The anticommons dilemma: the effects of externalities awareness and social value orientation

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Abstract

The social dilemma called the anticommons dilemma represents a context in which a scarce resource has multiple owners who can exclude one another from harvesting from that resource. Not much attention has been paid to factors that lead to non-cooperative decisions in this context. Consequently, the present study investigates how the salience of collective consequences (externalities awareness) influences (non-)cooperative choice behavior in people differing in social value orientations (SVO). After SVO was measured and one of the two externalities awareness conditions was presented, the participants (N = 168) had to indicate a minimum price to give a co-owner access to the resource (WTA) in a modified anticommons paradigm. It was expected that when externalities were made salient individuals would display higher levels of cooperation, by indicating lower WTA's, compared to when externalities were not made salient. Moreover, it was expected that when externalities were not made salient prosocials would display higher levels of cooperation than proselfs, whereas when externalities were made salient this difference would be smaller. Although the effect of externalities awareness and the interaction effect of this factor with SVO was non-significant, exploratory analyses indicated severe underuse of the common resource. The limitations of this study and suggestions for future research are discussed.

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1. Introduction

In case of a social dilemma, individuals face a situation in which they have to make a choice between the personal interest and the interest of the collective to which they belong, generally referred to the choice between ‘cooperation’ and ‘defection’ (De Kwaadsteniet, Van Dijk, Wit & De Cremer, 2006). In case all group members decide to cooperate, every member will be better off than when all choose to defect. In case the individual decides to defect, this will be personally more profitable than when deciding to cooperate, but will do more damage to the collective, regardless of the decisions of the other individuals (Kopelman, Weber & Messick, 2002).

Various types of social dilemmas have been studied, among which is the well-known commons dilemma. This dilemma refers to the situation where a scarce resource can be freely accessed by a number of individuals. When the individuals collectively harvest too much, they exceed the maximum of the natural limit. This overutilization will likely lead to the destruction or depletion of the resource. Consequently, each individual will be left with nothing due to a combination of not considering the social cost of overutilization and striving for individual profit.

A well-known example of the commons dilemma is about sheep farmers making use of a freely accessible pasture. The pasture can only provide food to a limited number of sheep. This is called the natural limit of the pasture. If each farmer, out of individual profit, decides to increase the number of their sheep grazing on the pasture, the farmers will collectively exceed the natural limit of the pasture. Consequently, the pasture will not be able to provide enough food for all the sheep. On the long term, the farmers will risk depletion of the resource due to the excessive usage. The latter will have detrimental consequences for the collective, as the field will decrease in its quality. Other real-life examples of the commons dilemma are energy consumption, overhunting, deforestation and air pollution.

According to Hardin (1968, 1998), a solution to maintain scarce collective resources is to apply exclusion rights. When applied, the owners are endowed with the right to exclude each other from using the common resource and as a result every co-owner has to obtain permission to harvest. However, according to Heller (1998) this solution might lead to another tragedy, namely the tragedy of the anticommons. Heller argued that it is likely that the common resource will be underused due to co-owners withholding resources from other

owners. Consequently, the capacity of the resource is not fully utilized (Dhont, Van Hiel & De Cremer, 2011).

A real-life example of the anticommons dilemma is about a drug company that wants to develop a new medicine. In order to create this medicine, the developers need to buy access to patents from different firms. Each patent holder is able to name a price. As the patent holders do not know which of the patents are most important for the new medicine, each patent holder will demand more money than the actual value of their intervention. The sum of the demanded prices will be higher than the new medicine's expected profits. Consequently, the developer has to stop the process. The community is not able to profit from this new medicine, as it could not be put on the market, and no money will be earned by the patent holders because of that. Other real-life examples are new media creations in the film and music industry and copy right protection.

Vanneste et al. (2006) compared the behavior in an anticommons dilemma with the behavior in a commons dilemma. Interestingly, the study showed that the amount of money taken in the commons condition was significantly lower than the asking prices in the analogous anticommons condition which indicates more individualistic behavior in the latter case. This higher level of non-cooperative choice behavior was also demonstrated in the follow-up studies by Van Hiel et al. (2008) and Dhont et al. (2011). As the payoff structures were identical, psychological variables seem to influence people's behavior differently in the two dilemmas. Compared to the commons dilemma, very few studies have investigated which dominant psychological factors amplify non-cooperative choice behavior in the anticommons dilemma.

The present study aims to further explore which factors influence decision making in the anticommons dilemma. Previous research has demonstrated that externalities awareness can increase cooperation in the anticommons dilemma (Dhont et al., 2011) and social value orientation (SVO) can influence cooperation in social dilemmas (Balliet, Parks & Joireman, 2009). To make a unique contribution and gain a more complete picture of cooperation in the anticommons dilemma, the present study combines the two factors. This section introduces externalities awareness and SVO, followed by how we expect this contextual factor and disposition to interact in the anticommons context.

