

# Carbon offsets out of the woods? The acceptability of domestic vs. international reforestation programmes

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# Carbon offsets out of the woods?

## The acceptability of domestic vs. international reforestation programmes\*

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### Abstract

Following the entry into force of the Paris Agreement in November 2016, governments around the world are now asked to turn their nationally determined contributions into concrete climate policies. Economic arguments justify implementing carbon pricing to achieve emission abatement targets in a cost-effective way, including the possibility to offset domestic greenhouse gas emissions in foreign countries. However, abating emissions abroad instead of domestically may face important political and popular resistance. We run a lab experiment with more than 300 participants by asking them to choose between a domestic and an international reforestation project. We test the effect of three informational treatments on the allocation of participants' endowment between the domestic and the international project. The treatments consist in: (1) making more salient the cost-effectiveness gains associated with offsetting carbon abroad (2) providing guarantees on the reliability of reforestation programmes (3) stressing local ancillary benefits associated with domestic offset projects. We find that stressing the cost-effectiveness of the reforestation programme abroad is the best way to increase its support, the economic argument in favour of offsetting abroad being largely overlooked by participants. We relate this finding to the recent literature on the drivers of public support for climate policies, generally pointing to a gap between people's preferences and economists' prescriptions.

**Keywords:** Climate policy; Carbon offsets; Reforestation; Acceptability

**JEL classification:** Q23, Q54, Q58

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# 1 Introduction

Following the 2016 entry into force of the Paris Agreement, governments are now expected to turn their greenhouse gas emissions pledges into concrete climate policies. Given the global public good nature of climate change mitigation and the important differences in cross-country marginal abatement costs, distributing abatement efforts across countries could substantially lower the overall cost of implementing a global climate policy (Morris et al. 2012; Kriegler et al. 2014). The choice of the policy instrument is crucial to ensure that the abatement objectives can be reached at a reasonable cost. Economists contend that carbon pricing represents the central pillar of the policy package necessary to transform pledges into effective emissions abatements (Goulder and Parry 2008; Aldy and Stavins 2012).

However, important political resistance opposes the use of carbon pricing, which explains the limited diffusion of carbon taxes and cap-and-trade programmes around the world (Baranzini and Carattini 2014; World Bank 2014). The same resistance also applies to the use of carbon offsets resulting from activities or projects implemented abroad but used to compensate domestic emissions, as well as more in general to the mechanisms permitting the compensation of emissions among countries (Monbiot, 2007; Schneider, 2009). For instance, the European Union (EU) Emissions Trading Scheme capped until 2013 the amount of carbon credits that firms could buy from emission abatement projects taking place outside the EU. Since 2013, international credits are no longer accepted. Similarly, the use of international offsets is currently capped in the California cap-and-trade scheme, and international offsets may disappear also from this scheme as it enters the third compliance period in 2018. In California, strong resistance to the use of offsets come for instance from local environmental justice groups, which claim that firms should undertake all the efforts to reduce their emissions locally, and provide co-benefits to local communities. The room for abating greenhouse gas emissions abroad is also limited by law in other contexts. In Switzerland, for instance, a minimum of 30% of the total emissions reduction must be achieved domestically. Stronger requirements may apply for some industries. For instance, fossil-thermal power plants must in principle offset all of their emissions, of which 50% must be compensated domestically. In the United States, the 2009 Waxman-Markey bill also included a cap for the use of carbon offsets, specific on the location of the abatements. Domestic offset and international offset programs were each capped at 1 billion metric tons, with the possibility for the Environmental Protection Agency to shift part of the domestic cap to international offsets only if it could be determined that the domestic supply was insufficient. At the same time, some countries, such as Norway or Costa Rica, plan to be carbon neutral already by the next decade or so. An objective that potentially implies a large use of offsetting practices. While Costa Rica plans to fund domestic forest carbon offsets undertake local measures to offset emissions through reforestation, reaching this objective in Norway would very likely require the purchase of a substantial amount of carbon offsets in foreign countries. This paper is motivated by the conflict between the large potential cost savings associated with abating emissions through projects implemented abroad and the possible political resistance to such practice.

Some evidence already suggests that the public may not always favour the most efficiency-enhancing solution, even when pay-offs are transparent as in the lab . In addition, practical reservations have been raised to the purchase of carbon offsets from projects implemented abroad. Evidence of abuses in the additionality condition have clearly contributed to reduce the credibility of the UNFCCC's mechanisms to facilitate international emissions trading, such as the Clean Development Mechanism and Joint Implementation (see Schneider and Kollmuss 2015; Tirole 2012). In

the light of these critiques, the preference that the general public seems to give to local projects, and to standards certifying projects generating emissions offsets abroad, should no longer surprise (see Blasch and Farsi 2014). However, beyond this, little is known on how to overcome these obstacles and increase the popularity of international carbon offsets.

We address this question empirically using an experimental approach. Such approach has already been used in the literature on the acceptability of climate policies, as the benefits of a controlled environment are particularly suitable to study how specific interventions may affect people’s preferences for a given instrument. Kallbekken et al. (2011) show how tax aversion can affect Pigouvian taxes, hampering the implementation of instruments that would increase efficiency in the experiment, and allow for pay-off maximization (cf. also Kallbekken et al. 2010). When it comes to internalizing externalities, “half” measures such as subsidies may be preferred to “full” measures such as carbon taxes. That is, also in the lab, trying to implement carbon taxes may result in no progress over the status-quo (Cherry et al. 2012). However, introducing Pigouvian taxes only for a limited period, or number of rounds, allows increasing their popularity. If participants are asked to vote on a Pigouvian tax after a trial period, they are more likely to support it (Cherry et al. 2014). Pigouvian taxes may however not deliver their effects immediately, as in the case of climate change given the residency time of greenhouse gas emissions in the atmosphere. Interestingly, this delay decrease the support for taxation, by more than any reasonable time discounting would suggest (Tiezzi and Xiao 2016).

Our experiment goes as follows. We gather about 300 students in the lab and observe how they allocate their endowment between two reforestation projects, one taking place domestically and one abroad. We provide three randomized informational treatments. The treatments mimic the role of a political campaign trying to foster (or hamper) the political support for generating carbon offsets from reforestation projects implemented in a foreign country, instead of domestically. Two treatments play in favour of carbon offsets generated abroad by (1) emphasizing the efficiency gains related with international projects and (2) giving guarantees on the reliability of the reforestation programmes. The third treatment stresses the local ancillary benefits from domestic carbon offset projects in terms of biodiversity, recreational activities, protection from natural disasters and local employment. We compare these three treatment groups with a neutrally framed control group.

We find that stressing the cost-effectiveness of the international reforestation programme leads to a significant change in its acceptability, much more than any other treatment does. According to our results, participants seem to already factor in the existence of local benefits and seem not to be questioning the credibility of the selected reforestation programmes, but their priors are substantially affected by the information provided on the economic rationale for undertaking projects generating carbon offsets in a foreign country rather than domestically.

