UNIVERSITÄT PASSAU
Wirtschaftswissenschaftliche Fakultät

Changing environmental conservation attitudes: Evidence from a framed field experiment among small-scale coffee farmers in Colombia

Ann-Kristin Reitmann

Diskussionsbeitrag Nr. V-82-20

Volkswirtschaftliche Reihe ISSN 1435-3520

PASSAUER DISKUSSIONSPAPIERE

Herausgeber:
Die Gruppe der volkswirtschaftlichen Professoren
der Wirtschaftswissenschaftlichen Fakultät
der Universität Passau
94030 Passau

Changing environmental conservation attitudes: Evidence from a framed field experiment among small-scale coffee farmers in Colombia

Ann-Kristin Reitmann

Diskussionsbeitrag Nr. V-82-20

Volkswirtschaftliche Reihe ISSN 1435-3520

Adresse des Autors/der Autoren:

Ann-Kristin Reitmann
Wirtschaftswissenschaftliche Fakultät
Universität Passau
94030 Passau

Telefon: +49 851 509 5313
Telefax: +49 851 509 3312
E-Mail: ann-kristin.reitmann@uni-passau.de

Changing environmental conservation attitudes: Evidence from a framed field experiment among small-scale coffee farmers in Colombia

Ann-Kristin Reitmann*, University of Passau

July 2020

Abstract: This paper evaluates the effect of training and extension services on environmental conservation attitudes among small-scale coffee farmers in Colombia. Post-harvest coffee processing is traditionally very water-intensive and poses a threat to the environment, which is why it is of particular importance to improve the coffee farmers' environmental attitudes. Theory predicts that improved attitudes towards a certain behavior will under certain circumstances also translate into behavioral changes – hence, in this context, an increase in environmental conservation. Two different measures of attitudes on environmental conservation are assessed: stated attitudes (self-reported survey questions) and revealed attitude (elicited via a framed field experiment). For the latter, farmers were offered to donate an endowment to a local reforestation project, where the farmers' willingness to donate is assumed to correlate with the valuation of environmental conservation. Based on the lower bound estimates, I do not find significant impacts of training participation on stated or revealed attitudes towards environmental conservation. Yet, at the upper bound, a positive and statistically significant effect on stated attitudes can be detected. This paper also makes a methodological contribution by critically reflecting on the suitability of both attitude measures to proxy for environmental conservation attitudes.

Key words: stated attitudes, revealed attitudes, environmental conservation, framed field experiment, Colombia
***JEL* codes:** D91, O13, O22, Q12, Q20

*Corresponding author: Ann-Kristin Reitmann, Innstraße 29, 94032 Passau, Germany; ann-kristin.reitmann@uni-passau.de. The data underlying this research were collected for an impact evaluation commissioned by the Policy and Evaluation Department of the Ministry of Foreign Affairs of the Netherlands (IOB). I thank Maximiliane Sievert for her support during the project and for her inputs on this paper. I am thankful to Nathalie Luck, Stefan Beierl, Michael Grimm and Luciane Lenz for valuable comments on earlier versions of this paper. I also thank Carlos Garcia, Gustavo Ochoa and their team for the great implementation of the survey.

1 Introduction

The negative consequences of climate change and environmental degradation are most evident in developing countries (Mendelsohn, Dinar, & Williams, 2006; Stern, 2008). Particularly farmers in poor, rural areas, whose livelihood depends on natural resources, are strongly affected and most vulnerable (Morton, 2007). To respond to this, considerable research and policy efforts are directed towards the promotion of sustainable behavior and environmental conservation (EC), and towards increasing the resilience of the affected population to environmental shocks.

To promote sustainable behavior, developed countries largely follow a formal or regulatory approach and employ economic incentives such as tradable licenses, or environmental taxes and subsidies (see e.g., Cropper & Oates, 1992; Stavins, 2019). This approach is in line with the economic rationale that environmental problems lie in the externalities of common-pool resources. To overcome them, the right incentives have to be put in place. However, the focus on such external interventions ignores the important contribution of pro-environmental preferences or attitudes, which are connected to an intrinsic motivation[1] to stimulate EC.[2] Pro-environmental attitudes can increase the demand for EC and help to overcome classic public goods and free-rider problems, because intrinsically motivated people voluntarily contribute to EC (Frey & Stutzer, 2008). Policies to encourage pro-environmental attitudes among the population are of particular importance for developing countries, where the institutional capacity to enforce external interventions is often lacking (Dietz, Ostrom, & Stern, 2003). In fact, studies on the management of common-pool resources in developing countries even find that the use of economic incentives can crowd out intrinsic motivation (see e.g., Rode, Gómez-Baggethun, & Krause, 2015, for a review). Instead, they find that natural resource management is most effective in poor countries when communities are able to self-organize and create their own rules (Baland & Platteau, 1996; Ostrom, 1990; Wade, 1987).

In this study, I investigate one possible mechanism for forming pro-environmental attitudes in a developing country setting. In particular, I examine the effect of training and extension services on stated and revealed EC attitudes among small-scale coffee farmers in Colombia. The training and extension services were provided in the course of a program implemented in Colombian coffee-growing regions, with the goal to improve water management in domestic and post-harvest coffee processing activities. Post-harvest coffee processing is traditionally very water-intensive and poses a threat to the environment through effluent wastewater that contaminates surface water bodies. During the training, which was largely provided by extension workers, the farmers learned about the general importance of EC and the protection of water sources in particular,

[1] According to Deci (1971), intrinsically motivated individuals act without apparent reward other than the activity itself, whereas extrinsic motivation is related to satisfaction coming from (tangible) external benefits (e.g., financial incentives or the avoidance of external punishment) (Ryan & Deci, 2000).

[2] Frey and Stutzer (2008) rather introduce the term "environmental morale", which is often connected with pro-environmental preferences or attitudes.

and how to implement more environment-friendly measures. By providing crucial information on EC through the training and extension component, the program can form pro-environmental attitudes. This might create an intrinsic motivation for sustainable behavior that ultimately results in increased adoption of EC devices and practices (i.e., without the necessity for external intervention). Through intensive community mobilization, the program may even contribute to the evolution of social norms on EC.

This paper contributes to a large strand of literature analyzing factors that influence the adoption of sustainable, climate adaptive agricultural innovations in developed and developing countries (Baumgart-Getz, Prokopy, & Floress, 2012; Knowler & Bradshaw, 2007; Prokopy, Floress, Klotthor-Weinkauf, & Baumgart-Getz, 2008; Wauters & Mathijs, 2014). Those agricultural innovations can be both devices and practices that rationalize the use of natural resources and therefore not only increase resilience but also contribute to EC. Yet, while recent studies include social psychological factors such as knowledge, perceptions and attitudes as potential drivers of technology adoption (Bopp, Engler, Poortvliet, & Jara-Rojas, 2019; Meijer, Catacutan, Ajayi, Sileshi, & Nieuwenhuis, 2015; Romero, Wollni, Rudolf, Asnawi, & Irawan, 2019), few studies actually consider pro-environmental attitudes as an outcome and, hence, little is known about factors that influence their formation. Assuming a positive effect on EC behavior, learning about potential drivers of pro-environmental attitudes is, thus, an important research goal in itself.

I rely on two different EC attitude measures. The first measure consists of stated attitudes from two rounds of a large farm survey among 699 farmers in treatment river basins as well as 700 farmers in river basins that are comparable to the treatment river basins, but that had not been chosen for implementation of the program under investigation (control group). The coffee farmers were asked about how much they identify themselves with seven statements on pro-environmental behavior. These questions were posed to all farmers before and after the implementation of the intervention. Considering that self-reported attitudes might suffer from social desirability bias, a second measure was employed at endline to elicit revealed attitudes. In a framed field experiment, farmers were offered to donate an endowment to a local reforestation project. This experimental measure of EC attitudes is based on the assumption that farmers' willingness to donate correlates not only with their valuation of the particular reforestation project but also with their general valuation of EC.[3] This type of experiment was already applied in other contexts to capture more robust measures of EC attitudes and behavior (see e.g., D'Adda, 2011; Karapetyan & D'Adda, 2014; Voors, Bulte, Kontoleon, List, & Turley, 2011). However, to the best of my knowledge, this is the first study to use this simple but innovative field experiment to evaluate the impact of a real intervention.

While around three-quarter of the sampled coffee farmers in the treatment group took up the training, I do not find significant impacts of participation on stated or revealed attitudes

[3]Reforestation has positive multiplier effects on EC; trees planted around water sources prevent soil erosion and, thus, improve water quantity and quality (e.g., D'Adda, 2011). These effects were also emphasized during the program's training sessions.

towards EC among treated relative to control farmers. Although intent-to-treat and local average treatment effects for both attitude measures are positive, the null hypothesis of no impact cannot be rejected at standard levels. I discuss various explanations for these null findings. In one alternative empirical specification, I only look at changes in stated attitudes among the treatment group before and after the program intervention. Indeed, when looking at these upper bound impacts of the program, I do observe a positive and statistically significant effect of the intensified training and extension services.

This study moreover makes a methodological contribution by critically reflecting on the suitability of both attitude measures to proxy for EC attitudes. I find a very low correlation between the two measures, thus, raising the question whether they capture different EC preferences or even different general social concerns (see also D'Adda, 2011). While stated EC attitudes correlate with actual EC behavior, the revealed attitude measure seems to capture either very specific environmental preferences with sole reference to deforestation, or even pro-social preferences in general.

The remainder of this paper is organized as follows. Section 2 describes the details of the program under investigation and the design of this study, including a description of the framed field experiment. The section also shows baseline summary statistics and provides a theoretical rationale for the impact of training and extension services on (pro-environmental) attitudes. Details on the estimation strategy are presented in Section 3. In Section 4, the results are described and further discussed. Section 5 concludes and reflects on implications for future research and program design.

2 Program and study design, baseline summary statistics and theoretical rationale

The program under investigation was implemented in various coffee-growing regions of Colombia. Unlike in other coffee-producing countries such as Brazil, Vietnam, or Indonesia, coffee production in Colombia is characterized by numerous small-scale family businesses with labor-intensive processes. Accounting for 25% of agricultural jobs, the coffee sector provides an important source of income for the rural population (FNC, 2013).

In the Colombian coffee sector, considerable amounts of water are required to process coffee after harvesting. Depending on the processing practices, the wastewater can have considerably elevated organic load, a high amount of suspended solids, and low pH levels. If left untreated and discharged into surface water bodies, these effluents can substantially contribute to contamination (see e.g., Beyene et al., 2012; Haddis & Devi, 2008). In general, water is abundant in Colombia's coffee-growing areas, although dry and wet periods lead to periodic fluctuations in rainfall. However, with changing climatic conditions, the effects of these phenomena have become stronger, resulting in periods of above-average drought on the one hand and excessive rainfall on the other. Periodic water shortages have sometimes resulted in substantial losses in coffee production in recent years. In turn, excess water, accompanied by increasing deforestation, has led to substantial soil erosion. To mitigate the effects of changing climatic conditions and to contribute to improving water quality, coffee farmers have to improve the management of local water resources. The program under evaluation contributed to that goal by information and sensitization campaigns, training, hardware investments and an improved institutional environment.[4]

2.1 Program intervention

The program covered 25 intervention municipalities that are evenly distributed across five of Colombia's nineteen coffee-growing departments. Within each municipality, one river basin was selected by the program implementer for the intervention. A river basin is defined by the area around a main river and all its tributaries. Within each river basin, the treatment population comprised all coffee farms which use and discharge water from or to the main river or its tributaries. The program started with a sensitization phase in the beginning of 2015, informing half of all coffee farms in each river basin about the upcoming intervention.

After the sensitization phase, the implementation of the program started in mid-2015.[5] These activities were largely executed through the well-established network of extension workers affiliated with the program implementer, who are in permanent contact with the coffee farmers in the municipality and provide technical assistance through regular field visits. The extension workers received additional training from the program implementer and got support from further technicians who were trained exclusively for the program's activities. Broadly, program activities were threefold. First, a small share of coffee farmers received technical assistance and financing for water-efficient and environment-friendly equipment for both domestic and productive activities. Eligible farms were located in the "area of intervention", a 200-meter radius around the main river. Second, the program offered training courses. Invitations to participate were extended quite openly to all coffee farms within the "area of influence", which is an area within the river basin that goes beyond the 200-meter radius of the area of intervention. The program supplied it's training modules in form of public campaigns, short courses, a set of longer sessions, workshops, demonstrations and field days/visits. The following training modules on EC related topics were offered: ecological coffee processing, good agricultural practices in coffee production, integrated water management (domestic and productive), soil and water conservation, and forest and soil management. It must be noted that through the local extension service, the program implementer has been working on the dissemination of water-efficient equipment and similar training programs for several years in the whole coffee region. However, the program

[4]For confidentiality reasons, details of the intervention under consideration are not provided.

[5]As mentioned above, the program also intervened on the institutional level. In the short term, however, the impact of that part is not expected to show on the farm level and therefore is not further considered in the course of this study.

under investigation separates itself from the program implementer's everyday business in terms of intensity. It is an intensification of the everyday business by taking a more comprehensive approach and a stronger community perspective. This is where the third core activity of the program comes in to play: community mobilization. It includes training modules on social topics (i.e., associative practices, generational renewal and gender, business management, and social responsibility) and the establishment of farmer associations to manage water resources in the river basin. Moreover, the program supported ecological restoration (i.e., reforestation activities) and bioengineering plans for each river basin.

The data used in this study was collected to evaluate various parts of the program. While this study evaluates the program's intensified training and extension services, the "main impact evaluation" focuses on the effect of the intervention on the adoption of water and soil conservation devices and practices in domestic and productive activities.[6] For both impact studies, the evaluation strategy is to mimic a randomized treatment assignment in a non-randomized difference-in-differences (DiD) approach. Before the program kick-off, for each treatment river basin, a control river basin was identified that resembled the respective treatment river basin. More specifically, the control river basins had to be located in the same municipality (to ensure the same socio-economic, ecological and weather conditions) and comparable with respect to the surface area, coffee farm population, size of the main river and the existence of other on-going environmental projects. In the treatment river basins, a random sampling approach was applied among farms pre-selected to receive beneficiary equipment (i.e., located in the area of intervention). Based on the number of farmers interviewed in each treatment river basin, comparable farms were surveyed in the control river basins. The baseline was collected from August to December 2015 and ultimately consisted of 1,399 farms, including 699 treatment farms and 700 control farms. Overall, selected coffee farms in treatment and control river basins were very similar with respect to various observable characteristics (see Section 2.3). The endline survey was conducted two years later from October to December 2017, where 1,351 farmers could successfully be re-interviewed, implying an attrition rate of only 3%.[7]

2.2 Pro-environmental attitude measures

Stated attitudes

The training aimed at enhancing pro-environmental attitudes and behavior in general and water conservation in particular. Accordingly, the statements to measure stated (i.e., self-reported)

[6] I call the other impact evaluation of the program "main impact evaluation" to distinguish it from the impact evaluation conducted in this study.

[7] The results of the main impact evaluation indicate that the adoption of promoted equipment and practices is higher in treatment river basins than in the control group, although effect sizes are rather small and very heterogeneous in the different regions. More details on the main impact evaluation can be obtained in the forthcoming endline report.

attitudes largely deal with water-related conservation behavior. The coffee farmers had to indicate how much they identify themselves with the behavior described in seven statement on a 5-point Likert scale: 1 – no identification, 2 – weak identification, 3 – indifferent, 4 – medium identification, 5 – complete identification. Due to the various meanings of "level of identification", I introduce the term "level of agreement" from this point on. That is, on which level do the coffee farmers agree that the behavior described in each statement applies to their own behavior and mindset. The statements are the following:

(1) *I reuse my water for several tasks.*
(2) *I am inspecting that none of the faucets, pipes and toilet are leaking.*
(3) *In my household, we save water.*
(4) *I conserve water even if my neighbors don't.*
(5) *Water conservation is not only a governmental obligation.*
(6) *Coffee is also well washed if not a lot of water is used.*
(7) *Good practices in coffee processing do not only include those that ensure good coffee quality.*[8]

While Statements 1 and 2 indicate attitudes towards domestic and productive water conservation behavior, the last two statements directly refer to post-harvest coffee processing. Statements 3, 4 and 5 indicate the farmer's own preferences towards water conservation and also in comparison to their neighbors and the government. The different training modules aim to transmit values and information to the participant, which should ultimately be reflected in high agreement with all of these statements. All statements were asked in the baseline and endline survey in both the treatment and control group.

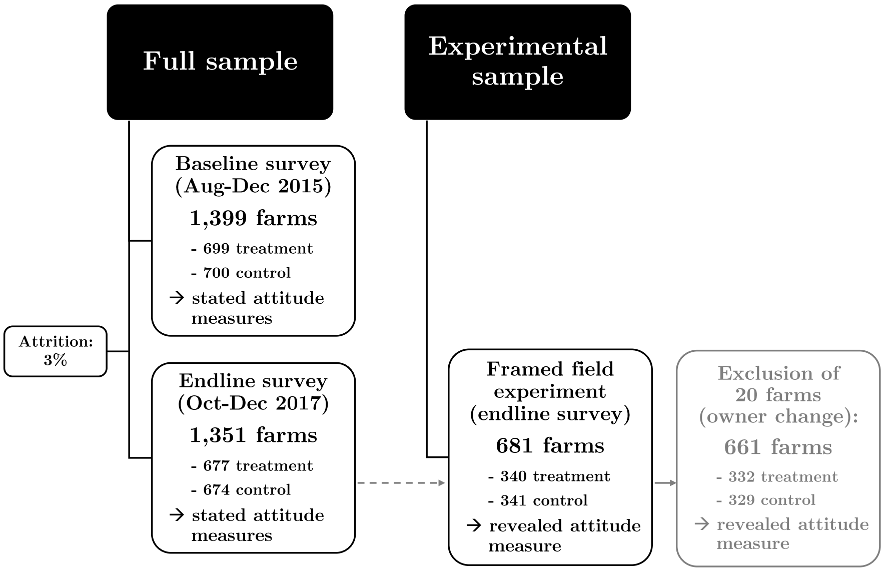
Stated EC attitude measures can potentially suffer from social desirability bias, namely respondents might provide answers that do not necessarily reflect their true opinion but rather align with what is viewed favorably by others (DeMaio, 1984). Although the survey team was independent of the program implementer, respondents might perceive a pressure for "environmental correctness" and hence overstate their pro-environmental attitudes during the interview.

Revealed attitudes from a framed field experiment

To complement the stated attitude measure on EC with a more robust, revealed attitude measure, a behavioral experiment was conducted after the endline survey with a sub-sample of 681 coffee farmers. Figure 1 provides an overview of the different samples:

[8] Statements 5, 6 and 7 were originally asked the other way around. In order to have high values reflecting pro-environmental attitudes, the statements were reversed for the analysis.

