

Gender in Environmental Context: An Effect of Property Rights, Fines, and Empathy Nudging

Authors:

Natalia V Czap (*corresponding author*), Department of Social Sciences (Economics)
University of Michigan-Dearborn, Phone: 313-583-6354, Email: nczap@umich.edu

Hans J Czap, Department of Management Sciences, University of Michigan-Dearborn

Gary D Lynne, Department and Agricultural Economics, University of Nebraska-Lincoln

Mark E Burbach, School of Natural Resources, University of Nebraska-Lincoln

Abstract

Experimental economics research shows that gender can often explain some of the variation in individual behavior in experiments. This is especially true for contextualized games (corruption, environmental protection) in which participants' behavior is guided by homegrown values and predispositions. We examine the gender differences in environmental behavior and the sharing of payoffs between a farmer and a water user under two alternative property rights assignments (farmer/polluter vs. water user/victim) and three methods of feedback (inducing empathy vs. imposing fine vs. no feedback). We found mixed evidence on gender differences concerning the choice of levels of pollution; this difference is only significant if the water user has the property rights and is faced with the threat of a fine. Overall, albeit not always statistically significant, it seems that females are sharing with their group members more than males. Specifically, the results suggest that females are often more empathetic than males when they are in a position of a victim (water user). In a position of a polluter (farmer), in contrast, females and males are almost equally empathetic. Overall imposing monetary fines is counterproductive and decreases environmentally friendly behavior (however it does not significantly affect sharing), while empathy nudging increases sharing behavior (however it does not significantly affect environmentally friendly behavior). Empathy nudging is more effective for females than for males. Imposing fines, however, has no significant gender effect for either conservation or sharing behavior. Our findings provide another argument for increased gender equality based on environmentally sustainable economic development and thus propose a push by national governments as well as international organizations to increase the economic role of women.

Keywords: gender effects, property rights assignment, conservation policy, empathy, environmental experiment, water quality

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1. Introduction

With the world population exceeding 7 billion in 2013¹ and economic output significantly larger than just a few years ago, the stress on the environment has never been larger. This trend can be expected to continue for the foreseeable future, making it imperative to figure out solutions to effectively manage our environment to ensure that an increased standard of living for the average human being does not coincide with unsustainable levels of resource exploitation and environmental degradation.

From a liberal economic perspective all one need to do is create a functioning market for the environment so that marginal costs can be equated to marginal benefits and hence an optimal solution can and will be found. While theoretically sound, this approach makes a number of strong assumptions, which are unlikely to hold in reality. One of the assumptions is that property rights are assigned and hence negotiations over the appropriate degree of usage can take place. Based on the Coasian Theorem it does not matter who obtains the property rights, as long as they are clearly defined and transaction costs of negotiations are negligible. In practical terms this is of course exceedingly unlikely to hold true for many markets, as for example it is hard to imagine how future generations can appropriately participate in the negotiation for the efficient usage of a natural resource. Due to the myopic nature of the majority of economic agents resource exploitation tends to be larger than optimal. Therefore, from a long-term environmental and economic efficiency perspective, policies may need to be put in place to curb resource exploitation to a sustainable level.

A number of such policies have been proposed, ranging from markets with caps on the overall production in the market (e.g. the carbon market), over incentive based schemes, such as Pigouvian taxes, to outright individual command-and-control regulations with stringent fines on violations. The typical analysis in this field assumes a representative agent to derive its theoretical conclusions. While this approach may allow deriving an appropriate general estimate of the effectiveness of a particular policy design it disregards useful information for fine-tuning of the policy. One of such heterogeneities that may provide important additional information is gender. Laboratory and field studies on various economic and environmental contexts show that gender is often a significant and economically relevant determinant of behavior. In experimental economics this is especially true for contextualized games (such as corruption, environmental protection) in which participants' behavior is guided by homegrown values and predispositions.

In this paper we will further examine the gender differences in environmental behavior and the sharing of payoffs in the context of negative externalities and two alternative property rights assignments (polluter vs. victim). In addition, we will analyze the impact of feedback in the context of gender. Section 2 ensues with a brief review of the relevant literature, leading to the testable hypotheses. Section 3 provides the experimental design and procedures, followed by Section 4 with the experimental results. The paper concludes with a section on implications and conclusions.

2. Theoretical basis

2.1. *Relevant literature*

Three streams of literature showing gender effects are relevant for this study: environmental and economic attitudes, property rights, and empathetic behavior and punishment.