The remainder of the paper is organized as follow. Section 2 introduces our hypotheses and describes the experimental design. Section 3 presents our data and results. Section 4 concludes.

## 2 Methodology

### 2.1 Economic background and hypotheses

In this paper, we focus on reforestation programmes and build on the United Nations’ REDD initiative (Reducing emissions from Deforestation and forest Degradation). The potential for climate change mitigation of REDD projects is considered enormous (Bellassen and Luysaert, 2014), given the generally low marginal costs of reforestation (van Kooten et al. 2004, Tavoni et al. 2007, Nielsen et al.

2014). It is indeed estimated that 20% of global greenhouse gas emissions are caused by deforestation, twice as much as transportation (IPCC, 2014). Relatedly, Potter et al. (2007) estimate that up to 20% of US emissions could be offset through forests sinks.<sup>1</sup> Forest offsets are encouraged since the Kyoto Protocol within the LULUCF (Land Use, Land Use Change, and Forestry) activities of the Clean Development Mechanism (UNFCCC, 2007). Forest offsets may also play an important role in the realization of the recent agreement that the International Civil Aviation Organization reached in October 2016 to limit the growth of carbon emissions in the civil aviation sector. According to this voluntary agreement, from 2020 any increase in airline carbon emissions should be compensated through the purchase of carbon offsets.

From an economic perspective, purchasing carbon offsets is a real-life decision with a private cost to the individual. Individuals may be willing to voluntarily contribute to a public good such as climate change mitigation if, for instance, they derive some utility from the public good being provided (i.e. in case of pure altruism) or if they derive some utility from their contribution, due to warm glow (Andreoni 1990), or due to a positive self-image (Nyborg et al. 2006). In the case of offsets, individuals may also be willing to engage in the private provision of a public good if this may allow compensating other activities to which they contributed and that might have reduced the overall level of the same public good (Kotchen 2009).

Most of the recent literature on the economics of carbon offsets has examined this question relying on stated preferences, while only a few papers attempted to provide evidence based on revealed preferences by using lab and field experiments.<sup>2</sup> Since stated preferences are subject to several well-known biases (see e.g. Alberini and Kahn 2006), in this paper, we address empirically the acceptability of carbon offsets generated from reforestation programmes implemented abroad using an experimental approach. Such an approach is arguably the best tool for inferring from revealed preferences, testing the effect of alternative policy designs that are not yet observed in reality, and causally identifying the effect of our treatments on people's preferences (Falk and Heckman 2009). Indeed the type of behavior observed in the lab can be very similar to the one undertaken in a similar natural setting, and the behavioral responses of student and non-student participants in lab experiments are often the same (cf. Alm et al. 2015).

Following the previous discussion, we formulate the following hypotheses on the potential effect of each type of informational treatment:

**Efficiency hypothesis:** Participants may pay attention to the amount allocated to carbon offsets, but not necessarily to the total quantity of emissions abated. Reminding them the cost differential between domestic and foreign reforestation programmes generating carbon offsets increases the amount allocated to foreign programmes and thus the overall abatement of carbon emissions.

**Confidence hypothesis:** Participants may not find projects abroad trustworthy. Providing guarantees on the trustworthiness of reforestation projects' providers increases the amount allocated to programmes abroad and thus the overall abatement of carbon emissions.

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<sup>1</sup>Note however that concerns have been raised about the limits of forest sinks. Unlike decarbonisation processes such as the development of renewable energy, forests sinks are affected by the so-called permanence problem (Gren and Zeleke, 2016). Indeed, uncertainties regarding climate change, the occurrence of wildfires or future anthropogenic activities provide no guarantee that all new forests (and thus the stored carbon) will stand on the long run (Galik and Jackson, 2009). Therefore, some national policies do not include international afforestation programmes in their eligible offsets programmes (cf. e.g. Swiss Federal Council, 2016).

<sup>2</sup>Stated preference studies include Brouwer et al. (2008), MacKerron et al. (2009), Carlsson et al. (2012), Blasch and Farsi (2014), Blasch and Ohndorf (2015) and Torres et al. (2015). Ovchinnikova et al. (2009), Löfgren et al. (2012) and Diederich and Goeschl (2014) are examples of revealed preference studies.

**Local benefits hypothesis:** Given that the main focus of the experiment is on greenhouse gas emissions, participants may neglect the local benefits of reforestation programmes. Reminding them the benefits of local forests increases the amount allocated to domestic reforestation programmes.

## 2.2 Experimental design

Carbon offsets can be generated by different activities, e.g. by energy-saving projects or carbon sequestration programmes. We base our experiment on forests since they are cognitively easier to understand for participants and since they allow us focusing on both developed and developing countries in a very similar context.

An additional advantage is that, while trees and forests may differ across countries in many characteristics, they can still represent the ideal of a homogeneous good in terms of CO<sub>2</sub> sequestration. Indeed, the effect on climate change mitigation of one ton of abated CO<sub>2</sub> is the same irrespective of the location this abatement took place. Also, relatively precise information on the CO<sub>2</sub> sequestration ability of each tree is available for both reforestation programmes in our study.

We select two reforestation programmes providing the same abatement per tree in both the domestic and the foreign (developing) country, but with a much lower price in the latter. The programme in the developed home country is located in Visp, Switzerland, while the programme in the developing country is located in Limay, Nicaragua. In these programmes, a tree in both Switzerland and Nicaragua captures 15 kg of CO<sub>2</sub> per year, while its price is 10 Swiss francs (CHF) in the former and only 3 in the latter country.<sup>3</sup> That is, given the price differential, with the same budget (e.g. with the same fiscal revenues from a carbon tax), emissions abatements can be three times larger in Nicaragua.

We ran the experiment in Geneva, Switzerland, in December 2015, with a sample of more than 300 students in management<sup>4</sup>. The experiment is organized in two stages. The first stage determines participants' endowment, and their donation to carbon offset projects. It thus introduces some variability in both the endowment and the amount of the donation. The allocation of this donation between domestic and international projects is then analysed in the second stage.

In the first stage, participants are randomly provided with 4 questions about microeconomics, whose answers determine their monetary endowment, along with a show-up fee of 2 Swiss francs. Each correct answer is rewarded with 2 francs, and so participants have the possibility to earn up to 8 additional francs.

Once the endowment is determined, participants are given the option to donate a share of it to the purchase of carbon offsets through reforestation programmes. At this stage, participants only decide how much money they want to spend in the purchase of carbon offsets and how much they keep for themselves, without further information on the specificities of the reforestation programme generating the carbon offsets. Participants are informed about some basic facts of climate change; are introduced to the role of deforestation in increasing the stock of greenhouse gas emissions in the atmosphere; and how reducing deforestation or increasing afforestation may help mitigating climate change. All participants are also informed that a nominal reforestation certificate can be made available to all purchasers of carbon offsets if they are willing to declare their identity once the experiment is over. This procedure may reassure participants that the purchase of carbon offsets is really taking place,

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<sup>3</sup>1CHF $\approx$ 1USD at the time of the study.

<sup>4</sup>See the Appendix for the full questionnaire.

