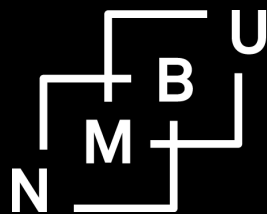# How are social preferences of youth related to their motivation to invest in environmental conservation (local public goods)?

Stein T. Holden and Mesfin Tilahun

Norwegian University of Life Sciences
Centre for Land Tenure Studies

How are social preferences of youth related to their motivation to invest in environmental conservation (local public goods)?

By Stein T. Holden and Mesfin Tilahun

Stein T. Holden is a professor in development and resource economics at the School of Economics and Business/Centre for Land Tenure Studies (CLTS) | NMBU) , Norwegian University of Life Sciences. Homepage: www.steinholden.com

ORCID ID: Stein T. Holden: https://orcid.org/0000-0001-7502-2392

Mesfin Tilahun is an associate professor at Department of Economics, Mekelle University, Ethiopia and at the School of Economics and Business, Norwegian University of Life Sciences.

ORCID ID: Mesfin Tilahun: https://orcid.org/0000-0003-3885-2017

Abstract

We have used simple incentivized social preference experiments for a sample of 2427 resource-poor rural youth that have formed natural-resource based youth business groups in their home communities. The experiments were combined with questions investigating their attitudes towards environmental conservation and willingness to contribute to conservation of local natural resources related to a compulsory labor contribution program. The paper investigates whether and how the revealed social preferences are associated with the attitudes towards environmental conservation and explores the spatial heterogeneity of conservation attitudes. It tests whether youth with altruistic and egalitarian social preferences are associated with stronger motivations for contributing to the compulsory conservation program than youth with selfish and spiteful preferences. Our study finds evidence in support of this hypothesis. We also find evidence of substantial spatial variation in the attitudes towards the environmental conservation program and much of this heterogeneity seems to be determined at the community (tabia) level which is the lowest administrative level and the level at which the compulsory conservation program is organized. In general, we find strong support for the compulsory conservation work program among the youth. 97% of the youth agree or strongly agree that the program is very important to protect the natural resource base and secure the future livelihoods in their community. On average the subjects were willing to contribute 19.4 days/year free labor to the program, which was close to the current requirement of 20 days/year.

Key words: Social preferences, incentivized experiments, attitudes towards conservation, compulsory public works, local public goods, natural resource conservation, Tigray.

JEL codes: D64; D91; H23; H26; Q56.

Introduction

Camerer and Fehr (2004) defined "social preferences" as how people rank different allocations of material payoffs to themselves and others. We elicit generalized social preferences in this study by using a set of simple binary incentivized dictator games, building on Fehr et al. (2013) and Bauer et al. (2014). To our knowledge there have been few empirical studies that have investigated how social (other regarding) preferences are associated with environmental preferences or conservation attitudes. Our basic intuition is that such correlation exists as environmental conservation attitudes may be driven by a concern regarding the welfare of future generations, or even one's own livelihood in the future. On the one hand, youth expect to live for a longer time they may also be more concerned about conserving the natural resource base to secure their future livelihood. On the other hand, they may lack the experience, maturity and insight that is required to be very forward-looking. Altruistic and egalitarian preferences may be related to such maturity and insight that can vary among youth. However, also more selfish youth have a self-interest in preserving their own future livelihoods, implying that selfishness also can drive conservation motives as long as selfishness is not myopic but is a concern for own future selves.

Poverty may also influence social and environmental preferences and attitudes as poverty may cause people to become more myopic and less able to think about the future and can be associated with high discount rates (Holden, Shiferaw and Wik 1998; Holden and Shiferaw 2002). However, there are many examples where resource-poor people also conserve their resources to secure their future livelihoods. Our study focuses on the semiarid Tigray region in Ethiopia, which has been characterized to belong to so-called "Less Favored Areas" (Hazell et al. 2019), where there have been massive investments in land and water conservation based on a conservation policy that has emphasized local participation and mobilization to create sustainable rural livelihoods. This started when Ethiopia was one of the poorest countries in the world and facing severe land degradation problems and after having experienced massive famines in the 1980s. This has taken place through a policy that enhanced the mobilization and collective action for conservation and partial compensation through Food-For-Work (FFW) and Cash-For-Work (CFW). The compulsory work contribution has in recent years been 20 days per able bodied adult person per year but was even up to 60 days per year in some years.

This chapter investigates the underlying motivation for these conservation efforts among rural youth in the region. We aim to study whether their motivation is related to their social preferences or mainly driven by community characteristics given the community level organization of conservation efforts and priorities based on the local needs. More specifically, we want to answer the following research questions:

Are environmental conservation attitudes and social preferences related? More specifically, how important are other-regarding preferences as drivers of environmental conservation attitudes and the willingness to contribute to conservation?

How motivated are poor rural youth to participate in the compulsory public works and provide free labor for conservation? How much spatial variation is there in their attitudes towards conservation across districts, communities, and youth business groups? How are the individual socioeconomic characteristics such as age, gender and education related to their motivation for

their contributions to conservation? We develop and test more specific hypotheses related to these research questions.

As the youth business groups we study have been allocated rehabilitated communal lands and are required to manage the land allocated in a sustainable way, their attitudes towards conservation are likely to be important for their efforts on their own allocated land as well. However, this study does not go into that. The sustainability of the distributed rehabilitated lands will depend on how the youth will manage the land resources they have been allocated, which in turn is a function of the attitudes of the youth towards environmental conservation. The participation in the compulsory work program is also likely to give the youth important practical skills related to how conservation investments should be made and fitted into local landscapes.

Thus, based on simple incentivized social preference experiments for a sample of 2427 resource-poor rural youth with access to the distributed rehabilitated land on which they have formed natural-resource based youth business groups in their home communities, this study aims to investigate their attitudes towards environmental conservation and willingness to contribute to conservation of local natural resources.

Brief literature review (may be expanded or dropped – due to space limitations).
How are social preferences and concerns for the environment related? We found few careful studies on this as there are few studies that have carefully investigated the social preferences of people at the same time as they investigated their attitudes towards environmental conservation (Martin-López et al. 2012).

Castro et al. (2011) studied the social preferences regarding the delivery of ecosystems services in a semiarid Mediterranean region (Iberian Peninsula). They considered whether lack of awareness undermined willingness to pay for environmental services but found that this was not the case as the general awareness of the problem was good. Rather the problem was that conservation was seen as a barrier towards economic development of the region.

Martin-López et al. (2012) analyze the socio-cultural preferences towards ecosystem services provided by different Spanish ecosystems. Their definition of social preferences is very wide and is stated as socio-cultural preferences which incorporate individual perceptions, knowledge, and associated values (ibid.). We use a narrower definition of social preferences and assess their extent of correlation with stated attitudes towards the importance of investing in ecosystem services and stated willingness to contribute to such investments.

Local context
Environmental characteristics
According to population projections by the Central Statistical Agency (CSA, 2021), the total human population in Tigray was 5.44 million in 2020, accounting for 5.5% of the country's population. Close to 71% of the population of Tigray in 2020 lives in rural areas with agriculture as its main source of livelihood. Though the percentage of the rural population in the region has been projected to have declined from 75% in 2015 to 71% in 2020, the number of people living in rural areas has been increasing from 3.8 million in 2015 to 3.9 million in

2020. The population density was increasing on average by 2% per year from 2015 to 2020 (see Table 1). According to CSA data on population by age structure for the year 2020, which is a projection based on the 2007 population census, youth (aged 15–39) account for 35% of the total population in the region. This is a relatively lower proportion compared to the national level figure, which indicates that 41.7% of the 112.1 million population of the country are youth in the age of 15 to 39 (World Bank 2019).

