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Socio-economic and environmental effects of eco-tourism*

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Abstract

Eradicating poverty and halting deforestation are two of the Sustainable Development Goals. Eco-tourism is considered a win-win strategy that can increase income and preserve forests. However, there are no well-identified impact evaluations of both variables at the same time. Seventy-six municipalities in Colombia were randomly assigned to either a control group or a treatment group that received eco-tourism promotion. I estimate the socio-economic and environmental effects of nine months of treatment using an ANCOVA specification that controls for baseline individual outcomes. In treated municipalities, I find an increase of 30% in the number of tourists and 16% in the number of workers. However, there are no statistically significant effects on business profits, poverty, or household income. At the same time, I do find a reduction of 100% of deforestation alerts around treated eco-tourism sites. These results illustrate the importance of economic opportunities for local communities in order to preserve forests.
JEL codes: Q56, Z32
Keywords: Eco-tourism; Poverty; Deforestation; Colombia

1 Introduction

Eradicating poverty and halting deforestation are two of the Sustainable Development Goals (United Nations, 2015). Eco-tourism is considered a win-win strategy that can

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increase host communities' income and preserve forests. According to the United Nations Conference on Trade and Development, tourism "exports" exceed manufacturing exports for 40% of developing countries and also exceed agricultural exports for half of them (Faber & Gaubert, 2019). In addition, eco-tourism could help preserve the environment (Food and Agricultural Organization, 2011). However, there are no well-identified impact evaluations of both economic and environmental variables at the same time (Alpízar & Ferraro, 2020). This paper measures the short term effect of eco-tourism on socio-economic indicators and deforestation.

This study takes place in Colombian regions historically affected by conflict. Colombia, together with Brazil, are the top two countries in the world in terms of biodiversity (Convention on Biological Diversity, 2020). But local communities in forest areas of Colombia lack income opportunities that do not degrade the environment.

The methodology is a Randomized Control Trial, where a travel company and I made pairs of similar municipalities. Within pairs, one of the municipalities was chosen at random to receive eco-tourism promotion. Treated municipalities were visited by the eco-tourism company that offered free eco-tourism training, product offer design, marketing content generation, and free voluntary enrollment to an online marketplace. To study the effect of treatment, I have in-person household socio-economic surveys and satellite measurements of forest cover and deforestation alerts. Baseline data was collected May-June 2019, and the short term follow-up was collected in February 2020.[1]

As stated in the pre-analysis plan, my preferred specifications are ANCOVA models, including the outcome variable's baseline value, randomization pair fixed effects, and controls. ANCOVA has more power than difference-in-differences when there is low

[1]The timing was given ex-ante by the funding requirement, but it coincidentally was right before the COVID-19 pandemic.

autocorrelation (McKenzie, 2012). Nowadays, I present robustness to simple treatment-control comparisons and difference-in-differences specifications.

I find that, in the nine months of eco-tourism promotion, the number of tourists increased by 12 clients in the average month per business, a 36% increase compared to the mean in the control group. The effect is larger in municipalities without much-existing tourism development and with a high level of homicides. Importantly, the results seem to be driven by new, rather than diverted, tourists from untreated municipalities. The results are also significant with randomization inference p-values.

The increase in the number of tourists is accompanied by an increase in the number of workers. But, despite the increase in tourists and workers, I do not find statistically significant effects on business profits, households' income, or poverty after nine months. The null effect in profits could be explained by the short period of evaluation and the new hires' adjustment costs. While the lack of short-term effects on household income could be explained by eco-tourism labor characteristics. If there are more tourists, more guides are hired to keep groups small to observe animals or transport capacity constraints. Consequently, wages per guide would be unchanged. Unfortunately, I do not have information on salaries and new hires to explore this explanation further.

On the environmental side, I use the coordinates of touristic attractions and deforestation alerts (Hansen et al., 2016). I draw circles of a radius of 2 kilometers around the attractions and count how many alerts are inside it. I observe a reduction of almost 100% on the deforestation alerts around promoted eco-tourism sites compared to sites in the control group. The results are robust to using different radius or business/household coordinates.

Numerous papers have shown the local economic benefits of tourism (Faber & Gaubert,

2019; Garsous, Corderi, Velasco, & Colombo, 2017; McGregor & Wills, 2017). In addition, Sims (2010) shows that national parks benefit nearby towns because of eco-tourism. But, to the best of my knowledge, this is the first randomized evaluation of the socio-economic and environmental effects of eco-tourism at the same time. The finding that tourism increases more in violent areas complements the result of Besley, Fetzer, and Mueller (2019); Neumayer (2004) that bad news coverage affects tourism. In this study, the eco-tourism promotion could be seen as positive news that counteracts the negative news about homicides.

Regarding the relationship between economic opportunities and deforestation, this paper is related to the literature on payments for ecosytem services. Households reduce deforestation when they receive payments for conservation (Jayachandran et al., 2017; Simonet, Subervie, Ezzine-de Blas, Cromberg, & Duchelle, 2019). However, cash transfers to alleviate poverty increased deforestation (Alix-Garcia, McIntosh, Sims, & Welch, 2013) in Mexico and reduced it in Indonesia (Ferraro & Simorangkir, 2020). In the case of eco-tourism, tourists' arrival generates job opportunities that induce households not to deforest. Eco-tourism acts like an indirect payment for conservation.

2 Context and Data

2.1 Context and Evaluation design

Colombia, together with Brazil, are the top two countries in the world in terms of biodiversity. Worldwide, Colombia ranks first in birds' and orchids' species diversity and second in plants and amphibians (Convention on Biological Diversity, 2020). But local communities in forest areas of Colombia lack income opportunities that do not degrade the environment. The Colombian president considers tourism as the "new oil" that

could create employment and lift households out of poverty (Portafolio, 2018).

The study takes place in the Amazon, Orinoquía, and Pacific regions of Colombia, given the low development indicators, forest coverage, and post-conflict characteristics. With the survey company we excluded municipalities with security concerns for surveyors and tourists like those in Arauca or Tumaco. Municipalities where travel to and from the capital, Bogotá is not frequently available, were also excluded.

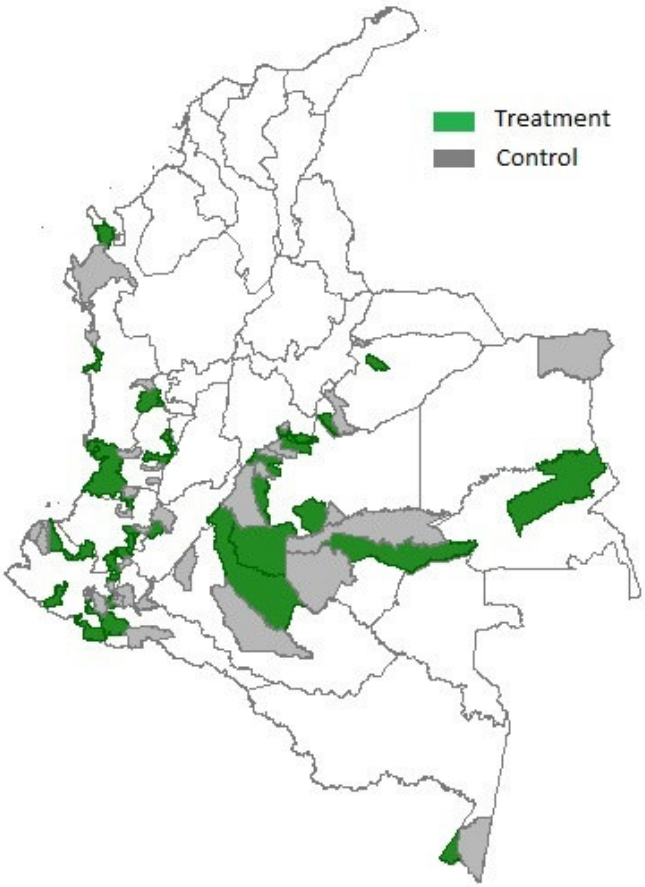
I select municipalities with similar levels of forest cover and poverty levels as those in the Ministry of Tourism "Turismo y Paz" (Tourism and Peace) program. With the expertise of the travel company we then created three groups of municipalities . The first group is called "Existing": those municipalities that already had tourism development. The second group is "Promising" municipalities: those without much tourism development, mainly because of the conflict, but with high-known tourism potential. Finally, the "Challenging" group, those without much tourism development and little-known tourism potential.

Within each group with the travel company we created pairs of similar municipalities, usually within the same state and ecosystems. For example, Nuqui and Bahia Solano on the Pacific Coast, Mesetas and Lejanias on the Eastern Plains. Within each pair, one municipality was selected at random to receive treatment.[2] See Figure 1 for the location of treatment and control municipalities. For all 76 municipalities, eco-tourism attractions were identified online and asking government offices.[3]. The travel company created guidelines for identifying potential eco-tourism hosts nearby these attraction on the field survey. These guidelines were used to select survey participants on treated and

[2]With random number generation on Stata.

