Community Identification Moderating the Impact of Financial Incentives in a Natural Resource Dilemma

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Abstract

The role of community identification was investigated in determining the effect of different tariff systems on domestic resource use (i.e., water). To this end, over a nine month interval both consumption and survey data were collected in 278 households in the U K, 203 of which were on a variable tariff (i.e., charges are related to use) and 75 on a fixed tariff (i.e., charges are unrelated to use). Adopting a social dilemma approach, we expected a variable tariff, compared to a fixed tariff, to be associated with more sustainable water use, in particular in a period when resources were relatively short. Furthermore, in the absence of a financial incentive to conserve (fixed tariff), resource use was expected to be moderated by the extent to which people identified with their community. These hypotheses received substantial support and they were confirmed by an experimental study simulating the resource dilemma in a laboratory setting. The implications of these findings for the management of scarce natural resources in society are discussed.

Community Identification Moderating the Impact of Financial Incentives in a Natural Resource Dilemma:

One of the major challenges for society in the 21st century is to cope with a growing mismatch between the demand for and supply of natural resources, such as land, energy, and water (OECD, 1998). Unless drastic changes in society occur, the call of the Rio Earth Summit for sustainable resource use may well be viewed as a well-intended fantasy rather than a real possibility. Experts agree that long-term policies will be necessary to prevent serious shortages. And, in addition to increasing resource supply, these should be aimed at promoting conservation, in particular for domestic use (Berk et al., 1980; Gardner & Stern, 1996; Kempton, Darley, & Stern, 1992).

A behavior change, however, might be difficult to achieve as conservation poses a threatening dilemma. While it is in the interests of society and the community to collectively restrain use, individual citizens are better off not to exercise restraint. For example, during a hot and dry weather spell, households may be tempted to use as much water as is convenient, hoping that sufficient others will make an effort to conserve. Yet, as most people think this way (and there is no a priori reason why they should not), water reserves could deplete rapidly, creating a possible water shortage. This conflict between private and public interest is known as a social dilemma or, more specifically, as a <u>resource dilemma</u> (Messick & Brewer, 1983; Van Vugt, Snyder, Tyler, & Biel, in press).

The present research adopts a social dilemma approach to investigate the combined effects of two different factors that may promote domestic conservation, financial incentives (tariff system) and community-based incentives (community identification). We will first report the results of a field study, examining the role of (self-reported) community identification in the impact of different tariff systems on domestic resource use. Subsequently, a laboratory study is presented which attempts to replicate the field results under conditions of tighter experimental control. The focus in our research is on the conservation of water as example of domestic resource use, first, because it is regarded as the biggest resource threat for societies worldwide (OECD, 1998). Second, while most social-psychological research has been conducted in the domain of domestic energy use (Stern & Aronson, 1984), the topic of water conservation has been relatively ignored by social-psychologists (for exceptions, see Tyler & Degoey, 1995; Van Vugt & Samuelson, 1999).

Water Conservation as Resource Dilemma: Theory and Previous Research

This research starts off with the assumption that the reward structure underlying water use and conservation resembles the N-person Prisoner's Dilemma Game (Dawes, 1980; Van Lange, Liebrand, Messick, & Wilke, 1992; Van Vugt & Samuelson, 1999). According to this definition, it is highly attractive for people and households to use as much water as they wish at their convenience. Indeed, most people want to have the freedom to wash their car, use the dishwasher or sprinkle their garden whenever they like. Yet, scarce water reserves are not likely to be sustained for long if citizens act according to their self-interest. Thus, the situation poses a social dilemma: "Shall I restrain my use to help preserve water resources, or use the amount I want and hope that the communal resource does not collapse?"

It is easy to see how this conflict between self-interest and the collective interest intensifies in periods when water supplies fall short of demand, such as in hot and dry weather spells, or, more extremely, in an acute resource crisis. Such conditions demand collective restraint from all people involved, but, at the same time make them realize they must try to maximize their outcomes while still possible, that is, before the resource collapses (Kramer, McClintock, & Messick, 1986; Van Vugt & Samuelson, 1999).

The literature on social dilemmas generally draws a distinction between two broad classes of strategies to tackle resource dilemmas, the structural and individual-psychological approach (Messick & Brewer, 1983). This distinction is useful in thinking about ways to promote the conservation of water. The structural approach contains strategies that intervene directly in the outcome structure of the dilemma. Their primary aim is to either eliminate or soften the conflict between the self-interest and the collective interest. An example of the first type is the introduction of a hose pipe or sprinkler ban during a shortage, so that people are forced to cooperate (Van Vugt, 1999). Examples of the second type are interventions which make conservation financially more attractive by inducing a change in the tariff structure of water. A common method is the installation of domestic water meters, which makes it possible to charge households for the water they actually use, rather than charging them a fixed rate regardless of use. A use dependent or variable tariff indeed provides households with a direct financial incentive to consume less water (Van Vugt & Samuelson, 1999).

The second approach to managing resource dilemmas is psychological, and contains interventions altering the way people value and think about the resource. The most typical example of this approach are activities to promote public awareness of a resource problem, for example, via the provision of information. Another example is community-based interventions, which aim to strengthen the social norms of conservation, and make people feel more committed to and responsible for the preservation of communal resources.

The present research investigates how these two approaches might interplay in saving water. In particular, we are interested in the effects of different tariff systems, and to what extent their impact is qualified by the strength of community attitudes. From a theoretical viewpoint, this research question is relevant as it could shed some light on the interaction between structural and psychological approaches to solving social dilemmas. Thus far, theorists of social dilemmas have considered these approaches relatively independently from each other, whereby social-psychologists have tended to focus predominantly on the psychological determinants of cooperation (e.g., communication, trust, identity). In contrast, researchers in other social sciences (economics, political science) have focused more on structural aspects, such as the role of incentives and institutions (Messick & Brewer, 1983). Yet, some studies have observed an interesting trade-off between structural and psychological solutions, with structural solutions, like incentives, being more (less) influential when facilitating social-psychological mechanisms are absent (present). For example, in an experimental study using a small-group public good, it was found that the contributions among those group members regarded as low in trust increased only after a system was introduced that penalized non-contributors to the good (Yamagishi, 1986). Furthermore, employing a similar paradigm, a recent study showed that the contributions from group members whose group identification was low, fell short of that of high-identifying group members, but only when there were no penalties for defection — when there was a chance of being penalized, the contributions of both low and high identifiers were essentially the same (Van Vugt & De Cremer, 1999). Extrapolating these findings to natural resource conservation, we could expect the impact of different tariff systems, where overuse is or is not penalized, to be qualified by differences in strength of community identity.

From an applied perspective, this integrative perspective is also important as financial incentive programs by themselves have, thus far, produced rather unreliable results in promoting sustainable use (Kempton, Darley, & Stern, 1992). The size of the incentive might make an important difference as well as the way it is administered - as punishment or reward. Moreover, the success of incentives could well depend upon social-psychological factors, such as the perceived severity of the problem or expectations about other people's conservation efforts (Stern, 1992; Van Vugt & Samuelson, 1999). Indeed, it may well be that financial incentives are particularly instrumental in communities that lack the "social capital" (cf. Putnam, 1993) to tackle resource problems through voluntary restraint.

