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THE BEHAVIORAL EFFECTS OF ENVIRONMENTAL ATTITUDES IN LOW-COST AND HIGH-COST SITUATIONS

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ABSTRACT

The low-cost hypothesis predicts that the strength of effects of environmental concern on environmental behavior diminishes with increasing behavioral costs. Thus, environmental concern influences environmental behavior primarily in situations and under conditions connected with low costs and little inconvenience for individual actors. In a first step, we develop and specify this hypothesis. Referring to two procedures, we then test it on the basis of an environmental survey of a random sample of 2307 respondents from the German population. The empirical evidence is positive. The low-cost hypothesis is not confined to the area of environmental research. It points to general limits of attitude-research (in high-cost situations) and to general limits of rational-choice theory (in low-cost situations), and suggests a strategy for integrating research in social psychology, sociology, and economics.

KEY WORDS • Attitudes and behavior • collective goods • environmental behaviour • low-cost hypothesis • rational choice • social norms

1. Introduction

There is now convincing empirical evidence that, at least in the aggregate, economic incentives have a strong impact on environmental behavior. This has been demonstrated in case studies and field experiments as well as in statistical analyses of data from a variety of activities related to the environment. For example, traffic mode decisions are to a large extent dependent on travel time, comfort, and the price of transportation alternatives (Domencich and McFadden 1975). Energy-saving is encouraged if households or

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firms have to bear the costs covering all or some part of negative external effects. The United States has almost the lowest energy prices among Western nations, but the highest per capita output of carbon dioxide. Cross-national studies on the relation of gasoline consumption and the price of gasoline report strong correlations between both variables (Weizsäcker and Jesinghaus 1992). A tax on products suspected of harming the environment clearly reduces demand. For instance, Italy has implemented a significant tax on plastic bags, resulting in a decrease in demand of 20% to 30% (OECD 1994). With respect to recycling, communities having introduced a fee for refuse service dependent on volume or weight have experienced a decrease of household waste carried to the refuse dump and report an increase of recycling activities. These and many more examples show that environmental behavior is clearly governed by the economic 'law of demand'.

In general, while economic incentives exert an influence on ecologically responsible behavior, pro-environmental attitudes have much less consistent effects. Accordingly, campaigns appealing to people's environmental conscience have sometimes been successful while others have failed. For example, moral persuasion to curb driving because of the danger of smog usually has little or no effect on actual behavior. On the other hand, Greenpeace launched a successful campaign to boycott Shell because of the planned sinking of the Brent-Spar oil rig in the North Sea some years ago. Many car drivers took action in accordance with the Greenpeace appeal, thereby inflicting considerable financial loss on the company, which finally led it to revise its plans. Research on the relation of environmental concern and ecological behavior has shown that, although positive, the strength of correlation varies, and, on the average, there is a moderate correlation between environmental attitudes and behavior (for reviews, see Weigel 1983; Hines et al. 1986/87). To explain the variation in correlations, additional conditions, such as the salience of environmental attitudes or the interference of competing attitudes, were brought into play. Moreover, attitude-behavior research in social psychology points to the so-called 'correspondence rule' (Ajzen and Fishbein 1980; Weigel 1983; Ajzen 1988). With this hypothesis, correlations will increase if attitudes and behavior have the same degree of specificity, in contrast to a situation where a general attitude (e.g. general environmental concern) is correlated with a specific behavior (e.g. recycling activities). In this article we shift the attention to another important

factor often neglected in attitude-behavior research. We argue that the costs of behavior (in a broad sense) are a key variable that helps explain the variation in the correlations between attitudes and behavior. Costs of alternative actions do not just shape behavior as in the standard rational-choice approach. According to the 'low-cost hypothesis', behavioral costs also moderate the effects of attitudes on the behavior in question. It is the aim of this article to present and discuss this hypothesis, and to test it on the basis of representative survey data.

2. The Low-Cost Hypothesis

The basic idea of the low-cost hypothesis is that environmental concern influences ecological behavior primarily in situations and under conditions connected with low costs and little inconvenience for individual actors. The lower the pressure of costs in a situation, the easier it is for actors to transform their attitudes into corresponding behavior. If costs are high, environmental concern does not help overcome one's reservations, and there will be few or no effects of environmental attitudes. In technical terms, this means that we expect higher correlations between environmental concern and ecological behavior in situations, for behavioral aspects and under circumstances characterized by low cost. The cost variable is continuous and is understood in a broader sense, i.e. not confined to financial costs. In addition to additive effects of costs and environmental attitudes, the hypothesis postulates an interaction effect in the sense that the strength of attitude effects on behavior varies depending on the cost intensity of the situation.

In the following, we first demonstrate that there are some hints to the low-cost hypothesis in the research tradition concerning environmental attitudes and behavior. In the next step we change the perspective by looking into the discussion concerning limits of rational-choice theory. Finally, we try to specify the low-cost hypothesis in a way that allows two different empirical test procedures.

Environmental Research

Implicitly or explicitly, the low-cost hypothesis can be found in diverse research areas dealing with environmental attitudes and behavior. Here we confine ourselves to pointing out some of these sources.

In their research on energy consumption, Stern and colleagues (Stern and Aronson 1984; Black et al. 1985; Stern 1992; Gardner and Stern 1996) articulate as one of their assumptions: 'a personal norm supporting energy conservation is most likely to be converted into action if the action involves little cost in time and money' (Stern and Aronson 1984: 73). Furthermore, they state that 'psychological variables such as attitudes and personal norms appear to have more effect on relatively inexpensive, easy-to-perform energy-saving actions' (Stern 1992: 285). As typical examples of 'easy-to-perform actions' they qualify everyday activities such as regulating the room temperature, lowering the temperature of home hot water, or switching off lights. To be stable, such behavioral routines need to be supported by corresponding attitudes or internalized norms. Major and often one-shot investment decisions are – according to Stern et al. – mainly determined by economic and financial considerations. In decisions related to insulating walls and ceilings or the installation of a new heating system, attitudinal factors play a minor role.

Also in the context of energy conservation, Tyler et al. (1982) formulate a 'defensive denial hypothesis'. This hypothesis predicts that under high-cost conditions, individual actors who are highly concerned about energy define and interpret the situation in a way that makes activation of this concern seem inappropriate. To avoid cognitive dissonance and to maintain positive self-esteem, individuals downgrade or eliminate environmental aspects in high-cost situations as a relevant decision criterion. Thus, the defensive denial hypothesis specifies a psychological mechanism that makes attitudes less important in high-cost than in low-cost situations. This mechanism may explain the result of many studies (e.g. Littig 1995) which show that recycling is dominated by environmental considerations, whereas most people do not apply such considerations to their mobility behavior.