Figure 1: Composition of the full and experimental sample



Note: This study applies the panel of 661 farms that are part of the (final) experimental sample.

In the framed field experiment (Harrison & List, 2004), the farmers received 20,000 Colombian Pesos (COP).[9] The experiment was not introduced as such but framed as an opportunity for donating to a reforestation project. No concrete project was named, the farmer was only informed that 20,000 COP suffice for planting 25 trees (including operation costs) and that they would be planted in their own district.[10] The farmer could freely decide on how to split the 20,000 COP between themselves and the project introduced by the enumerator. To ensure anonymity, the coffee farmer received an envelope to make the donation in privacy.[11] The donations were kept private to measure the intrinsic motivation of the individual farmer (D'Adda, 2011). 20,000 COP were slightly below the daily minimum wage of 24,600 COP at the time of the survey and, therefore, a substantial amount of money to the rural coffee farmers.

The experiment requires farmers to weigh the individual monetary short-term benefits from keeping the money against longer-term environmental benefits for the whole community through reforestation. Although the experiment is framed in the context of reforestation, it aims to capture not only the farmer's valuation of reforestation in particular, but the valuation of environmental conservation in general. The importance of reforestation and the implications for the quality and quantity of local water resources (e.g., prevention of erosion) was emphasized throughout the program and particularly in the EC related training. Hence, the underlying

[9]20,000 COP is equivalent to around 5.50 EUR (date of conversion: 19.02.2020).

[10]After program closure, the collected donations were given to local organizations in the river basins with a signed agreement to direct them towards reforestation in the district.

[11]The endowment was given out in ten 2,000 COP bills. Hence, donations could only be made in 2,000 COP steps.

hypothesis is that farmers who value (local) environmental quality, namely those who have high EC attitudes, donate more. If the program has a positive impact on EC attitudes, farmers in the treatment area should ultimately donate more than control group farmers. The revealed attitudes can be expected to be less biased than the stated attitudes for EC, because the "real stakes" introduce opportunity costs for socially desirable behavior.

Given that the donation in our experiment is directed towards a local reforestation project, it can be interpreted to mimic a public goods game (Voors et al., 2011). These types of experiments are frequently applied in the laboratory to assess social preferences (i.e., preferences that deviate from the standard model of self-interested individuals) and social norms (Camerer & Fehr, 2004; DellaVigna, 2009). Stressing the importance of local (i.e., social and ecological) context for the evaluation of real behavior, studies increasingly take experiments to the field (Anderies et al., 2011). A large body of research analyzes social preferences and the role of social norms in the context of common-pool resource management (see e.g., Brent, Friesen, Gangadharan, & Leibbrandt, 2017, for a review). The donation experiment I use in this study has been implemented in varying settings to elicit pro-environmental attitudes. D'Adda (2011), for instance, applies the experiment in Bolivia to examine how non-monetary and non-regulatory incentives affect pro-social behavior for EC. In another study, Karapetyan and D'Adda (2014) use donations to an environmental NGO in Sierra Leone to capture individual preferences for EC. However, to the best of my knowledge, this is the first to use the donation experiment for evaluating an actual intervention.[12]

The experiment was only conducted with a sub-sample of 681 farms (i.e., 340 treatment and 341 control group farms). In each department, three out of five treatment river basins with the "matching" control river basins were randomly selected.[13] Within the 30 selected river basins, all baseline farmers participated in the experiment.[14] I use this experimental sample for the main analysis of this study, namely for examining the effect of the program on both revealed and stated preferences.[15] The experimental sample does not differ systematically from the full sample (only few characteristics are statistically significant, though the differences are small in size; see Appendix A).

[12]It is, however, not unusual to find that field experiments embed small lab experiments (e.g., dictator games, public goods games, etc.) for research purposes (Banerjee & Duflo, 2009).

[13]In two departments, some control river basins were affected by treatment contamination (more on that in Section 3.3). For this reason, the "matching" treatment river basins were excluded from the random selection process.

[14]Only in one department, 40 farms per river basin were randomly selected to correct for the overrepresentation in the original sample.

[15]Twenty observations had to be excluded from the experimental sample because the residing family on the farm changed from baseline to endline. This is equally observed among both groups and leaves a final sample size of 661 farms (see also Figure 1). I do not believe that the treatment affected the composition of the sample through, for instance, selective migration.

2.3 Baseline summary statistics

To tease out the effect of intensified training and extension services provided through the program under consideration, the treatment and control group needed to be comparable at the baseline. Table 1 shows the mean and the respective standard deviation for a wide range of variables for the control group (Columns 1 and 2) and the treatment group (Columns 5 and 6), respectively. Column 3 contains the mean difference between both groups and Column 4 the corresponding p-value for significance. The groups are overall well balanced and differences between the two groups are generally small and significant at standard levels for only one of 40 variables (perception of erosion). Though, the joint null of equality is rejected at standard levels.

With respect to stated EC attitudes, Table 1 shows two things. First, the level of agreement with the statements is very similar among treatment and control group farmers at baseline. Second, for some statements, levels of agreement are already high, indicating very advanced pro-environmental attitudes. This might indicate that EC attitudes are indeed, on average, already well advanced, potentially due to the program implementer's long-standing efforts. Alternatively, it could reflect social desirability bias. However, if the latter was to apply, it would raise the question of why coffee farmers overstate their attitudes only for some statements and not for all.

I furthermore observe the farmers' behavior for different activities. The survey elicited whether they own and use relevant conservation equipment and apply conservation practices. Due to the high number of equipment and practices, I construct indices of standardized outcomes in the spirit of Kling, Liebman, and Katz (2007) for each "family" of activities (i.e., domestic EC, EC in coffee processing, soil and water conservation beyond coffee processing). Each index is constructed as the simple average of the outcomes within the family of activities, standardized using the mean and the standard deviation of the outcome estimated from the control group at endline (see also Tarozzi, Desai, & Johnson, 2015).[16] The figures in Table 1 do not show any significant differences in the three indices at baseline. Hence, both groups were not only comparable with respect to stated attitudes towards EC, but also with respect to actual EC behavior.

The baseline information moreover shows that training is also offered outside the program under investigation. As mentioned earlier, the program implementer and also other non-governmental and governmental organizations offer training on a variety of topics on a regular basis – among them on EC. It has to be stressed here again that training under evaluation differs strongly from the other training activities in terms of intensity and targeting. Hence, in this study, I am not be able to analyze the effect of training and extension services compared to no training at all, but only the effect of intensifying the training activities.

[16] For more information on the index construction see Appendix B.

Table 1: Baseline summary statistics and tests of balance

	Control				Treatment	
	(1) Mean	(2) SD	(3) Difference	(4) p-value	(5) Mean	(6) SD
HH characteristics						
Female head of HH (=1)	0.131	0.338	0.004	0.908	0.127	0.333
Age head of HH (years)	54.4	13.1	0.8	0.554	53.7	14.5
Head of HH is literate (=1)	0.906	0.293	-0.001	0.971	0.907	0.291
HH size (members)	3.6	1.7	0.1	0.528	3.5	1.6
HH lives on farm (=1)	0.605	0.490	0.033	0.519	0.572	0.495
Asset index (score)	0.058	1.481	0.066	0.737	-0.008	1.447
Secure land ownership (=1)	0.805	0.396	0.049	0.494	0.756	0.430
HH member works outside farm (=1)	0.264	0.442	-0.013	0.814	0.277	0.448
Farm characteristics						
Female farmer (=1)	0.267	0.443	0.020	0.631	0.247	0.432
Experience (years)	36.9	17.0	-2.5	0.299	39.4	15.9
Total farm area (ha)	4.6	6.9	-0.3	0.839	4.9	12.4
Coffee plantation area (ha)	2.3	2.6	-0.2	0.575	2.5	3.0
Coffee production (@cps)	262.8	783.0	-44.4	0.550	307.2	618.2
Coffee processing on farm (=1)	0.805	0.396	0.031	0.548	0.774	0.419
Farm cultivates other crops (=1)	0.252	0.435	0.069	0.280	0.184	0.388
HH owns livestock (=1)	0.365	0.482	0.085	0.241	0.280	0.450
Hired workers (=1)	0.845	0.362	-0.025	0.560	0.870	0.336
Farm pays for water (=1)	0.593	0.492	0.087	0.402	0.506	0.501
Water source on farm (=1)	0.699	0.459	-0.036	0.586	0.735	0.442
Perception of environmental problems						
Water shortage (=1)	0.243	0.430	-0.040	0.464	0.283	0.451
Erosion (=1)	0.271	0.445	-0.082	0.073*	0.352	0.478
Deforestation (=1)	0.505	0.501	-0.007	0.914	0.512	0.501
EC attitudes (scale 1-5)						
I reuse my water for several tasks	2.368	1.702	-0.295	0.229	2.663	1.716
I am inspecting that none of the faucets, pipes and toilet are leaking	4.605	0.989	0.045	0.641	4.560	1.019
In my household we save water	4.593	0.882	0.017	0.863	4.575	0.912
I conserve water even if my neighbors don't	4.757	0.668	0.046	0.629	4.711	0.734
Water conservation is not only a governmental obligation	4.541	1.009	0.035	0.787	4.506	1.047
Coffee is also well washed if not a lot of water is used	2.666	1.656	-0.060	0.739	2.726	1.625
Good practices in coffee processing do not only include those that ensure good coffee quality	1.574	1.174	-0.100	0.519	1.675	1.254
EC behavior indices						
Domestic EC devices and practices	-0.204	0.514	0.018	0.805	-0.222	0.484
Coffee processing EC devices and practices	-0.049	0.385	-0.057	0.387	0.008	0.394
Soil and water conservation practices	0.180	0.348	-0.047	0.403	0.227	0.326
Participation in EC related training(s)						
By program implementer (=1)	0.663	0.474	0.024	0.665	0.639	0.481
By supporting program implementer (=1)	0.040	0.195	0.018	0.348	0.021	0.144
By other entity (=1)	0.131	0.338	0.025	0.426	0.105	0.308
Social						
Member in sustainability initiative (=1)	0.626	0.485	-0.079	0.357	0.705	0.457
Group member (=1)	0.632	0.483	-0.030	0.459	0.663	0.474
Observations	329				332	

Note: Data from baseline (2015) survey. Columns 1 and 5 report the mean values for the control and treatment group, respectively. Columns 2 and 6 the respective standard deviation to the means. Column 3 shows the difference between the control and treatment means and Column 4 the p-values for the test of equality of means, robust to intra-river basin correlation. The number of clusters (river basins) is 30. The joint null of equal means is rejected at standard levels (F(29, 29) = 59.41, p-value = 0.000). When testing the joint null some variables are excluded because of collinearity. Explanation to some variables: The asset index is calculated using factor analysis based on housing characteristics and ownership of various durables (first factor). Secure land ownership is defined as holding the deed or any other relevant document to the land. Coffee production is measured in "arrobas de café pergamino seco" (@cps) with 1 @cps equaling 12.5 kg of dry parchment coffee. The EC behavior indices are described in detail in Appendix B. Training participation was inquired for the past 12 months prior to the baseline survey. Being member of a sustainability initiative enables farmers to sell their coffee under an ecolabel. Group membership indicates that the farmer or his/her spouse participates in a local community organization or association. The balance among the five departments is also tested (and given), but not shown in the table. *** indicates significance at 1%, ** at 5%, and * at 10%.

2.4 Theoretical rationale

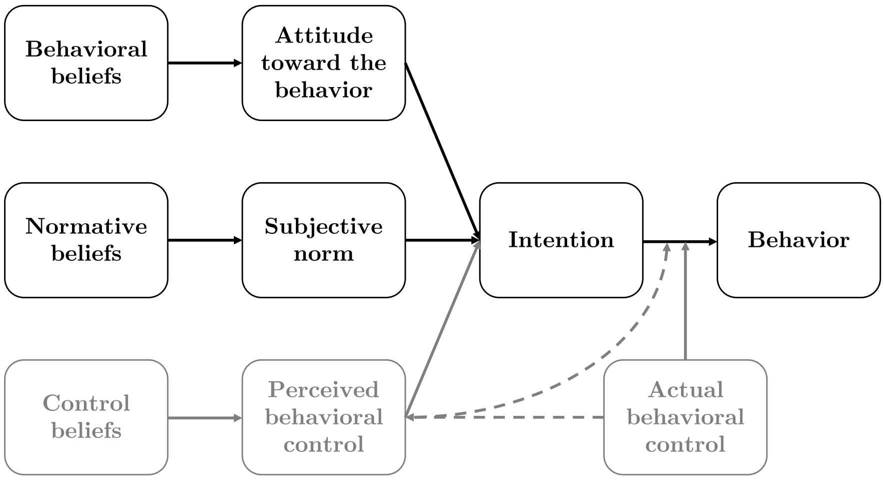
The literature on the adoption of sustainable conservation agriculture (e.g., water and soil conservation practices, agricultural best management practices, organic farming, etc.) offers a variety of theories and frameworks to study the behavior and decision-making processes of farmers. Classical economic models, for instance, are often based on the "expected utility concept". These models traditionally use structural variables of the individual farmer (e.g., socio-economic characteristics) and his or her environment (e.g., ecological conditions) to explain adoption behavior, but mostly ignore social psychological factors (Bopp et al., 2019; Greiner, Patterson, & Miller, 2009; Meijer et al., 2015; Vignola, Koellner, Scholz, & McDaniels, 2010). Factors such as knowledge, perceptions and attitudes are largely ignored in classical theoretical approaches, although their importance in explaining technology adoption more comprehensively has been identified in various empirical studies from developed countries (e.g., Baumgart-Getz et al., 2012; Greiner et al., 2009; Howley, 2013; Kollmuss & Agyeman, 2002; Prokopy et al., 2008). By contrast, in the field of psychology, such factors play a key role in explaining complex decision-making. Two popular models for predicting human behavior are the "theory of reasoned action" (TRA) (Ajzen & Fishbein, 1980) and its extension, the "theory of planned behavior" (TPB) (Ajzen, 1985). They are particularly useful for predicting ecological behavior (Bamberg & Möser, 2007; Baumgart-Getz et al., 2012; Kaiser, Wölfing, & Fuhrer, 1999; Kollmuss & Agyeman, 2002; Lynne, Casey, Hodges, & Rahmani, 1995). They identify attitudes towards the behavior, among other factors, as important mediators for actual behavior and, thus, also reflect on the determinants of these attitudes. Both frameworks serve as a theoretical rationale in this study for explaining the role of training and extension services in shaping EC attitudes.[17]

Figure 2 provides a simplified illustration of the TRA and the TPB, whereas the former (highlighted in black) builds the foundation for the latter (highlighted in gray). The intention to perform the behavior is depicted as the immediate antecedent of actual behavior and therefore captures the motivational factors that influence behavior. Intention, in turn, is described as a function of the person's attitude toward the behavior, subjective norms, and perceived behavioral control. The model predicts that the more favorable the attitude and subjective norm toward the behavior, and the higher the perceived behavioral control, the stronger should be a person's intention to perform the behavior. The relative importance of each component varies by the behavior and the population under consideration. The TPB extends the TRA by the factor of perceived behavioral control and actual behavioral control, because behavioral intention can only translate into behavior if the person is in volitional control. However, most behavior can also depend on non-motivational factors (Ajzen, 1985, 1991; Ajzen & Fishbein, 2005). In the context of EC, for instance, influences that are (at least partly) beyond the individual's control are financial constraints, ecological conditions, cooperation of other people or even political

[17]The theories only serve as a theoretical rationale. The goal is not to empirically test the TRA and TPB frameworks.

regulations (Kaiser et al., 1999).

Figure 2: The theories of reasoned action and planned behavior



Note: Own illustration following Ajzen and Fishbein (2005).

I focus on the first two mediators of intentions.[18] First, an attitude toward the behavior is defined as the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question. Second, a subjective norm refers to the perceived social pressure to perform the behavior or refrain from it. These two mediators are themselves determined by a set of underlying beliefs (i.e., behavioral beliefs and normative beliefs, respectively) that Ajzen (1991, p. 189) phrases as "salient information relevant to behavior". Thus, with respect to pro-environmental behavior and the application of conservation technology and practices, salient information includes knowledge about the existence and application of conservation technologies and practices, and what benefits or risk they bring to the individual, but also the community and environment (Jackson-Smith & McEvoy, 2011; Kreutzwiser et al., 2011). Moreover, social and moral norms toward conservation behavior are important information for the individual.

In the context of the program under investigation, providing the coffee farmers with training and extension services can be an effective way of forming behavioral beliefs through information dissemination (Knowler & Bradshaw, 2007). Moreover, joint training among farmers of the same river basin might affect normative beliefs. Apart from training intensity, this community-based approach is what sets the program apart from usual activities of the program implementer. A similar line of reasoning is also presented by Meijer et al. (2015). They provide an analytical framework on a farmer's decision to adopt new agricultural technologies by combining various theories, including the TPB. They also consider "communication and extension" as a crucial intervening variable for developing knowledge, perceptions and also attitudes about agricultural

[18]For the sake of simplicity, several important relations of both theories (e.g., feedback processes between the components) are not discussed nor depicted in Figure 2. For a detailed description of the theories see, for example, Ajzen and Fishbein (1980, 2005) or Ajzen (1985, 1991).

innovations. Moreover, a positive effect of extension training on the actual adoption of agricultural innovations has been found in various empirical studies in both developed and developing countries (e.g., Baumgart-Getz et al., 2012; de Buck, van Rijn, Roling, & Wossink, 2001; Krishnan & Patnam, 2013; Mugonola, Deckers, Poesen, Isabirye, & Mathijs, 2013; Pedzisa, Rugube, Winter-Nelson, Baylis, & Mazvimavi, 2015).

3 Empirical specification

3.1 Intention-to-treat effects

The attitude statements on EC were elicited before and after the intervention, which allows me to look at changes in outcomes at the farm level in a non-randomized DiD approach. Throughout this study, treatment is defined at the unit of treatment assignment, namely the river basin. For a given outcome, in this case the level of agreement with a statement S, the following equation is estimated:

$$S_{frdt} = \beta_{End}End_t + \beta_{Treat}Treat_r + \beta_{DiD}End_t \times Treat_r + \beta_{Cov}X_{frdt} + \alpha_d + u_{frdt}, \quad (1)$$

where S_{frdt} denotes the outcome for farm (or coffee farmer) f in river basin r in department d and time t (where $t = 0$ is the baseline and $t = 1$ is the endline). End_t and $Treat_r$ are binary variables equal to one when $t = 1$ and when the program was implemented in a treatment river basin r, respectively. The main coefficient of interest is therefore β_{DiD}, representing the DiD effect of the program in the treatment group (in comparison to the control group) at endline (in comparison to baseline). α_d is the department fixed effect that controls for time-invariant departmental specific characteristics. The five departments differ with respect to climatic conditions and, moreover, environmental laws or other regulations are often implemented at the department level. Equation 1 also controls for any differences between the control and treatment group observed at baseline in X_{frdt} (i.e., perceived erosion, see Table 1). The residual is allowed to be correlated within the river basin (i.e., the cluster), so all standard errors and tests are robust to intra-cluster correlation. Equation 1 are estimated separately for each of the seven statements described in Section 2.2. Considering the large number of outcomes, the probability of rejecting the null of no impact for at least some of the outcomes can be very large even when the null is true for all outcomes. I address this issue by conducting two types of multiple-inference adjustments. First, I construct an index of standardized outcomes to reduce the total number of tests performed (i.e., the EC attitude index, see Appendix B). Second, I calculate FDR-adjusted (more conservative) q-values in addition to the standard p-values. Here, I follow a method proposed by Benjamini and Hochberg

(1995), which is described in Anderson (2008).[19] This method controls for the false discovery rate (FDR), which is the expected proportion of rejections that are type I errors. The calculated FDR q-values are a natural analog to the standard p-value and provide the smallest level q at which the hypothesis would be rejected (Anderson, 2008).