First, we discuss the link between gender and economic and environmental decisions on the individual level. The effect of gender on economic choice is not straight forward. The experimental studies involving economic decision making suggest that gender is moderated by psychological

¹ www.census.gov accessed December 25, 2013.

traits and through that affects choices. Eckel & Grossman (1998), (2008) found that females are more generous. Croson & Gneezy (2009) found that females are more altruistic and more sensitive to social clues. Females are also found to empathize and be able to imagine themselves in the place of others more, as shown by Hoffman (1977), Baron-Cohen (2002), Goldenfeld et al (2005) and Baron-Cohen (2009). In addition, women are found to be more egalitarian and are more likely to engage in reciprocal behavior than men, who are more competitive (Chaudhuri & Gangadharan, 2007; Croson & Buchan, 1999; Croson & Gneezy, 2009). This results in higher degrees of self-reported environmental concern (Mohai, 1993; Olofsson & Oehman, 2006; Xiao and Dunlap, 2007) and translates in more environmentally conscious behavior by females in incentivized experiments (Menges & Traub, 2009; Czap and Czap, 2010; Czap et al. 2012). Specifically women paid more for green electricity and were free-riding less than men (Menges and Traub, 2009).

On the other hand some studies found no significant gender differences (Bolton and Katon 1995; Frey and Meier 2004) or reported ambiguous results (Andreoni and Vesterlung 2001; Cadsby et al 2010). Andreoni and Vesterlung (2001, p.293) noted that “men are more likely to be either perfectly selfish or perfectly selfless whereas women tend to be “equalitarians” who prefer to share evenly”. Davidson and Freudenburg (1996) report that the gender differences in terms of general environmental concerns are modest. However, women exhibit a much higher level of concern in their attitudes towards specific forms of environmental risk. Mohai (1992) found that despite of females showing greater environmental concern, they have lower rates of environmental activism.

Second, we discuss the relationship between gender, property rights, and collective management of resources. This relationship is even less clear-cut than the previous one. One strand of literature links gender and management of common pool resources via social capital. It is widely accepted that social capital is essential for effective collective action (Krishna and Uphoff, 1998; Pretty, 2003; Pretty and Ward, 2001; Putnam, Leonardi, & Nanetti, 1993; Scoones, 1998; Woolcock, 1998), which is, in turn, a key for sustainable natural resource management (Agrawal & Gibson, 1999; Baland and Platteau, 1996; Bromley, 1992; Korten, 1986; Ostrom, 1990; Pretty, 2002; Pretty and Smith, 2004; Reddy, 2000; Steins & Edwards, 1999; Wade, 1987). The participation of women in collective action is a key determinant in the success (Molinas, 1998), the share of women in the group is positively correlated with the frequency of meetings, solidarity, capacity for sustained collective action, more regenerative approaches, and better management of arising conflicts (Westermann et al. 2005). This may be due to women being more interdependent and altruistic (Folbre, 1994; Sharma, 1980; White, 1992). At the same time it is not entirely clear whether women are indeed more altruistic, or if this is an artifact of their social and economic environment (Jackson, 1993). Similarly, Westermann et al (2005) does not detect a difference in motives for collaboration in terms of altruistic or selfish, between groups of varying gender composition.

Another strand of the literature sees women as having close affinity to the environment due to their nurturing and caring role for family and future generations (Jackson, 1993; Manion, 2002; Martine and Villarreal, 1997) and hence the most likely choice to manage the environment at the local level (Green, Jokes, and Leach, 1998). Other authors argue that the difference in the role of women is not due to inherent biological differences, but social, economic, and political dynamics (Jackson, 1993; Rocheleau, 1995; Agrawal, 1992; Leach, 1991). Furthermore, gender differences in the management of natural resources may stem from the different resource constraints typically faced by women and men. Generally, it is argued, women need to rely more on common pool resources (Jackson, 1993; Martine and Villarreal, 1997) and hence face larger downsides to resource degradation. In addition to the difference in stakes faced by men and women, there also may be a difference in the type of social capital that is typically available to men and women. Whereas men often rely on formal relations, women tend to favor informal relations (Agrawal, 2000; Molyneux, 2002; More, 1990; Riddell et al., 2001).

Third, we discuss the link between gender, empathetic behavior, and the effect of punishment. Studies on empathy conclude that women score higher on empathetic concern and perspective taking (Davis, 1980; de Corte et al. 2007; O'Brien et al. 2013) as well as affective or emotional empathy (Toussaint & Webb, 2005). Baron-Cohen (2009) also notes that females perform better on many empathizing tests than men. According to O'Brien et al. (2013, p.173) it is possible that "the gender-based differences reflect motivational differences in self-reporting rather than actual differences in the ability to experience empathy", because these differences are less reliable in the studies involving alternative measures of empathy, such as facial expression and psychological arousal (Eisenberg & Lennon, 1983).

