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Environmental concern and pro-environmental behavior among residents in an oil palm cultivating hotspot

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Abstract

Oil palm is the most significant boom crop in Southeast Asia and associated with tremendous negative environmental effects. These environmental effects can influence the environmental concern (EC) and pro-environmental behavior (PEB) of the local population in different ways. While various research has investigated rural-urban differences for EC and PEB, evidence is missing for societies in the Global South where rural and urban populations face similar environmental problems. This paper addresses the questions of what influences EC and PEB of residents living in a hotspot for oil palm cultivation with a special focus on the geographical residence in Indonesia. Our results from OLS regressions show that overall, rural residents directly involved in oil palm cultivation tend to be more concerned than the urban respondents. This is true for general EC, as well as for the oil palm-related EC, which points towards oil palm farmers being aware of the environmental repercussions of oil palm plantations. We also find that connectedness with nature, connectedness with oil palms, and preferences for homogenized landscapes are important factors that are correlated with EC. PEB is measured in terms of donations made to a local environmental organization. Our results, first of all, show strong positive correlations between EC measures and PEB. Furthermore, results reveal that rural respondents make significantly higher donations. In addition, a higher connectedness with oil palms decreases donations among our respondents, while the hours participated in other environmental activities correlate positively with donations.

Keywords: environmental concern, pro-environmental behavior, rural-urban gap, hyperbolic sine transformation

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1. Introduction

Oil palm is the most significant boom crop in Southeast Asia and associated with a large-scale agrarian transformation (Hall 2009). Besides large-scale commercial investments in oil palm plantations, increasing numbers of smallholder farmers are involved in the sector (Euler et al. 2016). In Indonesia, the world's biggest producer of palm oil (Rist et al. 2010; Gatto et al. 2015), small-scale farmers account for about 40 percent of the land cultivated with oil palms (Euler et al. 2016). While this development has brought economic benefits for whole regions (Sjahza and Asmit 2019), it has also had tremendous negative environmental effects (Koh and Wilcove 2008; Obidzinski et al. 2012; Lee et al. 2014). Negative environmental effects experienced by the local population include water pollution from agrochemical use and air pollution from fires when land is cleared for new oil palm plantations. These environmental repercussions do not only affect the rural population, e.g. small-scale oil palm farmers who are directly involved in oil palm cultivation, but also the urban residents who are not necessarily involved in the oil palm sector (Varkkey 2013).

This study addresses two main research questions. First, it aims to understand the drivers of environmental concern[3] (EC) in a setting characterized by rapid land use transformation, particularly focusing on rural-urban differences in concern. Secondly, it investigates the links between the place of residence, environmental concern, and pro-environmental behavior[4] (PEB). Environmental concern and pro-environmental behaviour both indirectly or directly influence decisions made about the sustainable use of natural resources. As oil palms are associated with negative ecological aspects such as deforestation amongst others, it is highly relevant to understand how the local population thinks and behaves to develop more targeted policy and outreach instruments to support sustainable land-use changes. A better understanding of environmental concern and pro-environmental behavior and their variation in space in such a unique local context can inform the development of more targeted policy and outreach measures to support sustainable land-use transformations.

Previous research has found a weak rural-urban gap in EC, but with mixed results regarding who is more concerned about the environment (Huddart-Kennedy et al. 2009; Yu 2014; Mobley 2016). Different theories have been suggested to explain the gap. The environmental deprivation theory (Bogner and Wiseman 1997), for example, claims that exposure to environmental degradation increases EC, providing an explanation for urban residents usually having higher EC. The extractive-

[3] Definition of environmental concern: "Environmental concern has been treated as an evaluation of, or an attitude towards facts, one's own behaviour, or others' behaviour with consequences for the environment (Weigel, 1983; Ajzen,1989; Sjöberg, 1989; Takala, 1991). It seems then as if environmental concern may refer to both a specific attitude directly determining intentions, or more broadly to a general attitude or value orientation." (Fransson and Gärling 1999)

[4] Definition of pro-environmental behavior: "By 'pro-environmental behaviour', we simply mean behaviour that consciously seeks to minimize the negative impact of one 's actions on the natural and built world […]." (Kollmuss and Agyeman 2002)

commodity theory (Jones et al. 1999) states that rural residents possess a more utilitarian view of the environment and hence, are less concerned (Tremblay and Dunlap 1978; Lowe and Pinhey 1982; Jones et al. 1999). This also includes those rural residents that are not employed in natural-resource extractive industries, such as agriculture, due to a common culture (Tremblay and Dunlap 1978). In contrast to the frequent finding that urban residents are more environmentally concerned, Berenguer et al. (2005) found that for specific conservation issues, rural residents tend to be more concerned than urban residents. In a recent study, Sharp and Adua (2009) measure EC along a rural-urban gradient in Ohio, US, and found that besides geographical residence, social proximity to agriculture has a positive influence on EC. Literature that specifically focuses on EC in developing countries is scarce, and mostly confined to cross-national comparisons of EC (Rauwald and Moore 2002; Schultz et al. 2005; Watson and Halse 2005) or focusing on a particular case study in either urban (e.g. Khan et al. 2012) or rural settings (e.g. Baptiste and Nordenstam 2009).

Regarding PEB, a variety of different types of behavior have been analyzed in the literature including, e.g. recycling, buying organic food, political activities, and donating money (Shang and Croson 2009; Raihani et al. 2013). Only a few of these studies have specifically looked at rural-urban differences, finding mixed results regarding who engages more in PEB (Berenguer et al. 2005; Saphores et al. 2006; Huddart-Kennedy et al. 2009; Yao 2015). Yao (2015), for example, analyses PEB, defined as charitable donations, in the US, and finds that urban residents tend to donate more than rural residents. In contrast, Berenguer et al. (2005) found that rural residents in Spain engaged slightly more in PEB compared to urban residents.

Most studies on rural-urban differences in PEB are, however, conducted in industrialized countries, and hence, empirical evidence for developing countries is scarce. An exception is a recent study in Zambia that analyzed various types of PEB (waste minimization, re-use and recycling of garbage, no open burning of garbage, use of waste bins, and no dumping in undesignated areas) and found significant differences between rural and urban residents (Chileshe and Sampa Moonga 2019). For most types of PEB, urban residents showed higher engagement levels compared to rural residents, which may be related to differences in perceived barriers, such as lack of capital, information, and political will (Chileshe and Sampa Moonga 2019). However, like most studies cited above (except for donations in industrialized nations (Shang and Croson 2009; Raihani et al. 2013)), the study relies on self-reported behavior, which tends to be less reliable than actual observed behavior (Hamilton 1985; Corral-Verdugo 1997).

Our study was implemented in Jambi Province, Indonesia, and thus adds to the scarce literature on rural-urban differences in EC and PEB in a developing country context. We focus on rural and urban residents living in a hotspot of oil palm cultivation and thus being exposed to the same type of

environmental problems. While rural residents in our study area are actively involved in oil palm cultivation, urban residents are typically not. Nonetheless, they benefit from the economic development of the oil palm boom and suffer from the environmental consequences, which provides a unique setting to study rural-urban differences in EC and PEB. In our study, we use a donation game with real payoffs to measure PEB. This provides us with a consistent measure that can be applied to rural and urban residents alike, irrespective of the heterogeneous barriers and opportunities they face to engage in actual PEB. PEB is then measured as the amount donated to a local environmental organization that supports forest restoration, wildlife conservation, and sustainable local development in the research area.

The rest of the paper is organized as follows: The next section gives background information on the development of oil palm cultivation and the effects on the local population in Jambi, Indonesia. Section 3 explains the conceptualization and measurement of the main variables used in our study and provides information about the study context, data, and statistical framework. Section 4 presents the descriptive statistics and describes the construction of the EC measures. Section 5 shows the results, and section 6 discusses them and concludes.

2. Oil palm cultivation in Indonesia and its effects on the local population

Indonesia has been the world's biggest producer and exporter of palm oil since 2008 (Rist et al. 2010; Gatto et al. 2015) and has expanded the area under oil palm cultivation by another two million hectares between 2008 and 2018 (FAOSTAT, 2020). The province of Jambi on the island of Sumatra is a hotspot for biodiversity and oil palm cultivation with an increasing area under cultivation. Most of the oil palm plantations in Jambi have been established on former forest land (Koh and Wilcove 2008; Schwarze et al. 2015) as well as on land that was used for rubber and food crops (Schwarze et al. 2015). It could be shown that economic factors such as the worldwide increasing demand for palm oil (DeFries et al. 2010; Rulli et al. 2019), increasing product prices (Wheeler et al. 2013), and policies of the Indonesian government are associated with land clearing (Fitzherbert et al. 2008; Rist et al. 2010; Euler et al. 2016). In addition, the expansion of oil palm plantations has been associated with immigration and urbanization in the region (Budidarsono et al. 2013). Moreover, urban growth itself is positively correlated with deforestation (DeFries et al. 2010).

The expansion of oil palm monocultures has led to tremendous negative environmental effects, for example, through the loss of forest areas, decrease in biodiversity, and water and air pollution (Feintrenie et al. 2010; Gibson et al. 2011; Merten et al. 2016; Austin et al. 2017; Dislich et al. 2017;

Santika et al. 2019), an increase in greenhouse gas emissions (Fargione et al. 2008) as well as a rapid land-use transition (Villamor et al. 2015) directly and indirectly affecting the local population. With relatively high profitability and low labor costs, the expansion of oil palm plantations nowadays is more driven by economic profitability than by environmental suitability (Sayer et al. 2012), resulting in high opportunity costs of protecting forests and peatlands. Due to the common management practices applied in the oil palm sector that lead to water and air pollution (Feintrenie et al. 2010; Gibson et al. 2011; Merten et al. 2016; Austin et al. 2017; Dislich et al. 2017; Santika et al. 2019), public health, not only of farmers but also of others in the region, including in cities, is negatively affected. An example of this is the expansion of oil palm plantations on peatlands (Koh et al. 2011; Carlson et al. 2012; Stibig et al. 2014; Naylor et al. 2019) being responsible for environmental damages, especially in dry years (Naylor et al. 2019). Scholars have shown that 90 percent of transboundary haze in the Southern parts of South East Asia is coming from peatland fires (Varkkey 2013).

