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Pro-environmental behavior under bundled environmental and poverty reduction goals: Empirical evidence from Ethiopia

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ABSTRACT

Developing countries often design programs that bundle poverty reduction and environment goals. One such program is the Ethiopian food-for-work program in which participants get food or cash in return for participating in environmental protection, typically, forest and soil conservation works. While the economic impacts have been well investigated, little is known about the program's environmental impact and the willingness to participate in such programs. We elicit Ethiopian farmers' willingness to participate in a hypothetical afforestation program that mimics the components of the Ethiopian food-for-work program. We find that introducing food incentives decreases willingness to participate in the program. The participation rate, however, increases with an increase in the proportion of individuals selected for the food incentive. Our data points to signaling as the likely channel for the non-linearity of the participation rate in response to an increase in the share of food incentive recipients. These results suggest that (1) food-for-work programs could have unintended negative environmental effects and (2) directions for design reform that could mitigate such negative effects.

1. Introduction

Large-scale public work programs are increasingly used as a means to reduce poverty and vulnerability of the poor while creating employment opportunity and investment in local infrastructure and resources in many developing countries (Subbarao et al., 2012). The Ethiopian Productive Safety Net Program (PSNP), launched in 2005 replacing an older food-for-work program, is currently the second largest social protection program in Sub-Saharan Africa after South Africa (Andersson et al., 2011). The program has two components: food-for-work and direct transfers. Under the program, food-insecure households receive food/cash transfers in return for working on public projects (the food-for-work component) and households who cannot provide labor receive free aid (the direct transfer component). Many of the public projects involve environmental activities such as afforestation, soil conservation, and rehabilitation of degraded land. These projects are expected to contribute to sustainable environmental and natural resources management by supplementing pre-existing voluntary community works (Gebreselassie, March, 2006). However, there is an ongoing debate on the potential crowding-out effects of extrinsic incentives ((Frey, 1997); Bénabou and Tirole, 2006, (Bénabou and Tirole, 2011); Gneezy et al., 2011).[1] These studies suggest that the introduction of

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[1] The introduction of monetary incentives has been found to affect blood and charitable donations negatively (Timuss', 1970; Meier, 2007; Mellström and Johannesson, 2008); reduce previously unpaid work (Heyman and Ariely, 2004; Ariely, D. et al., 2009; Gneezy and Rustichini, 2000b), parents timely pick-up of their children from a day-care center (Gneezy and Aldo, 2000a), and demand for green goods (Perino et al., 2013; Kahsay et al., 2014); and decrease participation in environmental works (Kerr et al., 2012; Chervier et al., 2017).

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incentives may interact with pre-existing intrinsic or prosocial motivation, thereby crowding-out pre-existing voluntary behavior and co-operation. Some studies (e.g., Hoben, 1996; Abdulai et al., 2005; WFP Office of Evaluation, 2007) suggest that this may also be the case for the Ethiopian food-for-work (FFW) program.[2]

While there is a substantial literature on local and nation-wide effect of the Ethiopian PSNP and FFW programs,[3] only a few studies have evaluated its impact on the environment with regard to private soil conservation and tree holding. A study by Andersson et al. (2011) finds a positive effect of PSNP on private tree holding. Hagos and Holden (2003) find a positive correlation between public and private investment in soil conservation while Gebremedhin and Swinton (2003) find that the program undermines private soil conservation investment when the project involves the construction of soil conservation structures on private land but not on public land. Using farm-level bio-economic modeling, Holden et al. (2006) show that FFW may crowd-out or crowd-in private investment in soil conservation depending on its design, market conditions and technology. This is our point of departure. In this paper, we look into the FFW component and investigate whether providing incentives crowds-out pre-existing willingness to participate in collective environmental activities by eliciting farmers' willingness to participate in a hypothetical afforestation program that mimics the Ethiopian FFW program. This has a direct implication on the environmental effectiveness of FFW and related bundled programs, which have both environmental and food security goals. This is because such programs exclude a large section of the population from participating in community-based environmental management and changes the farmers' decision context from a norm of voluntary collective environmental management to a monetary frame. Moreover, once incentives are introduced, going back to a voluntary norm could be challenging (Gneezy et al., 2011).

We present field evidence on the effect of food incentive on pro-environmental behavior among smallholder farmers, who are often the target of FFW programs, as well as the potential mechanisms at work. We believe that our results provide important policy insights on the design of programs with an environmental component (e.g., framing and disassociation of FFW programs from environmental activities) that aim to foster pro-environmental behavior and collective action. This is particularly important for Ethiopia, which adopted an ambitious climate resilient green economy strategy (CRGE) and plans to rehabilitate three million hectares of land (two million hectares of afforestation and one million hectares of reforestation) by 2030 and pledges to restore 15 million ha of degraded and deforested lands by 2025.

The contributions of the paper are three-fold. Firstly, it contributes to the literature on the effect of programs that bundle environmental and food security goals by providing insights into potential unintended effects on the environment. While there is an extensive literature on the crowding-out/in effects of financial incentives in Payment for Ecosystem Services (PES) programs (e.g., Van Hecken and Bastiaensen, 2010; García-Amado et al., 2011; Narloch et al., 2012; Kerr et al., 2012; Agrawal et al., 2015; Chervier et al., 2017; Andersson et al., 2018), such effects in FFW-type programs, which bundle environmental and food security goals, have never been investigated before. While both PES and FFW-like programs are similar in terms of the links between incentives and ecosystem services, there are important distinctions. FFW programs selectively target the poor with the primary objective of consumption smoothing (during shocks) and asset accumulation. While environmental activities appear to dominate the list of activities, FFW programs also involve delivery of non-environmental public goods through collective action (e.g., building schools and health centers, construction and maintenance of village roads and irrigation canals). As such, FFW programs are not specifically designed to maximize ecosystem services. It rather bundled the environmental goal with a food security goal. Secondly, much of the crowding-out literature looks at financial incentives. Our paper adds an interesting feature by looking at whether food incentives crowd-out pro-environmental behavior. Finally, our unique elicitation design enabled us to shed light on whether signaling is an important mechanism through which incentives crowd-out pro--environmental behavior.

The remainder of the paper is organized as follows. In section two, we present the literature on the main channels for the crowding-out effect of incentives suggested in the literature. In section three, we present the data description and empirical strategy while section four presents the results. In section five, we discuss results and potential channels through which the food incentive might affect willingness to participate in afforestation programs. Section six concludes and discusses some policy implications.

2. Literature on channels for crowing-out effect of incentives

Two broad channels have been suggested in the literature for why incentives sometimes crowd-out prosocial behavior. One suggests that extrinsic incentives change basic preferences by directly reducing agents' intrinsic motivation (e.g., Deci, 1975; (Frey, 1997)). The other suggests that basic preferences remain unchanged but that extrinsic incentives affect the reputation payoff from doing prosocial activities (e.g., Bénabou and Tirole, 2006).[4]

Preference change explanation: According to this explanation agents are assumed to have pre-existing intrinsic motivation to contribute to prosocial activities. In the case of conservation activities, intrinsic motivation is related to pro-nature and non-instrumental values (e.g., moral value, existence value) (Rode et al., 2015; Bottazzi et al., 2018). Thus, extrinsic incentives may crowd-out intrinsic motivation by undermining self-determination of individuals. Depending on the relative strength of the price effect (the food incentive in our case) and motivation crowding-out effect, the overall effect of extrinsic incentives may be negative.

