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NORMS, SELF-SANCTIONING, AND CONTRIBUTIONS TO THE PUBLIC GOOD

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Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Orlando, FL, February 6-9, 2010

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ABSTRACT

The relationship between norms, self-sanctioning, and people's decisions about contributing to public goods is complex and often misunderstood in the public goods literature. We develop a model in which individuals hold an injunctive norm indicating how much they believe one should contribute to the public good. From the model we derive the following testable hypotheses: an increase in one's perception of the norm level of contribution to the public good (1) induces negative self-sanctioning and (2) will lead one to contribute more to the public good, and (3) that contributing to the public good induces positive self-sanctioning. To test these hypotheses, we elicit stated preferences for contributions to an organization which offsets carbon emissions and a proxy for self-sanctioning, change in respondent "self-image."

INTRODUCTION

Explications for observed levels of private provision of public goods, which often are higher than predicted by standard economic theory (Andreoni 1988, Ostrom), have evolved from simple models in which people care only about private good consumption and public good consumption (e.g. Bergstrom et al.) to models in which people actually enjoy the act of provision itself (Andreoni 1990) to more current and ever more complex models. The reason for the growing complexity is the need to explain other phenomena associated with providing public goods, for example: adverse effects of incentives designed to increase private provision, the role of norms and social pressure on behavior, and the role of sanctioning in decision-making (Bénabou and Tirole).

Herein, we examine the interaction between norms and sanctioning. By "sanctioning" we mean voluntary punishment or rewards inflicted by one person onto another (or oneself) who engages in a certain behavior. This kind of sanctioning often takes the form of reduced or increased social approval (Holländer), moral standing (Sugden), or reputation (Bernheim).[1]

In some cases, for example Bernheim, and Akerlof, it is this preference for reputation, approval, etc. which is used to model the *emergence* of conformity, or norms, in the first place. Akerlof assumes people earn a reputation value dependent upon whether or not they abide by some expected behavior. Bernheim sets up a basic model (upon which Bénabou and Tirole, and Andreoni and Bernheim are based) in which esteem is awarded based on the continuously valued perceived "type" of the individual, the term "type" referring to a level of whatever quality is under discussion: generous, kind, environmentally-concerned, etc.

[1] We refer to increases in prestige, etc. as positive sanctioning, and decreases as negative sanctioning.

In other cases, for example Brekke et al. and Bruvoll and Nyborg , sanctioning, which, in their models takes the form of a lower or higher "self-image," is *influenced by* a norm behavior (a given level of contribution to the public good). Self-image depends not on one's perceived "type" as in Bernheim, but in the action taken itself, and the more one's behavior deviates from the "norm" behavior (determined endogenously in Brekke et al. and exogenously in Bruvoll and Nyborg), the lower one's image. This is consistent with much of the sociology, psychology, and marketing literature on *self-image* or *self-concept* congruence, whereby the difference between people's image of themselves and their image of how they would like to be (or, in the marketing setting, the image associated with a product available for purchase) determines how likely they are to engage in a behavior (i.e. buy the product).[2]

There are evidently two main differences between the Bernheim model and the Brekke et al. model. First, as already mentioned, in the Bernheim model sanctioning depends on others' perception of one's type which is signaled by an action, whereas in Brekke et al., sanctioning is dependent upon the action itself. Secondly, whereas in Brekke et al. a change in the norm induces sanctioning, in Bernheim it does not, at least directly. In Bernheim's equilibrium, people's perceptions of type based on an action signal and people's actions themselves must be consistent with each other. If one changes his behavior, in particular away from the norm, he will suffer a penalty in terms of a damaged reputation because others infer his type to be different; if it were possible to change the norm without changing people's inferences about type, there would be no reason for individuals to alter their behavior. Both of these differences stem partially from the fact that Bernheim deals with social reputation, a setting in which inferences

[2] A seminal paper in the marketing literature on this subject is Grubb and Grathwohl. More modern papers include Mehta, and Fitzmaurice (general discussion) and Chang, and Heath and Scott (on, respectively, smoking and the automobile market.)

about one's true character based on an action signal play a natural role. Yet the self-sanctioning of Brekke et al. could also play a role in such a setting but is not permitted in Bernheim.

The primary contribution of this paper is to empirically test whether or not decisions to give to the public good are influenced by self-sanctioned injunctive norms[3]. We find that indeed they are, and this suggests that a more complete model involving the creation of norms from Bernheim and the affect of norms on behavior from Brekke et al. is desirable. To perform the empirical test we focus on self-sanctioning. Bernheim-model papers and Ariely et al. concentrate on how one is perceived by others, probably because it is more difficult to measure or make inferences about how one views himself, although Ariely et al. do mention that self-image could be absorbed by the constant term in their regression. The second contribution of this paper, therefore, is showing that self-sanctioning, which is independent of observation of one's behavior (by others), affects decisions to provide a public good.