With regards to economic benefits, oil palm expansion has led to an increase in incomes and an enhancement of the living standards of farmers and their communities (Gatto et al. 2015). Furthermore, the oil palm sector has also become an important source of income for non-farm households working as hired laborers in the oil palm plantations (Bou Dib et al. 2018). Accordingly, the oil palm sector has generated substantial job opportunities and income sources in rural areas (Pacheco et al. 2017). As oil palm cultivation has overall lower labor requirements than alternative cash crops like rubber, oil palm farmers can manage larger areas of oil palms or alternatively, use the saved time to engage in off-farm activities (Euler et al. 2017). Higher rural incomes are usually spent in the cities nearby, thus having a positive effect on the local economy. Furthermore, public and/or private sector investments in infrastructure (e.g. roads, education, and health) have augmented in the course of the oil palm boom, stimulating development in the region and hence, benefiting rural and urban residents alike (Budidarsono et al. 2013, Pacheco et al. 2017, Kubitza et al. 2018). This might ultimately also increase employment opportunities in the cities (Budidarsono et al. 2013).

3. Empirical data and estimation framework

3.1 Study area and sampling

Our research was implemented in Jambi Province, Sumatra, Indonesia. The island of Sumatra is a hotspot for biodiversity with an increasing area under monoculture crops like rubber and oil palm. About 75 percent of the land in Jambi Province under oil palm cultivation is managed by small-scale farmers (BPS-Statistics Indonesia 2019).

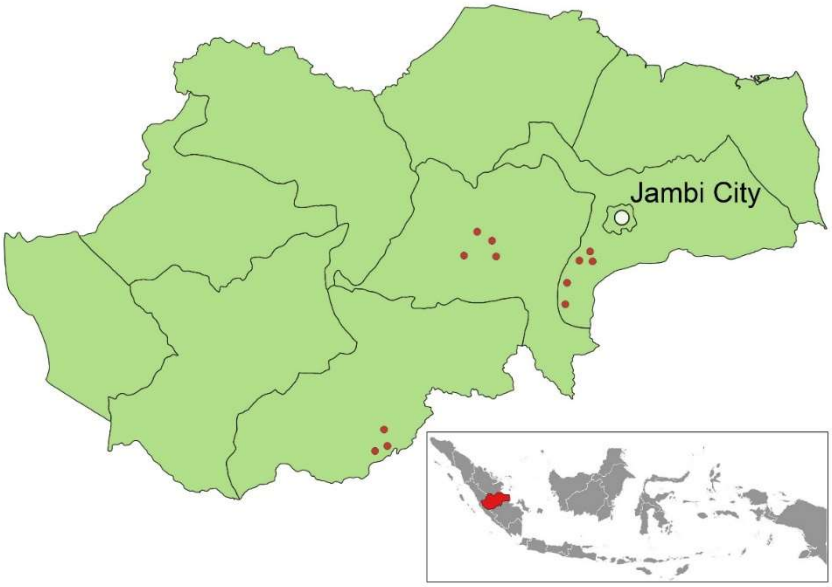

Figure 1: Research area: Jambi, Sumatra, Indonesia: The left side shows a map of the island of Sumatra, Indonesia; The right side shows a map of Jambi Province on Sumatra, Indonesia (The blue dots mark the villages where the interviews were conducted and the orange dot marks Jambi City were we also conducted our interviews.)

Our research was conducted in the lowland region of Jambi Province (figure 1). We interviewed oil palm farmers in three oil palm growing districts in Jambi Province, namely Muaro Jambi, Batanghari, and Sarolangun where the area under oil palm cultivation has expanded the most between 1995 and 2011 (Euler et al. 2016). A total of 12 villages were selected where 40 oil palm farmers per village were randomly selected and interviewed. In four of these villages, we were only able to interview 20-24 oil palm farmers due to logistical problems. A total of 408 rural oil palm farmers were interviewed in total. To reflect the actual farmers' composition in Jambi, we included transmigrant as well as local villages in our sample. The transmigration program was initiated by the Indonesian government in the 1980s and relocated families from Java to Sumatra and other islands. Each of the families was given two to three hectares of land and support from the government to cultivate cash crops (oil palms and rubber) (Gatto et al. 2015).

For the urban setting, we randomly chose six districts out of a total of 11 districts in Jambi City (about 500,000 inhabitants). In each of the chosen districts, we randomly selected one or two sub-districts, depending on the district's size, resulting in a total of 10 sub-districts in which the survey was implemented. In each sub-district between 32 and 37 households were randomly selected to participate in our survey. We ended up with a total of 349 respondents for the urban setting. Hence, our total sample consisted of 757 respondents. The data analyzed in this paper was collected with a standardized questionnaire. For the data collection, 10 local enumerators were trained. These 10 enumerators conducted the interviews in the villages as well as in Jambi City.

3.2 **Conceptualizing and measuring PEB**

Previous literature has usually assessed PEB based on self-reported measures. Although some studies have found a correlation between self-reported behavior and actual observed behavior (Fujii et al. 1985), others have only found low correlations, typically showing that actual observed behavior is more reliable (Hamilton 1985; Corral-Verdugo 1997). For many types of PEB, actual participation will depend on existing barriers and opportunities. Derksen and Gartrell (1993), for example, showed that recycling behavior among rural and urban residents strongly depended on whether residents had access to recycling options. To overcome some of these challenges associated with the measurement of PEB, and ensure that both rural, as well as urban residents, have access to the PEB, we implemented a donation game with real payoffs and used the amount donated to a local environmental organization as a measure of PEB. Harapan Rainforest was chosen as the recipient of donations, a conservation initiative located in Jambi Province that acquired the rights to manage almost 1,000 km^2 of forest land providing a model for forest restoration, wildlife conservation, and sustainable local development[5].

The donation game was designed as a dictator game which is commonly used in the literature to measure motivations for human behavior (Eckel et al. 1996; Hoffman et al. 1996; Bekkers 2007). Our game consisted of two players: the recipient (local environmental organization) and the allocator (respondent). The allocator was given an endowment that he/she had to split between himself/herself and the recipient. The recipient did not have any power within the game, and could only accept the distribution made by the allocator. Once the allocator had made his/her decision, the allocator received his/her share of the endowment that he/she had decided to keep. The amount that he/she had decided to donate was deposited in an envelope and later given to the recipient (Bekkers 2007; Bardsley 2008).

The donation game was embedded in the standardized questionnaire for the respondents. At the start of the game, each respondent received 35,000 IDR (2.48 USD[6]) in the form of a voucher to be redeemed at a local store. The enumerator provided the respondent with information about the work of Harapan Rainforest after which he/she had some time to think about how much money to keep and how much money to give to Harapan Rainforest. The respondent then noted the amount to keep and the amount to give to Harapan Rainforest on a piece of paper and returned it to the enumerator; after that, the interview continued. Participants did not receive any information about the other participants or their decisions, neither during nor after the interview.

[5] Information retrieved from BirdLife International: http://www.birdlife.org/
[6] The money was converted from IDR to USD using the conversion rate from June 2019.

While the donation game with real payoffs has the advantage of being incentive-compatible, one limitation in our setting is that anonymity could not be fully guaranteed, because the research assistant was able to observe the participant's allocation. Previous experimental research has shown that allocators tend to give more to the recipient when anonymity cannot be guaranteed (Franzen and Pointner 2012). Another study from Winking (2014) found that missing privacy, on the one hand, increased the shame that allocators felt, but on the other hand, after removing this specific cost, had a minimal effect on the allocator's actual behavior. While the amounts donated in our study may thus be slightly overestimated, we do not expect that this introduces a bias between rural and urban respondents, because all participants faced the same experimental conditions.

3.3 Measuring EC

Our measure of EC is based on the New Environmental Paradigm (NEP) Scale (Dunlap et al. 2003). The scale is built on the Schwartz norm-activation model of altruism that has been used to explain altruistic behavior (Kollmuss and Agyeman 2002). The NEP Scale includes a spectrum of beliefs and values that reflect a pro-environmental orientation and thus has become a widely used measure of EC (Dunlap et al. 2003). The NEP Scale consists of a total of 15 items (Dunlap et al. 2003), each of them is rated on a scale from 1=strongly agree to 5=strongly disagree.

We also obtained a measure for EC adapted to our specific oil palm case. For this, we included a scale with items specific to oil palm-related EC adapted from Dutcher et al. (2007) and Romero et al. (2019). Similar to the NEP Scale, each item of the specific oil palm concern is rated on a five-point Likert Scale between one and five where 1=strongly agree and 5=strongly disagree[7].

3.4 Measuring nature connectedness and social proximity to agriculture

Previous research has shown that if people feel more connected with nature, they have a higher EC and are less likely to engage in behaviors that harm the environment (Dutcher et al. 2007; Verges and Duffy 2010; Mayer and Frantz 2010; Arendt and Matthes 2016). To measure connectedness with nature, we used the Other in the self (OIS) scale developed by Aron et al. (1992). This scale measures how close one feels to nature through seven diagrams, each diagram consisting of two circles (nature

[7] The items for the specific oil palm-related EC can be found in section 4.2 Construction of EC measures.

and self). Each diagram differs from the other, starting from having the two circles separated (no connection between self and nature) up to where the two circles in the last diagram are almost one (a very strong connection between self and nature) (see figure A1). A higher number along the scale reflects a higher connectedness with nature, whereas a lower number on the scale reflects a lower connectedness with nature. In addition, we obtained a measure for landscape preferences, where respondents indicated which landscape they prefer to live in based on pictures. Previous research has shown that preferences for different landscapes are associated with EC (Kaltenborn and Bjerke 2002). We included three different landscape photos: oil palm monocultures, agroforest, and rainforest, where the latter two represent diverse landscapes. Based on the responses, we created a dummy variable reflecting the preferences to live in more diverse landscapes (=1) versus more homogeneous landscapes (=0) for our analysis.

Besides nature connectedness and landscape preferences, literature has shown that social proximity to agriculture has a potential influence on EC and PEB (Sharp and Adua 2009). Hence, we included two measures in our study to reflect social proximity to agriculture. The first one is socialization, which measures the years a respondent has lived in a village/city between the age of 0 and 18. The second one is another OIS scale, adapted to our specific setting. This OIS oil palm scale measures connectedness with oil palms. The two circles used for the OIS, in this case, represent oil palms and the self. We expect that in our particular study context, a setting with intense oil palm cultivation, a higher connectedness with oil palms is associated with lower EC.