Tariff systems and water use: A personal motive to conserve

The primary result of a change in the tariff of water use, from a fixed charge to a variable use-dependent charge, is that it gives people a direct financial incentive to consume less. One would therefore expect that households on a variable tariff use less water overall than households on a fixed tariff. Intuitively, one would predict this difference to be stable across different periods of the year, even though water demands vary from time to time. A social dilemma perspective on conservation suggests, however, that this assumption may be invalid. Indeed, we claim that particularly in periods when resources are short and there is an increased need for water, a variable tariff may be more effective in promoting sustainable use than a fixed tariff.

When water reserves are abundant there is no a conflict between the interest of the individual and community. People can use however much they want, and their requests will not affect seriously the communal water reservoirs. If resources become short arid the need for water is rising — as in the summer period, for example — conflicting pressures are instilled upon people. On the one hand, they should help out their community by restraining their use; yet, on the other hand, they may be tempted to use more before the resource becomes so short that rules and prohibitions are needed to regulate use. Clearly, the desire to act selfishly is attenuated by the tariff system they are under. Under a fixed charge there is no reason to reduce their request for water. However, under a variable charge, they will be charged for overuse. Thus, following a social dilemma approach, the difference in use between the two tariff systems is expected to be more pronounced when there is less availability of water, producing a tension between self-interest and the interest of the community.

Community identification and water use: A pro-social motive to conserve.

In addition to financial motives, conservation might also be aroused by particular community-based motives. These may derive, for example, from the importance attached to the preservation of a communal resource, to being a good member of the community, or helping out others to whom one feels connected. Indeed, following a social dilemma approach, the inherent conflict between people's self-interest - to use as much water as needed - and the collective interest - to exercise restraint - could also be solved by increasing the weight people assign to the collective interest.

A potentially important factor determining the transformation from self-interest to collective interest is the extent to which people identify with the community they live in. According to social identity theory (Hogg & Abrams, 1988; Tajfel & Turner, 1986), the strength of group or community identification reflects the psychological attachment of people to their community. Community identification is assumed to induce changes in attitudes and behaviors, bringing them closer in line with the needs of the community (Turner et al., 1987; Tyler & Degoey, 1995). The facilitating role of community identification has been shown in experimental research conducted within the social dilemma tradition. Various small group studies have revealed that, to the extent that people identify more strongly with their group, they become more willing to invest in collective goods and exercise restraint in communal resources (Brewer & Kramer, 1986; Brewer & Schneider, 1990; De Cremer & Van Vugt, 1999; Kramer & Brewer, 1984). In applied research, little attention has so far been paid to the potential benefits of community identification on resource conservation (for an exception, see Tyler & Degoey, 1995). Thus, it remains to be seen whether these results extend to large-scale natural dilemmas like domestic water use.

What might be the mechanisms through which community identification enhances the willingness to conserve water when there is a resource problem? Experimental findings suggest, first, that community identification might transform the definition of self-interest to an overarching community interest so that the boundaries between the private and collective interest are blurred (Brewer, 1979; De Cremer & Van Vugt, 1999). Greater identification with the community could also help to promote restraint by an increase in the trust in other community members. High community identifiers might have more trust in others' cooperative intentions; hence, they will expect their efforts to conserve in a shortage to be reciprocated by others in their community (Brewer, 1981; Kramer & Brewer, 1986). Finally, some recent evidence suggests that community identification can raise feelings of pride in the community (Smith & Tyler, 1997; Tyler & Degoey, 1995), which could further foster conservation when there is a need for it. All three mechanisms possibly play some part in accounting for the potentially facilitating effects of community identification on conservation.

Based on the above, one could expect the strength of community identification to influence the anticipated relation between tariff structure and water use. When the need for water increases (usually during the summer months), the temptation to increase demands in households with a variable tariff is held back by the prospect of a high water bill, and this will be the same for both low and high community identifiers. However, when households are on a fixed tariff and therefore have no financial incentive to conserve, the presence or absence of a sense of community identity could make a difference. Low identifying community members on a fixed tariff have no strong motive to restrain themselves as they are neither concerned about the impact of their demand on their bill nor on the state of the communal resources. Yet, high held back in their use by a strong desire to help out their community. Thus, the main prediction of the present research is an anticipated trade-off between tariff system (as personal incentive) and community identification (as pro-social incentive) on conservation, which is summarized in the hypotheses below.

Hypotheses

Hypothesis 1: Use will be lower under a variable tariff than a fixed tariff;

Hypothesis 1a: The effect of a variable tariff on preventing overuse will be more noticeable in periods when water needs are high and resources are relatively short (two-way interaction);

Hypothesis 2: The effect of community identification on preventing overuse will be noticeable under a fixed rather than variable tariff (two-way interaction);

Hypothesis 2a: The effect of community identification on preventing overuse will be more noticeable under a fixed rather than variable tariff, in particular, in periods when resources are relatively short (three-way interaction).

Field Study on Water Conservation

Method

Participants. This study was conducted in Chandler's Ford, a relatively affluent town in the Southern part of England in the county of Hampshire. There were 593 households with a water meter in Chandler's Ford, 451 of which were charged for the amount of water used (variable tariff), while 142 were charged according to a fixed tariff' All of these properties were meter read during a nine months interval. During this period a short questionnaire was sent to each of these households, 278 of which were returned complete (47.2%), 203 from charged households (45.0%), and 75 from uncharged households (52.8%). The sample data revealed that of the questionnaires 77% were completed by men and 23% by women. The age groups represented in the sample varied from 16-30 (0.4%), 31-45 (12.9%), 46-60 (45.3%) to over 60 (41.4%). Nearly half of the households were two-person households (45.7%), the majority lived in detached houses (65.6%o), and people had lived in their houses for 13.33 years on average (SD = 7.66).

Design and Procedure. A unique setting was available for this study. In 1989 meters had been installed in all the properties in one particular area of Chandler's Ford. This was part of a national trial on water meters, conducted in several areas of the country simultaneously, which lasted for two years. Although water meters are installed routinely in new properties, currently only about ten percent of houses in the UK have a meter (OFWAT, 1996). During the trial period all properties were charged according to use, but at the end people could revert back to a fixed charge-system, which 24% of households did. Thus, at the time of our study - seven years later — all properties in the sample had a meter, but just over three-quarters of households were actually charged for what they consumed (variable tariff), whereas the rest paid a fixed rate. Both groups received quarterly water bills, indicating the amount of money charged to their account (i.e., most households paid by direct debit).