Signaling explanation: Bénabou and Tirole (2006) show that individuals are motivated by intrinsic (prosocial preference), extrinsic (incentive), and reputation motives. Prosocial behavior serves as a way to signal one's prosocial preferences. Thus, extrinsic incentive may sometimes crowd-out prosocial behavior because it weakens the signal of prosocial motives that is sent when one undertakes prosocial behavior. Thus, the introduction of food incentive in the form of FFW program may reduce willingness to participate by diluting the signal of being pro-environmental as observers (including retrospective self) can no longer distinguish whether the behavior is motivated by prosocial preference or the food incentive. In a broader perspective, this mechanism also works for other types of signaling, for example, when a participant in the FFW program wants to avoid sending a negative signal that she/he is poor. This is because FFW program participants are selected based on their income status and thus participation in the

[2] This is in fact in line with recent studies that suggest that incentives, while decreasing the cost of participating in environmental activities, may worsen the environmental status by crowding-out environmental virtues (Vatn, 2010; Chervier et al., 2017) and undermine social norms and weaken collective action (Ostrom, 2000; Cleaver, 2000; Vatn, 2010; Fehr and Falk, 2002; Kerr et al., 2012).

[3] Previous studies that evaluate the impact of Ethiopian food-for-work program on various economic outcomes indicate mixed evidence (e.g., Maxwell et al., 1994; Barrett et al., 2004; Dercon and Krishnan, 2004; Abdulai et al., 2005; Gelan, 2007; Bezu and Holden, 2008; Tadesse and Shively, 2009; Gilligan and Hoddinott, 2007; Gilligan et al., 2009; Andersson et al., 2011; Alem and Broussard, 2013).

[4] Other channels through which incentives affect prosocial behavior include changing the decision environment from a social to a monetary frame (e.g., Gneezy and Rustichini, 2000b; Heyman and Ariely, 2004); and destroy trust (e.g., Falk and Kosfeld, 2006; Fehr and List, 2004).

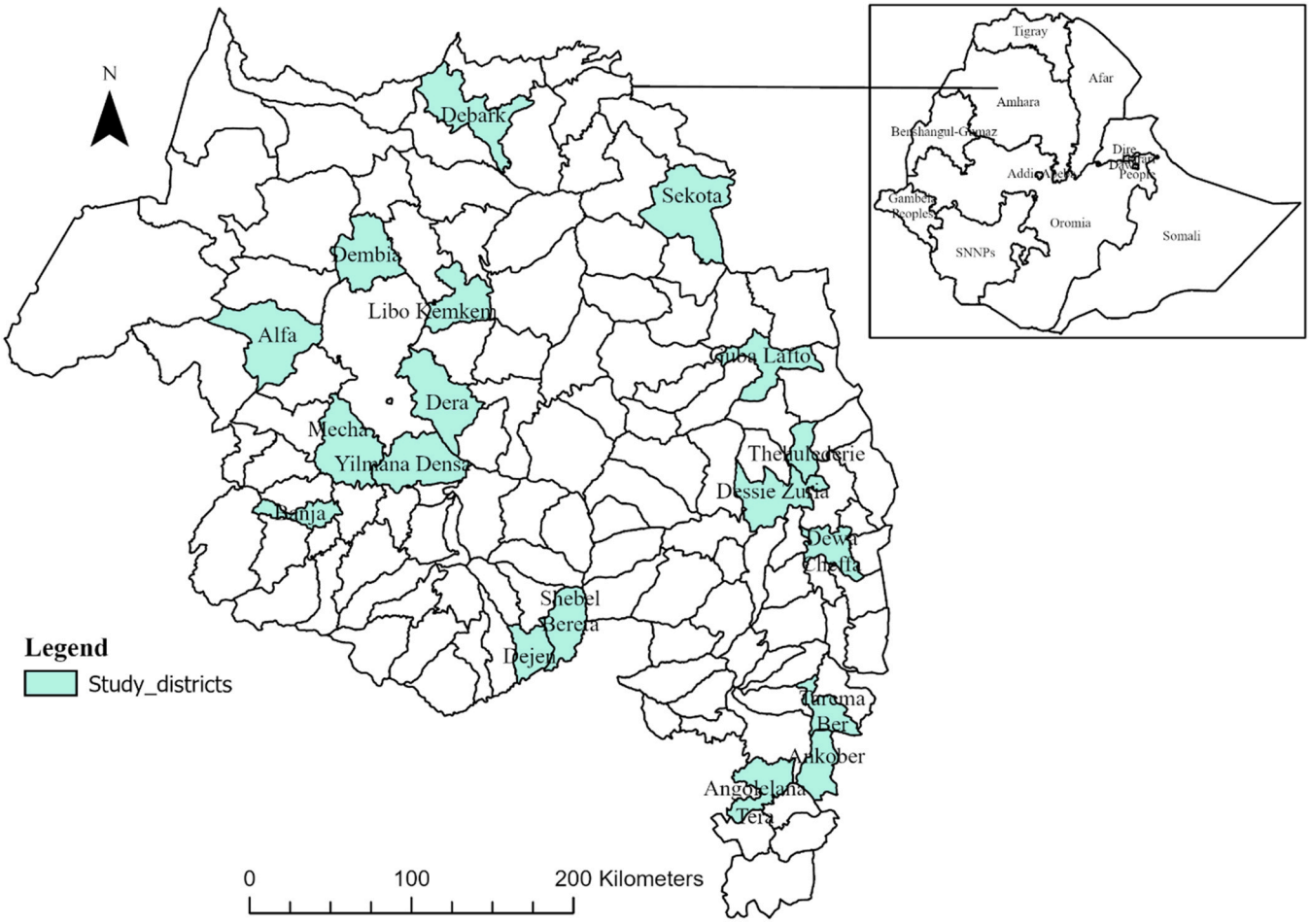

Fig. 1. Map of study sites in Amhara regional state.

program could send a stigmatizing signal of being 'poor and dependent', which is in line with the literature on the stigma effect of welfare dependence (Lindbeck et al., 1999; Dufwenberg and Lundholm, 2001).

We hypothesize that both prosocial signaling and 'non-poor' signaling are the main channels through which FFW crowd-out the willingness to participate in environmental programs. In Section 5, we discuss why the preference change or other explanations are less likely to explain the non-linear relationship between share of food incentive participants and willingness to participate in the program.

3. Data and econometric method

In this section, we present details of our sampling strategy, information collected, and empirical methods.

3.1. Data source and sample description

Our study uses data from a cross-sectional household survey, which was undertaken in the period April-May 2016, to study the behavior and welfare outcomes of smallholder farm households in the Amhara Regional State, Ethiopia. The regional state was organized into 10 administrative zones and 169 districts. The districts were further decentralized into 3437 local administrative *Kebelle*[5] (3018 rural *kebelles* and 419 urban *kebelles*). The data is collected from 18 randomly drawn districts where 28 rural *Kebelles* are randomly drawn as Enumeration Areas (EAs). We then randomly selected 15 recognized and 15 non-recognized households from each EAs, which gives us a total of 840 households for our study. Recognized households are households recognized by the government for their success in improving their livelihoods and/or adoption of productivity enhancing technologies, natural resource conservation, entrepreneurship, and farm management practices. The non-response rate was only 2.5% and this is attributed to the absence of household heads during the survey period.