To analyze the effect of the program on revealed attitudes (collected only at endline), I use a simple difference approach (i.e., the difference between treatment and control group at endline only):

$$D_{frd} = \beta_{Treat} Treat_r + \beta_{Cov} X_{frd} + \alpha_d + u_{frd}, \tag{2}$$

where D_{frd} denotes the contribution to the reforestation project from farm (or coffee farmer) f in river basin r in department d at time $t = 1$. β_{Treat} measures the impact of the program on the outcome. Considering that the treatment and control group farmers did not differ significantly at the baseline for a wide range of observable variables, I assume that donation behavior would have been similar as well. Equation 2 controls for differences at the baseline and department fixed effects. Moreover, for the discussion, I include further covariates that might affect donation behavior for a reforestation project in extensions of Equation 2. As with Equation 1, the residual is allowed to be correlated within the river basin.

The training was offered to all coffee farmers in the area of influence in the treatment river basins. Participation, however, was not mandatory and invited farmers (and their families) could decide how many training sessions they wanted to attend. Therefore, the estimates that stem from Equations 1 and 2 need to be interpreted as intention-to-treat (ITT) effects. That is, the average impact of giving access to intensified training and extension services in the treatment river basins, regardless of actual uptake. These estimates, thus, give the lower bound impacts. Hence, the effect of those that actually take up the treatment can be expected to be higher. These local average treatment effects (LATE) are introduced in the next section.

3.2 Local average treatment effects

In addition to simple ordinary least squares (OLS) regressions, I estimate the models depicted in Equations 1 and 2 using two-stage least squares (2SLS) to seek out the LATE, namely the average treatment effect for the compliers. For this, the dummy for assigned treatment is replaced with a dummy that indicates actual (self-reported) uptake of the treatment. Considering that the outcomes of interest are pro-environmental attitudes,

[19] The Stata code to compute the FDR-adjusted q-values is also provided by Michael L. Anderson (see `https://are.berkeley.edu/~{}mlanderson/ARE_Website/Research.html`).

uptake of the training might be endogenous. That is, coffee farmers with a higher valuation of EC are more inclined to participate in the training. One might also argue the other way and say that farmers with stronger pro-environmental attitudes do not see any benefit of participating in the training, because they are already well informed. I use treatment assignment to instrument for potential endogeneity in uptake. While treatment assignment, that is, whether or not a coffee farm is located in a treatment river basin, is a strong predictor for treatment uptake, it also needs to be exogenous to the outcome variables. The validity of this assumption is less obvious because treatment was not randomly assigned to the river basins and the program implementer selected the river basins on purpose. The balance checks depicted in Table 1, however, indicate that treatment and control group river basins were at least comparable with respect to (stated) environmental attitudes and behavior, and also with respect to participation in training 12 months prior to the survey, perception of environmental problems and social engagement. Hence, it seems justified to assume that river basins were selected for other reasons than low EC behavior and attitudes. Such reasons might be strategic or political reasons of the program implementer. With both the exclusion and the relevance criteria of a valid instrument being met, Equations 1and 2 are therefore adjusted for estimating the LATE of the program using instrumental variable (IV) estimation.

3.3 Threats to the identification strategy

The baseline summary statistics in Table 1 show a good balance in observed characteristics between both groups of coffee farmers. However, some threats to the identification strategy must be mentioned.

First, the program implementer did not fully comply with the experimental protocol regarding the designated area of influence. They occasionally extended it to the selected, close by control river basins. According to the program implementer, this decision was largely driven by idle capacity. Hence, some farmers in the control group were invited to participate in the training, which might result in underestimating the effect of the training for the treatment group. With 25 farms, the number of "contaminated" farms is relatively low and allows excluding them from the analysis to check the robustness of the main results. Since 85% of the affected farmers were concentrated in one department, I perform another robustness check, excluding all (treatment and control) observations from this department.

Second, another potential threat to the identification strategy is a possible violation of the common trend assumption. This assumption, which is particularly important for the DiD approach to be valid, supposes that in the absence of the program intervention, treatment and control farmers would have evolved similarly over time. However, as I show in more detail in Section 4.1, some farmers in the control group increased participation in usual, less intensive training offered outside of the program by the program implementer (as compared to treatment farmers). This training could affect pro-environmental attitudes in the control group, which again might lead to an underestimation of the program's impact. For this reason, I investigate the impact of the intensified training and extension services by looking at the simple difference between stated attitude measures before and after the program, but only for the treatment group. In order to rule out potential confounders, I include a range of controls (at their baseline value) that potentially affect EC attitudes such as socio-demographic characteristics of the household head, household wealth, farm characteristics, the EC behavior indices, participation in EC related training in the past and the perception of environmental problems in the district. In contrast to the ITT effects, which provide the lower-bound estimates, the simple difference results can be interpreted as the upper bounds of the program's impact. Unfortunately, I cannot do the same analysis for the revealed attitude measure, because it was only elicited in the endline survey.

Third, farmers in the treatment group are not fully untreated at the time of the baseline survey. As mentioned above, during the sensitization phase, farmers in the treatment river basins were informed about the program and, hence, were exposed to certain information on EC. However, judging from balanced stated EC attitudes and behavior at baseline, exposure during the sensitization phase did not have any impact (unless there existed a difference before the sensitization campaign, which was then eliminated).

Fourth, it is important to highlight the limitations of this study related to statistical power. The sample size was determined to ensure sufficient power to detect changes within the main impact evaluation. Thus, for the outcomes analyzed in this study, statistical power could ex ante be relatively low – especially considering the clustered design of the intervention and the fact that outcome variables might have a high intra-cluster correlation. Moreover, I only use the sub-sample of farmers with which the experiment was conducted at the endline. I discuss this further in Section 4.5.

4 Results

To estimate the impact of intensified training and extension services, I rely on farm survey data collected at the beginning (in 2015) and end (in 2017) of the intervention. Most of the information is self-reported. Training started in late 2015 and accompanied the farmers continuously over the two years of the intervention.

4.1 Uptake of the intervention

Table 2 shows descriptive statistics on participation in any training in general (Panel A) and in training on EC related topics in particular (Panel B). The table distinguishes between training offered by the program, and "regular" training offered by the main program implementer, the supporting program implementer (i.e., another entity that was involved in the program under investigation) and other entities. It indicates the mean and standard deviation of the control group in Columns 1 and 2 and of the treatment group in Columns 5 and 6. Column 3 depicts the difference in means between the two groups with the p-value of significance in Column 4. Column 5 shows that around three quarter of the treatment coffee farmers participated in training offered by the program (Panel A). By design, uptake of this training is significantly higher among treatment farmers. The same holds if the outcome is restricted to training on EC related topics (Panel B). While the program uptake among control group coffee farmers is not zero (due to the above-mentioned contamination of the control group), it is very low.

Table 2: Training participation

	Control				Treatment	
	(1) Mean	(2) SD	(3) Difference	(4) p-value	(5) Mean	(6) SD
(A) Participation in any training						
By program (=1)	0.036	0.188	-0.729	0.000***	0.765	0.425
Other (regular) trainings...						
... by program implementer (=1)	0.702	0.458	0.091	0.056*	0.611	0.488
... by supporting program implementer (=1)	0.088	0.284	0.034	0.637	0.054	0.227
... by other entity (=1)	0.091	0.288	-0.002	0.956	0.093	0.291
(B) Participation in EC related training						
By program (=1)	0.033	0.180	-0.711	0.000***	0.744	0.437
Other (regular) trainings...						
... by program implementer (=1)	0.690	0.463	0.338	0.000***	0.352	0.478
... by supporting program implementer (=1)	0.088	0.284	0.043	0.543	0.045	0.208
... by other entity (=1)	0.067	0.250	0.028	0.308	0.039	0.194
Observations	329				332	

Note: Data from endline (2017) survey. Columns 1 and 5 report the mean values for the control and treatment group, respectively. Columns 2 and 6 the respective standard deviation to the means. Column 3 shows the difference between the control and treatment means and Column 4 the p-values for the test of equality of means, robust to intra-river basin correlation. The number of clusters (river basins) is 30. *** indicates significance at 1%, ** at 5%, and * at 10%.

Both control and treatment group farmers also participated in other non-program training given by the program implementer; the share is slightly, but significantly higher in the control group. The difference becomes even larger when restricting the training to EC related topics only. While the share is around 70% in the control group, the share drops to 35% in the treatment group. This difference becomes a problem if the program implementer increased training offerings on EC related topics in the control group as a response to the program implemented in the treatment area. Or the other way around, if farmers in control areas increasingly demanded training on EC related topics in order to keep up with farmers in the treatment areas. As mentioned in Section 3.3, I address this possible threat to the identification strategy by investigating the effect of the intensified training and extensions services through a simple difference approach for the treatment group only.

In Appendix C, I look at characteristics that predict program training uptake among the treatment group at endline. To address endogeneity concerns, baseline characteristics are used as regressors. This information is of interest for the validity of the IV strategy, which is based on the assumption that the instrument is exogenous to the outcome variables. There are few strong predictors; only the perception of erosion is consistently driving the uptake of general program training and those that deal with EC related topics. Moreover, the participation in previous training given by the program implementer increase the probability of taking up the program training. Stated EC behavior and attitudes do not seem to be significant predictors (see Table C.1), which strengthens the IV approach.

4.2 Impact on stated attitudes

Next, I turn to the impact of program training and extension service on stated EC attitudes. Table 3 shows the DiD-ITT estimates for each statement separately (see Columns 1-7) and for the EC attitude index (Column 8). Although the ITT estimates on the effect of training on stated EC attitudes are positive, none of the estimates is significantly different from zero at standard levels. Hence, I do not find evidence that the large uptake of intensified training and extension services among the treatment group led to a significant positive change in stated EC attitudes. The high levels of agreement with EC that were already stated at the baseline for the statements 2-5 might explain part of the null findings. Even though the effects for the remaining statements are slightly larger (see Columns 1, 6 and 7), they are still not significantly different from zero. The same null finding holds for the index of standardized dependent variables.

For the ease of interpretation, the outcome variables are considered linear in the estimation of Equation 1. Yet, the seven statements were answered on a Likert-Scale ranging from 1 to 5 in integer values. I therefore re-estimate Equation 1 using ordered logit and find the results to be robust to the OLS results (see Appendix D, Table D.1, Panel A).

Table 3: Impact of the program on stated EC attitudes (ITT effect)

	Statements							EC attitude index
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1	2	3	4	5	6	7	
Treatment × Endline	0.205	0.059	0.124	0.130	0.059	0.334	0.123	0.140
	(0.387)	(0.131)	(0.161)	(0.131)	(0.124)	(0.251)	(0.322)	(0.093)
p-value	[0.599]	[0.656]	[0.447]	[0.330]	[0.640]	[0.193]	[0.706]	
FDR q-value	[0.706]	[0.706]	[0.706]	[0.706]	[0.706]	[0.706]	[0.706]	
Baseline controls	YES	YES	YES	YES	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,322	1,322	1,322	1,322	1,322	1,322	1,322	1,322
R-squared	0.032	0.015	0.014	0.021	0.030	0.063	0.064	0.055
Endline mean in control group	2.307	4.751	4.547	4.757	4.723	2.748	2.003	0.000

Statement 1:	I reuse my water for several tasks.
Statement 2:	I am inspecting that none of the faucets, pipes and toilet are leaking.
Statement 3:	In my household we save water.
Statement 4:	I conserve water even if my neighbors don't.
Statement 5:	Water conservation is not only a governmental obligation.
Statement 6:	Coffee is also well washed if not a lot of water is used.
Statement 7:	Good practices in coffee processing do not only include those that ensure good coffee quality.

Note: Data from baseline (2015) and endline (2017) survey. Standard errors (in parentheses) and tests are robust to intra-river basin correlation (there are 30 clusters/river basins). p- and q-values in brackets; the FDR q-values are computed as described in Anderson (2008), following the method of Benjamini and Hochberg (1995). All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion) and department fixed effects. The coefficients in Columns 1–8 are OLS estimates of β_{DiD} in Equation 1. The dependent variables in Columns 1–7 are defined as follows: level of agreement with statements 1-7 on a scale of 1-5, where high values reflect advanced pro-environmental attitudes. The dependent variable in Column 8 is an index of the dependent variables as outcome. The index is the simple average of the standardized outcomes in Columns 1–7, for details see Appendix B. The endline means reported at the bottom are calculated for control river basins. *** indicates significance at 1%, ** at 5%, and * at 10%.

Moreover, considering the nature of the treatment, which varies at the aggregate level of river basins, standard errors are clustered at the river basin level to allow for intra-cluster correlation. In Appendix D, I show the results of estimating Equation 1 with two different sets of standard errors. First, standard errors are clustered at the household level, considering that observations correlate not only within a cluster but also over time among the same farms at baseline and endline. Second, due to the relatively small number of clusters (i.e., 30 clusters), I use block bootstrap to estimate standard errors and test the relevant hypotheses (Cameron, Gelbach, & Miller, 2008; Cameron & Miller, 2015; Efron & Tibshirani, 1994). The results of both re-estimations are shown in Table D.1. In Panel B, I find that allowing the standard errors to correlate on the farm-level decreases standard-errors, which results in statistically significant impacts on stated attitudes for statements 4 and 6 (though not robust to controlling for FDR at q = 0.1) as well as the EC attitude index. Standard errors estimated using block bootstrap are very close to the original estimation method (see Panel C, Table D.1). Considering that block bootstrapped standard errors and those clustered at the river basin are both the more conservative approaches, but lead to very similar results, I remain with using clustered standard errors at the river basin as my preferred specification.

Table 3 shows the ITT effects, namely the average impact of inviting coffee farmers in treatment river basins to program training. I conduct three more robustness checks to see whether the contamination of the control group affects the results. First, I re-run Equation 1, but exclude those farmers from the control group that were in the respective treatment river basin's area of influence according to the program implementer. Second, I re-run Equation 1, but exclude those farmers from the control group that reported having participated in a program training at endline. Third, since most "contaminated" control coffee farmers were detected in one particular department, I re-run Equation 1, but exclude all (treatment and control) observations from the sample that are located in that department. The results are summarized in Table D.2, Panel A-C, and are very similar to the estimates depicted in Table 3. Hence, I conclude that the contamination of control group farmers attending the program training do not significantly affect the results.

Another explanation for the null-effects is the possibility that the common trend assumption does not hold, because control farmers have increased participation in non-program EC related training. For this reason, Table 4 shows the upper bound treatment effects of the program on the stated attitude measures for the treatment group in a simple before-and-after comparison. While in Panel A no controls are added, I control for a range of (observable) confounders in Panel B. Indeed, I observe a positive and significant

Table 4: Impact of the program on stated EC attitudes for the treatment group (simple difference approach)

	Statements							EC attitude index
	(1) 1	(2) 2	(3) 3	(4) 4	(5) 5	(6) 6	(7) 7	(8)
(A) No controls								
Endline (=1)	0.145	0.205***	0.078	0.130**	0.241***	0.416***	0.551***	0.254***
	(0.127)	(0.066)	(0.063)	(0.050)	(0.069)	(0.116)	(0.101)	(0.040)
p-value	[0.256]	[0.002]	[0.216]	[0.010]	[0.001]	[0.000]	[0.000]	
FDR q-value	[0.256]	[0.004]	[0.252]	[0.014]	[0.003]	[0.001]	[0.001]	
Baseline controls	NO	NO	NO	NO	NO	NO	NO	NO
Department FE	NO	NO	NO	NO	NO	NO	NO	NO
Observations	664	664	664	664	664	664	664	664
R-squared	0.002	0.002	0.014	0.002	0.010	0.018	0.019	0.043
(B) Additional baseline controls and department FE								
Endline (=1)	0.282	0.257*	0.166	0.216	0.377**	0.250	0.786***	0.349**
	(0.344)	(0.138)	(0.188)	(0.178)	(0.137)	(0.225)	(0.202)	(0.120)
p-value	[0.426]	[0.085]	[0.391]	[0.244]	[0.015]	[0.285]	[0.002]	
FDR q-value	[0.426]	[0.199]	[0.426]	[0.399]	[0.053]	[0.399]	[0.014]	
Baseline controls	YES	YES	YES	YES	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	664	664	664	664	664	664	664	664
R-squared	0.042	0.042	0.082	0.126	0.115	0.074	0.164	0.142
Baseline mean in treatment group	2.663	4.560	4.575	4.711	4.506	2.726	1.675	-0.098

Statement 1:	I reuse my water for several tasks.
Statement 2:	I am inspecting that none of the faucets, pipes and toilet are leaking.
Statement 3:	In my household we save water.
Statement 4:	I conserve water even if my neighbors don't.
Statement 5:	Water conservation is not only a governmental obligation.
Statement 6:	Coffee is also well washed if not a lot of water is used.
Statement 7:	Good practices in coffee processing do not only include those that ensure good coffee quality.

Note: Data from baseline (2015) and endline (2017) survey; the sample only comprises farms in the treatment group. Standard errors (in parentheses) and tests are robust to intra-river basin correlation (there are 15 clusters/river basins). p- and q-values in brackets; the FDR q-values are computed as described in Anderson (2008), following the method of Benjamini and Hochberg (1995). Panel A: All regression without controls. Panel B: All regressions also include department fixed effects and controls for characteristics at their baseline value that potentially affect pro-environmental attitudes: socio-demographic characteristics of the household head (gender, age, literacy level, farming experience, group membership), household wealth (asset-index, secure land ownership, land size, coffee production, hired workers), farm characteristics (payment for water, water source on farm, member of sustainability initiative), the EC behavior indices, participation in EC related training in the past and the perception of environmental problems in the district (water shortage, deforestation and erosion). The coefficients in Columns 1–8 are OLS estimates of a simple difference in the outcome variable before and after the treatment. The dependent variables in Columns 1–7 are defined as follows: level of agreement with statements 1-7 on a scale of 1-5, where high values reflect advanced pro-environmental attitudes. The dependent variable in Column 8 is an index of the dependent variables as outcome. The index is the simple average of the standardized outcomes in Columns 1–7, for details see Appendix B. The baseline means reported at the bottom are calculated for treatment river basins. *** indicates significance at 1%, ** at 5%, and * at 10%.

effect on pro-environmental attitudes for the treatment group from baseline to endline. Although these effects have to be interpreted with caution, since unobservable factors cannot be ruled out, these positive effects can be attributed to the intensified training and extension services. Even after controlling for a range of covariates and department fixed effects, the level of agreement increases for three out of the seven statements and also for the composite EC attitude index. When controlling for FDR at the 10% level (i.e., q = 0.1), two out of the three statements remain significant. The effect is particularly pronounced for statement number seven, where the baseline level of agreement was rather low at 1.7 and increases on average by 0.8.