On the other hand, evidence from biological and neuroscientific studies suggest that gender differences in empathy run deep. The biological basis of empathy was studied by Knickmeyer et al. (2006) who found a correlation between prenatal testosterone levels and the empathetic behavior in four-year olds. Neuroscientific evidence comes from the fMRI studies by Singer et al. (2006) and Schulte-Ruther et al. (2008) as well as Rueckert & Naybar (2008) who studied the relationship between the activation of the right cerebral hemisphere (RH) and empathy. Singer et al. (2006, p.466) found that "empathy-related responses were significantly reduced in males when observing an unfair person receiving pain". Schulte-Ruther et al. (2008) reported that females showed higher emotional expressivity and arousal in response to emotions of others than males. Furthermore, they found that females rely on emotional resonance/mirror neurons, whereas males use a cognitive strategy to determine their emotional response to the feelings of others. Rueckert and Naybar (2008) found a significant correlation between RH activation on the chimeric face task (recognizing emotion) and empathy questionnaire.

The strength of the empathetic responses to the distress or pain of others and desire for punishment has been also shown to depend on the perception of fairness of others. In this context females and males differ in their reaction to punishment. While both males and females showed similar empathy for fair players in the prisoner's dilemma game, males demonstrated less empathy for unfair players and higher activation in the reward-related areas suggesting desire for revenge, based on that Singer et al. (2006, p.466) concluded that "in men (at least) empathic responses are shaped by valuation of other people's social behaviour, such that they empathize with fair opponents while favouring the physical punishment of unfair opponents".

In the next subsection we will discuss the hypothesis that we infer from the literature and put to test in this study.

2.2. Testable hypotheses

Our first hypothesis is based on several studies that have shown that women are more likely to engage in environmental behavior than men. Mohai (1992), Olofsson & Oehman (2006) and Xiao & Dunlap (2007) found that females demonstrate higher levels of environmental concern in surveys and contribute more to the environment in experiments (Menges & Traub, 2009; Czap and Czap, 2010; Czap et al. 2012).

Hypothesis 1. Females behave more environmentally friendly than males.

Our second hypothesis is informed by the studies suggesting that females will be using environmental resources with more care than males (Jackson, 1993; Manion, 2002; Martine and Villarreal, 1997; Westermann et al. 2005) and that they tend to favor more informal relations (Agrawal, 2000; Molyneux, 2002; More, 1990; Riddell et al., 2001). This leads us to hypothesize that in the cases where woman possess property rights we would expect more sharing of common resources.

Hypothesis 2. Females who own property rights share more with their group members than males.

The literature mostly agrees on the gender differences when it comes to empathy: studies using self-reported empathy questionnaires (Davis, 1980; de Corte et al. 2007; O'Brien et al. 2013; Toussaint & Webb, 2005), biological (Knickmeyer et al., 2006) and neural basis (Rueckert & Naybar, 2008; Singer et al., 2006; Schulte-Ruther et al., 2008) demonstrated that females experience higher empathetic response than males. This leads us to hypothesize that females will be more prone to have a stronger emotional reaction on empathy nudging which in turn will cause them to change their behavior:

Hypothesis 3. Empathy nudging is more effective with females in moving individuals towards more environmentally friendly and sharing behavior.

Males (but not females) have been shown to consider punishment of unfair players to be rewarding (Singer et al. 2006). In everyday life we also observe a predominant role of men in the development and support of law enforcement and the justice system, which suggests that the punishment of norm violation could be more effective when applied to males rather than females, leading to the following hypothesis:

Hypothesis 4. Fines are more effective in moving individuals towards more environmentally friendly and sharing behavior when imposed on males than on females.

3. Experimental design and procedures

3.1. Experimental conditions in the downstream water pollution game

3.1.1. UF is PRO-No Feedback

We used a framed laboratory experiment representing a downstream water pollution situation. There are two players: Upstream Farmer (UF) and Downstream Water User (DWU). UF is an agricultural operator who has 500 acres of farming land upstream. UF owns the property rights (PRO) on the downstream water and thus can decide how much land out of 500 acres will be placed under Conservation Tillage (CT), with the corresponding pollution. CT is a relatively less harmful tilling practice as compared to intensive tillage due to land being disturbed minimally. CT leads to lower chemical runoff, less soil erosion and as a result higher drinking water quality in the rivers and lakes downstream. At the same time, CT is perceived as a more costly farming practice than intensive tillage due to less certainty regarding planting dates and higher risks. DWU is an individual who gets drinking water and uses water for recreational purposes from the river or the lake downstream. The payoff of DWU is therefore affected by the choice of CT by UF.

The game consists of three stages. During Stage 1 Upstream Farmer decides how much of farming land will be placed under Conservation Tillage. The rest of the land is assumed under intensive tillage. Depending on the chosen CT, UF and DWU get different initial payoffs (Table 1). Note, that the socially optimal (yielding the highest total payoff for both players) level of CT is 300, while the lowest level of water pollution will occur when CT=500. This implies an inherent tradeoff between economic (the individual and group profit) and environmental considerations.

