1 Title: Pro-Poor Land Transfers in the Presence of Landslides: New Insights on Norms in Land Markets

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Abstract

We investigate the presence of redistributive attitudes on the supply side of land markets in a mountainous area in Western Uganda. We test whether observed attitudes can be explained with an economic model on informal insurance within social networks or whether alternative explanations, such as normative drivers, are needed. To do so, we first collected detailed data on plot ownership, plot location and exposure to landslides among 401 farmers in Western Uganda. Then a discrete choice experiment (DCE) was conducted on the hypothetical sales of these plots in order to elicit preferences for specific buyer characteristics among respondents. We find that people prefer to sell their plots to family members and are therefore ready to forego some revenue from the sale. Moreover, farmers prefer to sell their land to poorer buyers, but only as long as the plots are not susceptible to landslides. When the plots are susceptible to landslides no preference is shown to sell plots to less wealthy buyers. Our results add to the literature on land markets and norms in the presence of environmental risks by illustrating that attitudes in favour of redistribution and disaster risk reduction cannot be explained by risk pooling and informal insurance considerations alone. Our study illustrates the potential of DCE to measure how redistributive attitudes might influence decisions during market transactions. This leads to some important recommendations for policies on land markets and disaster risk reduction.

1. INTRODUCTION

A large amount of work demonstrates the importance of solidarity mechanisms in the presence of economic risks (Fafchamps, 2011, 1992). Solidarity mechanisms are, for example, observed when productive means such as land and cattle are shared with persons who are in need (Baland and Francois, 2005; Beck and Bjerger, 2017; Ostrom, 2005). Within economics, redistribution mechanisms within a social network have been understood as a form of informal insurance which is triggered upon economic shocks. This is in line with the zero contribution hypothesis which states that a self-interested person would not voluntarily contribute to a public good such as the reduction of inequality (Fafchamps, 1992; Ostrom, 2014). Regarding access to land several mechanisms, such as communal property regimes and temporary transfers, have indeed been shown to function as an insurance system against shocks (Baland and Francois, 2005; Delpierre et al., 2012).

A recent study has shown that pro-poor temporary land transfers also exist in the absence of economic shocks (Beck and Bjerger, 2017). The authors of this study argue that this phenomenon is related to the presence of norms for redistribution, rather than informal insurance mechanisms. This relates to other studies who show the importance of (social) norms for market exchanges (Ostrom, 2000; Young, 2007). Yet, the link between redistributive choices and norms remains understudied.

Currently, economic literature provides three major interpretations of redistributive choices. They can stem from an individual's inequity aversion (personal norms), from a conformity to social norms, or from a risk pooling and mutual insurance perspective (Fershtman et al., 2012). The first two can be grouped into norm-driven redistributive choices, while the latter can be labelled as decisions driven by insurance considerations (Ostrom, 2000).

Very few studies have directly measured redistributive choices, and when they do so it is in the form of lab experiments (Fershtman et al., 2012). Most field studies on redistributive attitudes attempt to explain observed behaviour with expectations from theory without actually measuring the attitudes (Fafchamps, 2011; Kasper and Mulder, 2015; Krah et al., 2019; Townsend, 1994)¹. The lack of studies is essentially driven by the methodological difficulty to measure preferences in real markets for goods that are not directly transacted, but nevertheless drive behaviour.

We address this gap by means of an original household survey and a tool from environmental and health economics: Discrete Choice Experiments (DCE). We measure preferences of land owners for characteristics of hypothetical buyers of existing plots in a case study in Western Uganda, where both informal land transactions and devastating landslides are frequent. We then compare the measured preferences with theoretical predictions regarding land sales in a context of informal insurance against risks. This allows us to evaluate whether the observed choices can

¹ A notable exception is a lab-in-the-field experiment in Switzerland (Frey and Meier, 2004).

be explained by the zero contribution hypothesis or should be attributed to another explanation such as norms.

The contribution of this paper is both methodological and empirical. First, we propose and test a new methodology to quantitatively elicit preferences that can be involved in any sort of transaction. The quantification of these preferences allows us to explicitly test whether redistributive choices align with economic theories on risk pooling. Secondly, we apply this methodology to test for the relative importance of specific choices regarding land sales in the presence of landslide risk in rural Uganda. We find a preference to sell plots to poor members of the extended family as long as these plots are not exposed to landslides. These choices cannot be explained by informal risk sharing models alone and are therefore attributed to normative attitudes in favour of disaster risk prevention and pro-poor transfers to family members.