3.5 Econometric framework

In the first part of our analysis, we estimate the association between place of residence and EC; the model is specified as follows:

$$y_i = \beta_0 + \beta_1 city_i + \beta_2 NC_i + \beta_3 SPA_i + \beta_4 X_i + \varepsilon_i \quad (1)$$

where y_i is EC (general or oil palm-specific EC) of respondent i. $City_i$ is a dummy that equals 1 if the respondent has his or her current residence in the city, and a value of 0 if the respondent has his or her current residence in a village. NC_i contains variables related to nature connectedness; and SPA_i variables related to social proximity to agriculture. X_i is a vector of household sociodemographics. In the regression on oil-palm-related EC, we further include the general EC as a covariate to capture correlations between general EC and more specific EC (Stern et al. 1995). The βs are parameters to be estimated, and ε_i is a random error term. The model is estimated using OLS.

The second part of the analysis is dedicated to PEB, where we analyze the binary decision to donate as well as the amount donated to a local environmental organization. The model is specified as follows:

$$y_i = \beta_0 + \beta_1 city_i + \beta_2 Z_i + \beta_3 NC_i + \beta_4 SPA_i + \beta_5 X_i + \varepsilon_i \quad (2)$$

where y_i is the outcome variable – either the binary decision or the amount donated - by respondent i, and Z_i contains EC measures. $City_i$, NC_i, and SPA_i are defined as in equation (1) and X_i contains similar household sociodemographics. In addition, we include a covariate on self-reported PEB. The binary decision to donate is estimated using a probit model (Long 1997).

For the continuous outcome variable, the amount donated, we apply an inverse hyperbolic sine (IHS) transformation to the outcome variable (Bellemare and Wichman 2019) to accommodate non-normality. The IHS transformation has two important characteristics: (1) the transformation has similar properties as the log transformation but (2) it allows to keep zero-valued observations, unlike the log transformation. In our data, we have about 18 percent zero-valued observations because some respondents chose not to donate at all. For the continuous outcome variable y the IHS transformation can be written as follows:

$$\tilde{y} = \operatorname{arcsinh}(y) = \log(y + \sqrt{y^2 + 1}) \quad (3)$$

After the estimation, we follow Bellemare and Wichman (2019) and calculate elasticities for the respective continuous variables of interest. Standard errors are obtained applying the delta method for exact values. For the dummy variables, we calculate semi-elasticities.

As a robustness check, we also applied a double-hurdle model, which assumes that the donation decision follows a two-step process. In the first step, the respondent's decision to donate is estimated using a probit model. In the second step, the decision of how much to donate is estimated using a log-transformed OLS regression (Manning and Mullahy 2001). The results can be found in the appendix (tables A1 and A2).

4. Empirical data

4.1 Sample overview

Table 1 shows descriptive statistics for the sociodemographic variables. Column (1) presents data for the full sample, columns (2) and (3) for urban and rural residents respectively. Column (4) shows p-values of mean difference tests for the two sub-samples. We find significant differences between

urban and rural residents with respect to the age of the household head and the number of household members, although the latter difference is rather small. Regarding age, rural household heads are almost 3 years younger on average compared to urban household heads. The descriptives further show that around 90 percent of household heads in our sample have finished primary or secondary school. Education tends to be somewhat higher in the urban sample, but not significantly so. The asset index, as a proxy for wealth, also does not differ significantly between the two sub-samples. Significanlty more households living in a village have migrated there compared to the househods living in the city.

	(1)	(2)	(3)	(4)
	Mean estimates	City	Village	City = Village
Sociodemographics				
Age of household head	49.24 (12.08)	47.71 (13.08)	50.54 (11.00)	0.01**
Gender of household head: 1 = female 0 = male	8.98% 91.02%	12.61% 87.39%	5.88% 94.12%	0.11
Education of household head in years	9.99 (4.02)	10.54 (3.62)	9.53 (4.28)	0.19
Number of household members	4.03 (1.45)	4.31 (1.57)	3.80 (1.30)	0.02**
Asset index[1]	-7.37e-09 (0.72)	-0.20 (0.65)	0.17 (0.73)	0.16
Place of residence (in percent): 1 = Village 0 = City	100	46.10	53.90	-
Household migrated to current place of living 1 = yes 0 = no	56.27	44.13	66.67	0.06*
N	757	349	408	757

Columns (1) to (3) show mean estimates with the respective standard deviations in parentheses. Column (4) shows p-values for mean difference tests that were conducted with linear regression models and clustered standard errors at village/city level.

[1]: The asset index was constructed with a factor analysis. The following assets (dummy variables) are included: air conditioner, bike, generator, stereo system, computer, washing machine, car/truck, and radio.

* p < 0.1, ** p < 0.05, *** p < 0.01

Table 1: Descriptive statistics – sociodemographics

Income portfolios in the research area are quite diverse. About 60 percent of the rural households mentioned that they had at least one more income source besides agriculture. These additional income activities include wage labor on other farms and non-agricultural work of the household head or other household members. Urban households have on average 1.7 income sources. Only two percent of the urban households in our sample are involved somewhere along the oil palm value chain.

Among the rural households, more than 90 percent have a home garden growing fruits and vegetables primarily for self-consumption but also sell the harvest at local markets. In the urban area, where space is more limited than in the rural area, only about 40 percent of the households have a home garden.

Table 2 shows the descriptive statistics for nature connectedness and social proximity to agriculture. Regarding social proximity to agriculture, we find that rural respondents feel significantly more connected with oil palms than urban respondents. This is not surprising, since all rural households are engaged in oil palm cultivation, whereas only a few of the urban households are directly involved in the oil palm value chain. We can further see that rural residents have lived most of their childhood in a village, and urban residents have lived most of their childhood in the city. Rural residents, on average, have only spent 1.5 years in a city during their childhood, suggesting very low rates of urban-rural migration. For urban residents, the average years lived in a village during childhood is somewhat higher with 5.4 years, but still low, indicating that most urban residents grew up in the city.

Regarding nature connectedness, respondents overall feel very connected with nature, indicated by an average score of 5.6 out of a maximum of seven (column 1). Although urban residents have a slightly higher score, the difference between urban and rural households is not statistically significant. Based on our visual assessment of landscape preferences, we find that the majority of households in our sample prefer to live in more diverse landscapes, particularly in a landscape characterized by agroforests. Preferences for homogenized oil palm-dominated landscapes are slightly higher among rural households, but the difference between urban and rural samples is not significant.

	(1)	(2)	(3)	(4)
	Mean estimates	City	Village	City = Village
Social proximity to agriculture				
OIS oil palm	3.90 (1.94)	2.55 (1.53)	5.05 (1.46)	0.04**
Socialization:				
Years lived in a city (between 0 and 18)	6.61 (8.36)	12.60 (7.86)	1.48 (4.45)	
Years lived in a village (between 0 and 18)	11.39 (8.36)	5.40 (7.86)	16.52 (4.45)	0.13
Nature connectedness				
OIS	5.59 (1.32)	5.71 (1.29)	5.49 (1.34)	0.12
Preferred landscape 0 = I do not know 1 = Oil palm plantation monocultures 2 = Agroforests 3 = Rainforest	4.10% 17.17% 68.03% 10.70%	5.16% 10.60% 70.77% 13.47%	3.19% 22.79% 65.69% 8.33%	
Dummy for landscape preferences (1/0) 1 = More diverse landscapes, e.g. agroforest or rainforest 0 = Oil palm monocultures	82.83% 17.17%	89.40% 10.60%	77.21% 22.79%	0.26
N	757	349	408	757

Columns (1) to (3) show mean estimates with the respective standard deviations in parentheses. Column (4) shows p-values for mean difference tests that were conducted with linear regression models and clustered standard errors at village/city level.
* p < 0.1, ** p < 0.05, *** p < 0.01

Table 2: Descriptive statistics – nature connectedness and social proximity to agriculture

4.2 Construction of EC measures

Table 3 provides an overview of the fifteen items of the NEP scale, which is used to construct the general EC measure. Response categories for each item are given a numerical code between 1 and 5, such that higher values correspond to a stronger EC (note that for odd-numbered items the order is reversed for the construction of the total score so that a higher number reflects a higher concern). With a possible minimum score of 15 and a maximum of 75, the mean score for the NEP scale in our sample is 47.2. We find that our overall mean seems to arrange itself in the middle compared to other studies that were conducted in industrialized nations: Overall, this mean value lies well within the range of mean values found in other studies, typically conducted in industrialized nations: Berenguer

et al. (2005) report a mean value of 50.97 for the rural sample and of 54.47 for the urban sample in Spain. In Huddart-Kennedy et al. (2009), the overall sample mean for urban and rural respondents in Canada is 34.36.

Following Kotchen and Reiling (2000) and Clark et al. (2003), we combine the NEP items into a unidimensional scale applying factor analysis and use this scale for our analysis. We obtained a Cronbach's Alpha of 0.60 and a Kaiser-Meyer-Olkin (KMO) measure of 0.71, which is moderate. The item-total correlations for each item (table 3, column (3)) demonstrate that all correlations are reasonably good, ranging from a high of 0.45 to a low of 0.18 for 12 of the 15 items. Three items have a relatively low item-total correlation. We follow Khan et al. (2012) and drop these three items (items 4, 8, and 10) leading to a KMO of 0.74 and a Cronbach's Alpha of 0.66. These results suggest that in our sample the NEP scale (based on 12 items) forms an internally consistent measuring instrument of EC (Kotchen and Reiling 2000).