Based on the database of AIDDATA.ORG (https://www.aiddata.org/geoquery) on land cover that organized land cover data from European Space Agency, 54.7% of the total land area of Tigray in the year 2015 was covered with croplands mainly dominated by rainfed agricultural fields. Shrublands are the second dominant land cover types accounting 26.9% of the land area whereas grasslands account only 2.6% of the land in the region. The remaining 1% of the land area is covered with other land uses mainly urban settlements, water bodies, and wetlands (see Table 1). The five districts where our study sites are located account for close to 26% of the land area of the region, 29.4% of the croplands, 10.4% of the forest cover, 9.8% of the shrubland cover, and 28.3% of the grassland cover. Land covers in the five districts vary but in all the districts, cropland is the dominant land cover followed by shrublands.

The land cover data from the same source for the year 1992 indicated that croplands were covering 52.8% whereas shrubland, forest areas, and grasslands were accounting 32.7%, 11.2%, and 2.4% of the total land area of the region respectively (see Table 2). This indicates that there has been decline in shrubland covers and increases in cropland, forest land, and grassland covers over the years from 1992 to 2015. The increase in cropland cover may be associated with the increase in rural population whereas the increase in forest land and grass land covers might be due to the investments in land rehabilitation in the region. For example, according to data from the regional Bureau of Agriculture and Natural Resources, 552,480 ha of land, or 13.3% of the total land area of Tigray, was rehabilitated with labor contributions of rural people in the region (Holden an Tilahun, 2018). Holden and Tilahun (2018) reported that until 2015, close to 100,000 ha of the rehabilitated land, which accounts 18% of the total rehabilitated land, was distributed to about 218,000 landless people, mostly the youth.

The country has been following an agricultural development led industrialization (ADLI) strategy since the 1990s with emphasis on natural resource management and rehabilitation of degraded lands through different sustainable land management interventions. These interventions include the application of different soil and water conservation technologies and establishment of exclosures (protected areas) for facilitating natural regeneration. In Tigray region conservation was driven through a compulsory labor mobilization policy at the community level, where all able-bodied adults had to contribute 20[1] days/person/year for such investments in local public goods. The fulfillment of this requirement was a condition for accessing compensated work in terms of Food-For-Work (FFW) or Cash-For-Work (CFW) schemes that were also systematically used to conserve local natural resources and for infrastructure investments such as in irrigation dams, road building and maintenance (Hagos and Holden 2002). From 2006 compensated labor compensation for conservation was

---

[1] And for periods up to 60 days/person/year.

organized under the Productive Safety Net Program (PSNP), with support from the World Food Program as well as some similar labor mobilization programs, which have been serving as means for covering the labor costs of investments on sustainable land management in the region. The program to allocated rehabilitated communal lands to youth business groups was scaled up from 2011 as a response to the growing landlessness and demand for land by youth who searched for a rural livelihood in their home community.

As a result of more than three decades of implementation of land rehabilitation policies in the region, and the focus on creating livelihood opportunities to the land-poor youth thorough allocating rehabilitated exclosures on hillsides, Tigray region won the Future Policy Gold Award 2017 from the World Future Council and UNCCD (World Future Council & UNCCD, 2017).

Table 1. Human population in Tigray

District	Total land area in Km2	**Population**					
		Total		Age 15-39		Density in person/Km2	
		2015	2020	2015	2020	2015	2020
Adwa	1,889	108,872	119,337	38,215	41,888	58	63
Kilite Awlalo	2,058	110,821	121,473	38,899	42,638	54	59
Degua Tembien	1,853	126,953	139,156	44,562	48,845	69	75
Seharti Samire	2,724	139,479	152,886	48,958	53,664	51	56
Raya Azebo	2,133	154,861	169,747	54,358	59,583	73	80
Sum 5 districts	10,656	640,986	702,600	224,992	246,619	60	66
Sum other districts	39,423	4,415,014	4,839,400	1,549,708	1,698,671	112	123
Tigray Total	50,079	5,056,000	5,542,000	1,774,700	1,945,290	101	111

*Sources: *Central Statistical Agency of the Federal Democratic Republic of Ethiopia (CSA, 2020), ¶*

Table 2 Land cover in Tigray in 1992 and 2015

District	¶ Land cover as % of total land area in 1992 and 2015									
	Agriculture		Forest		Shrub		Grassland		Other land covers	
	1992	2015	1992	2015	1992	2015	1992	2015	1992	2015
Adwa	90.4	89.8	0.5	0.5	8.8	9.0	0.1	0.03	0.2	0.7
Kilite Awlalo	87.6	87.6	2.7	2.8	9.2	9.1	0.3	0.2	0.2	0.4
Degua Tembien	88.5	88.5	0.4	0.4	11.0	11.0	0.1	0.1	0.00	0.01
Seharti Samire	82.8	82.8	0.6	0.6	14.3	14.3	2.2	2.2	0.1	0.1
Raya Azebo	31.5	30.4	25.1	25.5	23.5	23.5	13.0	14.0	6.9	6.7
Sum 5 districts	70.7	70.3	7.9	8.0	15.0	15.0	4.4	4.7	2.1	2.1
um other districts	50.5	52.6	11.6	12.7	35.1	31.6	2.1	2.3	0.7	0.9
Tigray Total	52.8	54.7	11.2	12.2	32.7	29.6	2.4	2.6	0.9	1.0

Source: Own calculation based on data from Defourny, P. (2017): ESA Land Cover Climate Change Initiative (Land_Cover_cci): Land Cover Maps, v2.0.7. Centre for Environmental Data Analysis, 7/2017. https://www.esa-landcover-cci.org Management; https://www.aiddata.org/geoquery

Study sites and sample

Holden and Tilahun (2018) carried out a census of more than 700 youth business groups in five districts of Tigray region in northern Ethiopia. The close to 15,000 youth that participated in these groups were land-poor youth that aimed to create livelihoods in their home communities and they had been offered access to local resources as members of youth groups that were organized formally as primary cooperatives based on cooperative law in the country.

Experimental and survey design

Social preference experimental design

We used a set of simple incentivized binary dictator games using the approach of Fehr et al. (2013) with the expansion of Bauer et al. (2014). The experimental protocol was expanded to obtain individual social preferences towards an anonymous youth group member of another youth business group within the same district. While the social preference games also were played with another anonymous person in their own business group, we used only the generalized social preferences in this study. The experimental protocol is presented in Appendix 1. All subjects were exposed to the questions in the same order and one of the eight experiments was randomly chosen to be implemented for real (the strategy method).

Stated conservation attitude and investment questions

We used four stated preference questions to elicit environmental attitudes of the respondents. For the three first of these we used five-level Likert scales. The questions were related to the existing compulsory public works program for investment in the local public goods in the community. At the time of our survey, all able-bodied adult residents in the communities were required to contribute 20 days of work to the community for conservation of local natural resources. Our questions, in a stepwise way, elicited the general attitudes towards this program, whether they thought youth should contribute to this program, whether 20 days/year per person was considered appropriate, too much or too little, and finally we asked about the number of preferred days of work each were willing to contribute. The exact formulation of the questions and the Likert scales are presented in Appendix 1.

Theory and hypotheses

Based on the general theory on social or other regarding preferences, we aim to assess the following hypotheses. However, we do not have randomized treatments that allow us to identify treatment effects and can only judge the hypotheses based on the correlations between the social preference categories and stated conservation preferences.

Basic hypothesis:

H1: Stronger other-regarding preferences are positively correlated with environmental conservation motives.

This builds on the idea or assumption that environmental conservation motives are driven by a concern for future livelihoods of others.

H1a: Subjects with strong altruistic preferences have stronger attitudes in favor of environmental conservation motives than subjects that have selfish and spiteful preferences.

