Chapter 4

The role of SDR in CVM

4.1. Outline of the chapter

In the precedent chapter, it was shown that strong social norms are at work in the field of environmental protection. As a consequence, questions about private contributions to the provision of environmental goods such as reforestation, clean air or biodiversity protection become normatively sensitive issues. Since such topics are increasingly governed by social norms which prescribe what one should or should not do, respondents who are sensitive to the influence of norms are more and more likely to perceive incentive to bias their answers. So, for the case of contingent valuation surveys, one of the main preconditions for the appearance of SDR is given: they deal with sensitive issues. Consistent with this finding, it was argued in the introductory chapter that social desirability is mentioned quite frequently as a response bias in the contingent valuation literature. It was also said, however, that although many studies touch this topic to some extent, except for Laughland et al. (1994) there is no survey that systematically relates the tendency to respond in a socially desirable manner to WTP statements. In order to provide a comprehensive investigation of the existence of SDR in contingent valuation, the third chapter of this study developed a behavioral model based on rational choice theory. This model identified personal and situational factors that constitute the SDR phenomenon and theoretically specified how these factors are related. It becomes clear that each factor is necessary for SDR incentives to work on the respondent. Consequently, the product of the three factors is what is referred to as SDR variable in the present chapter. After introducing contingent valuation in chapter 2 and the concept of socially desirable responding in chapter 3, the overall aim of this chapter is to develop the theoretical foundations of an empirical investigation of the influence of SDR on WTP statements in contingent valuation surveys. It is in this chapter that the concept of SDR is integrated into the CVM framework. To this end, section 4.2 provides a discussion of the importance of SDR in CVM. The main rationales for an investigation of this response bias in contingent valuation surveys are presented. Firstly, WTP statements in contingent valuation surveys are a form of reported behavior. Respondents indicate what they would do under certain circumstances. Both sociology and
psychology find that in such situations SDR is very likely to distort survey responses. Secondly, the increasingly strong social norms with regard to environmental protection raise the likelihood that respondents in contingent valuation surveys bias their answers in a socially desirable direction. Subsequently, the empirical literature on social desirability in CVM is reviewed. It will become clear that this strand of literature is mainly confined to the detection of mode effects, whereas direct assessments of social desirability are almost completely missing.

When it comes to the specific form of influence of SDR on WTP statements for environmental goods, two basic types can be identified: There might be a direct influence of SDR incentives on the decision whether or not to state a positive WTP and on the specific WTP amount. In section 4.3, this relationship between a respondent’s incentives to answer in a socially desirable manner and the WTP response is established. Looking at the whole sample of observations, this means that SDR is potentially biasing the distribution of WTP statements affecting both the shape of the distribution, i.e. the relative frequency of the different WTP amounts, and the resulting mean WTP. To this end, a two-step analysis is provided. In a first step it is investigated to what extent SDR is influencing the fraction of respondents selecting a positive WTP amount instead of stating zero. Subsequently, the effect of incentives for socially desirable responding on the selection of a specific WTP is studied. Different types of regression models will be introduced to control for these channels of influence of SDR on WTP responses. In addition to that, it is conceivable that the two components of need for social approval, namely enhancement and denial, exert a different behavioral influence on respondents. Therefore, this section will also look at the theoretical relationships of those different features of the SDR construct and derive research hypotheses to be tested in the empirical analysis in chapter 5.

4.2. Socially desirable responding and the CVM

There are several reasons that call for a systematic analysis of SDR and the conditions for its occurrence in applied environmental valuation. Contingent valuation is a survey-based method and survey literature has long been acknowledging the distorting influence of social desirability in surveys (Krosnick 1999). As mentioned above not only sociology but also other disciplines that rely on survey data admit the proneness of responses to survey questions to be biased as a result of the respondent’s attempt to convey a positive self-image. These considerations also hold for the field of survey-based environmental valuation in general and the CVM in particular. Therefore, concern
for SDR in contingent valuation surveys has been accompanying the methodological advances in this field of research from the early days of this method. Mitchell and Carson (1989) mention the possibility that respondents shape their answers to CV surveys in order to please the interviewer or the sponsoring institution. The latter phenomenon is referred to as “sponsoring bias” (Mitchell and Carson 1989, p. 238). The fact that these authors discuss social desirability together with compliance and interviewer bias already indicates the close relationship of these phenomena.

Most concern for SDR in sociology revolves around so-called surveys dealing with reported behavior. Since many types of behavior cannot be observed by the researcher, or could only be observed at high costs, behavioral patterns of individuals are assessed through their own reports. For example people are asked what they would do in a certain situation or how they usually act in daily life. This “shortcut” is one typical form of behavioral research in sociology and psychology (Phillips and Clancy 1972). Contingent valuation interviews share this crucial feature with those self-reports because the central question in CVM is the elicitation of the WTP of a respondent for a public project. Due to the hypothetical nature of that question, its response is hypothetical, too. The respondent indicates what she would be willing to pay to realize the project contingent on its realization at some future point in time. So, as a result of this common feature of self-reports in sociology and psychology on the one hand and CV interviews in environmental valuation on the other hand, the two methods are equally likely to be prone to evoke SDR. This is easy to understand because in both methods the researcher has to rely on the statements of the respondent in order to assess the variables of interest – reported or hypothetical behavior. The reported and hypothetical nature of the stated response in turn is the reason why the respondent can very effectively influence the picture she conveys to the interviewer or the outside world in general. To this end no change in actual behavior is necessary, but merely a modified statement of what one would do in a certain situation, for instance how much one would be willing to pay if the respective project were to be realized.