Our results have some important consequences for policy, since they show that measures promoting further freeing of the land markets might erode existing solidarity mechanisms in the region. We therefore recommend that such measures, if implemented, are accompanied by risk reducing mechanisms to prevent the most vulnerable households from being exposed to the risk of losing their income sources due to landslides on their plots.

In the subsequent sections we first present the study area, which is crucial to understand the research objectives and conceptual framework. We then describe our data collection and empirical analysis, followed by the results, discussion and a conclusion.

2. BACKGROUND AND STUDY AREA

The Ruwenzori region covers an area of approximately 3000 km² spread over 31 sub-counties in four districts: Bundibugyo, Kasese, Kabarole and Ntoroko (Figure 1).

Figure 1: Overview of the study area. Darker areas have a steeper slope (adapted from Mertens et al. (2016))

2.1. CULTURE AND FAMILY STRUCTURE

Historically, the Ruwenzori region can be considered as a transition zone between the Buganda kingdom and Congo basin, thereby developing specific cultural formations (Pennacini, 2007). At present, different cultural groups, or ethnicities, populate the Ruwenzori mountains, the numerically largest groups being Bakonzo, Babouissi, Bamba and Batoro. While it has been argued that the distinction between ethnic groups mostly stems from attempts of colonial authorities (Kodesh, 2008), ethnicity currently plays an important role in the construction of identity of individuals and groups (Pennacini, 2007; Stacey, 2003). These ethnic identities should, however, be considered as superficial banners below which a whole lot of historical, socio-economic and political conflicts are at play (Reuss and Titeca, 2017).

Besides ethnicity, clans (*Enganda* in Luganda) that cross ethnic boundaries, play an important role in the identity of the people in Western Uganda (Willis, 1997). Recent anthropological research argues that, in contrast to ethnicity, clans and their totems have existed before colonization and that they have been playing an important role in connecting people in the pre-colonial society (Buchanan, 1978; François, 2004; Kodesh, 2008; Willis, 1997). Rather than showing kinship relations, clans express former arrangements of clientship and authority and thus illustrate relations in stated tradition (Buchanan, 1978; Willis, 1997). The existence of overlapping clans and totems across different ethnicities illustrates a “systematized perception of sameness coexisting alongside more closely bounded systems of ethnic identity” (Buchanan, 1978). It has been argued that such a system of affinities across ethnic and geographic boundaries form(ed) a sort of insurance network for populations that were/are frequently confronted with disastrous events and migration (Buchanan, 1978; François, 2004).

While clan membership has historically not been tied to access to land, present rarefication of the land has caused clan elders to prefer land to be given or sold to members of the same clan (François, 2004). Increasingly, clan membership has thus been used to wretch spiritual and economic control over land and other resources (Kodesh, 2008). While formal institutions tend towards more private tenure arrangements, communal land tenure arrangements and clan membership continue to play an important role in the access to land (Deininger et al., 2008; Willis, 1997).

2.2. LAND MARKETS

This does not impede land sales markets from being very active in Western Uganda (Deininger and Ali, 2008; Deininger and Castagnini, 2006; van Leeuwen, 2014). Farmers frequently buy and sell land, and both *inter-vivo* and *ex mortem* transfers are very common. Most of these transactions occur in a semi-formal manner, in the presence of the local chief who writes a land agreement, but without issuing an official title. Prices that are paid for plots depend strongly on circumstances and personal ties. They can be a combination of in-cash and in-kind, and of direct

1 and delayed payments. Therefore prices are very hard to survey in a reliable way. Despite
2 attempts to introduce a national titling scheme, very few plots in our study area do have a land
3 title (Mertens and Vranken, 2018). It is widely accepted, though, that local tenure systems,
4 without formal titling and without *de jure* enforcement frequently provide sufficient local tenure
5 security for active land markets and durable investments (Baland et al., 1999; Brasselle et al.,
6 2002; Katz et al., 2000; Omura, 2008; Platteau, 1996).

