = behavior; dashed lines indicate the additional factors in extended theories.

Figure 1: Strategies of Extending, Comparing and Combining Theories to Explain Pro-Environmental Behavior.

strong predictors of subway use; external costs in the form of station distance had no effect. An interaction effect between personal norm and external costs was not confirmed, which contradicts the low-cost hypothesis and to some extent the A-B-C model. In line with NAT, awareness of consequences (AC) played an important role. (Further, problem perception correlated strongly with AC, that is, the former was not an autonomous concept in this study.) The social/subjective norm (SN) showed the expected indirect as well as an unexpected direct effect on subway use.

Joireman et al. (2001) extended Stern et al.'s (1993) *value-belief-norm theory* (VBNT), which itself is an extension of Schwartz's *NAT*, by two aspects of a *social dilemma framework*: first, a social value orientation, that is, "the importance an individual attaches to their own and others' outcomes in situations of social interdependence" (136), and second, the consideration of future consequences, that is, "the importance they [the individuals] attach to the immediate vs. delayed consequences of their actions" (137). The extended model was tested on the basis of a survey of 191 college students from the USA concerning pro-environmental political intentions such as willingness to boycott environmentally harmful products and pro-environmental political behaviors such as environmental group membership. Both extensions were partly supported by the data. Social value orientation and consideration of future consequences had direct and, depending on which other variables were considered, significant effects on pro-environmental intention and behavior. Joireman et al. (2001) also assumed some interaction effects between the components of VBNT and their two additional components which were also partly supported. For example, individuals with a high level of consideration of future consequences had a stronger relationship between perceived social consequences and pro-environmental intentions.

Comparing Theories

In contrast to the strategy of extending existing theories, there are far fewer studies that *directly compare* the empirical performance of *different theories* in the context of pro-environmental behavior. Examples are the studies by Bamberg and Schmidt (2003), Wall et al. (2007), and Liebe et al. (2010). All three studies include Ajzen's theory of planned behavior (TPB) and Schwartz's norm-activation theory (NAT). Bamberg and Schmidt (2003) have also tested Triandis' theory of interpersonal behavior (i.e. also included habits) and Liebe et al. (2010) incorporate four additional theoretical approaches including elementary rational choice theory and propositions within the social dilemma framework. Bamberg and Schmidt (2003) studied students' intentions to use their car for traveling to university as well as students' actual car use based on a sample of 608 students at the University of Giessen, Germany, in 1997. Wall et al. (2007) investigate commuting mode choice through a study on car use by 539 students and staff of De Montfort University (DMU), U.K., in 2003. Liebe et al. (2010) explain individuals' willingness to pay (i.e. behavioral intention) for measures to protect forest biodiversity on a regional level using a sample of 305 people living in the Lüneburger Heide region, Germany, in 2004.

These studies use different strategies to test the TOPB and NAT. Bamberg and Schmidt (2003) apply structural equation modeling, and Wall et al. (2007) and Liebe et al. (2010) regressions analysis (logistic regressions) to predict the behavioral intentions in question (i.e. the intention to maintain or reduce car use and willingness to pay at all). With regard to NAT, Bamberg and Schmidt (2003) as well as Liebe et al. (2010) specify indirect effects of the norm-activating determinants ascription of consequences (AC, not considered in Liebe et al. 2010), awareness of responsibility (AR), and awareness of need (AN, not considered in Bamberg and Schmidt 2003) on behavioral intentions or behavior; Wall et al. (2007) estimate direct effects, that is, in their empirical model, the effect of the personal norm is not moderated by the awareness of consequences, which is not completely in line with an important assumption of NAT (see *section 2*).

Bamberg and Schmidt (2003) do not find much support for NAT. Ascription of consequences and responsibility do not show the expected moderating effects, whereas hypotheses derived from TOPB can be confirmed. In this study, TOPB has a higher explanatory power than NAT. Moreover, if the behavioral intention is controlled for, the behavior is not significantly influenced by the personal norm. Conversely, Wall et al. (2007) and Liebe et al. (2010) find that NAT performs better than TOPB in predicting the behavioral intentions in question. It has to be noted that these last two studies do not explicitly differentiate between behavioral intention and actual behavior, unlike in the study by Bamberg and Schmidt (2003).