Another reason why SDR is an issue for the CVM is the fact that environmental protection is associated with widely known social norms as discussed in section 3.2.4. The report of the NOAA Panel mentions that preserving the environment is widely considered desirable (Arrow et al. 1993), which hints at the central role of social norms as precondition for the occurrence of SDR. In this “era of environmental concern” (Mohr 1994), public awareness for problems of the environment such as destruction of ecosystems, air and water pollution, depletion of natural resources, or climate change has risen

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21 This idea is the basis for the inclusion of the factor trait desirability into the three-factor model of SDR in the third chapter.
sharply in many countries. At the same time, environmental protection has
become one of the main foci of government policy all over the world. As a
result of the huge public attention for environmental problems in recent
years and decades, it is increasingly likely that surveys that deal with envi-
ronmental topics, such as survey-based environmental valuation, are influ-
enced by social norms. If the majority of people hold pro-environmental
views, the statement of indifferent or even negative attitudes towards envi-
ronmental protection will most likely result in social disapproval. This kind
of moral appearance that is at stake when talking about normatively charged
topics works as a very powerful motivation to consider one’s own self-presen-
tation and even alter statements to avoid social disapproval.

Empirical research on SDR in contingent valuation

As indicated in the introductory chapter, social desirability is often men-
tioned to be a biasing factor in CV data, yet there have been very few
attempts to systematically investigate this influence. The means of analyzing
the role of SDR in contingent valuation most commonly applied in the litera-
ture so far is the variation of the level of anonymity – or put the other way
around the level of “publicness” – of survey responses and the whole inter-
view process. In order to reduce the likelihood of SDR to occur, the NOAA
Panel suggests the use of a so-called “simulated ballot-box” (Arrow et al.
1993). This has led researchers to systematically compare WTP estimates of
different survey modes (cf. section 2.2.1) in order to isolate the effect of a
variation in “publicness”, or rather in the degree of exposition of responses to
the interviewer. This is because in the field of contingent valuation, most
studies that investigate the impact of social desirability associate it very
closely with the presence of an interviewer. Therefore, the bulk of studies
that aim at this direction have compared WTP statements across different
survey modes, such as mail, telephone, and in-person interviewing (e.g.
methodological shortcomings that many of these studies suffer from are
differing sampling frames and different response rates across the modes.
That means that these studies are not reliably identifying the conditions of
the modes, which are compared as being exclusively responsible for the
different WTP estimates. Rather three potential sources of influence remain,
namely non-response, coverage, and social desirability.22 This holds for the

22 As will be demonstrated below, it is not even clear whether or not the comparison of
survey modes that only differ in the existence or non-existence of an interviewer is
really evidence for socially desirable responding.
survey to be higher than from a mail survey, Loomis and King (1994) who discover WTP from a mail survey to be higher than from a telephone survey, and Nielsen (2011) who detects no difference of mean WTP from in-person and internet surveys. With difference in response rates of different modes as high as for instance 24 percent in a mail survey and 97 percent in an in-person survey in Mannesto and Loomis’ (1991) study, it is obvious that these findings cannot be regarded as evidence for the impact of SDR on WTP statements.

This criticism is addressed by several more recent studies which explicitly hold the two factors sampling frame and response rate constant or at least approximately equal while comparing WTP statements across different modes (Ahlheim et al. 2010, Ethier et al. 2000, Leggett et al. 2003, Smith 2006, Whittaker et al. 1998). Additionally, these studies explicitly control for differences in demographic variables across different survey modes. Thus all remaining differences can be attributed to mode effects. Table 4.1 summarizes the results of all quoted studies that compare WTP estimates across different survey modes.

Table 4.1: Studies that compare WTP estimates across different survey modes

<table>
<thead>
<tr>
<th>Study</th>
<th>Mean WTP estimates</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mannesto and Loomis (1991)</td>
<td>in-person &gt; mail</td>
<td>Sampling frame and/or response rates across modes differ.</td>
</tr>
<tr>
<td>Loomis and King (1994)</td>
<td>phone &lt; mail</td>
<td></td>
</tr>
<tr>
<td>Nielsen (2011)</td>
<td>in-person = web-based</td>
<td></td>
</tr>
<tr>
<td>Whittaker et al. (1998)</td>
<td>phone &gt; mail</td>
<td></td>
</tr>
<tr>
<td>Ethier et al. (2000)</td>
<td>phone = mail</td>
<td></td>
</tr>
<tr>
<td>Leggett et al. (2003)</td>
<td>in-person &gt; self-administered</td>
<td>No significant differences in sampling frame and response rates across modes.</td>
</tr>
<tr>
<td>Smith (2006)</td>
<td>in-person = phone</td>
<td></td>
</tr>
<tr>
<td>Ahlheim et al. (2010)</td>
<td>in-person &gt; mail (DC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>in-person = mail (PC)</td>
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</table>