Based on the so-called 'A-B-C model' (attitudes-behaviors-external conditions model), Guagnano et al. (1995) investigated recycling participation of American households. One of the premises of this model is that 'attitude theories . . . lose predictive value as external conditions increase in strength' (p. 704). Even though Guagnano et al. did not find convincing evidence for this view in their own explorative study, the results of an earlier study by Derksen and Gartrell (1993) clearly support it. Derksen and Gartrell compared recycling activities in Canadian communities, one of

which offered its citizens convenient and easy-access recycling possibilities; the others did not. Derksen and Gartrell could show that environmental attitudes influenced recycling participation significantly in the first mentioned community, but not in the other communities. They resume: 'individual attitudes toward the environment affect recycling behavior only in the community with easy access to a structured recycling program' (p. 434).

Ungar (1994) gave a review of experiences related to behavioral reactions of Canadians to environmental problems. He summarizes diverse empirical findings in his conclusion that the majority of people follow a minimalism strategy:

> That is, popular reported changes focus on recycling and product-avoidance behaviours that require minimal effort and personal cost. (. . .) In short, and consistent with a minimalist perspective on behavioural change, people appear to be using recycling as a trade-off to avoid other, more inconvenient behaviours (p. 290).

> Few people want to 'give up' anything; however, if there is opportunity at low cost, they will use products and engage in actions that are more efficient and benign (p. 296).

In the US context, Dunlap and Scarce (1991) agree by emphasizing that 'the most popular behaviors tend to be those that require minimal effort and personal cost' (p. 657).

In our own empirical study (Diekmann and Preisendörfer 1998) comparing environmental concern and behavior in Munich (Germany) and Berne (Switzerland), we argued that compliance with environmental concern in low-cost areas is a cognitive strategy of individual actors to harmonize and reconcile seemingly incongruent environmental attitudes and behaviors. Ecological behavior constitutes a disparate and multi-faceted phenomenon, and people prefer to demonstrate their 'environmental correctness' in low-cost or 'alibi' areas. Mainly based on plausibility, we qualified recycling and shopping behavior as typical low-cost domains, and energy and mobility behavior as typical high-cost domains. In Munich as well as in Berne, environmental concern showed stronger correlation with recycling and shopping items than with energy and mobility items. Several authors have criticized this differentiation between recycling/shopping on the one hand and energy/mobility on the other (e.g. Lüdemann 1993). We agree that it is a rough working hypothesis for the cost distribution in the average and that more refined measures of costs are necessary. The empirical part of this article provides such measures.

Independently of our special research field of environmental attitudes and behavior, the low-cost hypothesis suggests an important consequence for attitude-research in general: The stronger the cost pressures of a situation, the less fruitful is the attitude-behavior approach taken from social psychology.

Rational-Choice Theory

The low-cost hypothesis includes the element of costs as a basic tenet of rational-choice theory. If we look into this research tradition, often seen as a counterpart to the paradigm of attitude-research, we find an interesting discussion parallel to the above discussion in attitude-research – a parallel discussion, however, from the opposite direction. Again, let us refer to some authors and research fields.

In a theoretical contribution, Zintl (1989) discusses strengths and weaknesses of rational-choice models in the social sciences. His position is that such models are useful without any restrictions, as long as they target an explanation problem dealing with collective phenomena. If the final *explanandum* is a macro-effect, the figure of *homo oeconomicus* serves as a 'micro-foundation' in the chain of explanation. Such a micro-foundation can and must be a relatively simple theory of action (for a similar argument, see Coleman 1990: Ch. 1). However, if rational choice is used as a genuine micro-theory, with the intention of explaining individual behavior, Zintl believes that it is necessary to distinguish between high-cost and low-cost situations. As micro-theory, rational choice is adequate in high-cost situations, but not in low-cost situations. In high-cost situations, cost components which can be observed from the outside are dominant decision criteria, and there is strong pressure on individual actors because their decisions can have far-reaching consequences for them. In low-cost situations, on the other hand, rational choice as micro-theory is less useful, because 'idiosyncratic decisions' will have consequences that do not affect the economic and personel welfare of an individual in a substantial way. Thus, if we want to explain individual behavior in low-cost situations, we need – according to Zintl – a more refined psychology, one that takes emotions, attitudes, subjective dispositions, etc., into account.

Indeed, most of the empirical regularities that depart in a systematic way from the predictions of rational choice seem to belong to the low-cost sector. Widely known, for example, is the so-called voting

paradox, i.e. the observation that many citizens participate in elections even though the probability that their single vote will influence the outcome is practically zero. Olson (1965: 164) speculates: 'The point is that there is a "threshold" above which costs and returns influence a person's action, and below which they do not.' Using the voting paradox as an example in a comment on the role of ideological convictions in economic theory, North (1986) articulates the position:

> The significance of ideological conviction in a specific setting is an inverse function of its costs to the individual. The elasticity of the function is surely specific to the issue and individual, but that it is negatively sloped can hardly be an issue (p. 234).

Barry's (1978) answer to the question 'when is the "economic" approach likely to work and when isn't it?' goes as follows: 'The best lead still seems to be the one mooted then, that the size of the cost is crucial' (p. 40), 'when the costs are high the "economic" mode of analysis comes into its own' (p. 46). When costs are low, the Pandora's box of more or less eccentric attitudes and behaviors is opened.

Low-cost situations as a 'challenge' to rational-choice models are also a topic of a series of articles by Kirchgässner and Pommerehne (Kirchgässner 1992; Kirchgässner and Pommerehne 1993). Using the term in a somewhat different way, Kirchgässner and Pommerehne define situations as low-cost if decisions have no serious personal consequences for the decision-makers. Concerning decision criteria, they assume: 'The less important . . . external pressures are, the more weight internal pressures gain, i.e., the more important become the preferences' (1993: 111). Starting from their definition of low-cost situations, Kirchgässner and Pommerehne distinguish different types of such situations depending on whether there are severe consequences for other specific actors or for society as a whole. A typical example of a low-cost situation with severe consequences for other actors was the 'Brent Spar' events in 1995. As mentioned above, Brent Spar was an old oil platform that Shell wanted to dump in the ocean. Environmental organizations in Germany and other European countries were heavily opposed to this plan and successfully mobilized the general public. Many 'environmentally concerned' car drivers participated in a boycott of Shell and simply decided to drive to the next gasoline station. After a couple of weeks, Shell gave up its plan. The decision problem was low-cost for car drivers, but had serious consequences for Shell.

So-called anomalies of rational choice are also an important topic within game theory (for a review, see Thaler 1992). For many types of games, experimental evidence shows an amount of cooperation which disconfirms theoretical predictions. A common objection against these experiments is that usually the rewards at stake are fairly low or non-existent. The expectation is that there is a 'stake effect', that is, higher rewards will push cooperative choices downwards in the direction of theory. An example of a model that directly builds in such a stake effect is the Rabin model (1993). Rabin's special interest is to incorporate fairness considerations into game theory, but he points out that his model can be generalized to other emotions, attitudes and motivations. As examples of behavior, strongly influenced by emotions and social goals he explicitly mentions voluntary reductions of water use during droughts and conservation of energy to help solve the energy crisis. Now, one of the predictions of the Rabin model is the following: Cooperative motivations 'have a stronger effect on behavior as the material cost of sacrificing becomes smaller' (p. 1282). Put in another way and with respect to fairness: 'the behavioral implications of fairness are greatest when the material consequences of an economic transaction are not too large' (p. 1282), and, 'the bigger the material payoffs, the less the player's behavior reflects their concern for fairness' (p. 1287). If we substitute concern for the environment for concern for fairness, this proposition is analogous to the low-cost hypothesis.