In September 1997 all 593 households in the sample received a small questionnaire by mail, which was addressed to the person in the household who paid the water bill. Of the returned questionnaires, 93% were indeed completed by the bill payer. An introduction letter was enclosed to explain the purpose of the study. It was stated that the research involved collaboration between researchers from Southampton

University and the water company to examine the relation between demographic and social variables and the domestic water demands of households. It was stated that all answers people gave would be treated confidentially. After two weeks a reminder was sent to all households participating in the study, irrespective of whether they had returned the questionnaire. Those who returned the survey within a month received a copy of the results, and a small gift (a water saving garden device).

Questionnaire. The questionnaire consisted of two parts. In the first part we asked various questions concerning their attitudes toward water use and conservation, their attitudes towards the water company and, relevant to the present study, the strength of identification with their community. To measure community attitudes we used a simple instrument (adapted from Tyler & Degoey, 1995), which contained the following three items tapping different aspects of community identity: (i) I feel strongly attached to the community I live in; (ii) There are many people in my community whom I think of as good friends; (iii) I often talk about my community as being a great place to live (1 = very strongly disagree, 5 = very strongly agree). These items correlated well (alpha = .79), and accordingly, one community identification scale was constructed. The scale had a mean score of 3.43 and a standard deviation of 0.78 A median split with a score of 3.67 as cut-off point was performed on the scale, which enabled us to contrast low (N = 133) with high community identifiers (N = 145).

In the second section we asked about the demographic make-up of the household with questions referring to the number of people in the household, number of children, age and gender, and the annual income of the household (optional). We also included questions referring to the type of housing people lived in, how long they had lived there, as well as a check on whether they were charged for their use according to a variable or fixed tariff. These questions were considered to be relevant as we expected not all people to be aware how they were charged for water (e.g., recent movers). In fact, all people in our final sample correctly identified they were charged at either a variable (N = 203) or fixed rate (N = 75) for the water they consumed.

Water Consumption Records. We collected monthly consumption figures (in 1000 liters) from each household in our sample during a nine-month period, from March 1997 Until November 1997. Meters were read on the last day of each calendar month and they were collected from these properties, with permission of the owners, by employees of the water company. Meters could be read without making an appointment with the customer as they were conveniently located outside the property (i.e., in most cases under the street pavement).[2]

Results

Our analyses proceeded in two different stages. In the first stage we examined if there were any systematic differences between the variable and fixed tariff households in terms of community identification and in terms of various demographic variables that are known to affect water consumption (e.g., age, household size, garden size, property value). In the second stage we conducted several analyses to test our central hypotheses.

Differences Between Tariff Groups. First, a comparison of the two groups revealed no differences in community identification between households that were on either a variable or fixed tariff, Chi-square (1, N = 278) < 1. The percentage high community identifiers was indeed virtually identical in both groups (variable tariff: 53.4%; fixed tariff: 48.7%).

There were differences however in the demographic make-up of the tariff groups, which could account for potential differences in water consumption. For example, the variable tariff group was comparatively older, with over 51% of the people reporting to be older than 60, whereas for the fixed rate group this percentage was 36%, Chi-square (3, N = 275) = 9.64, $p \leq .001$. Moreover, in the variable tariff group people had lived in their present house for a slightly longer period (13.50 years; se = 0.80) than people on a fixed tariff (11.50 years; SE = 1.31), $F(1,277) = 9.81$, $p \leq .01$. Finally, the size of the household was different. Households in the variable tariff group consisted on average of 2.4 members (SE = .79), whereas the fixed tariff group contained 3.25 members on average (SE = .13), $F(1, 277) = 28.64$, $p \leq .001$. We checked if differences in age, duration of stay, and household size were associated with differences in community identification, but neither of these correlations were significant (respective r's = .05, .06, .03, n.s.).

No systematic differences were found between the tariff groups in their reported income (an optional question that was answered by 81% of the participants), nor in type of housing, or property value. Most households in the two groups (about 50% in each) had an annual income between 30 and 50.000 English pounds. The majority of people in both the variable (59%) and fixed tariff (68%) groups were living in a detached house. Moreover, more than 75% of people in both groups lived in a house with an estimated value between 100 and 200.000 English pounds. Finally, the garden size appeared to be roughly the same between the tariff groups. About 40% of households in each group possessed a garden of more than 600 square meters (back and front garden, together).

Thus, there were some differences between the two groups in terms of the age of the respondent, the number of household members, and the duration of stay in the house. As these factors could affect the level of water consumption, they were included as covariates in the subsequent analyses. It was reassuring, however, that there were no differences between these groups in strength of community identification (which formed the central hypotheses of the study), nor in terms of income, property type and value, and garden size.

Hypotheses Testing. To test our formal hypotheses we conducted a repeated measures ANOVA with one within participant factor (Time: March until November 1997) and two between participants factors, Tariff (Variable vs. Fixed), and Community Identification (Low vs. High). Moreover, in a preliminary analysis we included the three above mentioned factors (household size, age, and duration of stay) as covariates to the design. This analysis revealed that of the three covariates only the effect of household size was significant, $F(1, 266) = 19.52$, $p \leq .001$. Age and length of stay in the house did not significantly predict water use, respective F's$(1, 266) = 1.28$ and 0.12, n.s.[3] For reasons of statistical power, these variables were dropped from further analyses.

Accordingly, a second analysis of variance was performed with the full factorial design, including household size as single covariate. These results showed, firstly, a strong main effect of Household size, $F(1, 273) = 38.70$, $p \leq .001$, indicating that water use increased with household size. Controlling for this factor, the ANOVA results revealed several main and interaction effects relevant to testing our hypotheses.

According to Hypothesis 1, water use would be lower in the variable tariff group than the fixed tariff group. This hypothesis was supported. The adjusted means showed an average use of 10.82 mega liters (x 1000) per month ($SE = .55$) for the variable tariff group compared to 15.32 ($SE = .93$) for the fixed tariff group, a difference of almost 5 mega liters, $F(1, 273) = 16.75$, $p \leq .001$.

In Hypothesis 2 an interaction was expected between tariff and community identification. This hypothesis received support, $F(1, 273) = 7.66$, $p \leq .001$, and the interaction pattern is displayed in Figure 1 (this effect qualified a marginally significant effect of community identification, $F(1, 273) = 3.18$, $p = 0.08$). Inspection of the adjusted means revealed that when tariff is variable, there was no significant difference between low ($M = 10.30$, $SE = 0.80$) and high community identifiers ($M = 11.34$, $SE = 0.75$) in average monthly water consumption, $F(1, 202) < 1$. However, when tariff is fixed, high identifiers appeared to use much less on average ($M = 12.93$, $SE = 1.32$), than low identifiers ($M = 17.71$, $SE = 1.25$), a difference of almost five mega liters, $F(1, 74) = 3.73$, $p \leq .05$. Further testing revealed that for low identifiers, the difference between fixed ($M = 17.71$) and variable tariff ($M = 10.30$) was highly significant, $F(1, 132) = 12.20$, $p \leq .001$, whereas this difference was less pronounced (yet still significant) for high identifiers (M's = 12.93 and 11.34), $F(1, 144) = 6.58$, $p \leq .05$.