		1	2	3
NEP number	NEP item	Mean	Standard deviation	$r_{i\text{-}t}$
1	We are approaching the limit of the number of people the earth can support.	3.56	1.08	0.32
2	Humans have the right to modify the natural environment to suit their needs.	2.21	1.02	0.29
3	When humans interfere with nature it often produces disastrous consequences.	3.75	0.97	0.21
4	Human ingenuity will ensure that people will be able to continue to live on the earth.	2.36	1.04	0.04
5	Humans are severely abusing the environment.	3.65	1.11	0.23
6	The earth has plenty of natural resources if we just learn how to develop them.	1.86	0.92	0.41
7	Plants and animals have as much right as humans to exist.	4.27	0.95	0.18
8	The balance of nature is strong enough to cope with the impacts of modern industrial nations.	2.73	1.08	-0.01
9	Despite our special abilities, humans are still subject to the laws of nature.	3.97	0.88	0.22
10	The so-called "ecological crisis" facing humankind has been greatly exaggerated.	2.66	1.05	0.04
11	The earth is like a spaceship with very limited room and resources.	3.73	1.09	0.36

12	Humans were meant to rule over the rest of nature.	2.31	1.12	0.30
13	The balance of nature is very delicate and easily upset.	4.02	0.78	0.45
14	Humans will eventually learn enough about how nature works to be able to control it.	2.15	0.86	0.19
15	If things like climate change continue on their present course, we will soon experience a major ecological catastrophe.	4.00	0.86	0.40
	N	757		
$r_{i\text{-}t}$*: Item-total correlation: shows how the item is correlated with a scale computed from only the other 14 items.*				

Table 3: Descriptives for NEP scale items

Table 4 gives an overview of the five items that are used to construct the oil-palm-specific EC. The coding (1 to 5) of items number 1, 2, 3, and 5 is reversed so that a higher value reflects a higher concern. The Cronbach's Alpha indicates that the internal consistency of the construct is acceptable (table 4) (Moss et al. 1998; Hair et al. 2009). Based on factor analysis, we derive two factors. Items 1, 2, and 3 load strongly on factor one, which thus reflects *concern about the negative environmental effects of oil palm cultivation*. Items 4 and 5 load strongly on factor two, which thus reflects *concern about the lack of local action to reduce the negative environmental effects of oil palm cultivation*.

	Cronbach's Alpha: 0.57 KMO: 0.65	1	2	3	4
Number	Oil palm concern items	Mean	Standard deviation	Factor loadings Factor 1	Factor loadings Factor 2
1	Oil palm expansion is increasing fast in Jambi. More and more area is used for oil palm plantations. If oil palm expansion continues at the current speed, problems of haze and air pollution will soon become unbearable in Jambi.	3.49	1.08	0.68	
2	Oil palm cultivation in Jambi has strong effects on global environmental problems.	3.46	1.09	0.69	
3	The expansion of oil palm will soon lead to the exhaustion of natural resources in Jambi.	3.57	1.12	0.66	
4	People in Indonesia worry too much about the negative environmental impact of oil palm cultivation.	2.62	1.12		0.59
5	We need to plant more native trees in Jambi to improve and protect the environment.	4.31	0.89		0.53
	N	757			

Table 4: Descriptives for oil palm-related concern items

5. Results

5.1 Determinants of EC

Table 5 reports the descriptive statistics for the different EC measures. We observe a tendency of rural respondents being more concerned than urban respondents, however, p-values of mean difference tests are just above the 10 percent threshold, and thus not significant according to commonly applied inference thresholds.

	(1)	(2)	(3)	(4)
	Mean estimates	City	Village	City = Village
Environmental concern				
General EC (12-item NEP scale)	0.00 (0.83)	-0.23 (0.77)	0.19 (0.84)	0.14
Concern about the negative environmental effects of oil palm cultivation	0.00 (0.83)	-0.12 (0.82)	0.10 (0.83)	0.11
Concern about the lack of local action to reduce the negative environmental effects of oil palm cultivation	0.00 (0.68)	-0.39 (0.69)	0.33 (0.46)	0.10
N	757	349	408	757

Columns (1) to (3) show mean estimates with the respective standard deviations in parentheses. Column (4) shows p-values for mean difference tests that were conducted with linear regression models and clustered standard errors at village/city level.
* p < 0.1, ** p < 0.05, *** p < 0.01

Table 5: Descriptive statistics - EC

Table 6 presents the results of the regression on general EC. The regression results reveal a significant association between place of residence and general EC: living in an urban area is associated with a 0.59-point decrease on the NEP scale, indicating that rural respondents in our sample are more environmentally concerned. As expected, we further find a positive and significant correlation between nature connectedness (OIS nature, preference for diverse landscapes) and general EC. In contrast, social proximity to agriculture as measured by connectedness with oil palms is negatively correlated with general EC.

	General EC
Sociodemographics	
Age of household head	-0.004 (0.002)
Education of household head (measured in years)	0.005 (0.008)
Gender of household head (1=female)	-0.06 (0.10)
Asset index	0.04 (0.04)
Place of residence	
Place of residence (1=village)	0.59*** (0.09)
Household migrated to current place of living (1=yes)	0.009 (0.07)
Social proximity to agriculture	
OIS oil palm	-0.05** (0.02)
Socialization (Years lived in a village between 0 and 18)	0.001 (0.005)
Nature connectedness	
OIS nature	0.08*** (0.02)
Preference for diverse landscapes (1=agroforest or rainforest)	0.30*** (0.08)
Constant	-0.65*** (0.23)
N	757
Columns (1) and (2) show estimates from an OLS regression; *Robust standard errors in parentheses;* ** p < 0.1, ** p < 0.05, *** p < 0.01*	

Table 6: OLS estimates for general EC (12-item NEP scale)

Table 7 presents regression results for the two oil palm-related EC measures. Place of residence is significantly associated with both oil palm-related EC measures. Compared to urban respondents, rural respondents have a significantly higher concern about the negative environmental effects of oil palm as well as about the lack of local actions to reduce these negative effects. Regarding the concern about the negative environmental effects of oil palm cultivation, we further find that the nature connectedness variables are positively correlated, whereas oil-palm connectedness is negatively correlated with this specific oil-palm-related concern. These findings are very much in line with the correlates of general EC, which finds further support in the fact that this specific oil-palm-related concern is significantly correlated with general EC (table 7, column 1).

Oil palm-related EC	Column (1) Concern about the negative environmental effects of oil palm cultivation	Column (2) Concern about the lack of local action to reduce the negative environmental effects of oil palm cultivation
Sociodemographics		
Age of household head	-0.0006 (0.002)	0.002 (0.002)
Education of household head (measured in years)	0.01 (0.008)	-0.008 (0.006)
Gender of household head (1=female)	-0.02 (0.09)	0.01 (0.09)
Asset index	-0.002 (0.04)	0.001 (0.03)
Place of residence		
Place of residence (1=village)	0.25*** (0.09)	0.69*** (0.07)
Household migrated to current place of living (1=yes)	0.05 (0.06)	-0.06 (0.05)
Social proximity to agriculture		
OIS oil palm	-0.09*** (0.02)	0.02 (0.01)
Socialization (Years lived in village between 0 and 18)	0.003 (0.005)	-0.00008 (0.004)
Nature connectedness		
OIS nature	0.06*** (0.02)	-0.02 (0.02)
Preference for diverse landscapes (1=agroforest or rainforest)	0.14* (0.08)	-0.03 (0.06)
Environmental concern (general)		
General EC (12-item NEP scale)	0.43*** (0.04)	-0.03 (0.03)
Constant	-0.37* (0.22)	-0.27 (0.18)
N	757	757
Columns (1) and (2) show estimates from an OLS regression; *Robust standard errors in parentheses;* ** p < 0.1, ** p < 0.05, *** p < 0.01*		

Table 7: OLS estimates for specific oil palm concern

5.2 Determinants of PEB

Table 8 shows descriptive statistics of self-reported participation in different types of PEB. Differences are not statistically significant between urban and rural residents, but there is a tendency for urban respondents to engage more hours in the different activities. While urban residents seem to be somewhat more engaged, also in terms of the total hours spent on PEB, we cannot discern whether

they are indeed more motivated to undertake PEB or whether they face more opportunities and fewer barriers to engaging.

	(1)	(2)	(3)	(4)
	Mean estimates	City	Village	City = Village
Self-reported PEB				
Hours participated in cleaning	15.41 (39.43)	20.30 (51.23)	11.22 (24.62)	0.29
Hours participated in wastewater management	0.42 (7.29)	0.55 (10.28)	0.31 (2.88)	0.41
Hours participated in recycling garbage	0.003 (0.07)	0.00 (0.00)	0.005 (0.10)	0.52
Hours participated in planting trees/other plants	0.28 (3.68)	0.56 (5.39)	0.05 (0.40)	0.47
Hours participated in environmental activities within the last 12 months (sum)	16.11 (40.93)	21.41 (53.35)	11.58 (25.19)	0.30
N	757	349	408	757
Columns (1) to (3) show mean estimates with the respective standard deviations in parentheses. Column (4) shows p-values for mean difference tests that were conducted with linear regression models and clustered standard errors at village/city level. ** p < 0.1, ** p < 0.05, *** p < 0.01*				

Table 8: Descriptive statistics – self-reported PEBs

As described above, we, therefore, used a donation game to elicit engagement in a PEB that is accessible to both urban and rural respondents alike. Table 9 provides descriptive statistics of the donation decision. Overall, more than three-quarters of the respondents decided to donate, with an average amount of 19.375 IDR (1.37 USD[8]). We can further see that a significantly larger percentage of the rural sample decides to donate, compared to the urban sample, and that the amount donated is significantly larger.

Donation to Harapan 1 = yes 0 = no	82.30% 17.70%		
Amount donated to Harapan (in IDR)	19,375 (14.568)		
N	757		
	City	**Village**	**City =Village**
	(1)	(2)	(3)
Donation to Harapan (percentage) 1 = yes 0 = no	 77.94 22.06	 86.03 13.97	0.01**
Amount donated to Harapan (in IDR)	15.616 (14.129)	22.591 (14.180)	0.095*
Percentage donated of the 35.000 IDR	44.62	64.55	
N	349	408	757
Standard deviations in parentheses;			

[8] The amount in USD shown was converted with the conversion rate from June 2019.

Figure A2 in the appendix shows the histogram of the donations made for the full sample. The histograms for the sub-samples (urban and rural residents) can be found in figures A3 and A4.
Column (3) shows p-value for mean difference test that was conducted with linear regression models and clustered standard errors at village/city level.
* p < 0.1, ** p < 0.05, *** p < 0.01

Table 9: Descriptives for donations

Table 10 presents regression results on the binary donation decision and the amount donated. Column (1) tests for correlations between EC and PEB, column (2) presents coefficients and estimated elasticities (lower part of column 2) for the amount donated, and column (3) shows correlates of the binary decision to donate. Results in column (1) reveal that EC is positively correlated with donations to a local environmental organization. General EC and *concern about the lack of local action* are significantly related to the amount donated, whereas the coefficient of *concern about the negative environmental effects of oil palm* is just above the critical p-value of 0.1.