Next, I present the DiD-LATE estimates in Table 5. In Panel A, participation in any training offered by the program is included as an instrument. The focus in Panel B is on the effect of training on topics related to EC. As expected, the instruments are strong (see coefficient of first stage) and the 2SLS estimates are larger than the DiD-ITT estimates. Yet, still, none of the effects are statistically significant.

Finally, I use quantile regression to study whether farmers with different levels of EC attitudes are affected differently by the treatment. This is particularly interesting because there is considerable heterogeneity in pro-environmental attitudes at baseline. I focus on the EC attitude index and conduct quantile regression at 9 equally spaced quantiles from 0.1 to 0.9, using the same specification as in Equation 1. The DiD results are shown in Figure 3, together with 90% confidence bands estimated applying 200 block-bootstrap replications using river basins as blocks. The OLS regression in Table 3 showed a positive, but insignificant ITT effect. The overall positive effect is confirmed by the quantile regressions, though impacts are larger for the deciles in the upper middle. Although one would expect a stronger effect for those with low initial attitudes, I find in turn that for the deciles sixth to seventh the effect is stronger and even significant at the 10% level. Hence, for a small fraction of farmers, that is those that already have above-average pro-environmental attitudes, the null of no impact can be rejected.

4.3 Impact on revealed attitudes

This section looks at the impact on revealed attitudes measured through donations to a local reforestation project. This measure aims to capture not only the farmer's valuation of reforestation in particular, but the valuation of EC in general.

On average, farmers donated 10,277 COP (with a standard deviation of 6,815 COP), which is around half the endowment they received. Figure 4 illustrates that 23% of the farmers donated exactly half of their endowment. 25% of the farmers donated the whole amount and some farmers even donated more than their initial endowment of 20,000 COP

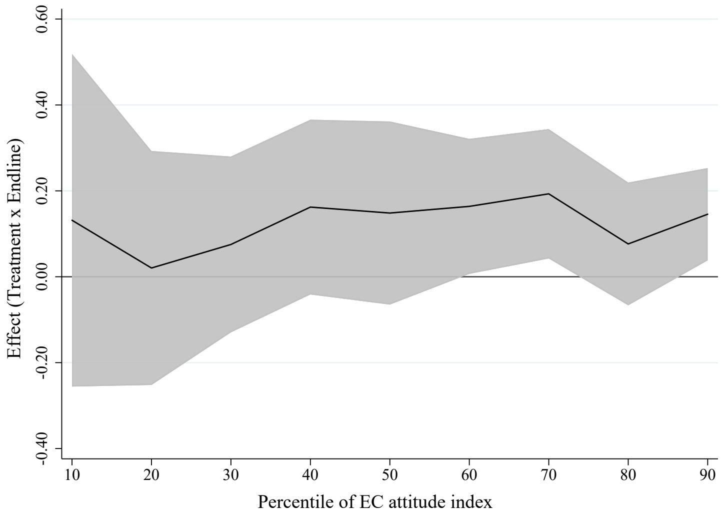
Table 5: Impact of the program on stated EC attitudes (LATE)

	Statements							EC attitude index
	(1) 1	(2) 2	(3) 3	(4) 4	(5) 5	(6) 6	(7) 7	(8)
(A) Any training given by program								
1st stage					0.729***			
					(0.038)			
2nd stage	0.282	0.081	0.170	0.178	0.080	0.458	0.168	0.192
	(0.520)	(0.175)	(0.215)	(0.175)	(0.167)	(0.344)	(0.435)	(0.126)
p-value	[0.588]	[0.645]	[0.429]	[0.310]	[0.631]	[0.183]	[0.699]	
FDR q-value	[0.699]	[0.699]	[0.699]	[0.699]	[0.699]	[0.699]	[0.699]	
(B) EC related training by program								
1st stage					0.711***			
					(0.040)			
2nd stage	0.289	0.083	0.174	0.182	0.082	0.469	0.173	0.197
	(0.533)	(0.180)	(0.221)	(0.180)	(0.172)	(0.351)	(0.446)	(0.129)
p-value	[0.588]	[0.645]	[0.430]	[0.310]	[0.631]	[0.181]	[0.699]	
FDR q-value	[0.699]	[0.699]	[0.699]	[0.699]	[0.699]	[0.699]	[0.699]	
Baseline controls	YES	YES	YES	YES	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,322	1,322	1,322	1,322	1,322	1,322	1,322	1,322
Endline mean in control group	2.307	4.751	4.547	4.757	4.723	2.748	2.003	0.000

Statement 1:	I reuse my water for several tasks.
Statement 2:	I am inspecting that none of the faucets, pipes and toilet are leaking.
Statement 3:	In my household we save water.
Statement 4:	I conserve water even if my neighbors don't.
Statement 5:	Water conservation is not only a governmental obligation.
Statement 6:	Coffee is also well washed if not a lot of water is used.
Statement 7:	Good practices in coffee processing do not only include those that ensure good coffee quality.

Note: Data from baseline (2015) and endline (2017) survey. Standard errors (in parentheses) and tests are robust to intra-river basin correlation (there are 30 clusters/river basins). p- and q-values in brackets; the FDR q-values are computed as described in Anderson (2008), following the method of Benjamini and Hochberg (1995). All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion) and department fixed effects. The coefficients are from the 2SLS estimation of Equation 1 where the dummy for assigned treatment is used as an instrument for actual uptake of the treatment (Panel A: participation in any training given by program; Panel B: participation in EC related training given by program). The 1st stage is the coefficient for (actual) training participation (interacted with the endline dummy), while the 2nd stage shows the estimates for the respective dependent variable specified in the Columns (also interacted with the endline dummy). The dependent variables in Columns 1–7 are defined as follows: level of agreement with statements 1-7 on a scale of 1-5, where high values reflect advanced pro-environmental attitudes. The dependent variable in Column 8 is an index of the dependent variables as outcome. The index is the simple average of the standardized outcomes in Columns 1–7, for details see Appendix B. The endline means reported at the bottom are calculated for control river basins. *** indicates significance at 1%, ** at 5%, and * at 10%.

Figure 3: Results of quantile regression



Note: Data from baseline (2015) and endline (2017) survey. The number of observations is 1,322. Standard errors are estimated using 200 block bootstrap replications with river basins as blocks. All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion) and department fixed effects. The graph shows the coefficients (depicted by the black line) of 9 quantile regression estimates of β_{DiD} in Equation 1. The gray shaded area indicates the 90% confidence bands. The dependent variable is an index of the statement variables as outcome, for details see Appendix B.

by adding up to 10,000 COP from their own resources. By contrast, only a very small fraction of less than 5% kept the whole amount of 20,000 COP to themselves.

Table 6 shows the results of estimating Equation 2. For now, I focus on the impact of the program, while only controlling for unbalanced baseline characteristics and department fixed effects (see Column 1).[20] Farmers in the treatment group donate on average more than the farmers in the control group. However, the difference in donations is not statistically significant at standard levels. LATE estimates depicted in Table 7 are similar, that is, the effect size increases, but remains statistically insignificant. The null findings in Table 6 are robust to using alternative standard errors, adjusting donations above 20,000 COP and accounting for treatment contamination in the control group (see Appendix E, Tables E.1 and E.2). The high average donations indicate a relatively high level of environmental valuation among the overall experimental sample. However, there is no evidence of stronger pro-environmental attitudes among those that benefited from the program compared to those that did not.

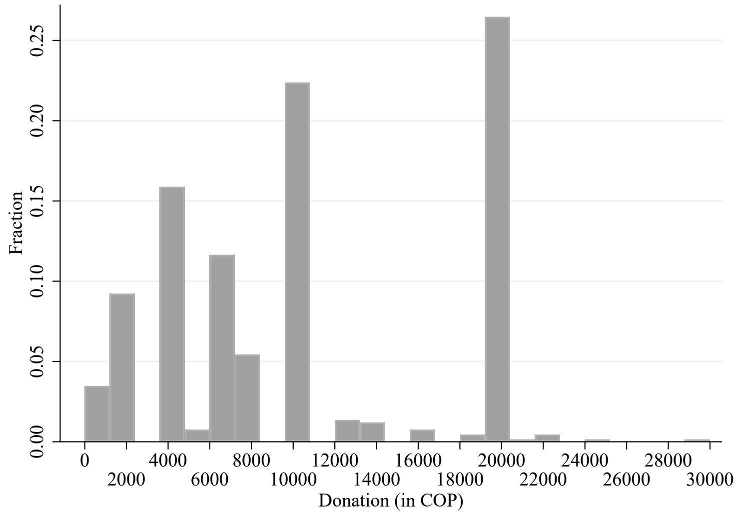
[20] When including further controls that potentially affect donations, the difference in donations between treatment and control group slightly increases, but the difference remains statistically insignificant (see Table 6, Columns 2-5).

Table 6: Impact of the program on revealed EC attitudes (ITT effect)

	Donation (in COP)				
	(1)	(2)	(3)	(4)	(5)
Treatment (=1)	655.4	764.1	762.7	822.5	788.0
	(1,077.6)	(915.3)	(899.9)	(882.6)	(873.0)
Correct knowledge question (=1)		-236.9	910.1	-37.8	1,150.3
		(1,455.9)	(1,334.8)	(1,415.0)	(1,275.9)
Conducted reforestation (=1)		-183.6	-242.9	-152.9	-255.8
		(576.5)	(520.7)	(579.9)	(535.6)
Perceived water shortage (=1)		-272.8	-175.5	-301.5	-235.9
		(557.9)	(511.9)	(577.4)	(521.8)
Perceived erosion (=1)		380.0	358.0	294.0	292.3
		(720.9)	(717.4)	(682.0)	(683.6)
Perceived deforestation (=1)		2,037.1***	2,002.6***	1,993.7***	1,977.1***
		(515.0)	(550.6)	(510.6)	(530.5)
Group member (=1)		749.6	467.9	784.0	476.7
		(668.2)	(637.6)	(664.9)	(628.2)
Trust in program implementer (=1)			757.8		882.0
			(791.5)		(785.7)
Trust in neighbors (=1)			1,661.0***		1,564.8***
			(558.6)		(551.9)
Asset index; 1st quartile		Ref.	Ref.	Ref.	Ref.
2nd quartile		2,207.0***	1,975.9***	2,079.2***	1,830.4**
		(646.6)	(667.5)	(661.2)	(711.7)
3rd quartile		2,525.6***	2,577.6***	2,450.9***	2,480.0***
		(717.9)	(762.5)	(766.2)	(821.3)
4th quartile		2,416.5***	2,261.1***	2,348.2***	2,189.3***
		(649.2)	(711.6)	(670.9)	(741.7)
Secure land ownership (=1)		794.2	770.8	838.8	806.7
		(704.7)	(695.2)	(721.5)	(722.0)
Total farm area (ha)		34.8	32.8	31.6	28.9
		(26.5)	(26.6)	(27.8)	(27.4)
Coffee production (@cps)		1.2	1.2	1.3	1.3
		(1.3)	(1.2)	(1.3)	(1.2)
Hired workers (=1)		533.9	626.2	570.2	646.6
		(921.6)	(892.2)	(910.1)	(891.2)
EC attitude index; 1st quartile				Ref.	Ref.
2nd quartile				1,103.2	1,303.0
				(775.6)	(772.4)
3rd quartile				726.0	933.9
				(531.3)	(574.3)
4th quartile				-359.1	-102.9
				(880.7)	(899.9)
Constant	12,480.6***	7,346.8***	4,887.2**	6,804.2***	4,165.5*
	(859.5)	(1,804.9)	(2,063.3)	(1,844.0)	(2,090.6)
Baseline controls	YES	YES	YES	YES	YES
Endline controls	NO	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES
Observations	661	661	629	661	629
R-squared	0.036	0.100	0.115	0.107	0.122
Endline mean in control group			9,960.5		

Note: Data from endline (2017) survey. Standard errors (in parentheses) and tests are robust to intra-river basin correlation (there are 30 clusters/river basins). All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion) and department fixed effects. The coefficients in Columns 1–5 are OLS estimates of β_{Treat} in Equation 2. The dependent variable is the donation in COP. Explanation to some variables: The knowledge questions was "What practice protects water sources?" with the correct answer being "plant native shrubs and trees". Group membership indicates that the farmer or his/her spouse participates in a local community organization or association. The trust variable was transformed into a binary variable with 1 = medium to strong trust. The asset index is calculated using factor analysis based on housing characteristics and ownership of various durables (first factor divided into quartiles). Secure land ownership is defined as holding the deed or any other relevant document to the land. Coffee production is measured in "arrobas de café pergamino seco" (@cps) with 1 @cps equaling 12.5 kg of dry parchment coffee. The EC attitude index is described in detail in Appendix B, here divided in quartiles. The endline means reported at the bottom are calculated for control river basins. *** indicates significance at 1%, ** at 5%, and * at 10%.

Figure 4: Donations to reforestation project



Note: Data from endline (2017) survey. The number of observations is 661 (i.e., treatment and control group farms are pooled).

Table 7: Impact of the program on revealed EC attitudes (LATE)

	Donation (in COP)				
	(1)	(2)	(3)	(4)	(5)
(A) Any training given by program					
1st stage	0.726***	0.708***	0.722***	0.714***	0.724***
	(0.037)	(0.037)	(0.043)	(0.037)	(0.042)
2nd stage	902.7	1,079.1	1,056.5	1,151.0	1,088.0
	(1,476.2)	(1,281.3)	(1,243.1)	(1,223.2)	(1,199.1)
(B) EC related training by program					
1st stage	0.708***	0.692***	0.705***	0.699***	0.707***
	(0.040)	(0.040)	(0.046)	(0.041)	(0.046)
2nd stage	926.1	1,103.9	1,082.7	1,175.8	1,113.9
	(1,515.2)	(1,313.5)	(1,277.6)	(1,252.9)	(1,231.6)
Baseline controls	YES	YES	YES	YES	YES
Endline controls	NO	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES
Observations	661	661	629	661	629
Endline mean in control group			9,960.5		

Note: Data from endline (2017) survey. Standard errors (in parentheses) and tests are robust to intra-river basin correlation (there are 30 clusters/river basins). All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion), endline controls (see Table 6) and department fixed effects. The coefficients are from the 2SLS estimation of Equation 2 where the dummy for assigned treatment is used as an instrument for actual uptake of the treatment (Panel A: participation in any training given by program; Panel B: participation in EC related training given by program). The 1st stage is the coefficient for (actual) training), while the 2nd stage shows the estimates for the respective dependent variable (i.e. donation in COP). The endline means reported at the bottom are calculated for control river basins. *** indicates significance at 1%, ** at 5%, and * at 10%.

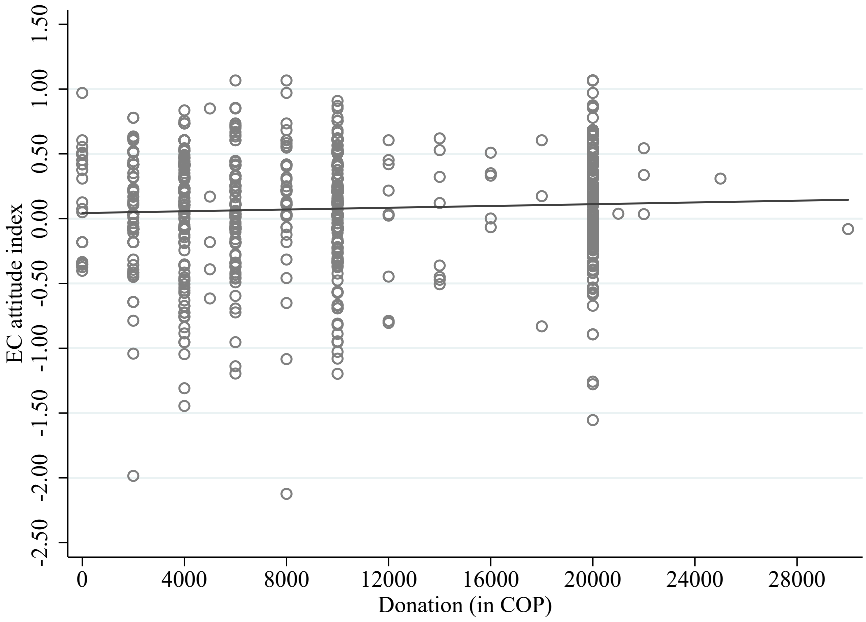
Taken all lower bound findings together, intensified training and extension services do not increase stated or revealed attitudes among treated coffee farmers. As discussed above, the lack of significant impacts might be attributed to the advanced levels of EC attitudes at baseline. A potential explanation for this is that the program implementer was already very involved with local coffee farmers and provided them with a well-established extension service and training. Hence, this questions the marginal benefits of intensifying the training and extension services through a program like the one under investigation. Moreover, while the control group did not benefit from the training (apart from a small share of contaminated farmers), they did participate in more non-program training, which might furthermore explain the small difference in EC attitudes between treatment and control group at endline.

4.4 Correlation between the attitude measures and their connection to actual behavior

In this section, I critically reflect on the two EC attitude measures applied in this study. Figure 5 maps the values of both stated and revealed measures against each other. The line represents the linear fit. For the stated attitudes, I focus on the index of standardized outcomes. The almost flat linear line reveals a very weak correlation between the two attitude measures. The pairwise correlation coefficient is very small at 0.05 and statistically insignificant at standard levels. Despite different types of measurement error, the lack of correlation suggests that the two variables capture different (social) preferences related to EC.