7 Land sales markets in Western Uganda are active, but they are not fully 'free'. Contrary to official
8 regulation at national level, land is mostly owned, inherited and transacted by males only.
9 Moreover, there is a strong preference to keep land within ownership of members of the same
10 extended family or clan (François, 2004). Additionally, while mapping the plots in the region, we
11 noted that several farmers felt tenure insecure and feared land grabbing (Mertens and Vranken,
12 2018). This is probably caused by the lack of titles and the consequential institutional multiplicity
13 in the region (Deininger and Ali, 2008; van Leeuwen, 2014).

14 2.3. LANDSLIDES

15 Every year, during the rainy seasons or following seismic activity landslides occur at different
16 locations and elevations in the Ruwenzori region (Jacobs et al., 2017). The location of these
17 landslides is determined by the type of the soil, slope length and steepness, vegetation cover and
18 local variations in topography (e.g. whether in a concavity or a convexity). A spatial correlation in
19 landslide susceptibility therefore exists. This results in a correlation in landslide susceptibility
20 among plots owned by a same household (Mertens and Vranken, 2018).

21 During prolonged rainfall, or during an earthquake, it frequently happens that several landslides
22 are observed in the same village, thereby affecting multiple plots at the same time. On average,
23 landslide density in the area varies between 3 and 4.9 slides / km² (Jacobs et al., 2017). These
24 landslides destroy crops and productive assets such as soil fertility and therefore have a
25 significant impact on the livelihoods of farmers in the region (Mertens et al., 2016). Reports
26 suggest that landslides have rendered over 14,000 people homeless over the last 50 years (Jacobs
27 et al., 2016).

28 Previous studies in the region suggest that farmers are very aware of the threat caused by
29 landslides, but that they have limited options to reduce landslide susceptibility (Mertens et al.,
30 2018). The lack of formal insurance mechanisms compels farmers to rely on ex-post emergency
31 measures and social networks to cope with the idiosyncratic income shock caused by landslides.
32 Yet, these ex-post solidarity mechanisms are not sufficient to compensate for the income loss
33 caused by landslides (Mertens et al., 2016). It has been shown that ex-post solidarity mechanisms
34 are often less efficient for disaster risk reduction than ex ante measures (Fafchamps, 2011, 1992;
35 Wisner et al., 2003). An ex post solidarity system might suffer from the problem of moral hazard,
36 since farmers might take less landslide risk reduction measures if they are (informally) insured

(Fafchamps, 1992). Ex-ante disaster prevention measures and pro-poor land transfers are therefore expected to be present within exposed communities².

A recent study has shown that farmers take into account landslide susceptibility when transacting land in the Ruwenzori region (Mertens and Vranken, 2018). It was found that farmers who are initially more exposed to landslides manage to reduce their average exposure to some extent by acquiring plots outside landslide prone areas. A basic assumption of that study was that transactions are driven by (discounted) utility maximization and disaster avoidance among the land buyers. In current study, an alternative explanation for the observed trend in land transactions in the Ruwenzori region is investigated. Qualitative research in the area suggests that general attitudes towards disaster risk reduction prevent those farmers who would not be able to cope with a serious income shock from acquiring plots which have a high landslide risk. These attitudes for disaster risk reduction would thus also act on the supply side of the land markets. The two explanations, on the supply side in current research and on the demand side in Mertens and Vranken (2018), are not exclusive, but complementary.

3. CONCEPTUAL FRAMEWORK

The first hypothesis in current study is that an attitude exists on the supply side in favour of pro-poor land transfers (H1). This is in line with literature on pro-poor land transfers and informal insurance mechanisms, as well as observations in the field (Beck and Bjerger, 2017; Fafchamps, 2011; Mertens and Vranken, 2018). The second hypothesis is that there is an additional tendency for not selling land with landslide hazard to poor farmers (H2). This derives from our own qualitative and quantitative observations (Mertens and Vranken, 2018). The counterfactual of H2 is that landslide hazard on a plot should not reduce the preference to sell this plot to poor farmers and thus that H1 holds irrespective the landslide susceptibility of the plot. Our theoretical model will show that the counterfactual of H2 is in line with what should be expected if choices were driven by informal risk sharing considerations alone. A confirmation of H2 would therefore require us to propose alternative explanations, such as normative drivers, for observed choices.