Results from the full model specifications in columns (2) and (3) show that place of residence is significantly associated with donation behavior. Rural residents donate 62 percent more and overall have a 19 percentage point higher likelihood to donate than urban residents. Regarding social proximity to agriculture, we find that respondents who feel more connected with oil palms engage less in donations to Harapan Rainforest. A one-point increase on the OIS oil palm scale decreases the amount donated by 31 percent on average and the overall probability to donate by two percentage points. Regarding nature connectedness, respondents who have a preference for more diverse landscapes donate 31 percent more and have a six-percentage point higher probability to make a donation compared to respondents who prefer more homogenous landscapes. We also find a positive correlation between self-reported participation in PEB and the amount donated, our observed measure of PEB.

Column (2) shows that when adding further covariates to the model on the amount donated, the EC measures turn insignificant. Since similar factors are correlated with EC (see tables 6 and 7) and PEB (table 10, column 2), it is likely that EC acts as a mediator, implying e.g. that rural households have higher EC and accordingly a higher willingness to donate.

As a robustness check, we estimated a double-hurdle model on the decision to donate (first hurdle) and the amount donated (second hurdle). Results are very similar to the results presented in table 10 and can be found in the appendix (tables A1 and A2).

	Amount donated	Amount donated[1]	Donation decision
	(1)	(2)	(3)
Sociodemographics			
Gender of household head (1=female)		-0.13 (0.21)	-0.02 (0.05)
Age of household head		-0.003 (0.005)	-0.00007 (0.001)
Education of household head (measured in years)		0.03* (0.02)	0.006* (0.004)
Asset index		0.35*** (0.07)	0.05** (0.02)
Number of household members		0.01 (0.04)	0.01 (0.009)
Place of residence			
Place of residence (1=village)		0.97*** (0.21)	0.19*** (0.05)
Household migrated to current place of living (1=yes)		0.14 (0.12)	0.01 (0.03)
Social proximity to agriculture			
Socialization (years lived in village between 0 and 18)		-0.02 (0.01)	-0.004** (0.002)
OIS oil palm		-0.08** (0.04)	-0.02** (0.009)
Nature connectedness			
OIS nature		0.03 (0.05)	0.04*** (0.01)
Preference for diverse landscapes (1=agroforest or rainforest)		0.37** (0.17)	0.06* (0.03)
Self-reported PEB			
Hours participated in environmental activities in the last 12 months (sum)		0.002* (0.001)	0.0002 (0.0004)
Environmental concern			
General EC (12-item NEP scale)	1.32* (0.72) (p-value: 0.067)	-0.03 (0.07)	-0.004 (0.02)
Concern about the negative environmental effects of oil palm cultivation	1.18 (0.72) (p-value: 0.102)	0.05 (0.07)	0.01 (0.02)
Concern about the lack of local action to reduce the negative environmental effects of oil palm cultivation	2.08*** (0.78) (p-value: 0.007)	-0.07 (0.09)	-0.01 (0.02)
Constant	19.38*** (0.52)	2.15*** (0.53)	-
N	757	757	757
Controls	yes	yes	yes
Elasticities for significant variables (semi-elasticities for dummy variables)			
Education of household head (measured in years)		0.29 (0.16)	
Asset index		-2.55e-09 (5.51e-10)	
Place of residence (1=village)		0.62	
OIS oil palm		-0.31 (0.16)	
Preference for diverse landscapes (1=agroforest or rainforest)		0.31	

Hours participated in environmental activities in the last 12 months (sum)		0.04 (0.02)	
Column (1) shows results from an OLS regression; Column (2) shows the estimates of an OLS model where the dependent variable (amount donated (in IDR)) was transformed with the IHS transformation; Column (3) shows average marginal effects from a probit model for the binary donation decision; *The lower part of column (2) shows estimated elasticities for significant continuous variables and semi-elasticities for dummy variables;* *Robust standard errors in parentheses;* *[1]: Shown in Indonesian Rupiah (IDR)* ** p < 0.1, ** p < 0.05, *** p < 0.01*			

Table 10: Regression results for donation behavior

6. Discussion and conclusion

We measured EC and PEB of residents living in one of the major oil palm producing regions in the world and compared EC and PEB of rural and urban residents. For this, we measured EC based on a 12-item NEP scale and an oil-palm-related adaptation of the scale. PEB was measured as donations made to a local environmental organization using a donation game. Our results show that rural residents directly involved with oil palm cultivation are significantly more concerned about the environment than urban respondents. This is true for general EC, as well as for oil palm-related EC. Furthermore, we find that nature connectedness and preferences for more diverse landscapes are positive correlates of EC, whereas social proximity to agriculture is negatively correlated with EC. Regarding PEB, our results reveal that more than three-quarters of our respondents decided to donate. We further find that rural respondents donate more, that nature connectedness influences donation behavior positively, and proximity to agriculture influences it negatively.

Earlier studies, especially in industrialized countries, have found mixed results concerning differences in EC between rural and urban residents (Huddart-Kennedy et al. 2009; Yu 2014; Mobley 2016). Our study finds that rural residents engaged in oil palm farming are more environmentally concerned. This finding is in line with the study by Sharp and Adua (2009) and Berenguer et al. (2005) and shows that oil palm farmers seem to be aware of the environmental effects of oil palm cultivation. It is interesting to see that even though urban residents are affected by exhaust fumes and waste amongst others in a more intense way than rural residents, besides the negative environmental effects of oil palm cultivation such as water and air pollution, they do have a lower general concern. One reason for the difference in EC between urban and rural residents might be that those respondents that are less concerned about the environment and are directly involved in oil palm cultivation might feel that the economic benefits they receive from the cultivation outweigh the negative environmental effects from oil palms. Another reason might be that the respondents with a lower EC who are not directly involved

in oil palm cultivation (the majority of urban residents) might not necessarily connect oil palm cultivation with negative environmental effects but more with economic benefits. Anecdotal evidence from our survey suggests that many urban respondents had the opinion that oil palm cultivation has brought economic welfare to the rural areas.

When looking at PEB, we find that rural respondents donate more money than urban residents which is in line with the findings of Huddart-Kennedy et al. (2009) for self-reported PEB but not with the findings by Yao (2015) for an industrialized nation context and Chileshe and Sampa Moonga (2019) (developing nation context). One reason for the rural-urban behavior difference in our study might be that urban residents do not see the reason to donate to an environmental organization when they are not directly involved in the cultivation of oil palms and hence do not feel responsible for the environmental consequences. In other words, rural respondents that are all oil palm farmers in our case and are responsible for some of the negative environmental effects from oil palm cultivation might feel the necessity to donate to an environmental cause. A second reason might be that urban residents do not connect oil palms with the negative effects such as deforestation and loss of biodiversity and hence, might not see the necessity to donate for such a cause.

Beyond this, we learn that EC, general as well as oil palm-related EC, and the donations made are positively correlated and are influenced by similar factors as seen in our results. This means that EC might act as a mediator and might explain why rural households that have a higher EC also have a higher willingness to donate. This shows that EC and PEB are indeed positively correlated as shown by Pisano and Lubell (2017) and that this correlation is highly relevant in developing nations, too. In addition, we find that self-reported PEB is higher among urban residents and that self-reported PEB and donations are positively correlated when controlling for geographical residence. Hence, this offers a starting point to strengthen PEB specifically related to oil palm cultivation and the negative environmental effects, especially, in urban areas.

Our study offers two policy implications to consider. Firstly, many rural residents who are directly involved in oil palm cultivation are aware of the environmental consequences of oil palm cultivation, show concern, and engage in PEB. While awareness and concern do not necessarily translate directly into PEB, this nonetheless offers a starting point for discussions and planning of interventions to foster sustainable oil palm cultivation. Secondly, when considering all local stakeholders, urban respondents who are mostly not directly involved in the oil palm sector are less concerned. They also donate less than their rural counterparts; however, for self-reported PEB they tend to engage more. Accordingly, urban residents may fail to connect the agrarian transformation with negative environmental effects. A similar failure of the general public to connect agriculture and the environment has been observed in other studies (Sharp and Adua 2009). To overcome this lack of connectedness and strengthen EC

and PEB, especially in the urban context, providing environmental education and information may be a promising approach. The provision of environmental education and information seems particularly relevant since our study finds – similar to studies in industrialized countries – that EC and PEB are positively correlated.

References

Ajzen, I. 1989. Attitude structure and behavior in Pratkanis, A.R., Beckler, S.J. and Greenwald, A.G. (Eds), Attitude Structure and Function, Lawrence Erlbaum, Hillsdale, NJ, 241-274.