In a survey to assess WTP for visiting a recreational park, Whittaker et al. (1998), in addition to holding constant sampling frame and response rate, also weigh responses by demographic variables that differ between the telephone and the mail sample. While these authors find mean WTP estimates in the telephone sample being significantly higher than in the mail sample, a study by Ethier et al. (2000) finds these two modes to yield the same WTP estimates for green electricity. Yet, the latter study detects significantly different responses to several non-WTP questions with obviously socially desirable content across the two modes. These authors conjecture that SDR does not affect WTP statements but only attitudinal questions.
Further evidence against a strong influence of SDR on WTP responses is reported in Smith (2006) who does not detect a difference in WTP estimates between an in-person and a telephone survey in a health economic context, either. However, these findings contrast the conclusion of Whittaker et al. (1998) who hold social desirability responsible for the significantly higher WTP statements in the telephone survey.

In response to the shortcomings of comparing data across survey modes Leggett et al. (2003) design a study that attempts to hold constant all characteristics of the survey by conducting two surveys at the same location and time. These authors compare WTP statements for user fees of a recreational park in the Southern United States elicited through either in-person or self-administered interviews. They find that WTP estimates of the in-person survey are significantly higher than such estimates of the self-administered survey and interpret these results as more reliable evidence for the existence of social desirability. Yet, this conclusion is dubious because what their findings really indicate is the following. Firstly, the level of anonymity represents a factor that is potentially biasing results in CVM surveys and secondly, that it might drive stated WTP alone, i.e. without interaction with other factors of SDR because these are not explicitly assessed and analyzed. Merely showing that WTP statements actively elicited by an interviewer are higher on average than such statements made on the questionnaire by respondents themselves does not necessarily prove the existence of SDR. Findings by Ahlheim et al. (2010) suggest that the form of the elicitation question, too, might influence the occurrence of such mode effects. In this study, WTP statements for the improvement of tap water quality in Thailand are found to differ between in-person and mail survey when the dichotomous choice (DC) format is applied but to be similar across these modes when the PC format is used. The authors can, however, only speculate whether this derives from the fact that DC responses are more prone to be influenced by yea-saying, i.e. social desirability. Further, by conducting two surveys – one before and one after revisions in the questionnaire based on results from so-called citizen expert group discussions – it can be shown that one reason for these differences between the in-person and mail survey is the self-selection bias associated with the latter survey mode. After the questionnaire has been modified according to input from local citizens, this biasing influence seems to have vanished. Thus, what these results portend is the fact that social desirability might not be the only factor being responsible for different WTP estimates across modes.

From a more general perspective, the CVM exercise resembles a voluntary contribution to the provision of a public good. Experimental economics provides some interesting insights as to the effect of anonymity on such contributions. While numerous laboratory experiments show that relaxation
of the participants’ anonymity increases voluntary private contributions to the provision of public goods (Andreoni and Petrie 2004, Rege and Telle 2004), several studies investigate the role of different degrees of “publicness” and thus also the effect of social desirability on such contributions in natural field experiments that resemble CVM settings more closely (Alpizar et al. 2008a, List et al. 2004). For instance List et al. (2004) conduct an experimental study in order to assess the role of different degrees of response perceptibility on actual and hypothetical contributions to a public good. They find that both actual and hypothetical contributions are highest when responses are perceptible by other participants of the experiment compared to settings when they can only be known by the experimenter or by nobody except the participant herself. The authors interpret the willingness to contribute more in the public setting as utility that participants receive from publicly advertising their goodwill. This utility must be separated from the “lump” value of the public good to be provided. This very much resembles the problem of SDR in contingent valuation where the additional WTP of a respondent influenced by social desirability concerns can analogously be interpreted as the value of the social approval she gets from this statement. Obviously, such an overstatement of WTP distorts the valuation of the good in question. Support for these findings is reported in Alpizar et al. (2008a) who are studying the effect of the degree of respondent anonymity and of the information of the contribution of others on the willingness to pay a voluntary entrance fee for a national park in Costa Rica. These authors find that social context defined as the degree of perceptibility of contribution statements by the experimenter is influencing actual and hypothetical contributions in the same way as in List et al. (2004). Although the focus of both studies is on the investigation of hypothetical bias, what is important is that decreasing anonymity increases WTP, and that social approval or esteem is likely to be the motivation for such behavior.

Apart from the experimental results regarding the relaxation of anonymity the above findings on mode effects in CVM are very inconsistent and indicate no clear tendency whether the use of in-person or telephone interviews results in higher or equal WTP estimates compared to mail or self-administered surveys. Further, the results in Ahlheim et al. (2010) show that it is far from clear that social desirability is the sole explanation for these mode effects, which is, however, the basic assumption of most of the work quoted above. Rather than conceptualizing differences in WTP estimates across survey modes as sufficient condition of the existence of SDR, it is likely to be in fact merely a necessary condition. If SDR is at work, survey modes that employ active interviewers, such as in-person and telephone surveys, can be expected to yield different WTP estimates than mail or self-administered surveys. However, if merely such a difference in results is reported it is not
safe to attribute this exclusively to the influence of SDR, since other factors, such as elicitation format, self-selection bias, the specific appearance of the interviewer and the time and location of the interview might play a role, too.