Table 1. Initial payoff distribution

Level of CT out of 500	UF's payoff, tokens	DWU's payoff, tokens	Total payoff (not displayed to players)
0	1500	300	1800
100	1300	700	2000
200	1100	1100	2200
300	900	1500	2400
400	700	1600	2300
500	500	1700	2200

During Stage 2 UF may choose to transfer some portion of DWU's payoff to self as a compensation for any reduction in payoff due to CT above 0. The maximum amount that can be transferred depends on the relative payoffs of the two players, but after the transfer the payoff of DWU cannot be below 300 tokens. The payoff can be transferred only one way – from DWU to UF. After the transfer, the final payoffs are calculated.

During Stage 3 the chosen level of CT, the transfer, and the final payoffs are displayed to both players. This condition is called "*UF is PRO-No Feedback*".

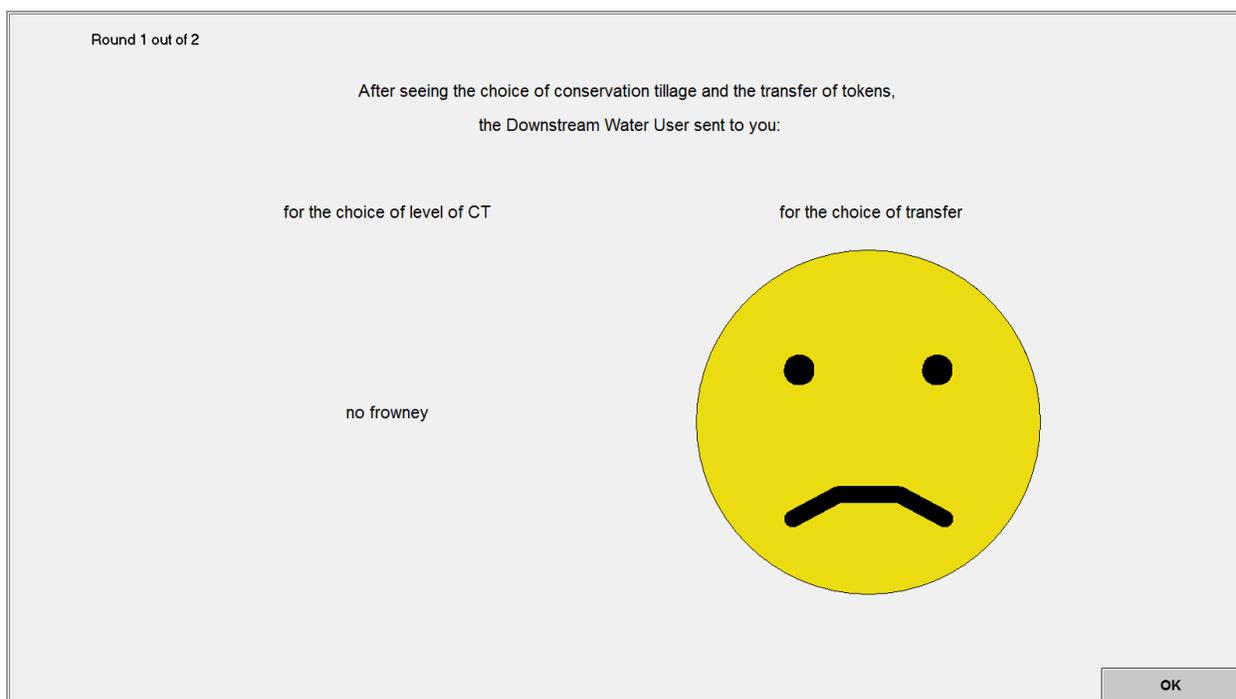
3.1.2. *DWU is PRO – No Feedback*

In this condition Downstream Water User owns the property rights to the downstream water quality and thus decides how much land will be placed under conservation tillage during Stage 1. DWU also chooses how much of their payoff (if anything) to transfer to UF during Stage 2. Stage 3 in this condition is the same as in "*UF is PRO-No Feedback*" condition.

3.1.3. *UF is PRO – Inducing Empathy*

Stages 1 and 2 in this condition are the same as in "*UF is PRO-No Feedback*" condition. During Stage 3 DWU (after seeing the choice of conservation tillage, the amount of the transfer and the resulting payoffs) can express their emotions to UF by sending a frowney face ☹. The frowney can be sent for the level of CT chosen by UF and/or for the final payoff distribution. So DWU can express 0, 1, or 2 frowney faces. Sending each frowney is costly – 50 tokens. The game round finishes with Stage 4 during which the feedback (0, 1 or 2 frowneys) is graphically displayed to UF (Figure 1).

Figure 1. *The z-Tree screen shot: an example of emotional feedback sent by DWU to UF*



3.1.4. DWU is PRO – Inducing Empathy

This condition replicates the “*UF is PRO-Inducing Empathy*” condition with two differences. First, DWU as a property rights owner decides on the level of CT and the transfer (similarly to “*DWU is PRO – No feedback*”). Second, the emotional feedback on Stage 3 is sent by UF to DWU.