To assess the relationship between the two attitude measures and EC behavior, I further look at their correlation. Figure 6 maps the values of the index against the three standardized indices for EC behavior (i.e., Panel A: domestic activities, Panel B: coffee processing activities, Panel C: soil and water conservation activities). All three measures of EC behavior are positively correlated. The pairwise correlation coefficients are significant and respectively range between 0.21 and 0.28, indicating a moderate correlation. By contrast, for the revealed attitude measure, I observe a much weaker positive correlation between the three measures of behavior and the level of donations (see Figure 7). This even holds for the soil and water conservation practices index, which includes actual reforestation activities conducted by the coffee farmers. Conclusions from these pairwise correlations have to be interpreted with caution, as other factors can play a role for the connection between the attitude measures and behavior (e.g., perceived and actual behavioral control; in particular financial constraints). However, the weak correlation

Figure 5: Correlation between stated and revealed EC attitudes



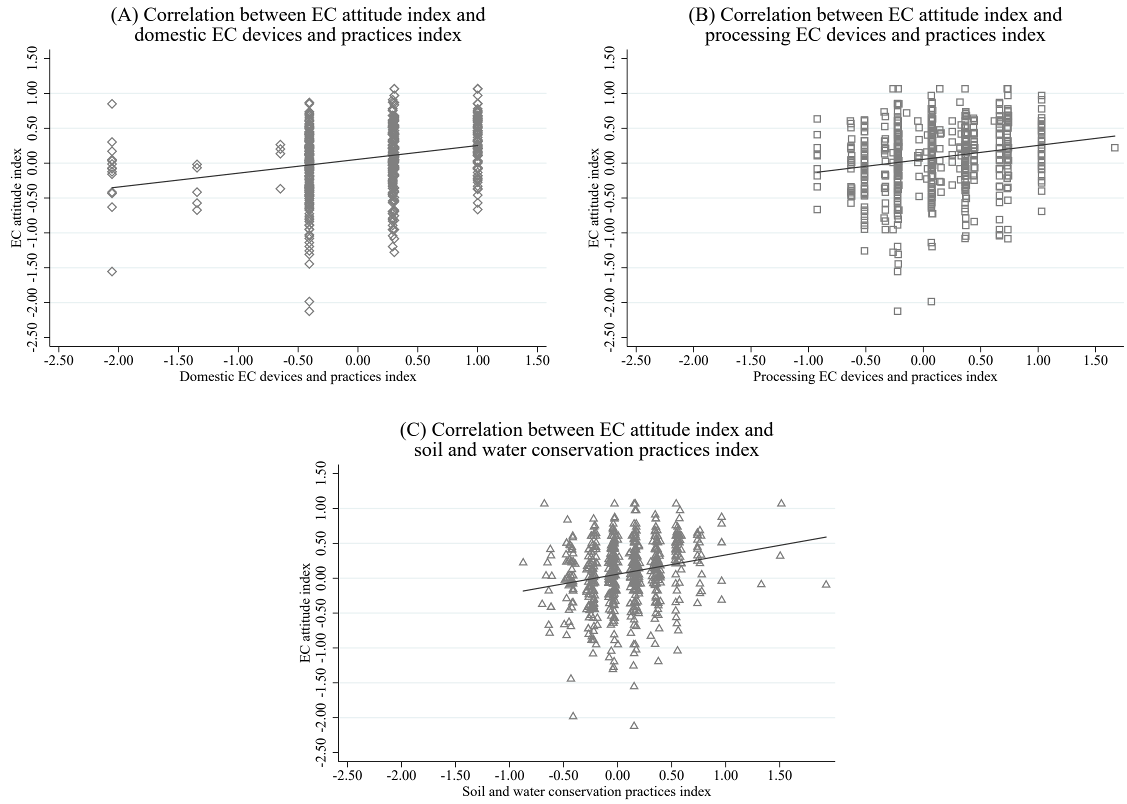
Note: Data from endline (2017) survey. The number of observations is 661 (i.e., treatment and control group farms are pooled). The pairwise correlation coefficient is 0.051. *** indicates significance at 1%, ** at 5%, and * at 10%.

between first, stated and revealed EC measures and second, revealed attitudes and EC behavior, might indicate that the conducted donation experiment does not necessarily solely capture EC-related preferences.

I look more closely into the revealed attitude measure by turning back to Table 6, which shows the ITT effect of intensified training and extension services on revealed EC attitudes. In Columns 2-5, Equation 2 was extended by adding controls (measured at endline)[21], which further explain donation behavior in the framed field experiment. While the coefficient for the treatment dummy remains statistically insignificant, three other variables are significantly affecting donations. First, if the farmer perceived deforestation as a problem in the district, donations are, on average, 2,000 COP higher. This finding suggests that the desire to contribute to conservation is fostered by awareness of environ-

[21] I use the endline value of these variables, because I am interested in the correlation between characteristics of the respondent that might affect donations at the time of the experiment (the experiment was conducted subsequent to the endline survey). Some of these characteristics might be affected through the treatment (e.g., awareness of environmental problems or the trust variables). I therefore re-estimate the regressions in Table 6, but replace the covariates with their baseline value (see Appendix E, Table E.3). The endline variables that are positively and significantly correlated with donations, also show positive and significant effects at baseline. Though, the effects for perceived deforestation and trust drop in size. It can be speculated that these variables have been positively affected by the treatment and, thus, lead to higher donations at the endline. The investigation of these effects goes beyond the scope of this study and is therefore not be further discussed.

Figure 6: Correlation between stated EC attitudes and actual EC behavior

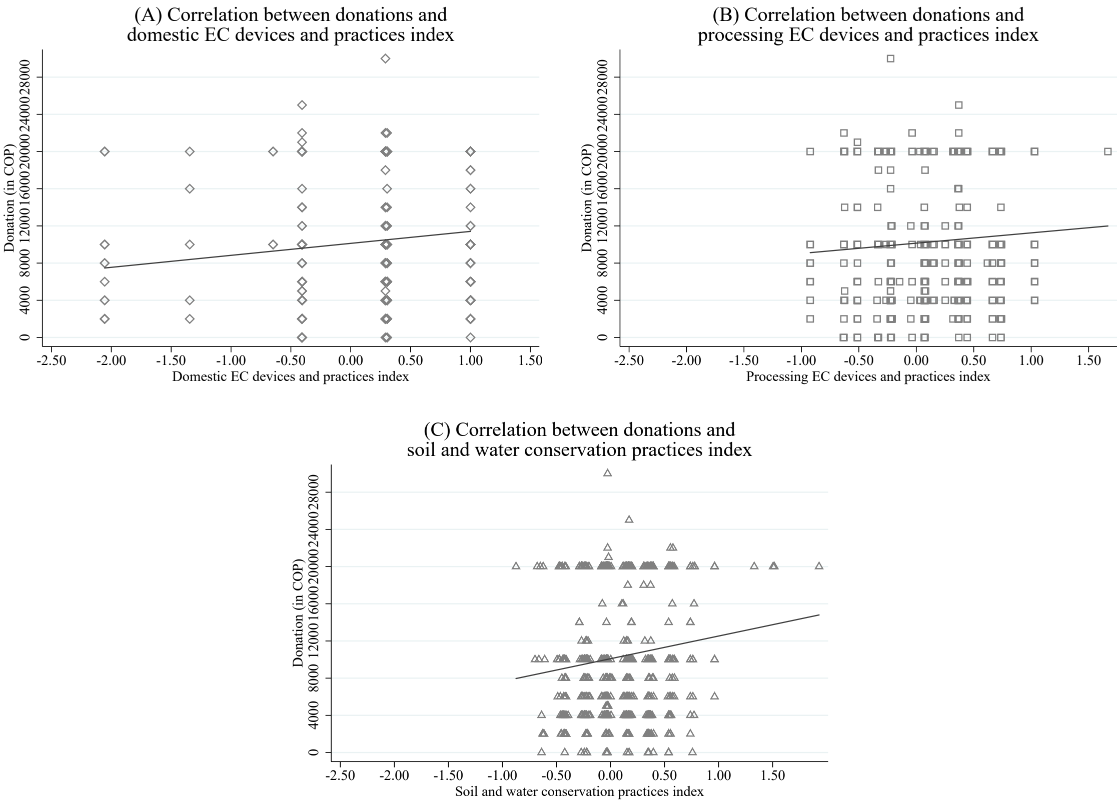


Note: Data from endline (2017) survey. The number of observations is 661 (i.e., treatment and control group farms are pooled). Panel A: the pairwise correlation coefficient is 0.206***. Panel B: the pairwise correlation coefficient is 0.279***. Panel C: the pairwise correlation coefficient is 0.211***. *** indicates significance at 1%, ** at 5%, and * at 10%.

mental problems, in this case particularly perceived deforestation. This finding is in line with theoretical considerations from Forsyth, Garcia, Zyzniewski, Story, and Kerr (2004); Gould, Saupe, and Klemme (1989) and Ostrom (1999), and further supported by empirical studies (see e.g., Bardhan, 2000; Jumbe & Angelsen, 2007; Karapetyan & D'Adda, 2014; Traoré, Landry, & Amara, 1998; Voors et al., 2011). The lack of a significant influence of other perceived environmental problems (i.e., water shortage and erosion) indicates that farmers do not necessarily associate reforestation with EC beyond the positive effects for reforestation in particular.[22] Hence, support for the reforestation might not proxy for the valuation of EC in general, but only for the reforestation project if the farmer perceives deforestation to be a problem. Second, wealthier farmers (measured through an asset in-

[22] As mentioned earlier, reforestation reduces erosion with multiplier effects on water quantity and quality. Knowing that, the perception of water shortage and erosion should influence the support for a reforestation project as well. In fact, the survey posed the following knowledge question to the farmers: "What practice protects water sources?". Among three possible answers, the correct one is "plant native shrubs and trees". A control for whether they answered the question correctly is included (see coefficient "correct knowledge question"), but suggests no influence.

Figure 7: Correlation between revealed EC attitudes and actual EC behavior



Note: Data from endline (2017) survey. The number of observations is 661 (i.e., treatment and control group farms are pooled). Panel A: the pairwise correlation coefficient is 0.076. Panel B: the pairwise correlation coefficient is 0.121***. Panel C: the pairwise correlation coefficient is 0.125***. *** indicates significance at 1%, ** at 5%, and * at 10%.

dex) donate, on average, higher amounts. The endowment is close to the daily minimum wage and poorer farmers might be constrained to support the reforestation project due to financial hardship. The impact of factors beyond the individual's control, among them financial hardship, are also predicted by the TRA and TPB (see Section 2.4). Third, farmers with higher levels of trust towards neighbors (particularly neighboring coffee farmers) donate, on average, 1,600 COP more.[23] This finding might indicate that the donation experiment partly captures pro-social preferences towards helping the community, with the reforestation project simply acting as a channel. Abstracting from the first finding above (i.e., the influence of perceiving deforestation), coffee farmers might perceive the reforestation project as a generic project addressing community problems in general. D'Adda (2011) draws a similar conclusion from her donation experiment in Bolivia. The

[23] A small share of farmers refused to answer the trust questions, which is why the number of observations drops to 629 when controlling for trust. When running the regressions in Columns 1,2 and 4 with the steady sample of 629 observations, most effect sizes only change to a small extent and statistical significance remains largely unchanged (see Appendix E, Table E.4).

enumerators did not name any specific organization to execute the reforestation project and, hence, farmers might automatically think of a local organization for the implementation. High trust levels within the community, thus, foster the support for the project (see e.g., Aida, 2019; Bouma, van Soest, & Bulte, 2008). Coffee farmers might have also expected the program implementer to execute the reforestation project (particularly in treatment areas) – however, trust towards the program implementer is not significantly driving donations.

Lastly, in the last two Columns in Table 6, the EC attitude index is included into the regression in form of quartiles. The stated attitude measure shows no significant effect. The lack of correlation between experimental indices of social preferences and those elicited through surveys is consistent with studies in psychology (Lee & Nisbett, 1991). Hence, considering the correlation with EC behavior, the applied stated attitude measure in this study measures environmental-specific preferences fairly well. In turn, the same conclusion cannot be drawn for the revealed attitude measure. Although the donation experiment was intended to capture environmental-specific preferences, it seems to capture either a reforestation-specific preference, or overall pro-social preferences.

4.5 Discussion of statistical power

A final but important cautionary note is that the failure to identify statistically significant impacts on the outcomes of interest might be the result of insufficient statistical power. Recall that the data used for this study comes from the main impact evaluation of the program which focused on the effect on the adoption of water and soil conservation devices and practices in domestic and productive coffee farming activities.[24] While adoption is often measured in binary units, attitude measures are more complex and can involve measurement error, which, while not causing estimation bias under certain conditions, will increase the standard errors of the estimates. Attitudes on EC might be guided by prevailing social norms, which means that intra-cluster correlation is high, increasing standard errors even further. Due to budget and logistical constraints, the donation experiment was implemented only with a sub-sample of 681 farmers in 30 river basins.

Using this sub-sample, I use the control group data to calculate the minimum detectable effect (MDE) sizes. That is the smallest effect that one can distinguish from a null hypothesis of no effect with the given power. The MDE is calculated for the EC attitude index and the level of donations, assuming a 5% significance level and a power of 80%. For both outcomes, the estimated effect size is below the MDE. For the EC attitude index,

[24]Sample sizes were determined in order to detect changes in water conservation behavior of a magnitude around 6 to 12 percentage points depending on the indicator.

the calculated MDE is 0.179. Hence, considering the estimated effect size of 0.140 (see Table 3), I am unable to distinguish between a very small effect and an insignificant effect. The same holds for the outcome from the donation experiment; here the calculated MDE of 3,012.3 COP is far above the estimated effect of 655.4 (see Table 6).

For stated attitudes, which were elicited among the full sample of coffee farmers from all 50 river basins (i.e., not just the experimental sample), I can test whether more significant results can be detected with an increased sample size. Appendix A shows that the non-experimental sample does not differ strongly from the experimental sample. I therefore re-estimate Equation 1 with the full sample, with the results summarized in Table F.1 (see In Appendix F). All effects for the single statements remain positive, but still statistically insignificant. However, the attitude index now shows a positive and statistically significant effect.

5 Conclusion

This study evaluates the impact of intensified training and extension services on stated and revealed EC attitudes among Colombian coffee farmers. The services were delivered through a program that aimed at improving water management in domestic and in post-harvest coffee processing activities. The program was implemented between 2015 and 2017 in selected river basins located in Colombian coffee-growing regions. While the program is very specific to the studied region, training and extension services are offered in various countries and in different agricultural sectors. The results are a useful addition to studies on EC in agricultural settings in developing countries (see e.g., Quiroga, Suárez, Diego Solís, & Martinez-Juarez, 2020), which largely focus on drivers of technology uptake but neglect the role of attitudes. The theoretical frameworks of TRA and TPB predict that attitudes towards a certain behavior are a key mediator for adopting that behavior (Ajzen, 1985; Ajzen & Fishbein, 1980), and empirical studies – mostly based in developed countries – on different types of EC behavior find this relationship to be relevant (e.g., Baumgart-Getz et al., 2012; Greiner et al., 2009; Howley, 2013; Kollmuss & Agyeman, 2002; Prokopy et al., 2008). According to the theoretical models, attitudes are themselves determined by behavioral beliefs, which are influenced through various background characteristics including salient information on the relevant behavior. Thus, specialized training and extension services that focus on informing the farmers on EC behavior in domestic and coffee processing activities might contribute to forming these behavioral beliefs.

Despite the high participation rates in program training among the coffee farms in the treatment group, I do not find clear evidence of improvements in stated or revealed attitudes in treated compared to control areas. For the stated EC attitudes, for which baseline information is available, the lack of significant impacts can be attributed to the advanced pro-environmental attitudes among both treatment and control group farmers already before the program. The null findings therefore question the marginal benefit of intensifying the program implementer's efforts. Another angle is that changes in attitudes – and most importantly also social norms within the community – might take longer than two years to adjust. Thus, the desired impact can potentially show in the long term. Also, certain caveats to the identification strategy have to be kept in mind. First, treatment could not be randomly assigned to river basins and, hence, impact estimates rely on a non-randomized DiD approach. Though, the selected control group farmers though were very comparable to the treatment group farmers at baseline. Second, while the preferred estimates are ITTs to begin with, the impact estimates suffer from contamination of the control group due to few cases where training invitations were also extended to farmers living in control river basins. Third, the main estimates discussed so far can be interpreted as the lower bounds of the expected effect of the program and largely rely on the common trend assumption for the control group. Yet, the increased participation in non-program training on EC related issues among the control group at the time of the endline provides another possible threat to the identification strategy. When restricting the analysis to solely the treatment group applying a simple before-and-after comparison (controlling for observable confounding factors), I do observe a statistically significant, positive effect. Although these effects have to be interpreted with caution as upper bounds, there is evidence of a positive effect of the program's intensified training and extensions services on stated pro-environmental attitudes. Fourth, a crucial cautionary note is that the failure to identify statistically significant impacts on our key outcomes might be the result of insufficient statistical power. That means, I am unable to distinguish between very small effects and insignificant effects.

This study makes a methodological contribution in terms of comparing different measures of EC attitudes. I find that stated EC attitudes, which rely on self-reported agreement with different statements on EC, are correlated with actual EC behavior. The picture looks different when looking at revealed EC attitudes, which are based on a framed field experiment where farmers had the opportunity to donate an endowment to a local reforestation project. Not only the correlation between the revealed attitude measure and actual behavior is low, but also the correlation between both attitude measures. Further investigation of the donation behavior shows that the revealed attitude measure does not necessarily proxy for overall environmental valuation, but potentially two other types of preferences.

First, the level of donations might reflect very specific reforestation preferences with sole reference to deforestation in particular. These preferences are largely driven by the awareness of environmental problems related to the specific natural resource, which is the perception of deforestation in the area. The role of perceptions of environmental problems for technology adoption is also observed in various empirical studies in different contexts of EC (see e.g., Bardhan, 2000; Jumbe & Angelsen, 2007; Karapetyan & D'Adda, 2014; Traoré et al., 1998; Voors et al., 2011). While this suggests that awareness of environmental problems directly affects conservation behavior, the former might also be mediated through stronger EC attitudes. Thus, creating awareness for environmental problems prevalent in the specific area – potentially through training and extension services – can positively affect EC attitudes and consequently lead to EC behavior (Truelove, Carrico, & Thabrew, 2015).

Second, it is also possible that donations in the framed field experiment mirror pro-social preferences in general. Further empirical work using similar experiments should therefore include differently framed experiments, namely varying the type of projects the donations would go to, and including a neutral option to control for the possibility of simply capturing the overall level of altruism (Eckel & Grossman, 1996). The fact that donations to a project that relates to EC are driven by pro-social preferences calls for an alternative way of promoting pro-environmental behavior. Thus, EC behavior might not only be determined by specific EC attitudes, but by pro-social attitudes in general (Rode et al., 2015). The positive relationship between social capital (e.g., community level trust and norms) and stronger cooperation in community resource management is also observed by Bouma et al. (2008) in rural villages in India, by Cavalcanti, Engel, and Leibbrandt (2013) in Brazilian fishing communities and by Aida (2019) among users of irrigation systems in Sri Lanka. In terms of policy or program interventions, pro-social attitudes and, thus, the formation of social capital should be fostered through efforts of community mobilization and creating trust among users of shared natural resources.