Heads of the sample households were invited to nearby urban centers. After general introduction about the purpose of the study, we conducted a one-to-one interview given the limited education background of respondents. The interview was conducted in the local language (Amharic). Participants in the survey were paid 100 ETB (≈4.75 USD at the time of the study) for participating in the survey as a compensation for their time and travel cost as participants had to travel to a nearby urban center for the study. We collected information on a vector of socio-economic and demographic characteristics of the respondent (including gender, literacy, household size, wealth, and so on) Fig. 1.

As part of the survey questionnaire, we was asked each participant two questions regarding their willingness to participate in a hypothetical afforestation program, which aims at increasing forest cover and environmental rehabilitation. Participants are required to answer "Yes" or "No" to these questions. The first question was framed as *"Imagine that the government introduced a public project where village residents are required to plant trees for 5 days a year for free. This is done for the sake of protecting the environment and increasing our forest cover. Do you want to participate?"* while second question is framed as *"Imagine now that the government will compensate 20 per cent of the participants at the bottom of income distribution who will then receive 20 kilos of wheat. Do you want to*

[5] *Kebelle* is the smallest administrative unit in Ethiopia.

Table 1
Descriptive statistics.

Variables	Sample	Mean	Standard deviation
Contribution	819	0.74	0.44
Age	819	46.34	10.16
Gender	819	0.96	0.19
Marital Status	819	0.96	0.19
Education	819	2.03	3.04
Household size	819	6.16	1.75
Annual income	819	24,612.60	66,556.72
Land holding	819	4.17	3.46
Livestock holding	819	4.97	3.35
Religion	819	0.85	0.35
Social network	819	0.76	0.43
Risk preference	819	3.15	3.00
Recognized farmer	819	0.50	0.50
Participation in food-for-work program	819	0.13	0.34
Years of participation in food-for-work program[a]	819	0.50	1.55
Wealth status	819	2.271	.81
Income status	819	2.497	1.024
Participate in prosocial activities	819	.759	.427
Donation	819	22.441	106.087

Note: Land holding is measured in timad (a local measure) and one timad is approximately 0.25 ha; Social network (1 if a member to groups, organizations, networks, or associations, 0 otherwise); Risk preference is measured by the number of safe choices before a switch in an incentivized risk experiment; and Recognized farmer (1 if subject is recognized/win award, 0 otherwise). Wealth status refers to perceived status by respondents with ranges between 1 (poor) and 4 (rich). Income status refers to income quantiles based on the actual income with ranges between 1 (bottom 20%) and 4 (top 20%). Participate in prosocial activities has two values, 1 if yes to whether the respondent regularly participates in prosocial activities 0 otherwise. Donation is the amount money the respondent donates to help others. [a]Note that the average years of participation in food-for-work program is 4 years for the 13% who participated in the program.

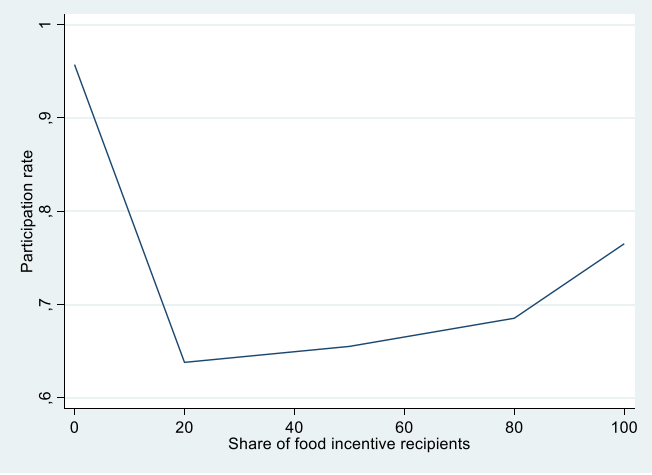

Fig. 2. Food incentives and participation rate.

participate?" We also ask each participant the second question where the share of food incentive recipients at the bottom of the income distribution was set to 50 per cent, 80 per cent, and 100 per cent of the participants. Therefore, participation was open for everyone while the food incentive is only paid for participants below the suggested income thresholds. This helps us to understand whether FFW-type incentives affect voluntary environmental participation not only among the eligible community members, but also in the wider community.

Designing a hypothetical afforestation program was necessary in order to answer whether incentives crowd-out pro-environmental behavior at community level. Firstly, we need to know farmers' willingness to participate in an environmental program without incentives. While we could have asked about the actual FFW program without the food incentive, this would still be hypothetical since all FFW programs involve incentives. Moreover, our hypothetical afforestation program is normally the type of environmental activity covered by the actual FFW program. Secondly, we wanted to understand potential mechanisms through which incentives may crowd-out pro-environmental behavior. To do so, we varied the share of farmers eligible for payment (0%, 20%, 50%, 80% and 100%). This enables us to know the share of participants under each scenario. In the actual FFW program, we have neither different thresholds nor is it possible to include non-paid farmers in environmental programs. Finally, the actual FFW program is essentially meant to address food insecurity while at the same time contributing to the environment and has no universal coverage of all districts or all kebelles within eligible districts in our study area. While it is possible to assume that most farmers have heard about the program, they are less likely to know the exact design and implementation of the actual FFW program if they did not participate. Thus, for non-FFW districts or kebelles, we would under all circumstances need to ask about a hypothetical afforestation program that they had not experienced.

Table 1 below presents the descriptive statistics. 96% of our sampled households are male. This is because we invited household heads and in most parts of Ethiopia the head of the typical household is male. 13% of our sample households have participated in the actual food-for-work programs in their kebelle for a period of, on average, 4 years. However, it is important to note that the actual program operates in 26 of the 28 Kebelles in our sample accounting for 93% of the respondents. We do not find a significant difference in willingness to participate in the hypothetical FFW program between participants and non-participants of the actual FFW program.

3.2. Econometric method and identification strategy

Our identification strategy exploits the participation decision in the afforestation program of survey participants. First, we use OLS and Probit models and regress willingness to participate (Y_i) on food incentive controlling for socio-economic characteristics (X_i) and village fixed effects (α_z).

$$Y_i = \beta_0 + \beta_1 * incentive + \beta_2 X_i + \alpha_z + \varepsilon_i \quad (1)$$

Both Y_i and *incentive* variables are binary indicators of contribution decision (1 if yes, 0 otherwise) and food incentive (1 if there is food incentive, 0 otherwise) respectively. The parameter 'β_1', which is our main parameter of interest, captures the effect of food incentives on willingness to participate in our hypothetical government afforestation program. β_2 captures the effect of other covariates. More importantly, we control for annual income and other wealth indicators such as land and livestock holding to rule out the expectation of individuals on getting food incentive (which depends on self-judgment of income and wealth) as an explanation for the crowding-out effects. α_z captures village level fixed effects while ε_i captures other unobserved factors that may contribute to heterogeneity in households' decision to participate in the program.