3.1.5. UF is PRO – Imposing Fine

Stages 1 and 2 in this condition are the same as in “*UF is PRO-No feedback*” condition. During Stage 3 DWU (after seeing the choice of conservation tillage, the amount of the transfer and the resulting payoffs) can apply a monetary fine (assessed in tokens) on UF for the level of CT chosen by UF and/or for the transfer & final payoff distribution. Imposing a fine is costly for DWU: each 5 tokens of fine imposed on UF cost DWU 1 token. The game round finishes with Stage 4 during which the amounts of each fine are displayed to UF.

3.1.6. DWU is PRO – Imposing Fine

This condition replicates the “*UF is PRO-Imposing Fine*” condition with two differences. First, DWU as a property rights owner decides on the level of CT and the transfer (similarly to “*DWU is PRO – No Feedback*”). Second, the fine on Stage 3 is imposed by UF on DWU.

3.2. Earning the role of Property Rights Owner

Before the subjects started to play the game, they participated in a PRO activity. The performance in the activity determined if they were to become the property rights owners or not². The subjects

² The subjects were informed that performance and the speed of the quiz completion will determine how much control over their decisions they will have during the experiment.

were provided with a short essay “Arguments in Favor of Private Property Rights in the Context of Water Pollution” which was based on Bromley’s (1989) five arguments, including first occupancy, labor, utility, political liberty, moral & ethical grounds. After reading the essay the participants had to answer 7 multiple choice questions on the readings. Based on the scores the top 50% of the participants in each session earned the role of property rights owner (ties were broken by the speed with which the subjects completed the quiz).

3.3. Procedures and subjects

The experiment was designed and administered using the economics experimental software z-Tree (Fischbacher, 2007). It has been conducted in the Experimental and Behavioral Economics Laboratory at XXXXX University. The participant’s decisions during the experiment were tracked using a 5-digit random number to assure anonymity. After the subjects completed the PRO activity they received information on their performance. Following the instructions the experimenter answered questions and the participants were asked to take a quiz. The quiz tested their understanding of the institutions and the ability to calculate the payoffs correctly (the subjects were not allowed to proceed until they submitted an accurate answer). The game was played for two rounds which allowed us to measure the distribution of the payoffs before and after the feedback (if the feedback was applied). After the participants completed the experiment they were paid privately their experiment earnings in cash. The mean earnings were \$45.16 (standard deviation \$9.79), while the opportunity costs (average reported hourly wage) were \$9.73³.

In total 432 subjects participated in six conditions, which were run in 33 sessions, each 60-90 minutes long. In all of the experimental conditions there was an almost equal split of the participants by gender (Table 2). A third of the subjects grew up in mostly rural area and over one quarter of the subjects have farmers in their families which make them quite familiar with the context of the study.

Table 2. Descriptive statistics of the participants’ demographics

Variable	Characteristic
Gender	51% females (45, 56, 50, 52, 48, & 55% in the respective 6 conditions)
Age	Average 29; range 19-85 years
Grew up in rural area	33%
Have farmer(s) in family	77%
Total number of subjects	432

4. Experimental results and discussion

4.1. Environmental and sharing behavior depending on the property rights ownership

There is no consistent pattern (Table 3) in the choices of conservation tillage by female and male-property rights owners: 3 of the differences are positive, 2 are negative. In only one condition *DWU is PRO – Imposing Fine* the difference is significant (Wilcoxon rank sum test, p-value = 0.02), which means that females chose a lower level of pollution, i.e. higher conservation tillage, which resulted in higher water quality downstream. Overall, men exhibited more uniformity in their choices, as

³ The participant’s earnings in this experiment are consistent with the incentive payments in other similar recent studies (e.g. Cubitt et al. 2011; Duffy and Kornienko 2010).

presented by a lower standard deviation, than women. Notably, both females and males are choosing above the social optimum of 300 acres, suggesting that they do not go for the highest economic payoff. At the same time, they are very far below the environmental optimum of 500 acres. This leads us to reject Hypothesis 1 and note the following:

Finding 1. Under the threat of fine female water users (but not farmers) behave more environmentally friendly than males.