References

Aida, T. (2019). Social capital as an instrument for common pool resource management: A case study of irrigation management in Sri Lanka. *Oxford Economic Papers*, *71*(4), 952–978.

Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In J. Kuhl & J. Beckmann (Eds.), *Action Control: From Cognition to Behavior* (pp. 11–39). Berlin, Heidelberg: Springer-Verlag.

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour.* Englewood Cliffs, NJ: Prentice-Hall.

Ajzen, I., & Fishbein, M. (2005). The Influence of Attitudes on Behavior. In D. Albarracín, B. T. Johnson, & M. P. Zanna (Eds.), *Handbook of Attitudes* (pp. 173–221). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Anderies, J. M., Janssen, M. A., Bousquet, F., Cardenas, J. C., Castillo, D., Lopez, M. C., ... Wutich, A. (2011). The challenge of understanding decisions in experimental studies of common pool resource governance. *Ecological Economics*, *70*(9), 1571–1579.

Anderson, M. L. (2008). Multiple inference and gender differences in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects. *Journal of the American Statistical Association*, *103*(484), 1481–1495.

Baland, J.-M., & Platteau, J.-P. (1996). *Halting Degradation of Natural Resources: Is there a Role for Rural Communities?* Rome: Food and Agriculture Organization.

Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, *27*(1), 14–25.

Banerjee, A. V., & Duflo, E. (2009). The Experimental Approach to Development Economics. *Annual Review of Economics*, *1*, 151–178.

Bardhan, P. (2000). Irrigation and Cooperation: An Empirical Analysis of 48 Irrigation Communities in South India. *Economic Development and Cultural Change*, *48*(4), 847–865.

Baumgart-Getz, A., Prokopy, L. S., & Floress, K. (2012). Why farmers adopt best management practice in the United States: A meta-analysis of the adoption literature. *Journal of Environmental Management*, *96*(1), 17–25.

Benjamini, Y., & Hochberg, Y. (1995). Controlling the False Discovery Rate: A Practical and Powerful Approach to Multiple Testing. *Journal of Royal Statistical Society*, *57*(1), 289–300.

Beyene, A., Kassahun, Y., Addis, T., Assefa, F., Amsalu, A., Legesse, W., ... Triest, L. (2012). The impact of traditional coffee processing on river water quality in Ethiopia and the urgency of adopting sound environmental practices. *Environmental Monitoring and Assessment*, *184*, 7053–7063.

Bopp, C., Engler, A., Poortvliet, P. M., & Jara-Rojas, R. (2019). The role of farmers' intrinsic motivation in the effectiveness of policy incentives to promote sustainable agricultural practices. *Journal of Environmental Management*, *244*, 320–327.

Bouma, J., van Soest, D., & Bulte, E. (2008). Trust, Trustworthiness and Cooperation: Social Capital and Community Resource Management. *Journal of Environmental Economics and Management*, *56*(2), 155–166.

Brent, D. A., Friesen, L., Gangadharan, L., & Leibbrandt, A. (2017). Behavioral Insights from Field Experiments in Environmental Economics. *International Review of Environmental and Resource Economics*, *10*(2), 95–143.

Camerer, C. F., & Fehr, E. (2004). Measuring Social Norms and Preferences Using Experimental Games: A Guide for Social Scientists. In J. Henrich, R. Boyd, S. Bowles, C. Camerer, E. Fehr, & H. Gintis (Eds.), *Foundations of Human Sociality: Economic Experiments and Ethnographic Evidence from Fifteen Small-Scale Societies* (pp. 55–95). Oxford, UK: Oxford University Press.

Cavalcanti, C., Engel, S., & Leibbrandt, A. (2013). Social integration, participation, and community resource management. *Journal of Environmental Economics and Management*, *65*(2), 262–276.

Cropper, M. L., & Oates, W. E. (1992). Environmental Economics: A Survey. *Journal of Economic Literature*, *30*(2), 675–740.

D'Adda, G. (2011). Motivation crowding in environmental protection: Evidence from an artefactual field experiment. *Ecological Economics*, *70*(11), 2083–2097.

de Buck, A., van Rijn, I., Roling, N., & Wossink, G. (2001). Farmers' reasons for changing or not changing to more sustainable practices: An exploratory study of arable farming in the Netherlands. *Journal of Agricultural Education and Extension*, *7*(3), 153–166.

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, *18*(1), 105–115.

DellaVigna, S. (2009). Psychology and Economics: Evidence from the Field. *Journal of Economic Literature*, *47*(2), 315–372.

DeMaio, T. J. (1984). Social desirability and survey measurement: A review. In C. F. Turner & E. Martin (Eds.), *Surveying Subjective Phenomena* (Vol. 2, pp. 257–282). New York, NY: Russell Sage Foundation.

Dietz, T., Ostrom, E., & Stern, P. C. (2003). The Struggle to Govern the Commons. *Science*, *302*(5652), 1907–1912.

Eckel, C. C., & Grossman, P. J. (1996). Altruism in Anonymous Dictator Games. *Games and Economic Behavior*, *16*(2), 181–191.

FNC. (2013). *Current Outlook and Future Coffee Production Trends in Colom-*

bia. Retrieved 2020-01-18, from http://www.cafedecolombia.com/bb-fnc-en/index.php/comments/current_landscape_and_future_coffee_production_trends_in_colombia

Forsyth, D. R., Garcia, M., Zyzniewski, L. E., Story, P. A., & Kerr, N. A. (2004). Watershed Pollution and Preservation: The Awareness-Appraisal Model of Environmentally Positive Intentions and Behaviors. *Analyses of Social Issues and Public Policy*, *4*(1), 115–128.

Frey, B. S., & Stutzer, A. (2008). Environmental morale and motivation. In A. Lewis (Ed.), *Cambridge Handbook of Psychology and Economic Behaviour* (pp. 406–428). Cambridge, UK: Cambridge University Press.

Gould, B. W., Saupe, W. E., & Klemme, R. M. (1989). Conservation Tillage: The Role of Farm and Operator Characteristics and the Perception of Soil Erosion. *Land Economics*, *65*(2), 167–182.

Greiner, R., Patterson, L., & Miller, O. (2009). Motivations, risk perceptions and adoption of conservation practices by farmers. *Agricultural Systems*, *99*(2-3), 86–104.

Haddis, A., & Devi, R. (2008). Effect of effluent generated from coffee processing plant on the water bodies and human health in its vicinity. *Journal of Hazardous Materials*, *152*(1), 259–262.

Harrison, G. W., & List, J. A. (2004). Field Experiments. *Journal of Economic Literature*, *42*(4), 1009–1055.

Howley, P. (2013). Examining farm forest owners' forest management in Ireland: The role of economic, lifestyle and multifunctional ownership objectives. *Journal of Environmental Management*, *123*, 105–112.

Jackson-Smith, D. B., & McEvoy, J. P. (2011). Assessing the Long-term Impacts of Water Quality Outreach and Education Efforts on Agricultural Landowners. *Journal of Agricultural Education and Extension*, *17*(4), 341–353.

Jumbe, C. B., & Angelsen, A. (2007). Forest dependence and participation in CPR management: Empirical evidence from forest co-management in Malawi. *Ecological Economics*, *62*(3-4), 661–672.

Kaiser, F. G., Wölfing, S., & Fuhrer, U. (1999). Environmental attitude and ecological behaviour. *Journal of Environmental Psychology*, *19*(1), 1–19.

Karapetyan, D., & D'Adda, G. (2014). Determinants of conservation among the rural poor: A charitable contribution experiment. *Ecological Economics*, *99*, 74–87.

Kling, J. R., Liebman, J. B., & Katz, L. F. (2007). Experimental analysis of neighborhood effects. *Econometrica*, *75*(1), 83–119.

Knowler, D., & Bradshaw, B. (2007). Farmers' adoption of conservation agriculture: A review and synthesis of recent research. *Food Policy*, *32*(1), 25–48.

Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, *8*(3), 239–260.

Kreutzwiser, R., De Loë, R., Imgrund, K., Conboy, M. J., Simpson, H., & Plummer, R. (2011). Understanding stewardship behaviour: Factors facilitating and constraining private water well stewardship. *Journal of Environmental Management*, *92*(4), 1104–1114.

Krishnan, P., & Patnam, M. (2013). Neighbors and extension agents in Ethiopia: Who matters more for technology adoption? *American Journal of Agricultural Economics*, *96*(1), 308–327.

Lee, R., & Nisbett, R. E. (1991). *The Person and the Situation: Perspectives of Social Psychology.* New York, NY: McGraw-Hill.

Lynne, G. D., Casey, C. F., Hodges, A., & Rahmani, M. (1995). Conservation technology adoption decisions and the theory of planned behavior. *Journal of Economic Psychology*, *16*(4), 581–598.

Meijer, S. S., Catacutan, D., Ajayi, O. C., Sileshi, G. W., & Nieuwenhuis, M. (2015). The role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations among smallholder farmers in sub-Saharan Africa. *International Journal of Agricultural Sustainability*, *13*(1), 40–54.

Mendelsohn, R., Dinar, A., & Williams, L. (2006). The distributional impact of climate change on rich and poor countries. *Environment and Development Economics*, *11*(2), 159–178.

Morton, J. F. (2007). The impact of climate change on smallholder and subsistence agriculture. *Proceedings of the National Academy of Sciences of the United States of America*, *104*(50), 19680–19685.

Mugonola, B., Deckers, J., Poesen, J., Isabirye, M., & Mathijs, E. (2013). Adoption of soil and water conservation technologies in the Rwizi catchment of south western Uganda. *International Journal of Agricultural Sustainability*, *11*(3), 264–281.

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action.* Cambridge, UK: Cambridge University Press.

Ostrom, E. (1999). *Self-Governance and Forest Resources* (OCCASIONAL PAPER, No. 20). Jakarta: Center for International Forestry Research.

Pedzisa, T., Rugube, L., Winter-Nelson, A., Baylis, K., & Mazvimavi, K. (2015). The Intensity of adoption of Conservation agriculture by smallholder farmers in Zimbabwe. *Agrekon*, *54*(3), 1–22.

Prokopy, L. S., Floress, K., Klotthor-Weinkauf, D., & Baumgart-Getz, A. (2008). Determinants of agricultural best management practice adoption: Evidence from the literature. *Journal of Soil and Water Conservation*, *63*(5), 300–311.

Quiroga, S., Suárez, C., Diego Solís, J., & Martinez-Juarez, P. (2020). Framing vulnerability and coffee farmers' behaviour in the context of climate change adaptation in Nicaragua. *World Development*, *126*, 104733.

Rode, J., Gómez-Baggethun, E., & Krause, T. (2015). Motivation crowding by economic incentives in conservation policy: A review of the empirical evidence. *Ecological Economics*, *117*, 270–282.

Romero, M., Wollni, M., Rudolf, K., Asnawi, R., & Irawan, B. (2019). Promoting biodiversity enrichment in smallholder oil palm monocultures – Experimental evidence from Indonesia. *World Development*, *124*, 1–16.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, *25*(1), 54–67.

Stavins, R. N. (Ed.). (2019). *Economics of the Environment: Selected Readings* (7th ed.). Cheltenham: Edward Elgar Publishing.

Stern, N. (2008). The Economics of Climate Change. *American Economic Review: Papers & Proceedings*, *98*(2), 1–37.

Tarozzi, A., Desai, J., & Johnson, K. (2015). The impacts of microcredit: Evidence from Ethiopia. *American Economic Journal: Applied Economics*, *7*(1), 54–89.

Traoré, N., Landry, É., & Amara, N. (1998). On-Farm Adoption of Conservation Practices: The Role of Farm and Farmer Characteristics, Perceptions, and Health Hazards. *Land Economics*, *74*(1), 114–127.

Truelove, H. B., Carrico, A. R., & Thabrew, L. (2015). A socio-psychological model for analyzing climate change adaptation: A case study of Sri Lankan paddy farmers. *Global Environmental Change*, *31*, 85–97.

Vignola, R., Koellner, T., Scholz, R. W., & McDaniels, T. L. (2010). Decision-making by farmers regarding ecosystem services: Factors affecting soil conservation efforts in Costa Rica. *Land Use Policy*, *27*(4), 1132–1142.

Voors, M., Bulte, E., Kontoleon, A., List, J. A., & Turley, T. (2011). Using Artefactual Field Experiments to Learn about the Incentives for Sustainable Forest Use in Developing Economies. *American Economic Review: Papers & Proceedings*, *101*(3), 329–333.

Wade, R. (1987). The management of common property resources: collective action as an alternative to privatisation or state regulation. *Cambridge Journal of Economics*, *11*(2), 95–106.

Wauters, E., & Mathijs, E. (2014). The adoption of farm level soil conservation practices in developed countries: A meta-analytic review. *International Journal of Agricultural Resources, Governance and Ecology*, *10*(1), 78–102.

Appendix

Appendix A: Comparability of samples

Table A.1: Baseline summary statistics of the non-experimental and experimental sample with tests of balance

	Non-experimental sample				Experimental sample	
	(1) Mean	(2) SD	(3) Difference	(4) p-value	(5) Mean	(6) SD
Treatment group (=1)	0.500	0.500	-0.002	0.987	0.502	0.500
HH characteristics						
Female head of HH (=1)	0.125	0.331	-0.004	0.882	0.129	0.335
Age head of HH (years)	53.6	13.2	-0.5	0.624	54.0	13.8
Head of HH is literate (=1)	0.925	0.263	0.019	0.178	0.906	0.292
HH size (members)	3.6	1.7	0.0	0.969	3.6	1.6
HH lives on farm (=1)	0.634	0.482	0.046	0.284	0.589	0.492
Asset index (score)	-0.003	1.358	-0.028	0.824	0.025	1.464
Secure land ownership (=1)	0.838	0.368	0.058	0.207	0.781	0.414
HH member works outside farm (=1)	0.209	0.407	-0.062	0.061*	0.271	0.445
Farm characteristics						
Female farmer (=1)	0.261	0.439	0.003	0.925	0.257	0.437
Experience (years)	38.8	16.2	0.6	0.643	38.2	16.5
Total farm area (ha)	4.4	6.8	-0.3	0.671	4.7	10.1
Coffee plantation area (ha)	2.4	3.8	0.1	0.878	2.4	2.8
Coffee production (@cps)	297.0	962.1	11.9	0.852	285.1	704.9
Coffee processing on farm (=1)	0.820	0.384	0.030	0.417	0.790	0.408
Farm cultivates other crops (=1)	0.154	0.361	-0.064	0.057*	0.218	0.413
HH owns livestock (=1)	0.334	0.472	0.012	0.831	0.322	0.468
Hired workers (=1)	0.855	0.353	-0.003	0.901	0.858	0.350
Farm pays for water (=1)	0.460	0.499	-0.089	0.249	0.549	0.498
Water source on farm (=1)	0.616	0.487	-0.101	0.048**	0.717	0.451
Perception of environmental problems						
Water shortage (=1)	0.240	0.427	-0.024	0.549	0.263	0.441
Erosion (=1)	0.323	0.468	0.012	0.771	0.312	0.464
Deforestation (=1)	0.462	0.499	-0.046	0.376	0.508	0.500
EC attitudes (scale 1-5)						
I reuse my water for several tasks	2.368	1.702	-0.295	0.031**	2.663	1.716
I am inspecting that none of the faucets, pipes and toilet are leaking	4.620	0.997	0.038	0.609	4.582	1.004
In my household we save water	4.593	0.882	0.017	0.863	4.575	0.912
I conserve water even if my neighbors don't	4.757	0.668	0.046	0.629	4.711	0.734
Water conservation is not only a governmental obligation	4.541	1.009	0.035	0.787	4.506	1.047
Coffee is also well washed if not a lot of water is used	2.666	1.656	-0.060	0.739	2.726	1.625
Good practices in coffee processing do not only include those that ensure good coffee quality	1.617	1.232	-0.007	0.942	1.625	1.215

Table A.1: (continued)

	Non-experimental sample				Experimental sample	
	(1) Mean	(2) SD	(3) Difference	(4) p-value	(5) Mean	(6) SD
EC behavior indices						
Domestic EC devices and practices index	-0.149	0.526	0.082	0.159	-0.232	0.471
Coffee processing EC devices and practices index	0.023	0.435	0.042	0.477	-0.019	0.390
Soil and water conservation practices index	0.185	0.328	-0.041	0.253	0.226	0.347
Participation in EC related training(s)						
By program implementer (=1)	0.710	0.454	0.060	0.148	0.651	0.477
By supporting program implementer (=1)	0.063	0.242	0.032	0.064*	0.030	0.171
By other entity (=1)	0.081	0.273	-0.037	0.076*	0.118	0.323
Social						
Member in sustainability initiative (=1)	0.736	0.441	0.071	0.225	0.666	0.472
Group member (=1)	0.712	0.453	0.064	0.095*	0.648	0.478
Observations	656				661	

Note: Data from baseline (2015) survey. Columns 1 and 5 report the mean values for the non-experimental and experimental sample, respectively. Columns 2 and 6 the respective standard deviation to the means. Column 3 shows the difference between non-experimental and experimental sample means and Column 4 the p-values for the test of equality of means, robust to intra-river basin correlation. The number of clusters (river basins) is 50. The joint null of equal means is rejected at standard levels ($F(39, 49) = 11.20$, p-value = 0.000). Explanation to some variables: The asset index is calculated using factor analysis based on housing characteristics and ownership of various durables (first factor). Secure land ownership is defined as holding the deed or any other relevant document to the land. Coffee production is measured in "arrobas de café pergamino seco" (@cps) with 1 @cps equaling 12.5 kg of dry parchment coffee. The EC behavior indices are described in detail in Appendix B. Training participation was inquired for the past 12 months prior to the baseline survey. Being member of a sustainability initiative enables farmers to sell their coffee under an ecolabel. Group membership indicates that the farmer or his/her spouse participates in a local community organization or association. The balance among the five departments is also tested (and given), but not shown in the table. *** indicates significance at 1%, ** at 5%, and * at 10%.

Appendix B: Indices of standardized outcomes

In this study, four farm-level indices of standardized outcomes are constructed in the spirit of Kling et al. (2007) and following Tarozzi et al. (2015). In these indices, a "family" of outcomes is combined, namely EC attitudes, domestic EC devices and practices, coffee processing EC devices and practices, and soil and water conservation practices (beyond coffee processing). I illustrate the procedure using the EC attitude index.

First, each of the seven attitude statements (see Section 2.2) is standardized by subtracting the mean and dividing by the standard deviation of the variable calculated for the control group at endline. Second, the index is calculated as the simple average of the seven standardized variables. All four indices are calculated in a similar way and constructed in a way that larger, positive values indicate higher EC attitudes and behavior.