Next, we re-estimate Eq. (1) using OLS and Probit models with a categorical *incentive* variable.[6].

[6] We also estimate a multivariate probit model in which the binary outcomes of each incentive category are jointly estimated to circumvent potential correlation among the binary outcomes. However, our conclusions remain the same (results are not reported here, but available upon request).

Table 2
Food incentive and willingness to participate in afforestation program.

	OLS (1)	OLS (2)	OLS (3)	Probit (4)	OLS (5)	OLS (6)
Food incentive	-0271***	-0280***	-0280***	-0384***	-0327***	-0201***
	(0015)	(0015)	(0015)	(0025)	(0018)	(0016)
Controls	No	Yes	Yes	Yes	Yes	
Village fixed effects	No	No	Yes	Yes	Yes	
Constant	0957***	1301***	1315***	3183***	1166***	1161***
	(0007)	(0125)	(0159)	(0613)	(0134)	(0122)
R-squared	0061	0095	0149		0227	0138
Pseudo R^2				0154		
Number of observations	4089	3964	3964	3964	1586	1586

Note: Clustered (at household level) standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, *** $p < 0.01$. Included control variables: Age, religion, marital status, household size, gender, education, social network, risk preference, land holding, livestock holding, annual income and farmers' recognition.

Table 3
Food incentive and willingness to participate in afforestation program.

	OLS (1)	OLS (2)	OLS (3)	Probit (4)
Share of food incentive recipients				
No food incentive (base category)				
20 per cent	-0319***	-0327***	-0327***	-0418***
	(0017)	(0017)	(0017)	(0026)
50 per cent	-0302***	-0311***	-0311***	-0406***
	(0017)	(0017)	(0017)	(0026)
80 per cent	-0272***	-0280***	-0280***	-0380***
	(0017)	(0017)	(0017)	(0026)
100 per cent	-0192***	-0201***	-0201***	-0310***
	(0016)	(0016)	(0016)	(0026)
Controls	No	Yes	Yes	Yes
Village fixed effects	No	No	Yes	Yes
Constant	0957***	1301***	1315***	3196***
	(0007)	(0125)	(0159)	(0619)
R-squared	0071	0104	0159	
Pseudo R^2				0163
Number of observations	4089	3964	3964	3964

Note: Clustered (at household level) standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Included control variables: Age, religion, marital status, household size, gender, education, social network, risk preference, land holding, livestock holding, annual income and farmers' recognition.

Table 4
Food incentive and willingness to participate in afforestation program: Interaction between food incentive and prosocial behavior.

	(1)	(2)	(3)
Food incentive	0.045	-0.194***	-0.275***
	(0.097)	(0.022)	(0.011)
Ln(income)*food incentive	-0.035***		
	(0.010)		
Prosocial*food incentive		-0.113***	
		(0.025)	
Donation*food incentive			-0.0002***
			(0.000)
Controls	Yes	Yes	Yes
Village fixed effects	Yes	Yes	Yes
Constant	1.055***	1.269***	1.313***
	(0.107)	(0.091)	(0.090)
R-squared	0.151	0.155	0.150
Number of observations	3964	3964	3964

Note: Clustered (at household level) standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Included control variables: Age, religion, marital status, household size, gender, education, social network, risk preference, land holding, livestock holding, annual income and farmers' recognition.

$$incentive = \begin{cases} 0,\ \textit{If no food incentive} \\ 1,\ \textit{if share of food incentive receipents is } 20\ \textit{per cent} \\ 2,\ \textit{if share of food incentive receipents is } 50\ \textit{per cent} \\ 3,\ \textit{if share of food incentive receipenets is } 80\ \textit{per cent} \\ 4,\ \textit{if share of food incentive receipents is } 100\ \textit{per cent} \end{cases}$$

These categories correspond to the hypothetical questions explained above in Section 3.1. Our specification is important to understand whether the willingness to participate in the afforestation program varies depending on the share of food incentive recipients. This result provides important insights to the channels through which food incentives affect pro-environmental behavior.

4. Results

We first present our main results directly from the raw data. Then we control for potential biases econometrically. We find that participation rate declines substantially when food incentives are introduced pointing to the crowding-out effect of extrinsic incentives. However, once incentives are introduced, the share of individuals who are willing to participate in the program increases with an increase in the share of food incentive recipients. Fig. 2 below presents the share of respondents who are willing to participate in the afforestation program under different shares of food incentive recipients. Without incentives, about 96 per cent of the sampled households are willing to participate in the afforestation program. Although this figure is very high, it is not uncommon to have large turnout for voluntary environmental works in the study area as also detailed in the next section. Once the food incentive is introduced, we see that the share of respondents who are willing to participate in the afforestation program decreases. However, the participation rate increases in response to the increase in the share of food incentive recipients, but in all cases substantially below the participation rate without incentives. This non-linear relationship clearly illustrates a substantial crowding-out of pre-existing willingness to participate after incentives are introduced and an increased willingness to participate with increasing share of incentive recipients.

Next, we check if these results hold when controlling for a vector of socio-economic and demographic characteristics and village specific fixed effects as specified in Eq. (1). In addition to the food incentive, there may be a number of other socio-economic characteristics of farmers that affect their willingness to participate in environmental programs. Our detailed data enables us to control for key socio-economic characteristics of the farmer. Cultural factors (e.g., norm of collective action), geographic characteristics (e.g., slope and climate) and nature of the forest may also affect farmers' participation decision. Hence, we include village fixed effects to control for these factors. In Table 2 below, we present estimation results on the effect of introducing food incentives on farmers' willingness to contribute labor to an afforestation program. Columns (1)-(3) present OLS estimates while column (4) presents marginal effects from a Probit model. Columns (5) presents OLS estimates by limiting the observations to cases without incentive

Table 5
Food incentive and willingness to participate in afforestation program: Interaction between food incentive and wealth quantiles.

	Wealth quantiles based on annual income (1)	Wealth quantiles based on livestock holding (2)	Wealth quantiles based on land holding (3)	Wealth quantiles based on perceived wealth status (4)
Share of food incentive recipients				
No food incentive				
20 per cent	-0319***	-0327***	-0327***	-0319***
	(0018)	(0018)	(0018)	(0018)
50 per cent	-0298***	-0307***	-0311***	-0282***
	(0018)	(0021)	(0022)	(0021)
80 per cent	-0256***	-0281***	-0280***	-0271***
	(0018)	(0021)	(0020)	(0017)
100 per cent	-0196***	-0198***	-0199***	-0187***
	(0016)	(0018)	(0018)	(0016)
Wealth quantiles				
First quantile (bottom 20 per cent)				
Second quantile	-0.045**	-0045**	-0040*	-0.067***
	(0.021)	(0020)	(0023)	(0.021)
Third quantile	-0.049**	-0016	-0056**	-0.085***
	(0.021)	(0021)	(0023)	(0.026)
Fourth quantile (top 20 per cent)	-0.084***	-0045*	-0013	-0.081***
	(0.024)	(0025)	(0025)	(0.028)
Interaction between wealth quantiles and share of food incentive recipients				
Second quantile*50 per cent	-0.014	-0015	-0002	-0.033
	(0.035)	(0038)	(0036)	(0.035)
Third quantile*80 per cent	-0.052	0003	-0000	-0.004
	(0.035)	(0037)	(0038)	(0.049)
Fourth quantile*100 per cent	0.021	-0013	-0009	-0.038
	(0.040)	(0043)	(0040)	(0.050)
Controls	Yes	Yes	Yes	Yes
Village fixed effects	Yes	Yes	Yes	Yes
Constant	1.129***	1332***	1355***	1.154***
	(0.076)	(0091)	(0091)	(0.077)
R-squared	0.157	0.160	0161	0.157
Number of observations	4089	3964	3964	4089