[3]Specifically, we asked for attractions that are safe to visit and the travel time from the town hall was less than one hour

Figure 1: Location of treatment and control municipalities



Notes: This map presents the location of treatment (green) and control (gray) municipalities.

control municipalities with the same criteria.[4]

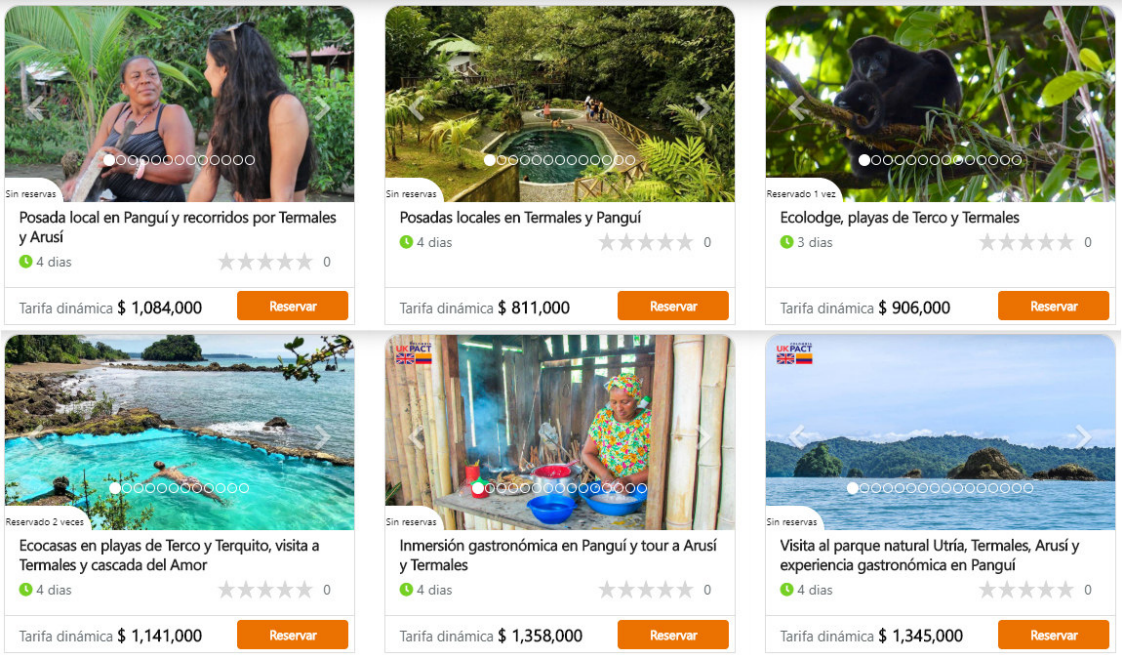
2.2 Socio-economic survey

The survey company collected baseline data on the 76 study municipalities on May-June 2019. The tourism company then visited the 38 treatment municipalities to design tourism products, offer free eco-tourism training, and did online advertising from June to December 2019. See Figure **??** for an example of designed tourism products. The short

[4]For example, attractions with animals on captivity, like a zoo, were not selected.

term follow-up survey took place in February 2020; this was before the first COVID-19 case and restrictions started in Colombia. See Figure A.3 on the Appendix for the timeline.

Figure 2: Example of tourism products



Notes: This image is from the webpage of the online market place displaying the eco-tourism products. The two products on the bottom-right are new products developed in treatment municipalities and have a small logo of the donor.

Table 1 presents baseline summary statistics of the data we have. Column 1 presents the mean for treatment municipalities and Column 2 for the control municipalities. Below each row, in parenthesis, the table shows the standard deviation. Column 3 presents the difference between the two groups, and below, in square brackets, the tests' p-value on whether the means are equal. Overall, there are no statistically significant differences between treatment and control groups. Panel A presents statistics at the municipality level. The study municipalities have a large area with forest cover; around half the population lived in poverty, and the homicides rate is high, higher than the national average. Panel B has statistics at the business level. The average surveyed business is small, receiving 1.5 tourists a day on average, and employing five workers. Finally, Panel

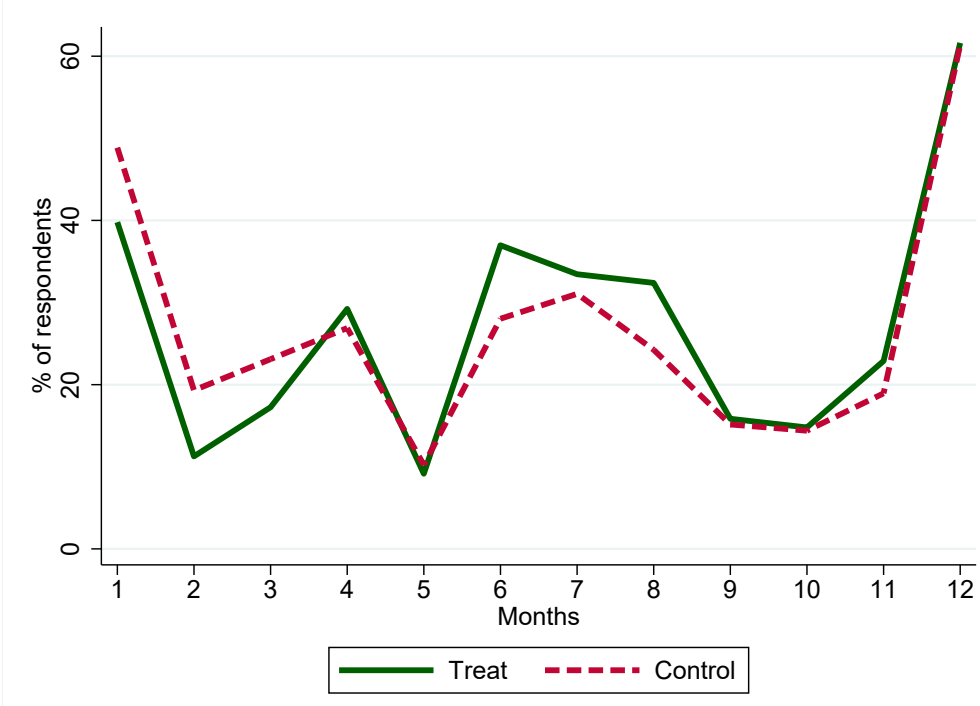
Table 1: Summary statistics

Variable:	Treatment (sd) (1)	Control (sd) (2)	Difference [p-value] (3)
Panel A: Municipalities			
Forest cover area (km2)	1380.4	1955.0	-574.6
	(2722.7)	(3702.3)	[0.5]
Poverty index	50.4	52.2	-1.8
	(24.3)	(27.2)	[0.8]
Homicides 2018 per 100k inh	33.1	29.5	3.6
	(28.0)	(24.1)	[0.5]
N	38	38	
Panel B: Business Baseline			
N tourists normal month	44.7	43.1	1.6
	(124.1)	(95.0)	[0.9]
N workers	5.1	5.3	-0.2
	(5.0)	(5.4)	[0.7]
Profits (MCOP/month)	0.6	0.8	-0.2
	(1.4)	(1.5)	[0.1]
Alerts rate around 2km site	0.04	0.06	-0.02
	(0.44)	(0.55)	[0.80]
N	284	264	
Panel C: Household Baseline			
Tourism income (MCOP/month)	0.4	0.4	0.0
	(0.6)	(0.6)	[0.9]
Income (MCOP/month)	1.2	1.2	0.0
	(1.1)	(1.1)	[1.0]
Gender (Male)	0.5	0.5	0.0
	(0.5)	(0.5)	[0.7]
Alerts rate around 2km HH/Bussines	0.05	0.02	0.03
	(0.46)	(0.22)	[0.21]
N	384	356	
Attrition	0.040	0.065	-0.025
	(0.197)	(0.246)	[0.118]
N	421	402	

Notes: This table presents summary statistics for treatment and control groups in Column (1) and (2), respectively. While Column (3) presents results for mean difference tests between both groups.

C presents statistics for households. They have an average of 1.3 million COP in monthly income (around U$400), and around a third is derived from tourism. The last row checks whether attrition is balanced. 'subsection We calculate forest and deforestation alerts using (Hansen et al., 2016). See Appendix A for all the details on the procedure. Table A.1 presents the percentage of the forest around survey participants. I calculate the forest area around touristic attractions and the business headquarter or household. Around 37% of the area on a circle of 1km radius around the headquarter has forest. This percentage increases with the radius of the circle as it includes areas farther from urban areas. For the touristic attractions, 48% of the area of the 1km circle is forest. Note that control municipalities have more forest cover than treatment municipalities, and this is statistically significant. Consequently, I will control for forest area or study deforestation alerts as proportion of the forest area.

Figure 3: Months when is possible to rely only on tourism



Notes: This figure shows the evolution in % of respondents across months. Solid green line corresponds to the treatment group and dotted red line correspond to the control group.