Specification of the Hypothesis

From our discussion so far it should have become evident that the relevance of the low-cost hypothesis is not confined to environmental research. In a more general vein, the hypothesis points to possible limits of attitude research (in high-cost situations) and of rational-choice theory (in low-cost situations). Moreover, the hypothesis opens up a strategy for integrating research in social psychology and economics. For these reasons, it seems worthwile to elaborate and to specify the hypothesis.

Directly based on the notion of an interaction effect, we can start with a simple diagram depicted in Figure 1. The x-axis shows the costs of an ecological activity, and the y-axis the strength of the effect of environmental concern on this activity. The expectation is that the attitude effect decreases with increasing costs.

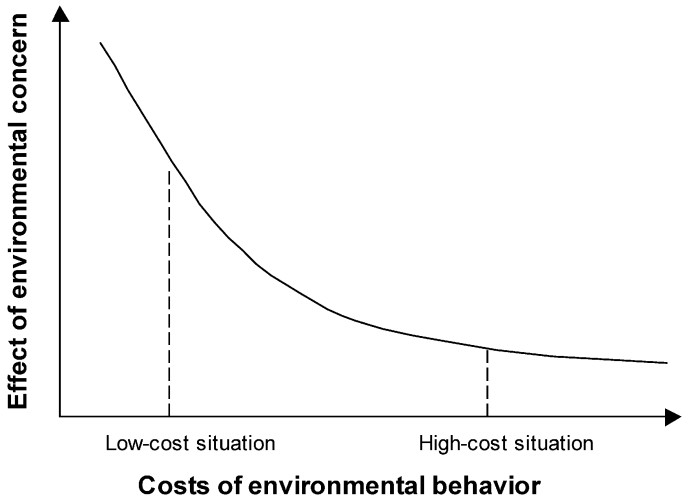

Figure 1. The low-cost hypothesis of environmental behavior

Why is the function negatively sloped? For a sketch of the argument, consider a binary decision problem X with alternatives x_1 and x_2, whereby x_1 is a pro-environmental activity and x_2 is not. Subjective costs of alternatives (a cost index including monetary costs, time, inconvenience) are $c(x_1)$ and $c(x_2)$, respectively. We assume that for most actors the pro-environmental activity is 'costly', i.e. $c(x_1) > c(x_2)$ or $d = c(x_1) - c(x_2) > 0$[1]. To simplify, we take into account only the subset of actors to whom this inequality applies, and we distinguish only the two states 'low cost' (d is small) and 'high cost' (d is large). Figure 2a is an example of a distribution of costs for decision R (e.g. participation in a recycling program) with alternatives r_1 (= participation) and r_2 (= non-participation). For the majority the cost difference is small, and for a minority it is large. Thus, in the aggregate, R can be qualified as a low-cost situation. On the other hand, decision T (e.g. using public transport versus a private car to go to work), shown in Figure 2b, refers to a high-cost situation. For a minority the cost difference between t_1 (= using public transport) and t_2 (= using a private car) is small, and for the majority it is large.

Of course, if environmental concern is not an issue, all actors will choose r_2 or t_2 irrespective of a low-cost or high-cost situation. This, however, changes if environmental attitudes come into play. If an

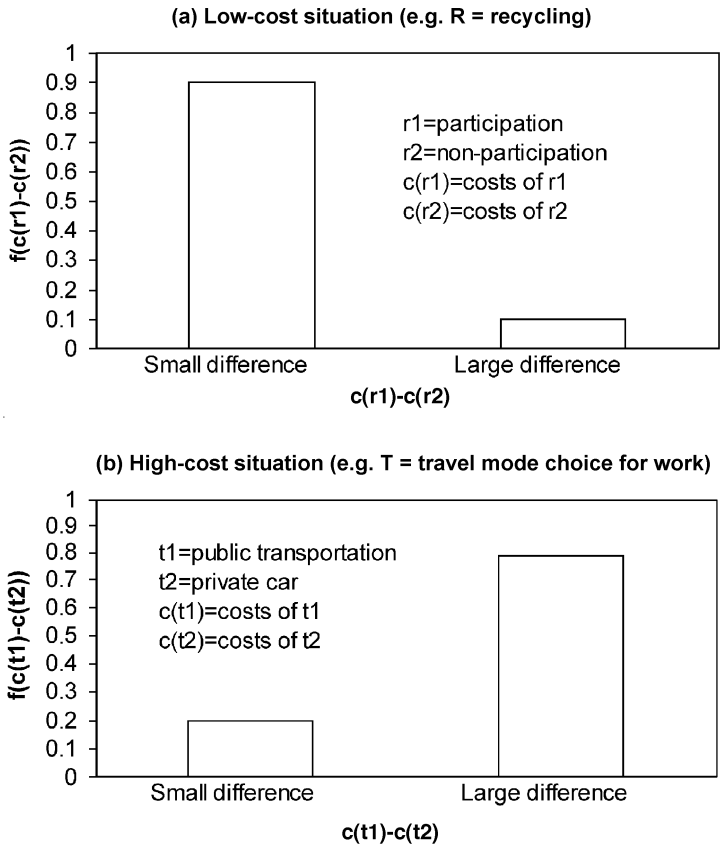

Figure 2. Low-cost and high-cost situations

actor complies with a valued norm, this enhances the utility of pro-environmental behavior; on the other hand, violating it may lead to the disutility of cognitive dissonance. Depending on d and the intensity of the attitude, the utility of complying with the norm may compensate for the cost difference of the pro-environmental behavior relative to its alternative. If there is variance in the intensity of the attitude, this variance matters concerning behavior. Hence, there may be an effect of the attitude on behavior in low-cost situations. However, in high-cost situations economic incentives dominate attitude effects for most people. Even if the value of the attitude varies in the population, the variance has little impact on the behavior. In

general, the larger d, the smaller the proportion of actors with attitudes strong enough to compensate for the cost difference. If, with increasing d, this proportion approaches zero, the effect of the attitude on the behavior decreases, too. This is shown in Figure 1.