Note: Clustered (at household level) standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Included control variables common for all columns: Age, religion, marital status, household size, gender, education, social network, risk preference and farmers' recognition. Additional controls include land holding and livestock holding for columns (1) and (4); land holding and annual income for column (2); and annual income and livestock holding for column (3).

and an incentive with 20% share of recipients. Column (6) re-estimates the model in column (5), but with 100% share of recipients instead of 20%. Columns (5) and (6) are presented to alleviate concerns related to imbalance in the frequency of with and without food incentive since observations with food incentive are 4 times higher than without food incentives. Full estimation results are presented in Appendix Table A1.

The results confirm what we saw in the raw data and indicate that farmers are less likely to participate in afforestation programs once food incentives are introduced. This result is robust to the inclusion of socio-economic controls and village fixed effects and holds for both linear OLS and non-linear Probit models. In the full estimation results reported in the Appendix, we find that smallholder farmers who are Christians, risk averse, recognized, have large family size, and belong to a social network are more likely to contribute to the proposed afforestation program. These results are not surprising: (i) smallholder farmers who are recognized are more likely to have greater awareness on the importance of afforestation; (ii) Large family households have availability of labor; and (iii) farmers who belong to a social network may have better information and knowledge about afforestation. In contrast, smallholder farmers who are older, male and more educated, and have higher annual income and livestock wealth are less likely to participate in the program. This could be due to, for example, availability of time as male, educated, and wealthy farmers are expected to be involved in off-farm employment and business activities. Finally, controlling for participation or years of participation in food-for-work programs does not affect the estimated effects (details available on request).

In Table 3 below, we present estimation results with a categorical *incentive* variable as explained in the Econometric method and identification strategy sub-Section. Full estimation results are presented in Appendix Table A2.

The estimated coefficients suggest that the magnitude of the crowding-out effect decreases when the share of food incentive recipients increases. This is in line with what we observed in Fig. 2 that individuals are more likely to participate in the proposed afforestation program when the share of food incentive recipients increases.

Table 4 below presents the estimated effects of interaction between (i) food incentive and annual income and (ii) food incentive and pro-social behavior (as proxied by participation in prosocial activities and financial donation). Full estimation results are presented in Appendix Table A3. The results suggest that the crowding-out effect is higher among people who have higher annual income, participate in prosocial activities and donate money.

Finally, we present the estimated effects of the interaction between share of food incentive recipients and wealth quantiles in Table 5. Full estimation results are presented in Appendix Table A4. None of the interaction effects is statistically significant irrespective of how we construct the wealth quantiles, i.e., based on annual income, livestock holding, land holding or perceived wealth status, suggesting that the food incentives crowds-out pro-environmental behavior across all wealth quantiles.

5. Discussion

Our results show that introducing food incentives decreases smallholder farmers' willingness to participate in the proposed afforestation program. This is quite intuitive given that the Amhara region has a well-established pre-existing norm on collective voluntary environmental activities in afforestation and soil conservation activities. While community-based voluntary environmental management has a long history in the region, this was particularly at its height in the 80s, which was considered as 'golden age' of the history of Ethiopian forestry (Berhanu, 2009), when afforestation programs were heavily promoted by the then government. As a result, thousands of hectares have been afforested and rehabilitated which are currently visible in the region. Such norms are still common where many villagers participate in annual voluntary afforestation and soil conservation activities. While such programs are normally announced by the government, it is often the village administration headed by the kebelle chairperson, in collaboration with local elders, who organizes such voluntary environmental activities. Many argue that this is threatened by the introduction of FFW-type incentives. When FFW program was introduced in Ethiopia, more extensively in late 80s, all pre-existing voluntary community works on rehabilitation and conservation of environment have been either merged, replaced or dissolved. As a result, the performance of FFW programs with respect to forest management have been disappointing and at times counterproductive, with low rehabilitation targets

Table A1
Food incentive and willingness to participate in afforestation program: full estimation results.

	OLS (1)	OLS (2)	OLS (3)	Probit (4)	OLS (5)	OLS (6)
Food incentive	-0271***	-0280***	-0280***	-0384***	-0327***	-0201***
	(0015)	(0015)	(0015)	(0025)	(0018)	(0016)
Age		-0003**	-0002*	-0002*	-0000	-0003***
		(0001)	(0001)	(0001)	(0001)	(0001)
Religion		0126***	0042	0039	0031	0011
		(0038)	(0076)	(0067)	(0058)	(0051)
Marital status		0002	0018	0023	0002	0024
		(0064)	(0065)	(0068)	(0058)	(0054)
Household size		0007	0006	0006	0005	0005
		(0007)	(0007)	(0007)	(0006)	(0005)
Gender		-0072	-0065	-0074	-0049	-0029
		(0063)	(0058)	(0066)	(0048)	(0047)
Education		-0008*	-0007*	-0007*	-0006*	-0005
		(0004)	(0004)	(0004)	(0003)	(0003)
Social network		0030	0040	0042	0042*	0043*
		(0028)	(0028)	(0027)	(0023)	(0022)
Risk preference		0006	0004	0003	-0001	-0002
		(0004)	(0004)	(0004)	(0003)	(0003)
Land holding		-0001	0000	0000	-0002	0001
		(0003)	(0004)	(0004)	(0003)	(0002)
Livestock holding		-0008**	-0006	-0006	-0003	-0004
		(0004)	(0004)	(0004)	(0003)	(0003)
Ln(income)		-0030***	-0024**	-0024**	-0017*	-0014
		(0010)	(0011)	(0011)	(0010)	(0009)
Recognized farmer		0025	0016	0019	0013	0019
		(0025)	(0024)	(0024)	(0019)	(0018)
Village fixed effects	No	No	Yes	Yes	Yes	Yes
Constant	0957***	1301***	1315***	3183***	1166***	1161***
	(0007)	(0125)	(0159)	(0613)	(0134)	(0122)
R-squared	0061	0095	0149		0227	0138
Pseudo R^2				0154		
Number of observations	4089	3964	3964	3964	1586	1586

Note: Clustered standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

and tree survival rates (Hoben, 1996).