1.1. Externalities awareness

Firstly, cooperation differences might be based on the individual's awareness of the collective consequences of one's choice behavior, or in short, externalities awareness. A study from Dhont et al. (2011) showed that the underlying mechanism accounting for the higher level of non-cooperative behavior in anticommons compared to the commons dilemmas, can be explained by a relatively lower level of externalities awareness. In other words, it highlighted the mediating role of externalities awareness. As a possible explanation for this lower level of externalities awareness in the anticommons dilemmas, Dhont et al. (2011) highlighted the structural features of the two dilemmas. In the commons dilemma the property is already present when people have to make a decision. However, in the commons dilemma the property has to be created or is non-productive. As a result, the implications of decision making are quite clear in a commons context but are ambiguous in an anticommons context. Making the externalities salient to the individual increased the awareness, especially in the anticommons condition, of conflict between the individual and collective interest. It was shown that when externalities were made salient to the individual, by stressing the negative consequences of non-cooperative choice behavior for the other owners and for the common property, individuals exhibited relatively high levels of cooperative choice behavior as opposed to when externalities were not made salient. Dhont et al. (2011) suggested that making the externalities salient in the anticommons dilemma transforms the underlying rationality principle from the individual level to the group level, resulting in a higher chance of cooperative behavior.

1.2. Social value orientation

Secondly, besides contextual factors, cooperation differences might also be based on dispositional preferences such as the individual's social value orientation ('SVO'). Much research has focused on the relationship between SVO and cooperation in social dilemmas. A meta-analysis conducted by Balliet et al. (2009) combined the results of 82 studies assessing this relationship, and established a significant and small to medium effect size.

The SVO model distinguishes social orientation types based on the evaluation of outcomes for the individual and for the other(s) and weight the welfare of others in relation to their own (Messick & McClintock, 1968; Van Lange, 1999). Generally, in previous research three different types of social value orientation have been distinguished (Van Lange, 1999). First,

the cooperation typology where individuals prefer to either maximize collective outcomes or strive for equal outcomes. Second, the individualism typology where individuals prefer to maximize own outcomes. Third, the competition typology where individuals prefer to maximize the difference between their outcome and the outcome of other(s) (Messick & McClintock, 1968). Generally, cooperators are referred to as prosocials and individualists and competitors are referred to as proselfs (e.g., De Kwaadsteniet et al., 2006; Kramer, McClintock, & Messick, 1986; McClintock & Liebrand, 1988; Van Horen, Van der Wal & Grinstein, 2018; Van Lange & Kuhlman, 1994). However, it should be taken into account that prosocials and proselfs potentially do not behave differently depending on the environmental characteristics of the social dilemma (cf. Balliet et al., 2009; De Kwaadsteniet et al., 2006; Parks, 1994; Roch & Samuelson, 1997). In other words, to obtain a clear picture of the effect of the social value orientation on cooperation, one should look further into the role of situational characteristics that are present in the social dilemma.

1.3. Strong versus weak situations

In order to predict if the cooperative choice behavior of proselfs and prosocials differ in the anticommons dilemma, one should take into account the situational characteristics of the dilemma. In this study externalities awareness is a dominant situational characteristic which aims to make environmental cues for choice behavior salient, by turning the attention of the individual to the collective consequences of their behavior. One possible perspective that enables prediction in this anticommons context, originates from Snyder and Ickes.
According to Snyder and Ickes (1985), a distinction can be made between psychologically "strong" situation or psychologically "weak" situation. A strong situation is defined by salient cues to guide behavior due to a high degree of structure and definition. In contrast, a weak situation is defined by a low degree of structure and definition, due to the ambiguous and unstructured environment behavior will be influenced more strongly by one's dispositions than by the contextual environment. According to Van Lange (1997) this personality-contextual behavior is also applicable to social dilemmas.
When applying this theoretical perspective to the context of anticommons dilemmas, anticommons dilemmas without externalities awareness can be perceived as weak situations as the collective consequences of choice behavior remain more ambigious to the individual. This results in a lack of clarity. Whereas, anticommons dilemmas with externalities awareness can be considered as strong situations. It presents the individual the collective consequences of their choice behavior. Hence, in an anticommons dilemma with externalities awareness, it

is suggested that the behavior of each individual will be controlled more by the salient situational cues of their environment. In other words, both the proselfs and the prosocials will use the collective consequences as a focal point resulting in comparable levels of choice behavior. By contrast, in an anticommons dilemma without this type of guidance, it is suggested that individuals will more look inward for cues such as their SVO, to choose how to behave. In other words, proselfs and prosocials will use their own SVO as a focal point resulting in different levels of choice behavior. Therefore, we expect an interaction effect. SVO will less strongly influence cooperative behavior when externalities are salient compared to when externalities are not salient.

1.4. The present research

Based on the review of the literature, one main and one interaction effect are expected within the context of the anticommons dilemma. First, we expect to replicate the finding from the earlier Dhont et al. (2011)'s study regarding the effect from externalities awareness on choice behavior.

Hypothesis 1: When externalities are made salient, individuals exhibit relatively higher levels of cooperative choice behavior compared to when externalities are not made salient.

Second, we expect a significant effect of social value orientation in anticommons without externalities awareness. After all, in this case we expect dispositions to have more of an influence on choice behavior than contextual factors. Moreover, we expect a smaller effect of social value orientation in anticommons with externalities awareness. Because in this case, we expect contextual factors to have a stronger influence on choice behavior than dispositions. Put differently, we expect a significant interaction effect between externalities awareness and SVO on choice behavior.