HYPOTHESES

We posit that people decide how much to give to a public good in the context of a utility maximization problem similar to that proposed by Brekke et al.:

$$\text{Max}_c \; u(x, G, s) \qquad \text{s.t.} \qquad \begin{aligned} x &= 1 - c \\ G &= p + c \\ s &= s(n, c) \end{aligned} \qquad (1)$$

People choose their monetary contribution, *c*, to maximize their utility, the arguments of which are numeraire consumption level, *x* (income normalized to 1), the public good level, *G* (*p* is

[3] We define a statistical norm simply as what is generally done in a population, whereas an injunctive norm is what *should* be done. See Interis for more discussion on norms.

exogenous public good provision), and level of (self) sanctioning, *s*. Utility is increasing in each of its arguments. Self-sanctioning depends on how much one contributes to the public good and some norm level of contribution to the public good, *n*. It is the investigation of these two properties that is the main objective of this paper.

One way of thinking about the norm in this setup is that it has already emerged, in the sense of heterogeneous people conforming to some behavior, perhaps along the lines of Bernheim. But then at some point, the norm became internalized such that changing the norm affects utility directly. For example, suppose someone, so as not to appear unfriendly, joins a group of work peers for lunch every day. He sends a signal (going to lunch) from which others infer his type (friendly) *a la* Bernheim. Soon he begins to actually enjoy the lunch gatherings in and of themselves such that if one day everyone else decides not to go to lunch (which does not reflect on him anything about his friendliness) he is disappointed.

To look at the effect of norms on behavior directly rather than through changes in perceptions of one's type we focus on self-sanctioning rather than social (or, external) sanctioning. We assume, as does Bernheim, that an individual knows with certainty his own type. If someone changes his action (gives more or less to the public good), assuming his type actually does remain constant he will infer this to be the case precisely because he always observes his own type with certainty. Nevertheless, he may or may not self-sanction. Any one of the forms of self-sanctioning mentioned earlier (e.g. esteem, reputation, image) is equally difficult to measure. We therefore chose a change in "self-image," as reported by the survey respondent, as the proxy for self-sanctioning. More on how we measure self-image is provided in the Method section.

Our first hypothesis examines the interaction of one's decision about how much to give to the public good and sanctioning.

Action Independence Hypothesis: a person does not (positively) self-sanction if he contributes to the public good.

This test is useful for determining whether contributing induces positive self-sanctioning or if people make a contribution that is consistent with a given level of self-sanctioning. A rejection of the Action Independence Hypothesis suggests the former, in which case contribution (c) is indeed an argument of self-sanctioning (s), and $s_c > 0$ where s_c is the partial derivative of s with respect to c.

We assume that a norm public good contribution (not necessarily the same between respondents) exists and investigate whether or not changing the norm has an effect on self-sanctioning or utility in general. If, on the other hand, changing the norm does not induce self-sanctioning, there should be no resulting change in contribution to the public good since there is neither a change in utility nor a potential increase in utility from changing one's contribution.

Injunctive Norm Hypothesis: a contribution amount people believe one "should contribute" - an injunctive norm - affects their decision-making process as follows:

(i) an increase in the injunctive norm induces negative self-sanctioning.

(ii) an increase in the injunctive norm raises one's contribution to the public good.

Hypothesis (i) states that the norm contribution (n) is an argument of s, and that $s_n < 0$. Hypothesis (ii) states that if the norm increases, people will contribute more when they revisit their optimization problem (1).

DATA COLLECTION

The data come from survey responses of a National Science Foundation funded project to "develop a systematic framework for modeling the technological, economic, environmental and social aspects of the life cycle of industrial materials, and use it for improving decision making and education across disciplines about all aspects of materials use (with a focus on transportation fuels)," by professors Bhavik Bakshi, Prem Goel, and Tim Haab, of The Ohio State University.[4] The survey was administered via the internet by a private company called Knowledge Networks which has the first online research panel that is representative of the entire United States population. Survey respondents are pre-recruited by Knowledge Networks and typically answer approximately four surveys each month. Knowledge Networks provides an incentive scheme for respondents to answer the surveys and stores each respondent's demographic information so that it does not need to be collected for each survey. The present survey was administered only to residents of Ohio, aged 18 and over, and was available over a ten-day period in mid-March, 2009. Of 859 individuals sampled, 537 completed the survey (62.5% completion rate), 532 of which satisfactorily completed the survey based on minimum survey requirements.

The primary objective of the survey was to determine the optimal level of three indices, an Environmental Damage Index, a Human Health Risk Index, and a Natural Resource Use

[4] Of, respectively, the departments of Chemical and Biomolecular Engineering, Statistics, and Agricultural, Environmental, and Development Economics.

Index, which attempt to summarize effects of different vectors of pollution emissions (e.g. carbon dioxide, sulfur dioxide, ozone, etc.) resulting from different nation-wide levels of fuels uses (combinations of e.g. ethanol, gasoline, coal-generated electricity) into three broad categories. The primary task of survey respondents was to answer a series of contingent choice questions each of which provided the levels of each of the three indices and a resulting average fuel price for each given combination. As stated above, the survey was administered via the internet. With the exception of referring to definitions of some technical terms (for example, explanations of each of the indices) appearing at an earlier point in the survey, respondents were shown the entire survey in a linear manner, unable to access earlier or future parts of the survey. Each question was presented one at a time, and information was broken up into small doses (a page or two at a time) so respondents were unable to either change responses to earlier questions, or look ahead at future information before answering current questions. Part of the survey was designated to addressing the issues about sanctioning and norms presented in this paper (henceforth the word "survey" refers only to this section of the overall survey).