The relation between attitudes, social norms, and rational-choice models deserves a more thorough discussion than can be pursued here. However, for the purpose of the present study a short sketch may suffice. Although attitudes and social norms are different concepts, the attitude of environmental concern contains a strong normative component. The norm prescribes that one should care for the collective good of the quality of the environment in one's daily activities. Often, such a norm is in conflict with the preferred action. In this case, there is a trade-off between the costs of norm violation (i.e. cognitive dissonance) and the gain from the most preferred but environmentally harmful course of action. In terms of a constrained-choice model, actors maximize utility under the constraint of an internalized social norm which imposes an extra cost for environmentally harmful activities. Conceive of this as a 'tax', whereby the tax varies with the degree of environmental concern and where the costs of norm violations matter more in low-cost situations than in high-cost situations.

We defined a low-cost (high-cost) situation as a distribution of costs such that d is small (large) for most people in the population. Except in extreme situations with no cost variance, in low-cost situations usually there is a small high-cost subgroup as there is a small low-cost subgroup in high-cost situations. These considerations suggest two different test strategies for the low-cost hypothesis. Test procedure 1 compares the effects of environmental concern on different types of ecological behavior (R, T, etc.), with the expectation that the effects are stronger in low-cost activities. Test procedure 2 looks at a specific behavior (e.g. T), with the expectation that the effects are stronger in the low-cost subgroup. The empirical part of this article employs these two test strategies.

3. Data and Variables

Data

Our data come from the survey 'Environmental Concern in Germany 1996'. This survey conducted in January/February 1996

was supported by a grant to the authors from the German Federal Ministry of Environment. Based on random samples of the population in West and East Germany, the data were collected in face-to-face interviews. There were 1,095 interviews with citizens of West Germany, and 1,212 interviews with citizens of East Germany, thus a total of 2,307 interviews. The sampling population was restricted to German citizens living in private households and older than 17 years. The social research institute that carried out the fieldwork for us reported a response rate of 72% (Preisendörfer 1996).

Compared to other environmental surveys, a special feature of our survey was that – in spite of the title – it concentrated on environmentally relevant behavior. Of course, we should bear in mind that it is self-reported behavior. The questionnaire was broad and required an average interview time of one hour. Besides questions concerning environmental attitudes, ecological knowledge, socio-demographic characteristics, etc., environmental behavior was examined in four topical areas: recycling, shopping, energy and water saving, and mobility/transportation. We select our behavorial items for testing the low-cost hypothesis from these four substantive areas.

The survey was stratified by West and East Germany (80% of all Germans live in West, 20% in East). Moreover, according to the sampling scheme people living in households with more adult people had a lower probability of being selected. To adjust for these two factors (West/East, household size), we weighted the data. The weighting procedure was chosen so that the total number of interviews (2,307) did not change. All our analyses are based on this weighted data set.

Variables

To test the low-cost hypothesis, we need information about environmental behavior, environmental concern and behavioral costs. Our cost measures, which are described later, are indirect and different for the two test procedures. In this section, we introduce our measures of environmental behavior and environmental concern.

As has been said, the survey investigated environmental behavior in four topical areas. Even though it included a broader range of behavioral items in each area, we selected four items in each domain.

Recycling behavior: Recycling participation with respect to different materials was measured on a four-level scale (always, often, sometimes, never). Eighty-six percent reported that their household 'always' recycles paper/newspapers, 85% glass, 69% plastics, and 55% organic material (food scraps, yard wastes, etc.). From a total of nine materials captured in the survey, we selected these four materials because participation rates show some variance. Recycling participation for paper and glass is highest, plastics ranges in the middle, and out of the nine materials recycling of organic material is lowest.

Shopping behavior: Consumers in Germany can leave packaging material of products at the store where they buy the products. Sixty-eight percent agree that within the past four weeks they have used this possibility (at least once). Another question concerned the most important officially certified eco-label in Germany, the 'Blauer Engel'. Sixty-two percent of the respondents declare that they know this label and that they often buy products with this label; these products usually have slightly higher prices. Furthermore, for environmental reasons, it is advisable to buy local fruits and vegetables according to the season. That they 'always' or 'often' buy seasonal fruits and vegetables from the region is stated by 61%. Finally, 56% state that they 'always' buy beverages like soda-water, fruit juices or beer in returnable and refillable bottles, and not in cans or other one-way packages.

Energy and water-saving behavior: On a 5-point scale (always, often, sometimes, seldom, never), 58% say that they 'always' or 'often' switch off lights when they are leaving a room in their house or apartment. While we know that switching off lights does not influence the energy budget of a household in a substantial way, earlier studies (e.g. Wortmann 1994) nevertheless have shown that it is a useful 'indicator' variable for energy-saving endeavors. Most stores in Germany offer normal light bulbs and energy-saving bulbs. Of our respondents, 55% declare that their household is completely or at least partially equipped with energy-saving bulbs. Further equipment consists of water-saving installations (e.g. low-flow shower heads or water-saving installations for the toilet). Fifty-three percent have this equipment in their household. A relatively sensitive question was whether respondents taking a bath or a shower turn off the water when they soap their body or shampoo their hair; 43% answer that they normally do this.

Mobility/transportation behavior: Our measures of mobility and transportation behavior mainly pertain to the extent of private car use. Thirty-five percent say that they usually do their shopping without a car. Concerning weekend trips, 31% declare that they organize these trips so that they do not need an automobile. With respect to the last holiday trip, 27% did not use a car or an airplane to reach their destination. And finally, 18% of all households do not own a car at all (for whatever reasons).

Within the research on environmental attitudes and behavior, there is a long discussion on how to measure environmental concern (for reviews, see Van Liere and Dunlap 1981; Schahn 1996). In our survey 'Environmental Concern in Germany 1996' we started from a widely accepted definition of the German Advisory Board for Environmental Questions (Rat der Sachverständigen für Umweltfragen 1978: 445), which circumscribes environmental concern as 'insight into the threat to our natural resources, connected with the willingness to do something against it'. This definition conceptualizes environmental concern as a general attitude, composed of a cognitive component (insight into the endangerment) and a conative component (willingness to do something). Most previous research, however, shows that this definition ignores an important third element, namely the emotional content of environmental concern. Individuals who are highly concered about the environment generally express stronger feelings of fear, anger, pessimism, etc., with respect to environmental problems, which the definition should account for.

Respondents of our survey were asked to answer 20 statements intended to measure environmental concern. Based on substantive considerations and on results of explorative factor analyses, we finally decided to use nine statements for a summary measure of environmental concern. These statements, which could be answered on a 5-digit scale, and their descriptive results are given in Table 1.

It can be seen from the table that environmental problems are an emotionally charged topic in Germany; 74% are in fear concerning environmental conditions for future generations, and 66% expect an environmental catastrophe if we continue our style of living. The willingness to do something is on a lower level. Fifty-four percent agree that we should be willing to reduce our standard of living, and 27% opt for environmental protection measures even at the cost of jobs.