Arendt, F., and Matthes, J., 2016. Nature Documentaries, Connectedness to Nature, and Pro-environmental Behavior. Environmental Communication, 10(4), 453–472. https://doi.org/10.1080/17524032.2014.993415

Aron, A. Aron, E.N., Smollan, D., 1992. Inclusion of other in the self-scale and the structure of interpersonal closeness. Journal of Personality and Social Psychology 63(4), 596–612. https://doi.org/10.1037/0022-3514.63.4.596

Austin, K. G., Mosnier, A., Pirker, J., McCallum, I., Fritz, S., Kasibhatla, P.S., 2017. Shifting patterns of oil palm driven deforestation in Indonesia and implications for zero-deforestation commitments. Land Use Policy 69, 41–48. https://doi.org/10.1016/j.landusepol.2017.08.036

Bardsley, N., 2008. Dictator game giving: Altruism or artefact? Experimental Economics 11(2), 122–133. https://doi.org/10.1007/s10683-007-9172-2

Baptiste, A.K., Nordenstam, B.J., 2009. Impact of oil and gas drilling in Trinidad: Factors influencing environmental attitudes and behaviours within three rural wetland communities. Environmental Conservation 36, 14–21. https://doi.org/10.1017/S0376892909005268

Bekkers, R., 2007. Measuring Altruistic Behavior in Surveys: The All-or-Nothing Dictator Game. Survey Research Methods 1(3), 139-144. https://doi.org/10.18148/srm/2007.v1i3.54

Bellemare, M.F., Wichman, C.J., 2019. Elasticities and the Inverse Hyperbolic Sine Transformation. Oxford Bulletin of Economics and Statistics 82(1), 50-61. https://doi.org/10.1111/obes.12325

Belotti, F., Deb, P., Manning, W.G., Norton, E.C., 2015. twopm: Two-part models. Stata Journal 15(1), 3–20. https://doi.org/10.1177/1536867X1501500102

Berenguer, J., Corraliza, J.A., Martin, R., 2005. Rural-Urban differences in environmental concern, attitudes, and actions. European Journal of Psychological Assessment 21(2), 128–138. https://doi.org/10.1027/1015-5759.21.2.128

Bogner, F.X., Wiseman, M., 1997. Environmental Perception of Rural and Urban Pupils. Journal of Environmental Psychology 17, 111–122. https://doi.org/10.1006/jevp.1997.0046

Bou Dib, J., Krishna, V.V., Alamsyah, V., Qaim, M., 2018. Land-Use Change and Livelihoods of Non-farm Households: The Role of Income from Employment in Oil Palm and Rubber in Rural Indonesia. Land Use Policy 76, 828–38. https://doi.org/10.1016/j.landusepol.2018.03.020

BPS-Statistics Indonesia, 2019. Indonesian Oil Palm Statistics. Indonesian Central Bureau of Statistics

Budidarsono, S., Susanti, A., Zoomers, A., 2013. Oil Palm Plantations in Indonesia: The Implications for Migration, Settlement/Resettlement and Local Economic Development. Biofuels - Economy, Environment and Sustainability. InTech. https://doi.org/10.5772/53586

Carlson, K.M., Curran, L.M., Ratnasari, D., Pittman, A.M., Soares-Filho, B.S., Asner, G.P., Trigg, S.N., Gaveau, D.A., Lawrence, D., Rodrigues, H.O., 2012. Committed carbon emissions, deforestation, and community land conversion from oil palm plantation expansion in West Kalimantan, Indonesia. Proceedings of the National Academy of Sciences U. S. A. 109, 7559–7564. https://doi.org/10.1073/pnas.1200452109

Chileshe, B., Sampa Moonga, M., 2019. Disparities in Pro-Environmental Behaviour between Rural and Urban Areas in Zambia. International Journal of Humanities Social Sciences and Education 4 (6), 196-215. http://dspace.unza.zm/handle/123456789/6029

Clark, C.F., Kotchen, M.J., Moore, M.R., 2003. Internal and external influences on pro-environmental behavior: Participation in a green electricity program. Journal of Environmental Psychology, 23(3), 237–246. https://doi.org/10.1016/S0272-4944(02)00105-6

Corral-Verdugo, V., 1997. Dual "realities" of conservation behavior: Self-reports vs observations of re-use and recycling behavior. Journal of Environmental Psychology 17(2), 135-145. https://doi.org/10.1006/jevp.1997.0048

DeFries, R.S., Rudel, T., Uriarte, M., Hansen, M., 2010. Deforestation driven by urban population growth and agricultural trade in the twenty-first century. Nature Geoscience 3, 178–181. https://doi.org/10.1038/ngeo756

Derksen, L., Gartrell, J., 1993. The Social Context of Recycling. American Sociological Review 58(3), 434-442. https://doi.org/10.2307/2095910

Dislich, C., Keyel, A.C., Salecker, J., Kisel, Y., Meyer, K.M., Auliya, M., Barnes, A.D., Corre, M.D., Darras, K., Faust, H., Hess, B., Klasen, S., Knohl, A., Kreft, H., Meijide, A., Nurdiansyah, F., Otten, F., Pe'er, G., Steinebach, S., Tarigan, S., Tölle, M.H., Tscharntke, T., Wiegand, K., 2017. A review of the ecosystem functions in oil palm plantations, using forests as a reference system. Biological Reviews 92(3), 1539–1569. https://doi.org/10.1111/brv.12295

Dunlap, R.E., Van Liere, K.D., Mertig, A.G., Jones, R.E., 2003. New Trends in Measuring Environmental Attitudes: Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale. Journal of Social Issues 56(3), 425-442. https://doi.org/10.1111/0022-4537.00176

Dutcher, D.D., Finley, J.C., Luloff, A.E., Johnson, J.B., 2007. Connectivity with nature as a measure of environmental values. Environment and Behavior 39(4), 474–493. https://doi.org/10.1177/0013916506298794

Eckel, C.C., Grossman, P.J., Andreoni, J., Ball, S., Gilles, R., Goodman, A., Hoffman, E., 1996. Altruism in Anonymous Dictator Games. Games and Economic Behavior 16, 181–191. https://doi.org/10.1006/game.1996.0081

Euler, M., Schwarze, S., Siregar, H., Qaim, M., 2016. Oil Palm Expansion among Smallholder Farmers in Sumatra, Indonesia. Journal of Agricultural Economics 67(3), 658–676. https://doi.org/10.1111/1477-9552.12163

Euler, M., Krishna, V.V., Schwarze, S., Siregar, H., Qaim, M., 2017. Oil palm adoption, household welfare, and nutrition among smallholder farmers in Indonesia. World Development 93, 219-235. https://doi.org/10.1016/j.worlddev.2016.12.019

FAOSTAT, Crop Production Data (Rome, Food and Agricultural Organization of the United Nations, 2020)

Fargione, J., Hill, J., Tilman, D., Polasky, S., Hawthorne, P., 2008. Land clearing and the biofuel carbon debt. Science, 319(5867), 1235–1238. https://doi.org/10.1126/science.1152747

Feintrenie, L., Chong, W.K., Levang, P., 2010. Why do farmers prefer oil palm? lessons learnt from Bungo District, Indonesia. Small-Scale Forestry 9(3), 379–396. https://doi.org/10.1007/s11842-010-9122-2

Fitzherbert, E., Struebig, M., Moerl, A., Danielsen, F., Bruehl, C., Donald, P., Phalan, B., 2008. How will oil palm expansion affect biodiversity? Trends in Ecology and Evolution 23(10), 538–545. https://doi.org/10.1016/j.tree.2008.06.012

Fransson, N., Gärling, T., 1999. Environmental concern: Conceptual definitions, measurement methods, and research findings. Journal of Environmental Psychology 19(4), 369–382. https://doi.org/10.1006/jevp.1999.0141

Franzen, A., Pointner, S., 2012. Anonymity in the dictator game revisited. Journal of Economic Behavior and Organization 81(1), 74–81. https://doi.org/10.1016/j.jebo.2011.09.005

Fujii, E.T., Hennessy, M., Mak, J., 1985. An evaluation of the validity and reliability of survey response data on household electricity conservation. Evaluation Review 9, 93–104. https://doi.org/10.1177/0193841X8500900106

Gatto, M., Wollni, M., Qaim, M., 2015. Oil palm boom and land-use dynamics in Indonesia: The role of policies and socioeconomic factors. Land Use Policy 46, 292-303. https://doi.org/10.1016/j.landusepol.2015.03.001

Gibson, L., Lee, T.M., Koh, L.P., Brook, B.W., Gardner, T.A., Barlow, J., Peres, C.A., Bradshaw, C.J.A., Laurance, W.F., Lovejoy, T.E., Sodhi, N.S., 2011. Primary forests are irreplaceable for sustaining tropical biodiversity. Nature 478(7369), 378–381. https://doi.org/10.1038/nature10425

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., 2009. Multivariate data analysis: A global perspective. 7th edition. Upper Saddle River: Prentice Hall.

Hamilton, L.C., 1985. Self-Reported and Actual Savings in a Water Conservation Campaign. Environment and Behavior 17(3), 315–326. https://doi.org/10.1177/0013916585173003

Hall, D., 2009. The 2008 World Development Report and the political economy of Southeast Asian agriculture. Journal of Peasant Studies 36(3), 603–609. https://doi.org/10.1080/03066150903142964

Hoffman, E., McCabe, K., Smith V.L., 1996. Social Distance and Other-Regarding Behavior in Dictator Games. The American Economic Review 86(3), 653–660. https://www.jstor.org/stable/2118218

Huddart-Kennedy, E., Beckley, T.M., McFarlane, B.L., Nadeau, S., 2009. Rural-urban differences in environmental concern in Canada. Rural Sociology 74(3), 309–329. https://doi.org/10.1526/003601109789037268

Jones, R.E., Fly, J.M., Cordell, H.K., 1999. How green is my valley? Tracking rural and urban environmentalism in the Southern Appalachian Ecoregion. Rural Sociology 64(3), 482–499. https://doi.org/10.1111/j.1549-0831.1999.tb00363.x

Kaltenborn, B.P., Bjerke, T., 2002. Associations between environmental value orientations and landscape preferences. Landscape and Urban Planning 59, 1–11. https ://doi.org/10.1016/S0169 -2046(01)00243 -2

Khan, A., Khan, M.N., Adil, M., 2012. Exploring the New Ecological Paradigm (NEP) Scale in India: Item Analysis, Factor Structure and Refinement. Asia-Pacific Journal of Management Research and Innovation 8(4), 389–397. https://doi.org/10.1177/2319510x13477966

Koh, L.P., and Wilcove, D.S., 2008. Is oil palm agriculture really destroying tropical biodiversity? Conservation Letters 1(2), 60–64. https://doi.org/10.1111/j.1755-263x.2008.00011.x

Koh, L.P., Miettinen, J., Liew, S.C., Ghazoul, J., 2011. Remotely sensed evidence of tropical peatland conversion to oil palm. Proceedings of the National Academy of Sciences 108(12), 5127-5132. https://doi.org/10.1073/pnas.1018776108

Kollmuss, A., Agyeman, J., 2002. Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? Environmental Education Research 8(3), 239–260. https://doi.org/10.1080/13504620220145401

Kotchen, M.J., Reiling, S.D., 2000. Environmental attitudes, motivations, and contingent valuation of nonuse values: a case study involving endangered species. Ecological Economics 32(1), 93-107. https://doi.org/10.1016/S0921-8009(99)00069-5

Kubitza, C., Krishna, V.V., Alamsyah, Z., Qaim, M., 2018. The Economics Behind an Ecological Crisis: Livelihood Effects of Oil Palm Expansion in Sumatra, Indonesia. Human Ecology 46, 107–116. https://doi.org/10.1007/s10745-017-9965-7

Lee, J.S.H., Ghazoul, J., Obidzinski, K., Koh, L.P., 2014. Oil palm smallholder yields and incomes constrained by harvesting practices and type of smallholder management in Indonesia. Agronomy for Sustainable Development 34(2), 501–513. https://doi.org/10.1007/s13593-013-0159-4

Long, J.S., 1997. Regression Models for Categorical and Limited Dependent Variables. Thousand Oaks, CA: Sage Publications.