For the three behavioral indices, I included the following practices and devices. The survey asked for actual usage of the devices and not just the possession. Domestic environmental conservation: application of water savers, usage of domestic wastewater treatment system, separation of organic and inorganic waste. EC during coffee processing: usage of dry hopper, hydraulic separator and ecological coffee washing device (e.g., tub tank), pulping and transporting pulp without water, usage of processing wastewater treatment system, usage of a (proper) pit. Soil and water conservation practices (beyond coffee processing): reforestation, no burnings, plan contouring, soil coverage, designation of protection areas, living fences and barriers, noble weeds, drainage channels, contouring lines and other conservation practices.

Appendix C: Training uptake

Table C.1: Predictors of program training uptake

	Linear probability		Logit	
	(1) Program training (=1)	(2) Program EC related training (=1)	(3) Program training (=1)	(4) Program EC related training (=1)
Female head of HH (=1)	0.030	0.026	0.086	0.081
	(0.741)	(0.804)	(0.890)	(0.898)
Age head of HH (years)	-0.000	-0.001	-0.002	-0.003
	(0.849)	(0.785)	(0.898)	(0.830)
Head of HH is literate (=1)	-0.058	-0.080	-0.369	-0.475
	(0.397)	(0.285)	(0.392)	(0.284)
HH lives on farm (=1)	0.124	0.085	0.737*	0.474
	(0.131)	(0.301)	(0.080)	(0.256)
Asset index; 1st quartile	Ref.	Ref.	Ref.	Ref.
2nd quartile	0.034	0.055	0.278	0.394
	(0.568)	(0.415)	(0.459)	(0.318)
3rd quartile	0.090	0.109	0.586	0.666
	(0.222)	(0.142)	(0.224)	(0.124)
4th quartile	-0.025	-0.045	-0.159	-0.249
	(0.709)	(0.522)	(0.657)	(0.472)
Secure land ownership (=1)	0.014	0.019	0.086	0.098
	(0.643)	(0.617)	(0.583)	(0.596)
Experience (years)	-0.000	0.001	-0.007	0.001
	(0.792)	(0.790)	(0.584)	(0.924)
Total farm area (ha)	-0.001	-0.001	-0.008	-0.005
	(0.196)	(0.377)	(0.190)	(0.354)
Coffee production (@cps)	-0.000***	-0.000***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.002)	(0.004)
Coffee processing on farm (=1)	0.034	0.056	0.296	0.389
	(0.613)	(0.415)	(0.397)	(0.243)
Hired workers (=1)	-0.030	-0.042	-0.188	-0.296
	(0.708)	(0.620)	(0.718)	(0.564)
Farm pays for water (=1)	0.084*	0.078	0.551**	0.474
	(0.073)	(0.173)	(0.041)	(0.142)
Water source on farm (=1)	-0.044	-0.026	-0.414	-0.231
	(0.411)	(0.600)	(0.307)	(0.467)
Perceived water shortage (=1)	-0.043	-0.041	-0.278	-0.223
	(0.488)	(0.513)	(0.429)	(0.486)
Perceived erosion (=1)	0.061*	0.076*	0.431**	0.510**
	(0.088)	(0.054)	(0.037)	(0.024)
Perceived deforestation (=1)	-0.041	-0.008	-0.195	0.011
	(0.557)	(0.911)	(0.628)	(0.978)
EC attitude index	-0.031	0.001	-0.224	0.015
	(0.449)	(0.991)	(0.411)	(0.959)
Domestic EC index	0.050	0.041	0.390	0.278
	(0.459)	(0.543)	(0.347)	(0.469)
Coffee processing EC index	0.040	0.005	0.271	0.004
	(0.527)	(0.934)	(0.527)	(0.990)
Soil and water EC index	0.018	0.024	0.052	0.096
	(0.848)	(0.757)	(0.935)	(0.835)

Table C.1: (continued)

	Linear probability		Logit	
	(1) Program training (=1)	(2) Program EC related training (=1)	(3) Program training (=1)	(4) Program EC related training (=1)
Training by program implementer (=1)	0.097**	0.079	0.610**	0.449*
	(0.042)	(0.111)	(0.017)	(0.084)
Member in sustainability initiative (=1)	-0.017	0.010	-0.084	0.076
	(0.771)	(0.855)	(0.797)	(0.795)
Group member (=1)	0.081	0.041	0.459	0.210
	(0.208)	(0.501)	(0.182)	(0.511)
Constant	0.791***	0.769***	1.744*	1.549*
	(0.000)	(0.000)	(0.058)	(0.084)
Department FE	YES	YES	YES	YES
Observations	332	332	332	332
R-squared	0.154	0.137		

Note: Data from endline (2017) survey; only farmers from the treatment group are included. Standard errors (in parentheses) and tests are robust to intra-river basin correlation (there are 30 clusters/river basins). All regressions also include department fixed effects. The coefficients in Columns 1–2 are linear probability estimates and in Columns 3-4 logit estimates. The dependent variable in Columns 1 and 3 is whether the farmer reports to have participated in any program training at endline and in Columns 2 and 4 whether the farmer reports to have participated in a program training related to EC. All covariates are baseline values. The asset index is calculated using factor analysis based on housing characteristics and ownership of various durables (first factor divided into quartiles). Secure land ownership is defined as holding the deed or any other relevant document to the land. Coffee production is measured in "arrobas de café pergamino seco" (@cps) with 1 @cps equaling 12.5 kg of dry parchment coffee. The EC attitude and behavior indices are described in detail in Appendix B. Being member of a sustainability initiative enables farmers to sell their coffee under an ecolabel. Group membership indicates that the farmer or his/her spouse participates in a local community organization or association. *** indicates significance at 1%, ** at 5%, and * at 10%.

Appendix D: Sensitivity analysis of the impact on stated attitudes

Table D.1: Impact of the program on stated EC attitudes (robustness: estimation and standard errors)

	Statements							EC attitude index
	(1) 1	(2) 2	(3) 3	(4) 4	(5) 5	(6) 6	(7) 7	(8)
(A) Ordered logit model								
Treatment ×	0.116	0.350	0.170	0.684	0.163	0.322	-0.019	
Endline	(0.447)	(0.465)	(0.392)	(0.580)	(0.436)	(0.297)	(0.463)	
p-value	[0.794]	[0.451]	[0.664]	[0.238]	[0.708]	[0.278]	[0.967]	
FDR q-value	[0.927]	[0.927]	[0.927]	[0.927]	[0.927]	[0.927]	[0.967]	
(B) Standard errors clustered at HH-level								
Treatment ×	0.205	0.059	0.124	0.130*	0.059	0.334**	0.123	0.140***
Endline	(0.173)	(0.089)	(0.089)	(0.072)	(0.095)	(0.155)	(0.137)	(0.051)
p-value	[0.237]	[0.506]	[0.163]	[0.071]	[0.539]	[0.031]	[0.372]	
FDR q-value	[0.415]	[0.539]	[0.381]	[0.249]	[0.539]	[0.217]	[0.521]	
(C) Block bootstrap standard errors								
Treatment ×	0.205	0.059	0.124	0.130	0.059	0.334	0.123	0.140
Endline	(0.445)	(0.136)	(0.167)	(0.141)	(0.114)	(0.287)	(0.333)	(0.103)
p-value	[0.722]	[0.665]	[0.457]	[0.358]	[0.606]	[0.245]	[0.712]	
FDR q-value	[0.722]	[0.722]	[0.722]	[0.722]	[0.722]	[0.722]	[0.722]	
Baseline controls	YES	YES	YES	YES	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,322	1,322	1,322	1,322	1,322	1,322	1,322	1,322

Statement 1:	I reuse my water for several tasks.
Statement 2:	I am inspecting that none of the faucets, pipes and toilet are leaking.
Statement 3:	In my household we save water.
Statement 4:	I conserve water even if my neighbors don't.
Statement 5:	Water conservation is not only a governmental obligation.
Statement 6:	Coffee is also well washed if not a lot of water is used.
Statement 7:	Good practices in coffee processing do not only include those that ensure good coffee quality.

Note: Data from baseline (2015) and endline (2017) survey. Panel A: standard errors (in parentheses) and tests are robust to intra-river basin correlation (there are 30 clusters/river basins).Panel B: standard errors (in parentheses) and tests are robust to intra-household correlation (there are 661 clusters/households). Panel C: standard errors (in parentheses) are estimated using 200 block bootstrap replications with river basins as blocks. p- and q-values in brackets; the FDR q-values are computed as described in Anderson (2008), following the method of Benjamini and Hochberg (1995). All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion) and department fixed effects. Panel A: the coefficients in Columns 1–8 are ordered logit estimates of β_{DiD} in Equation 1. Panel B and C: the coefficients in Columns 1–8 are OLS estimates of β_{DiD} in Equation 1. The dependent variables in Columns 1–7 are defined as follows: level of agreement with statements 1-7 on a scale of 1-5, where high values reflect advanced pro-environmental attitudes. The dependent variable in Column 8 is an index of the dependent variables as outcome. The index is the simple average of the standardized outcomes in Columns 1–7, for details see Appendix B. *** indicates significance at 1%, ** at 5%, and * at 10%.

Table D.2: Impact of the program on stated EC attitudes (robustness: contamination of control group)

	Statements							EC attitude index
	(1) 1	(2) 2	(3) 3	(4) 4	(5) 5	(6) 6	(7) 7	(8)
(A) Exclusion of control group farms within area of influence								
Treatment × Endline	0.224 (0.391)	0.063 (0.128)	0.101 (0.169)	0.097 (0.132)	0.067 (0.131)	0.310 (0.252)	0.068 (0.334)	0.125 (0.094)
p-value	[0.572]	[0.624]	[0.553]	[0.471]	[0.614]	[0.229]	[0.841]	
FDR q-value	[0.728]	[0.728]	[0.728]	[0.728]	[0.728]	[0.728]	[0.841]	
Observations	1,272	1,272	1,272	1,272	1,272	1,272	1,272	1,272
(B) Exclusion of control group farms that participated in program training								
Treatment × Endline	0.179 (0.392)	0.066 (0.131)	0.129 (0.158)	0.126 (0.130)	0.058 (0.127)	0.343 (0.249)	0.132 (0.325)	0.141 (0.093)
p-value	[0.651]	[0.617]	[0.421]	[0.338]	[0.652]	[0.178]	[0.688]	
FDR q-value	[0.688]	[0.688]	[0.688]	[0.688]	[0.688]	[0.688]	[0.688]	
Observations	1,298	1,298	1,298	1,298	1,298	1,298	1,298	1,298
(C) Exclusion of all river basins located in most contaminated department								
Treatment × Endline	0.384 (0.467)	0.083 (0.144)	0.184 (0.197)	0.131 (0.158)	0.019 (0.143)	0.432 (0.280)	0.072 (0.382)	0.169 (0.111)
p-value	[0.420]	[0.569]	[0.360]	[0.416]	[0.897]	[0.137]	[0.852]	
FDR q-value	[0.735]	[0.797]	[0.735]	[0.735]	[0.897]	[0.735]	[0.897]	
Observations	1,042	1,042	1,042	1,042	1,042	1,042	1,042	1,042
Baseline controls	YES	YES	YES	YES	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES	YES	YES	YES

Statement 1:	I reuse my water for several tasks.
Statement 2:	I am inspecting that none of the faucets, pipes and toilet are leaking.
Statement 3:	In my household we save water.
Statement 4:	I conserve water even if my neighbors don't.
Statement 5:	Water conservation is not only a governmental obligation.
Statement 6:	Coffee is also well washed if not a lot of water is used.
Statement 7:	Good practices in coffee processing do not only include those that ensure good coffee quality.

Note: Data from baseline (2015) and endline (2017) survey. Panel A: exclusion of control area farms within area of influence from sample. Panel B: exclusion of control area farms that reported having participated in any training by program. Panel C: exclusion of all river basins located in most contaminated department. Standard errors (in parentheses) and tests are robust to intra-river basin correlation (Panel A-B: there are 30 clusters/river basins; Panel C: 24 clusters/river basins). p- and q-values in brackets; the FDR q-values are computed as described in Anderson (2008), following the method of Benjamini and Hochberg (1995). All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion) and department fixed effects. The coefficients in Columns 1–8 are OLS estimates of β_{DiD} in Equation 1. The dependent variables in Columns 1–7 are defined as follows level of agreement with statements 1-7 on a scale of 1-5, where high values reflect advanced pro-environmental attitudes. The dependent variable in Column 8 is an index of the dependent variables as outcome. The index is the simple average of the standardized outcomes in Columns 1–7, for details see Appendix B. *** indicates significance at 1%, ** at 5%, and * at 10%.

Appendix E: Sensitivity analysis of the impact on revealed attitudes

Table E.1: Impact of the program on revealed EC attitudes (robustness: standard errors)

	Donation (in COP)				
	(1)	(2)	(3)	(4)	(5)
(A) No clustered standard errors					
Treatment (=1)	655.4	764.1	762.7	822.5	788.0
	(525.2)	(524.4)	(539.2)	(533.1)	(547.5)
(B) Block bootstrap standard errors					
Treatment (=1)	655.4	764.1	762.7	822.5	788.0
	(1,194.7)	(1,061.8)	(1,073.7)	(1,041.4)	(1,060.0)
Baseline controls	YES	YES	YES	YES	YES
Endline controls	NO	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES
Observations	661	661	629	661	629

Note: Data from endline (2017) survey. Panel A: standard errors (in parentheses), no clustering. Panel B: standard errors (in parentheses) are estimated using 200 block bootstrap replications with river basins as blocks. All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion), endline controls (see Table 6) and department fixed effects. The coefficients in Columns 1–8 are OLS estimates of β_{Treat} in Equation 2. The dependent variable is the donation in COP. *** indicates significance at 1%, ** at 5%, and * at 10%.

Table E.2: Impact of the program on revealed EC attitudes (robustness: sample composition and contamination of control group)

	Donation (in COP)				
	(1)	(2)	(3)	(4)	(5)
(A) Reduction of donations above 20,000 COP					
Treatment (=1)	604.0	718.2	712.9	776.8	738.8
	(1,075.1)	(911.9)	(898.1)	(880.0)	(871.8)
Observations	661	661	629	661	629
(B) Exclusion of control group farms within area of influence					
Treatment (=1)	575.9	678.0	725.1	726.4	732.3
	(1,107.8)	(946.7)	(929.1)	(913.0)	(901.6)
Observations	636	636	605	636	605
(C) Exclusion of control group farms that participated in program training					
Treatment (=1)	583.1	715.8	693.3	751.7	691.8
	(1,065.5)	(897.4)	(878.5)	(865.3)	(846.9)
Observations	649	649	617	649	617
(D) Exclusion of all river basins located in most contaminated department					
Treatment (=1)	-36.2	154.8	197.6	226.6	223.1
	(1,249.3)	(1,055.0)	(1,016.0)	(1,024.8)	(993.1)
Observations	521	521	494	521	494
Baseline controls	YES	YES	YES	YES	YES
Endline controls	NO	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES

Note: Data from endline (2017) survey. Panel A: donations above 20,000 COP were reduced to 20,000 COP. Panel B: exclusion of control area farms within area of influence from sample. Panel C: exclusion of control area farms that reported having participated in any training by program. Panel D: exclusion of all river basins located in most contaminated department. Standard errors (in parentheses) and tests are robust to intra-river basin correlation (Panel A-C: there are 30 clusters/river basins; Panel D: 24 clusters/river basins). All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion), endline controls (see Table 6) and department fixed effects. The coefficients in Columns 1–8 are OLS estimates of β_{Treat} in Equation 2. The dependent variable is the donation in COP. *** indicates significance at 1%, ** at 5%, and * at 10%.

Table E.3: Impact of the program on revealed EC attitudes (robustness: additional baseline controls)

	Donation (in COP)				
	(1)	(2)	(3)	(4)	(5)
Treatment (=1)	655.4	552.8	555.9	586.4	546.2
	(1,077.6)	(947.5)	(960.4)	(907.8)	(920.9)
Correct knowledge question (=1)		-558.6	-1,148.4	-433.8	-991.0
		(1,272.4)	(1,465.7)	(1,266.8)	(1,460.9)
Conducted reforestation (=1)		-64.2	-456.1	-82.4	-498.6
		(632.4)	(669.6)	(630.0)	(679.3)
Perceived water shortage (=1)		-558.7	-497.3	-596.3	-499.8
		(572.8)	(561.9)	(562.4)	(553.4)
Perceived erosion (=1)		959.8*	796.6	903.5*	726.3
		(502.4)	(595.9)	(492.8)	(587.0)
Perceived deforestation (=1)	-163.1	-295.2	-716.5	-278.0	-737.3
	(527.3)	(524.2)	(588.2)	(537.4)	(611.9)
Group member (=1)		8.0	66.2	58.8	124.5
		(538.1)	(624.4)	(540.5)	(613.5)
Trust in program implementer (=1)			-598.7		-539.8
			(993.7)		(1,008.0)
Trust in neighbors (=1)			1,007.8*		1,011.0
			(581.8)		(598.7)
Asset index; 1st quartile		Ref.	Ref.	Ref.	Ref.
2nd quartile		2,451.6***	3,299.6***	2,340.0***	3,189.8***
		(679.4)	(697.5)	(700.6)	(718.3)
3rd quartile		2,867.7***	2,920.8***	2,793.1***	2,817.7***
		(711.5)	(839.2)	(745.5)	(873.3)
4th quartile		2,710.0***	2,884.1***	2,636.0***	2,814.8***
		(624.2)	(772.5)	(651.6)	(793.5)
Secure land ownership (=1)		-316.6	-44.7	-310.2	-35.9
		(781.2)	(890.4)	(782.2)	(887.7)
Total farm area (ha)		32.8	31.8	29.7	27.6
		(22.3)	(25.6)	(23.3)	(26.3)
Coffee production (@cps)		1.1***	1.3***	1.1***	1.3***
		(0.3)	(0.4)	(0.3)	(0.4)
Hired workers (=1)		2,355.2***	1,704.9*	2,339.5***	1,688.7*
		(831.9)	(914.7)	(803.3)	(889.2)
EC attitude index; 1st quartile				Ref.	Ref.
2nd quartile				1,100.8	1,257.6
				(784.9)	(861.0)
3rd quartile				885.3*	1,083.3**
				(471.7)	(514.7)
4th quartile				-136.4	20.5
				(869.2)	(970.7)
Constant	12,480.6***	7,842.0***	8,733.0***	7,395.4***	8,077.6***
	(859.5)	(2,140.4)	(2,411.3)	(2,259.6)	(2,551.0)
Baseline controls	YES	YES	YES	YES	YES
Additional baseline controls	NO	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES
Observations	661	661	562	661	562
R-squared	0.036	0.105	0.117	0.111	0.125

Note: Data from endline (2017) survey. Standard errors (in parentheses) and tests are robust to intra-river basin correlation (there are 30 clusters/river basins). All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion) and department fixed effects. The coefficients in Columns 1–5 are OLS estimates of β_{Treat} in Equation 2. The dependent variable is the donation in COP. Explanation to some variables: The knowledge questions was "What practice protects water sources?" with the correct answer being "plant native shrubs and trees". Group membership indicates that the farmer or his/her spouse participates in a local community organization or association. The trust variable was transformed into a binary variable with 1 = medium to strong trust. The asset index is calculated using factor analysis based on housing characteristics and ownership of various durables (first factor divided into quartiles). Secure land ownership is defined as holding the deed or any other relevant document to the land. Coffee production is measured in "arrobas de café pergamino seco" (@cps) with 1 @cps equaling 12.5 kg of dry parchment coffee. The EC attitude index is described in detail in Appendix B, here divided in quartiles. *** indicates significance at 1%, ** at 5%, and * at 10%.