Our results suggest that FFW-type programs, bundling environmental and food security goals, could have unintended effects on the environment by changing the decision context from a voluntary collective environmental work to a monetary frame and creating a norm that environmental protection is something that needs payment and that it is the responsibility of the government/NGOs. The idea that introducing incentives may crowd-out prosocial behavior by changing the decision context from a social to a monetary frame has previously been documented (e.g., Gneezy and Rustichini, 2000b; Heyman and Ariely, 2004). This could have far-reaching consequences not only on the environmental activities covered by FFW program, but also on other environmental management areas that are not covered by the program, for example, by decreasing participation rate in non-FFW voluntary environmental management programs and local community cooperation in enforcing local environmental regulations as well as promoting 'community-level' moral hazard in the implementation and follow-up activities of FFW projects. Instances of not safeguarding or even destroying the environmental works done by FFW programs in the hope of keeping the program in place have previously been reported in the Ethiopian context (Kebede, 1995; Shiferaw and Holden, 1999; Mazengia and Mowo, 2012). Moreover, once a monetary norm is developed, going back to pre-existing voluntary environmental management could be difficult (see Gneezy et al., 2011 for an interesting synthesis of the evidence on crowding-out effects of incentives). The idea that local communities may refuse to work on environmental management voluntary after the introduction of FFW programs has been previously documented (Hoben, 1995). Our results show that participation rates declined after the food incentive on selected households was introduced. While paying most community members increases the participation rate as reflected by the 80% and 100% thresholds, this does not reach the pre-FFW participation rate.

Our results are also in line with the previous literature that shows that incentives sometimes crowd-out prosocial behavior. For example, (Frey and Oberholzer-Gee, 1997) find that the percentage of respondents who agreed to accept a nuclear waste repository significantly dropped when compensation was offered as compared to a condition without compensation. Similarly, in a field experiment conducted in Tanzania, Kerr et al. (2012) find that low payment for natural resource conservation results in a lower participation rate than no payment at all suggesting crowding-out effects. They further find that group payments made through village authorities decrease participation rate in Mexico. Alpízar et al. (2017) find that excluding individuals from monetary incentives decreases prosocial behavior among the excluded ones. Chervier et al. (2017) find that payments made to local communities emphasize money-related values and increase the likelihood of breaking conversation rule in a study that compares PES participants and non-participants in Cambodia. Similarly, Agrawal et al. (2015) find that villagers in India who received material benefits were more likely to change their motivation for forest protection from an environmental to an economic one as compared to those who do not receive economic benefits. In this regard, Rode et al. (2015) present an extensive review on crowding-out effects of PES programs and show that the evidence so far is inconclusive. Recently, Andersson et al. (2018) find strong evidence against crowding-out of extrinsic incentives in a framed field experiment among 1200 tropical forest users in Bolivia, Peru, Uganda, Tanzania and Indonesia. Participants were divided into three treatments: PES, interpersonal communication, and PES + interpersonal communication. The authors find (i) a positive effect on conservation behavior in all the three treatments; (ii) this behavior persists even when the payment stopped; (iii) the effect is higher when PES is combined with interpersonal communication; and (iv) trust plays important role in amplifying these effects.

In the following, we discuss potential channels through which food

Table A2
Food incentive and willingness to participate in afforestation program: full estimation results.

	OLS (1)	OLS (2)	OLS (3)	Probit (4)
Share of food incentive recipients				
No food incentive				
20 per cent	-0319***	-0327***	-0327***	-0418***
	(0017)	(0017)	(0017)	(0026)
50 per cent	-0302***	-0311***	-0311***	-0406***
	(0017)	(0017)	(0017)	(0026)
80 per cent	-0272***	-0280***	-0280***	-0380***
	(0017)	(0017)	(0017)	(0026)
100 per cent	-0192***	-0201***	-0201***	-0310***
	(0016)	(0016)	(0016)	(0026)
Age		-0003**	-0002*	-0002**
		(0001)	(0001)	(0001)
Religion		0126***	0042	0039
		(0038)	(0076)	(0067)
Marital status		0002	0018	0023
		(0064)	(0065)	(0068)
Household size		0007	0006	0006
		(0007)	(0007)	(0007)
Gender		-0072	-0065	-0074
		(0063)	(0058)	(0066)
Education		-0008*	-0007*	-0007*
		(0004)	(0004)	(0004)
Social network		0030	0040	0042
		(0028)	(0028)	(0027)
Risk preference		0006	0004	0003
		(0004)	(0004)	(0004)
Land holding		-0001	0000	0000
		(0003)	(0004)	(0004)
Livestock holding		-0008**	-0006	-0006
		(0004)	(0004)	(0004)
Ln(income)		-0030***	-0024**	-0023**
		(0010)	(0011)	(0011)
Recognized farmer		0025	0016	0019
		(0025)	(0024)	(0024)
Village fixed effects	No	No	Yes	Yes
Constant	0957***	1301***	1315***	3196***
	(0007)	(0125)	(0159)	(0619)
R-squared	0071	0104	0159	
Pseudo R^2				0163
Number of observations	4089	3964	3964	3964

Note: Clustered standard errors are in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A3
Food incentive and willingness to participate in afforestation program: interaction between food incentive and prosocial behavior, full estimation results.

	(1)	(2)	(3)
Food incentive	0.045	-0.194***	-0.275***
	(0.097)	(0.022)	(0.011)
Age	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)
Religion	0.042	0.046	0.043
	(0.046)	(0.046)	(0.046)
Marital status	0.018	0.029	0.019
	(0.035)	(0.035)	(0.035)
Household size	0.006	0.007*	0.006
	(0.004)	(0.004)	(0.004)
Gender	-0.065*	-0.065*	-0.067**
	(0.034)	(0.035)	(0.034)
Education	-0.007***	-0.007***	-0.007***
	(0.003)	(0.003)	(0.003)
Social network	0.040**	0.051***	0.039**
	(0.017)	(0.017)	(0.017)
Risk preference	0.004*	0.004*	0.004*
	(0.002)	(0.002)	(0.002)
Land holding	0.000	0.001	0.000
	(0.002)	(0.002)	(0.002)
Livestock holding	-0.006**	-0.006**	-0.006**
	(0.002)	(0.002)	(0.002)
Ln(income)	0.004	-0.024***	-0.024***
	(0.009)	(0.006)	(0.006)
Recognized farmer	0.016	0.022	0.017
	(0.014)	(0.014)	(0.014)
Ln(income)*food incentive	-0.035***		
	(0.010)		
Prosocial		0.027	
		(0.020)	
Prosocial*food incentive		-0.113***	
		(0.025)	
Donation			0.0001**
			(0.000)
Donation*food incentive			-0.0002***
			(0.000)
Village fixed effects	Yes	Yes	Yes
Constant	1.055***	1.269***	1.313***
	(0.107)	(0.091)	(0.090)
R-squared	0.151	0.155	0.150
Number of observations	3964	3964	3964