H1b: Subjects with strong inequality averse preferences are less motivated towards environmental conservation than subjects with strong altruistic preferences.

H1c: Subjects with inequality averse preferences have stronger attitudes in favor of environmental conservation motives than subjects that have selfish and spiteful preferences (based on the assumption that they are more socially inclined).

H2. Environmental preferences are influenced by community characteristics and shaped by community level priorities and needs for conservation of natural resources.

This hypothesis is based on the strong emphasis on environmental conservation in Ethiopia in general and in the Tigray region in particular given that the region has been classified as an environmental hotspot with severe land degradation in the past (Shiferaw and Holden 1998: 1999; 2001; Tadesse 2001). the strong degree of collective action for conservation in the Tigray region. The study thereby also investigates the motivation among youth to support this regional conservation strategy that has been in place for close to 30 years after the fall of the military Derg regime and the Tigray People Liberation Front (TPLF) took full control over the regional land policy.

H3. Environmental consciousness is influenced by within youth group interactions among group members.

H4. Environmental consciousness is positively associated with education but youth with more education have higher opportunity cost of labor and are therefore less motivated for community work.

H5. Younger youth are less motivated to contribute to community work.

This is based on the assumption that environmental and social consciousness increases with age.

H5. Men are more motivated to contribute to environmental conservation than women.

This is based on the context and the traditional gender division of labor with men taking the main responsibility for agricultural production within households while women are responsible for household chores.

Data
Data on social preferences and environmental attitudes were collected from a stratified random sample of 2427 youth group business members (complete data for 2351 members), in 45 communities (*tabias*[2]) in 246 youth business groups in five districts in the Tigray region of Ethiopia based on the experimental and survey designs described above.

---

[2] A *tabia* is the lowest administrative unit, equivalent of a municipality.

Estimation strategy

We start by running parsimonious linear panel data models of the correlation between the attitude responses (Tables 2-4 give an overview of their distribution based on 5-level Likert scales) and the social preference categories. We included enumerator dummy variables for 12 enumerators as well in all models. The enumerators interviewed one youth business group member each in each youth business group and they are thereby orthogonal on groups and this should minimize the potential enumerator bias in our models. In addition to inspecting the sign and significance of the social preference type dummy variables we assess the within-group and between-group R-squares as indicators of "explained" variation in the models as an indication of how much of the variation in environmental attitudes is correlated with the included RHS variables that may vary within groups or across groups.

To further assess the importance of spatial or socially related variables, we compare the results for models without community variables, models with district (*woreda*) fixed effects (FE) (5 woredas), models with community (*tabia*) FE (45), and finally models with youth business group FE (246 groups). We assess the difference in how much of the total variation these alternative specifications pick up of the between-group variation. This may indicate which levels of administration and social influence are more important in the formation of environmental conservation attitudes. E.g. to test whether attitude formation within youth business groups is more important than the community (level) level, we run models with youth group FE instead of community FE and assess the relative contributions to the R-squares in the linear panel data models.

We then assess the importance of individual characteristics other than their social preferences, such as their gender, age, education, and birth rank/gendered sibling composition. It also allows us to assess whether the addition of these variables affects the size and significance of the social preference variables that may potentially be correlated with these individual characteristics. Models with these individual characteristics are also run with the alternative spatial and social group specifications. In an appendix we also include the model results for multinomial logit models where the social preference type is regressed on the individual characteristics, with district (*woreda*) and enumerator FE.

Descriptive statistics
Social preferences

The social preference categorization based on the binary incentivized dictator games in the outgroup and ingroup settings are presented in Table 3. It is important to remember that "outgroup" was framed as "another youth group member in another unknown youth business group within the same district" while "ingroup" was framed as "another anonymous youth group member in same youth group". The table demonstrates a substantial higher percentage of altruistic social preferences in the ingroup (25.2%) than in the outgroup (10.2%) setting and a substantial lower percentage of spiteful preferences in the ingroup (3.2%) than in the outgroup (16.7%) setting. In this study we focus on the outgroup social preferences as they are likely to be more exogenous and less influenced by ingroup characteristics.

Table 3. Social preference categorization based on games with unknown outgroup members

Social preference type	Outgroup		Ingroup	
	Freq.	Percent	Freq.	Percent
Altruist	247	10.2	612	25.2
Weak altruist	54	2.2	89	3.7
Egalitarian	406	16.7	444	18.3
Weak egalitarian	447	18.4	505	20.8
Spiteful	406	16.7	77	3.2
Selfish	791	32.6	673	27.7
Missing	76	3.1	27	1.1
Total	2427	100	2427	100

Conservation attitudes

A five-lever Likert scale was used to categorize the responses to four questions to map the respondents' environmental attitudes. The questions were presented in the same order for all 2427 respondents.

The first most general question we asked was "*Community compulsory work is very important to protect the natural resource base and secure the future livelihood of people in the community*" with five response categories. The distribution of responses was as follows in Table 4.

Table 4. Attitudes towards community compulsory work to conserve natural resources (E1)

Response	Freq.	Percent	Cum.
Strongly disagree (1)	30	1.24	1.24
Disagree (2)	20	0.82	2.06
Uncertain (3)	11	0.45	2.51
Agree (4)	835	34.4	36.92
Strongly agree (5)	1531	63.08	100
Total	2427	100	

Note: The five categories are ranked in a Likert scale used in regressions.

The follow-up question was more specific and directed at whether youth should contribute. The question was stated as "*It is important that youth participate in the conservation of land resources in the community*" and had the same five response categories as above. The responses are presented in Table 5.

Table 5. Attitude towards youth participation in communal land conservation (E2)

Response	Freq.	Percent	Cum.
Strongly disagree (1)	24	0.99	0.99
Disagree (2)	14	0.58	1.57
Uncertain (3)	16	0.66	2.22
Agree (4)	990	40.79	43.02
Strongly agree (5)	1383	56.98	100
Total	2427	100	

To investigate the attitudes towards the current level of annual compulsory work for the community in man-days per person, we asked the following question "*The current level of compulsory free labor of 20 days for conservation of the natural resources in the community is…*" and with the following five alternative answer categories that they had to choose one of. The distribution of responses was as follows in Table 6.

Table 6. Attitude towards the current level of compulsory work for conservation in the community (E4)

Response	Freq.	Percent	Cum.
Much too high (1)	36	1.48	1.48
Too high (2)	392	16.15	17.63
Appropriate (3)	1735	71.49	89.12
Too low (4)	235	9.68	98.81
Much too low (5)	29	1.19	100
Total	2427	100	

We also asked the follow-up control question "*How many days are you willing to work for free in the community per year to help conserve the natural resources (soil and water conservation, tree planting)? No. of days/yr*". We present the average and median number of days stated for each of the five categories above, see Table 7.

Table 7. Preferred number of days of community work to conserve natural resources per attitude category (E5).

Response in Table 6	Mean	Median	St. Error	N
Much too high (1)	8.75	10	0.50	36
Too high (2)	11.43	10	0.17	392
Appropriate (3)	19.63	20	0.12	1735
Too low (4)	30.32	30	0.43	235
Much too low (5)	40.69	40	2.19	29
All	19.43	20	0.15	2427

Table 7 shows a good correspondence between the category stated in Table 6 and the preferred mean and median number of compulsory working days stated in Table 7. Basic socio-economic characteristics of the subjects are presented in Table 8 and we will assess how these are correlated with the social preferences and conservation attitude variables.