Therefore, in order to assess the influence of social desirability in CVM interviews a more direct approach has to be employed. The only study that has ever attempted to directly measure the tendency to respond in a socially desirable manner and relate this to stated WTP is reported in Laughland et al. (1994). In this study, the Marlowe-Crowne SD scale is administered along with a self-administered CV questionnaire in a student sample. The hypothesis that respondents with higher need for social approval as measured by the Marlowe-Crowne SD scale generally have a significantly higher WTP for socially desirable goods, such as improved food safety and landscape preservation, is not supported by the data. This means that simply correlating a psychological SDR score with open-ended and dichotomous choice WTP data is not necessarily able to reveal any impact of SDR on contingent valuation statements. Although the authors acknowledge the existence of a more differentiated concept of social desirability consisting at least of need for approval and trait desirability, this conceptual multidimensionality is not taken into account in their empirical study. The reason for the weak effect of need for social approval might be the fact that the level of social desirability of the two goods to be valued is not explicitly assessed and included into the model. Thus, the failure of separately measuring if the good to be valued is indeed considered socially desirable (trait desirability) and relating this to the score of need for approval might be an explanation for the failure of finding a robust relationship between SDR and WTP statements in this study. These considerations are the basis of the development of the three-factor approach displayed in the previous chapter and tested in the empirical part of this study.

4.3. The effects of SDR on WTP statements

The influence of incentives for SDR on WTP statements manifests itself in a direct relationship between these two variables. It is conceivable that WTP statements are systematically affected by the SDR variable, i.e. by the factors that constitute this variable according to the three-factor model of socially desirable responding. In other words, it will be tested if incentives for SDR are a determinant of WTP statements.

At this point the main implications of the three-factor model for the statement of WTP in a contingent valuation survey must be investigated in greater detail. Section 3.3 introduces the three-factor model of overall incen-
tives for SDR that includes both situational and personality characteristics. The first factor, need for social approval, constitutes a personality characteristic. The measurement scale employed in the survey assigns a need for approval score to each respondent with a high score indicating a relatively high need for approval and a low score a low level of approval seeking. In addition to this personality variable, the level of perceived anonymity in the interview situation and the trait desirability with respect to the specific question content are conditional on the interview situation, i.e. they are situational variables. In the case of the essential part of a contingent valuation interview, namely the elicitation of the WTP for a public project in the environmental sector, trait desirability refers to the perceived desirability of stating a high amount. Thus, this factor is positive only for those respondents who feel that it is socially desirable to contribute more to the environmental project in question than less. If the respondent perceives a high level of anonymity, this means that she does not consider the interview to be public and does not even believe the interviewer to be able to get to know her WTP statement. Therefore, only with a lack of perfect (perceived) anonymity does the respondent feel that her responses are perceived by the interviewer or another outside public.

The basic idea of a set of factors jointly determining the level of individual bias as conceptualized in the three-factor model can be found in several other studies that investigate survey bias. The sociological studies that first investigated the relationship between need for social approval and trait desirability have been discussed in detail in section 3.2.3 (Gove and Geerken 1977, Phillips and Clancy 1970, 1972). While the results in Phillips and Clancy (1972) indicate that need for social approval and trait desirability independently influence a variety of self-reported characteristics and patterns of behavior, Gove and Geerken (1977) do not find any systematic influence of the two factors on three different indicators of mental health. In addition to that, two more recent studies test the interaction of more than one constituting factor of SDR (Chen et al. 1997, Stocké 2004, 2007). Chen et al. (1997) identify an interaction effect between perceived desirability of positive and negative affectivity (i.e. trait desirability) and need for social approval as measured by the Marlowe-Crowne SD scale. The data of this study show that the probability of a respondent endorsing an item of the two scales measuring positive and negative affectivity is closely related to the judged

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23 In this context, positive affectivity is defined as “individuals’ level of pleasurable engagement with their environment” (Chen et al. 1997, p. 184). In contrast to that, these authors refer to negative affectivity as an “aversive mood state” towards the environment. While high positive affectivity is associated with enthusiastic, active and energetic feelings, negative affectivity manifests itself in distress, anger, disgust, and nervousness.
This relationship turned out to be much stronger for respondents with high need for social approval, i.e. the level of need for approval modifies the relationship of trait desirability and dependent variables. This is equal to an interaction effect of need for social approval and trait desirability. Stocké (2004a, 2007) tests the three-factor model as specified above with respect to attitudes of Germans towards foreigners. The results of this study support the hypothesis of the three-factor model, namely that there is only a significant influence of SDR on survey responses if all three factors of this construct are at work simultaneously. Although both need for approval and trait desirability have a significant and independent effect on attitudinal statements regarding foreigners, an interaction model of all three factors yields a significant interaction effect. It should be noted that this is the only study that practically integrates the lack-of-anonymity factor into the model. However, it is not assessed as perceived anonymity but simply as objective anonymity by means of comparing different interview treatments. Therefore, it is not clear to what extent respondents in the anonymous treatment actually believe the assurance of anonymity, and how strong the resulting influence is on response behavior. Like discussed in section 3.3.2 it would be more appropriate to employ lack of perceived anonymity as the third factor in the model.