There is a rich literature documenting the existence of informal insurance schemes against shocks (Baland et al., 2016; Caudell et al., 2015; De Weerd and Dercon, 2006; Fafchamps, 2011). In case of such a network of informal insurance, the $Income_j$ of a farmer j at a given moment in time (subscripts for time t not shown) is determined by its income Y_j from agriculture on one or several plots, plus non-agricultural income R_j received, minus gifts G_j to his or her network (equation 1). Expected income Y_{jp} from agriculture on a plot p can be assumed to follow a production function F_p multiplied by the expected price of the products (P) and discounted by a risk factor accounting for landslide susceptibility ($1 - Sus_p$), see equation 2. G_j depends on the network with size n of the farmer j , as well as the demands (d_i) from individuals $i \in \{1, \dots, n\}$ within the network (equation 3). These demands are function of the individuals' $wealth_i$ (equation 4). The poorer a

² We employ 'community' interchangeably for local social network, which can consist of extended family members, neighbours or clan members.

person i is, the more likely s/he is to fall below an income threshold after which demands d_i are addressed to farmer j . R_j also depends on the personal network of farmer j , his/her status and the occurrence of shocks, but is less important here and therefore omitted in the remaining analysis.

$$Income_j = Y_j + R_j - G_j \quad \text{Eq. 1}$$

$$E(Y_j) = \sum_p E(Y_{jp}) = \sum_p (1 - Sus_p) * E(PF_p) \quad \text{Eq. 2}$$

$$E(G_j) = \sum_i E(d_i) \quad \text{Eq. 3}$$

$$E(d_i) = f(wealth_i) \quad \text{Eq. 4}$$

We assume that the farmer wants to sell one of his/her plots and has to make a choice regarding the selling price, as well as the characteristics of the buyer³. In case of a purely economic transaction and in the presence of formal insurance networks, only the price offered by a buyer should matter (Table 1). Moreover, if the land market is in equilibrium, the price of land upon sale should equal the discounted expected future income from cultivating the land or renting it out. This implies that landslide susceptibility reduces the price of a plot (see equation 2).

In the absence of formal external insurance mechanisms, buyer characteristics start to matter. This holds even under a purely economic reasoning and the assumption of market equilibrium. Indeed, the price demanded by farmer j for plot p from buyer i will not only be determined by the forgone income from agriculture on plot p ($\Delta Y_{jp} = -E(Y_{jp})$), but also by a change in gifts to the network (eq. 5). The latter becomes particularly relevant if the buyer is from within the network, is poor and has no or less access to alternative external insurance mechanisms so that informal insurance has to be provided by the seller. Since a land transaction increases the productive resources of the buyer i , other things being equal, the gifts from seller j to buyer i are expected to decrease after the transaction ($\Delta G_{ji} < 0$). Therefore, the price demanded by farmer j from a poor person i within the social network will be lower than the price demanded from a non-poor person within the network or from someone outside the social network (Table 1). The price will actually equal the discounted (discount factor k^t) expected income from the plot plus the (negative) change in expected gifts, due to a change in expected demands (d_i) from person i ⁴. A poorer household will typically demand more gifts and hence, the reduction in gifts will be larger if a land transaction occurs. Thus, the poorer the buyer from within the social network is, the larger, i.e. more negative, the change in demands by this person (= gifts to this person) will be. It might therefore be convenient to preferentially sell land to poor members of the social

³ The reason for the sale of the plot, whether it is because of labour constraints, need for cash or desire to buy another plot, is not relevant here.

⁴ For readability the discount factor is not shown in equation 4. If we account for multiple time periods, the full equation is

$$Price_{jpi} = \sum_{t=0} \frac{1}{k^t} * E(Y_{pt}) + \sum_{t=0} \frac{1}{k^t} * E(\Delta G_{jit})$$

network in order to reduce their future demand for support. A lower price is therefore demanded from a poor household as compared to a richer one (Eq. 5)⁵.

$$Price_{jpi} = \Delta Income_j = E(Y_p) + E(\Delta G_{ji}) \quad \text{Eq. 5}$$

A plot that is susceptible to landslides has a higher output variance than a plot that is not susceptible. If a susceptible plot is being sold to a poor household within the network, the seller j may still be expected to support the buyer i whenever a landslide happens. The expected change in gifts $E(\Delta G_{jip})$ after the sale of a susceptible plot will therefore be smaller (less negative) than when a non-susceptible plot is being sold to a poor buyer within the social network. (eq. 6)⁶.