Hypothesis 2: When externalities are not made salient prosocials exhibit relatively higher levels of cooperative choice behavior than proselfs, whereas we expect this difference to be smaller when externalities are made salient.

2. Method

In the current experiment participants were presented with an anticommons dilemma where externalities were made salient or not. This section provides an overview of the corresponding method.

2.1 Participants and design

Adult participants with a sufficient grasp of the English language were recruited through the online platform M-Turk. The participants took part in an online computer-based experiment on "decision making", wherein they had the chance to earn money (maximally US $1.50) in addition to their participation fee (US $2.00). Based on earlier studies 40 to 50 participants were needed per cell. In this study the independent variable externalities awareness consisted of two conditions and the independent variable SVO was on an interval level, leading to a minimum of 160 participants. However, the sample size was expanded to a number of 238 participants to be able to anticipate on outliers or data that would not be sufficient to test the hypotheses due to participants leaving the online task environment prematurely.
Inspection showed that there were 10 outliers in the dataset in terms of scores on the independent variables (Leverage > 0.053). Nevertheless, these outliers were not influential (Cook's Distance < 1.00) and were therefore not excluded from the analysis. Eventually, the final sample consisted of 168 participants (M_{age} = 38.11, SE_{age} = 9.89; 31.7% female) since 70 participants were excluded due to leaving the experiment too early.

The hypotheses were tested by manipulating externalities between-subjects as a nominal variable (externalities salient versus externalities not salient) and measuring SVO as an interval variable. The dependent variable was the participants' WTA, which is on an interval level. Lower WTA scores indicate higher cooperative choice behavior.

2.2. Procedure

At the beginning of the study, the participants were proportionally assigned to either the externalities salient or the externalities not salient condition. This assignment was based on the time one entered the online environment; the participants were alternately assigned to one of the two conditions. After being presented with an informed consent, the participants were requested to fill out the SVO measure. Thereafter, they were presented with the task instruction of the anticommons dilemma followed by five comprehension questions to ensure

that they understood the task. To continue, the comprehension questions had to be completed without giving an incorrect answer. Dependent upon the condition, the participant subsequently read an additional text or was directly navigated to the online environment where the experiment started. After completion of the experimental session the participants were asked to answer a few exploratory questions: demographic questions, questions to measure the participants level of externalities awareness and a mixture of questions to measure the level of uncertainty and the experience of a psychologically strong or weak situation. The latter two questionnaires are presented in the appendix. In order to calculate the final payments, 3-person groups were randomly formed afterwards. Finally, the participants were debriefed, thanked for their participation and received a payment dependent on the final outcome of the task.

2.3. Measures

Assessment of social value orientation

In order to assess participants' social value orientations, the participants completed the six primary items of the 'SVO Slider Measure' (Murphy, Ackerman & Handgraaf, 2011) at the beginning of the experimental session. According to Murphy and Ackermann (2013)'s meta-analysis, the measure has good psychometric properties qualities. For each item the participants needed to mark which of the six distributions they preferred between the self and an unknown other (e.g. for one item the choices were [Choice 1: Points to Self = 100, points to other = 50], [2 = 94,56], …., [8 = 56,94] [9 = 50,100]. The preferred allocations of the specified points determines how people weigh the welfare of others in relation to their own. Based on the choices it is possible to rank order the preferences, to check for transitivity in the revealed preferences but most importantly to calculate a SVO (angle degree) score by the official formula SVO=arctan [(xother − 50)/(xself − 50)] (Murphy et all., 2011). The range of SVO scores is between -16.26° and 61.39°, where lower SVO scores indicate a more proself personality and higher SVO scores indicate a more prosocial personality.

The anticommons dilemma

In order to assess cooperative choice behavior the participants participated in a one-shot anticommons game (which was called "group task" in the instructions), meaning that they could not depend on the anticipation of future play with the same co-owners. Across the two conditions, the basic dilemma structure was analogous. The participants were presented with a

3-person anticommons task involving 3 co-owners of one collective resource worth 150 points in total. It was told to the participants that each co-owner could harvest 50 points from the collective resource, provided that the other co-owners granted their permission to do so. To obtain this permission, each co-owner was endowed with an additional 50 points that they could either use to negotiate with their co-owners to use the resource or keep for themselves. If the participant preferred to use the points to negotiate, this participant would have to place a bid without knowing the prices that the other co-owners indicated as acceptable. The participant knew that as a group the co-owners faced the same situation; one round would be presented where each co-owner had to make two decisions, namely the minimum price that they would accept to grant permission and their own bid. Moreover, the identity of the group members would remain unknown, communication was not possible and decisions could not be adjusted at a later stage. Each point was worth US $0.01 (approximately €0.008) which was paid out in real money at the end of the experiment.