In the only application of an SDR scale in a contingent valuation survey by Laughland et al. (1994) discussed above, a significant effect of need for social approval on WTP statements for improved food safety and landscape protection cannot be found. What is totally neglected in that study and might also be a reason for the failure to find significant impact of SDR on WTP statements is the influence of an interviewer because the survey is self-administered. That means that for each respondent the lack of anonymity factor equals zero (i.e. the situation is in fact anonymous), and according to the three-factor model in such a situation no influence of the other factors on the dependent variable can be expected. In an in-person survey results might have been different.

In sum, empirical evidence on the interaction of the different factors of SDR is highly inconclusive. While some studies find a viable interaction effect of two or all three factors for certain survey topics, results of other investigations show independent influence of the different factors. Presumably the specific topic of the survey, i.e. the dependent variable of the analytic model is crucial to the applicability of the three-factor model of SDR. Therefore, this study wants to scrutinize the applicability of this approach to survey-based environmental valuation. It is hypothesized that if all three factors need for social approval, trait desirability, and a lack of perfect anonymity are present, a respondent feels the urge to respond in a socially desirable way rather than entirely truthfully. However, this idea of conceptu-
alizing SDR as the result of the simultaneous existence of three factors is new in the field of survey-based environmental valuation. Therefore, the appropriateness and plausibility of this model has to be scrutinized empirically.

This can be done in two steps. Firstly, it is conceivable that these incentives affect the decision of a respondent whether to state zero or a positive WTP. So as the first part of the analysis, the influence of SDR on this decision is investigated. In societies characterized by publicly promoted environmental concern, the statement of a zero WTP for a public environmental good might trigger social disapproval. As environmental conservation is beneficial to the whole society, citizens are likely to perceive that everybody should contribute to this effort (cf. section 3.2.4). Therefore, it can be expected that a good part of respondents perceive social norms that call for a contribution to the environmental project independent of the individual valuation of it. Clearly, such calls for a contribution can be expected to influence respondents with incentives for socially desirable responding more strongly. This means that the incentives for SDR also work as a motivation to state a positive WTP to avoid social disapproval regardless of these respondents actually valuing the environmental project or not. It can thus be hypothesized that the fraction of zero responses in a sample is influenced by the existence of SDR incentives. Consequently, the following hypothesis can be formulated.

**Hypothesis 1**: Respondents with overall incentives for SDR are significantly more likely to state a positive WTP than respondents without such incentives.

This hypothesis can be tested by employing a simple probit regression model with the likelihood to state a positive WTP as dependent variable. In addition to this regression model, the first part of this empirical analysis is simply to check whether there are more respondents selecting the first (0 RMB) or second (1-5 RMB) interval on the payment card when the SDR factors are present or not. To this end, histograms of the response frequencies of the different WTP amounts on the PC will be displayed. Since respondents with incentives for SDR are dependent on the evaluative judgement of their social environment, it can be expected that those who originally wanted to select a WTP of zero switch to the first positive interval to avoid social disapproval. From the point of view of these respondents the switch to the next highest PC interval might appear insignificant, especially because they might perceive the hypothetical nature of the elicitation question. However, this kind of misreporting of WTP statements will bias the estimation of mean WTP and therefore of the social value of the public project in question.
As a second step, the analysis investigates the effect of incentives for SDR on the specific WTP stated by a respondent. Since the trait desirability variable assesses whether respondents think that expressing a higher WTP is better, it can be expected that respondents with incentives for SDR systematically state higher WTP amounts. As above, the main idea is the non-compensating relationship of the three factors in the model. This means that it is expected that the biasing influence of SDR incentives only exists for those respondents who exhibit all of the three factors need for social approval, lack of perfect anonymity and trait desirability. Therefore, the following hypothesis will be tested:

**Hypothesis 2**: Respondents with overall incentives for SDR state a significantly higher WTP than respondents without such incentives.

If this hypothesis can be rejected it has to be investigated which of the single factors systematically influence WTP statements and whether they do it independently or jointly. To this end, the factors will also be included as a set of explanatory variables independently. The specific research design including the estimation model to test these hypotheses will be introduced below.

The influence of enhancement and denial

As is further documented in chapter 5, a modified version of the impression management subscale of the Balanced Inventory of Desirable Responding (BIDR) is employed to measure need for social approval in the empirical part of this study. One of the main advantages of the use of the BIDR is its capability of separately measuring the two components of need for approval, namely denial and enhancement. These concepts and their influence on WTP statements have already been introduced in section 3.2.2, and it is at this point that their dichotomy becomes relevant for the empirical analysis. The BIDR allows for the calculation of three different scores: an overall score of need for social approval, an enhancement score, and a denial score. It is very well conceivable that individuals score differently on the two subscales when they are following different strategies to gain social approval. In this respect it must consequently be investigated if the enhancement and denial components of social desirability exert a differing influence on mean WTP.

It has been shown that the strategy of approval seeking is to some extent conditional on the cultural background of the individual (Lalwani et al. 2006, Lalwani et al. 2009). Although for the case of Western subjects several studies have presented evidence that the dichotomy of denial and enhancement cannot be detected empirically within the impression management.
dimension of SDR (Paulhus and Reid 1991), this is still fervently debated concerning Asian respondents (Li and Li 2008). Therefore, in the framework of this empirical analysis the relative strength of the enhancement and denial components to influence WTP statements will be tested.