3 Estimating equations

Given the randomized experiment, I could compare mean outcomes in treatment and control groups. However, as specified in the pre-analysis plan, I prefer to control for baseline outcomes. That is, I estimate treatment effects with an ANCOVA model of equation (1). Y_{imp} is one of the outcomes of interest such as income, number of tourists for business/individual i, on municipality m, from randomization pair p. $Promoted_m$ is an indicator for whether municipality m was randomly chosen for treatment. $Y_{imp,-1}$ is the baseline value of the outcome. X_i are individual controls (education), and municipality controls Z_m. Given that the randomization was within pairs of similar municipalities, I add pair fixed effects γ_p.(i.e., stratification-level dummies). Finally, ε_{imp} is an error term that we cluster at the municipality level.

$$Y_{imp} = \beta_A Promoted_m + \eta Y_{imp,-1} + \alpha_3 X_i + \delta_3 Z_m + \gamma_p + \varepsilon_{imp} \tag{1}$$

As robustness we also estimate simple treatment and control comparisons, adding controls (equation 2) and difference-in-differences specifications (equation 3).

$$Y_{imp} = \beta_R Promoted_m + \alpha_2 X_i + \delta_2 Z_m + \gamma_p + \varepsilon_{imp} \tag{2}$$

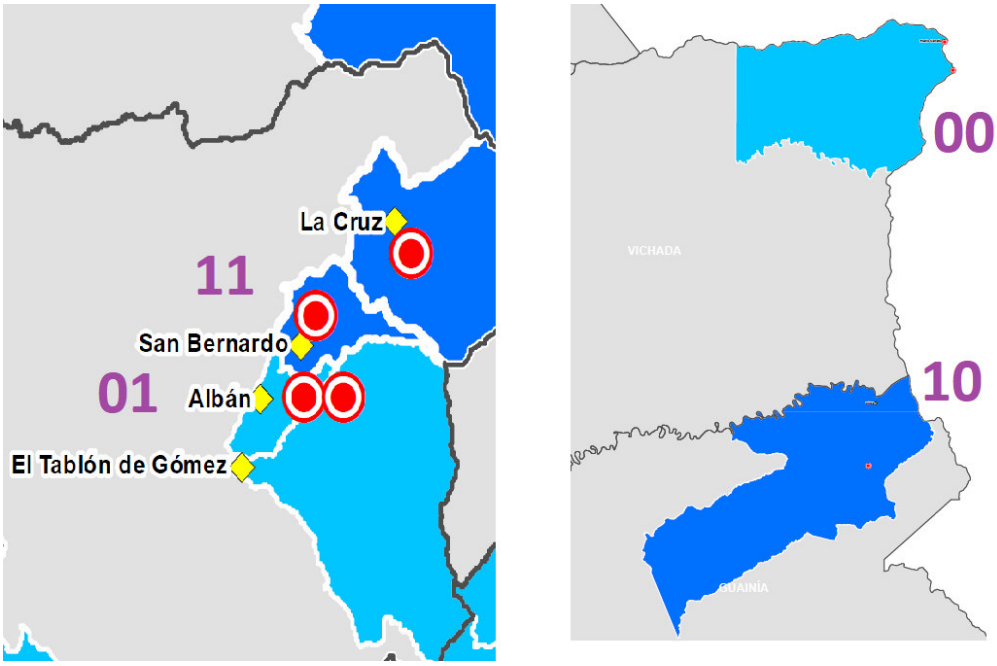
$$Y_{impt} = \beta_D After_t \times Promoted_m + \gamma_p + \gamma_t + \varepsilon_{impt} \tag{3}$$

Promoting eco-tourism in one municipality could affect its neighbors in two different ways. It can positively affect neighbors because it can bring more tourists to the area

that visited the promoted municipality and its neighbors. But it can affect neighbors negatively if it does not increase tourists to the area, and it just diverts tourists that were already coming to the area. I use inverse probability weighting following the code of (Coppock, 2014).

Figure 4 illustrates the four possible types of municipalities we can have. The pure control (00) municipalities are those in the control group far from treated municipalities, and therefore unlikely to be affected by spillovers. The treatment municipalities isolated enough not to be affected by spillovers (10). The control municipalities that are close to treated municipalities and could receive spillovers (01). And finally, the treated municipalities that can be affected by spillovers (11). Note that municipalities in the same pair next to each other will always be affected by spillovers. Consequently, their probability of pure control is zero and consequently do not enter the pure control regression.

Figure 4: Spillovers

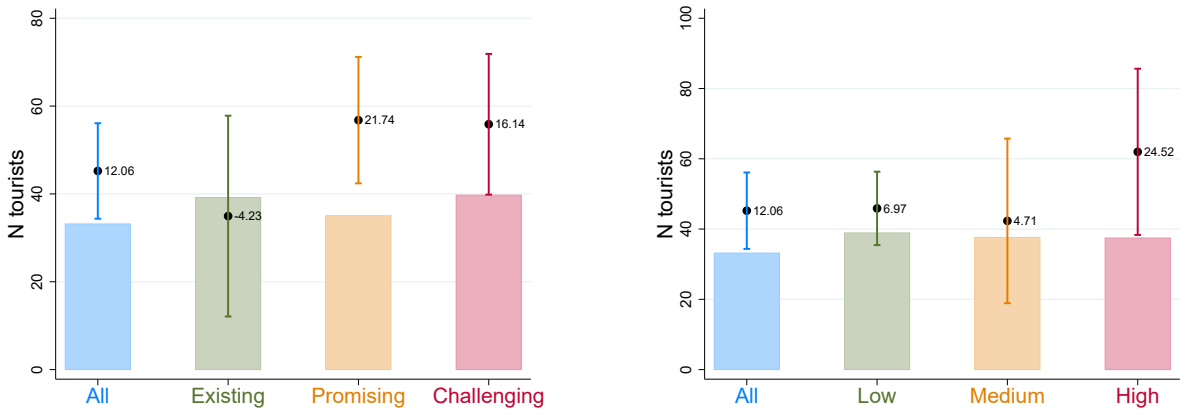


Notes: This figure shows the type of municipalities in our sample. 00 corresponds to pure control municipalities and 10 corresponds to the pure treatment municipalities. While 01 and 11 are the control and treatment municipalities that can be affected by spillovers.

4 Short-term results

4.1 Number of tourists

Figure 5: Effect on tourists



(A) Number of tourists

(B) Homicides per 100,000 inhabitants

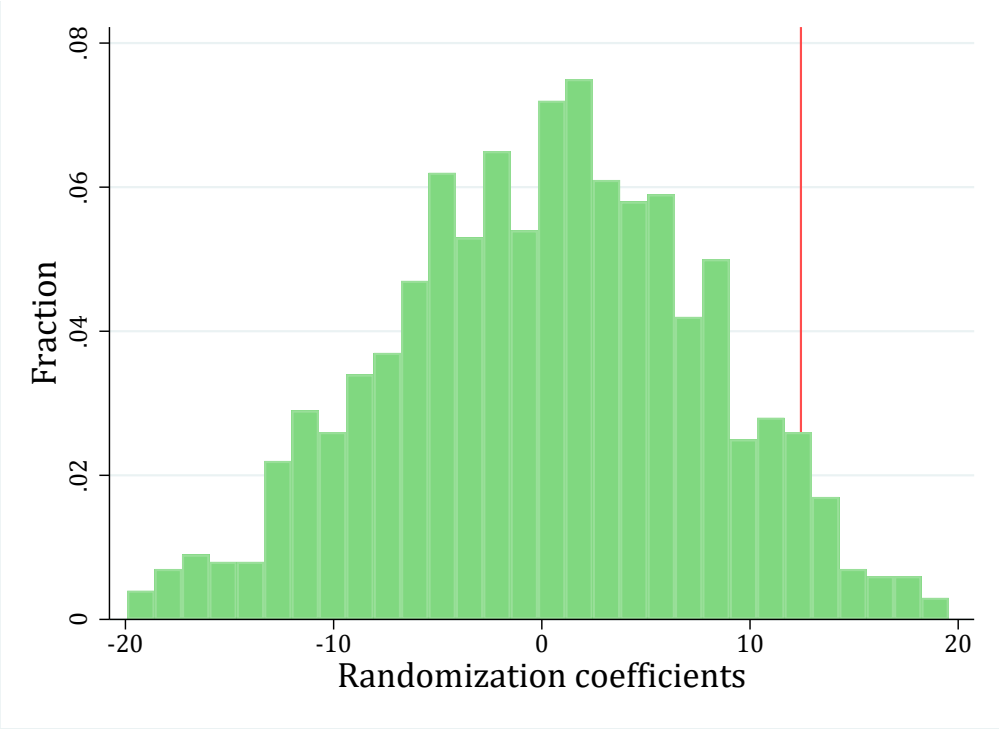
Notes: Panel A of this figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for the specification using dummies for the three type of municipalities in the sample. Panel B presents heterogeneity by security conditions on the municipalities . Low: less than 24 homicides per 100k inh. Medium: Between 24 and 50 homicides per 100k inh. High: More than 50 homicides per 100k inh.