In the two conditions, as mentioned before, two decisions had to be made. Firstly, the participants had to indicate how many points they were minimally willing to accept from each co-owner (WTA) to grant them access to the collective resource. This price ranged from 0 to 25 points. Second, the participants had to indicate how many points they were maximally willing to pay to each co-owner (WTP) to gain access to the collective resource. This price ranged from 0 to 25 points. If the WTA of each co-owner was lower or equal to the amount the participant was maximally willing to pay (WTP), the latter was granted access and received 50 points from the collective resource (WTA's ≤ WTP = DEAL). If the WTA of one or both of the two co-owners exceeded the amount the participant was maximally willing to pay (WTP), the latter was not granted access and received 0 points from the collective resource (ONE OR BOTH WTA's > WTP = NO DEAL). When a deal was made between the participants, the participant who was granted access paid her/his indicated bid price (WTP). Moreover, the two co-owners received the amount of points indicated as minimally willing to accept to give access (WTA). If no deal was made between the participants, the participant kept those points and the other co-owners did not receive their indicated amount of points. Thus, the final amount of points a participant possessed was dependent on three matters: being granted to harvest, the number of points that one had to pay and the number of points that one received. After the experimental session, the participants received feedback about the decisions of the other two co-owner.

The WTA that the participants indicated was used to assess the effect of externalities awareness and SVO on cooperative choice behavior, and therefore served as the main dependent variable. The range of the WTA is between 0 and 25, where lower WTA scores indicate more cooperative choice behavior and higher WTA scores indicate more non-cooperative choice behavior.

Manipulation of externalities awareness

The only difference between the externalities awareness conditions was whether or not the participants received additional information about the consequences of cooperative and non-cooperative choice behavior, before having to indicate their WTA and WTP. Or put differently, if the externalities were made salient or not. In the externalities not salient condition no extra information was given. However, in the externalities salient condition, the danger of underuse was emphasized by stating: "it is important to note that setting a high asking price can have negative consequences for the collective (i.e., all three co-owners together). That is, when you set an asking price that is higher than the amount your co-owners are willing to pay, they will not gain access to the resource. As a consequence, the resource will be underused, making the collective payoff lower than it could have been.". By contrast the advantage of cooperative choice behavior was emphasized by stating: "At the same time, setting a low asking price is beneficial to the collective (i.e., all three co-owners together). After all, if all co-owners set a low asking price, the chance is higher that everyone gets access to the resource, and that the resource is optimally used.". To test whether the manipulation was successful, the participants completed four items measuring their levels of externalities awareness after indicating their WTA and WTP. For example, we asked participants to what extent they were aware of the consequences of their decisions. These items had to be rated on a 7-point Likert scale ranging from to a small extent (1) to a large extent (7).

2.4 Statistical analyses

This study tested one main effect and one interaction effect. For this purpose, it was required to perform a PCA and ANCOVA before testing the hypotheses. First, a PCA was performed to assess if the externalities awareness questions reflect one latent construct. Thereafter, an ANCOVA was performed on participants' mean externalities awareness scores to assess if the manipulation was successful. In order to test the two hypotheses of this study a multiple

regression analysis with the WTA's as the criterion variable, two centered predictors (the externalities awareness conditions and SVO) and one centered interaction was conducted.

3. Results

As outlined in the introduction, externalities awareness and SVO potentially effects the cooperative choice behavior in the anticommons dilemma. This section provides an overview of the experimental results.

3.1 Preliminary analyses

3.1.1 Principal component analysis

Data analyses first required to check if the questions used to measure the participants' level of externalities awareness, would reflect this component. To that end, a principal component analysis (PCA) was conducted with the four externalities awareness items. As expected, the PCA analysis resulted in a one-component solution, which can be seen in Table 1.

Table 1. *Component loadings for the externalities awareness scale*

Item	Externalities awareness
1. To what extent were you aware of the consequences of your decisions?	0.69
2. To what extent were you aware of the fact that if all participants ask for a small amount of points, every co-owner benefits?	0.77
3. To what extent were you aware of the fact that if all participants ask for a big amount of points the collective interest will be harmed?	0.84
4. To what extent were you aware of the fact that the resource would be left unused if all participants would not be granted access?	0.73
Eigenvalue	2.29
% Variance explained	57.4

3.1.2 Reliability

When the reliability of the externalities awareness scale was tested, the Cronbach's alpha indicated sufficient (a = 0.746) internal consistency. Consequently, the four items were averaged to create one externalities awareness score per participant.

3.1.3 Manipulation check

In the two conditions, after participants indicated their WTA and WTP, the participants were asked to complete four items measuring their levels of externalities awareness (1 = aware to a small extent; 7 = aware to a large extent). For the data analysis the average externalities awareness scores were used. Higher scores denoted higher perceived externalities awareness. The results from an ANCOVA indicated that the manipulation of externalities awareness was successful due to a significant main effect of externalities awareness ($F(1, 165) = 10.00$, $p = 0.002$), and a non-significant effect of SVO ($F(1, 165) = 0.55$, $p = 0.478$). As expected, participants in the externalities not salient condition ($M^* = 5.59$, $SE = 0.12$) indicated that they were significantly less aware of the externalities while indicating their WTA and WTP compared to the participants in the externalities salient condition ($M^* = 6.09$, $SE = 0.11$).

3.2 Main analyses

To test the hypotheses, a multiple regression analysis was performed with WTA as the criterion variable and SVO, the externalities awareness conditions and their interaction as the predictor variables.

In order to include the interaction term while avoiding multicollinearity, a centering methodology was applied. Table 2 shows that as a result, the correlation between the two independent variables decreased (0.817 versus -0.074) indicating decreased multicollinearity.