Table 1. Statements for measuring environmental concern (%)

	−	±	++
Affective aspects			
I am afraid when I think about environmental conditions for future generations	8	18	74
If we continue our current style of living, we are approaching an environmental catastrophe	11	23	66
Watching TV or reading in the newspaper about environmental problems, I am often embarrassed and angry	11	26	63
Cognitive aspects			
The great majority of German people do not act in an environmentally responsible way	13	29	58
There are limits of economic growth which the industrialized world has already reached or will reach very soon	10	34	56
* In my opinion, environmental problems are greatly exaggerated by proponents of the environmental movement	54	27	19
Conative aspects			
It is still true that politicians do much too little to protect the environment	8	26	66
To protect the environment, we all should be willing to reduce our current standard of living	11	35	54
Environmental protection measures should be carried out, even if this reduces the number of jobs in the economy	36	37	27

Note: Five-digit response scale: strongly disagree, disagree, partially disagree/partially agree, agree, strongly agree. − means strongly disagree/disagree, ± means partially disagree/partially agree, ++ means strongly agree/agree. * Disagreement is seen as indicating higher environmental concern.

A factor analysis based on the nine statements of Table 1 gives a one-dimensional solution only if we exclude the item of environmental protection measures at the cost of jobs. Nevertheless, we decided to keep this item because it is an important topic in the German discussion about environmental protection. Besides results of explorative statistical techniques, we believe that a useful scale of environmental concern should capture the most salient topics in

public debate. The items in Table 1 seem to fit this criterion. They include the topics 'future generations', 'environmental catastrophe', 'limits of economic growth', 'environmentalists exaggerate', 'politicians do not do enough', 'reduction of our standard of living', and 'environment versus jobs'.[2]

Recoding all statements to 0–4, we constructed an additive index of environmental concern and standardized the range of this index to 0–20. The mean of the index is 13.1 and the reliability of the scale is 0.72 (Cronbach's alpha).

Whereas our measure of environmental concern is a measure of a general attitude (no item aims at a specific domain of environmental protection), the behavioral items are specific: they pertain to specific topical areas (recycling, shopping, etc.). Now, when we correlate general environmental concern with specific environmental behaviors, according to the well-known 'correspondence rule' (Ajzen and Fishbein 1980; Ajzen 1988) we should expect only moderate correlations from the beginning. The correspondence rule demands that the attitude and the behavior measures should have a similar domain and a similar degree of specificity/generality, and our measures clearly violate this rule. Independently of the controversy within social psychology whether the correspondence rule is a useful devise or not (for a review see Ungar 1994), it is not the absolute values of correlations that are interesting for the low-cost hypothesis, but rather the rank order of correlations and their relative values. Because we want to compare correlations, an empirical test of the low-cost hypothesis is not possible without measuring common attitude. The correspondence rule is violated for all our attitude-behavior correlations, the bias is similar, and this should not influence the ranking, i.e. whether correlation x is higher or lower than correlation y.

4. Empirical Results

Test Procedure 1

Test strategy 1 for the low-cost hypothesis will compare the effects of environmental concern in different types of environmental behavior. The prediction is that the effects of environmental concern are stronger for low-cost than for high-cost activities. Attitude effects should decline with increasing 'cost intensities' of behavioral aspects.

To test this, we need a ranking of our 16 behavioral items according to their cost intensity, which can be seen as a continuous variable. We did not try in our survey to measure the cost intensity of different behaviors directly (e.g. by asking people how difficult, expensive, easy, comfortable, etc., a behavior is for them). However, there is a more or less straightforward working hypothesis: We can assume that the frequency of a behavior in the aggregate indicates its average cost intensity. An ecological activity shown by 90% of the population appears to be considered less costly than an activity shown by 20%. Surely, for some people the first-mentioned behavior is more cost intensive than the second, but the assumption should hold true in the aggregate (for a similar argument, see Franzen 1995).

If in light of this assumption we look back on our descriptive results, we see the following implications: On average, the recycling of paper is less cost-intensive than the recycling of organic material (recycling area); leaving packaging material in stores is associated with lower behavioral costs than always buying refill bottles (shopping area); switching off lights is a less demanding activity than reducing water consumption under the shower (energy- and water-saving area); and managing one's shopping without an automobile is less inconvenient than having no car at all (mobility/transportation area). Furthermore, recycling becomes a typical low-cost domain and mobility/transportation a typical high-cost domain.

These implications can be qualified as highly plausible for the German context. Taking into account different samples and structural settings, they are in line with the results of our Munich–Berne study (see above), and with findings of other German studies (e.g. Schahn 1996). In his study about recycling in two German communities, Schahn (1996: Ch. 4) directly asked his respondents how they evaluate recycling opportunities. It turned out that most respondents 'do not see any problems because recycling does not take much time and is conveniently organized' (p. 165).

However, the frequency of such behavior varies not only with cost intensity. The perceived efficacy of an action for the environmental good may also play a role. Unfortunately, with our data we cannot control for efficacy. Whether this variable might have distorted our cost measure has to be ascertained by further studies. Of course, the efficacy problem is irrelevant for our second test strategy. With the second test we compare low-cost behavior with high-cost behavior

Table 2. Relationship between environmental concern and environmental behavior for low-cost and high-cost activities

Behavioral items	*Percent*	*Pearson correlation*	*Gamma correlation*	*Logit effect*
Recycling of paper	86	0.14	0.24	0.12* (4.34)
Recycling of glass	85	0.14	0.23	0.13* (5.13)
Recycling of plastics	69	0.14	0.19	0.13* (5.98)
Depositing packaging material in stores	68	0.17	0.22	0.13* (6.38)
Buying products with eco-label	62	0.17	0.21	0.11* (4.73)
Buying seasonal fruits/vegetables from region	61	0.15	0.19	0.13* (6.36)
Switching off lights	58	0.10	0.12	0.09* (4.83)
Buying refill bottles	57	0.13	0.16	0.09* (4.78)
Recyling of organic material	55	0.12	0.14	0.11* (5.45)
Use of energy-saving bulbs in household	55	0.09	0.12	0.10* (5.03)
Use of water-saving installations in household	53	0.09	0.11	0.07* (3.55)
Reducing water-consumption under shower	43	0.14	0.17	0.08* (4.17)
Shopping without car	35	0.05	0.06	0.03 (1.32)
Weekend trips without car	31	0.01	0.02	0.02 (1.15)
Last holiday without car/ airplane	27	−0.05	−0.06	−0.01 (0.11)
No car in household	18	−0.01	−0.01	0.01 (0.23)

Note: A more detailed description of the behavorial items and of the environmental concern measure is given in the variables section. Logit models include – in addition to environmental concern – six control variables (West/East Germany, gender, age, schooling, income, political orientation left/right). t-values of logit effects in parentheses. * Significant at 0.05 level.

for the same type of environmental actions. The efficacy of an action will be held at a constant level with this design.

Based on the assumption that the frequency of a behavior reflects its average cost intensity, the first column of Table 2 ranks our 16 behavorial items according to their frequencies. All items are 0/1 coded, and the table gives the percentages of environmental behavior. The percentages simply correspond to the descriptive results already reported in the variables section, but now we ignore the domain differentiation. At the top of the table we find three recycling items, the shopping and energy items are placed in the middle, and the four mobility/transportation items are at the end.