Table 8. Basic individual characteristics

Variable	Obs	Mean	Std. Dev.	Min	Max
Male dummy	2,427	0.69	0.46	0	1
Age, years	2,427	32.3	9.48	18	75
Education, years	2,427	4.66	3.95	0	15
Birth rank	2,427	3.35	2.15	0	16
No of elder brothers	2,427	1.14	1.31	0	10

Results and discussion

The results are presented in a sequence of tables below, from the more general attitude towards compulsory labor for conservation of natural resources in their community (E1) (Table 9), to their attitude towards the youth contributing to this program (E2) (Table 10), E1 conditional on E2 (Table 11), their assessment of the level of contribution to the program (E4) conditional on E1 (Table 12), and their individual willingness to work (days per year) on the program (E5), conditional on E1, E2 and/or E4) (Table 13). Tables 9-12 contain parsimonious specifications that only include social preference types and enumerator dummies as controls, and then models with district, community or youth group fixed effects without and with other individual characteristics (see Table 8).

We present the main results directly related to our hypotheses with the same order as in the theory and hypothesis section.

Our first hypothesis H1 with sub-hypotheses H1a, H1b and H1c on the relationship between social preferences and attitudes towards environmental conservation can be assessed by inspecting the results in Tables 9 (general attitude) and 10 (attitude towards the youth contributing). The results are found to be consistent with the main hypothesis and the sub-hypotheses. The altruists were used as the base category and were hypothesized to have the strongest preferences for environmental conservation. All the signs for the other social preference types had negative signs in Tables 9 and 10, although all types were not significantly lower than for the altruist group. We find strong support for hypothesis H1a (selfish and spiteful preferences) in Table 10 and for selfish preferences being associated with weaker general conservation attitudes in Table 9. When assessing the sizes of the coefficients for the egalitarian and weak egalitarian preference types, we see that they fall in a middle category in line with our hypotheses, but statistical significance levels are weak. However, the results with different controls are very consistent across models within and across Tables 9 and 10. The smallest group for social preference types is the "weak altruist" group and its parameter values fall outside the general pattern for the other categories (largest size negative coefficients but has large standard errors).

Overall, the results do not enable us to reject any of the hypotheses H1, H1a-H1c. However, the social preference category variables explain only a small share of the variation in the environmental preference categories. This could also be due to the general strong support to the compulsory public works program in Ethiopia as seen in Tables 4 and 5 which show that >97% of the respondents agree or strongly agree that compulsory work to protect the natural resource base in their communities is very important and that it is important that the youth contribute to the program.

In Table 11 we assessed the importance of the social preference categories for the importance given to youth contributing to the compulsory community work (E2), conditional on their general response to the importance of the compulsory labor program (E1). Table 11 demonstrates a very strong positive correlation between the general attitude and the attitude towards the youths' responsibility. In the conditional models the spiteful group was significantly less supportive to the idea that the youth should contribute compared to the

altruists. Again, all coefficients were negative for all social preference types compared to the altruists. This evidence further supports the hypotheses H1, H1a-H1c.

Our H2 hypothesis stated that *environmental preferences are influenced by community characteristics and shaped by community level priorities and needs for conservation of natural resources* and we included alternative controls to assess this. We assess how much of the between-group variance is "explained" by the different controls. Tables 9 and 10 show that the models including community (*tabia*) dummies explain more of the between group variance than the models with district FE and the youth group FE. This makes sense as the organization of the compulsory community work is done at the *tabia* level which is the lowest administrative level of the regional government. At this level it is the extension agents and community leaders that orchestrate the compulsory work by setting priorities, organizing groups, giving tasks and monitoring individual contributions. It is therefore not surprising that many of the *tabia* dummies are significant. Ideally, we would have liked to do a closer inspection of these *tabia* FEs and related them to a set of community characteristics, but we do not have access to such data. Overall, we cannot reject hypothesis H2.

Our hypothesis H3 that *environmental consciousness is influenced by within youth group interactions among group members*. The fact that the youth group FEs explain much less of the between-group variation indicates that group membership and within-group dynamics have little influence on the members' motivation for taking part in compulsory community conservation work. We, therefore, reject hypothesis H3.

Tables 9 and 10 also reveal some interesting significant differences between the districts in our sample. Raya Azebo, located in the south-east, was used as the base. The general motivation for conservation was significantly lower in Degua Tembien, located in the central highlands of Tigray, compared to Raya Azabo. In Adwa and Seharti Samre, the general motivation was significantly higher than in Raya Azebo, and particularly high in Adwa.

Regarding the motivation among youth to participate in the conservation work, the variation across districts was somewhat different and there was not significant difference between Raya Azebo and Degua Tembien. The motivation was substantially higher in Adwa district, while for Seharti Samre the district dummy was significant only in the model without individual characteristics. It is worth noting that the youth business group program was first started and scaled up in Adwa district, and this may be one reason for the high motivation among youth there.

We then assess our hypotheses related to the individual socioeconomic characteristics. The first of these, hypothesis H4, stated that *environmental consciousness is positively associated with education but youth with more education have higher opportunity cost of labor and are therefore less motivated for community work*. Tables 9, 10 and 11 provides strong support for the first part of this hypothesis regarding their general motivation (significant at 1 and 5% levels in all four models in Table 9) and emphasis on the need for youth to contribute was also significant in four models in Table 10 and in three of four models in Table 11. When it came to the number of days of contributed work, see Table 12, the education variable was only significant (at 10 and 5% levels) in two of four models and when it came to own stated

willingness to work, it gave a significant positive effect (at 10% level only) in one of six models. This weaker difference when it comes to own contribution may be due to their higher opportunity cost of labor as the hypothesis alluded to, but this effect was weaker than was implied by the hypothesis.

Our hypothesis H5 stated that *younger youth are less motivated to contribute to community work.* However, age is insignificant in all models in Tables 9, 10 and 11 and for the amount of compulsory work (Table 12), age was significant (at 1% level) and with a negative sign in all four models, indicating that elder respondents were more likely to consider 20 days of work too much relative to younger members. Consistent with this, in Table 13 age was negatively and significantly (at 1 and 5% levels in all six models) related to the individually specified number of days they were willing to work. The coefficients on the age variable varied substantially in Table 13 depending on the inclusion of conditioning attitude variables but a 20 years old member would on average be willing to work 0.2-0.8 days more than a 30 years old member. We also included birth rank and number of elder brothers to assess whether there were any sibling effects on the motivation to work. The birth rank was significant and with a negative sign so youth with more elder siblings are less motivated to contribute to the program. These findings imply that we reject hypothesis H5. Younger subjects are willing to do more compulsory community work than elder subjects.

Our final hypothesis (H6) stated that *men are more motivated to contribute to environmental conservation than women.* Tables 9 and 10 provide strong support for this hypothesis as the male dummy variable was significant (at 1% level) in all four models in both tables. It is interesting to note, however, that when we come to Table 11, the male dummy is not significant in any of the models. This indicates that male members do not give relatively more emphasis to the responsibility of the youth than females do after we have controlled for the general individual attitudes towards compulsory conservation work. When it comes to the attitude towards 20 days of work conditional on conservation attitudes (Table 12), the male dummy is only significant (at 5% level) in one of four models. In the models with the number of days they were willing to work (Table 13), the male dummy is insignificant in all models, including in the unconditional model (1). This implies that even though men express a stronger general motivation for and support to the compulsory communal conservation program, their individual willingness to work expressed in form of the number of days worked is not significantly higher than that of women.

A few other issues may be worth considering. We cannot rule out that education is an endogenous variable that is correlated with social preference types. E.g. whether education contributes by enhancing the likelihood that individuals become more socially inclined and more likely to be classified as altruistic and egalitarian. To investigate this, we used a multinomial logit model to regress the social preference types on the individual characteristics and district dummies while having enumerator dummy variables as controls. The results of this model are presented in Appendix 2. Education was only significantly correlated with the selfish preference type and individuals with more education were less likely to be selfish. Appendix 2 also shows that males were less likely to be selfish (significant at 1% level) than women and selfishness declined with age (significant at 10% level only). Individuals from Degua Tembien

district were substantially more likely to be selfish and less likely to be egalitarian than individuals in all other regions. The likelihood of individuals being spiteful declined with age (significant at 5% level).