However, all three studies ultimately show that a *combined model including all theoretically derived variables* performs best and that some variables lose significance in these comprehensive models. Whereas Bamberg and Schmidt (2003), like Wall et al. (2007), argue that the theories under consideration are supplementary, Liebe et al. (2010) reveal that whole theories can lose explanatory power (e.g., all variables of the TOPB). But it has to be borne in mind that the latter study is based on six different theoretical approaches compared to the other two studies with three and two approaches.

The three studies illustrate that conclusions might be very different when theories are compared directly, in contrast to studies that focus solely on single approaches or extending of single approaches by one or two determinants. These examples also demonstrate that comparisons between studies are limited since, even if the same class of environmental behavior is investigated, studies mostly employ different measurement instruments for one and the same concept and different techniques of statistical data analysis.

Combining Theories

Bamberg and Möser (2007) replicate and extend the well-known meta-analysis by Hines et al. (1986/87) regarding the determinants of responsible environmental behavior and propose an integrative theoretical model which is primarily based on a combination of TOPB and NAT. The model is shown in Fig. 1. Although they do not ignore theoretical arguments, the changes Bamberg and Möser propose compared to the original versions of the two underlying theories are mainly traced back to empirical findings. For example, many studies revealed

that compared to the social/subjective norm, a personal/moral norm is a direct determinant of behavioral intention (see Armitage and Connor 2001; also the study by Harland et al. 1999 discussed above). The meta-analysis by Bamberg and Möser is based on 57 independent samples reported in 46 studies between 1995 and 2006 and comprises a broad variety of pro-environmental behaviors. The findings support some basic assumptions of both theories TOBP and NAT, for instance, that intention is the main determinant of behavior and that other effects are mediated by the behavioral intention (which is also supported in the studies discussed above). At the same time, however, they reject some assumptions such as that of direct effects of the perceived behavioral control or the personal norm on behavior. Moreover, Bamberg and Möser's findings demonstrate that norm activation is influenced by cognitive (problem awareness, PA), emotional (feeling of guilt, FG) and social determinants (social norm, SN). Overall, they employ an integrative perspective and their results show quite complex relationships between the single constructs.

4. Discussion and Conclusions

Studies that attempt to understand, explain and promote pro-environmental behavior rely on an identifiable set of theoretical approaches: (a) elementary rational choice theory, (b) subjective expected utility (SEU) theory as used in social psychological and sociological research which includes (c) the theory of planned behavior (TOPB), (d) norm-activation theory (NAT), (e) theories of habitual behavior, and (f) theories within a social dilemma framework. These theories are based on different assumptions and highlight specific key explanatory factors. Firstly, whereas most theories under consideration (e.g., TOPB, NAT, and social dilemma framework) work with the assumption of reasoned action, some approaches point to the importance of automatic behavioral processes (e.g., habitual behavior). Secondly, the theories identify different main driving forces behind pro-environmental behavior: (a) external behavioral restrictions such as prices, (b) values or attitudes, and (c) social or moral norms. Thirdly, all of these single theoretical approaches have been supported in some empirical studies.

Since there is positive evidence for each of the single theories and hence, for each of the different key explanatory factors, the question remains how these theories relate to each other. Three strategies for answering this question can be found in the literature. These are not disjunctive strategies, that is, some studies follow more than one strategy. Using the first strategy, existing theories are extended by one or more explanatory factors which are mostly derived from another theory. One striking example is the extension of TOPB by a personal norm as proposed in NAT. The second strategy, which can be called 'competitive theory testing', comprises a more or less systematic comparison of at least two theories. A typical research question would be which of the two theories TOPB and NAT best explains a pro-environmental behavior in question. However, some of the studies following this strategy end up with the third strategy that aims at combining different theories. This means, for instance, that significant factors

of both theories TOPB and NAT as well as the relations between these factors are identified and combined in a revised ‘theoretical’ model. Indeed, researchers often refer to the need of a coherent, integrative framework, and it seems that a multiple-motive perspective is becoming mainstream. Goal-framing theory is considered to be such a comprehensive and integrative theoretical approach, and it is argued that affect-based explanations refer to hedonic goal frames, TOPB to gain goal frames, and NAT to normative goal frames (e.g., Lindenberg/Steg 2007). However, goal-framing theory has not been empirically tested to date with regard to pro-environmental behavior (Steg/Vlek 2009).