Note: Clustered standard errors are in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

incentives may affect farmers' willingness to participate in the afforestation program. From our data, 96 per cent of the sampled households are willing to participate in the hypothetical afforestation program without incentives. This decreases substantially when incentives are introduced. However, once incentives are introduced, participation rate increases when the share of food incentive recipients increase. This non-linear relationship between participation rate and share of incentive recipients makes it less likely that the crowding-out effect was due to participants perception of control by the government and their self-determination undermined as suggested by the motivation crowing-out hypothesis. Our data rather points to signaling as a likely channel. First, Fig. 2 and results in Table 3 above show an increase in the share of people who are willing to participate in the program when the proportion of people selected for the food incentive increases. This is in line with signaling to avoid stigma. That is, the higher the share of people who receive food incentive, the lower negative signal (higher valuation for money or stigma of 'poor and dependent') associated with participation. This may then induce people who are concerned about 'non-poor' signaling to participate in the program. Second, we find that the crowding-out effect is driven mainly by people who have higher annual income, regularly participate in prosocial activities in their local communities and donate money to help others which suggest prosocial signaling as an explanation (see Table 4 above). These results are consistent with the idea that the introduction of food incentive dilutes the signal of being prosocial and raise the possibility of stigmatizing food incentive recipients for being 'poor and dependent'.[7]

Third, we also ask participants a question, which is framed differently as *"Imagine now that the government will compensate for a randomly selected 20 per cent of the participants who will then receive 20 kilos of wheat. Do you want to participate?"* Similar to the income-based selection of food incentive recipients, we see crowding-out effect. However, this effect decreases by about 48% as compared to income-based selection of food incentive recipients (see Appendix Table A4). This is consistent with signaling explanation since the stigma of being poor and dependent is higher when receiving food incentive based on income-based than lottery-based selection.

Our results may also be driven by loss of reputation in the eyes of the enumerator because of the one-to-one interview with respondents (this excludes reputation effect in the eyes of other respondents). Thus,

[7] This is in line with the literature on incentives and endogenous norms (Bénabou and Tirole, 2006) as well as the stigma effect of welfare dependence (Lindbeck et al., 1999; Dufwenberg and Lundholm, 2001).

Table A4
Food incentive and willingness to participate in afforestation program: interaction between food incentive and wealth quantiles.

	Wealth quantiles based on annual income (1)	Wealth quantiles based on livestock holding (2)	Wealth quantiles based on land holding (3)	Wealth quantiles based on perceived wealth status (4)
Share of food incentive recipients				
No food incentive				
20 per cent	-0319***	-0327***	-0327***	-0319***
	(0018)	(0018)	(0018)	(0018)
50 per cent	-0298***	-0307***	-0311***	-0282***
	(0018)	(0021)	(0022)	(0021)
80 per cent	-0256***	-0281***	-0280***	-0271***
	(0018)	(0021)	(0020)	(0017)
100 per cent	-0196***	-0198***	-0199***	-0187***
	(0016)	(0018)	(0018)	(0016)
Wealth quantiles				
First quantile (bottom 20 per cent)				
Second quantile	-0.045**	-0045**	-0040*	-0.067***
	(0.021)	(0020)	(0023)	(0.021)
Third quantile	-0.049**	-0016	-0056**	-0.085***
	(0.021)	(0021)	(0023)	(0.026)
Fourth quantile (top 20 per cent)	-0.084***	-0045*	-0013	-0.081***
	(0.024)	(0025)	(0025)	(0.028)
Interaction between wealth quantiles and share of food incentive recipients				
Second quantile*50 per cent	-0.014	-0015	-0002	-0.033
	(0.035)	(0038)	(0036)	(0.035)
Third quantile*80 per cent	-0.052	0003	-0000	-0.004
	(0.035)	(0037)	(0038)	(0.049)
Fourth quantile*100 per cent	0.021	-0013	-0009	-0.038
	(0.040)	(0043)	(0040)	(0.050)
Age	-0.002***	-0002***	-0002***	-0.002***
	(0.001)	(0001)	(0001)	(0.001)
Religion	0.042	0049	0038	0.039
	(0.043)	(0046)	(0046)	(0.044)
Marital status	0.016	0019	0018	0.019
	(0.037)	(0035)	(0035)	(0.035)
Household size	0.007	0006	0007*	0.006
	(0.004)	(0004)	(0004)	(0.004)
Gender	-0.056	-0068**	-0066*	-0.059*
	(0.039)	(0034)	(0034)	(0.035)
Education	-0.006**	-0008***	-0008***	-0.008***
	(0.003)	(0002)	(0002)	(0.002)
Social network	0.051***	0039**	0043**	0.041**
	(0.016)	(0016)	(0017)	(0.016)
Risk preference	0.002	0004*	0004*	0.003
	(0.002)	(0002)	(0002)	(0.002)
Land holding	0.000	0000		-0.000
	(0.002)	(0002)		(0.002)
Livestock holding	-0.007***		-0023***	-0.007***
	(0.002)		(0006)	(0.002)
Ln(income)		-0025***	-0006**	
		(0006)	(0002)	
Recognized farmer	0.023*	0015	0015	0.023*
	(0.014)	(0014)	(0014)	(0.014)
Village fixed effects	Yes	Yes	Yes	Yes
Constant	1.129***	1332***	1355***	1.154***
	(0.076)	(0091)	(0091)	(0.077)
R-squared	0.157	0.160	0161	0.157
Number of observations	4089	3964	3964	4089

Note: Clustered standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A5
food incentive and willingness to participate in afforestation program: lottery-based incentives (OLS estimates), full estimation results.

	(1)	(2)	(3)	(4)
Food incentive	-0144***	-0145***	-0145***	-0193***
	(0013)	(0013)	(0013)	(0021)
Age		-0002*	-0001	-0001
		(0001)	(0001)	(0001)
Religion		0106***	-0019	-0015
		(0033)	(0053)	(0051)
Marital status		-0017	-0025	-0027
		(0047)	(0046)	(0052)
Household size		0008	0008	0009
		(0006)	(0006)	(0006)
Gender		-0029	-0012	-0019
		(0051)	(0049)	(0055)
Education		-0001	0000	-0000
		(0004)	(0004)	(0003)
Social network		0052**	0057**	0057**
		(0025)	(0025)	(0023)
Risk preference		0000	-0000	-0001
		(0004)	(0004)	(0003)
Land holding		0000	-0000	-0000
		(0003)	(0003)	(0003)
Livestock holding		-0008**	-0011***	-0010***
		(0003)	(0004)	(0003)
Ln(income)		-0023**	-0021 * *	-0020**
		(0009)	(0010)	(0009)
Recognized farmer		0009	0009	0013
		(0020)	(0020)	(0020)
Village fixed effects	No	No	Yes	Yes
Constant	0957***	1166***	1215***	3038***
	(0007)	(0118)	(0148)	(0682)
R-squared	0025	0053	0093	
Pseudo R^2				0122
Number of observations	4090	3965	3965	3965

Note: Clustered standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

responses by the participant could mask the enumerator effect. This is a specific type of signaling which is similar to what is known as "experimenter effect" in experimental studies.[8] While we cannot completely exclude the enumerator effect, we have two reasons to believe that this is less likely to be the case. First, the enumerator effect is the same for the 5 decisions: without incentive and with incentive under varying share of food incentive recipients (20 per cent, 50 per cent, 80 per cent, and 100 per cent). If our results were purely driven by the "enumerator effect", we should have seen no change (or perhaps a decrease) in willingness to participate when share of food incentive recipients increase. This is because an individual who respond "No" under the decision with 20 per cent share of food incentive recipients is less likely to say "Yes" under the

[8] "Experimenter effect" implies that subjects may behave more prosocial either because they perceive behaving greedy leads to exclusion in future experiments or reputation effect (Henrich et al., 2001).

subsequent decisions as this may signal image-seeking to the enumerator. Second, previous studies show that the "experimenter effect" depends on contextual factors (for instance, social norms, frames, and past experiences) that are beyond the experimenter (Harrison and List, 2004; Levitt and List, 2007). For example, Henrich et al. (2005) find large variations in behavior across communities in developing countries in one-shot ultimatum, dictator, and public goods games. They attribute these variations to differences in patterns of everyday life and the social norms operating in the communities.