TABLE 1: Reforestation programmes

	<b>Programme 1</b>	<b>Programme 2</b>
<b>Place</b>	Visp, Switzerland	Limay, Nicaragua
<b>CO<sub>2</sub> / tree / year</b>	15 kg	15 kg
<b>Cost / tree</b>	CHF 10	CHF 3

knowing also that reputational effects may have a significant positive impact on the contribution to a public good (Milinski et al., 2002).<sup>5</sup>

In the second stage, once the amount dedicated to reforestation is elicited, respondents are asked in a second stage to split it between the two specific programmes, taking place in Switzerland and Nicaragua. This decision represents our outcome of interest, as it allows understanding the preferences of people towards generating carbon offsets through a domestic or an international reforestation programme. Basic information about both reforestation programmes is provided to all participants as done in Table 1.

However, additional information is randomly provided in the form of the following three treatments. Treatment 1 (T1) stresses the price differential between buying a tree in Nicaragua and in Switzerland, emphasizing that funding the least-cost programme would result in higher emissions abatement, for a fixed endowment. T1 is thus designed to test the efficiency hypothesis. Treatment 2 (T2) informs participants that both programmes are guaranteed by reputable and independent institutions: the United Nations Environment Programme for the Nicaraguan project and the local government for the domestic programme. Hence, this treatment is designed to test the confidence hypothesis. Treatment 3 (T3) introduces the role of local ancillary benefits of reforestation. We recall to participants the recreational activities that the Swiss population undertakes in local forests, the importance of forests for the local biodiversity, as well as the availability of wood and non-wood products for collection, for providing local jobs and for contributing to economic growth. T3 is so designed to test the local benefits hypothesis, favouring the domestic reforestation programme.

Following the standard procedure, we administer a short debriefing survey to understand students' contributions and collect the usual socio-economic characteristics.

### 3 Empirical analysis

#### 3.1 Descriptive statistics and first stage

We analyse the data from the two stages of our experiment. The first stage determines the endowments and participant's contribution to the purchase of carbon offsets. The second stage captures the allocation decision between the two reforestation programmes and addresses our main research question. Table 2 provides information on the first stage for the full sample. Descriptive statistics of the explanatory variables are available in Table A.1 in the Appendix. On average, participants contribute to climate change mitigation with about 6 francs each, i.e. about 80% of the average endowment of about 7 francs. Yet, 15% of them are not willing to contribute at all to a reforestation program.

<sup>5</sup>Information on these programmes is available at <https://www.helvetia.com/ch/content/fr/qui-somme-nous/engagement/foret-protectrice.html> (last accessed on November 26<sup>th</sup>, 2015) and <http://http://www.tree-nation.com/plant> (last accessed on November 26<sup>th</sup>, 2015).

In this stage, we analyse the propensity to contribute to a generic reforestation programme generating carbon offsets relative to the initial endowment. Our econometric specification is given as follows:

$$y_i = a + bx'_i + \varepsilon_i \quad (1)$$

With  $y_i$  the fraction of endowment given to reforestation by individual  $i$ ,  $a$  a constant,  $b$  the vector of coefficients for different control variables included in the matrix of covariates  $x$  and  $\varepsilon_i$  the heteroskedasticity-robust standard error.

Following the environmental psychology literature, we would expect pro-environmental behaviour to depend positively on the following two arguments. First, the feeling of responsibility to contribute to the environmental public good at stake, the so-called “ascription of responsibility” (see e.g. Stern et al. 1999). Second, the perception of the environmental impact that behaving in a pro-environmental way would generate, the so-called “awareness of consequences”.

To measure ascription of responsibility, we use two variables. The first variable is the standard measure of climate concern from the Gallup survey (cf. Lee et al. 2015) and the World Value Survey (WVS). Individuals were asked to answer on a 5 Likert scale from “I do not agree at all” to “I totally agree” to the following statement: “I consider that climate warming is a serious threat for the future”. We transform this variable into a binary measure (called *Climate concern*) taking the value 1 if an individual “pretty much agrees” or “totally agrees”, and 0 otherwise. As shown by the descriptive statistics in Table A.1 in the Appendix, the variable for environmental concern scores particularly high, with 86% of the sample declaring to be concerned by climate change. For comparison, in the 2007 wave of the World Values Survey climate concern in Switzerland was about 89%.<sup>6</sup> The second variable is a dummy taking value 1 if respondents feel morally obliged to contribute to climate change mitigation (we call it *Moral obligation*). This variable results from the “pretty much agree” and “totally agree” answers to the following statement: “I feel morally obliged to protect climate.” Compared to climate concern, a relatively lower proportion (67%) states to feel morally obliged to contribute to climate change mitigation.

To measure awareness of consequences, we use a variable capturing the belief that even small contributions to climate change are important, such as the ones under examination in this study. This question was worded as follows: “How do you agree to the following statement? ‘In my opinion, even small contributions are useful to protect the climate’”. 85% of the sample considers that even small contributions are important.

As remarked by Nyborg et al. (2006), we note that considering a public good as important is a necessary, but not sufficient, condition for the voluntary provision of such good. Obviously, individuals cannot spontaneously contribute to the optimal provision of all public goods. Whether an individual is willing to contribute to a given good also depends on the descriptive norm concerning the provision of such good, i.e. what others do. Much evidence has been provided on conditional cooperation in local environments (Fehr and Fischbacher 2003). However, conditional cooperation in the climate commons may appear less likely. Yet, according to Ostrom (2009), managing global dilemmas requires as much trust as managing local dilemmas does. Ostrom’s claim relies on the observed existence of reciprocity and trust at the local level, which may benefit the provision of any social good, regardless of its local or global characteristics. Supporting Ostrom’s intuition, Carattini

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<sup>6</sup>Given the expected low variation across respondents in this type of questions, we also identify members of environmental organisations, a measure that usually performs relatively well as indicator of “greenness”.

TABLE 2: Descriptive statistics

Variable	Contributors	Non-contributors
Endowment	7.15 (1.90)	7.34 (1.93)
Contribution	5.81 (2.59)	0 (0)
Contribution (% of initial endowment)	0.83 (0.30)	0 (0)
Observations	261	46

Standard deviations in parentheses.

et al. (2015) find for instance a negative correlation between trust and greenhouse gas emissions among European countries. Ostrom’s element of trust reconciles with the model of Nyborg et al. (2006): since the norm is not always visible, individuals may form a belief on the expected contribution by others (see also Carattini 2015). This case applies to our experiment since communication is strictly forbidden between players. Hence, we use as measure of participants’ belief of others’ contribution the answers to the following question: “In your opinion, what share of their endowment other participants on average contributed to the reforestation program?”.

We also add to the model a few variables that are related with the specificity of the public good under scrutiny. Since no details on the reforestation programmes are provided at this stage, it is plausible that some individuals that use local forests may be more likely to contribute than others. Frequent usage is indeed a common determinant of contribution to the provision of ecosystem services in general (Czajkowski et al., 2014). We thus ask how often the respondent visits forests in general and add a dummy variable to account for regular or frequent visits.