Figure 5 presents graphically the results of estimating equation (1) using bar charts. The first bar on the left presents the mean number of tourists on all control municipalities in the short-term follow-up survey. On top of this bar, there is a point with the estimated effect of eco-tourism promotion, and its associated 95% confidence interval. If the interval touches the top of the bar, it means I cannot reject the treatment effect is zero. The other bars represent the mean separated by municipalities' type and the treatment effect for each case. The blue bar on the left indicates that the average business on control municipalities received around 33 tourists. The dot on top illustrates that eco-tourism promotion increased the number of tourists by 12, a 36% increase. As the interval around the dot does not intersect the top of the bar, the effect is statistically different from zero. When separating by municipality type, I find that for municipalities

with "Existing" tourism offer, there were no changes in the number of tourists (although the coefficient is -4, it is not statistically different from zero, because the interval crosses the bar). This lack of effect could be because these destinations were already well known. In contrast, there is an increases of 22 and 16 tourists for "Promising" and "Challenging" municipalities, respectively.

Figure A.4 presents heterogeneity by security conditions on the municipality, measured by homicides per 100,000 inhabitants using data provided by the National Police from 2019. Interestingly, the effect is larger for municipalities with a high level of homicides (in total or absolute terms). This result could be explained because these municipalities had a bad reputation, so promotion is more important. See Table A.4 on the Appendix for the table with the result of these graphs.

Figure 6: Inference randomization



Notes: This figure presents the results of performing 1,000 alternative randomization and compare the observe effect. P-value: 4.6%

4.2 Robustness

Table 2 presents the results for different specifications. Columns 1-2 are the ANCOVA results, with Column 2, like all even columns, including controls. The results in Column 1 are similar to those in Column 2; the main result we presented in the graphs above. Columns 3-4 present the results for the simple RCT results. The coefficients are slightly higher but within the confidence interval. Finally, Columns 5-6 present the results for the difference-in-differences specification. The coefficients are around 30% smaller and not statistically significant, but within our main result's confidence interval. The smaller coefficients could be explained because the number of tourists was slightly higher for treatment municipalities at baseline.

Table 2: Effects of eco-tourism promotion on number of tourists

Dependent variable:	Number of tourists normal month					
	ANCOVA		RCT		Diff-in-Diffs	
	(1)	(2)	(3)	(4)	(5)	(6)
Promoted	14.2**	12.4**	15.0**	12.9**	9.28	7.69
	(5.52)	(5.53)	(6.14)	(6.26)	(6.31)	(6.77)
Controls	No	Yes	No	Yes	No	Yes
Mean Dep. Var. Control	33.05	33.05	33.05	33.05	38.07	38.07
Observations	548	548	548	548	1,096	1,096
Adjusted R^2	0.18	0.19	0.07	0.08	0.07	0.07

Notes: This table presents results for all the specifications used. Columns 1-2 are the ANCOVA results. Columns 3-4 are the RCT results. Columns 5-6 are the Diff in diffs results. The first column of each specification has no controls. Robust standard errors are clustered at the municipality level and are shown in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

There are 2^{38} possible configurations of treatment and control municipalities, given that we randomized at the pair level. To test how unlikely is the observed increase in the number of tourists, I perform 1,000 alternative randomizations and compare the observed effect with estimated hypothetical effects. Figure 6 presents the histogram of

the randomization. The actual estimated effect is unlikely with a p-value of 4.6%.

Table A.2 presents the results of estimating equation (1) but comparing the groups of municipalities accounting for spillovers. Column 1 compares the treated municipalities without spillovers against the pure treatment municipalities. While column 2 compares treatment and control that have spillovers. In both cases, the coefficient's magnitude is similar to the main result of Table 2. However, the coefficients are not statistically significant, probably due to the small number of observations with non-zero probability in each group. In columns 3 and 4, I cannot estimate the spillover effect. This because if the municipalities in the pair are close, it cannot happen that one is pure control, and the other receives spillovers. Consequently, the pair fixed effects absorb all the variation.

4.3 Business and Households

Table 3 presents the results of estimating the ANCOVA model of equation (1) for other variables. Column 1 shows that there is an increase in eco-tourism training as expected with the treatment. Column 2 shows a statistically significant increase of 0.86 workers from a mean of 5.27 workers, which is a 16% increase. Column 3 presents the effect on reported business profits. There are no statistically significant changes, and the estimated coefficients are pretty close to zero. The increase in the number of tourists and the lack of change in profits could be explained by increased labor and other adjustment costs. Columns 4-6 study the effect on poverty, tourism income and household income. In none of the three cases the effect is statistically different from zero.

4.4 Deforestation

Table 3 presents the results of estimating equation (1) for the deforestation variables. Column 1 uses as the dependent variable the number of deforestation alerts inside the

Table 3: Effects of eco-tourism promotion on socio-economic variables

Dependent variable:	Eco-tourism Training	N workers	Profits	Poverty	Tourism income	All income
	(1)	(2)	(3)	(4)	(5)	(6)
Promoted	6.28**	0.86**	-0.036	1.16	-0.0081	-0.044
	(3.15)	(0.38)	(0.072)	(2.95)	(0.031)	(0.046)
Mean Dep. Var. Control	52.55	5.27	0.59	47.56	0.36	1.12
Observations	567	365	536	725	740	729
Adjusted R^2	0.39	0.58	0.20	0.32	0.22	0.46

Notes: This table presents results for different outcomes in ANCOVA specifications with controls. Robust standard errors are clustered at the municipality level and are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

2km radius circle center around the eco-tourism attraction. There is a reduction of 0.31 alerts in treated municipalities, compared to a mean of 0.29 in control municipalities, a reduction of more than 100%. This result could be because control sites had slightly more forest at baseline, so I control for this variable in Column 2. The coefficient is still 86% of the mean in control sites. Alternatively, I can use as the dependent variable the alerts as a proportion of the forest area. Doing this in Column 3, the effect is again more than 100% the control mean. Column 4 looks at a bigger circle, increasing the radius from 2km to 5km. Finally, Column 5 looks at the forest around the business headquarter or the surveyed household. In both cases, the estimated effect is more than 90% the mean in the control group. I also calculate List, Shaikh, and Xu (2019) p-values to correct for multiple hypothesis testing. The results are still significant at the 10% level.

5 Conclusions

Eradicating poverty and protecting the environment are key development challenges. Eco-tourism can in principle solve both challenges at the same time. Seventy-six mu-

Table 4: Effects of eco-tourism promotion on deforestation

Dependent variable:	Alerts		Rate		Rate
Around:	Eco-tourism site				Business/HH
	(1)	(2)	(3)	(4)	(5)
Promoted	-0.31**	-0.25**	-0.40**	-1.04**	-0.087**
	(0.14)	(0.11)	(0.17)	(0.47)	(0.035)
Forest Control	No	Yes	No	No	No
Radius	2	2	2	5	2
P-value	[0.026]	[0.023]	[0.024]	[0.029]	[0.016]
FWER p-value	0.08	0.09	0.08	0.08	0.08
Mean Dep. Var. Control	0.29	0.29	0.37	1.12	0.08
Observations	533	533	533	533	780
Adjusted R^2	0.24	0.26	0.23	0.42	0.07

Notes: This table presents results for deforestation outcomes in ANCOVA specifications with controls. Alerts is the raw number of Hansen et al. (2016) alerts in a circle of radius 2 kilometers around the touristic attraction. Rate refers to alerts as percentage of the area of the circle that is forested. Business/HH refers to the case I draw the circles around the surveyed business or household. Robust standard errors clustered at the municipality level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

nicipalities in Colombia were randomly assigned to receive eco-tourism promotion. I estimate the socio-economic and environmental effects of nine months of treatment. I find an increase of 30% in the number of tourists and 16% in the number of workers. However, I do not observe statistically significant effects on business profits, poverty or household income after nine months. At the same time, there is a reduction of deforestation alerts around the eco-tourism sites of around 100%.

These results illustrate that eco-tourism can help preserve forests and generate employment in the short term. That is, eco-tourism is like an indirect payment for ecosystem services program. Longer term analysis are necessary to measure what happens with profits and income, and if the employment and deforestation results are preserved.

References

Alix-Garcia, J., McIntosh, C., Sims, K. R., & Welch, J. R. (2013). The ecological footprint of poverty alleviation: evidence from mexico's oportunidades program. *Review of Economics and Statistics*, *95*(2), 417–435.

Alpízar, F., & Ferraro, P. J. (2020). The environmental effects of poverty programs and the poverty effects of environmental programs: The missing rcts. *World Development*, *127*, 104783.

Besley, T. J., Fetzer, T., & Mueller, H. F. (2019). Terror and tourism: The economic consequences of media coverage.

Convention on Biological Diversity. (2020). *Colombia main details.* Retrieved from http://www.cbd.int/countries/profile/?country=co

Coppock, A. (2014). *10 things to know about spillovers.* Retrieved from https://egap.org/resource/10-things-to-know-about-spillovers/

Faber, B., & Gaubert, C. (2019). Tourism and economic development: evidence from mexico's coastline. *American Economic Review*, *109*(6), 2245–93.

Ferraro, P. J., & Simorangkir, R. (2020). Conditional cash transfers to alleviate poverty also reduced deforestation in indonesia. *Science Advances*, *6*(24), eaaz1298.

Food and Agricultural Organization. (2011). *Ecotourism can play vital role in maintaining healthy forests.* Retrieved from http://www.fao.org/news/story/en/item/90192/icode/

Garsous, G., Corderi, D., Velasco, M., & Colombo, A. (2017). Tax incentives and job creation in the tourism sector of brazil's sudene area. *World development*, *96*, 87–101.