Respondents were asked about giving money to an organization which offsets carbon emissions. The idea of "offsetting" was explained as "[paying] for the reduction of greenhouse gas emissions from another source in order to compensate for the creation of greenhouse gas emissions resulting from your own actions." It was further explained how the money is used by the organizations, how humans create carbon emissions, and why they might give money to offset emissions. Specifically, it was pointed out that although carbon emissions have been linked to global warming, an individual acting alone will have no impact on global warming, but that their gift does in fact eliminate a certain amount of emissions from another source (i.e. it in fact "offsets"). Follow up questions in the survey attempted to control for environmental

predisposition including: past environmentally-oriented behavior, membership/contribution to environmental organizations, attitudes on global warming, and recycling habits, as well as more standard demographic attributes. The complete survey is provided in the appendix.

It was decided that for the given investigation it would be necessary to measure self-image directly since change in self-image was used as the proxy for self-sanctioning. Measuring image directly so has no precedence in the economics literature, but does have abundant backing in the sociology, psychology, and marketing literature in which image is usually measured on a Likert-type scale. For example, Fitzmaurice asks respondents directly whether a given aerobic exercise "fits their image of themselves," using a seven point scale of agreement intensity. Amos et al. come up with a list of nineteen adjectives applicable to smoking advertisements and ask survey respondents whether they agree or disagree, over a five point scale of intensity, that the adjectives describe the ad, the respondent, or the respondent's ideal self. Marsh et al. ask adolescent respondents whether 70 specific statements (based on the Physical Self Description Questionnaire) are true or false over a six point intensity scale.

It is important to note that this marketing and sociology vein of literature generally deals with the concept of *self-image congruence* which holds that decisions (usually whether or not to buy a product) depend upon the congruency (or alternatively, the discrepancy) between the image associated with a behavior or product and the image or ideal image of the individual. The traditional method has been to break image down into various attributes (e.g. sporty, elegant, sexy) and have people rate themselves and the product across each of these attributes. These measures are then aggregated into an "image" factor. Sirgy et al. develop a new method of dealing with image based on three conclusions they reach regarding this more traditional method of measuring self-image congruence: (1) it is better to measure the discrepancy directly rather

than measure two levels of image (or the attribute) and take the difference, (2) it is better to avoid pre-determined attributes so as to avoid including irrelevant attributes, and (3) in many instances, it is better to use a more global image comparison rather than comparing across attributes of image. Contrary to the first point, we measured image directly rather than a discrepancy. The reason is that in the examples used in Sirgy et al., direction of discrepancy is either not important for their purposes or not addressed. For example, they ask only *how far* the image of a product is from the image of the respondent (on some scale such as: very similar - not similar) but the direction is not asked (e.g. *more* or *less* sexy, intelligent, etc.). In our study, it would be difficult to interpret results in which respondents award others who engage in higher levels of giving to the public good a lower image value than those who engage in relatively lower levels of giving to the public good.[5] Furthermore, if respondents rate themselves instead of others, there should be no discrepancy at all if self-sanctioning is indeed independent of their actions (the Action Independence Hypothesis).[6] To prohibit this possibility, we measure image directly.

A compromise also had to be reached in implementing the second conclusion of Sirgy et al. We administered a preliminary draft of the survey to a convenience sample (size 8) to check for general understanding and ability to answer the survey. Since it was primarily a check for clarity, respondents were simply given a Microsoft Word document of the survey sent to them through e-mail. Following Sirgy et al., we asked respondents to picture someone who gives $Y to offset carbon emissions, and then to write down what adjectives they might use to describe such a person. Respondents were then asked to "rate the image" of such a person on a

[5] However, this might make sense in a social setting in which people that are *too* generous in giving to the public good face a penalty by being perceived as showy or holier-than-thou.

[6] How would one answer a question such as, "What would be the difference in your image between if you gave $100 to charity and if you gave $10?" It is not too difficult to imagine the respondent being offended at the implication there should be any difference whatsoever.

continuous scale from 0-10. They also had to rate their own image on the same scale (see appendix). Respondents were given an open-ended question at the end of the survey which asked: "We'd like to know if you found any part of this information or any of these questions confusing. If so, please explain below why you thought it was confusing."

This preliminary draft performed poorly (perhaps predictably so); the respondents (3 out of the 8) did not know how to interpret "image" in order to make a judgment about the answer to the rating question. One of the causes of this failure, which was not present in the Sirgy et al. setting, was precisely our decision to measure image directly rather than the congruence of image; it is easier to answer a question which asks one to rate how "like me" or "similar to me" or "consistent with how I see myself" someone else who gives $Y is because respondents can summon whatever criteria they wish to answer the question since they know what they themselves are like. To simply rate someone else's image, however, leaves one wondering as to the appropriate criteria. People have a much stronger concept of what "like me" means than they do about what "image" means. In a second round of revision, it was decided that some specific attributes of image would be suggested[7]. Given the context of carbon offsetting, we decided to ask respondents to consider peoples' images as "environmentally-concerned (or responsible, or aware, or active)." The question about describing a person who gives $Y was still included so that people were free to call to mind their own relevant attributes. Also, in the actual questions, respondents were asked to rate the "environmental image" of themselves and someone else who gives $Y, with the aim of still trying to assess image at the global level as recommended by Sirgy et al.