In addition, two other elements have to be taken into account in the specific case of carbon offsets. While individuals may be ready to contribute to climate change, they may not be willing to do so through the purchase of carbon offsets. First, several practical reservations can be applied to the use of carbon offsets (see Conte and Kotchen 2010) and no guarantees on the quality of the project providers are given at this stage. Most practical reservations concern the effective realisation of projects generating carbon offsets, as well as the possibly faulty application of the condition of additionality. Recent scandals, mainly related with the Joint Implementation programme, may have contributed to the opinion that carbon offsets do not always really reduce emissions (see Schneider and Kollmuss 2015, but also Tirole 2012). Also, some may be concerned by the (in)effectiveness of forests as carbon sinks in the long run. We thus capture such possible opinion with the degree of agreement to the following statement: “Reforestation is effective in reducing the stock of CO<sub>2</sub> in the atmosphere in the long run”. Second, general ethical considerations may limit the uptake of carbon offsetting in general. In this context, we try to capture the potential opposition to the “commodification” of nature, an argument often used by environmentalists to oppose the use of market-based solutions to environmental externalities (Baron and Leshner, 2000; Sandel, 2012). We thus exploit answers to the following statement: “I do not want to consider natural resources as a marketed commodity.”

Table 3 presents our estimates. Given that our outcome variable is a continuous variable bounded between 0 and 1 (ratio of contribution over endowment), we estimate both an ordinary least squares (OLS) and a specific generalised linear model for fractional outcomes (GLM). Columns (1) and (2)

TABLE 3: Average marginal effects on contributions

	(1)	(2)
	OLS	GLM
Climate concern	0.039 (0.08)	0.016 (0.07)
Small contributions are important	0.13* (0.07)	0.11* (0.06)
Green member	-0.00099 (0.05)	-0.0084 (0.06)
Moral obligation	0.0099 (0.05)	0.016 (0.04)
Belief about others' contribution	0.71*** (0.06)	0.68*** (0.05)
Frequent forest user	0.071 (0.05)	0.070 (0.05)
Practical reservations	-0.069 (0.05)	-0.055 (0.04)
Ethical reservations w.r.t. the commodification of nature	-0.024 (0.04)	-0.016 (0.04)
Observations	299	299
Adjusted- $R^2$	0.347	

Heteroskedasticity-robust standard errors in parentheses.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

show our coefficients for OLS and the average marginal effect of a fractional logit GLM, respectively.<sup>7</sup> Since all estimates are statistically the same in both columns, and to allow for straightforward interpretation, we comment the estimated effects based on column (1).

Virtually all variables have the predicted sign. If we look at the statistical significance of our estimates, our model suggests that the demand for carbon offsets generated by reforestation programmes is dominated by attitudinal variables, in particular the belief that small contributions do help to make a difference, as well as the belief about others' contributions. We expected that if you believe that even your action has an importance in helping the environment, then you are willing to contribute more. Results about the belief of others' contributions match the recent evidence of Blasch and Farsi (2014), Blasch and Ohndorf (2015) and Schwirplies and Ziegler (2016). All these studies find indeed a positive effect on the demand for carbon offsets for variables very similar to our measure of beliefs about others' behaviour, namely, and respectively, "expected cooperation", "expected share of offset customers in society" and "expectation of society". Along with related literature showing similar patterns for other climate-friendly behaviours, this evidence is used to support the existence of conditional cooperation in the climate commons (Carattini 2015). Not surprisingly for a lab experiment, even if with a relatively large sample, none of the other covariates reaches the standard thresholds for statistical significance. The signs of their coefficients indicate that moral obligations, concern about climate change and frequent use of forests tend to be positively correlated with the demand for carbon offsets, while ethical concerns tend to decrease the likelihood of a purchase. Green membership does not have a statistically significant impact, but its sign is at odds with expectations. It may capture ethical concerns with respect to offsetting other than the risk of commodification of nature. In this respect, a recent study analyses the reasons of ecological and environmental economists for participating in the official offsetting programmes of their respective academic conferences, showing that the main ethical concern expressed by conference participants is rather related to moral licensing, i.e. the implications of encouraging carbon-intensive lifestyle by supporting the use of carbon offsets (Carattini and Tavoni 2016, cf. also Anderson 2012).

In the questionnaire we also asked for participants' income. Given the relative loss in observations that the inclusion of the income variable implies, we do not consider income differences in our model. Yet, we note that running additional estimations accounting for income differences do not affect, statistically speaking, any of the estimates of Table 3, while the coefficient for income does not reach statistical significance. This result comes as no surprise, since the private demand for environmental quality is likely to be only partially expressed, due to the (global) public good characteristics of climate change mitigation (cf. Roca 2003).

Given the supporting results of the first stage, we now turn to the second stage to analyse the effects of our treatments.

### 3.2 Second stage

The second stage includes only participants providing a strictly positive monetary contribution to the generic reforestation programme. We examine the decision to allocate such contribution between

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<sup>7</sup>A tobit model could also be a potential candidate for a non-linear fit of our data. We thus follow Papke and Wooldridge (1993) and apply a specification link test to select the most appropriate model between the fractional logit GLM, and a tobit model. The specification test rejects the null hypothesis of good link specification for the tobit model ( $p\text{-value}<0.001$ ), whereas it does not for the fractional logit GLM ( $p\text{-value}>0.90$ ). Based on the test outcome, we select GLM as our preferred non-linear specification. All additional estimations are available by the authors upon request.

TABLE 4: Allocation of the monetary contributions to the programme abroad, per treatment

	T0	T1	T2	T3
Mean contribution to the international programme (% of total contribution)	0.63	0.73	0.64	0.59
	(0.35)	(0.36)	(0.34)	(0.33)
Frequency of contributions to the international programme > 0	0.86	0.88	0.87	0.86
	(0.35)	(0.33)	(0.34)	(0.35)
Observations	59	66	70	66

Standard deviations in parentheses.

the domestic and the foreign reforestation programme. Participants are randomly allocated to one of the four treatments, which results in 59 to 70 observations for each treatment. We create our variable of interest as a ratio, with the participant’s contribution to the reforestation programme abroad as numerator, and her total contribution as denominator. We expect this ratio to be affected by the informational treatments as discussed in Section 2.1. Table 4 shows some statistics for our dependent variable for each treatment group. As expected, we observe some variation across treatments. In particular, contributions to the reforestation programme located abroad are the highest with the efficiency treatment, and the lowest with the local benefits treatments.