Table 3. Decisions of property rights owners in Round 1

Average by condition	PRO is female	PRO is male	Difference	Difference is significant?
Conservation Tillage, max 500 acres				
<i>UF is PRO – No Feedback</i>	373	344	+	No
<i>DWU is PRO – No Feedback</i>	325	388	-	No
<i>UF is PRO – Inducing Empathy</i>	282	317	-	No
<i>DWU is PRO – Inducing Empathy</i>	348	348	0	No
<i>UF is PRO – Imposing Fine</i>	330	290	+	No
<i>DWU is PRO – Imposing Fine</i>	355	315	+	Yes, p-value=0.024
Share of PRO payoff				
<i>UF is PRO – No Feedback</i>	0.641	0.642	-	No
<i>DWU is PRO – No Feedback</i>	0.505	0.578	-	No
<i>UF is PRO – Inducing Empathy</i>	0.644	0.679	-	No
<i>DWU is PRO – Inducing Empathy</i>	0.540	0.580	-	Yes, p-value = 0.088
<i>UF is PRO – Imposing Fine</i>	0.577	0.644	-	No
<i>DWU is PRO – Imposing Fine</i>	0.521	0.510	+	No

In terms of sharing behavior female property right owners were more likely to allocate a higher share of payoff to their group members (*Table 3*) which is evident by the negative difference in 5 out of 6 cases between what females allocated to themselves (e.g. 54% in the *DWU is PRO – Inducing Empathy* condition) versus what males allocated (58% in the same condition). The differences between the average shares are not significant except in the *DWU is PRO – Inducing Empathy* condition (Wilcoxon rank sum test, p-value = 0.09). This leads us to reject Hypothesis 2 and state the following:

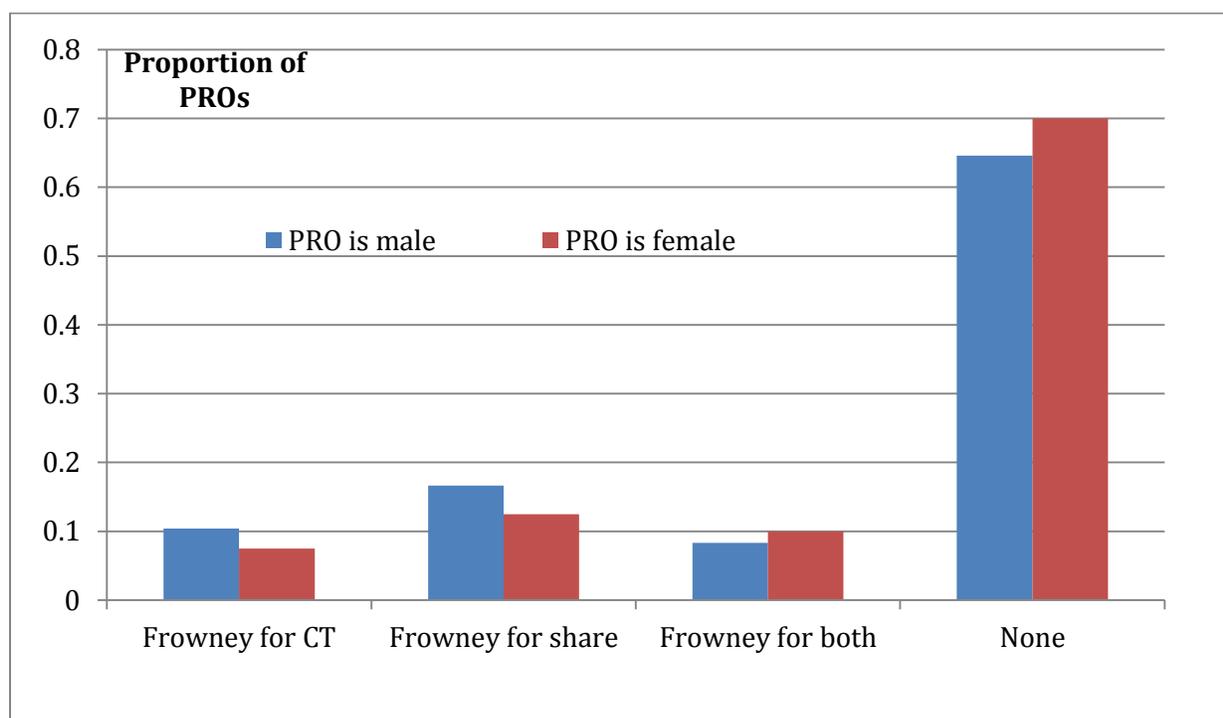
Finding 2. In the induced empathy situation female water users (but not farmers) share more than males with their group members.

Taking together these observations suggest that the effect of fines and empathy nudging depends on whether females are making a decision from the position of a farmer (polluter) or a water user (victim). As a polluter, both genders decide similarly. If the victim is the property rights owner, however, gender differences can be observed. Intriguingly, the fine and empathy affect different dimensions of behavior: the threat of fine decreases the level of pollution chosen by women, while empathy nudging increases the level of sharing.

4.2. Effectiveness of empathy nudging and fines

Empathy nudging by sending an emotional feedback in the form of an emoticon was applied in 33% of the cases. Overall male property right owners were receiving such feedback more often than females, which is probably driven by the more generous behavior of female-PROs in Round 1 (since the conservation levels by male-PROs were overall higher in the *Inducing Empathy* conditions). In particular, 12 out of 40 females-PROs received at least one 😞 and 17 out of 48 males received at least one 😞. Men were more likely than women to receive one frowney, while women were more likely than men to receive two frowneys (Figure 2).