$$E(\Delta G_{jip}) = (1 - Sus_p) * E(\Delta d_i) < 0 \quad \text{Eq. 6}$$

Landslide susceptibility on a plot thus equally reduces the expected income from agriculture on the plot (Eq. 2) and the expected change in gifts (i.e. with increasing landslide susceptibility, expected gifts will be larger; Eq. 6). Hence, landslide susceptibility (captured by the term $1 - Sus_p$) affects the price demanded from all buyers in a similar way. The impact is thus independent of the type of buyer, i.e. whether s/he is from in- or outside the network, poor or non-poor (Table 1).

Table 1: Stylized overview of price demanded to different buyers under zero contribution hypothesis. The gifts demanded by a farmer within the social network depend on the wealth status of the demander. Since a rich person is not expected to demand gifts, expected change in gifts after the sale of a plot is zero. Susceptibility on a plot equally reduces the price demanded for all buyers.

	Non-susceptible plot	Susceptible plot
Buyer outside social network	$E(Y_p)$	$(1 - Sus_p) * E(Y_p)$
Buyer within social network and poor	$E(Y_p) + E(\Delta G_{ji})$	$(1 - Sus_p) * (E(Y_p) + E(\Delta G_{ji}))$
Buyer within social network and rich	$E(Y_p)$	$(1 - Sus_p) * E(Y_p)$

Given these equations, one should expect that (1) landslide susceptibility reduces the productivity and thus also the price of a plot, irrespective of the wealth status of the buyer; and that (2) poor households within the social network have to pay a lower price for the plots (irrespective of landslide susceptibility), but only because this corresponds with a discounted change in future demands/gifts. In other words, the willingness to accept a lower price from poor persons within the social network is high. If we assume that the willingness to accept a lower price from poor members of the network is the expression of a wish to sell to these people, this second expectation is in line with H1. Finally, these two expectations are independent from each

⁵ The money received by farmer j from his/her network (R_j) will likely also change following the transaction, but this change does not necessarily depend on the characteristics of the buyer. It therefore does not matter for our reasoning and will be omitted in the following equations.

⁶ In the absence of full insurance, $E(\Delta G_{jp})$ may be discounted by a factor λ (not shown). This discount factor can be changed after a land transaction because the relation between the transacting parties is modified (e.g. social ties being strengthened). This does not have an influence on the conceptual framework and is not further discussed.

other if H2 does not hold⁷. Indeed, landslide susceptibility should not additionally change, and certainly not increase, the price demanded from poor households, since landslide susceptibility both affects the value of the plot and the size of expected demands (Eq. 5). In other words, the willingness to accept a lower price from poor members of the network should not be altered by the susceptibility on the plot. A finding in this sense would be in line with the zero-contribution hypothesis and would lead us to reject H2.

In case both H1 and H2 are confirmed, this suggests that there is an attitude in favour of pro-poor land transfers but only if the land is not susceptible to landslides. In that case, land sales are not only driven by insurance considerations and should be explained with other concepts, such as norms. A confirmation of H1 and rejection of H2 suggests that there is an attitude in favour of pro-poor land transfers which is not affected by the presence of landslides on the plot and which can therefore be explained by standard theories of informal insurance networks (i.e. the zero contribution hypothesis is confirmed)⁸. In case both H1 and H2 are rejected, no pro-poor or risk reducing attitudes in land transactions can be identified⁹.

4. DATA AND METHODOLOGY

4.1. THE HOUSEHOLD SURVEY

We surveyed a stratified two-stage random sample of 401 households (HHs) in 41 remote villages in the Ruwenzori region (Figure 1). Villages and HHs affected by landslides were identified prior to the survey implementation, respectively through workshops and field visits at district level, as well as village-level interviews in June- September 2014 (see Mertens et al., 2016). The villages were subsequently stratified on the presence of recent landslides, and the HHs in each village were stratified on whether they had been affected by a landslide in the previous 15 years. HHs that have experienced landslides have been oversampled.