In the econometric analysis, we test whether these differences among treatments are statistically significant, conditional on covariates, and we assess the magnitude of the treatment effects. We test the following specification:

$$Y_i = \alpha + \beta_1 T_1 + \beta_2 T_2 + \beta_3 T_3 + \gamma X_i' + \epsilon_i \quad (2)$$

in which our dependent variable  $Y$  is the percentage of participant  $i$ ’s contribution allocated to the reforestation programme implemented abroad,  $\alpha$  a constant and  $\beta_j$  the treatment effect for treatments  $j = 1, 2, 3$ .  $X_i$  is a vector of control variables and  $\gamma$  the vector of associated coefficients. Controls take into account the possible heterogeneity across individuals, along with  $\epsilon_i$ , the heteroskedasticity-robust standard error.<sup>8</sup>

Since the outcome variable is a fraction, we compare the estimates from ordinary least squares (OLS) with those of a fractional logit GLM, as in the first stage. As shown by Table 5, all estimates for the variables of interests are robust across specifications. We thus again interpret the results based

<sup>8</sup>Due to the randomised allocation of the treatments, the inclusion of control variables does not affect the coefficients of the observed treatment effects, but it does increase the model’s precision. Descriptive statistics for these variables are available in Table A.2 in the Appendix. The number of observations only slightly decreases when introducing control variables. The use of heteroskedasticity-robust standard errors is justified by standard heteroskedasticity tests such as modified Wald and Breusch-Pagan/Cook-Weisberg tests. The estimates for the control variables are displayed by Table A.3 in the Appendix. Virtually all coefficients have the expected sign, but most variables are not statistically significant. Declaring to be a frequent visitor of forests does not significantly affect the contribution to the local programme, nor does having previous experience with the domestic forest mentioned in the experiment. General ethical reservations such as being unwilling to consider natural resources as a marketed commodity, as well as other ethical concerns related with offsets abroad, such as opposition to carbon markets or concerns on the fairness of offsetting domestic emissions abroad do not reach statistical significance either. Given the relatively low number of observations and low variability of these variables, these results are not particularly surprising. Related to the previous discussion on conditional cooperation in the climate commons, we find that expectation about others’ behaviour also shapes the allocation decision. Finally, our indicator of economic literacy, which indicates whether the respondent has some basic knowledge in microeconomics, increases contribution to the reforestation programme implemented abroad, as expected. This result seems consistent with the assumption of Braaten et al. (2015) on the potential impact of economic training, who maintain that economists are typically taught to focus on outcome, i.e. on efficiency.

TABLE 5: Average treatment effects

	(1)	(2)
	OLS	GLM
Efficiency treatment (T1)	0.11*	0.12*
	(0.06)	(0.06)
Confidence treatment (T2)	0.026	0.025
	(0.06)	(0.06)
Local benefits treatment (T3)	-0.025	-0.024
	(0.06)	(0.05)
Covariates	Yes	Yes
Observations	256	256
Adjusted $R^2$	0.15	
AIC	148.5	1.08

Heteroskedasticity-robust standard errors in parentheses.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

on the estimates from OLS.

Compared to the control group, the reference in the regressions, we find that all treatments have the expected effect. The informational treatment that reminds the importance of efficiency reasons in favour of the programme generating carbon offsets abroad and the treatment that provides guarantees on the quality of the offsetting programmes have both a positive impact on the relative allocation to the reforestation programme in Nicaragua. Likewise, the local benefits treatment increases the likelihood of the domestic programme. However, only the efficiency treatment has a statistically significant impact. This result suggests, as in Cherry et al. (2012), that participants tend to not completely factor in the efficiency argument supporting the use of international carbon offsets. Our causal estimate suggests that the efficiency treatment leads to about a 10 percentage point increase in the contribution to the programme generating carbon offsets abroad, compared to the neutral framing of the control group.

On the contrary, the results suggest that the potential lack of credibility of the programme abroad is not a major concern for the individuals in the sample, who perhaps trust the experimenters in their choice of the reforestation programmes. Indeed, debriefing questions report that only 12% of respondents do not trust the Nicaraguan government for the implementation of the international reforestation programme, while no participant stated distrust in the Swiss government. Furthermore, we note that trust in the Nicaraguan government for the sub-sample having experienced treatment 2 is not statistically different than the reported average for the whole sample, supporting this explanation. Another reason could contribute to explain this result. It could be that the scepticism towards carbon offsets affects domestic and international reforestation programmes in the same way. In the same spirit, we find that participants account already to a large extent for the potential benefits derived by the local programme, including how it may support the local biodiversity, which explains the limited effectiveness of the local benefits treatment in boosting contributions to the local programme. If asked whether they would have contributed more to a reforestation programme taking place in an industrialised country rather than in Nicaragua, about 55% affirms they would have contributed the same.

TABLE 6: Average treatment effects on the probability to contribute to the programme abroad (extensive margin)

	(1)	(2)
	OLS	Logit
Efficiency treatment	0.030 (0.058)	0.022 (0.058)
Confidence treatment	0.039 (0.059)	0.032 (0.056)
Local benefits treatment	0.018 (0.060)	0.0048 (0.055)
Covariates	Yes	Yes
Observations	256	256

Heteroskedasticity-robust standard errors in parentheses.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Given the effectiveness of the efficiency treatment, and to orient potential policy interventions, we now analyse whether the response that we observe to treatment 1 takes place on the intensive or on the extensive margins. In the same spirit, we also look at heterogeneous treatment effects to determine whether responses to this treatment vary based on some of the participants' characteristics.

### Intensive vs. extensive margin

Our results show that the efficiency treatment increases on average the contribution to the reforestation programme generating carbon offsets abroad relative to the domestic reforestation programme. This increased contribution could take two forms. In the efficiency treatment, we could either observe the same proportion of participants contributing to the programme abroad as in the control group, but these would on average be contributing more. On the other hand, we could observe a higher proportion of participants contributing with a positive sum to the programme abroad, without necessarily having a different average contribution. That is, the change in behaviour could take place both on the intensive and extensive margins, respectively. To do so, and given the results of Table 5, we look at the treatment effects on the proportion of individuals contributing a positive value to the programme abroad, i.e. we isolate the effect on the extensive margin. Descriptive statistics in Table 4 show that this proportion does not differ significantly across treatments. This is confirmed by the models presented in Table 6, showing that the effect of the treatments is not statistically significant. Since the dependent variable is binary, whether the individual allocates a strictly positive share of her contribution to the international programme, we show both estimates from OLS and logit.<sup>9</sup>

Hence, while the informational treatment that stresses the gain in economic efficiency of generating carbon offsets abroad has a positive impact on the average contribution to the programme abroad, this treatment does not affect the proportion of individuals contributing a positive amount to this programme, i.e. the extensive margin. That is, participants that are already predisposed to contribute to the programme abroad are likely to increase their contribution, whereas the remaining participants

<sup>9</sup>Results including covariates are presented in Table A.4 in the Appendix. Estimates from a probit model would lead to the same conclusions.

are likely to be unaffected. Hence, in presence of strong preferences for the local programme, the efficiency treatment may not be effective.