Hansen, M. C., Krylov, A., Tyukavina, A., Potapov, P. V., Turubanova, S., Zutta, B., ... Moore, R. (2016). Humid tropical forest disturbance alerts using landsat data. *Environmental Research Letters*, *11*(3), 034008.

Jayachandran, S., De Laat, J., Lambin, E. F., Stanton, C. Y., Audy, R., & Thomas, N. E. (2017). Cash for carbon: A randomized trial of payments for ecosystem services to reduce deforestation. *Science*, *357*(6348), 267–273.

List, J. A., Shaikh, A. M., & Xu, Y. (2019). Multiple hypothesis testing in experimental economics. *Experimental Economics*, *22*(4), 773–793.

McGregor, T., & Wills, S. (2017). Surfing a wave of economic growth.

McKenzie, D. (2012). Beyond baseline and follow-up: The case for more t in experiments. *Journal of development Economics*, *99*(2), 210–221.

Neumayer, E. (2004). The impact of political violence on tourism: Dynamic cross-national estimation. *Journal of conflict resolution*, *48*(2), 259–281.

Portafolio. (2018). *El turismo es el nuevo petroleo de colombia.* Retrieved from https://www.portafolio.co/economia/gobierno/el-turismo-es-el-nuevo-petroleo-de-colombia-522265

Simonet, G., Subervie, J., Ezzine-de Blas, D., Cromberg, M., & Duchelle, A. E. (2019). Effectiveness of a redd+ project in reducing deforestation in the brazilian amazon. *American Journal of Agricultural Economics*, *101*(1), 211–229.

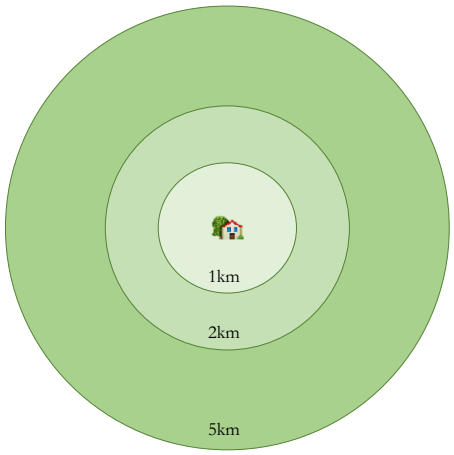
Sims, K. R. (2010). Conservation and development: Evidence from thai protected areas. *Journal of environmental economics and management*, *60*(2), 94–114.

United Nations. (2015). *Sustainable development goals.* Retrieved from https://www.un.org/sustainabledevelopment/sustainable-development-goals/

Appendix A Estimating forest area around a given coordinate

For each coordinate of a household/business or touristic attraction, we calculate circular buffers of 1, 2, and 5 kilometers around it. This procedure is illustrated in Figure A.1.

Figure A.1: Buffers



Each buffer is intersected with the forest data raster of Global Forest Watch (GFW) for 2018, as shown in Figure A.2. This raster contains the coverage percentage for each pixel of 30×30 meters. Following GFW, a pixel is covered with forest when this percentage is greater than 50%. Next, we add the pixels that contain forest. The number of pixels is then converted to square kilometers.

Figure A.2: Buffers with forest raster

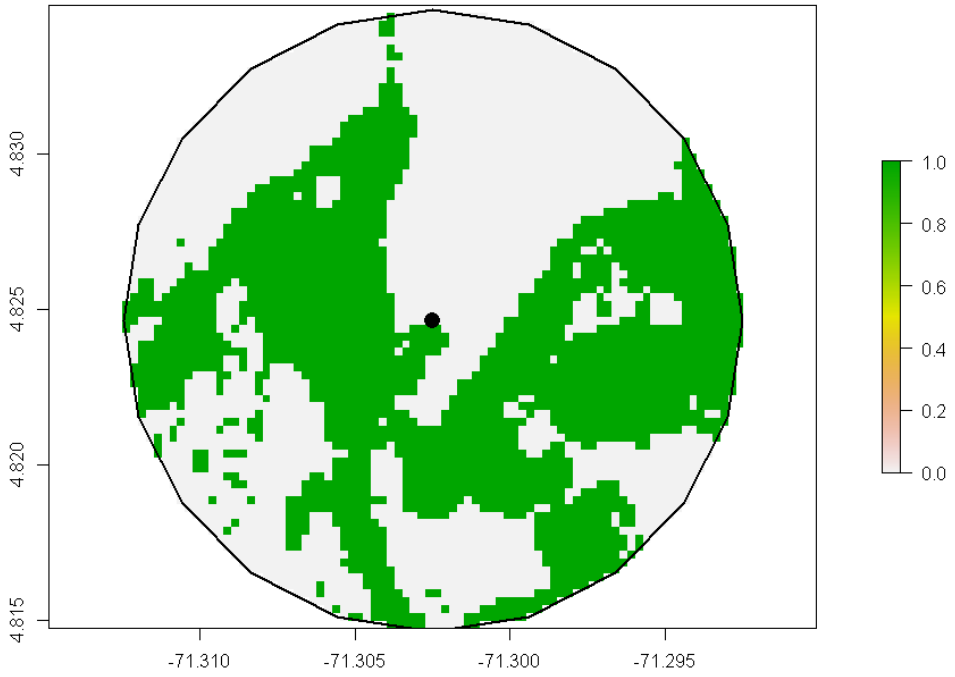


Figure A.5 presents the effect on Awake advertising (Panel A) and eco-tourism training (Panel B). There is a slight increase in the percentage of businesses that state they advertise on Awake's market place. More importantly, there is an increase of 8 percentage points on eco-tourism training in treated municipalities.

Figure A.4 presents heterogeneity by security conditions, measured by homicides on the municipality using data provided by the National Police from 2019. Panel A, separates by homicides per 100,000 inhabitants and Panel B by the total number of homicides. Interestingly, the effect is larger for municipalities with a high level of homicides in total or absolute terms. This could be explained because these municipalities had low number of tourists so promotion is more important there.

Panel A of Figure A.6 presents heterogeneity by remoteness of the destination, measured by road distance from Bogota. The smallest increase is for municipalities without road connection to Bogota, probably because this implies using airplane which increases the cost. The effect is larger for municipalities less than 8 hours by road from Bogota, although we cannot reject is different from zero. The increase in municipalities more than 8 hours from Bogota is 28 tourists and is statistically significant. This could be due to these municipalities being close to other major cities like Cali. When we compare the results for January 2020 with January 2019 on Panel B of Figure A.6, we only observe the increase in number of tourists for the promising municipalities.

Table A.1: Summary statistics forest cover

Variable:	Treatment (sd) (1)	Control (sd) (2)	Difference [p-value] (3)
Headquarters % forest 1km	36.939	37.802	-0.863
	(28.451)	(25.766)	[0.649]
Headquarters % forest 2km	41.425	44.661	-3.236*
	(26.972)	(24.594)	[0.073]
Headquarters % forest 5km	47.438	53.766	-6.328***
	(24.671)	(22.807)	[0.000]
N	421	402	
Attraction % forest 1km	42.804	54.028	-11.224***
	(27.339)	(22.508)	[0.000]
Attraction % forest 2km	44.913	56.500	-11.587***
	(24.831)	(20.145)	[0.000]
Attraction % forest 5km	48.254	58.960	-10.706***
	(24.615)	(17.243)	[0.000]
N	300	263	

Notes: This table presents summary statistics for treatment and control groups in Column (1) and (2), respectively. While Column (3) presents results for mean difference tests between both groups. See Appendix A for details on the procedure to estimate forest.

A.1 Effects on business

Panel A of Figure A.7 presents the effect on reported business profits. We do not observe any statistically significant changes, and the estimated coefficients are pretty close to zero. The increase in number of tourists and the lack of change in profits could be explained by an increase in costs. This is what we observe on Panel B of Figure A.7, there was an statistically significant increase of 0.8 workers from a mean of 5.2 workers, that is a 15% increase. However, when we look at total costs on Figure A.8 Panel A we find a decrease, especially for the promising municipalities that had the largest increase in workers. One option is that they separate the amount they obtained from credit, that we observe increased on Panel B Figure A.8 . Nowadays, this puzzle, requires further investigation.

We find no effects on the percentage of surveyed individuals with professional tourism card (Figure A.9 Panel A), and stays at less than 5%. This is not surprising given that this certification requires high school completion and two years of courses. There is a slight increase on business on the National Tourism Registry, but is not statistically significant (Panel B). This registry is free and easier to obtain. On Figure A.10 we observe an increase of 9 percentage points on the individuals with first aid course certification.