Table 2. *Correlation matrix of SVO (centered), externalities awareness (centered) and WTA, N = 168**

	SVO	Externalities	WTA	SVO x externalities	Externalities centered	SVO centered	Externalities x SVO centered
SVO	1.000						
Externalities	-0.067	1.000					
WTA	-0.193*	-0.105	1.000				
SVO x externalities	0.817**	0.446**	-0.235**	1.000			
Externalities centered	-0.067	1.000*	-0.105	0.446**	1.000		

SVO centered	1.00**	-0.067	-0.193*	0.817*	-0.067	1.000	
Externalites x SVO centered	-0.074	0.008	-0.048	0.225**	0.008	-0.074	1.000

*$p < 0.05$. **$p < 0.01$.

The multiple regression analysis revealed that the three predictors had a significant effect on WTA, $F(3,164) = 3.19$, $p = 0.025$. The combined effect of the three predictors accounts for 6% variance ($R^2 = 0.055$) in the indicated WTA's in this sample.

Table 3 shows the regression outcomes that are central for testing the hypotheses. Hypothesis 1 was not corroborated, externalities awareness appeared to be a non-significant predictor of WTA, β = -0.118, $SE = 1.138$, $p = 0.123$, $sr^2 = 0.014$. Although the externalities awareness effect was not significant, participants reported slightly higher WTA's in the externalities not salient condition ($M = 16.62$, $SE = 6.73$, $n = 79$) compared to the externalities salient condition ($M = 15.06$, $SE = 8.07$, $n = 89$). Hypothesis 2 was not confirmed either, there was no significant interaction between externalities awareness and SVO on WTA, β = 0.063, $SE = 0.094$, $p = 0.123$, $sr^2 = 0.004$. Apart from the hypotheses, the SVO of participants appeared to be a significant predictor of WTA, β = -0.206, $SE = 0.047$, $p = 0.008$, $sr^2 = 0.042$. This revealed that prosocials cooperated more by setting a relatively lower WTA's compared to proselfs.

Table 3. *Regression coefficients*, $N = 168$*

	b	*SE*	β	*t*	*p*-value	sr^2
Constant	15.761	0.568		27.76	<0.001	
Externalities awareness centered	-1.762	1.138	-0.118	-1.55	0.123	0.014
SVO centered	-0.127	0.047	-0.206	-2.70	0.008	0.042
Interaction	-0.077	0.094	0.063	-0.82	0.413	0.004

*$R^2 = 0.055$, $F(3,164) = 3.19$, $p = 0.025$; b = unstandardized regression coefficient, *SE* = standard error, β = standardised regression coefficient, sr^2 = semi-partial correlation

3.3 Exploratory analyses

On an exploratory basis, we assessed three topics. First of all, we assessed whether the participant's experience of a psychological weak situation was more frequent in the externalities not salient condition and the experience of a psychological strong situation was more frequent in the externalities salient condition. As outlined in the method section, this experience was measured with eight exploratory questions. Furthermore, we assessed whether the former predictors had an effect on the group outcomes in the anticommons dilemma. Lastly, the (un)successfulness of the groups was studied and compared between conditions.

3.3.1. Psychological weak versus strong situation

On an exploratory basis we assessed if the experience of a psychological weak or psychological strong situation was in line with our expectations. Data analyses first required to recode scores, so that low scores (1 = to a small extent) would reflect the experience of a psychological weak situation and high scores (7 = to a large extent) would reflect the experience of a psychological strong situation. The data of one participant was excluded from the sample used in the previous analyses, due to leaving the experiment too early. Thereafter, it was required to check if the eight questions used to measure the participants level of experiencing a psychologically weak versus strong situation, would reflect this component. To that end, two principal component analyses (PCAs) were conducted with varimax rotation. The PCA analysis with the eight psychologically weak versus strong situation items, resulted in a two-component solution (KMO = 0.693; Barlett's test, x^2 (28) = 341.109, $p < 0.001$) with item 8 cross-loading on both components. However, due to a low Cronbachs alpha for both subscales ($a_{component\_1}$ = 0.315 and $a_{component\_2}$ = 0.166) item 3 was deleted. As can be seen in Table 4, the PCA analysis without this item resulted in a two-component solution (KMO = 0.663; Barlett's test, x^2 (21) = 289.048, $p < 0.001$). The Cronbachs alpha for the first scale consisting out of items 7 to 10 indicated sufficient ($a_{component\_1}$ = 0.773) internal consistency, however the Cronbachs alpha for the second scale consisting out of items 4 to 6 and 8 indicated insufficient ($a_{component\_2}$ = -0.185) internal consistency. Therefore, the high loading (> 0.40) items on the first component were aggregated to form one average psychologically weak versus strong situation score per participant.