A rationale for the expected stronger behavioral influence of denial can be found in prospect theory (cf. section 3.2.2). Within that framework, individuals value losses more strongly than equivalent gains (Kahneman and Tversky 1979). Thus, the fear of a loss has a stronger motivating influence on behavior than the prospect of an equivalent future gain. If this characteristic of the individual value function within the larger framework of prospect theory is correct, the behavioral influence of the denial component of SDR should be stronger than that of enhancement. It has been introduced earlier that the strategy referred to as enhancement is the conscious exaggeration of one’s own positive qualities in order to receive approval from others, whereas denial refers to a defensive strategy in which the individual seeks to avoid dropping under a certain minimum level regarding her appearance in the eyes of others. So, indeed enhancement corresponds to the prospect of a positive change in social approval, whereas the denial concept refers to the fear of decreased approval by others.

The idea that denial influences the statement of WTP more than enhancement is further supported by the fact that the survey in the present study is conducted in the socio-cultural context of China. When it comes to rural China, it makes sense to assume that the more defensive denial strategy is of greater importance than the enhancement strategy. It has been reported that Chinese people are educated in a way not to stand out among a group of people. Liu et al. (2003, p. 292) quote an important Confucian teaching: “Tall trees catch more wind”, which stresses modesty and warns people not to strive for individualistic goals. Such a mindset would result in much less enhancement of Chinese individuals that have a basic need for social approval compared with their Western counterparts. Empirically, the above expectation can be tested by the following hypothesis.

**Hypothesis 3**: In all the above models, the denial component of need for social approval has a stronger influence on WTP statements than the enhancement component.

This hypothesis can be tested by replacing the overall need for approval score in the three-factor model by the separate denial and enhancement scores in turn. That means that the subscores are both included in a model that investigates the main effects of the three factors of SDR and in interaction models.
Research design

After the main hypotheses for the empirical investigation have been formulated, the actual research design is to be introduced in greater detail. When modeling the three factors in an empirical application in a CVM study, one of them is continuous while the others are binary. Since the first factor, need for social approval, is measured by means of a social desirability scale, its output is a score and thus continuous. Following the tradition of decades of social desirability research outlined in sections 3.2.2 and 3.2.3, respondents can be classified as having any level of need for social approval. As introduced above, this is a general personality characteristic of the respondent which is assumed not to vary across situations, i.e. survey topics and settings. In the following, the need for approval variable for respondent \( h \) will be denoted \( N_h \).

In this setting, perceived anonymity is modeled as a binary variable because it describes a certain state of the interview situation – the interview setting is either perceived as anonymous, i.e. the respondent feels that her answers cannot be linked to her in any way, or it is not. When the former is the case and the respondent perceives complete anonymity, the interview situation can be interpreted as non-public, which is modeled with the binary variable \( P_h \). This variable takes the value 1 if the respondent does not feel that the interview situation is anonymous (i.e. it is somehow public) and zero if she perceives it to be anonymous. Coded in this way, the variable equals 1 if there is an incentive to respond in a socially desirable way and zero if there is no such incentive.

Eventually, the desirability of a certain answer option is assumed to be binary for the following reasons. The main variable of interest in CVM studies is of course the WTP response, so the trait desirability variable \( T_h \) should assess how socially desirable a certain answer is. Due to the numerosness of possible answers in the PC elicitation format respondents are simply asked if they think that it is more desirable to state a high WTP than a low one. If this is the case, the variable equals 1. Yet, if respondents do not think that stating a higher WTP is more socially desirable, \( T_h \) is equal to zero. Respondents agreeing to this statement (i.e. having \( T_h = 1 \)) are assumed to perceive a social norm that asks for a high contribution to the good to be valued. When it comes to stating their WTP for the environmental project in question they simply feel that stating the more the better. The question for trait desirability is thus a tool to assess to what extent a respondent perceives the social norm concerning the topic in question – the contribution to the provi-

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24 In open-ended CVM the number of possible answers is infinite since any positive number is a potential answer. When the PC approach is employed, all intervals on the card are possible options, which are still quite numerous. Only when the DC elicitation format is applied could one think of another way of assessing trait desirability by just asking how desirable it is to accept / not to accept a certain bid.
ion of a public environmental good. The three SDR variables are summarized in table 4.2.

Table 4.2: Coding of the variables of the three-factor model of SDR

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Name of the factor</th>
<th>Range</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIDR14</td>
<td>Need for social approval</td>
<td>[0; 14]</td>
<td>$N_h$</td>
</tr>
<tr>
<td>PUBLIC/EXPUB</td>
<td>Lack of anonymity or “Publicness”</td>
<td>0,1</td>
<td>$P_h$</td>
</tr>
<tr>
<td>TRAIT</td>
<td>Trait desirability</td>
<td>0,1</td>
<td>$T_h$</td>
</tr>
</tbody>
</table>

In the first model hypothesis 1 is tested. This is done by means of an ordinary probit regression model with the dummy variable $posWTP_h$ as dependent variable. This variable is 1 for respondents with a positive WTP and zero when a respondent states a zero WTP. In addition to the usual set of demographic variables, the three SDR variables enter the regression model according to 4.1. In that equation, $s_h$ is a $j$-dimensional vector of characteristics of household $h$ as well as the whole interview setting. Accordingly, $y$ is a $j$-dimensional vector of coefficients (Haab and McConnell 2002, p. 26). It thus holds that

$$y_{s_h} = \sum_{j=1}^{J} y_j s_{jh}. \quad (4.1)$$

This relationship is of importance in order to assess the influence of characteristics of the respondent or the interview procedure on WTP statements. It is the vector $s_h$ that comprises all explanatory variables of the WTP estimation model, such as respondent’s demographic and attitudinal variables as well as specific settings of the interview process. Consequently, the SDR variables have to be included in this manner, as well.