TABLE 7: Heterogeneous treatment effects

	(1)	(2)	(3)
	Offsetting abroad is acceptable	Ethical reservations w.r.t. commodification of nature	Economic growth is the priority (vs. the environment)
T1 x Offset abroad	0.16* (0.08)		
T1 x NO offset abroad	0.096 (0.07)		
T1 x Ethical reservations		0.068 (0.08)	
T1 x NO ethical reservations		0.15** (0.08)	
T1 x Economy the priority			0.055 (0.13)
T1 x Economy NOT the priority			0.12* (0.06)
Confidence treatment	0.024 (0.06)	0.023 (0.06)	0.025 (0.06)
Local benefits treatment	-0.022 (0.06)	-0.023 (0.06)	-0.022 (0.06)
Constant	0.44*** (0.09)	0.422*** (0.09)	0.44*** (0.09)
Covariates	Yes	Yes	Yes
Observations	256	256	256
$R^2$	0.19	0.19	0.19
Adjusted- $R^2$	0.15	0.15	0.15

Heteroskedasticity-robust standard errors in parentheses. T1 represents the efficiency treatment.

In all specifications we control for beliefs about others' contribution and frequent forest users, experience with the domestic site, acceptability of offsets abroad, ethical reservations against the commodification of nature, climate concern, green membership and economic growth as the priority (vs. the environment).

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Heterogeneous effects

To disentangle the heterogeneous effects of our most effective treatment on different subgroups of the sample, we test several extensions of model (2) adding interaction terms. We believe that some subsamples could be particularly affected by the efficiency treatment. We test the interaction between the efficiency treatment and the following dummy variables: *offsetting abroad is acceptable*; *ethical reservations with respect to the commodification of nature*; and *economic growth, rather than envir-*

*environmental protection, is the priority.* Similar to models (1) and (2), we estimate the coefficients with OLS. All of the results are quantitatively the same when estimating with GLM. Column (1) shows the heterogeneous effect of T1 on individuals who think that it is morally acceptable to compensate CO<sub>2</sub> emissions abroad. Not surprisingly, only those considering carbon offsets generated abroad as acceptable react to the informational treatment, whereas those expressing ethical concerns in this matter are more likely to remain on their positions. This supports the evidence provided on the treatment effect on the extensive margin. Relatedly, column (2) shows that only the participants that do not have ethical reservations related with the commodification of nature are affected by the efficiency treatment. Finally, we look at whether “green” individuals are more or less responsive to the efficiency treatment than the rest of the sample. We use as proxy for greenness the WVS question “Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent”. Interestingly, we find that, on average, “green” participants tend to participate more in the purchase of carbon offsets generated abroad when submitted to the efficiency treatment. This suggests that, absent any external intervention, people caring for the environment may be reticent to contribute in “large” proportions to the programme abroad, but stressing the higher environmental impacts achieved abroad with the same amount of money may be very effective in spurring participation to the international reforestation programme.

## Discussion

Our results are very closely related to a common finding in the literature on the acceptability of energy and carbon taxes. Voters tend in general to prefer “non-coercive” instruments such as subsidies to environmental taxes, because they perceive the former as an effective incentive rewarding good behaviour while the latter as an ineffective punishment (Steg et al. 2006). Environmental taxes are thus often perceived as Ramsey-type instruments aiming at raising additional fiscal revenues rather than Pigouvian policies modifying behaviour to correct for existing externalities, hence their unpopularity. However, this stylised fact does not apply to all individuals in the general public. For those individuals that do perceive the environmental effectiveness of environmental taxes (without the need for environmental earmarking), the support for these instruments is much higher, as shown in several studies (cf. e.g. Bristow et al. 2010; Kallbekken and Sælen 2011; Sælen and Kallbekken 2011; Baranzini and Carattini 2016; Carattini et al. 2016a,b). Our results are very much complementary. In this study, making salient the large differential in terms of environmental effectiveness between the two reforestation programmes is the key driver for a higher willingness to support otherwise less popular international carbon offsets.

Our results have important implications for policy makers. While addressing the issue of credibility of programmes abroad after the recent scandals related to the Joint Implementation projects is in our view crucial, credibility is probably not the main concern for the general public. The main driver to higher support for carbon offsets abroad is another: while for economists it is obvious that efficiency reasons would play in favour of abating emissions where it is cheapest, assuming that this is obvious also for the general public may be misleading. Information thus need to flow from governments to the general public to make people understand why it is so important to undertake emissions abatements in developing countries. While other valid arguments oppose the use of carbon abatements abroad, our results show that stressing the importance of being able to provide a higher environmental benefit is sufficient to have an important fraction of contributions switching from the local to the international programme. Linking carbon markets between developed and emerging countries would also require

sufficient political support in the former, backing the purchase of carbon allowances from low- and middle-income countries. Therefore, reducing opposition to abatements taking place abroad may be highly beneficial for the prospect of future domestic and international climate policy.

## 4 Conclusion

Turning pledges into operational policies is the next challenge for policy makers. These policies need not only to be sufficiently effective to reach the emissions abatement objectives. They also need to be as inexpensive as possible to leave some economic and political room for further policy tightening, in particular when it will come to set post-2020 ambitions. Only in this way we can hope to have a credible global climate policy capping the global temperature increase at maximum 2°C above pre-industrialised levels.

Many political obstacles face the realisation of pledges in a cost-effective way. One of these is the public resistance to the use of carbon credits and carbon offsets associated with greenhouse gas abatements in foreign countries, instead of domestically. We address this issue in an experimental framework, in which participants are requested to allocate funding between a domestic and an international reforestation programme, the latter taking place in a developing country, where it is cheaper.

We apply several informational treatments and find that the allocation decision is responsive to the provision of information on the cost-effectiveness of the reforestation programme implemented abroad. On the contrary, the decision is not particularly responsive to guarantees addressing a potential lack of credibility of the reforestation programme in the developing country and to information on the local benefits associated with the domestic programme. Our results suggest that stressing the potential for higher abatements in foreign countries is effective in changing participants' prior in favour of international carbon offsets. Hence, individuals in the general public may be willing to increase their support for the use of international carbon offsets and related carbon markets, provided that they are in position to appreciate their environmental benefits.

Our novel findings contribute to the literature on the acceptability of climate policy instruments and on the emerging literature on carbon offsets. They suggest that some of the potential resistance to the use of carbon credits and carbon offsets generated in foreign countries may be, to some extent, spurious. Effective communication from policy makers could then address and partly overcome, as in our experiment, such resistances. While current pledges may not be sufficient to avoid dangerous interferences with the climate system, they are already relatively ambitious to the extent that they require a high number of countries to implement, in a relatively short timeframe, policies of unprecedented scope and stringency. As time goes by, and policy-makers take their time to implement the required policies, the level of stringency requested to meet the climate targets increases. International carbon offsets can represent a timely response to ensure that the current pledges are met, and so support the functioning of Paris' ratchet mechanism, and the survival of the whole agreement.