Insert Figure 1 about here

In addition, there were various time effects on water use. First, a main effect for Time emerged, $F(8, 266) = 3.97$, $p < .001$. This was qualified however by various higher order interaction effects which are discussed below.[4]

According to Hypothesis 1a, differences between the tariff systems would be more pronounced in periods when water demands were high rather than low. The analysis revealed the expected interaction between Time and Tariff, $F(8, 266) = 2.80$, $p < .01$. To examine this interaction in more detail, trend analyses were performed on these data, which revealed evidence for a quadratic trend, $F(1, 273) = 3.45$, $p = .05$. As can be seen in Figure 2, differences between the two tariff systems were indeed more pronounced in the summer months (from June to September, in particular in the latter month) than in the pre summer (March - May) and post summer (October - November). Thus, as anticipated, a variable tariff structure seemed to have a particularly beneficial effect on preventing excessive water consumption in a period when the need for water is high, but resources are relatively short.[5]

Insert Figure 2 about here.

Importantly, the analysis also revealed a qualification of the Tariff x Community Identification interaction by the Time-factor, $F(8, 266) = 2.10$, $p < .05$, which is in support of Hypothesis 2a. Further analyses were performed on the data to examine the trend of this Time effect, and support was obtained for a quadratic trend, $F(1, 273) = 4.53$, $p < .05$. The nature of this effect is displayed in Figure 3. It suggests that the moderating effect of community identification on the amount of water used under a fixed tariff is particularly noticeable in periods when water needs are high. In the last summer month (September), the water use of low community identifiers under a fixed tariff is showing a peak, whereas the usage of the other consumer groups (high identifiers on a fixed tariff, high and low identifiers on a variable tariff) remains fairly stable across the nine months interval. This finding supports Hypothesis 2a.

Insert Figure 3 about here.

A final significant finding that emerged from our analysis was an interaction between Time and Household size, $F(8, 266) = 3.86$, $p \leq .001$, the pattern of which followed a quadratic trend $F(1,273) = 10.35$, $p \leq .001$. It appeared that differences between smaller and larger households in water use were particularly distinct in the summer period when the resource is relatively scarce (from June to September), whereas they were less pronounced in the pre-summer and post-summer time.

Summary of findings

The results of the field study provided support for our hypotheses in that, controlling for differences in household size, under a variable tariff households used overall less water than under a fixed tariff (Hypothesis 1), and that the effect of a variable tariff on sustainable use was more pronounced in a period when resources were relatively short (and the need for water was relatively high; Hypothesis 1a). Furthermore, as predicted in Hypothesis 2, the facilitating effect of community identification was noticeable only under a fixed tariff (two-way interaction), in particular, when resources were relatively short (Hypothesis 2a).

Laboratory Study

The field study revealed substantial, yet not entirely conclusive evidence for our hypotheses. First, we cannot fully exclude the possibility of a self-selection bias in the formation of tariff groups. In our data analysis we have eliminated the influence of some obvious external factors, such as the number of people in the household, duration of stay (pre-trial vs. post-trial movers), and household income; yet there is still a possibility that the obtained differences in water use are caused by other factors ("the third factor problem").[6] To deal with this issue, we designed a laboratory experiment to replicate the findings in a controlled environment. This also enabled us to create a situation of a resource shortage, and contrast it with an abundance situation. In the field study, even though resources were relatively shorter during the summer period, not all people may have perceived it this way (Van Vugt & Samuelson, 1999). Therefore, the social dilemma may have not been equally salient to everyone involved. Finally, the experimental study allowed us to investigate some possible explanations for the positive impact of community identification in a resource shortage when personal incentives are lacking (e.g., greater trust, concern about collective).

A computer mediated resource dilemma task, adapted from previous research (Messick et al., 1983; Rutte & Wilke, 1985), was used to simulate the water resource problem. In this task environment, participants are assigned to small groups (of six each), where they are asked to individually make requests from a common resource pool filled with a limited number of points (representing a monetary value). Each will get the amount he or she requested; however, if the total sum of requests exceeds the pool size, no one in the group will get any points. The conditions of this task were manipulated so that people (i) were either faced with a small or a big pool (resource state); (ii) either paid a fixed or variable tariff for the number of points harvested (tariff system), and (iii) identified either strongly or weakly with their group (community identification).

Method

Participants and Design. Participants were 43 female and 34 male psychology Honors undergraduates from Southampton University, all between 18 and 22 years of age. They participated in this computer-led study for the fulfillment of their course requirements. For each experimental session, six people were invited simultaneously to the laboratory.[7] Students were randomly assigned to each of eight experimental conditions following a 2(Group identification: Low vs. High) x 2(Resource state: Shortage vs. Abundance) x 2(Tariff system: Fixed vs. Variable) between-participants factorial design.

Procedure. Upon arrival in the lab, participants were guided to separate cubicles with a chair and table, where they were seated in front of a computer. All further instructions were transferred via the computer. After a brief introduction into the use of the computer, participants received information about the particular contents of the study. They were going to work on a group problem, explained as follows: "In everyday life there are various resources that are valuable to everyone, which everyone wants to use as much as they can. If people restrain themselves in using the resource there will be sufficient for everyone. However, if people use too much of the common resource, there is a danger of depleting it. Each person thus must decide for themselves how much of the resource they want." This was illustrated with an example close to the students' experience: "Take for example the computer resources in the psychology department. If each student uses the computer for as long as they like, there is a possibility of creating waiting times for others. It would better for all if students limit the time they work on the computer. Not all people may decide to do this, however, and they could profit from the restraint of others. Each student therefore faces a difficult decision: To use the computer facilities as much as they need or to be modest in their use."

Thereafter, the actual task was introduced. It was explained to people that they soon were to make a decision how many points to take out of a common resource pool, shared by all six group members. Each point represented 30 pence ($0.50), thus it was in their interest to harvest as many as possible, but with an imposed maximum of ten points. We made clear that, out of budgetary reasons, the amount of money would not be paid out directly, but each pence they earned would give them one lottery ticket for a raffle with a prize of £25. Also, to explain the dilemma character of the task, it was made explicit that if the total number of harvested points by group members would exceed the pool size, no one would get any points, regardless of their request.

Manipulation of Resource State. Participants were told that the number of points in the common resource pool was not fixed, but varied between 20 and 50 points. The computer would randomly decide for each experimental group how many points were available in the pool. In practice, half of the participants received information that the resource pool contained 48 points (Abundance-condition), whereas the others were told the pool contained 24 points (Shortage-condition). The optimal harvest in these respective conditions would thus be either 8 or 4 points per person.

Manipulation of Tariff System. Referring to the example of the shared departmental computer resources, it was explained that in some departments students were asked to pay money for using these computers. Similarly, there were costs involved in harvesting points from the pool. In the Fixed Tariff-condition, it was stated that for a standard fee of 30 pence, participants could harvest as many points as they wanted from the common resource. In the Variable Tariff-condition, people would have to pay £0.05 for each point they harvested. This amount was chosen because with an average pool size of 36 points (24+48/2) and a Pareto optimal harvest of 6 points each, the fee would be equal across the tariff conditions (6x0.05 = 0.30). To pay for this, each person started with a fee of £1, put in an envelope on the table next to the computer. The final payments would be settled with the experimenter after the study.