Table 9. Attitudes towards compulsory communal work to conserve natural resources

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Social preference type								
Base: Altruist	0	0	0	0	0	0	0	0
Weak altruist	-0.165	-0.164	-0.143	-0.125	-0.161	-0.159	-0.136	-0.123
	(0.109)	(0.106)	(0.109)	(0.113)	(0.107)	(0.104)	(0.107)	(0.112)
Egalitarian	-0.0396	-0.057	-0.0575	-0.0321	-0.0283	-0.0463	-0.0491	-0.0252
	(0.048)	(0.048)	(0.047)	(0.050)	(0.049)	(0.049)	(0.047)	(0.051)
Weak egalitarian	-0.0880*	-0.0955**	-0.0814*	-0.0687	-0.0796	-0.0835*	-0.0703	-0.0586
	(0.049)	(0.049)	(0.048)	(0.053)	(0.050)	(0.050)	(0.049)	(0.054)
Spiteful	-0.0832	-0.101*	-0.0872	-0.0447	-0.0778	-0.0908	-0.0807	-0.0403
	(0.056)	(0.055)	(0.054)	(0.061)	(0.057)	(0.056)	(0.055)	(0.062)
Selfish	-0.146***	-0.126**	-0.110**	-0.0847	-0.125**	-0.101**	-0.0879*	-0.0641
	(0.051)	(0.050)	(0.049)	(0.056)	(0.052)	(0.050)	(0.050)	(0.056)
Male dummy					0.116***	0.134***	0.124***	0.145***
					(0.030)	(0.028)	(0.027)	(0.030)
Age, years					0.001	0.001	0.002	0.001
					(0.002)	(0.002)	(0.002)	(0.002)
Education, years					0.013***	0.008**	0.011***	0.008**
					(0.003)	(0.003)	(0.004)	(0.004)
Birth rank					0.005	0.003	0.002	0.005
					(0.009)	(0.009)	(0.009)	(0.010)
No of elder brothers					0.006	0.005	0.005	0.000
					(0.014)	(0.013)	(0.014)	(0.015)
District FE, Base=Raya Azebo		0				0		
Degua Tembien district		-0.0779*				-0.101**		
		(0.046)				(0.046)		
Seharti Samre districts		0.0888**				0.0639		
		(0.043)				(0.045)		
Adwa district		0.188***				0.167***		
		(0.037)				(0.038)		
Enumerator dummies (12)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
District (woreda) dummies (4)	No	Yes	No	No	No	Yes	No	No
Community (tabia) dummies (45)	No	No	Yes	No	No	No	Yes	No
Youth group dummies (246)	No	No	No	Yes	No	No	No	Yes
Constant	4.719***	4.644***	4.728***	4.689***	4.486***	4.458***	4.527***	4.467***

	(0.065)	(0.073)	(0.086)	(0.067)	(0.096)	(0.098)	(0.109)	(0.106)
R-sq.-within	0.0956	0.0956	0.0962	0.0962	0.1052	0.1067	0.1069	0.1073
R-sq.-between	0.2657	0.2657	0.4766	0.0437	0.1103	0.2818	0.4867	0.0610
R-sq.-overall	0.1168	0.1168	0.1428	0.0900	0.1043	0.1279	0.1534	0.1016
N	2351	2351	2351	2351	2351	2351	2351	2351

Note: Linear Probability models with group random effects, cluster-robust standard errors in parentheses, clustering at youth group level. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 10. Attitude towards the responsibility of the youth to participate in the compulsory conservation activities in the community

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Outgroup social preference type								
Base: Altruist	0	0	0	0	0	0	0	0
Weak altruist	-0.171*	-0.176*	-0.157	-0.109	-0.167*	-0.169*	-0.15	-0.106
	(0.103)	(0.100)	(0.106)	(0.109)	(0.101)	(0.099)	(0.105)	(0.108)
Egalitarian	-0.081*	-0.088**	-0.087**	-0.065	-0.070	-0.077*	-0.079*	-0.058
	(0.043)	(0.043)	(0.043)	(0.045)	(0.043)	(0.043)	(0.043)	(0.045)
Weak egalitarian	-0.083*	-0.090**	-0.079*	-0.061	-0.075*	-0.080*	-0.069	-0.054
	(0.043)	(0.042)	(0.043)	(0.046)	(0.043)	(0.043)	(0.043)	(0.047)
Spiteful	-0.122**	-0.134***	-0.127**	-0.108**	-0.115**	-0.123**	-0.121**	-0.104*
	(0.050)	(0.050)	(0.050)	(0.054)	(0.050)	(0.051)	(0.050)	(0.054)
Selfish	-0.141***	-0.138***	-0.123***	-0.105**	-0.121***	-0.115***	-0.103**	-0.088*
	(0.043)	(0.043)	(0.044)	(0.048)	(0.045)	(0.045)	(0.044)	(0.049)
Male dummy					0.094***	0.103***	0.100***	0.121***
					(0.024)	(0.024)	(0.024)	(0.025)
Age, years					0.002	0.001	0.002	0.001
					(0.001)	(0.001)	(0.002)	(0.002)
Education, years					0.0136***	0.010***	0.012***	0.009**
					(0.003)	(0.003)	(0.003)	(0.004)
Birth rank					0.013	0.011	0.012	0.016*
					(0.009)	(0.009)	(0.009)	(0.009)
No of elder brothers					-0.007	-0.006	-0.008	-0.011
					(0.011)	(0.011)	(0.012)	(0.012)
District FE, Base=Raya Azebo		0				0		
Degua Tembien district		0.041				0.016		
		(0.043)				(0.044)		
Seharti Samre district		0.088**				0.061		
		(0.040)				(0.041)		
Adwa district		0.164***				0.137***		

	(0.036)				(0.036)			
Enumerator dummies (12)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
District (woreda) dummies (4)	No	Yes	No	No	No	Yes	No	No
Community (tabia) dummies (45)	No	No	Yes	No	No	No	Yes	No
Youth group dummies (246)	No	No	No	Yes	No	No	No	Yes
Constant	4.625***	4.537***	4.585***	4.603***	4.388***	4.341***	4.388***	4.393***
	(0.056)	(0.063)	(0.085)	(0.057)	(0.082)	(0.083)	(0.099)	(0.090)
R-sq.-within	0.1245	0.1246	0.1252	0.1251	0.1346	0.1353	0.1356	0.136
R-sq.-between	0.0373	0.1229	0.2952	0.0272	0.0754	0.1318	0.3022	0.0489
R-sq.-overall	0.115	0.1255	0.1456	0.1143	0.1278	0.1355	0.1559	0.1262
N	2351	2351	2351	2351	2351	2351	2351	2351