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## Appendix

TABLE A.1: Descriptive statistics (1<sup>st</sup> stage)

Variable	Mean	Std. Dev.	Min.	Max.	N
Endowment CHF	7.2	1.87	2	10	299
Contribution >0 0/1	0.86	0.35	0	1	299
Contribution (% of initial endowment)	0.70	0.4	0	1	299
Climate concern 0/1	0.86	0.34	0	1	299
Small contributions are important 0/1	0.85	0.36	0	1	299
Green member 0/1	0.09	0.29	0	1	299
Moral obligation 0/1	0.67	0.47	0	1	299
Belief about others' contribution (% of initial endowment)	0.53	0.30	0	1	299
Frequent forest user 0/1	0.19	0.39	0	1	299
Practical reservations 0/1	0.27	0.45	0	1	299
Ethical reservations w.r.t. the commodification of nature 0/1	0.48	0.5	0	1	299

TABLE A.2: Descriptive statistics (2<sup>nd</sup> stage)

Variable	Mean	Std. Dev.	Min.	Max.	N
Belief about others' contribution abroad 0/1	0.70	0.46	0	1	256
Economic literacy 0/1	0.43	0.520	0	1	256
Frequent forest user 0/1	0.19	0.39	0	1	256
Experience with domestic site 0/1	0.35	0.48	0	1	256
Offsetting abroad is acceptable 0/1	0.29	0.45	0	1	256
Ethical reservations w.r.t. the commodification of nature 0/1	0.49	0.50	0	1	256
Carbon markets are acceptable 0/1	0.21	0.41	0	1	256
Green member 0/1	0.10	0.30	0	1	256
Economy the priority 0/1	0.11	0.31	0	1	256

TABLE A.3: Average treatment effects

	(1)	(2)
	OLS	GLM
Efficiency treatment (T1)	0.11*	0.12*
	(0.06)	(0.06)
Confidence treatment (T2)	0.026	0.025
	(0.06)	(0.06)
Local benefits treatment (T3)	-0.025	-0.024
	(0.06)	(0.05)
Belief about others' contribution abroad	0.26***	0.24***
	(0.05)	(0.04)
Economic literacy	0.068*	0.067*
	(0.04)	(0.04)
Frequent forest user	0.033	0.034
	(0.06)	(0.06)
Experience with domestic site	-0.043	-0.043
	(0.04)	(0.04)
Offsetting abroad is acceptable	0.019	0.023
	(0.04)	(0.04)
Ethical reservations w.r.t. to the commodification of nature	-0.031	-0.032
	(0.04)	(0.04)
Carbon markets are acceptable	0.0083	-0.0069
	(0.05)	(0.05)
Green member	0.10	0.11
	(0.06)	(0.07)
Observations	256	256
Adjusted $R^2$	0.15	

Heteroskedasticity-robust standard errors in parentheses.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

TABLE A.4: Average treatment effects on the probability to contribute (extensive margin)

	(1)	(2)
	Logit	OLS
Efficiency treatment	0.022 (0.058)	0.030 (0.058)
Confidence treatment	0.032 (0.056)	0.039 (0.059)
Local benefits treatment	0.0048 (0.055)	0.018 (0.060)
Belief about others' contribution abroad	0.19*** (0.029)	0.22*** (0.054)
Economic literacy	0.029 (0.039)	0.025 (0.041)
Frequent forest user	0.042 (0.059)	0.040 (0.048)
Experience with domestic site	-0.024 (0.040)	-0.022 (0.042)
Offsetting abroad is acceptable	0.068 (0.051)	0.056 (0.042)
Ethical reservations w.r.t. to the commodification of nature	0.013 (0.039)	0.010 (0.040)
Carbon markets are acceptable	-0.040 (0.049)	-0.030 (0.051)
Green member	0.13 (0.11)	0.081 (0.051)
Covariates	Yes	Yes
Observations	256	256

Heteroskedasticity-robust standard errors in parentheses.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Questionnaire

Welcome and thank you for participating to our experiment on climate policy!

Please read questions and texts carefully and answer sincerely without communicating with your classmates. By participating to this experiment, you can earn up to CHF 10 if you answer all questions until the end of the survey. Your answers will be treated anonymously. Your participation and answers have no impact on your final grade.

You will now have to answer 4 true/false questions. We give you CHF 2 for your participation and every correct answer will be rewarded by other CHF 2. You have 90 seconds to answer all 4 questions.<sup>10</sup>

1. **The demand curve for a good/service is generally downward sloped.**  True  False
2. **The income-elasticity of demand for an inferior good is negative.**  True  False
3. **Macroeconomics analyses households and firms' decisions.**  True  False
4. **“It is unfair that poor households pay the same amount for their health insurance as a billionaire .” This is a normative statement.**  True  False
5. **Economists generally assume that individuals are irrational and altruist and maximize the welfare of the society (homo oeconomicus).**  True  False
6. **In 2014, Switzerland exported more coffee than chocolate, in monetary value.**  True  False
7. **Perfect competition refers to a market where a firm has no influence on prices.**  True  False
8. **Monopoly is an imperfect competition market structure, wherein a single buyer will push the price downward.**  True  False
9. **The opportunity cost of an activity represents the value of the best alternative.**  True  False
10. **The “invisible hand” described by Adam Smith is a metaphor to illustrate the State’s intervention in the economy.**  True  False

Congratulations! You have earned CHF\_\_\_\_\_. We remind you that you must finish answering the questionnaire to receive this amount. Instructions on how to be paid are given at the end.

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<sup>10</sup>Students were randomly provided 4 questions among the following 10.

**Please read the following text:**

Climate warming is a phenomenon of increasing temperature at the world level. It is partly caused by greenhouse gas (GHG) emissions from human activities. Main consequences on the environment and humankind predicted by the IPCC (Intergovernmental Panel on Climate Change) are the following:

1. Polar glaciers melting and increasing sea level
2. Extinction of numerous vegetal and animal species
3. Lower land productivity
4. More difficult access to water resources
5. Increasing number of extreme meteorological phenomena (heavy rains, storms, drought, etc.)
6. Increasing mortality linked with heat, extension of zones infested by diseases such as cholera, malaria, allergies...
7. Mass migration by people who have lost their land
8. Risk of global geopolitical destabilisation and civil wars

Carbon dioxide (CO<sub>2</sub>) is the main greenhouse gas responsible for climate warming. CO<sub>2</sub> emissions are mainly caused by the combustion of fossil fuels such as coal, oil or natural gas, for energy production or industrial activities. However, deforestation across the world has contributed to GHG emissions to a larger extent than transportation. Indeed trees absorb CO<sub>2</sub> from the atmosphere and are thus important carbon sinks, so that increasing reforestation or reducing deforestation are effective and efficient tools to reduce CO<sub>2</sub> emissions.

**Part 1:**

You now have the opportunity to participate in a real reforestation programme, which will allow taking CO<sub>2</sub> out from the atmosphere. Thanks to your contribution, we will finance tree planting, which would offset CO<sub>2</sub> emissions linked with all economic activities, including your own activities. The funding to reforestation programmes will be taken from the amount that you have earned in the previous questions. You can freely decide which amount you wish to give to tree planting, without exceeding the amount that you have earned.

The money will really be used to finance reforestation. We will receive a certificate attesting the tree planting. If you participate and wish it, your name can be added on the reforestation certificate. Otherwise, you can keep complete anonymity.

Please note again that your participation to this experiment is not mandatory and will have no impact on your final grade.