We administered this second version of the survey in a pre-test via Knowledge Networks to a sample of 34 respondents. This pre-test took the form of the final survey. That is,

[7] Also, some minor changes were made to the language of the survey for purposes of clarity.

respondents answered the survey via the internet, and were shown the information and questions piecemeal, unable to move forward or backward in the survey, as described earlier. After the revisions based on the convenience sample responses, which essentially proposed some criteria on which to base their rating, but did not limit their rating to be across those criteria, the pre-test respondents generally felt comfortable answering the image rating questions. None of the 34 respondents indicated in the response to the same open-ended question (above) that he or she had any difficulty answering the survey. We believe the final form of the survey to still have the spirit of the Sirgy et al. approach. We also checked the pre-test results to make sure that the random components of the survey (described below) appeared random, and indeed they did. After this series of checks and changes, the final version of the survey was administered to the final sample of 537 respondents.

METHOD

There are two main questions of the survey pertinent to the analysis: (1) suppose you had to rate your own environmental image on a scale from 0 to 10, with 10 being the highest possible environmental image and 0 being the lowest possible environmental image. What image rating would you give yourself?, and (2) would you be willing to give $B to offset carbon emissions (see appendix)? We will refer to these two questions as the self-image question and the contribution question, respectively (these labels are used only for clarity in this paper and were not used in the actual survey). The order in which the questions were asked was randomized.

If the Action Independence Hypothesis is true, then the self-image rating of a respondent who gives a positive contribution should not change depending upon his answer to the contribution question (his self-image will be the same before and after he contributes so there is no positive self-sanctioning). Therefore, the random ordering of the contribution question and the self-image question serves to test the Action Independence Hypothesis – if the order of these two questions matters, the hypothesis is rejected. If the order does matter, the marginal effect of the contribution question response on self-image can be estimated. Since information and questions were presented in a linear fashion, the random ordering of the questions provides for a clear test.

Before explaining the test for the Injunctive Norm Effect Hypothesis we must first explain how the norm was handled in the survey. As a general rule, when investigating a certain policy using surveys, the researcher tries to avoid any manipulation of or influencing of people's perceptions, preconceived notions, etc., in order to avoid biasing survey responses. However, the survey here is not undertaken in order to investigate specific potential policy but only to investigate in general how norms and self-sanctioning influence people's decision-making (in a public goods provision context). Particularly, we want to know: if an injunctive norm exists, and if it changes, what happens? It was therefore decided that there should be no harm, given the present research agenda, in establishing/eliciting the norm, towards the beginning of the survey, before the two main questions are asked.

The "norm" in this case is an amount of money given to the carbon offsetting organization. First, a norm anchoring statement was provided which gave an amount $A that the average person who offsets emissions gives each year. The value A randomly took on one of two values, 21 and 32. This statement was followed by a norm elicitation question which asked

the respondent to choose a range he or she thought the average person actually *should* give (see appendix). Although not essential here, it would have been preferable if the order of the norm anchoring statement and norm elicitation question could have been randomized along with the image rating and CV questions, but not doing so saves at least a handful of treatments in the survey design. The main requirement for the analysis is to see if an injunctive norm exists and, if so, to know what it is. The response to the norm elicitation question is assumed to be the value of the injunctive norm, *n*, – how much the respondent thinks the average person actually should give. The astute reader will also notice that the norm anchoring statement refers to the average *carbon offsetter* whereas the norm elicitation question refers to a "someone" from the general population. One could therefore argue that the respondent is misled into holding an artificially high norm (since the average person in the general population gives nothing). We would counter-argue that it is the respondent's choice to tie his or her norm response to the average person in the first place, and regardless, it does not matter so long as the value from the norm elicitation question is actually what drives the responses to the image rating and contribution questions. The actual value of the norm used was the midpoint of the ranges in the norm elicitation question, or $0 or the maximum value presented, if the respondent chose "nothing" or "quite a bit more than...", respectively (see appendix).

Testing the Injunctive Norm Hypothesis therefore amounts to checking whether the norm, for part (i), significantly affects image and is negative, and for part (ii), significantly affects contribution and is positive. If so, the hypothesis is not rejected and there is reason to believe that an injunctive norm exists and that it affects behavior. One would require only the assumption that self-sanctioning is an argument of utility to argue that a change in norm affects decision making directly (without a corresponding change in perceptions, as in Bernheim). In

general, people should be able to re-optimize their utility by altering their behavior when negative self-sanctioning results from a change in the norm.