Figure 2. Empathy nudging received, by gender of the property right owner



In order to evaluate the effectiveness of inducing empathy we constructed a regression using gender as a dummy and controlling for whether the property rights owner is an upstream farmer or a downstream water user (Table 4). In these regressions we considered only cases when an emoticon 😞 was sent. The dependent variable in Model 1 is the absolute change in the level of conservation tillage in Round 2 as compared to Round 1. The results of Model 1 support our Hypothesis 3 that empathy nudging is more effective for females than for males when one is trying to increase environmentally friendly behavior: the coefficient in front of dummy *Gender=Female* is positive and statistically significant at 5%. This coefficient is also economically significant – a female receiving a frowney increases CT by about 10% of the Round 1 CT averages.

In addition, empathy nudging tends to be more effective for females as compared to males when it comes to decreasing the share of payoff that the property rights owner allocated to him/herself (Model 2 in Table 4). The coefficient in front of dummy *Gender=Female* is negative, albeit, with a p-value of .11, just insignificant at standard levels.

Finding 3: Empathy nudging of females is more effective in moving individuals towards more environmentally friendly and sharing behavior (supporting Hypothesis 3).

We also found that empathy nudging decreases the proportion of payoff allocated by the PRO to themselves (-0.05 percentage points, p -value=0.0135⁴), thus increasing payoff sharing, however it does not significantly increase conservation levels.

Table 4. Empathy nudging: regressions for changes in Round 2 as compared to Round 1

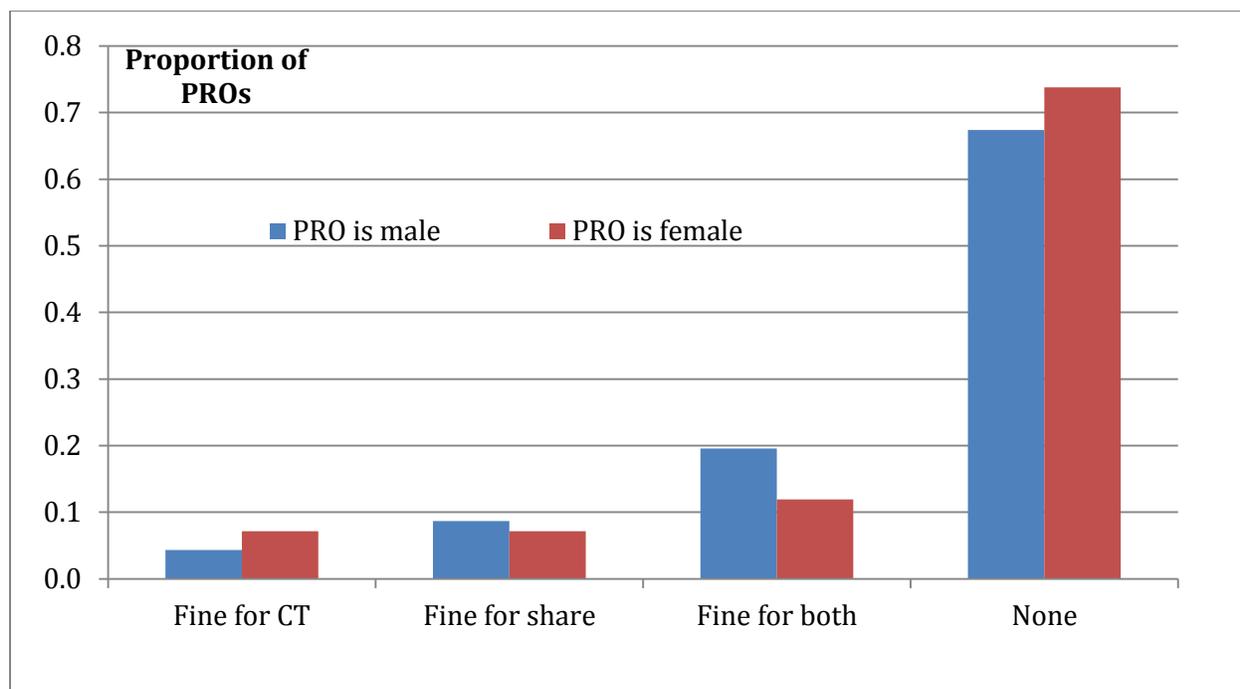
Conditions and variables	Model 1	Model 2
DV: change in conservation tillage, max 500 acres		
<i>Intercept</i>	-19.71**	
<i>Dummy for Gender (Female=1, Male=0)</i>	28.37**	
<i>Dummy for PRO (UF is PRO=1, DWU is PRO=0)</i>	16.72	
R-sq.	0.09	
DV: change in share of PRO payoff		
<i>Intercept</i>		-0.0029
<i>Dummy for Gender (Female=1, Male=0)</i>		-0.039†
<i>Dummy for PRO (UF is PRO=1, DWU is PRO=0)</i>		-0.0203
R-squared		0.11

Significance: † - p -value=0.107; ** - p -value<0.05.