Although an integrative perspective between automatic behavioral processes and deliberative behavioral processes including self-interested behavior, altruistic behavior and social dilemma aspects might be convincing at first glance, there are several critical points at second glance. Firstly, tests of one and the same theory can differ greatly between studies. Differences refer to the theoretical specification, extent of testing, and operationalization of core theoretical variables. Only a minority of the studies offer a full test of the theories under consideration and theories are specified rather differently when it comes to specific empirical tests. This is especially obvious in the case of NAT and theoretical propositions within the social dilemma framework. For example, in testing NAT some studies include the personal norm while others do not. Moreover, one and the same theoretically derived variable is operationalized differently between studies. All of these points make comparisons between studies difficult and case-by-case might even make them meaningless. *It follows that the treatment of theories needs more standardization in empirical research on pro-environmental behavior.*

Secondly, there is something at work that may be called an ‘integrative bias’ in research on pro-environmental behavior. It seems that ‘more is better’ is the main principle beyond theory development; here ‘more’ refers to the number of empirically significant determinants and motives included in a theoretical model. As has been already pointed out, current research tends to view theories as being complementary, for example, by integrating models of self-interested and moral behavior (e.g., “pro-environmental behavior as a mixture of self-interest and pro-social motives”, Bamberg/Möser 2007, 22). This carries the risk of covering divergent implications for behavior that follow from different theories. For example, models focusing on self-interested behavior typically imply different policy advice than models focusing on moral behavior (e.g., Thøgersen 1996 highlights this point with regard to the literature on recycling behavior). *It follows that more competitive theory testing is needed, that is, more studies that clarify under what conditions a certain theory is more successful in explaining pro-environmental behavior than other theories* (also mentioned by Steg/Vlek 2009).

Thirdly, studies with a clear focus on theory comparison are rare, and most of these focus on a limited number of theories. Normally, two theories are considered whereas the picture might change if more approaches are included (Liebe et al. 2010, for example). Currently, the research field seems to be dominated by TOPB and NAT. This is not surprising because many (social) psychologists

are engaged in this field, and the ‘empirical success’ of both theories leads to a multiplication of applications. However, it could be useful to broaden the theoretical perspective and, for instance, to more often apply, in a rival perspective, theories within the social dilemma framework regarding time preferences or social preferences. Moreover, in empirical research based on surveys, which is still the most frequently used mode, it is difficult to test or reveal the causal relations proposed by the theories. Researchers on social dilemmas are used to conducting laboratory and field experiments to single out causal factors; thus, research on pro-environmental behavior could benefit more from both the theoretical and empirical insights from research on social dilemmas. *It follows that a broader theoretical foundation and more experimental studies are needed that test causal relations proposed by theories* (also mentioned by Bamberg/Möser 2007).

Fourthly and most remarkably, hardly any studies on pro-environmental behavior discuss the quality, that is, the *theoretical* strengths and weaknesses, of the explanatory approaches considered. There seems to be an agreement that any theory is better than no theory at all, but scholars do not pay sufficient attention to the quality of their theoretical arguments (including the author of the present article, see Liebe et al. 2010), and often the explanatory power of a theory is implicitly equated with explained variance in statistical models. From a theoretical point of view, for example, a theory should be able to explain several forms of pro-environmental behaviors simultaneously. This is not the case in theories such as TOPB and NAT which include as core elements the attitude toward a specific behavior or a personal norm toward a specific behavior that is explained (Bamberg 2003 is an exception and at least mentions this point regarding TOPB). If, furthermore, theoretical determinants derived from different theories are combined in an integrative model, mostly expressed in a simple causal diagram, it is often not made clear whether and, if so, which common theoretical assumptions hold for the new theoretical model. For instance, does an extension of the TOPB by a personal norm or a habitual factor mean that assumptions of ‘sociological’ SEU theory underlying TOPB also apply to these new factors? *It follows that there is a need for much more theory-oriented discussions, that is, an evaluation of the theories themselves.*

Summarizing, it can be safely said that sociological, (socio-)psychological and economic research provides useful insights into understanding, explaining, and promoting pro-environmental behavior. There is an impressive variety of explanatory approaches and empirical studies. However, future research might benefit from a higher degree of standardization in order to facilitate serious comparisons between studies, from employing a broader theoretical perspective and more competitive theory testing compared to primarily combining theories, and from evaluating the quality of the theories under consideration not solely on empirical grounds, but also on theoretical grounds.

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