Self-image was measured on a scale 0, 0.5, 1.0, 1.5,..., 10.0. Respondents were also asked to rate the image of a hypothetical other person on the same scale. Ten observations were dropped in which the respondents gave themselves an extremely high image rating (≥9.5), contributed nothing, and gave the theoretical person an extremely low image rating (≤0.5) - deemed "protest responses" for lack of a better term. Twenty-six additional observations were dropped because of missing responses on key questions. Thus the complete sample of usable observations was 496, all or a subset of which were used, depending upon the hypothesis being tested.

The respondents were asked whether or not they were willing to give a certain amount to offset carbon emissions, $B. If they answered "yes" they were then asked if they would be willing to give a higher amount, B_H. If they answered "no" they were asked if they were willing to give a lower amount, B_L. The proxy for actual willingness-to-pay was B_H, B, B_L, or 0, depending upon their responses to the two questions ({yes, yes}, {yes, no}, {no, yes}, and {no, no} respectively). In effect a lower bound was obtained on each respondent's willingness to pay, which itself could be estimated if so desired. The respondents did not actually make a payment and were made aware that the payments were only hypothetical. We explained this to respondents with the following statement which aimed to induce respondents to carefully consider their response, as proposed in Hoehn and Randall:

> We are asking these questions to gather information about people's opinions on environmental issues. You will not actually have to make any payment as a direct response to answering this survey. However, we ask you to please answer as honestly and accurately as possible since your responses will be used to help decision makers decide the future direction of environmental policy.

It is accepted that hypothetical voluntary payments in surveys can be much higher than actual willingness to pay (Champ et al., Berrens et al.). Because of free-riding, respondents will have an incentive to strategically state a willingness to pay that is higher than their actual willingness to pay if they believe that the provision of the public good depends on total aggregate contributions exceeding the cost of provision and that their stated willingness to contribute will not be collected (Hoehn and Randall). We believe that there should be little *strategic* reason to overstate willingness to pay in our survey since the hypothetical situation in the survey closely mimics the actual setting in which respondents might contribute; in either the real or hypothetical setting, people would be making a contribution that results in a decrease in greenhouse gas emissions from another source, and the amount offset by their contribution is independent of what anyone else does. Both Champ et al. and Berrens et al. conclude that controlling for respondent response uncertainty (for example, asking them how certain they are that they would actually contribute the stated amount) can result in estimates of willingness to pay which are much closer to actual willingness to pay in a hypothetical voluntary contribution survey. Also, it may at times be desirable to use voluntary contributions as the payment mechanism if, for example, it is similar to a real contribution setting (as we claim is the case in our survey) or if it is not believable that something like a tax or bond (which are generally believed to be more incentive-compatible if passed via referendum) would be used to raise revenue for the public good as might be the case for a relatively inexpensive project (Berrens et al.) Unfortunately, no measure of respondent uncertainty was collected in our survey.

EMPIRICAL MODEL AND RESULTS

The three main pieces of information collected were the respondents' hypothetical contributions to carbon offsetting, *c*, their self-image ratings, *I*, and their values for the norm contribution, *n*. Additional variables of interest included the respondent's concern for global warming (1=not concerned, 4 = extremely concerned), a self-reported measure of political ideology (1=extremely liberal, 7 = extremely conservative), a dummy variable for whether or not the respondent had engaged in environmentally-oriented activities in the past, a dummy for whether or not the respondent recycles regularly, and demographic variables age, income, number of children in the household 17 or younger, current employment status, and education, which was measured both in total years of schooling, and with dummies for degrees received (high-school diploma, 2-year degree, 4-year degree, Master's degree, and Ph.D). Also, there was a dummy variable for whether or not the contribution question came before the image-rating question (=1 if so) to test the Action Independence Hypothesis. Summary statistics for the non-dummy variables are presented in table 1.

TABLE 1 – Summary Statistics

Variable	Mean	Standard Deviation
Contribution	12.03	16.02
Norm contribution	16.08	20.15
Self-image Rating	4.79	2.47
Global Warming Concern	2.04	0.81
Political Ideology	4.25	1.47
Children in Household	0.48	0.94
Bi-monthly Income	2290.05	1429.19
Initial Contribution*	27.53	9.09

Notes: N = 496. *This is the amount the respondent was initially asked to contribute.

The choice of econometric model was largely driven by testing the Injunctive Norm Hypothesis, which is the main concern of this paper. According to the theoretical setup above, agents choose a contribution to the public good to maximize their utility where self-sanctioning is one of the arguments of utility and is a function of the norm and the contribution. Thus theoretically, self-sanctioning and contribution are determined jointly, there is endogeneity, and somehow this must be accounted for. We estimated a three-stage least squares model (3SLS) on the full sample, according to the following structural equations:

$$c = \alpha_0 + \alpha_1 I + \alpha_2 n + \alpha_y^{'}\mathbf{y} + \alpha_z^{'}\mathbf{z}_1 + \varepsilon_c \qquad (2.1)$$

$$I = \beta_0 + \beta_1 c + \beta_2 n + \beta_y^{'}\mathbf{y} + \beta_z^{'}\mathbf{z}_2 + \varepsilon_I \qquad (2.2)$$