Table 4. *Rotated component loadings for the psychologically weak versus strong situation scale*

Items	Psychological weak versus strong situation	Component 2
4. To what extent was the asking price you have set based on what you personally wanted?	0.18	-0.65
5. To what extent did the task provide you with clear guidelines for setting an asking price?	0.09	-0.71
6. To what extent did the task provide you with a wide variety of possible responses?	-0.09	-0.61
7. To what extent did the task guide you towards the choice you eventually made?	0.71	0.39
8. To what extent did the task make clear what was appropriate to do?	0.58	0.49
9. To what extent did you feel pressured to set a low asking price?	0.86	-0.14
10. To what extent did you feel pressured to make sure the other co-owners would get access to the resource?	0.86	-0.13
a	0.773	-0.185
Eigenvalue	2.50	1.58
% Variance explained	35.7	22.5

The results from an ANCOVA indicated that the manipulation of externalities awareness was accompanied by the experience of a psychologically strong versus weak situation, due to a significant main effect of externalities awareness ($F(1, 164) = 23.17$, $p < 0.001$) and a non-significant effect of SVO ($F(1, 164) = 0.10$, $p = 0.753$). As expected, participants in the externalities not salient condition ($M^* = 4.15$, $SE = 0.15$) indicated that they experienced a more psychologically weak situation than participants in the externalities salient condition ($M^* = 5.17$, $SE = 0.15$).

3.3.2. Effect predictors on group outcome

For exploratory reasons we also assessed whether SVO, externalities awareness and their interaction had an effect on the group outcome in the anticommons dilemma. Transferring the focus from the individual outcome to the group outcome as a dependent variable, both being indications of cooperative choice behavior, could potentially lead to different effects of the predictors in this dilemma.

The original 3-person groups could consist of both participants assigned to the externalities salient condition and the not salient condition. However, for this exploratory analysis groups should solely consist of participants assigned to one of the two conditions. Therefore, the data analysis first required to create new random groups categorized by their externalities awareness condition. Initially, the sample was divided by condition. In both samples, participants were given a random number in order to create 3-person groups using Excel. The data of two participants was excluded from the salient condition sample due the requirement groups had to consist of 3 persons each. Eventually, 26 not salient condition groups and 29 salient condition groups were formed and the new group outcomes were calculated.

To determine whether the predictors used in the former multiple regression analysis would significantly influence group outcomes, a multiple regression analysis was performed with group outcomes as the criterion variable and SVO, the externalities awareness conditions and their interaction as the predictor variables. The multiple regression revealed that the three predictors, had a no significant effect on the group outcomes, $F(3,51) = 0.69$, $p = 0.562$. The combined effect of the three predictors accounts for 4% variance ($R^2 = 0.039$) in the final group outcomes in this sample. Table 5 shows the regression outcomes, all three predictors appeared to be non-significant ($p > 0.05$).

Table 5. *Regression coefficients with group outcome as the dependent variable*, $N = 165$*

	b	*SE*	β	*t*	*p*-value	sr^2
Constant	194.309	4.001		48.56	<0.001	
Externalities awareness centered	-4.686	8.106	-0.082	-0.58	0.566	0.006
SVO centered	-0.349	0.322	-0.151	-1.08	0.284	0.022

Interaction	0.651	0.648	0.140	1.00	0.320	0.019

*R^2 = 0.039, F(3,51) = 0.069 p = 0.562 ; b = unstandardized regression coefficient, *SE* = standard error, β = standardised regression coefficient, sr^2 = semi-partial correlation

3.3.3. (Un)Succesfulness groups

Lastly, we assessed on an exploratory basis how successful the groups in the externalities salient and not salient condition performed in terms of granted access to the common resource. This was studied to provide further insight regarding the question if making externalities salient would lead to groups utilizing the common resource more as opposed to when externalities were not made salient.

Table 6 presents a complete overview of how the groups in each condition performed as a group focussing on the deals made and the (under)use of the collective resource. A similarity between both conditions is that the number of participants reaching a deal was below average. Furthermore, in both conditions most groups granted one co-owner (61.5 % and 69.0%), followed by granting two co-owners (23.1% and 27.6%), followed by not granting any co-owner (11.5% and 3.5%), followed by groups granting each co-owner (3.9% versus 0.0%).

Table 6. *Deals and group outcomes (count and percentage within condition)*, *N* = 165

	Externalities not salient condition	Externalities salient condition
Number of individuals with deal	31 (39.7%)	36 (41.4%)
Groups complete underuse resource	3 (11.5%)	1 (3.5%)
One group member access resource	16 (61.5%)	20 (69.0%)
Two group members access resource	6 (23.1%)	8 (27.6%)
Groups complete use resource	1 (3.9%)	0 (0.0%)
Number of groups in condition	26	29

4. Discussion

Prior work has documented a remarkable difference between choice behavior in the commons and the anticommons dilemma; it indicated a significant higher level of non-cooperative behavior in the latter dilemma. Despite this interesting finding, not much is known about which factors amplify non-cooperative choice behavior in the anticommons dilemma. In the present study, it was our primary interest to develop a monetary incentivised anticommons paradigm and explore the effect of SVO and the salience of externalities on cooperative choice behavior (WTA) in this setting. This section addresses the main findings, exploratory findings, limitations and suggestions for future research.

4.1. Main findings

The present study focused on the effect of the salience of externalities and SVO on cooperative choice behavior. For this purpose, an incentivised game presenting the anticommons dilemma situation was designed. In this newly developed paradigm, we manipulated externalities awareness. Either participants were made aware of the externalities by receiving information about the consequences of cooperative and non-cooperative choice behavior for the collective or participants were not made aware of these consequences by not receiving this extra information.