Note: Linear Probability models with group random effects, cluster-robust standard errors in parentheses, clustering at youth group level. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 11. Attitudes towards youth contributing to compulsory conservation in the community, conditional on the general attitude towards such conservation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Attitude towards conservation	0.625***	0.627***	0.625***	0.624***	0.621***	0.624***	0.622***	0.621***
	(0.033)	(0.033)	(0.033)	(0.034)	(0.033)	(0.034)	(0.034)	(0.034)
Outgroup social preference type								
Base: Altruist	0	0	0	0	0	0	0	0
Weak altruist	-0.069	-0.072	-0.065	-0.031	-0.066	-0.069	-0.063	-0.106
	(0.065)	(0.065)	(0.068)	(0.069)	(0.065)	(0.065)	(0.068)	(0.108)
Egalitarian	-0.057*	-0.052*	-0.050	-0.045	-0.053*	-0.048	-0.048	-0.058
	(0.031)	(0.031)	(0.031)	(0.032)	(0.031)	(0.031)	(0.031)	(0.045)
Weak egalitarian	-0.0275	-0.0303	-0.0269	-0.0182	-0.0251	-0.0272	-0.0248	-0.054
	(0.034)	(0.034)	(0.035)	(0.037)	(0.035)	(0.035)	(0.036)	(0.047)
Spiteful	-0.069*	-0.071**	-0.073**	-0.080**	-0.066*	-0.067*	-0.072**	-0.079**
	(0.035)	(0.035)	(0.036)	(0.040)	(0.036)	(0.036)	(0.036)	(0.040)
Selfish	-0.049	-0.059*	-0.054*	-0.052	-0.043	-0.053	-0.048	-0.088*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(0.031)	(0.032)	(0.033)	(0.035)	(0.032)	(0.032)	(0.033)	(0.049)
Male dummy					0.0225	0.0192	0.0239	0.031
					(0.021)	(0.021)	(0.021)	(0.023)
Age, years					0.0007	0.0008	0.0005	-0.000
					(0.001)	(0.001)	(0.001)	(0.001)
Education, years					0.006**	0.005*	0.005*	0.004
					(0.002)	(0.003)	(0.003)	(0.003)
Birth rank					0.010*	0.009*	0.011**	0.013**
					(0.005)	(0.005)	(0.006)	(0.006)
No of elder brothers					-0.010	-0.009	-0.011	-0.011
					(0.008)	(0.008)	(0.008)	(0.008)
District FE, Base=Raya Azebo		0				0		
Degua Tembien district		0.090***				0.079**		
		(0.031)				(0.032)		
Seharti Samre districts		0.032				0.021		
		(0.032)				(0.033)		
Adwa district		0.047*				0.033		
		(0.028)				(0.029)		
Enumerator dummies (12)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
District (woreda) dummies (4)	No	Yes	No	No	No	Yes	No	No
Community (tabia) dummies (45)	No	No	Yes	No	No	No	Yes	No
Youth group dummies (246)	No	No	No	Yes	No	No	No	Yes
Constant	1.674***	1.624***	1.628***	1.676***	1.604***	1.560***	1.573***	1.620***
	(0.167)	(0.168)	(0.192)	(0.171)	(0.169)	(0.168)	(0.191)	(0.175)
R-sq.-within	0.5044	0.5044	0.5046	0.5047	0.5062	0.5062	0.5065	0.5067
R-sq.-between	0.479	0.4944	0.557	0.4737	0.4814	0.4938	0.5567	0.472
R-sq.-overall	0.5015	0.5036	0.5103	0.5011	0.5034	0.5051	0.512	0.5028
N	2351	2351	2351	2351	2351	2351	2351	2351

Note: Linear Probability models with group random effects, cluster-robust standard errors in parentheses, clustering at youth group level. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 12. The current level of compulsory free labor of 20 days for conservation of the natural resources in the community is: 1=Much too high, 2=Too high, 3=Appropriate, 4=Too low, 5=Much too low

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Attitude towards conservation	0.091***	0.086***	0.086***	0.085***	0.087***	0.083***	0.085***	0.082***
	(0.023)	(0.023)	(0.024)	(0.024)	(0.023)	(0.024)	(0.024)	(0.024)
Social preference type								
Base: Altruist	0	0	0	0	0	0	0	0
Weak altruist	-0.001	-0.002	0.010	0.016	-0.014	-0.014	-0.003	0.000
	(0.110)	(0.109)	(0.111)	(0.110)	(0.111)	(0.110)	(0.112)	(0.111)
Egalitarian	0.073	0.072	0.079*	0.092*	0.068	0.067	0.073	0.089*
	(0.047)	(0.047)	(0.048)	(0.050)	(0.047)	(0.047)	(0.047)	(0.050)
Weak egalitarian	0.073	0.069	0.0779*	0.114**	0.059	0.057	0.067	0.108**
	(0.046)	(0.045)	(0.047)	(0.049)	(0.046)	(0.046)	(0.046)	(0.049)
Spiteful	0.050	0.043	0.056	0.094**	0.031	0.027	0.040	0.0851*
	(0.045)	(0.045)	(0.044)	(0.047)	(0.044)	(0.044)	(0.044)	(0.046)
Selfish	0.064	0.062	0.070*	0.089**	0.062	0.061	0.066	0.090**
	(0.039)	(0.040)	(0.041)	(0.044)	(0.040)	(0.040)	(0.041)	(0.044)
Male dummy					0.035	0.037	0.029	0.068**
					(0.029)	(0.029)	(0.030)	(0.033)
Age, years					-0.006***	-0.006***	-0.007***	-0.006***
					(0.002)	(0.001)	(0.002)	(0.002)
Education, years					0.008**	0.006*	0.004	0.002
					(0.004)	(0.004)	(0.004)	(0.004)
Birth rank					-0.006	-0.007	-0.007	-0.005
					(0.007)	(0.007)	(0.007)	(0.007)
No of elder brothers					-0.001	-0.001	-0.003	-0.001
					(0.011)	(0.011)	(0.010)	(0.011)
District FE, Base=Raya Azebo		0				0		
Degua Tembien district		0.067*				0.045		
		(0.037)				(0.036)		

Seharti Samre districts		0.080*				0.092**		
		(0.043)				(0.044)		
Adwa district		0.102***				0.073**		
		(0.034)				(0.035)		
Enumerator dummies (12)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
District (woreda) dummies (4)	No	Yes	No	No	No	Yes	No	No
Community (tabia) dummies (45)	No	No	Yes	No	No	No	Yes	No
Youth group dummies (246)	No	No	No	Yes	No	No	No	Yes
Constant	2.365***	2.322***	2.239***	2.375***	2.533***	2.518***	2.479***	2.559***
	(0.119)	(0.122)	(0.159)	(0.119)	(0.125)	(0.125)	(0.154)	(0.129)
R-sq.-within	0.0653	0.0652	0.0686	0.0659	0.0722	0.0727	0.0758	0.0747
R-sq.-between	0.0332	0.0636	0.2799	0.0204	0.0939	0.1095	0.3231	0.0455
R-sq.-overall	0.0609	0.0648	0.0946	0.06	0.0756	0.0781	0.1065	0.0724
N	2351	2351	2351	2351	2351	2351	2351	2351

Note: Linear Probability models with group random effects, cluster-robust standard errors in parentheses, clustering at youth group level. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 13. How many days are you willing to work for free in the community per year to help conserve the natural resources (soil and water conservation, tree planting)? (No. of days/year)

Dep var.: E5: WTW days/year	(1)	(2)	(3)	(4)	(5)	(6)
Attitude towards conservation (E1)		0.956***		0.232	0.472	
		(0.260)		(0.151)	(0.323)	
20 days community work attitude (E4)			8.554***	8.530***		8.520***
			(0.236)	(0.236)		(0.236)
Youth contribute attitude (E2)					0.778***	0.348**
					(0.299)	(0.155)
Outgroup social preference type						
Base: Altruist	0	0	0	0	0	0
Weak altruist	-0.146	-0.016	-0.022	0.010	0.035	0.030
	(1.090)	(1.096)	(0.813)	(0.811)	(1.096)	(0.806)