The variables *c*, *I*, and *n* are defined earlier as the contribution to the public good, self-image, and norm contribution, respectively, and α_y, α_z, β_y and β_z are vectors of parameters. **y** is a vector of exogenous variables common to both equations: the measures of political ideology and concern for global warming. **z** is a matrix of non-common exogenous control variables, where $\mathbf{z}_1$ includes number of children in the household 17 or younger, an employment dummy (=1 if employed), income, and initial contribution amount the respondent was asked if he was willing to give. $\mathbf{z}_2$ includes the recycling dummy and the dummy for past engagement in environmentally-oriented activities. Age and education had no effect on the dependent variables or the sign or significance of the parameters on any other independent variables so they were therefore not included in the final results. Also, measuring concern for global warming and political ideology on scales rather than assigning dummy variables for each possible response makes no difference on the sign or significance of the results. This model specification is

motivated by the supposition that one's contribution depends more on concern for the future (number of children) and ability to contribute (income and current employment status) whereas one's environmental self-image depends more on actions undertaken (e.g. recycling, past environmental stewardship).

The Hausman specification test of the null hypothesis that both the 3SLS estimator and the two-stage least squares (2SLS) estimator are consistent but the former is more efficient, with the alternative hypothesis that only the latter is consistent, results in a failure to reject the null, indicating that there are efficiency gains to estimating the variance-covariance matrix (see Greene). We therefore use the 3SLS estimator.

ACTION INDEPENDENCE HYPOTHESIS

To test the Action Independence Hypothesis we limit the sample to include only contributors (N= 211) since we want to know: if someone contributes, does he positively self-sanction? For those who choose not to contribute, there is no change in behavior, so there is no comparison to be made. The test involves the basic model as described above, but with a dummy for whether or not the contribution question was asked before the image questions (=1 if so) included as an independent variable in equation 2.2. If the parameter on this dummy is significant, the hypothesis is rejected and we conclude that positive self-sanctioning results from contributing to the public good. Although equations 2.1 and 2.2 (with the contribution question dummy) are estimated jointly using 3SLS, we present only the parameter estimates for equation 2.2 since the Action Hypothesis is concerned only with the effect of contribution on self-sanctioning. The results are presented in table 2.

TABLE 2 - Action Independence Hypothesis Results

Variable	Estimate	t-value
Contribution question first (dummy)	0.52	1.83*
Norm contribution	-0.01	-1.29
Contribution	0.02	1.21
Concern for Global Warming	0.91	4.42***
Recycling dummy	1.35	4.18***
Past Environmental Activity	-0.04	-0.15
Political Ideology	0.24	2.20**
Intercept	0.69	0.79

Notes: Dependent variable: self-image. Significance: * indicates 10 percent level, ** indicates 5 percent level, *** indicates 1 percent level. N = 211.

The parameter on the dummy for whether or not the contribution question was asked first is positive and significant, with a magnitude of 0.52. This indicates that if someone contributes he will give himself an image rating that is roughly 0.52 points higher, on a scale from 0 to 10, than his self-image rating prior to contributing. The Action Independence Hypothesis is therefore rejected and we conclude that after contributing, one self-sanctions positively, here in the form of a higher environmental self-image rating.

Other estimates show that, amongst contributors, the more concerned one is with global warming and if one recycles, the higher will be his self-image rating. Also, the more conservative one is, the higher one's self-image rating.

INJUNCTIVE NORM HYPOTHESIS

The results used to test the Injunctive Norm Hypothesis are presented in table 3. If the parameter on the effect of the norm on self-image is negative and significant, we fail to reject hypothesis (i). If the parameter on the effect of the norm on contribution is positive and significant, we fail to reject hypothesis (ii). Although the dummy for whether or not the

contribution question was asked first is significant among contributors, as shown in the previous section, it is not for the general sample, and so it is not included in the regressions of table 3. However, including the dummy in the model here (for the entire sample of qualified observations, N = 496) does not change the signs or significance of any parameters and their magnitudes are virtually identical.

The parameter on the effect of the norm, the amount the respondent thinks the average person should contribute to carbon offsetting, on self-image is indeed negative (-0.05) and significant at the five percent level, as shown in the second column of table 3. The Injunctive Norm Hypothesis (i) is therefore not rejected, indicating that respondents negatively self-sanction when the amount they feel someone ought to contribute increases. Contribution, on the other hand, has a significant positive effect (0.14) on self-image; a higher contribution leads to positive self-sanctioning *ceteris paribus*, as assumed in the theory presented in (1). This result leads one to believe that, even in a social public goods setting such as the Bernheim model, self-sanctioning could be important in the decision-making process.

TABLE 3 –Injunctive Norm Hypothesis Results

	Dependent Variable	
Variable	Contribution	Self-image
Self-image	3.51	--
	(2.50)***	
Contribution	--	0.14
		(2.53)***
Norm contribution	0.39	-0.05
	(10.82)***	(-2.12)**
Global Warming Concern	1.04	0.20
	(0.73)	(0.80)
Political Ideology	-1.45	0.23
	(-3.04)***	(1.97)**
Children Under 18	0.44	--
	(1.03)	

Cuurently Employed (dummy)	1.25 (1.17)	--
Initial Contribution	0.10 (1.43)	--
Bi-Monthly Income	0.00 0.46	--
Recycling (dummy)	--	0.40 (1.42)
Environmental Activity (dummy)	--	0.16 (1.23)
Intercept	-10.82 (-2.45)***	2.20 (3.52)***

Notes: t-values in parentheses. Significance: * indicates 10 percent level, ** indicates 5 percent level, *** indicates 1 percent level. N = 496.