Table E.4: Impact of the program on revealed EC attitudes (robustness: steady sample)

	Donation (in COP)				
	(1)	(2)	(3)	(4)	(5)
Treatment (=1)	609.3	752.7	762.7	797.2	788.0
	(1,060.6)	(909.7)	(899.9)	(890.3)	(873.0)
Correct knowledge question (=1)		544.1	910.1	767.8	1,150.3
		(1,351.0)	(1,334.8)	(1,307.8)	(1,275.9)
Conducted reforestation (=1)		-172.2	-242.9	-195.4	-255.8
		(538.4)	(520.7)	(549.7)	(535.6)
Perceived water shortage (=1)		-92.5	-175.5	-145.5	-235.9
		(523.3)	(511.9)	(535.5)	(521.8)
Perceived erosion (=1)		226.6	358.0	167.0	292.3
		(696.2)	(717.4)	(664.3)	(683.6)
Perceived deforestation (=1)		1,855.7***	2,002.6***	1,827.3***	1,977.1***
		(544.2)	(550.6)	(527.3)	(530.5)
Group member (=1)		676.2	467.9	681.9	476.7
		(671.3)	(637.6)	(663.1)	(628.2)
Trust in program implementer (=1)			757.8		882.0
			(791.5)		(785.7)
Trust in neighbors (=1)			1,661.0***		1,564.8***
			(558.6)		(551.9)
Asset index; 1st quartile		Ref.	Ref.	Ref.	Ref.
2nd quartile		2,027.3***	1,975.9***	1,879.2**	1,830.4**
		(668.4)	(667.5)	(698.5)	(711.7)
3rd quartile		2,539.8***	2,577.6***	2,443.3***	2,480.0***
		(760.4)	(762.5)	(814.6)	(821.3)
4th quartile		2,408.4***	2,261.1***	2,324.7***	2,189.3***
		(671.7)	(711.6)	(697.9)	(741.7)
Secure land ownership (=1)		825.9	770.8	863.5	806.7
		(714.3)	(695.2)	(743.1)	(722.0)
Total farm area (ha)		30.2	32.8	26.6	28.9
		(25.0)	(26.6)	(26.0)	(27.4)
Coffee production (@cps)		1.2	1.2	1.2	1.3
		(1.3)	(1.2)	(1.3)	(1.2)
Hired workers (=1)		612.6	626.2	644.1	646.6
		(947.4)	(892.2)	(939.2)	(891.2)
EC attitude index; 1st quartile				Ref.	Ref.
2nd quartile				1,472.3*	1,303.0
				(797.7)	(772.4)
3rd quartile				985.3*	933.9
				(552.2)	(574.3)
4th quartile				46.4	-102.9
				(873.5)	(899.9)
Constant	12,982.3***	7,095.3***	4,887.2**	6,318.5***	4,165.5*
	(981.4)	(1,831.9)	(2,063.3)	(1,907.6)	(2,090.6)
Baseline controls	YES	YES	YES	YES	YES
Endline controls	NO	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES
Observations	629	629	629	629	629
R-squared	0.040	0.098	0.115	0.106	0.122

Note: Data from endline (2017) survey. Steady sample among all regressions (i.e., sample comprises of farms in the experimental sample for which information on the trust variables was available). Standard errors (in parentheses) and tests are robust to intra-river basin correlation (there are 30 clusters/river basins). All regressions also include controls for unbalanced baseline characteristics (i.e., the perception of erosion) and department fixed effects. The coefficients in Columns 1–5 are OLS estimates of β_{Treat} in Equation 2. The dependent variable is the donation in COP. Explanation to some variables: The knowledge questions was "What practice protects water sources?" with the correct answer being "plant native shrubs and trees". Group membership indicates that the farmer or his/her spouse participates in a local community organization or association. The trust variable was transformed into a binary variable with 1 = medium to strong trust. The asset index is calculated using factor analysis based on housing characteristics and ownership of various durables (first factor divided into quartiles). Secure land ownership is defined as holding the deed or any other relevant document to the land. Coffee production is measured in "arrobas de café pergamino seco" (@cps) with 1 @cps equaling 12.5 kg of dry parchment coffee. The EC attitude index is described in detail in Appendix B, here divided in quartiles. *** indicates significance at 1%, ** at 5%, and * at 10%.

Appendix F: Impact on stated attitudes for the full sample

Table F.1: Impact of the program on stated EC attitudes for the full sample (ITT effect)

	Statements							EC attitude index
	(1) 1	(2) 2	(3) 3	(4) 4	(5) 5	(6) 6	(7) 7	(8)
Treatment × Endline	0.248 (0.235)	0.017 (0.084)	0.070 (0.108)	0.083 (0.078)	0.070 (0.107)	0.151 (0.188)	0.159 (0.215)	0.105* (0.061)
p-value	[0.296]	[0.835]	[0.524]	[0.294]	[0.513]	[0.427]	[0.463]	
FDR q-value	[0.612]	[0.835]	[0.612]	[0.612]	[0.612]	[0.612]	[0.612]	
Baseline controls	YES	YES	YES	YES	YES	YES	YES	YES
Department FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,634	2,634	2,634	2,634	2,634	2,634	2,634	2,634
R-squared	0.026	0.012	0.006	0.011	0.024	0.047	0.060	0.052
Endline mean in control group	2.352	4.750	4.586	4.753	4.737	2.816	1.968	0.000

Statement 1:	I reuse my water for several tasks.
Statement 2:	I am inspecting that none of the faucets, pipes and toilet are leaking.
Statement 3:	In my household we save water.
Statement 4:	I conserve water even if my neighbors don't.
Statement 5:	Water conservation is not only a governmental obligation.
Statement 6:	Coffee is also well washed if not a lot of water is used.
Statement 7:	Good practices in coffee processing do not only include those that ensure good coffee quality.

Note: Data from baseline (2015) and endline (2017) survey. Standard errors (in parentheses) and tests are robust to intra-river basin correlation (there are 50 clusters/river basins). p- and q-values in brackets; the FDR q-values are computed as described in Anderson (2008), following the method of Benjamini and Hochberg (1995). All regressions also include controls for unbalanced baseline characteristics (i.e., living on farm) and department fixed effects. The coefficients in Columns 1–8 are OLS estimates of β_{DiD} in Equation 1. The dependent variables in Columns 1–7 are defined as follows: level of agreement with statements 1-7 on a scale of 1-5, where high values reflect advanced pro-environmental attitudes. The dependent variable in Column 8 is an index of the dependent variables as outcome. The index is the simple average of the standardized outcomes in Columns 1–7, for details see Appendix B. The endline means reported at the bottom are calculated for control river basins. *** indicates significance at 1%, ** at 5%, and * at 10%.

Volkswirtschaftliche Reihe der Passauer Diskussionspapiere

Bisher sind erschienen:

V-1-98 Gerhard Rübel, Can adjustments to working hours help reduce unemployment?

V-2-98 Martin Werding, Pay-as-you-go Public Pension Schemes and Endogenous Fertility: The Reconstruction of Intergenerational Exchange

V-3-98 Carsten Eckel, International Trade, Direct Investment, and the Skill Differential in General Equilibrium

V-4-98 Reinar Lüdeke, Das Staatsbudget und intergenerationelle Umverteilung, Das Staatsvermögen als Instrument intergenerativer Verteilungspolitik und der "generational accounting"-Ansatz: Alter Wein in neuen (höherwertigen) Schläuchen?

V-5-98 Anja Klüver und Gerhard Rübel, Räumliche Industriekonzentration und die komparativen Vorteile von Ländern - eine empirische Studie der Europäischen Union

V-6-98 Klaus Beckmann und Elisabeth Lackner, Vom Leviathan und von optimalen Steuern

V-7-98 Martin Werding, The Pay-as-you-go Mechanism as Human Capital Funding: The "Mackenroth hypothesis" Revisited

V-8-98 Reinar Lüdeke und Klaus Beckmann, Social Costs of Higher Education: Production and Financing. The Case of Germany (1994)

V-9-98 Gerhard Rübel, "Faire" Löhne und die Flexibilität von Arbeitsmärkten in einem Zwei-Sektoren-Modell

V-10-98 Klaus Beckmann, Notizen zum Steueranteil von Rentenversicherungsbeiträgen im Umlageverfahren

V-11-98 Christian Jasperneite und Hans Joachim Allinger, Trendwende am westdeutschen Arbeitsmarkt? - Eine ökonometrische Analyse

V-12-98 Christian Jasperneite und Hans Joachim Allinger, Langfristige Perspektiven für den westdeutschen Arbeitsmarkt: Was sagen die Gesetze von Okun und Verdoorn?

V-13-98 Hans Joachim Allinger und Christian Jasperneite, Saisonbereinigung von Arbeitsmarktdaten bei aktiver Arbeitsmarktpolitik

V-14-99 Reinar Lüdeke und Klaus Beckmann, Hochschulbildung, Humankapital und Beruf: Auswertung einer Längsschnittsbefragung Passauer Absolventen 1988 - 1998

V-15-99 Gerhard Rübel, Volkseinkommenssteigerung durch ausgabenfinanzierte Steuersenkung - Eine Umkehrung des Haavelmo-Theorems für offene Volkswirtschaften

V-16-99 Silke Klüver, Konzentrationsursachen in der europäichen Versicherungsbranche - eine empirische Untersuchung

V-17-99 Reinar Lüdeke, Familienlastenausgleich, Elternleistungsausgleich und die Neufundierung der umlagefinanzierten Altersversorgung

V-18-99 Anja Klüver und Gerhard Rübel, Industrielle Konzentration als Kriterium für die Geeignetheit eines einheitlichen Währungsraums – Eine empirische Untersuchung der Europäischen Union von 1972 bis 1996

V-19-00 Carsten, Eckel, Fragmentation, Efficiency-seeking FDI, and Employment

V-20-00 Christian Jasperneite, Understanding Hysteresis in Unemployment: The German Case

V-21-00 Jörg Althammer, Reforming Family Taxation

V-22-00 Carsten Eckel, Labor Market Adjustments to Globalization: Unemployment versus Relative Wages

V-23-00 Klaus Beckmann, Tax Competition through Tax Evasion

V-24-01 Klaus Beckmann, Steuerhinterziehung, begrenzte Rationalität und Referenzabhängigkeit: Theorie und experimentelle Evidenz

V-25-01 Klaus Beckmann, Solidarity, Democracy, and Tax Evasion: an Experimental Study

V-26-04 Michael Fritsch, Udo Brixy und Oliver Falck, The Effect of Industry, Region and Time on New Business Survival - A Multi-Dimensional Analysis

V-27-04 Gerhard D. Kleinhenz, Bevölkerung und Wachstum - Die Bevölkerungsentwicklung in Deutschland als Herausforderung für Wirtschafts- und Sozialpolitik

V-28-04 Johann Graf Lambsdorf, The Puzzle with Increasing Money Demand - Evidence from a Cross-Section of Countries

V-29-04 Frauke David, Oliver Falck, Stephan Heblich und Christoph Kneiding, Generationsgerechtigkeit und Unternehmen

V-30-04 Roland Engels†, Zur mikroökonomischen Fundierung der Geldnachfrage in allgemeinen Gleichgewichtsmodellen

V-31-05 Johann Graf Lambsdorff, Between Two Evils – Investors Prefer Grand Corruption!

V-32-05 Oliver Falck, Das Scheitern junger Betriebe – Ein Überlebensdauermodell auf Basis des IAB-Betriebspanels

V-33-05 Raphaela Seubert - On the Nature of the Corrupt Firm: Where to Situate Liability?

V-34-05 Johann Graf Lambsdorff – Consequences and Causes of Corruption – What do We Know from a Cross-Section of Countries?

V-35-05 Stephan Heblich - Arbeitszeitflexibilisierung Revisited

V-36-05 Oliver Falck und Stephan Heblich - Das Konzept der eigenverantwortlichen Generation zur Bewältigung des demographischen Wandels

V-37-05 Florian Birkenfeld, Daniel Gastl, Stephan Heblich, Ferry Lienert, Mascha Maergoyz, Oksana Mont und Andrius Plepys - Product ban versus risk management by setting emission and technology requirements – the effect of different regulatory schemes taking the use of trichloroethylene in Sweden and Germany as an example

V-38-05 Johann Graf Lambsdorff - Determining Trends for Perceived Levels of Corruption

V-39-05 Oliver Falck - Mayflies and Long-Distance Runners: The Effects of New Business Formation on Industry Growth

V-40-05 Johann Graf Lambsdorff und Christian Engelen - Hares and Stags in Argentinean Debt Restructuring

V-41-05 Johann Graf Lambsdorff und Mathias Nell – Let Them Take Gifts, and Cheat Those Who Seek Influence

V-42-06 Hans Joachim Allinger – Bürgerversicherung und Kopfpauschale haben vieles gemeinsam – Anmerkungen zur Diskussion einer Reform der gesetzlichen Krankenversicherung

V-43-06 Michael Schinke und Johann Graf Lambsdorff - Insider Trading among Central Bankers – a Treatise on Temptation and Policy Choice

V-44-06 Johann Graf Lambsdorff und Hady Fink - Combating Corruption in Colombia: Perceptions and Achievements

V-45-06 Oliver Falck und Stephan Heblich - Corporate Social Responsibility: Einbettung des Unternehmens in das Wirtschaftssystem

V-46-06 Johann Graf Lambsdorff und Luka Bajec - There Is No Bank Lending Channel!

V-47-06 Christian Engelen und Johann Graf Lambsdorff - Das Keynesianische Konsensmodell

V-48-07 Stephan Heblich - Eigenverantwortliche Individuen und Pro-Aktive Unternehmen

V-49-07 Christian Engelen und Johann Graf Lambsdorff - Das Keynesianische Konsensmodell einer offenen Volkswirtschaft

V-50-07 Christian Engelen und Johann Graf Lambsdorff - Fairness in Sovereign Debt Restructuring

V-51-07 Johann Graf Lambsdorff und Björn Frank - Corrupt Reciprocity - an Experiment

V-52-07 Mathias Nell - Strategic Aspects of Voluntary Disclosure Programs for Corruption Offences - Towards a Design of Good Practice -

V-53-07 Mathias Nell - Contracts Induced by Means of Bribery - Should they be Void or Valid?

V-54-08 Michael Pflüger – Die Neue Ökonomische Geographie: Ein Überblick

V-55-08 Florian Birkenfeld und Shima'a Hanafy - Wie zentral sind die Abschlussprüfungen an deutschen Schulen wirklich?"

V-56-08 Florian Birkenfeld - Kleine Klassen und gute Luft - Warum sind die Grundschulen auf dem Land besser?

V-57-08 Johann Graf Lambsdorff – The Organization of Anticorruption – Getting Incentives Right!

V-58-09 Oliver Farhauer und Alexandra Kröll - Verfahren zur Messung räumlicher Konzentration und regionaler Spezialisierung in der Regionalökonomik

V-59-09 Oliver Farhauer und Alexandra Kröll - Die Shift-Share-Analyse als Instrument der Regional- und Clusterforschung

V-60-10 Johann Graf Lambsdorff – Deterrence and Constrained Enforcement – Alternative Regimes to Deal with Bribery

V-61-10 Johann Graf Lambsdorff – Who Accepts Bribery? Evidence from a Global Household Survey

V-62-10 Oliver Farhauer und Alexandra Kröll – What We Can and What We Can’t Say About Employment Growth in Specialised Cities

V-63-11 Johann Graf Lambsdorff, Manuel Schubert und Marcus Giamattei – On the Role of Heuristics - Experimental Evidence on Inflation Dynamics

V- 64-12 Manuel Schubert und Johann Graf Lambsdorff – On the Costs of Kindness - An Experimental Investigation of Guilty Minds and Negative Reciprocity

V-65-12 Manuel Schubert – Deeds rather than Omissions - How Intended Consequences Provoke Negative Reciprocity

V-66-12 Agnes Binagwaho, Renate Hartwig, Denyse Ingeri und Andrew Makaka – Mutual Health Insurance and its Contribution to Improving Child Health in Rwanda

V-67-15 Marcus Giamattei – Cold Turkey vs. Gradualism – Evidence on Disinflation; Strategies from Laboratory Experiment

V-68-15 Marcus Giamattei, Johann Graf Lambsdorff – classEx – an Online Software for Classroom Experiments

V-69-15 Johann Graf Lambsdorff – Preventing Corruption by Promoting Trust – Insights from Behaviorial Science

V-70-16 Lukas Schötz – Power and Rents – political influence on rent extraction. Quasi-experimental evidence for Bavaria

V-71-16 Lukas Schötz – Mayor Games in Bavaria: Self Selection of Local Politicians is not influenced by constitutionally defined remuneration increases

V-72-16 Johann Graf Lambsdorff, Marcus Giamattei, Katharina Werner, Manuel Schubert-Emotion vs. Cognition – Experimental Evidence on Cooperation from the 2014 Soccer World Cup

V-73-16 Katharina Werner – Whom do People Trust after a Violent Conflict? - Experimental Evidence from Maluku, Indonesia

V-74-16 Katharina Werner, Johann Graf Lambsdorff – Emotional Numbing and Lessons Learned after a Violent Conflict – Experimental Evidence from Ambon, Indonesia

V-75-17 Ramona Molitor – Publicly Announced Speed Limit Enforcement and Its Impact on Road Safety – Evidence From the German Blitzmarathons

V-76-17 Johannes Lorenz – Population Dynamics of Tax Avoidance with Crowding Effects

V-77-19 Katrin Huber – The role of the career costs of children for the effect of public child care on fertility and maternal employment

V-78-19 Markus Fritsch, Andrew Adrian Yu Pua, Joachim Schnurbus – Revisiting habits and heterogeneity in demands

V-79-20 Susanna Grundmann – Do just deserts and competition shape patterns of cheating?

V-80-20 Susanna Grundmann, Marcus Giamattei, Johann Graf Lambsdorff – On the downward rigidity of wages – evidence from an experimental labour market with monetary neutrality

V-81-20 Michael Grimm, Renate Hartwig, Ann-Kristin Reitmann, Fadima Yaya Bocoum – Can informal redistribution withstand formal safety nets? Insights from urban-rural transfers in Burkina Faso