In the second column of Table 2, we refer to Pearson correlations for measuring the strength of the relationship between environmental concern and each behavioral aspect. Pearson correlations start with values of about 0.15, and decrease to zero or even slightly negative values. Alternatively, we may see environmental concern and behavioral items as ordinal variables, and use Gamma correlations. Gamma correlations begin with values of about 0.20, go to 0.10, and again are practically zero for the mobility/transportation items. Even though (as expected) all correlations are low, the pattern of decreasing correlations is clear.

The last column of Table 2 shows the effects of environmental concern on the behavioral aspects in binary logit models. Whereas Pearson and Gamma are bivariate correlations, the logit effects are the effects of environmental concern after controlling for a set of six basic socio-demographic variables (West/East Germany, gender, age, schooling, income, political left/right orientation). Once more, the pattern follows the prediction of the low-cost hypothesis: effects of environmental concern are stronger for the low-cost than for the high-cost activities. Environmental concern influences all recycling, shopping and energy items significantly, but there are no significant effects in the area of mobility/transportation.

Spearman rank correlations between the frequency column on the one side and the Pearson, Gamma and logit columns on the other, are 0.82 (frequency-Pearson), 0.93 (frequency-Gamma), and 0.92 (frequency-logit). Figure 3 presents the relationship between frequencies and logit effects.

The x-axis of Figure 3 indicates the cost intensity of each behavioral aspect by the percentage of those who do not follow the environmental alternative (14% for recycling of paper, 15% for recycling of glass, etc.), and the y-axis represents the logit effects.

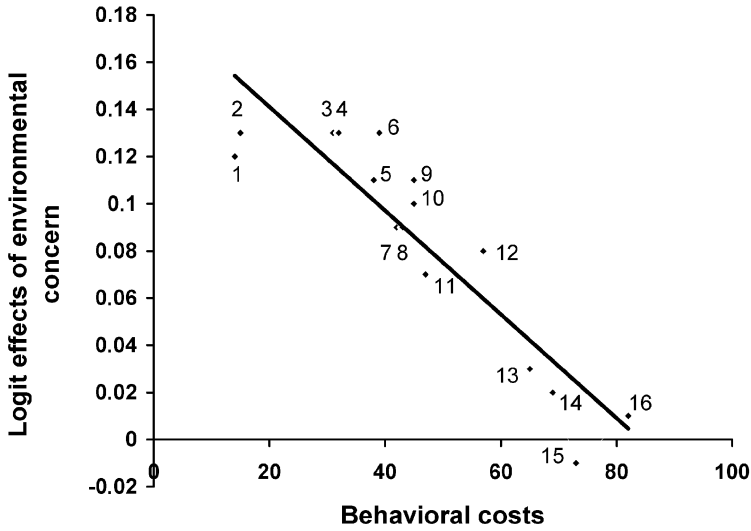

Figure 3. Logit effects of environmental concern on environmental behavior characterized by varying behavioral costs

1 = recycling paper; 2 = recycling of glass; 3 = recycling of plastics; 4 = depositing package material; 5 = buying products with eco-label; 6 = buying seasonal fruits/vegetables from region; 7 = switching off lights; 8 = buying refill bottles; 9 = recycling of organic material; 10 = using energy-saving bulbs in household; 11 = using water-saving installations in household; 12 = reducing water-consumption under shower; 13 = shopping without car; 14 = weekend trips without car; 15 = last holiday without car/airplane; 16 = no car in household.

In accordance with the low-cost hypothesis, the regression line has a negative slope, confirming the hypothesis in the light of test procedure 1.

Test Procedure 2

While test strategy 1 differentiates low-cost versus high-cost activities, test strategy 2 looks at specific behavior and differentiates actors in low-cost versus high-cost situations with respect to this activity. Even though there may be multiple groups with gradually varying costs, we simply distinguish between a group of 'low-cost people' and a group of 'high-cost people'. The expectation is that for the low-cost people (i.e. for those 90% in Figure 2a for whom $c(r_1) - c(r_2)$ is small) the effect of environmental concern on the

behavior under investigation (R) is stronger than for the high-cost people (10% in Figure 2a).

This kind of test requires a measure whether a certain behavior is low-cost or high-cost for individual actors. In our data, we do not have direct cost measures (actually, we refrained from trying to collect such direct information because of evident validity problems of subjective assessments). Instead, as with test procedure 1, we rely on auxiliary assumptions. Based on the data available, it is not possible to formulate reasonable cost assumptions for all our 16 behavioral items. However, we can do so for the following six items: recycling of paper, recycling of plastics, recycling of organic material, use of water-saving installations in household, shopping without a car, and no car in household. For these six items we have additional information in the data which allows us to separate a low-cost and a high-cost group. The auxiliary assumptions are different for each behavioral aspect.

With respect to recycling of paper, our assumption is that those people who have their own paper bin are in a low-cost situation. Some communities in Germany equip all households with separate paper bins, and organize a regular pick-up service (each week or every two weeks). Twenty-five percent of our respondents say that their community has such a system, and we qualify them as belonging to the low-cost group because behavioral costs of paper recycling are reduced to the choice of the right bin. Most communities, however, have one paper container per neighborhood, and this means that people live within a certain distance to the next container. Seventy-five percent belong to this distance group (according to our data, their median distance is 300 meters), and we qualify them as belonging to the high-cost group. Ninety-two percent of the low-cost group and 86% of the distance group say that their household always recycles paper. This difference shows that distance matters even though the difference is quite small.

Now, when we compute Pearson and Gamma correlations and logit effects for the low-cost and high-cost subgroup, we get the values in Table 3. In the low-cost group, environmental concern and participation in the recycling of paper correlate with 0.22 (Pearson) and 0.45 (Gamma). The corresponding correlations in the high-cost group are 0.12 and 0.22. As in Table 2, the logit models control for six socio-demographic variables (West/East Germany, gender, age, schooling, income, political orientation left/right). The logit effects of environmental concern with regard

Table 3. Relationship between environmental concern and environmental behavior under low-cost and high-cost conditions

Behavioral items	*Low-cost condition*	*High-cost condition*
Recycling of paper		
Pearson correlation	0.22	0.12
Gamma correlation	0.45	0.22
Logit effect	0.19* (2.17)	0.11* (3.19)
Recycling of plastics		
Pearson correlation	0.17	0.10
Gamma correlation	0.24	0.15
Logit effect	0.17* (6.14)	0.07 (1.90)
Recycling of organic material		
Pearson correlation	0.11	0.06
Gamma correlation	0.12	0.08
Logit effect	0.11* (3.56)	0.03 (1.05)
Use of water-saving installations in household		
Pearson correlation	0.13	−0.01
Gamma correlation	0.15	−0.01
Logit effect	0.10* (4.34)	0.01 (0.14)
Shopping without car		
Pearson correlation	0.11	−0.02
Gamma correlation	0.15	−0.04
Logit effect	0.03 (0.78)	−0.02 (0.53)
No car in household		
Pearson correlation	0.09	−0.07
Gamma correlation	0.13	−0.12
Logit effect	0.01 (0.34)	−0.02 (0.46)

Note: The description of what constitutes a low and high-cost condition for each behavioral item is given in the text. t-values of logit effects in parentheses.
* Significant at 0.05 level.

to paper recycling are 0.19 in the low-cost group and 0.11 in the high-cost group, respectively. Thus, bivariate correlations as well as logit effects are stronger in the low-cost than in the high-cost group, and this is in line with predictions of the low-cost hypothesis.