The first column of table 3 shows that the norm contribution raises the contribution by $0.39 for each additional dollar of the norm and is highly significant; the hypothesis that an increase in the norm raises one's contribution (ii) is not rejected. The result that a higher norm contribution leads to a higher actual contribution is not very surprising since it simply indicates that respondents' actual behavior is consistent with what they think one should do.

There are a few other noteworthy results. First, the more conservative one rates himself, the less he will contribute, but the higher he will rate his environmental self-image. This could almost be interpreted as a criticism amongst conservatives of the ability of environmental self-image to act as a proxy for self-sanctioning, or alternatively, as a criticism of the implication that this particular action, contributing to a carbon offsetting organization, should have any effect on self-sanctioning. Only six respondents actually commented that the former was the case, although others could have felt that way and not said so. On the other hand, there were many comments in support of the latter assertion; several respondents questioned the effectiveness of a contribution in the first place, others explicitly did not trust the government to spend

contributions effectively,[8] still others said that although they would not contribute to carbon offsetting, they engage in other environmental activities so they feel no worse off not contributing.

Income and employment status are insignificant in determining contribution, perhaps because elicited contributions were relatively small ($10-50). Global warming concern, recycling, and engagement in environmentally-oriented activities do not affect self-image in the total sample of respondents, whereas the first two do in the sample of contributors only (table 2). We believe this to be resulting from non-contributors being more likely to not have a sense of environmental self-image. Someone who is more concerned about contributing to public goods is more likely to identify himself as environmentally-concerned (or responsible, or aware, or active). Someone who is not likely to engage in carbon offsetting or recycling, for example, might have less of an idea on how to answer the self-image rating question.

SUMMARY

Failure to reject the Injunctive Norm Hypothesis (i) gives credence to the hypothesis that a change in an injunctive norm, which people are assumed to hold in the first place, induces them to self-sanction. The fact that the marginal effect of the injunctive norm on self-image is negative lends support to the theory proposed by Brekke et al. Failure to reject the Injunctive Norm Hypothesis (ii) indicates that raising the norm contribution causes people to contribute more. Essentially, most kinds of public campaigns attempt to instill in people a sense of obligation to undertake a certain behavior (carpooling, helping the needy, not littering, etc.).

[8] Although the examples of carbon offsetting organizations given in the survey were private companies, it was not explicitly stated that they were such. This may be one flaw of the survey.

Whether or not these campaigns are successful in terms of raising contributions to the public good is debatable (McKenzie-Mohr gives an overview, Bator and Cialdini propose methods for a successful campaign), but if so, the first hypothesis gives us a clue as to why; people (negatively) self-sanction when they feel obligated to undertake a certain behavior. In order to offset this effect they must undertake the behavior (or "improve" their behavior for a continuous choice), and this takes place through a larger utility maximization problem which also includes, among other things, how much the individual cares about the public good in question, and tradeoffs with other uses of income.

The results from the Action-Independence Hypothesis test suggest that one contributes and then self-sanctions as opposed to making a contribution that is consistent with a given level of self-sanctioning.

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APPENDIX

THE SURVEY

We would now like to focus your attention on the Environmental Damage Index only.

One of the factors affecting the Environmental Damage Index is climate change. Suppose you have an opportunity to influence climate change and potentially lower the Environmental Damage Index. Recall that a lower Environmental Damage Index generally means less damage to plant and animal populations, and lower levels of land, water, and air pollution.

In particular, you can give money to an organization that offsets some of your greenhouse gas emissions (particularly methane and carbon dioxide) which may contribute to climate change. People cause the emissions of greenhouse gases primarily through energy use such as electricity, heating, and driving. "Offsetting" greenhouse gas emissions occurs when you pay for the reduction of greenhouse gas emissions from another source in order to compensate for the creation of greenhouse gas emissions resulting from your own actions.

[Q3.1] Have you ever contributed money to offset some or part of your greenhouse gas emissions in the past?

Yes
No

[Q3.1b] If so, approximately how often do you make contributions?

a. I contributed once in the past.
b. I have contributed a few times in the past.
c. I contribute regularly monthly
d. I contribute regularly yearly
e. I contribute regularly (other)

Money received by the offsetting organization (for example, TerraPass, LiveNeutral.org, etc.) is invested in alternative energy generation and technology that limits methane and carbon dioxide from entering the atmosphere. Most people who give to such an organization voluntarily curb their greenhouse gas emissions in other ways, but use these monetary gifts to offset those emissions that are harder to eliminate, such as necessary vehicle use, necessary electricity use, etc.