Table A.2: Spillovers

Comparison	10 vs 00	11 vs 01	01 vs 00	11 vs 10
	(1)	(2)	(3)	(4)
Promoted	14.1	11.2		
	(11.9)	(9.02)		
Spillover			.	.
			(.)	(.)
Observations	148	320	60	96
Adjusted R^2	0.24	0.21	.	.
Group FE	Yes	Yes	Yes	Yes

Notes: 00=pure control, 01=control spill-over, 10=treated without spillover, 11=treated and spillover

Table A.3: Spillovers

Comparison	10 vs 00	11 vs 01	01 vs 00	11 vs 10
	(1)	(2)	(3)	(4)
Promoted	19.9*	9.61		
	(10.2)	(11.6)		
Spillover			-3.69	-16.3
			(8.09)	(14.9)
Observations	148	320	60	96
Adjusted R^2	0.27	0.13	0.33	0.25
Group FE	No	No	No	No

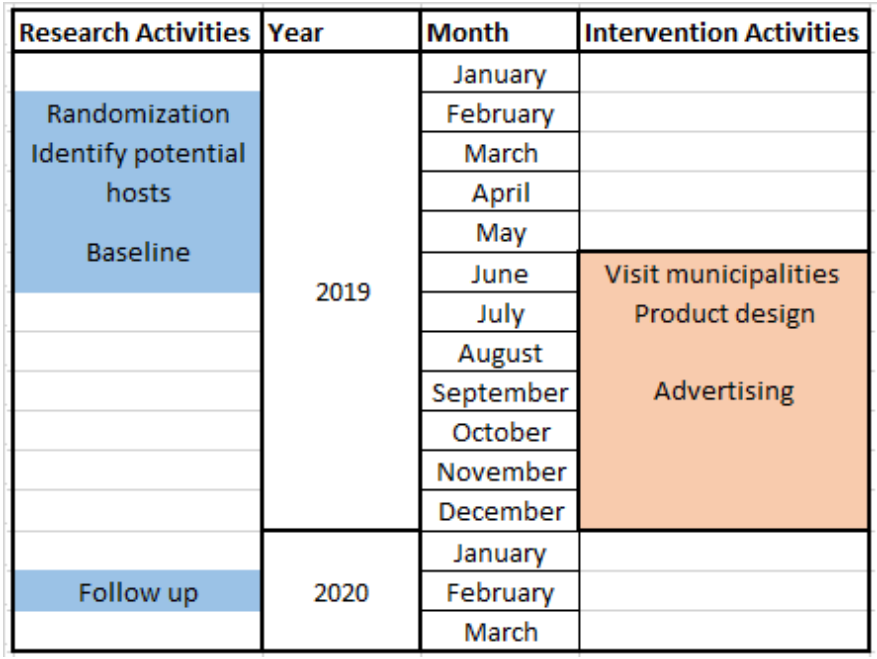
Notes: 00=pure control, 01=control spill-over, 10=treated without spillover, 11=treated and spillover

Table A.4: Heterogeneous results

	ANCOVA	Groups	Violence	National Parks
	(1)	(2)	(3)	(4)
Promoted	12.4**			
	(5.53)			
Existing		-4.23		
		(11.5)		
Promising		21.7***		
		(7.23)		
Challenging		16.1**		
		(8.04)		
Low			11.3	
			(6.87)	
Medium			4.97	
			(11.7)	
High			23.9**	
			(11.9)	
Without parks				31.3**
				(12.0)
With parks				8.47
				(5.93)
Mean Dep. Var. Control	33.05	33.05	33.05	33.05
Observations	548	548	548	548
Adjusted R^2	0.19	0.19	0.19	0.19

Notes: This table presents heterogeneous results for ANCOVA specification using the number of tourists as the dependent variable. Column 1 corresponds to the main result. Column 2 corresponds to a specification using dummies for the three types of municipalities. Column 3 corresponds to a specification using dummies for violence. Column 3 corresponds to a specification using dummies for national parks. Robust standard errors are clustered at the municipality level and are shown in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure A.3: Timeline



Notes: This figure presents the timeline of the study by month. Research activities are on the left and intervention activities on the right column.

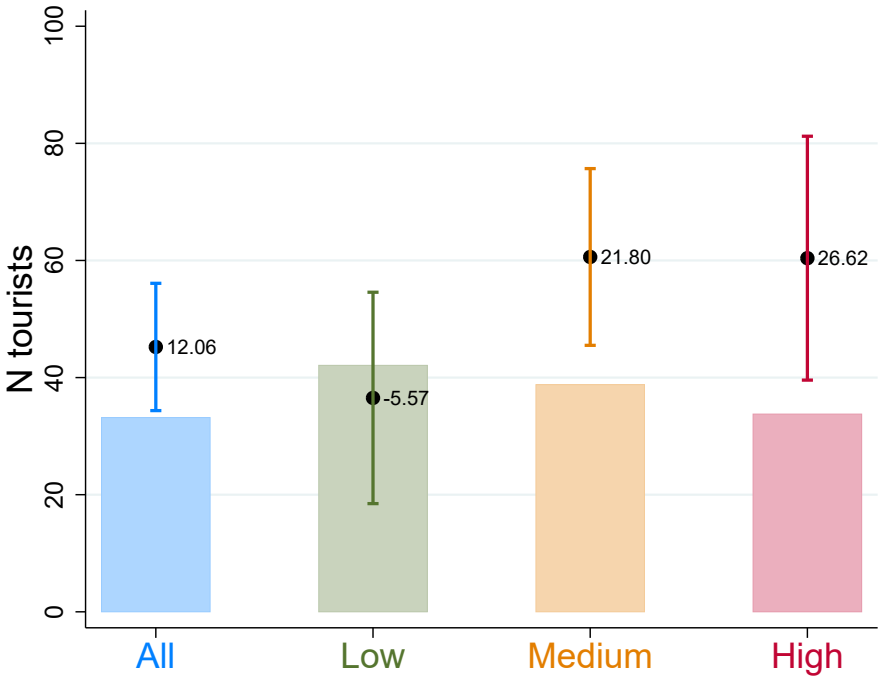
A.2 Effects on households income

After looking at the effects on business we now turn to the effects on households' income. Figure A.11 presents the effect on tourism income (Panel A) and total income (Panel B). There are no statistically significant effects on households tourism or total income. Figure A.12 presents the effect separating by individual type (Panel A) and level of education (Panel B). Operator refers to the tourism aggregator that could create a tourism package to offer on the market place. Supplier is the restaurant, hotel, driver or guide that sell a part of this package to the operator. Beneficiary are those located nearby touristic attraction that can benefit from larger numbers of tourists. For example a bakery close to the hotel or a handicraft business close to a waterfall. We do not observe income effects neither by individual type or education level. There are also no differential income effects by sex on Figure A.13. Figure A.14 presents the effect on expenditure (Panel A) and savings (Panel B). There are no statistically significant changes in any of the variables.

A.3 Effects on perceptions and attitudes

Figure A.15 presents the effect on perception of tourism importance (Panel A) valuation of natural heritage (Panel B), hectares they hypothetically would allocate for conservation (Panel C) and the practice of burning wastes (Panel D). There was a slight increase

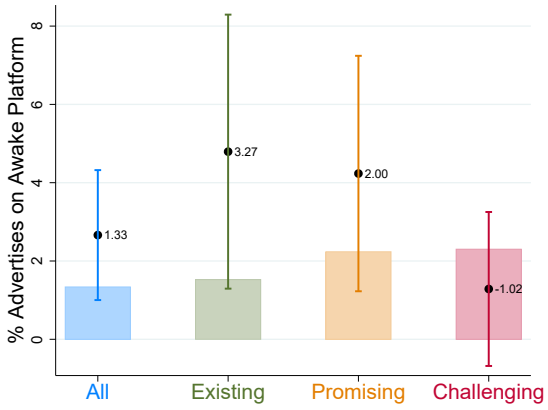
Figure A.4: Effect on tourists by security conditions



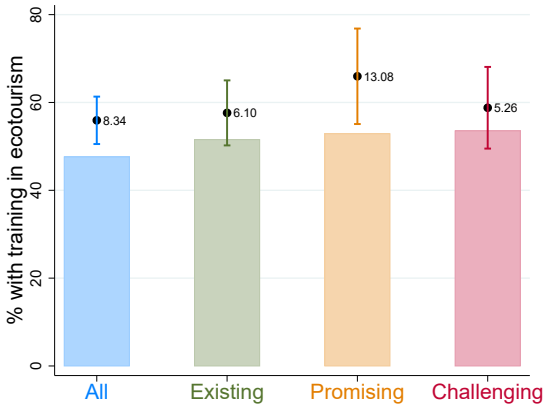
Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for heterogeneity by security conditions on the municipalities. Low: less than 5 homicides. Medium: Between 6 and 15 homicides. High: More than 16 homicides. Data from 2019.

in the perception of tourism importance, but is not statistically significant. For the case of valuation of natural heritage, the increase is statistically significant. However it does not translate into stating they will hypothetically allocate more hectares for conservation. Surprisingly we observe an increase in waste burning in Panel D. Although is not statistically significant it is worth checking if the extra tourists are creating waste they cannot dispose properly.