As compared to emotional feedback, fines were applied a little bit more reluctantly – monetary punishment was imposed in 29.5% of the cases. Similarly to the *Inducing Empathy* conditions, overall male property right owners received fines more often than females in the *Imposing Fine* conditions, which is driven by both more sharing and higher conservation levels that were chosen by female-PROs. In particular, 11 out of 42 females-PROs received at least one fine and 15 out of 46 males received at least one fine. Men were much more likely than women to receive two fines (Figure 3).

⁴ For the detailed regression results please contact the authors.

Figure 3. Fines received, by gender of the property right owner



In order to evaluate the effectiveness of imposing a fine we constructed regressions using gender as a dummy and controlling for whether the property rights owner is an upstream farmer or a downstream water user (Table 5). The dependent variable in Model 3 is the absolute change in the level of conservation tillage in Round 2 as compared to Round 1, the dependent variable in Model 4 is the absolute change in the share of the payoff allocated by the PRO to themselves. We found no support for our Hypothesis 4 that fines are more effective for males than for females (none of the regression coefficients are statistically significant at 10%).

Finding 4: Fines imposed on property rights owners have no statistically significant different effect on females compared to males, both in terms of conservation levels and payoff sharing.

Table 5. Imposing fine: regressions for changes in Round 2 as compared to Round 1

Conditions and variables	Model 3	Model 4
DV: change in conservation tillage, max 500 acres		
<i>Intercept</i>	-4.586	
<i>Dummy for Gender (Female=1, Male=0)</i>	-9.605	
<i>Dummy for PRO (UF is PRO=1, DWU is PRO=0)</i>	3.299	
R-sq.	0.01	
DV: change in share of PRO payoff		
<i>Intercept</i>		-0.005
<i>Dummy for Gender (Female=1, Male=0)</i>		-0.052

<i>Dummy for PRO (UF is PRO=1, DWU is PRO=0)</i>		0.066
R-squared		0.12

Moreover we found that fines actually have a counterproductive effect by decreasing the levels of conservation (by 40.96 acres, p -value=0.075⁵). They do not, however, affect sharing behavior. Coupled with our previous finding we can offer the following observation which warrants further research:

Observation: Imposing monetary fines is counterproductive and decreases environmentally friendly behavior (however it does not significantly affect sharing), while empathy nudging increases sharing behavior (however it does not significantly affect environmentally friendly behavior).

5. Conclusion

Generally, we find that imposing monetary fines is counterproductive as it decreases environmentally friendly behavior. From a classical economic perspective this is a very surprising result as fines are supposed to increase the perceived cost of behaving in an environmentally damaging way, and therefore should increase environmentally friendly behavior rather than decrease it. From a behavioral economics perspective there are two possible explanations for this behavior. The first explanation is based on revenge as a driving force of behavior. Subjects do not like being fined or punished and rather than behaving in a rational way, they instead try to take revenge. The second explanation is based on intrinsic versus extrinsic motivation. Whereas subjects might be intrinsically motivated to protect the environment or do the socially right thing, getting a monetary fine may shift the focus on the purely pecuniary dimension (see Gneezy and Rustichini (2000a, 2000b) and Czap et al (2013) for similar findings) and hence may cause subjects to disregard the environmental impact of their decisions. This finding has important policy implications, as much of the current environmental policy is based on command and control approaches. Imposing fines is not an effective policy!

Interestingly, the same cannot be said about threatening to impose a fine. Here is where heterogeneity becomes an important consideration. Females are much more susceptible to the threat of monetary fines and behave, compared to males, more environmentally friendly as a result of such a threat as long as they are in the position of a downstream water user. Furthermore, the results in this paper suggest that females are also more significantly affected by potential social disapproval (the induced empathy situation) and actual empathy nudging than their male counterparts.

From an environmental economic perspective with focus on less developed countries this provides good news as well as bad news. The bad news is that males are neither very responsive to fines nor to empathy nudging. If anything, the effect of fines will be counterproductive. Since the vast majority to economic assets is owned and controlled, or managed, by males, this implies significant challenges for an environmentally sustainable development strategy. The good news is that the results in this paper support that females are relatively responsive to policy designs meant to enhance environmentally conscious behavior. This provides another argument for increasing gender equality that is based on environmentally sustainable economic development and thus may strengthen the push by national governments as well as international organizations to increase the economic role of women.

⁵ For the detailed regression results please contact the authors.

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