EXPERIMENTAL DESIGN NOTES:

- **The values (A, B, C, D, E) should vary according to the following scheme:**
  - **A a random draw from the set {21, 32} with corresponding X of 8 or 12% respectively**
    - **If A = 21 then B a random draw from set {15, 30} with corresponding Y of 6 or 11% respectively**
    - **If A = 32 then B a random draw from set {25, 40} with corresponding Y of 9 or 15% respectively**
      - **If B = 15, then [C D] = [21 10]**
      - **If B = 30, then [C D] = [40 21]**
      - **If B = 25, then [C D] = [32 15]**
      - **If B = 40, then [C D] = [50 32]**
  - **E is the *other* value in the set from which B is drawn (e.g. if B = 15, then E = 30)**
- **Q3.1 values.**
  - **For A = 21**
    - **[0, 1 to 9, 10 to 18, 19 to 23, 24 to 40, more than 40]**
  - **For A = 32**
    - **[0, 1 to 15, 16 to 29, 30 to 34, 35 to 50, more than 50]**

Norm Anchoring Statement: The average person who gives to such an organization gives $**[A]** per year. A gift of $**[A]** would offset approximately **[X]**% of an average American's yearly greenhouse gas emissions.

Norm Elicitation Question: To help decision makers understand what people think about these types of programs, we would like to know what you think about them. You may think that this contribution is too high or too low. In your opinion, how much do you think someone actually <u>should</u> give to offset greenhouse gas emissions?

- ○ $0 (nothing)
- ○ $1 to **[A/2]** (quite a bit less than $**[A]**)
- ○ $**[A/2+1]** to **[A-2]** (somewhat less than $**[A]**)

- $**[A-2]** to **[A+2]** (around $**[A]**)
- $**[A+3]** to **[1.7*A]** (somewhat more than $**[A]**)
- More than $**[1.7*A]** (quite a bit more than $**[A]**)

*note: this is a rough approximation of the values in this question (see design notes above). The statements in parentheses were visible to respondents.

Although, the average carbon offsetter gives $**[A]**, we are interested in whether or not you would be willing to give $**[B]** to such an organization in order to offset some of your greenhouse gas emissions and potentially lower the Environmental Damage Index. It is important to remember that an individual acting alone cannot change the Environmental Damage Index for the United States. Only if a large portion of United States residents act together can the Environmental Damage Index be reduced. Therefore, any change in the index depends on what everyone does collectively. However, a gift of $**[B]** in fact offsets approximately **[Y]**% of the average American's yearly greenhouse gas emissions.

We are asking these questions to gather information about people's opinions on environmental issues. You will not actually have to make any payment as a direct response to answering this survey. However, we ask you to please answer as honestly and accurately as possible since your responses will be used to help decision makers decide the future direction of environmental policy.

Contribution Question: Keeping in mind that an individual gift does not affect the Environmental Damage Index for the U.S. as a whole, (a large number of people would need to contribute for the Environmental Damage Index for the U.S. to be reduced), but your gift would offset **[Y]**% of an average American's yearly greenhouse gas emissions, would you be willing to give $**[B]** to offset greenhouse gas emissions?

Yes, I would be willing to give $**[B]**.
No, I would not be willing to give $**[B]**.

[Q3.4A] If yes, would you be willing to give instead $**[C]** to offset greenhouse gas emissions?

Yes, I would be willing to give $**[C]**.
No, I would not be willing to give $**[C]**.

[Q3.4B] If no, would you be willing to give instead $**[D]** to offset greenhouse gas emissions?

Yes, I would be willing to give $**[D]**.
No, I would not be willing to give $**[D]**.

We are trying to get a sense of how people view themselves in the context of environmental issues. In particular, we are interested in people's images of environmentally-concerned (or responsible, or aware, or active) people.

Self-image Question: Suppose you had to rate your own environmental image on a scale from 0 to 10, with 10 being the highest possible environmental image, and 0 being the lowest possible environmental image. What rating would you give yourself?

Description Question: Picture in your mind someone who would give an amount of $**[E]** to offset greenhouse gas emissions. What words would you use to describe such a person? Enter as many as you like below:

Other-image Question: Suppose you had to rate the environmental image of someone who gives $**[E]** on a scale from 0 to 10, with 10 being the highest possible environmental image, and 0 being the lowest possible environmental image. What rating would you give this person?

[Q3.7] Are you currently a member of any organization with an environmentally-oriented agenda such as the Sierra Club, the National Wildlife Foundation, the Nature Conservancy, or others?

Yes
No

[Q3.8] Have you ever contributed money to any such organization with an environmentally-oriented agenda?

Yes
No

[Q3.9] Have you ever engaged in any environmentally-oriented activities in your community or elsewhere such as litter cleanup, planting trees, or others?

Yes
No

[Q3.10] Do you currently have any bumper stickers on your vehicle?

Yes
No
I do not own a vehicle

[Q3.10a] What do the bumper stickers say?

[Q3.11] Do you believe that humans are part of the cause of global warming?

Yes
No

[Q3.12] How concerned are you with global warming?

a. Not concerned
b. Somewhat concerned
c. Very concerned
d. Extremely concerned

[Q3.13] Do you recycle regularly?

Yes
No

CHECK3. In the previous questions, we asked you about different ways to improve the Environmental Damage Index and other factors related to global warming.

We'd like to know if you found any part of this information or any of these questions confusing. If so, please explain below