Figure A.5: Effect on awake advertising and eco-tourism training



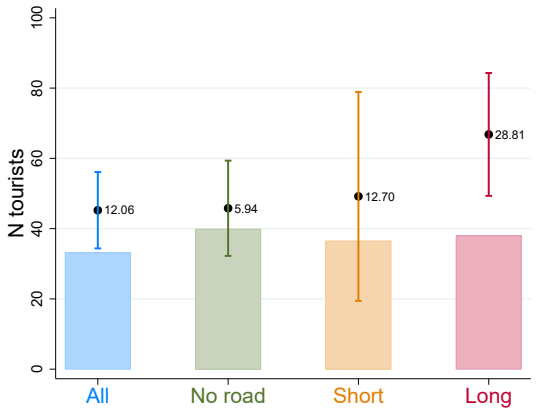
(A) Awake advertising



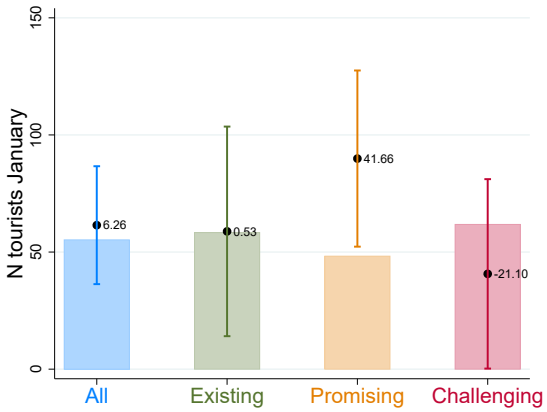
(B) Eco-tourism training

Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for the specification using dummies for the three type of municipalities in the sample.

Figure A.6: Effect on tourists by remoteness of the destination



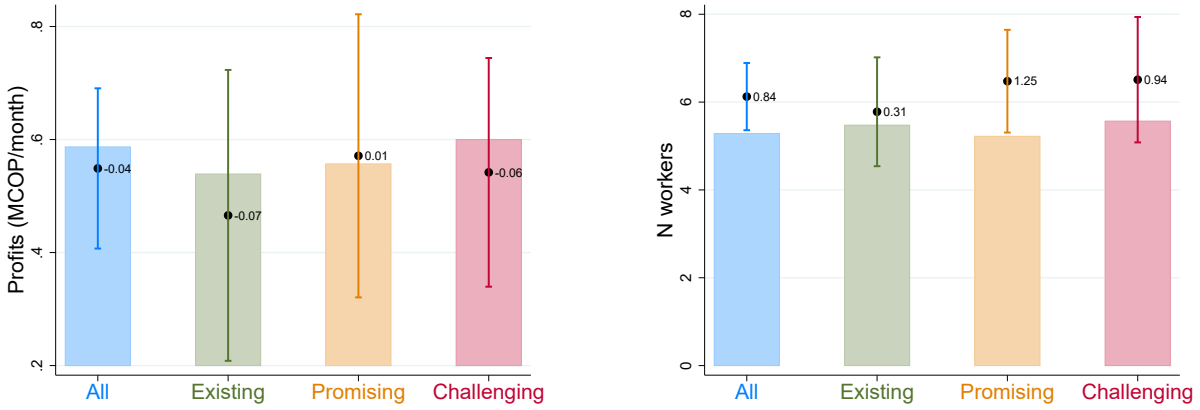
(A) Tourist by destination



(B) January's tourists

Notes: Panel A of this figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for heterogeneity by remoteness of the destination. Short distance is less than 8 hours. Long distance is more than 8 hours. Panel B of the figure reports results for all the sample (blue bar) and using dummies by type of municipality, using number of tourists in January.

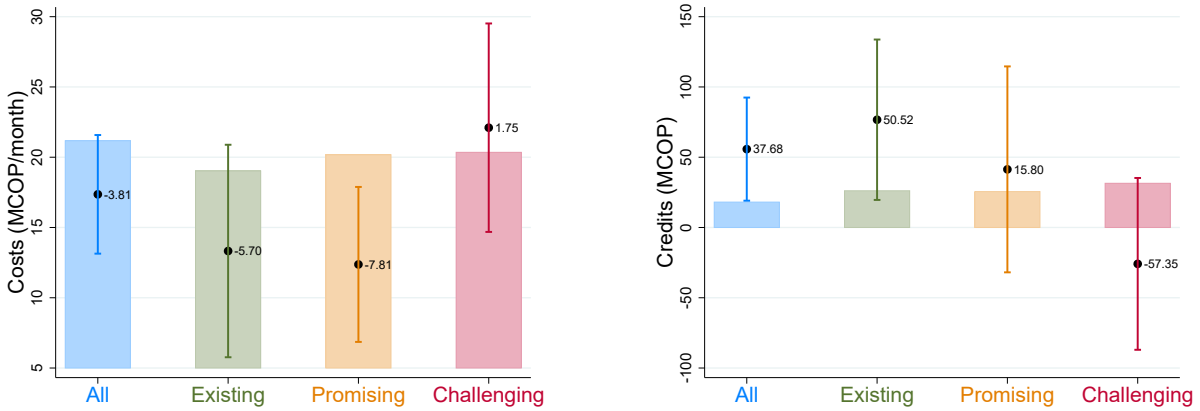
Figure A.7: Effect on reported business profits and costs



(A) Reported business profits (B) Number of workers

Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for the specification using dummies for the three type of municipalities in the sample.

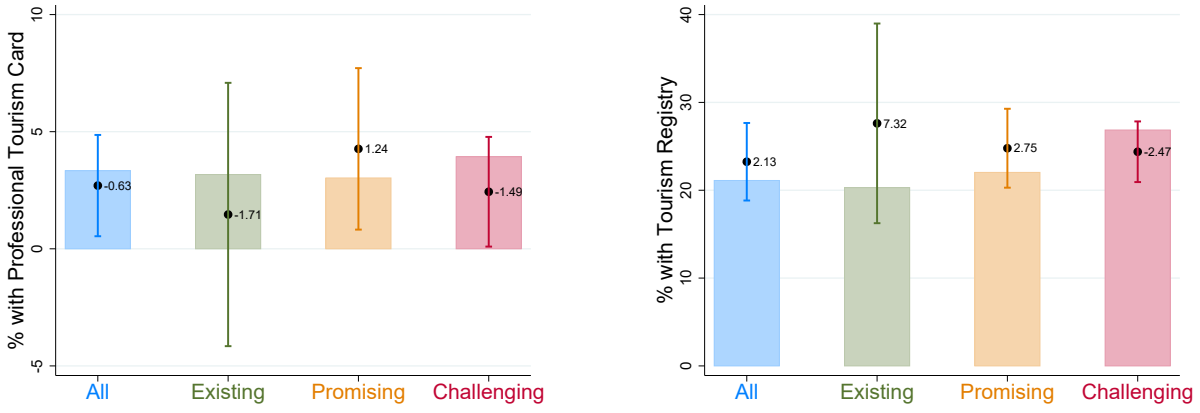
Figure A.8: Effect on total costs and credits



(A) Total costs (B) Credits

Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for the specification using dummies for the three type of municipalities in the sample.

Figure A.9: Effect on professional tourism card and National Tourism Registry

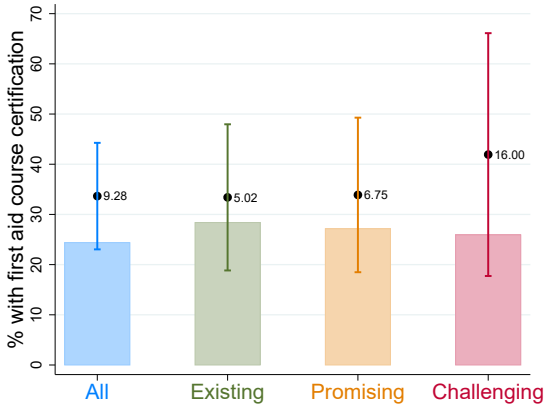


(A) Professional tourism card

(B) National Tourism Registry

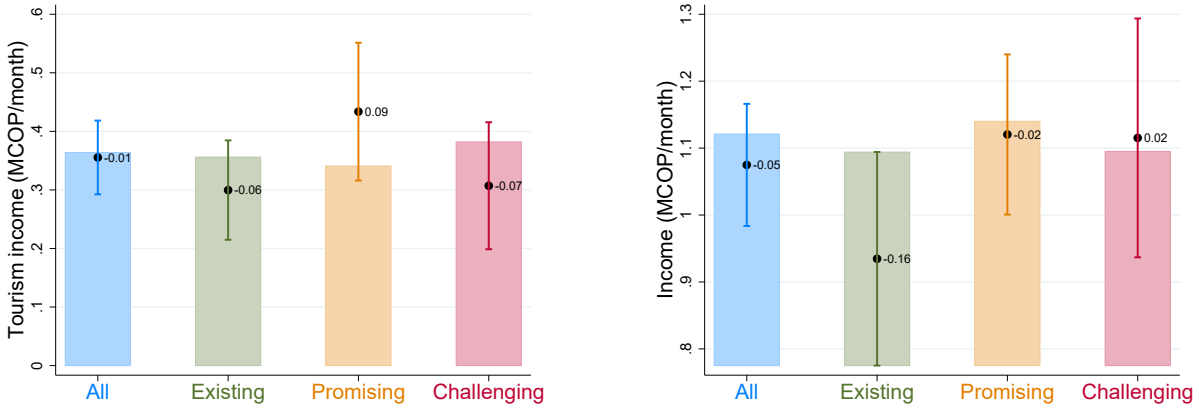
Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for the specification using dummies for the three type of municipalities in the sample.