The second model refers to hypothesis 2. In order to test the influence of SDR on the specific WTP amount, the above factors have to be included as explanatory variables in an estimation model. This model for payment card CV as introduced in section 2.2.2 is basically a maximum likelihood procedure (cf. Cameron and Huppert 1989). The log likelihood function of the PC approach is specified in 2.24 for respondents $h = 1, \ldots, H$. Similar to model 1, it can be extended to include more explanatory variables besides the boundaries of the selected PC interval according to 2.25. After setting up the basic models to find determinants of positive WTP and the specific WTP amount, respectively, the inclusion of the factors of SDR should be illustrated. The interpretation of the influence of the respective coefficients is the same in both models and will be discussed in the following.
The three-factor model of SDR gives clear instructions how the three factors are to be combined to yield the SDR variable that will be included into the model as additional explanatory variable. As a result of the non-compensatory nature of the relationship between the three factors they have to be multiplied. From an econometric perspective, the model appropriate for the inclusion of three mutually influencing variables is a fully specified interaction model (cf. Brambor et al. 2006, Kam and Franzese 2007). Thus, the factors enter the estimation equation both separately and multiplicatively connected. With this model in its fully specified form the vector of explanatory variables reads

\[ \gamma_{sh} = \sum_{j=1}^{J} \gamma_{y} s_{jh} + \delta_{1} N_{h} + \delta_{2} P_{h} + \delta_{3} T_{h} + \delta_{4} N_{h} P_{h} + \delta_{5} N_{h} T_{h} + \delta_{6} P_{h} T_{h} + \delta_{7} N_{h} P_{h} T_{h}. \]  

(4.2)

In this equation, \( N_{h} \) is the need for approval score, \( P_{h} \) the level of “publicness” and \( T_{h} \) the trait desirability rating of respondent \( h \) (cf. table 4.2). Assuming that \( N_{h} \) is continuous and both \( P_{h} \) and \( T_{h} \) are binary variables describing a certain state, the interpretation of the coefficients \( \delta_{1} \) to \( \delta_{7} \) is as follows. \( \delta_{1} \), \( \delta_{2} \), and \( \delta_{3} \) describe the influence of the respective factors of SDR on WTP if the two other factors are zero, respectively. For instance, if both need for approval \( N_{h} \) and trait desirability \( T_{h} \) are zero, \( \delta_{2} \) indicates the effect of the fact that the interview is not completely perceived to be anonymous. Coefficients \( \delta_{4} \), \( \delta_{5} \), and \( \delta_{6} \) describe the influence of an interaction of two factors on WTP when the respective third factor is zero. Coefficient \( \delta_{5} \) for example represents the effect of need for approval on WTP for respondents who perceive trait desirability but no lack of anonymity. That means that this coefficient describes the effect of a two-part interaction of need for approval and trait desirability when lack of anonymity is zero. The other two coefficients of this kind, \( \delta_{4} \) and \( \delta_{6} \), also indicate the impacts of such two-part interactions with the respective third factor being equal to zero. As hypothesized according to the three-factor model, these two-part interactions are not expected to be significantly different from zero.

The main coefficient of interest, however, is \( \delta_{7} \), the coefficient of the overall interaction term. If this coefficient is significantly positive, hypotheses 1 and 2, respectively, cannot be rejected. This means that there is a significantly positive influence of SDR when all three factors are non-zero.

25 Note that this equation indicates the general form of a regression model. Although it was mentioned that a probit model is employed to test hypothesis 1, the focus at this stage is on the form of inclusion of explanatory variables. Therefore, this general form is chosen.
Analogously, $\delta_1$ to $\delta_6$ are not expected to be significantly different from zero because these coefficients express the simultaneous influence of one or two SDR factors when the respective rest of the set of factors is zero. According to the three-factor model, in such situations there would be no influence of (such an incomplete form of) SDR on WTP statements.