The test logic for the other five behavioral aspects in Table 3 is analogous to that of paper recycling. We must, however, give a description of the cost assumptions connected with these behaviors.

Concerning recycling of plastics, our split of a low-cost and high-cost group is based on the way plastics recycling is organized in

households. Even though there is one big organization in Germany (called 'Duales System Deutschland') which has the main responsibility for plastics recycling, this organization offers – in cooperation with local authorities – different options to neighborhoods. Most households (75%) have separate plastics bins, but a minority (25%) has plastics containers in the neighborhood. Thus, again we can distinguish an 'at home' group (low-cost) and a distance group (high-cost). Whereas 74% of the low-cost group are regular recyclers of plastics, this percentage decreases to 58 in the high-cost group.

An important factor influencing recycling of organic material probably is whether a community has established a recycling program for this material or not. Fifty-two percent of our respondents declare that their communities have such a program, while 48% say they do not have it. Sixty-nine percent of the low-cost group, living in a community with a recycling program for organic material, reply that they always recycle organic material, compared to 43% in the high-cost group.

Our cost assumption with respect to the installation of water-saving equipment in the household goes as follows: Water-saving installations are high-cost and rational actors do not profit, if costs of water (per month or year) are fixed and do not depend on the amount of water consumption. On the other hand, water-saving installations are low-cost, if households pay for the amount of water they actually use. Twenty-three percent of our respondents are in a high-cost situation defined in the following way. Most of them have rented a house or an apartment with a contract that specifies a fixed sum of money for water. The remaining 77% are in a low-cost situation, i.e. they pay for the water according to actual consumption. Fifty-nine percent of the low-cost group, compared to 35% of the high-cost group, reply that they have water-saving installations in their households.

For shopping without a car, our low/high-cost distinction is based on the distance of the store where respondents do their shopping most often. Those 33% at a distance of less than one kilometer are defined as the low-cost group, the other 67% as the high-cost group. Percentages of car users differ greatly between these two groups; 66% of the low-cost, but only 19% of the high-cost group do their shopping without a car.

Finally, concerning the decision 'no car versus car in household' our low/high-cost grouping is based on the assumption that to

own no car is easier and less inconvenient for people living in larger cities (i.e. cities with 100,000 or more inhabitants). Larger cities in Germany have a relatively well-established system of public transportation and are connected to the national and European railroad system. For people living in smaller cities or villages, it seems more difficult to manage everyday life without an automobile. About one-third of our respondents live in larger cities (low-cost condition), two-thirds do not (high-cost condition), and 24% of the low-cost versus 15% of the high-cost group do not own a car.

It can be seen from Table 3 that for all six behavioral items Pearson and Gamma correlations and logit effects follow the prediction of the low-cost hypothesis.[3] Under low-cost conditions, environmental concern significantly affects recycling of paper, recycling of plastics, recycling of organic material, and use of water-saving installations in the household. Under high-cost conditions, we observe only one significant logit effect, namely the effect of environmental concern on recycling of paper. Concerning shopping without car and no car in household, logit effects are not significant, but in the low-cost situations effects are positive as predicted, while they are negative in the high-cost conditions.

In an additional step, we may ask whether the logit effects for the two conditions in Table 3 differ significantly from each other. To test for such differences, we estimated a single logit equation which includes – besides the control variables and the main effects of environmental concern and of low-cost (1 = low-cost condition, 0 = high-cost condition) – the interaction 'low-cost * environmental concern'. We centered environmental concern to a mean of zero to get meaningful main effects. The results are given in Table 4.

All six interaction effects are positive, and thus in line with the low-cost expectation. A positive interaction effect means that under low-cost conditions environmental concern has an additional influence on behavior. For recycling of paper and use of water-saving installations in household, interaction effects are significant, and for recycling of organic material, the effect is near the 0.05 significance level.

Even though we are primarily interested in the interaction effects, the results in Table 4 are also interesting with respect to the main effects of environmental concern and the low-cost dummy variables. The main effects of environmental concern in Table 4 are the effects of environmental concern under high-cost conditions, and thus roughly identical to the high-cost column in Table 3.[4] Independently

Table 4. Main effects and interaction effects of environmental concern and 'costs' on environmental behavior (binary logit models)

Behavioral items	*Main effect: environmental concern (EC)*	*Main effect: low-cost dummy (LC)*	*Interaction effect: LC * EC*
Recycling of paper	0.11* (3.12)	1.11* (3.99)	0.10 (1.14)
Recycling of plastics	0.07* (1.97)	0.91* (6.79)	0.10* (2.30)
Recycling of organic material	0.03 (1.19)	1.09* (9.45)	0.08 (1.91)
Use of water-saving installations in household	−0.01 (0.14)	1.23* (9.09)	0.11* (2.24)
Shopping without car	−0.01 (0.33)	2.17* (16.59)	0.04 (0.93)
No car in household	−0.02 (0.79)	0.85* (5.77)	0.06 (1.10)

Note: In addition to EC, LC, and LC*EC, the models include six control variables (West/East Germany, gender, age, schooling, income, political orientation left/right). t-values of logit effects in parentheses. * Significant at 0.05 level.

of high-cost or low-cost, the main effects of environmental concern are not very strong. Much stronger are the main effects of costs. According to Table 4, the low-cost dummy variables show highly significant effects on all six behavioral items. This clearly supports a structural and/or economic approach to the explanation of environmental behavior. However, because our cost variables are tailored to the specific behavior, whereas environmental concern is a general attitude measure, we probably should not over-interpret this finding. The important conclusion is that our results also support the low-cost hypothesis in the light of test procedure 2.

5. Discussion

Summarizing our analyses we can say that the low-cost hypothesis is corroborated by the data and merits further investigation. However, three objections can be raised: First, we have examined self-reported rather than observed behavior. Self-reported behavior is probably

biased towards 'ecological correctness', and this bias may be especially strong in our study because respondents did know that they were participating in an environmental survey. Although in their review of studies about the relation of environmental attitudes and behavior, Hines et al. (1986/87) did not find differences in correlations between studies referring to self-reported and observed behavior, the latter measure is clearly more valid than self-reports. However, even if attitudes and behavior may appear more consistent using data based on self-reports, a possible bias of correlations does not harm our test results. The reason is that our test strategy focuses on differences of correlations or effects from low-cost situations and high-cost situations, and the differences are not necessarily biased.