Manipulation of Group Identification. Participants then received some more information about the purpose of the study. The present study ran in conjunction with studies at other universities in Southern England. A list of names of these universities (supposedly) participating in the study was provided to the students. They were chosen carefully to make sure they were comparable in size and entry requirements (many participants may well have applied to one or more of these before joining this university). In the High Group Identification-condition the purpose of the study was said to be to draw a comparison between how student groups at different universities would manage the resource task. In the Low Identification-condition the purpose of the study was to see how student groups in general would manage the task, and no reference was made to making comparisons between universities. This procedure was adapted from earlier research (Brewer & Kramer, 1984; Van Vugt & De Cremer, 1999).

Manipulation Checks. In order to make sure that all participants understood the instructions, a summary of the information was presented on screen before start of the task. In addition, a small quiz was conducted to test understanding of the instructions, and for each question the correct answer was provided as feedback upon completion. We asked how many points there were available in the common resource pool. All except one participant (97%) in each of the Resource-conditions correctly identified this number (either 48 or 24 points), Chi-square (3, $N = 67$) = 67.00, $p \leq .001$. Second, we asked via a multiple choice question to indicate the nature of the tariff system ("What are the costs involved in taking points from the resource?" 1 = no costs involved, 2 = a standard cost of 0.30 pence regardless of number of points, 3 = 0.05 pence per point taken). In the Fixed tariff-condition, one participant (97%) failed to answer this question correctly, whereas in the Variable tariff there were two people mistaken (94%), Chi-square (2, $N = 67$) = 59.57, $p \leq .001$. A third multiple choice-question was issued to measure people's understanding of the study's purpose (the group identification-manipulation check). All but one participant in each condition (97%) correctly indicated that the study's purpose was to compare how student groups in general (Low Identification-condition) or student groups from different universities (High Identification-condition) were doing in the task, Chi-square (2, N = 67) = 59.24, $p \leq .001$.

Even though the correct answer to these questions was provided as standard feedback to all participants, as a double-check we conducted our main analyses both with and without people who made at least one mistake in answering the questions (N = 5). As these results turned out to be virtually the same, we will only report the analyses of the full sample below.

Dependent Measure. After this test, the task started, and the main question posed to participants was "How many points do you want from the pool? (type in any amount with a minimum of 0 and a maximum of ten points)". The program was designed in such a way that any number outside this range was registered as an error, and people were asked to retype a different amount.

Post-experimental Questionnaire. After participants made their choice, they were asked to indicate the reasons for their harvest decision ("I chose for this amount, because......;" 1 = strongly disagree, 7 = strongly agree). Four reasons were listed, which are regarded as the dominant motives in resource dilemma decisions (Samuelson et al., 1984; Wilke, 1993);: (a) self-interest ("....I was concerned about my own outcomes); (b) collective interest ("...I was concerned about the resource"); (c) trust ("... I was afraid that others were too greedy"); (d) fairness ("...I considered this amount fair").

Debriefing. After indicating their choice, they read on the computer screen that the task had now finished, and they would receive a debriefing from the experimenter. In the debriefing, they were told about the real purpose of the study and the nature and background of the manipulations. It was further explained that, at the end of the study, one person would be selected to receive the promised lottery prize of 25 pounds. Unlike what was suggested before the experiment, however, chances of obtaining the prize were not performance-related – as these were influenced by the experimental condition people were assigned to -- and each participant would have an equal chance of winning.

Results

Hypotheses Testing. The same hypotheses as in Study 1 were tested in this experimental study, using a 2(Tariff: variable vs. fixed), by 2(Group identification: low vs. high) by 2(Resource state: shortage vs. abundance) between participant-design with the individuals' requests as dependent variable. The full results are presented in Table 1.

Insert Table 1 about here.

First, unlike the field study, there was no main effect of tariff system, $F(1, 59) < 1$ on individual request. Thus, Hypothesis 1 received no support.

In Hypothesis 1a, we predicted that a variable tariff would be particularly beneficial in reducing requests in the shortage-condition (interaction between tariff and resource state). There was, first, a strong main effect of resource state, $F(1, 59) = 43.43$, $p \leq .001$, showing that people made smaller requests in the shortage-condition ($M = 4.01$) than in the abundance-condition ($M = 6.50$). However, this main effect was qualified by an interaction between tariff and resource, $F(1, 59) = 4.20$, $p \leq .05$. The associated means are shown in Table 1. In accordance with our hypothesis, in the shortage-condition the requests were smaller under a variable tariff than fixed tariff (M's = 3.53 vs. 4.50), $F(1, 32) = 4.44$, $p \leq .05$, whereas in the abundance-condition there was no such difference (M's = 6.80 vs. 6.22), $F(1, 33) < 1$.

Another way to look at this result is to compare how people in the tariff conditions dealt with the varying resource conditions. People in the <u>variable tariff</u> system took 3.27 points less, on average, in the shortage-condition (M's = 6.80 vs. 3.53), $F(1, 33) = 32.62$, $p \leq .001$, whereas in the <u>fixed tariff</u> condition people, on average, took 1.72 points less in the shortage-condition (M's = 6.22 vs. 4.50), $F(1, 32) = 10.80$, $p \leq .001$ -- nearly half the amount of the variable tariff-condition.

In Hypotheses 2 and 2a, we predicted beneficial effects of group identification in moderating individual requests. Although there was no support for an interaction between group identification and tariff as such, $F(1, 59) < 1$, the predicted three-way interaction (Hypothesis 2a) did receive support, $F(1, 59) = 4.02$, $p \leq .05$. In Hypothesis 2a, we expected there would be a positive effect of group identification on reducing requests as a result of changing resource conditions, but that this would be most noticeable under a fixed rather than variable tariff structure (three-way interaction). The associated means are reproduced in Table 1. This table reveals quite clearly that, under a <u>variable tariff</u> the decrease in average request was about equal between the high (M's = 6.33 and 3.56; difference of 2.76) and low identifiers (M's = 6.89 and 3.50; difference of 3.39) when moving from an abundance to a shortage situation, both p's <.05 Yet, under a <u>fixed tariff</u>, the decrease in requested points was much stronger for high identifiers (M's = 7.25 and 4.12; a difference of 3.13 points; $p \leq .05$) than for low identifiers (M's = 5.56 and 4.88; a difference of just 0.68 points). In fact, this latter condition was the only one with no systematic difference in request between abundance and shortage conditions, $F(1, 16) < 1$.

Finally, when looking at the shortage-condition only, the same conclusion emerges. When comparing the tariff systems, it appears that low identifiers requested more, on average, under a fixed tariff (M = 3.50) than a variable tariff (M = 4.88), $p \leq .05$, whereas this trend was not there for high identifiers (M's = 4.12 and 3.56), n.s. Moreover, post-hoc testing reveals that the mean harvest for low identifiers on a fixed tariff differed from all of the other means in the shortage-condition (p's <.05). This suggests a variable tariff was indeed more effective in reducing the requests of low identifiers, whereas high identifiers' requests were not affected by tariff system.