4.1.1 Main effect externalities awareness

It was hypothesized that making externalities salient would lead individuals to exhibit relatively high levels of cooperative choice behavior as opposed to when externalities were not made salient. The present study revealed slightly higher WTAs in the externalities not salient condition as opposed to the externalities salient condition, indicating relatively more cooperative choice behavior in the latter condition. However, this difference was statistically non-significant. Therefore, the results did not corroborate Hypothesis 1 and consequently did not align with Dhont et al.'s research findings (2011) on the cooperation effect of externalities awareness within the anticommons dilemma.

One might argue that the disparity could have been caused by a lack of understanding about which WTA decision would be (non)cooperative. However, two results indicate that this may not be a plausible explanation. Firstly, an effect of SVO was found. Secondly, the exploratory analysis revealed the experience of a more psychological strong situation and more awareness of the externalities among participants in the externalities salient condition than participants in

the externalities not salient condition. These results indicate that the participants understood which decision would be (non)cooperative and the participants in the salient condition understood the social dilemma structure. We will elaborate on two alternative explanations for the discrepancy between the findings of this study and the Dhont et al.'s study, that do seem to be plausible.

First, the disparity might have been caused by the difference between the Dhont et al.'s anticommons paradigm and the anticommons paradigm used in the current study. Both presented an anticommons situation to determine the effect of externalities awareness on choice behavior. However, in Dhont et al.'s (2011) study the hypothetical scenario methodology by Vanneste et al. (2006) was applied, whereas in the present study a new, incentivized, non-hypothetical scenario methodology was applied. The use of a hypothetical decision situation with hypothetical pay-offs might have led to different research findings due to the influence of social desirability. Generally, socially desirable responding (SDR) refers to a behaviour, that requires motivation for engagement, which may result in inaccurate scores and results from the interaction of the person with the situation (MacCann et al., 2012). Social desirability can thereby be viewed as a bias. Social desirability to indicate a more cooperative choice might have existed in the Dhont et al.'s (2011) study, because hypothetical decisions involve no real incentives or tangible outcomes but however do involve pressure to please the self-image or the experimenter. This bias, that potentially was of influence in the previous study, could have led to individuals misrepresenting their true preferences to create a favourable impression, which in turn negatively influenced the validity of the responses. One could argue that in the current study the desire to gain real monetary awards may have outweighed the desire to present oneself in a socially desirable way, leading to a different choice behavior pattern.

Second, the disparity might have been caused by the assessment of the participant's social value orientation in the beginning of the current study. This assessment might have led to different research findings due to potentially making the participants social value orientation salient before the anticommons task. Taylor and Thompson (1982), defined salience as "the phenomenon that when one's attention is differentially directed to one portion of the environment rather than to others, the information obtained in that portion will receive disproportionate weighting in subsequent judgments." (p. 175). One could argue that in the current study the assessment of SVO led to a decision making context where besides externalities awareness also the participants social value was made salient. Most importantly,

the effect of SVO being salient may have outweighed the effect of externalities salience. Consequently, participants might have focussed more on relevant internal cues (SVO) than external cues (externalities awareness) while determining their choice behavior, leading to a negligible effect of the latter in the dilemma.

4.1.2. Interaction effect of externalities awareness and SVO

One of the hypotheses argued that when externalities are not salient (i.e. in a "weak" situation), prosocials would exhibit higher levels of cooperative choice behavior than proselfs. This difference was expected to be smaller when externalities are salient (i.e. in a "strong" situation). In other words, a large SVO effect in the externalities not salient condition, whereas a limited SVO effect in the externalities salient condition was expected. The present study, however, revealed a statistically non-significant interaction effect between externalities awareness and SVO on choice behavior and therefore did not corroborate Hypothesis 2. As noted before, the exploratory analysis revealed that participants in the externalities salient condition experienced a more psychologically strong situation than participants in the not salient condition. It therefore appears that making the externalities salient led to more structure and definition and less ambiguity concerning the task environment. Surprisingly, this did not yield the predicted effects which might have been caused by the previously mentioned scenario where the effect of SVO outweighed the effect of externalities awareness.

4.2. Exploratory findings

Our additional analyses assessed if the experience of a psychological weak or psychological strong situation was in line with our expectations, the effect of the former predictors on the group outcome and the successfulness of groups.

First of all, as outlined in the main findings, the additional inspection of our data revealed the experience of a more psychology weak situation in the externalities not salient condition and the experience of a more psychology strong situation in the externalities salient condition. Furthermore, data revealed that the relationship between externalities awareness, SVO and their interaction on group outcomes, was not significant. This corresponds with the results of the main analysis. The only difference between the two results is that the effect of SVO was now non-significant. Lastly, when studying the success of groups in terms of granted access, both conditions showed the same pattern. The majority of groups granted one individual to

use the resource and the minority of groups granted each individual to use the resource. Surprisingly, in the externalities salient condition not a single group granted all individuals access and in both conditions most participants did not reach a deal. This suggests that highlighting the collective consequences did not lead to efficient use of the common resource. Hence, the occurrence of the tragedy of the anticommons did not seem to be prevented.