Secondly, one can question our reliance on indirect cost measures. Alternatively, there is the possibility of using subjective measures of costs, discomfort, inconveniences, etc., although it is not clear that the validity of such measures would be higher. Nevertheless, more direct and subjective cost measures could provide additional data for testing the low-cost hypothesis.

A more fundamental, third objection concerns altruistic behavior in high-cost situations. We know of many examples of persons paying a high price to live for their convictions or risking their lives to save others (Oliner 2003). The low-cost hypothesis does not deny that some people act heroically disregarding even high costs of moral conduct. For example, many persons rescued Jewish people in Nazi Germany and Nazi-occupied territories at risk of their own lives (Oliner and Oliner 1992). Oskar Schindler is one of the best-known of them today. Less known is Georg Elser, a Wurttemberg joiner, who showed great courage and endeavour in attempting to assassinate Adolf Hitler at the beginning of the war. Hitler survived only by pure chance, and Elser was later murdered in the Dachau concentration camp. Nevertheless, as a proportion of the population these people formed a small fraction. Vaclav Havel sacrificed his freedom, material gain, and his health for his beliefs, not knowing in advance that he would be rewarded later by the change to democracy and by worldwide esteem and the position of Czech president (Steiner 1996). Yet, heroic behavior is not a rule but a frequent exception. In normal times, at least, it is not a mass phenomenon. Hence we believe that in explaining aggregate behavior, the low-cost hypothesis works well. Presumably, the low-cost hypothesis is a regularity but not a general law. Investigations into the robustness of social norms when stakes are increasing

in experimental game theory yielded mixed results. For example, Fehr et al. (2002) did not find a stake-effect for altruistic reciprocity. Hence, one might speculate that certain norms are more affected by rising costs than others. Exploring conditions for the robustness of norms concerning 'stakes' (the slope of the low-cost function) would be an interesting and fruitful research program.

Our research has policy implications as well as consequences for theories on the relation between attitudes and behavior. The low-cost hypothesis predicts that environmental attitudes are more important for low-cost activities and under low-cost conditions. This does not mean, however, that the hypothesis mainly pertains to marginal aspects of environmental protection. Our impression is that in many areas of environmental protection (e.g. in the areas of littering, recycling, or shopping) behavioral demands and necessary changes of behavior actually do have a low-cost character. Very often, relatively small contributions are expected from individual actors, but such small contributions of many people would have substantial effects in aggregate. Many environmental problems are caused by the fact that environmental quality has the character of a public good. Individual actors believe (and are right in believing) that – as single actors – they cannot contribute very much, and the incentive for free-riding induces them to hold back their contribution. Environmental concern may help people to overcome this incentive so that they make their small contribution. Furthermore, if we conceptualize low-cost as a condition characterized by small cost differences between alternatives, not the absolute level of 'stakes' matters, but comparative stakes. In the extreme of indifference between two alternatives, attitudes make the difference. (Buridan's donkey would not have starved if he had had a positive attitude toward one of the equally distant bundles of hay in front of him.) Thus, a low-cost situation does not preclude that we are dealing with a behavior that is very important to individual actors.

For policy measures concerning environmental protection, why should people's environmental consciousness matter at all? Why not implement economic incentive schemes for all kinds of ecology-related behavior? First of all, it would be neither possible nor desirable to economize all social activities. Particularly in low-cost situations, transaction costs such as monitoring behavior and enforcing payment may be comparatively high. Moreover, economic incentive schemes frequently have undesirable side effects. A volume-dependent fee on household refuse introduced by many

Swiss communities also increased 'wild' dumping of refuse. Another possible side effect is 'crowding out'. Depending on circumstances, the implementation of economic incentive schemes may destroy or weaken the intrinsic motivation to contribute to the protection of the environment (Frey 1997). On the other hand, in high-cost situations change in environmental behavior can be brought about only by changing the incentive structure, making responsible behavior towards the environment less costly. Nevertheless, for institutional change a high level of environmental concern in the population is a necessity, too. At least in democracies, if a large proportion of the population places great emphasis on environmental issues, political elites or law-makers have a strong incentive to care for institutional reform in favor of the environment.

Given the low-cost hypothesis, we can derive another practical conclusion often ignored in scientific and public discussion. Political action transforming high-cost to low-cost situations (e.g. a program making public transportation more attractive) will have two effects: a direct effect in the form that reduced costs increase demand, and an additional indirect effect in the form that environmental concern more often will result in action. This indirect effect strengthens the efficiency of political measures designed as incentive programs. However, if structural circumstances and/or cost conditions are clearly at odds with environmental behavior, and if there is no perspective that this will change, we can assume that individual actors will finally adapt their environmental attitudes or develop a cynical perspective. This may explain that in Western countries the environmental consciousness of the general public was very high a decade ago, but has declined considerably since then (e.g. Schupp and Wagner 1998).

Compared to other so-called moderator variables of the relation between attitudes and behavior, discussed mainly within social psychology, the low-cost hypothesis postulating an interaction effect of attitudes with the 'cost variable' has the theoretical advantage of bringing in economics and sociology. Attitude research of social psychology is often seen as a research program opposed to sociology, which focuses on structural settings and constraints, and to economics which stresses incentives and monetary costs. By taking into account the social and economic embeddedness of behavior, the low-cost hypothesis can build a bridge for integrating the different perspectives.

NOTES

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1. This assumption is based on the notion that a certain type of environmental behavior would not be a topic of public debate, if for most actors the environmental alternative (x_1) could be qualified as an 'evidently rational option'.
2. Actually, our results do not change substantially if we exclude the statement 'environment versus jobs' from our environmental concern measure. We have used the statements of Table 1 in two other surveys, and based on our overall experience the solution of Table 1 is the most appropriate set of items. Following factor loadings, the single best item for measuring environmental concern is the statement 'If we continue our current style of living, we are approaching an environmental catastrophe'. This holds for the survey 'Environmental Concern in Germany 1996' as well as for the other two surveys mentioned.
3. We would like to add that we used test procedure 2 to analyze two further behavioral items, namely (1) recycling of glass and (2) purchase of refill-bottles. Concerning recycling of glass, our assumption was that a long distance to the next glass container constitutes a high-cost situation (as in the case of recycling paper and shopping without a car). Concerning purchase of refill-bottles our assumption was that low-income households are in a high-cost situation because the average prices of beverages in refill-bottles are higher. However, those assumptions did not prove to be valid, i.e. recycling of glass did not vary with the distance of the next glass container, and purchase of refill-bottles did not depend on income. So the basic requirements for a suitable test-situation were not given. Because we dropped the items after knowing the estimates, in a strict sense estimates for six out of eight items follow the prediction.
4. Effects are not completely identical, because we included only the interaction 'low-cost * environmental concern', and not the other interactions (low-cost * West/East Germany, low-cost * gender, etc.).

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