Exploring Overuse and Underuse. For exploratory purposes, we also examined what the obtained requests, if combined, would have meant for the preservation of the common resource pool. To this end, we contrasted the mean request with the optimal request had participants used an equal division-rule to partition the resource (Allison & Messick, 1990). In the shortage-condition the optimal request would be 4 (24 points in total), whereas in the abundance-conditions the optimal use would be 8 (48 points in total). Analyses of the deviations from the optimum revealed that, in all the abundance-conditions the resource would have been saved, even though people were not using it very efficiently (M_{dev} = -1.50 points; $p \leq .05$). In the shortage-conditions use was more efficient (M_{dev} = 0.01; n.s.); nevertheless. the resource would have been depleted in both fixed tariff-conditions

(Mdev = 0.50; $p \leq .05$), but more so in a group with low identifiers (Mdev = 0.88; $p \leq .05$) than high identifiers (Mdev = 0.12; n.s). Accordingly, in further support of our main conclusion, overuse is most likely to occur among low group identifiers in periods when resources are short and there is no financial incentive to show restraint.

Post-Experimental Results. In an exploratory vein of the study, four separate ANOVA's, including the full three-factor design, were conducted to investigate the reasons participants gave for their harvest decision (i.e., self-interest, collective interest, trust, fairness). From the outset, we did not think these analyses would reveal much news as the reasons were given ex-post-facto, and were therefore very likely to be influenced by the individual's own request. There was indeed just one significant effect on the reason referring to the collective interest ("I chose for this amount, because I was concerned about the resource" [1 = strongly disagree, 7 = strongly agree]). A significant three-way interaction was found, $F(1, 59) = 3.98$, $p < .05$, which somehow paralleled the results on the actual request.

Among high identifiers, there was an increase in importance assigned to this motive, from the abundance to the shortage-condition, but only when the tariff was fixed (M's = 5.00 vs. 5.75; SE's = .57 and .55, $p < .05$) not when it was variable (M's = 5.00 vs. 5.22; SE's = .53 and .62, n.s.). In contrast, low identifiers assigned (much) greater weight to this motive in the shortage than abundance-condition, but only under a variable tariff (M's = 5.88 vs. 4.13; both SE's = .57; $p < .01$), not under a fixed tariff (M's = 5.25 vs. 5.44; SE's = .57 and .62). Thus, this result seems to suggest that the beneficial effects of tariff system (fixed vs. variable) on participants with a distinct group identification is due to the weights they assign to the collective interest (i.e., maintaining the resource under the condition of a shortage) rather than to self-interest, lack of trust, or fairness of one's request.

General Discussion

The primary purpose of this research was to investigate the moderating effects of community identification on the use of financial incentive strategies to promote water conservation. Both the field and lab study revealed that identification processes were particularly instrumental in preventing overuse of the communal resource in periods when the supplies were short (and needs high), and in the absence of a financial incentive for restraint. Below we will address this main finding as well as some other major and minor results and their implications for resource management practice and theory.

The most important prediction of this research, the anticipated interaction between tariff structure, community identification, and resource condition (Hypothesis 2a) received support in both presented studies. In the field study, low community identifiers on a fixed tariff showed a greater increase in water use in the summer months of 1997 (September, in particular) than either low identifiers on a variable tariff and high identifiers in either tariff condition. Similarly, in the lab study, there was a substantial decrease in harvesting under shortage conditions in all the experimental conditions, except when low identifiers were on a fixed tariff. Extrapolating these findings to natural resource management in society, it seems that in situations with the potential risk of a shortage – when needs are high but supplies relatively short -- communities must rely either on adequate incentive systems or on the strength of local community ties to preserve common resources.

This finding contributes to our thinking about conditions for successful resource management. In her influential book on common resource problems, Elinor Ostrom (1990) distinguishes between three broad classes of factors contributing to efficient resource management: (i) local resource dependence, (ii) presence of community, and (iii) appropriate rules to regulate use. Our research underlines the importance of this taxonomy by showing that strategies to promote resource conservation must be targeted at decreasing resource dependency, strengthening community networks, and designing adequate incentive systems for conservation. Our research, however, goes an important step further by delineating an important interplay between these strategies. That is, in the absence of opportunities to increase supplies thereby reducing resource dependency, policy makers should either work on the design of adequate tariff systems or focus on ways to develop community ties so as to encourage citizens to cooperate for the common good. These latter activities might be particularly important in areas where resources are scarce, but where a system of metering is practically impossible (e.g., dorms, apartment blocks) or socially undesirable (e.g., less wealthy areas).

The facilitating effect of community identification processes is relevant from a theoretical perspective as well. Our field study is, to our knowledge, the first to show the importance of this factor in moderating voluntary decisions in large scale natural resource dilemmas. Until now, the positive role of social identification has been demonstrated in social dilemma studies involving relatively small groups of between 4 and 32 members, where group identification is artificially created by inducing a common fate procedure (e.g., Kramer & Brewer, 1984; see also our lab study). It is encouraging that social identification, as measured by a simple three-item survey, also predicts prosocial behavior in a real-world dilemma, like water conservation, where the impact of an individual contribution is negligible (cf. personal efficacy; Kerr, 1989). It might therefore be useful to include this powerful, easy-to-administer instrument in further work on resource conservation (e.g., domestic energy use, recycling) and other dilemmas within communities (e.g., volunteer and community aid programs).

As anticipated, the present studies suggest that community identification processes come into play only when (a) there is a communal threat and (b) the direct personal benefits for acting cooperatively are lacking (i.e., in the absence of financial incentives). Recall that there were no significant main effects of identification in neither of the reported studies. This sheds some light on thinking about the role of social identification in social dilemmas. Theorists have often assumed that a strong social identity automatically triggers a concern for the collective good (Brewer & Schneider, 1990; Tyler, 1999; Tyler & DeGoey, 1995). Yet, based on our results, it is probably more adequate to think of community identification as a buffer, which elicits cooperation only when there is a perceived threat to the community.

This idea receives further support by looking at the mechanisms underlying the community identification effect found in the field study. Identification with community was operationalized in terms of people's feelings of community attachment, their pride in the community, and the quality of contacts with other community members (i.e., "there are many people in my community whom I think of as good friends"). These aspects become indeed more salient in the face of a resource crisis. For example, in the face of a water shortage trust in fellow community members becomes an important issue as people would want their efforts to be reciprocated by others. Moreover, the quality and frequency of interactions in a community determines the ease with which people can be mobilized into collective action (social capital; cf. Putnam, 1993). Finally, in crisis situations community pride is at stake as people want their community to do at least as good as (if not better than) other communities (Tajfel & Turner, 1986).