**What amount of your earnings do you want to (total must be equal to your earnings - otherwise an error message is displayed):**

Give to the reforestation programme: CHF \_\_\_\_\_

Keep for you: CHF \_\_\_\_\_

At the end of the survey you will receive CHF \_\_\_\_\_ and CHF \_\_\_\_\_ will be used to finance reforestation.

**Among the following reasons, which one is the main reason why you did not contribute more to the reforestation programme?**

- I prefer using the money for things that are more valuable to me
- I have the feeling that I legitimise a bad behaviour
- I disagree with individual CO<sub>2</sub> offsetting
- I do not want to consider natural resources as a marketed commodity
- I do not agree to be asked to buy something within the framework of this survey
- I would like more information

**In your opinion, what share of their endowment other participants on average contributed to the reforestation programme? \_\_\_\_\_%**

**Part 2:**

You now have the choice to split your contribution between two different reforestation programmes. You can freely allocate your amount between the two programmes. Please notice that we will collect all participants' contributions and finance trees from the overall amount. We will complete the missing fraction of a tree, if needed. Hence there is no problem if you cannot finance an entire tree.<sup>1112</sup>

TABLE A.5: Reforestation programmes

Programme 1	Programme 2
Place: Visp, Switzerland	Place: Limay, Nicaragua
CO <sub>2</sub> sequestration / tree / year: 15kg	CO <sub>2</sub> sequestration / tree / year: 15kg
Cost / tree: CHF10	Cost / tree: CHF3

**Neutral treatment (T0):** The above programmes are very similar, but differ according to the place where they are implemented: Programme 1 plans to plant trees in Wallis, Switzerland and programme 2 in Limay, Nicaragua.

**Efficiency treatment (T1):** The above programmes are very similar, but differ according to the place where they are implemented: Programme 1 plans to plant trees in Wallis, Switzerland and programme 2 in Limay, Nicaragua. A new tree in Switzerland has the same CO<sub>2</sub> sequestration potential as a new tree in Nicaragua but the same amount of money allows to plant more trees in Nicaragua than in Switzerland, the price per tree being lower in Nicaragua. As the place of emission reduction has no importance for the stock in the atmosphere, it is more efficient to plant trees where it is the cheapest: with the same amount it is possible to buy more trees in Nicaragua and thus to further reduce CO<sub>2</sub> emissions.

<sup>11</sup>After this point, each individual randomly received one of the following treatments.

<sup>12</sup>To avoid order effects, programme are randomly numbered 1 or 2.

**Confidence treatment (T2):** The above programmes are very similar, but differ according to the place where they are implemented: Programme 1 plans to plant trees in Wallis, Switzerland and programme 2 in Limay, Nicaragua. Both programmes are strictly controlled by external institutions. In Switzerland, local authorities are directly taking part in the programme while in Nicaragua, the United Nations Environmental Programme (UNEP) oversees the projects to avoid any abuses. These institutions guarantee that the money sent will indeed be used to implement reforestation programmes, in Switzerland as in Nicaragua.

**Local benefits treatment (T3):** The above programmes are very similar, but differ according to the place where they are implemented: Programme 1 plans to plant trees in Wallis, Switzerland and programme 2 in Limay, Nicaragua. A new tree in Switzerland has the same CO<sub>2</sub> sequestration potential as a new tree in Nicaragua but reforestation in Switzerland implies a series of advantages for the local population. The Swiss population indeed enjoys forest to recreate: it is estimated that Swiss people spend more than 80 hours per year in forests, for leisure such as hiking, mushrooms picking, etc. Forests also allow to protect the Swiss population against natural hazards such as avalanches, landslides or rock slides. Moreover, Swiss forests are home to numerous local species, in particular amphibians and lichens, under the threat of extinction. Finally, forests are also a source of income for part of the population. In 2014, the gross income from the forest industry in Switzerland amounted to CHF 900 millions.

**How much of your contribution do you wish to allocate to (total must be equal to your contribution - otherwise an error message is displayed):**

The Swiss programme: CHF \_\_\_\_\_

The Nicaraguan programme: CHF \_\_\_\_\_

**Among the following reasons, which one is the main reason why you did not contribute more to the Nicaraguan programme?**

- Local benefits are more important in Switzerland than in Nicaragua
- It is unfair to compensate Swiss CO<sub>2</sub> emissions abroad
- I do not trust the Nicaraguan government for the implementation of this programme
- It is not my duty to pay for a programme in Nicaragua
- None of the above

**Among the following reasons, which one is the main reason why you did not contribute more to the Swiss programme?**

- Populations in Nicaragua need more financial help than in Switzerland
- Local benefits are more important in Nicaragua than in Switzerland
- The price of a tree is lower in Nicaragua and hence, for the same amount, I can reduce more CO<sub>2</sub> if I buy trees in Nicaragua rather than in Switzerland

- It is not my duty to pay for this programme
- None of the above

**In your opinion, for which programme did your classmate contribute the most?**

- The programme in Switzerland
- The programme in Nicaragua
- Their contribution is, on average, the same for both programmes

**It is possible to offset GHG emissions by other means than reforestation (renewable energy, methane recuperation, etc.). If the programme proposed to contribute to another type of project instead of reforestation, would your contribution have been:**

- The same
- Higher
- Lower

**If the reforestation programme abroad had not been in Nicaragua but in an industrialised country, would your contribution have been:**

- The same
- Higher
- Lower

**Please answer the following questions:**

	Never	Sometimes	Regularly	Often
Have you ever been to the Visp region?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have you ever been to Nicaragua?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How often do you go to forests?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**How do you agree with the following statements?**

	Not at all	Pretty not	Neutral	Pretty much	Totally
I consider that climate warming is a serious threat for the future	<input type="checkbox"/>				
Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs	<input type="checkbox"/>				
Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent	<input type="checkbox"/>				
I feel morally obliged to protect the climate	<input type="checkbox"/>				
In my opinion, even small contributions are useful to protect the climate	<input type="checkbox"/>				
Reforestation is effective in reducing the stock of CO <sub>2</sub> in the atmosphere	<input type="checkbox"/>				
The creation of carbon markets is an acceptable solution to reduce GHG emissions	<input type="checkbox"/>				
It is morally acceptable to offset domestic CO <sub>2</sub> emissions abroad	<input type="checkbox"/>				
Every country should offset the major part of its CO <sub>2</sub> emissions on its own territory	<input type="checkbox"/>				
I do not want to consider natural resources as a marketed commodity	<input type="checkbox"/>				
I disagree with individual CO <sub>2</sub> offsetting	<input type="checkbox"/>				

Are you member of or donate to an environmental friendly organisation?

- Yes
- No

Are you:

- Male
- Female

How old are you? \_\_\_\_\_ years old

What is your ZIP code? \_\_\_\_\_

Is your mother tongue Spanish or are you originally from Latin America?

- Yes
- No

What type of diploma have you earned?

What type of study did your parents complete?

Please indicate the interval that best represents your personal monthly budget (without rents nor insurances).

We thank you for your participation to this survey!