Finally, our results could be driven by economic reasons: "protest effect" or strategic economic reactions. First, participants may think that 20 kg of wheat for 5 days of labor is small. But they subsequently accept this when more people are offered the same incentive. However, the market price of 20 kg is about 240 ETB (≈10.5 USD at the time of the study) which is an average wage of farmers for 3–5 days (depending on where they live). Thus, our results are not likely to be driven by "protest effect". Second, individuals may decide not to participate in the program after observing the percentage of individuals who will be selected for food incentive and realize that they will not be selected given their income status. This implies that when the share of food incentive recipients increases, we should be able to see an increase in participation among individuals in the relevant income distribution. For example, when the share of food incentive recipients increases from 20% to 50%, we should see a positive reaction by individuals who are in the lower 20–50% income distribution. However, we do not find such reaction in our data (see Appendix Table A5).

While our sample is representative of the Amhara regional state and households are randomly selected and attrition rate is very small (only 2.5 per cent), concern remains regarding a potential hypothetical bias (List and Gallet, 2001; Murphy et al., 2005). This is because we elicit individual's willingness to participate based on a hypothetical afforestation program. Previous studies that compare lab experiments and stated preference surveys find mixed evidence regarding hypothetical bias. While some studies (Lusk and Schroeder, 2004; Johansson-Stenman and Svedsäter, 2008, 2012) find differences in willingness-to-pay between stated preference survey and lab experiment, others (Shogren et al., 1999; Carlsson and Martinsson, 2001; Chang et al., 2009) find similar willingness-to-pay estimate from both methods. Yet, previous studies (Cameron and Englin, 1997; Carlsson, 2010) suggest that the extent of hypothetical bias depends on respondents' prior experience and context. In this respect, our sampled households are familiar with afforestation program both in voluntary contribution and under FFW programs; and we frame the hypothetical program in a way that mimics the Ethiopian FFW program. These are expected to mitigate potential hypothetical bias in our study. Furthermore, we checked the correlation between participation in the actual FFW program and changes in response to the hypothetical FFW from no food incentive scenario to food incentive for the 20 per cent of the participants at the bottom of income distribution scenario. We find a positive correlation between the two suggesting that our findings are less likely to be biased.

6. Conclusion and policy implications

Food-for-work-programs affect both development and environmental aspects by smoothing consumption of individuals during shocks (e.g., drought) and helping to build assets, which in turn may reduce the pressure on natural resources and promote rehabilitation of the environment using community labor. However, such programs may have unintended consequences of crowding-out pro-environmental behavior and undermine collective action. In this paper, we find that farmers are (substantially) less likely to participate in the program when food incentives are introduced. We also find that the willingness to participate in the program increases in response to an increase in the proportion of people selected for food incentive. The latter results point to the argument that the effectiveness of extrinsic incentives may depend on their design (e.g., Gneezy et al., 2011; Rode et al., 2015). Our results suggest that signaling (prosocial or stigma avoidance) is a likely channel through which food incentives crowd-out willingness to participate in the proposed program.

We believe that our findings offer important policy insights into the use of extrinsic incentives in environmental protection and biodiversity conservations. First, if there is a well-functioning pre-existing voluntary work, one should avoid supplementing this with programs that bundled economic and environmental goals such as the food-for-work program because of the risk of crowding-out. Instead, the program activities could be directed towards areas neglected by voluntary works. This way, the poor can still participate in FFW programs and get paid, but work on projects that do not include environmental activities such as local irrigation infrastructure or construction of a school or health center. Some of FFW projects indeed cover these activities. If FFW programs can pay every member in the village, it is less likely that we will have an issue of participation as also documented in our results that participation rate increases with an increase in the share of incentive recipients. In this scenario, we may perhaps worry about crowding-out effects of changing pre-existing voluntary collection environmental protection into a monetary frame. However, in reality, FFW programs focus on selected households (often selected based on their income status), excluding majority of the community members. This is where we suggest that it could be a good idea to dissociate the environmental component from the food security component if the communities have pre-existing norm of voluntary environmental management. In fact, in its evaluation of the Ethiopian food-for-work program, the World Food Program (WFP) suggests that the program should target other public works such as village road and irrigation projects instead of environmental projects (WFP, 2007). Moreover To extent, this is being implemented in some parts of Ethiopia. Second, the lower crowding-out effects of a lottery-based selection (as compared to income-based selection) suggests that it is important to find selection criteria that do not stigmatize participants of the program. In line with, pre-existing community works on the environment could be supported, for example, in the form of collective goods such as school and health centers. These policy implications are also relevant to other environmental programs that use incentives in biodiversity conservation and environmental protection and rehabilitation, such as payment for Ecosystem Services (PES) and reducing emissions from deforestation and forest degradation (REDD+).

Clearly, whether FFW-type programs crowd-out pro-environmental behavior depends on several factors such as the presence of well-established pre-existing norms of voluntary environmental management and the share of people in the local community who are eligible for the FFW-program. Thus, the validity of our results in other parts of Ethiopia and developing countries in general depends, among others, on these factors. As argued by Vatn (2010) and Sommerville et al. (2010), whether incentives increase or decreases participation depends on local institutions. However, many rural areas of developing countries often have long standing traditions of norm-based collective action on environmental management and other social aspects (Ostrom, 1990; Cleaver, 2000) and extrinsic incentives are likely to crowd-out environmental virtues (Vatn, 2010), undermine social norms and weaken collective action (Cleaver, 2000), and reduce people's satisfaction (Kerr et al., 2012).

Despite these policy insights, care should be taken in interpreting our results. Firstly, while the hypothetical program we proposed mimics several components of the real FFW program in Ethiopia and the survey participants are rural farmers that are actually targeted by this program, our results may still be prone to hypothetical bias. Secondly, there could be an order effect as we did not randomize the willingness to participate questions and this could be correlated with omitted characteristics of the decision-maker. Finally, understating the exact channel through which food incentive may crowd-out pro-environmental behavior is very important in designing public programs that aim to mitigate these effects. While our data points to signaling as a likely channel through

which food incentive decreases willingness to participate in the proposed afforestation program, we cannot exclude other potential explanations for our findings. We hope future studies with more rigorous methods such as carefully designed incentive compatible field experiments or randomized controlled trials will investigate and document the crowding-out effect of FFW and related bundled programs as well as the mechanisms through which food incentives may crowd-out pro-environmental behavior.

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Disclosure statement

"No potential conflict of interest was reported by the authors."

Appendix

See appendix Tables A1–A5.

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