In this regard, it may be relevant to look at the reasons participants gave for their harvest in the lab study. We found that high group identifiers assigned a greater weight to the collective interest (to preserve the resource) in the shortage-condition, especially when there was no personal incentive to cooperate (fixed tariff-condition). As no such differences were found in the importance assigned to self-interest, fairness, and (lack of) trust in others - the other dominant motives in resource dilemmas (Samuelson et al., 1984) — this might explain their relatively modest request in that condition. This interpretation is quite consistent with the idea that community identification gives rise to a transformation of motivation (Kelley & Thibaut, 1978), whereby the distinction between private and collective interests is blurred (Brewer, 1979). That, on the contrary, low identifiers became more concerned about resource preservation in the condition where they paid for their use (variable tariff) is congruent with this claim. As they were primarily motivated by self-interest, their concern about the resource, the collective interest, was raised only when they were faced with a shortage and had a personal incentive to conserve.

Thus, from these results we may conclude, first, that social identification processes will "kick in" only when people experience a noticeable conflict between private interests and those of the broader community, such as in a shortage. Furthermore, post-hoc analyses of the lab data suggest that a motivational transformation (Kelley & Thibaut, 1978), rather than selfishness, trust or a perception of fairness, is the most likely cause of the beneficial effects of community identification on conservation. This finding is in line with recent research on public good dilemmas (De Cremer & Van Vugt, 1999). Using the same manipulation of group identification, this research revealed that people who would normally be unwilling to co-operate with others because of basic selfishness (i.e., pro-self orientation), started contributing when a common group membership was made salient.

The influence of tariff system deserves some brief commentary (Hypothesis 1). The fact that households on a variable tariff used less, overall, than households on a fixed tariff is consistent with classic theories of decision-making (i.e., game theory, rational choice-theory), which assume that people will only cooperate if it is in their self-interest. This result is in line with a previous archive study that compared the aggregated consumption data in a community in the US before and after the implementation of water meters (Hankie & Boland, 1971). Interestingly, however, in both our studies we found that a variable tariff was particularly beneficial in preventing overuse in case of a shortage (interaction between tariff and resource; Hypothesis 1a). In the lab study, for example, people in the shortage-condition were underusing the resource under a variable tariff (average of 0.47 below efficiency point), while they were clearly overusing the resource under a fixed tariff (average of 0.50 above efficient use). From a game-theoretical or social dilemma perspective, this can be seen as evidence that people's temptation to increase their request was presumably overridden by a desire not to pay too much.

In addition however to giving people a direct financial incentive, there may be other advantages associated with a pay-per-use system. For example, when people have to pay for what they use, this might increase the value they attach to the resource (Van Vugt & Samuelson, 1999). Also, a variable tariff might be considered a fairer method of charging, and makes people more accountable as their use can be monitored by authorities (Jerdee & Rosen, 1974). Finally, as previous research on energy use has pointed out (Seligman & Darley, 1977), the feedback associated with the system of water metering helps households to develop knowledge and skills to conserve when needed. On the basis of our findings, we cannot ascertain the exact role of these factors. That the same finding (interaction between tariff and resource state) was obtained in the lab study where no feedback was given, suggests however that the acquired skills and knowledge alone (through the provision of feedback) are unlikely to fully account for the effects of metering.

Strengths and Limitations of Present Research

Before closing we should note a strength and some limitations of the present research. One potential strength is the combination of field and lab data, which enabled us to address the inherent weaknesses of either of these approaches. For example, the potential danger of a self-selection bias in the comparison of the variable versus fixed tariff households was addressed by assigning people randomly to either of these conditions in the lab study. The convergence between the main results of these studies gives us good faith in both the internal and external validity of our findings. This is particularly encouraging in light of the controversy about the use of experimental games to simulate real-world social dilemmas. In the past, worries have been expressed about the external validity of social dilemma research (Nemeth, 1972; Pruitt & Kimmel, 1977; Van Lange et al., 1992), and systematic comparisons between the results of lab and field research on social dilemmas have been rare (for an exception, see Samuelson, 1990). Our results show that it can be valuable to use a combined approach where field research, with its inherent design weaknesses, is complemented with more rigorously designed experimental studies.

We should also note several limitations of the presented studies. First, there was a discrepancy in findings of the field and lab study, most notably for the main effect of tariff system. This effect was highly significant in the field study, a finding comparable to previous research on water tariffs (Hankie & Boland, 1971), but not in the lab study. That there was no systematic difference in the lab study might have to do with the relatively minor sums of money at stake (i.e., 30 pence per earned point). In contrast, the amount that households can save by restraining water use can easily amount to 20 pounds per month (OFWAT, 1996). Another difference pertaining to this is the fact that the lab study was only a single-trial experiment so that people in both the tariff conditions may have been relatively cautious in their harvest. It would be good for follow-up studies on the effect of tariff systems to consider using a multi-trial replenishable resource dilemma paradigm, like the one developed by Messick and others (Messick et al., 1983; Samuelson et al., 1984), which bears perhaps a greater similarity to real-world resource problems.

A third concern is that, even though most of our predictions about the impact of tariff system and community identification on water use were supported, it is hard to say precisely which underlying behaviors caused these effects. For example, differences in use between households on a variable versus fixed tariff could be attributed to differences in curtailment (e.g., frequency of showering, taking baths, or using the washing machine) or perhaps to differences in purchase of water consuming devices (e.g., sprinklers, dishwashers). Yet, the fact that there were no systematic income or life-style differences between the tariff groups, and that the effects were still there when correcting for household size suggests that distinct behavioral patterns are the most likely explanation. Moreover, as the differences were most pronounced during the summer it may well mean that variable tariff households, relative to fixed tariff households, are more modest in outdoor use (e.g., sprinkling garden, filling swimming pool).

Finally, can these findings be generalized to other resource management problems in society? Water resources have specific features, such as local resource dependency and seasonal variations in resource use and availability, which make it comparable to, for example, the management of fisheries, forestries, and land. Paralleling our findings, such studies indeed show that, in the absence of adequate penalty systems, strongly tied communities cope better with local shortages than weakly tied communities (Ostrom, 1990). Moreover, some indirect evidence for our claims stems from research on domestic energy conservation, which shows that energy use is generally lower in apartment buildings that provide personal use meters rather than communal use meters (Gardner & Stern, 1996). As such buildings generally also lack a sense of community, those studies provide some more, albeit circumstantial, evidence for the claim that metering is particularly effective in reducing use in places where community identification is low.

Implications and Directions for Future Research

With these limitations in mind, we suggest the following directions for future research. First, through further laboratory experimentation, it is possible to compare the effectiveness of various other (and even more sophisticated) tariff systems on use. For example, for natural resources that have strong seasonal fluctuations in demand, a tariff system whereby customers pay more when demands are expected to be high could turn out to be highly efficient in reducing demands (a form of "peak-time" tariff). Small-scale experimentation may prove to be a successful and cost-efficient way to test out the impact of different tariff systems under various resource conditions. Second, it is important to establish a link between the overall use records and daily use patterns in households. This enables to target interventions to specific differences between the groups. For example, if it appears that households on a variable tariff, in contrast to households on a fixed tariff, invest more in resource saving technologies, this could be used in education about water conservation.