	(1)	(2)	(3)	(4)	(5)	(6)
Egalitarian	0.164	0.211	-0.421	-0.408	0.248	-0.392
	(0.551)	(0.547)	(0.372)	(0.371)	(0.546)	(0.373)
Weak egalitarian	0.275	0.343	-0.247	-0.230	0.362	-0.221
	(0.529)	(0.526)	(0.365)	(0.365)	(0.524)	(0.365)
Spiteful	0.369	0.446	0.089	0.109	0.501	0.132
	(0.570)	(0.568)	(0.452)	(0.452)	(0.568)	(0.452)
Selfish	0.437	0.521	-0.061	-0.039	0.559	-0.023
	(0.485)	(0.483)	(0.345)	(0.344)	(0.485)	(0.345)
Male dummy	0.381	0.263	0.040	0.012	0.244	0.006
	(0.351)	(0.354)	(0.241)	(0.243)	(0.354)	(0.241)
Age, years	-0.079***	-0.080***	-0.022**	-0.022**	-0.081***	-0.023**
	(0.017)	(0.017)	(0.010)	(0.010)	(0.017)	(0.010)
Education, years	0.0883*	0.078	0.051	0.048	0.075	0.047
	(0.048)	(0.048)	(0.033)	(0.033)	(0.048)	(0.033)
Birth rank	-0.176**	-0.178**	-0.120**	-0.121**	-0.186**	-0.125**
	(0.079)	(0.078)	(0.052)	(0.052)	(0.078)	(0.052)
No of elder brothers	0.041	0.037	0.060	0.059	0.045	0.063
	(0.112)	(0.111)	(0.071)	(0.071)	(0.111)	(0.071)
Enumerator dummies (12)	Yes	Yes	Yes	Yes	Yes	Yes
Community (tabia) dummies (45)	Yes	Yes	Yes	Yes	Yes	Yes
Constant	19.54***	15.21***	-4.948***	-5.934***	13.99***	-6.380***
	(1.117)	(1.649)	(0.799)	(1.038)	(1.722)	(1.039)
R-sq.-within	0.0693	0.0758	0.5222	0.5227	0.0787	0.5233
R-sq.-between	0.3369	0.3466	0.7215	0.7219	0.3431	0.721
R-sq.-overall	0.1016	0.1081	0.544	0.5444	0.1104	0.5448
N	2351	2351	2351	2351	2351	2351

Note: Linear panel data models with community FE and youth group RE, cluster-robust standard errors in parentheses, clustering at youth group level. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Conclusion

We have used simple incentivized social preference experiments for a sample of 2427 resource-poor rural youth (complete data for 2351 subjects) from 246 youth business groups, in 45 communities in five districts in Tigray region of Ethiopia. The experiments were combined with questions investigating their attitudes towards environmental conservation and willingness to contribute to conservation of local natural resources under a compulsory labor contribution program. The chapter investigates whether and how the revealed social preferences are associated with the attitudes towards environmental conservation and explores the spatial heterogeneity of conservation attitudes. It tests whether youth with altruistic and egalitarian social preferences are associated with stronger motivations for contributing to the compulsory conservation program than youth with selfish and spiteful preferences. Our study finds evidence in support of this hypothesis. We also find evidence of substantial spatial variation in the attitudes towards the environmental conservation program and much of this heterogeneity seems to be determined at the community (*tabia*) level which is the lowest administrative level and the level at which the compulsory conservation program is organized. In general, we find strong support for the compulsory conservation works program among the youth. 97% of the youth agree or strongly agree that the program is very important to protect the natural resource base and secure the future livelihoods in their community. On average the subjects were willing to contribute 19.4 days/year free labor to the program, which was close to the current requirement of 20 days/year.

References

Bauer, M., Chytilová, J., & Pertold-Gebicka, B. (2014). Parental background and other-regarding preferences in children. *Experimental Economics*, 17(1), 24-46.

Bryan BA, Raymond CM, Crossman ND, Macdonald DH (2010) Targeting the management of ecosystem services based on social values: Where, what, and how? *Landscape Urban Plan* 97: 111–122.

Camerer, C.F. and Fehr, E. (2004). Measuring social norms and preferences using experimental games: A guide for social scientists. *Foundations of human sociality: Economic experiments and ethnographic evidence from fifteen small-scale societies*, 97, 55-95.

Castro, A. J., Martín-López, B., García-Llorente, M., Aguilera, P. A., López, E., & Cabello, J. (2011). Social preferences regarding the delivery of ecosystem services in a semiarid Mediterranean region. *Journal of Arid Environments*, *75*(11), 1201-1208.Central

Statistical Authority (2020). Statistical abstract: Population. Addis Ababa, Ethiopia: Central Statistical Authority of the Federal Democratic Republic of Ethiopia. http://213.55.92.111/redbin/RpWebEngine.exe/Portal?BASE=ABS&lang=eng

Fehr, E., Glätzle-Rützler, D., & Sutter, M. (2013). The development of egalitarianism, altruism, spite, and parochialism in childhood and adolescence. *European Economic Review*, *64*, 369-383.

Hagos, F. and Holden, S.T. (2002). Incentives for conservation in Tigray, Ethiopia: Findings from a household survey. Noregian University of Life Sciencrs. Reprint 2017: MergedFile (unit.no)

Holden, S. T., & Shiferaw, B. (2002). Poverty and land degradation: Peasants' willingness to pay to sustain land productivity. *Natural resource management in African agriculture: Understanding and improving current practices*.

Holden S.T. and Tilahun M., (2018). The Importance of Ostrom's Design Principles: Youth Group Performance in Northern Ethiopia. *World Development* 104, 10-30. https://doi.org/10.1016/j.worlddev.2017.11.010

Holden, S. T., Shiferaw, B. & Wik, M.(1998). Poverty, Market Imperfections, and Time Preferences: Of Relevance for Environmental Policy? *Environment and Development Economics* 3: 105-130.

Kumar M., & Kumar, P. (2008). Valuation of the ecosystem services: a psycho-cultural perspective. Ecol Econ 64: 808–819.

Taddese, G., 2001. Land degradation: a challenge to Ethiopia. *Environmental management*, *27*(6), pp.815-824.

Shiferaw, B. and Holden, S.T., 1998. Resource degradation and adoption of land conservation technologies in the Ethiopian highlands: a case study in Andit Tid, North Shewa. *Agricultural Economics*, *18*(3), pp.233-247.

Shiferaw, B. and Holden, S. T. (1999). Soil Erosion and Smallholders' Conservation Decisions in the Highlands of Ethiopia. *World Development* 27(4): 739-752.

Shiferaw, B. and Holden, S. T. (2000). Policy Instruments for Sustainable Land Management: The Case of Highland Smallholders in Ethiopia. *Agricultural Economics* 22: 217-232.

World Bank (2021). Data on World Development Indicators. https://databank.worldbank.org/reports.aspx?source=2&series=SP.POP.TOTL&country=ETHOf relevance: cited in Martin-López et al. 2012:

World Future Council and United Nations Convention to Combat Desertification (UNCCD) (2017). Future Policy Award crowns the World's Best Land Restoration Policies Ethiopia wins Gold Award │ Other winning policies from China, Brazil and Jordan.https://www.worldfuturecouncil.org/press-release-fpa-2017/

Appendix. Social Preference Experimental Design and Environmental Preference Questions

Social Preference Experiment

	Game set 1		
a.	We will introduce to you **eight** sharing games where you will decide what you prefer.		
b.	You will have a chance to earn money by participation in these games and your **answers** will affect		
	how much you and some others will get.		
c.	Only one game will result in payout but you do not know which one when you make your **answers**.		
d.	A lottery will determine which ones will be for real after all the games are played.		
e.	By making careful **answers** in each game, you have a greater chance of getting your preferred payout.		