Lowe, G.D., Pinhey, T.K., 1982. Rural-Urban Differences in Support for Environmental Protection. Rural Sociology 47(1), 114-128.

Madden, D., 2008. Sample selection versus two-part models revisited: The case of female smoking and drinking. Journal of Health Economics 27(2), 300–307. https://doi.org/10.1016/j.jhealeco.2007.07.001

Manning, W.G., Mullahy, J., 2001. Estimating log models: to transform or not to transform? Journal of Health Economics 20(4), 461-494. https://doi.org/10.1016/s0167-6296(01)00086-8

Mayer, F.S., Frantz, C.M.P., 2004. The connectedness to nature scale: A measure of individuals' feeling in community with nature. Journal of Environmental Psychology 24(4), 503–515. https://doi.org/10.1016/j.jenvp.2004.10.001

Merten, J., Röll, A., Guillaume, T., Meijide, A., Tarigan, S., Agusta, H., Dislich, C., Dittrich, C., Faust, H., Gunawan, D., Hein, J., Hendrayanto, Knohl, A., Kuzyakov, Y., Wiegand, K., Hölscher, D., 2016. Water scarcity and oil palm expansion: social views and environmental processes. Ecology and Society 21(2). https://doi.org/10.5751/ES-08214-210205

Mobley, C., 2016. What Matters When Explaining Environmentalism at the Watershed Level: Who You Are, Where You Live, What You See, or What You Perceive? Environment and Behavior 48(9), 1148–1174. https://doi.org/10.1177/0013916515586058

Moss, S., Prosser, H., Costello, H., Simpson, N., Patel, P., Rowe, S., Turner, S., Hatton C., 1998. Reliability and validity of the PAS-ADD Checklist for detecting psychiatric disorders in adults with intellectual disability. Journal of Intellectual Disability Research 42(2), 173–183. https://doi.org/10.1046/j.1365-2788.1998.00116.x

Naylor, R.L., Higgins, M.M., Edwards, R.B., Falcon, W.P., 2019. Decentralization and the environment: Assessing smallholder oil palm development in Indonesia. Ambio 48, 1195–1208. https://doi.org/10.1007/s13280-018-1135-7

Obidzinski, K., Andriani, R., Komarudin, H., Andrianto, A., 2012. Environmental and social impacts of oil palm plantations and their implications for biofuel production in Indonesia. Ecology and Society 17(1), 25. https://doi.org/10.5751/ES-04775-170125

Pacheco, P., Gnych, S., Dermawan, A., Komarudin, H., Okarda, B., 2017. The palm oil global value chain: Implications for economic growth and social and environmental sustainability, The palm oil global value chain: Implications for economic growth and social and environmental sustainability. Center for International Forestry Research (CIFOR). https://doi.org/10.17528/cifor/006405

Pisano, I., Lubell, M., 2017. Environmental Behavior in Cross-National Perspective: A Multilevel Analysis of 30 Countries. Environment and Behavior 49, 31–58. https://doi.org/10.1177/0013916515600494

Raihani, N.J., Mace, R., Lamba, S., 2013. The Effect of $1, $5 and $10 Stakes in an Online Dictator Game. PLoS ONE 8(8), e0073131. https://doi.org/10.1371/journal.pone.0073131

Rauwald, K.S., Moore, C.F., 2002. Environmental attitudes as predictors of policy support across three countries. Environment and Behavior 34, 709–739. https://doi.org/10.1177/001391602237243

Rist, L., Feintrenie, L., Levang, P., 2010. The livelihood impacts of oil palm: Smallholders in Indonesia. Biodiversity and Conservation 19(4), 1009–1024. https://doi.org/10.1007/s10531-010-9815-z

Romero, M., Wollni, M., Rudolf, K., Asnawi, R., Irawan, B., 2019. Promoting biodiversity enrichment in smallholder oil palm monocultures – Experimental evidence from Indonesia. World Development 124, 104638. https://doi.org/10.1016/j.worlddev.2019.104638

Rulli, M.C., Casirati, S., Dell'Angelo, J., Davis, K.F., Passera, C., D'Odorico, P., 2019. Interdependencies and telecoupling of oil palm expansion at the expense of Indonesian rainforest. Renewable and Sustainable Energy Reviews 105, 499–512. https://doi.org/10.1016/j.rser.2018.12.050

Santika, T., Wilson, K.A., Meijaard, E., Budiharta, S., Law, E.E., Sabri, M., Struebig, M., Ancrenaz, M., Poh, T.M., 2019. Changing landscapes, livelihoods and village welfare in the context of oil palm development. Land Use Policy 87, 104073. https://doi.org/10.1016/j.landusepol.2019.104073

Saphores, J.-D.M., Nixon, H., Ogunseitan, O.A., 2006. Household willingness to recycle electronic waste - An application to California. Environment and Behavior 38(2), 183-208

Sayer, J., Ghazoul, J., Nelson, P., Klintuni Boedhihartono, A., 2012. Oil palm expansion transforms tropical landscapes and livelihoods. Global Food Security 1(2), 114-119. https://doi.org/10.1016/j.gfs.2012.10.003

Schultz, P.W., Gouveia, V.V., Cameron, L.D., Tankha, G., Schmuck, P., Franěk, M., 2005. Values and their relationship to environmental concern and conservation behavior. Journal of Cross-Cultural Psychology 36(4), 457–475. https://doi.org/10.1177/0022022105275962

Schwarze, S., Euler, M., Gatto, M., Hein, J., Hettig, E., Holtkamp, A.M., Izhar, L., Kunz, Y., Lay, J., Merten, J., Moser, S., Mußhoff, O., Otten, F., Qaim, M., 2015. Rubber vs. oil palm: an analysis of factors influencing smallholders' crop choice in Jambi, Indonesia. https://doi.org/10.13140/RG.2.1.1695.0808

Shang, J., Croson, R., 2009. A field experiment in charitable contribution: The impact of social information on the voluntary provision of public goods. Economic Journal 119(540), 1422–1439. https://doi.org/10.1111/j.1468-0297.2009.02267.x

Sharp, J., Adua, L., 2009. The social basis of agro-environmental concern: Physical versus social proximity. Rural Sociology 74(1), 56–85. https://doi.org/10.1526/003601109787524061

Sjahza, A., Asmit, B., 2019. Regional economic empowerment through oil palm economic institutional development. Management of Environmental Quality: An International Journal 30, 1256–1278. https://doi.org/10.1108/MEQ-02-2018-0036

Sjöberg, L., 1989. Global change and human action: Psychological perspectives. International Social Science Journal 121, 414-432.

Stibig, H.J., Achard, F., Carboni, S., Raši, R., Miettinen, J., 2014. Change in tropical forest cover of Southeast Asia from 1990 to 2010. Biogeosciences 11, 247–258. https://doi.org/10.5194/bg-11-247-2014

Stern, P.C., Dietz, T., Guagnano, G.A., 1995. The New Ecological Paradigm in Social-Psychological Context. Environment and Behaviour 27(6), 723-743. https://doi.org/10.1177/0013916595276001

Takala, M., 1991. Environmental awareness and human activity. International Journal of Psychology 26, 585-597. https://doi.org/10.1080/00207599108247146

Tremblay, K.R., Dunlap R.E., 1978. Rural Residence and Concern with Environmental Quality: A Replication and Extension. Rural Sociology 43(3), 474–91.

Varkkey, H., 2013. Oil palm plantations and transboundary haze: Patronage networks and land licensing in Indonesia's peatlands. Wetlands 33(4), 679–690. https://doi.org/10.1007/s13157-013-0423-z

Verges, M., Duffy, S., 2010. Connected to Birds but Not Bees: Valence Moderates Implicit Associations with Nature. Environment and Behavior 42(5), 625–642. https://doi.org/10.1177/0013916508330210

Villamor, G., Akiefnawati, R., Van Noordwijk, M., Desrianti, F., Pradhan, U., 2015. Land use change and shifts in gender roles in central Sumatra, Indonesia. International Forestry Review 17(1), 1-15. https://doi.org/10.1505/146554815816002211

Watson K., Halse C.M., 2005. Environmental Attitudes of Pre-service Teachers: A Conceptual and Methodological Dilemma in Cross-Cultural Data Collection. Asia Pacific Education Review 6(1), 59-71. https://doi.org/10.1007/BF03024968

Weigel, R.H., 1983. Environmental attitudes and prediction of behavior. In Feimer, N.R., Geller, E.S. (Eds), Environmental Psychology: Directions and Perspectives, Praeger, New York, NY, 257-287.

Wheeler, D., Hammer, D., Kraft, R., Dasgupta, S., Blankespoor, B., 2013. Economic dynamics and forest clearing: a spatial econometric analysis for Indonesia. Ecological Economics 85, 85-96. https://doi.org/10.1016/j.ecolecon.2012.11.005

Winking, J., 2014. Anonymity versus privacy in the dictator game: Revealing donor decisions to recipients does not substantially impact donor behavior. PLoS ONE, 9(12). https://doi.org/10.1371/journal.pone.0115419

Wooldridge, J.M., 2010. Econometric analysis of cross section and panel data. 2nd edition, Cambridge, Mass.: MIT Press.