Figure A.10: Effect on first aid course certification



Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for the specification using dummies for the three type of municipalities in the sample.

Figure A.11: Effect on tourism income and total income

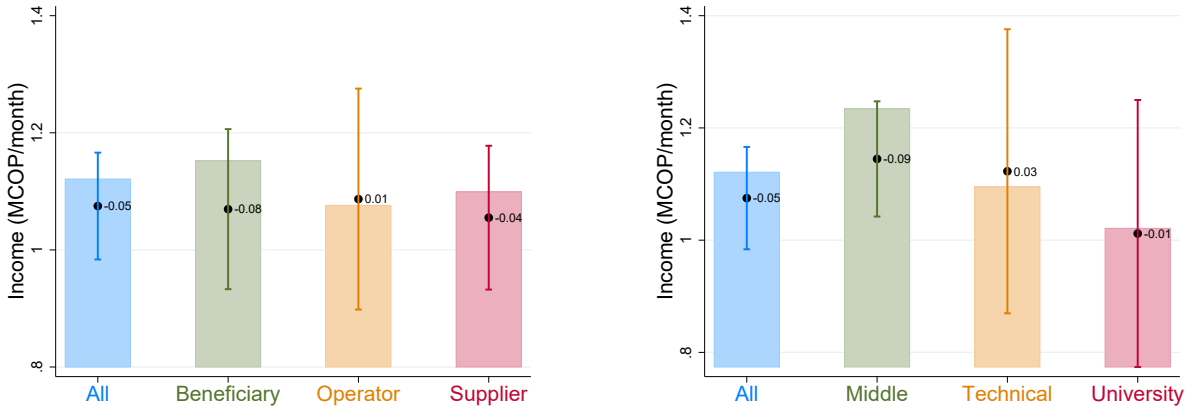


(A) Tourism income

(B) Total income

Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for the specification using dummies for the three type of municipalities in the sample.

Figure A.12: Effect on total income by individual type and level of education

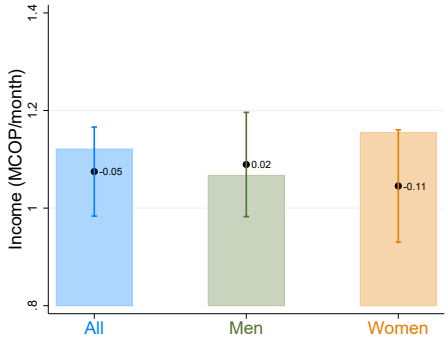


(A) Individual type

(B) Level of education

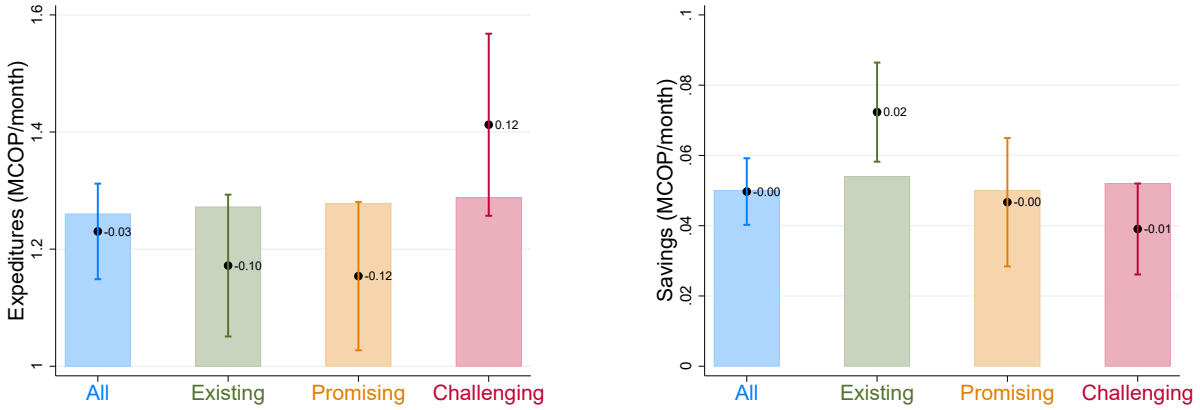
Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample. In panel A, green, yellow and red bars represent the results for heterogeneity by individual type. While in panel B present the results for heterogeneity by level of education.

Figure A.13: Effect on total income by sex



Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for heterogeneity by sex.

Figure A.14: Effect on expenditure and savings

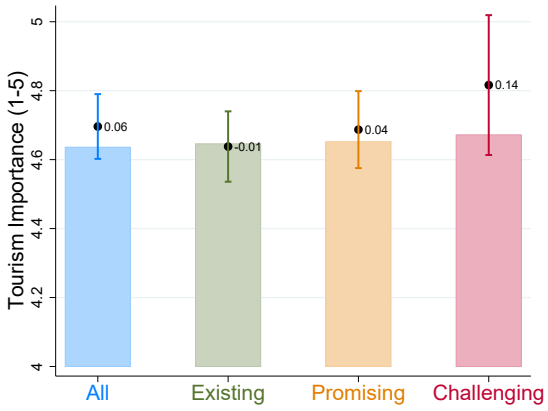


(A) Expenditure

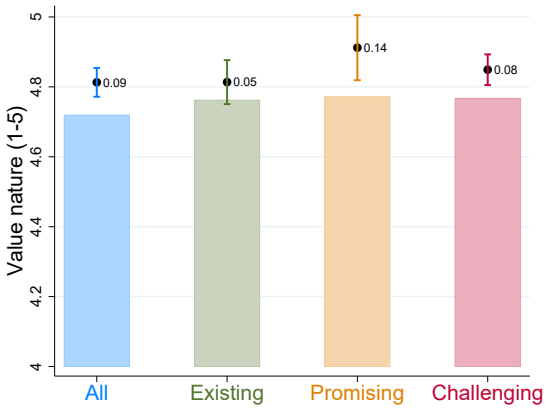
(B) Savings

Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for the specification using dummies for the three type of municipalities in the sample.

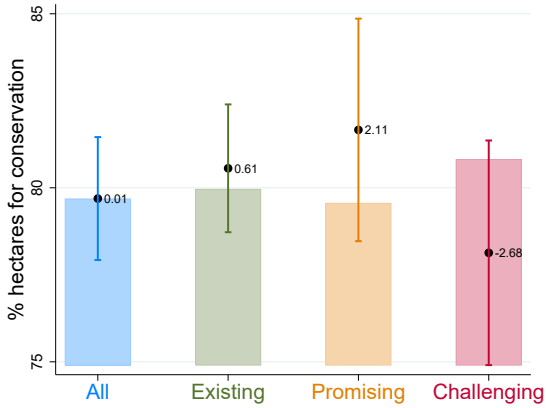
Figure A.15: Effect on perceptions



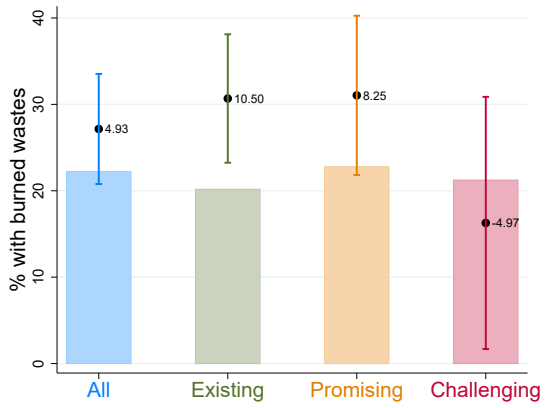
(A) Tourism importance



(B) Valuation of natural heritage



(C) Hectares for conservation



(D) Burned wastes

Notes: This figure reports the coefficients obtained from the estimation of Equation (1) represented by black points, together with 95% confidence intervals represented by the solid lines. Bars represents the mean of the dependent variable on control municipalities. Blue bar on the left represent results for all the sample, and green, yellow and red bars represent the results for the specification using dummies for the three type of municipalities in the sample.

Table A.5: Effects of eco-tourism promotion on deforestation

Dependent variable:	Alerts		Rate		Rate
Around:	Eco-tourism site				Business/HH
	(1)	(2)	(3)	(4)	(5)
Promoted	-0.31**	-0.25**	-0.40**	-1.04**	-0.087**
	(0.14)	(0.11)	(0.17)	(0.47)	(0.035)
Forest Control	No	Yes	No	No	No
Radius	2	2	2	5	2
P-value	[0.026]	[0.023]	[0.024]	[0.029]	[0.016]
FWER p-value	0.08	0.09	0.08	0.08	0.08
Mean Dep. Var. Control	0.29	0.29	0.37	1.12	0.08
Observations	533	533	533	533	780
Adjusted R^2	0.24	0.26	0.23	0.42	0.07

Notes: This table presents results for RCT without controls specification using deforestation outcomes. Robust standard errors are clustered at the municipality level and are shown in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.