As an alternative to the fully specified interaction model, a short version of that model will be applied, too. In general, interaction models with three interacting variables are unlikely to yield significant results because the presence of so many product terms computed of the same three factors leads to relatively high correlations between these additional explanatory variables. Therefore, the fact that the two situational factors are binary can be exploited and they can simply be multiplied to yield one new factor. So, after multiplying trait desirability $T_h$ and lack of anonymity $P_h$, the new dummy variable $PT_h$ is equal to one for respondents who do not perceive perfect anonymity and rate the desirability of stating higher WTP amounts higher than stating lower amounts. The new variable is equal to zero when either both or just one of the original variables are zero. It consists of the two situational components of incentives for SDR and is thus the situational precondition for the third factor, need for social approval, to be able to exert influence on WTP statements. This means that only in situations which are favorable to the influence of SDR incentives (i.e. without perfect anonymity and with trait desirability at the same time) can an influence of need for social approval be expected. Thus, this new situational dummy can be interpreted as a moderator of the influence of need for social approval on WTP statements. According to hypotheses 1 and 2, when the dummy is 1, need for approval potentially influences WTP, and when it equals zero there is no such influence. With this short interaction model, the basic character of the three factor model to integrate both personal and situational components of SDR is preserved. The alternative interaction model with need for social approval $N_h$ and the product of trait desirability and lack of anonymity $PT_h$ for respondent $h$ has the form

$$y_{S_h} = \sum_{j=1}^J \gamma_j s_{jh} + \delta_1 N_h + \delta_2 PT_h + \delta_3 N_h PT_h.$$  \hspace{1cm} (4.3)

Again, when the coefficient of the interaction term $\delta_3$ is significantly different from zero, hypotheses 1 and 2, respectively, cannot be rejected. At the same time, the coefficients of the two constituent terms $\delta_1$ and $\delta_2$ should not be significant. These two interaction models constitute the way the additional social desirability variables will be included into the model to estimate determinants of WTP. In addition to this empirical test of the three-factor model, the main effects of the three factors will be tested. This will be done
by including the all factors \( N_h, P_h \) and \( T_h \) independently. According to hypotheses 1 and 2, there should be no independent influence of any of the factors on the decision to state a positive WTP and on the specific WTP amount, respectively.

Model 3 tests the influence of the enhancement and denial components as expressed in hypothesis 3. To this end, the need for social approval score \( N_h \) is replaced in all models specified above in turn by a score of all enhancement items \( N^e_h \) of respondent \( h \) and a score of all denial items \( N^d_h \), respectively. Apart from this, nothing else changes in the respective models. That is, first the model of WTP determinants according to 2.24 is calculated including in turn the fully specified interaction model, the short interaction model, and the main effects model for both enhancement and denial. In addition to all this, two more models are tested including both \( N^e_h \) and \( N^d_h \) simultaneously. This is firstly, the main effects model including both the enhancement score \( N^e_h \) and the denial score \( N^d_h \) as well as the other two factors \( P_h \) and \( T_h \). Secondly, the last variation uses the two interaction terms that can be calculated with the enhancement and the denial score only, i.e. \( N^e_h P_h T_h \) and \( N^d_h P_h T_h \). In both of these models the relative influence of the enhancement and denial components can be compared directly.

### 4.4. Summary

This chapter integrated the concept of SDR as developed in chapter 3 into the framework of the CVM. Two main reasons can be found why concern for the occurrence of SDR in contingent valuation surveys is justified. Firstly, CVM is a survey-based technique that assesses statements about intended behavior, i.e. the WTP statement. If respondents only indicate what they would do under certain circumstances they have the chance to please the interviewer by simply modifying their verbal response without having to change actual behavior. Secondly, in today’s societies pro-environmental behavior is heavily charged with social norms. If more and more people hold pro-environmental attitudes, the statement of indifferent or negative views regarding the contribution to the provision of environmental goods is associated with costs in the form of social disapproval. As a consequence, respondents anticipating such disapproval are likely to bias their responses in order to comply with the norms they perceive. Subsequently, some approaches of SDR research in contingent valuation were reviewed. Most of these empirical studies compare mean WTP estimates across survey modes and often find mode effects. Generally, surveys employing interviewers, such as in-person and telephone surveys, elicit higher WTP statements than mail.
or self-administered surveys, which do not rely on the active involvement of an interviewer. However, it is argued that this finding is rather a necessary than a sufficient condition of the existence of SDR. Instead, a more direct approach, such as the administration of a social desirability scale along with the CV survey and the inclusion of other factors of this response bias, has to be employed.

In the second part of the chapter, section 4.3 developed the research hypotheses and introduced the specific research design for the empirical study reported in chapter 5. That section dealt with the direct influence of SDR on WTP statements. The main assertion of the three-factor model of desirable responding is expressed in hypotheses 1 and 2: If all factors are present there is a significant influence of SDR on WTP statements. This can be tested by including the three factors into the regression model to identify the determinants of WTP responses as an interaction model. Different specifications of this model will be tested in the next chapter; these are a fully specified interaction model, a short interaction model and the main effects model which includes all factors independently. This analysis is done in two steps. Hypothesis 1 specified that there is an effect of incentives for SDR on the decision whether to state zero or a positive WTP amount. Individuals perceiving such incentives are expected to be more likely to give a positive WTP response. Similarly, hypothesis 2 states that the presence of all three factors biases the stated WTP amounts upwards. Respondents who feel the incentives to answer in a socially desirable manner are expected to state systematically higher WTP amounts than respondents without such incentives. The research design consisting of the different types of regression models apply to both steps of this analysis. The last aspect to be discussed in that section was the relative influence of the enhancement and denial components of need for social approval on WTP. Following the notion of loss aversion in prospect theory, the influence of the denial component on WTP is expected to be stronger. This expectation is expressed in hypothesis 3. Therefore, in all the above models the overall need for approval score is replaced by separate enhancement and denial scores to test their relative impact on WTP statements.