4.2. Limitations and suggestions for future research

Before closing, some limitations and suggestions are worth noting that may lead to interesting future studies.

First, due to practical convenience, the participant's social value orientation was measured in the beginning of the study. As outlined in the main findings, measuring this dispositional preference potentially may have outweighed the effect of externalities salience. Therefore, a suggestion for future work is to design a procedure where the salience of this disposition would be minimalised. One way to accomplish this is to measure the social value in a separate experimental session that would take place further in advance. When the participants' social value orientation is measured a considerable time before the study takes place, it is plausible that this disposition will not be salient during the study. Consequently, with this adjusted procedure, the salience of externalities would potentially have a significant effect on cooperative choice behavior.

Second, a one-shot anticommons game was used in the present study. It is recognised that this choice limits the generalizability of our findings because the effect of externalities awareness potentially changes or remains stable over time. Therefore, it would be interesting to gain further insight into the longitudinal relationship between this factor and cooperative choice behavior in the anticommons dilemma. In the realm of research on cooperation in groups, repeated interactions allow more complex and conditional strategies for example direct, indirect and generalized reciprocity. With this in mind, sequential interaction creates the ability to generate cooperation in settings in which it is currently lacking (Rand & Nowak, 2013). This could also be applicable to anticommons dilemmas. Therefore, a suggestion for future work is to include additional rounds in the game. The latter creates the potential of the cost-benefit ratio of the cooperative choice behavior being greater than the non-cooperative choice behavior. However, it should be noted that revising the design by creating an

interaction structure, would lead to a quite complex design due to the addition of a third factor: time.
Third, the present study focused on the effect of the salience of one type of externalities: the collective consequences of cooperative and non-cooperative behavior. It would be worthwhile to investigate the impact of the salience of other externalities types in the context of the anticommons dilemma. For example, future study could focus on the consequences of (non-) cooperative choice behavior for uninvolved third parties. Dilemma outcomes affect the decision makers, but frequently affect third parties uninvolved in the decision-making as well. Thus, investigating the effect of making externalities for third parties salient would contribute to gain a more complete picture of cooperation in the anticommons dilemma.
Fourth, it should be noted that this study focussed on highlighting the consequences of cooperative and non-cooperative choice behavior. Thus, a framework including both the positive and the negative consequences was used in order to more cleanly measure the effect of externalities awareness. It seems likely that solely framing the negative or positive externalities would elicit different behavior patterns compared to this study. Investigating the effect of framing the externalities solely positive or negative, would also contribute to gain a more complete picture of cooperation in this social dilemma.

Finally, in this study a monetary incentivised anticommons paradigm was used which highlighted the consequences of both the cooperative and non-cooperative choice behavior. The preliminary results demonstrate the feasibility of using this paradigm. To the best of our knowledge this paradigm has not been used in any anticommons study yet. Hence, this study provides a novel and promising method for future studies to assess behavior in the context of the anticommons dilemma. A great consequence would be instigating other researchers to embrace this incentivized and neutrally framed paradigm and provide a comprehensive set of replication studies. The latter would further increase the independence and generalizability of the results of this study.

5. Conclusion

In conclusion, the present anticommons study indicated that making the externalities salient did not evoke significantly higher levels of cooperative choice behavior. This was despite the fact that participants correctly identified the dilemma character and were aware of the collective consequences. Also, no significant differences between the cooperative choice behavior levels of prosocials and proselfs in the externalities salient and not salient condition were found. Apart from the hypotheses, prosocials exhibited higher levels of cooperative choice behavior than proselfs.

Thus, the results did not corroborate with the hypotheses. However, in line with previous work, this study did show that an anticommons dilemma paradigm leads to severe underuse of the common resource. Moreover, it adds to the literature by experimentally testing the effect of making externalities salient and taking into account SVO in the anticommons dilemma. As a first experiment manipulating externalities awareness by the use of an incentivised anticommons paradigm, the findings of the present study sheds a new light on the topic of externalities awareness in the anticommons dilemma.

Appendix A

Externalities awareness and uncertainty questionnaire

Externalities awareness questions

1. To what extent were you aware of the consequences of your decisions?
2. To what extent were you aware of the fact that if all participants ask for a small amount of points, every co-owner benefits?
3. To what extent were you aware of the fact that if all participants ask for a big amount of points the collective interest will be harmed?
4. To what extent were you aware of the fact that the resource would be left unused if all participants would not be granted access?

Uncertainty questions

1. To what extent were you uncertain about the consequences of your decision?
2. To what extent did the task provide you with enough information to make a good decision?
3. To what extent were you uncertain about getting access to the resource?

Experience of a psychologically strong or weak situation questions

1. To what extent were you uncertain about the asking price you had to determine?
2. To what extent was the asking price you have set based on what you personally wanted?
3. To what extent did the task provide you with clear guidelines for setting an asking price?
4. To what extent did the task provide you with a wide variety of possible responses?
5. To what extent did the task guide you towards the choice you eventually made?
6. To what extent did the task make clear what was appropriate to do?
7. To what extent did you feel pressured to set a low asking price?
8. To what extent did you feel pressured to make sure the other co-owners would get access to the resource?

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