Rather than information and persuasion, however, what seems to be most effective in promoting conservation is the move to an individualized tariff system. Meters should be installed routinely in all houses - recall that in the UK only 10% of households have meters, while metering is even more exceptional in most nonindustrialized countries. Moreover, social-psychological interventions, such as social-network approaches (Weenig, 1999), are needed to promote the adoption of these and other water-saving technologies (e.g., power showers, toilet dams; Geller et al., 1983). According to our findings, metered tariffs not only decrease resource demands structurally, but they are particularly effective in moderating use in periods when the danger of a shortage is acute. In areas where metering is practically impossible or socially undesirable, interventions must focus on the development of community ties, for example, by initiating focus groups or by setting up inter-community competitions (Samuelson, 1990). Finally, in case of an acute shortage interventions must be targeted specifically at weakly tied communities without meters as in those areas people presumably lack the motivation or ability to cut demands voluntarily.

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Footnotes

1. The variable tariff system, in fact, included a small fixed charge for sewage and waste water. The charges in the fixed tariff system were only very indirectly related to use; they were calculated based on the rateable value of the property.
2. The surveys were sent out to customers in the middle of September '97. This was considered a convenient period for the survey as customers would not have received their summer bill yet, and their answers could, therefore, not have been affected by feedback about their consumption. We cannot be sure about the potential impact of completing the survey on their use in the subsequent months (October-December). Yet the fact that post-summer consumption patterns were quite similar to the pre-summer data suggests no such effect.
3. The duration of stay-measure enabled us to compare people who had been living in their present home during the metering trials (1989-91; 62.8%) with those who had moved their afterwards (33.8%). These two groups were contrasted, but no significant difference emerged in their average water use, $F(1, 278) < 1$.
4. In a further statistical analysis we regrouped the nine months in three categories, pre-summer (March-May), summer (June - September), and post-summer (October - November), and added this as within-factor to the design. Because this analysis revealed more or less the same differences for time, both in terms of main and interaction effects, we have decided, for reasons of brevity, to describe only the full nine month analysis here.
5. September is the month that people would normally return from their summer holidays, which would explain the peak in water use for that month, in particular.

6. Although there might be a potential third factor problem in interpreting the main effect of tariff system, it is difficult to see how any such factor could explain the moderating influence of community identification on water use.
7. Because in three of the sessions only five people showed up, experimental assistants were asked to participate in the group as "bogus" members. Once participants were in their cubicle, the assistants left the scene.

Figure Captions

Figure 1. Average monthly water use as a function of tariff system and strength of community identification

Figure 2. Trends in water use as a function of tariff system

Figure 3. Trends in water use as a function of tariff system and strength of community identification.

Figure 1.

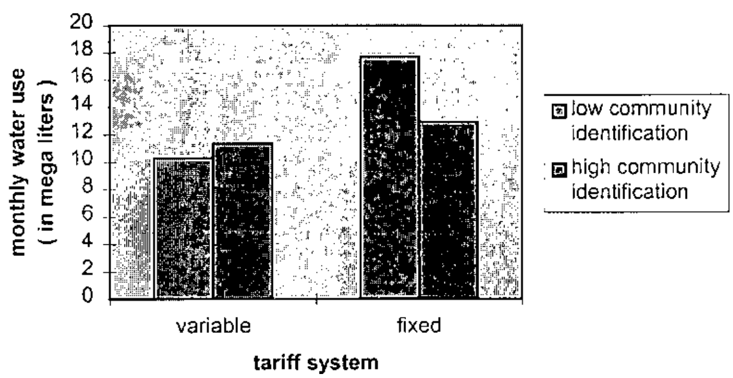
monthly water use
(in mega liters)
20
18
16
14
12
10
8
6
4
2
0
variable
fixed
tariff system
low community identification
high community identification

Figure 2.

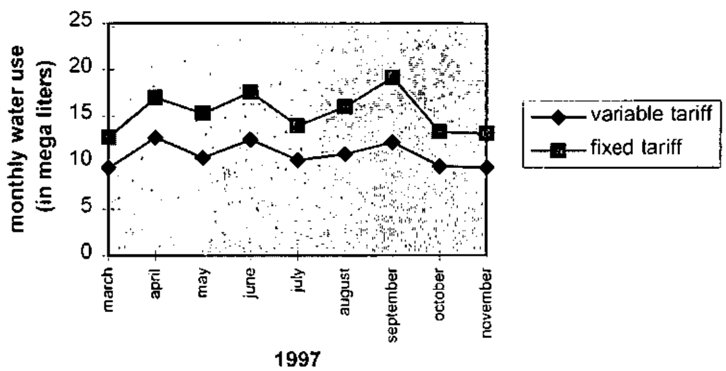
monthly water use
(in mega liters)
25
20
15
10
5
0
march
april
may
june
july
august
september
october
november
1997
variable tariff
fixed tariff

Figure 3.

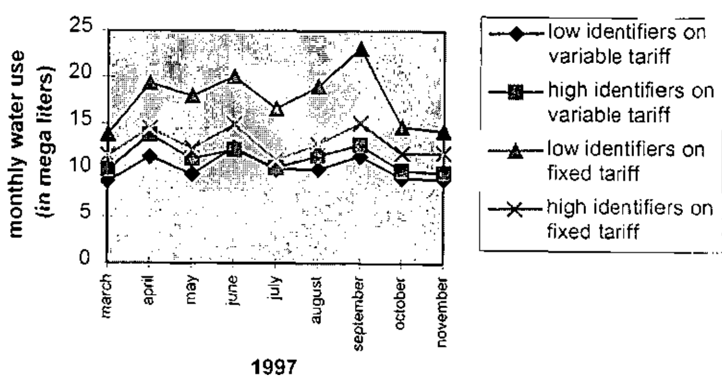
monthly water use
(in mega liters)
0
5
10
15
20
25
march
april
may
june
july
august
september
october
november
1997
low identifiers on variable tariff
high identifiers on variable tariff
low identifiers on fixed tariff
high identifiers on fixed tariff

Table 1. Request as Function of Tariff System, Resource Condition, and Group Identification, Study 2

		Resource			
		Shortage		Abundance	
Tariff System	Group Identification				
Fixed	Low	4.88^{a1} (.55)		5.56^{a1} (.52)	
	High	4.12^{a2} (.55)		7.25^{b2} (.55)	
			4.50^{a1} (.39)		6.22^{b2} (.38)
Variable	Low	3.50^{a2} (.55)		6.89^{b2} (.55)	
	High	3.56^{a2} (.52)		6.33^{b2} (.52)	
			3.53^{a2} (.38)		6.79^{b2} (.38)

Note. Means with a different superscript differ significantly from each other, $p \leq .05$ (different letter symbol for significant row-wise comparison; different numeric symbol for significant column-wise comparison);