S1	**Sharing game 1**: You can choose between two sharing options **between yourself and another unknown member of your own youth group:**
	
	Option 1: 20 ETB for yourself AND **20 ETB** for another
	
	    unknown member of your own youth group
	
	Option 2: 20 ETB for yourself AND **0 ETB** for another
	
	    unknown member of your own youth group
		Choice of sharing option: 1 or 2	

S2	**Sharing game 2**: You can choose between two sharing options **between yourself and an unknown member of another youth group in your woreda:**
	
	Option 1: 20 ETB for yourself AND **20 ETB** for another
	
	    unknown member of another youth group in the woreda
	
	Option 2: **20 ETB** for yourself AND **0 ETB** for another
	
	    unknown member of another youth group in the woreda
		Choice of sharing option: 1 or 2	

S3	**Sharing game 3**: You can choose between two sharing options **between yourself and another unknown member of your own youth group:** **Option 1: 20 ETB** for yourself AND **20 ETB** for another **unknown** member of your own youth group	Choice of sharing option: 1 or 2	

	Option 2: 20 ETB for yourself AND **40 ETB** for another **unknown** member of your own youth group		
S4	**Sharing game 4**: You can choose between two sharing options **between yourself and an unknown member of another youth group in your woreda:** **Option 1: 20 ETB** for yourself AND **20 ETB** for another **unknown** member of another youth group in the woreda **Option 2: 20 ETB** for yourself AND **40 ETB** for another **unknown** member of another youth group in the woreda	Choice of sharing option: 1 or 2	
S5	**Sharing game 5**: You can choose between two sharing options **between yourself and another unknown member of your own youth group:** **Option 1**: **20 ETB** for yourself AND **20 ETB** for another **unknown** member of your own youth group **Option 2: 40 ETB** for yourself AND **0 ETB** for another **unknown** member of your own youth group	Choice of sharing option: 1 or 2	
S6	**Sharing game 6:** You can choose between two sharing options **between yourself and an unknown member of another youth group in your woreda**: **Option 1: 20 ETB** for yourself AND **20 ETB** for another **unknown** member of another youth group in the woreda **Option 2: 40 ETB** for yourself AND **0 ETB** for another **unknown** member of another youth group in the woreda	Choice of sharing option: 1 or 2	
S7	**Sharing game 7**: You can choose between two sharing options **between yourself and another unknown member of your own youth group:** **Option 1**: **20 ETB** for yourself AND **20 ETB** for another **unknown** member of another youth group in the woreda **Option 2: 30 ETB** for yourself AND **40 ETB** for another **unknown** member of another youth group in the woreda	Choice of sharing option: 1 or 2	

| S8 | **Sharing game 8**: You can choose between two sharing options **between yourself and another unknown member of another youth group in your woreda**:

 Option 1: **20 ETB** for yourself AND **20 ETB** for another

        unknown member of another youth group in the woreda

 Option 2: 30 ETB for yourself AND **40 ETB** for another

        unknown member of another youth group in the woreda | Choice of sharing option: 1 or 2 | |
| G1 (S1-S8) | **Lottery to determine which of the games is real will take place at the end of the survey interview** | | |

	Environmental attitudes: Respond to the following statements with the following alternatives:		
E1	Community compulsory work is very important to protect the natural resource base and secure the future livelihood of people in the community **1=Strongly disagree, 2=Disagree, 3=Uncertain, 4=Agree, 5=Strongly agree**	Code	
E2	It is important that youth participate in the conservation of land resources in the community. **1=Strongly disagree, 2=Disagree, 3=Uncertain, 4=Agree, 5=Strongly agree**	Code	
E4	The current level of compulsory free labor of 20 days for conservation of the natural resources in the community is: **1=Much too high, 2=Too high, 3=Appropriate, 4=Too low, 5=Much too low.**	Code	
E5	How many days are you willing to work for free in the community per year to help conserve the natural resources (soil and water conservation, tree planting)? No. of days/yr:_____	Days per year	

Appendix 2. Social preference types and socio-economic characteristics: Multinomial logit models with district (woreda) and enumerator fixed effects.

Weak_altruist	RRR	Robust SE	z	P>|z|	95% Conf. Int.	
Male dummy	1.116	0.391	0.310	0.754	0.561	2.220
Age, years	0.975	0.018	-1.370	0.171	0.939	1.011
Education, years	0.960	0.041	-0.960	0.338	0.883	1.043
Birth rank	0.990	0.120	-0.090	0.931	0.780	1.255
No of elder brothers	0.882	0.194	-0.570	0.568	0.574	1.357
Woreda (Base: Raya azebo)						
Degua Tembien,	1.314	0.584	0.610	0.539	0.550	3.139
Seharti Samre	0.934	0.509	-0.120	0.901	0.321	2.718
Adwa	1.113	0.425	0.280	0.779	0.527	2.352
Constant	0.131	0.177	-1.510	0.132	0.009	1.839
Egalitarian						
Male dummy	0.759	0.156	-1.340	0.180	0.507	1.136
Age, years	0.985*	0.009	-1.730	0.084	0.968	1.002
Education, years	0.970	0.022	-1.310	0.192	0.927	1.015
Birth rank	0.973	0.056	-0.480	0.631	0.869	1.089
No of elder brothers	1.074	0.106	0.720	0.472	0.885	1.303
Woreda (Base: Raya azebo)						
Degua Tembien,	0.545**	0.156	-2.120	0.034	0.311	0.956
Seharti Samre	0.974	0.264	-0.100	0.921	0.572	1.657
Adwa	1.053	0.231	0.240	0.813	0.685	1.619
Constant	5.252***	2.535	3.440	0.001	2.039	13.524
Weak_egalitarian						
Male dummy	0.702*	0.138	-1.800	0.072	0.477	1.033
Age, years	0.973***	0.008	-3.340	0.001	0.957	0.989
Education, years	0.975	0.021	-1.150	0.250	0.934	1.018
Birth rank	1.041	0.057	0.730	0.463	0.935	1.160
No of elder brothers	1.029	0.101	0.290	0.772	0.849	1.247
Woreda (Base: Raya azebo)						
Degua Tembien,	1.301	0.339	1.010	0.312	0.781	2.169
Seharti Samre	1.109	0.320	0.360	0.719	0.630	1.954
Adwa	1.306	0.300	1.160	0.245	0.833	2.048
Constant	3.468**	1.764	2.440	0.015	1.279	9.401
Spiteful						
Male dummy	0.748	0.145	-1.500	0.134	0.512	1.093
Age, years	0.976**	0.009	-2.540	0.011	0.957	0.994
Education, years	0.987	0.024	-0.550	0.585	0.941	1.035
Birth rank	0.932	0.056	-1.160	0.247	0.828	1.050
No of elder brothers	1.142	0.120	1.260	0.208	0.929	1.403
Woreda (Base: Raya azebo)						
Degua Tembien,	1.211	0.405	0.570	0.567	0.629	2.334
Seharti Samre	1.342	0.436	0.910	0.365	0.710	2.538
Adwa	1.511	0.428	1.460	0.144	0.868	2.631
Constant	3.111**	1.579	2.240	0.025	1.150	8.415

Selfish						
Male dummy	0.495***	0.088	-3.950	0.000	0.349	0.701
Age, years	0.987*	0.008	-1.680	0.094	0.972	1.002
Education, years	0.954**	0.020	-2.300	0.021	0.916	0.993
Birth rank	0.996	0.055	-0.080	0.936	0.893	1.110
No of elder brothers	1.027	0.097	0.280	0.777	0.854	1.236
Woreda (Base: Raya azebo)						
Degua Tembien,	2.729***	0.703	3.900	0.000	1.647	4.520
Seharti Samre	1.143	0.305	0.500	0.617	0.677	1.930
Adwa	1.280	0.278	1.140	0.255	0.837	1.958
Constant	9.282***	3.984	5.190	0.000	4.002	21.529

Note: Base category is Altruist. RRR=relative risk ratio. Cluster-robust standard errors, clustering at youth group level. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.