Yao, K., 2015. Who Gives? The Determinants of Charitable Giving, Volunteering, and Their Relationship. Working paper. Wharton School, University of Pennsylvania. Retrieved from http://repository.upenn.edu/wharton_research_scholars/126

Yu, X., 2014. Is environment “a city thing” in China? Rural-urban differences in environmental attitudes. Journal of Environmental Psychology 38, 39–48. https://doi.org/10.1016/j.jenvp.2013.12.009

Appendix

	Unconditional expected value E(Y|X)	Donation decision Pr(Y>0|X)	Conditional expected value E(Y|X, Y>0)
	(1)	(2)	(3)
Sociodemographics			
Gender of household head (1=female)	-1.534 (2.386)	-0.02 (0.05)	-1.090 (2.061)
Age of household head	-0.051 (0.060)	-0.00007 (0.001)	-0.050 (0.050)
Education of household head (measured in years)	0.304* (0.182)	0.006* (0.004)	0.156 (0.156)
Asset index	5.347*** (0.890)	0.05** (0.02)	4.185*** (0.823)
Number household members	-0.511 (0.488)	0.01 (0.009)	-0.781* (0.402)
Place of residence			
Place of residence (1=village)	9.040*** (2.239)	0.19*** (0.05)	4.668** (2.051)
Household migrated to current place of living (1=yes)	2.810** (1.407)	0.01 (0.03)	2.531** (1.221)
Social proximity to agriculture			
Socialization (years lived in village between 0 and 18)	-0.033 (0.112)	-0.004** (0.002)	0.069 (0.094)
OIS oil palm	-0.482 (0.454)	-0.02** (0.009)	0.025 (0.388)
Connectedness with nature			
OIS nature	-1.716*** (0.448)	0.04*** (0.01)	-2.571*** (0.447)
Preference for diverse landscapes (1=agroforest or rainforest)	4.729** (1.845)	0.06* (0.03)	3.430** (1.596)
Other environmental behavior			
Hours participated in environmental activities in the last 12 months (sum)	0.041*** (0.014)	0.0002 (0.0004)	0.037*** (0.013)
Environmental concern			
General EC (12-item NEP scale)	-0.317 (0.849)	-0.004 (0.02)	-0.230 (0.758)
Concern about the negative environmental effects of oil palm cultivation	0.626 (0.848)	0.01 (0.02)	0.307 (0.752)
Concern about the lack of local action to reduce the negative environmental effects of oil palm cultivation	-0.708 (1.098)	-0.01 (0.02)	-0.470 (0.959)
N	757	757	623
Control variables included	yes	yes	yes

Column (1) shows the average marginal effects for the unconditional expected values for the amount donated in '000 IDR. Column (2) shows average marginal effects from a probit model for the binary decision of whether to donate or not; column (3) reports average marginal effects for the intensity decision conditional on the decision to donate in '000 IDR. An OLS with log transformation was used for the estimation of the results in columns (1) and (3).
Standard errors in parentheses;
* p < 0.1, ** p < 0.05, *** p < 0.01
For the two-step model, we selected a probit model (Humphreys 2013) for modeling the binary donation decision. For the second part of the model, the intensity decision, we had to select between a generalized linear model (GLM)

and an ordinary least squares (OLS) approach. In cases where one finds evidence of heteroscedasticity in the OLS residuals on the log-scale, OLS will be biased (Manning and Mullahy 2001) and GLM is preferred. Additionally, if the OLS log-scale residuals are heavier tailed than normal we would prefer OLS with log transformation over GLM to reduce precision losses (Manning and Mullahy 2001). Our data shows that we prefer the OLS model over the GLM estimation as we firstly, do not find proof for heteroscedasticity present (p=0.2334) which was tested with a White test. Secondly, the kurtosis value for the amount donated (log-scale residuals) shows a value of 2.40. Hence, we use an OLS with log transformation. As we applied a log-transformed OLS regression we have to do a retransformation to go from log(y_hat) to y_hat. For this retransformation, we apply Duan's smearing estimator (Duan 1983). In addition, we have to apply a non-parametric bootstrapping to compute the correct standard errors and confidence intervals for the unconditional marginal effects (Belotti et al. 2015).

Table A1: Estimates for donations made using a two-step model

	(1) Amount donated (log)	(2) Selection equation
Age of household head	-0.002 (0.002)	-0.0001 (0.005)
Education of household head (measured in years)	0.007 (0.008)	0.03* (0.02)
Gender of household head (1=female)	-0.07 (0.10)	-0.09 (0.19)
Asset index	0.21*** (0.04)	0.22** (0.09)
Number household members	-0.04** (0.02)	0.04 (0.04)
Place of residence (1=village)	0.22** (0.09)	0.78*** (0.18)
Socialization (years lived in village between 0 and 18)	0.006 (0.005)	-0.02* (0.009)
Hours participated in environmental activities (sum)	0.002*** (0.0006)	0.0006 (0.002)
OIS nature	-0.13*** (0.02)	0.16*** (0.04)
Preference for diverse landscapes (1=agroforest or rainforest)	0.18** (0.08)	0.26* (0.14)
Constant	3.45*** (0.30)	-0.39 (0.49)
OIS oil palm		-0.10** (0.04)
N	757	623

Estimated coefficients from a Heckman selection model.
Standard errors presented in parentheses.
Wald test of independent equations (rho = 0): chi2(1) = 0.02 (p-value = 0.875)

We follow Wooldridge (2010) and use the logarithmic transformation of our outcome variable the amount donated to make sure that only positive values are predicted.
We assume that the connectedness with oil palms affects the decision to donate negatively as those respondents that feel connected to oil palms probably would rather not support tree planting to tackle the negative environmental effects of oil palm cultivation. We further assume that the connectedness with oil palms does not play a role in the amount donated which is supported by the insignificance of this coefficient for the intensity decision as can be seen in table A1.

The Wald test of independence shows that we cannot reject the independence assumption (p-value = 0.875). Furthermore, the inverse Mills ratio is significant in the model and the variance inflation factors (VIFs) of the regression of the inverse Mills ratio on the remaining parameters in our model are 13.49 (without OIS oil palm) and 13.65 (with OIS oil palm). Hence, we prefer the two-step model for our estimations. The critical level for conducting this test is 30 (Madden 2008).
**p < 0.1, **p < 0.05, ***p < 0.01.*

Table A2: Heckman selection model results

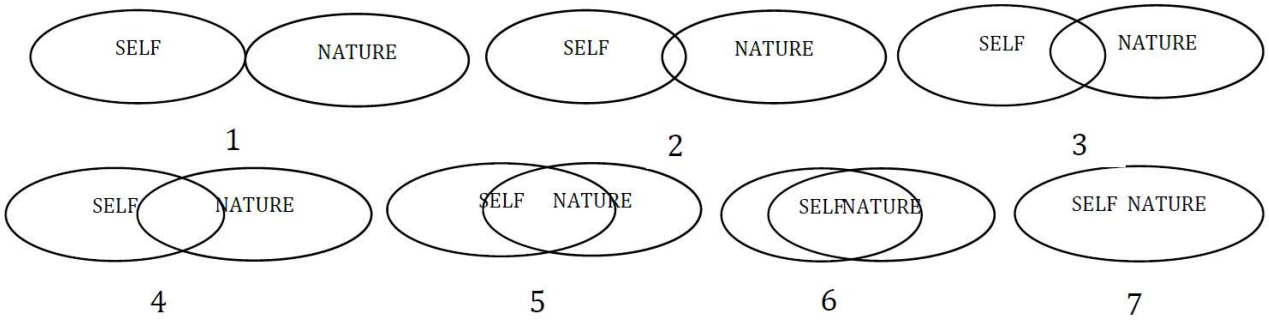

Figure A1: OIS scale (Aron et al. 1992)

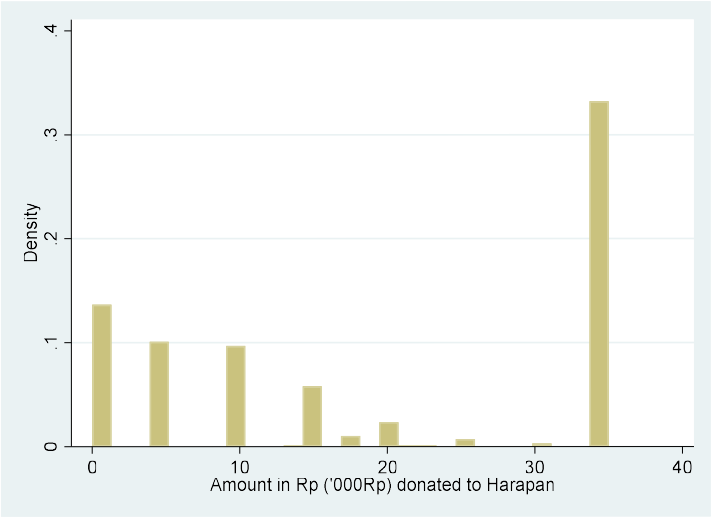

Figure A2: Histogram for donations (in IDR)

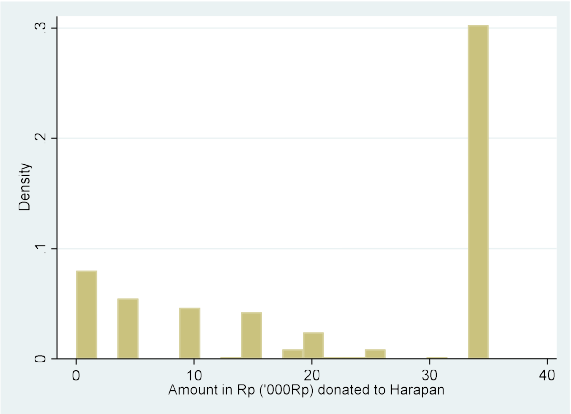

Figure A3: Donations for respondents currently in the village (in IDR)

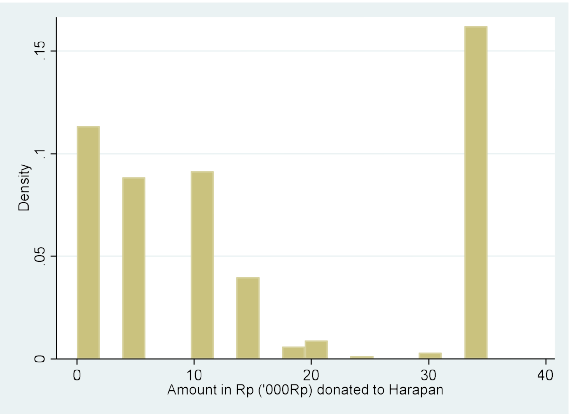

Figure A4: Donations for respondents currently living in the city (in IDR)