⁷ From the perspective of the buyer, landslide susceptibility and associated output variance likely matters more for poorer and more risk averse farmers. Poor farmers are therefore expected to offer an even lower price for plots susceptible to landslides than rich farmers. This may reduce the price demanded by the seller in case no other buyer is available. In this particular case, mechanisms (1) and (2) would not be independent, but would reinforce each other. This is opposite to the attenuation proposed by H2.

⁸ Strong information asymmetries between the seller and buyer regarding landslide susceptibility on the plot could lead to a similar result. Yet, since landslide susceptibility on plots is generally well-known in the region (Mertens and Vranken, 2018), information asymmetries regarding landslide susceptibility between the seller and his/her social network are likely very small.

⁹ The presence of alternative formal or informal insurance mechanisms that operate outside the social network should not alter this conceptual framework. Since such insurance mechanisms were not observed in the study area, we do not further discuss them here (Mertens et al., 2016).

1 The HHs in our sample were visited for a first time with paper questionnaires in February-March
2 2015 and a second time with questionnaires on tablets¹⁰ in August-September 2016¹¹. The second
3 round was entirely developed to investigate choices during land transactions. Only HHs that were
4 interviewed in both rounds are included in this analysis. Attrition is very low (3%). Four HHs were
5 dropped during data cleaning, because the HH head refused to answer questions on plot
6 cultivation and ownership. Our final sample therefore contains 397 HHs. An overview of the
7 sample characteristics is given in Table 3 and Table 4.

8 The questionnaires included questions on HH demographics, perceptions and experience with
9 landslides, detailed information on plot ownership, plot transactions and plot cultivation, as well
10 as questions on agricultural production and other questions needed to determine HH income
11 (Grosh and Glewwe, 2000). Individual plots were mapped with GPS. Plots are defined as
12 continuous pieces of land that were obtained during the same land transaction. If two adjacent
13 pieces of land were obtained at different moments in time, we therefore consider them as
14 different plots. In total 779 plots, or 75 % of the 1041 plots owned by the HHs in our sample, have
15 been mapped with a GPS¹². The georeferencing of the plots was used to extract information
16 about their size, landslide susceptibility, slope steepness, as well as distance from the house and
17 from the road network.

18 The probability to have a landslide on a plot is determined by the probability that a landslide
19 starts on the plot or in the close surroundings of the plot and thereby leads to a withdrawal or a
20 deposition of soil. This probability was therefore calculated by estimating the landslide
21 susceptibility in a buffer of 30 meters around the plot. The susceptibility data were obtained from
22 a regional landslide susceptibility map produced through logistic regression modelling at 30m
23 resolution (Jacobs et al., 2017b). After extracting landslide susceptibility estimates for all plots,
24 the data were normalized over the whole sample. After triangulation with data from the HH
25 survey, information on landslide susceptibility, slope and plot location is only available for those
26 plots that were mapped, while information on the (estimated) size of the plots is available for all
27 plots (Kilic et al., 2013; Mertens and Vranken, 2018).

¹⁰ Tablets were used in the second time to increase efficiency and to allow a true randomization of the questions in the DCE. Survey CTO was used on Samsung tablets.

¹¹ To some extent, the research questions formulated and tested in this manuscript originate from our fieldwork. The hypotheses in current paper were formulated during the first round of data collection and during the analysis of these data (Mertens et al., 2018, 2016). This approach, whereby the research topic and questions are elaborated during the data collection, is the standard approach in anthropology, but is infrequent in economics. However, since the research questions that are tested in this manuscript have been developed before the implementation and analysis of the DCE, we believe that our research complies with procedures prescribed for quantitative research (i.e. no data mining has been involved in the development of this research).

¹² GPS points were taken in front of the farm houses and on the corners of each plot owned or cultivated by the HHs. Some plots could not be mapped due to refusal by the owner to bring the enumerators to their plots. This was most frequently related to an excessive walking distance from the house to the plot. Other plots could not be mapped because the boundaries were contested by neighbours, because technical errors were made during mapping, or because the plots were rented in.

4.2. DCE FOR ELICITING PREFERENCES

Respondents were asked to consider the hypothetical case in which they would decide to sell one of their plots because of an urgent need for money (e.g. to pay for school fees). We made use of a DCE to elicit the preferences regarding the characteristics of a hypothetical buyer. These preferences were elicited for each of the plots owned and cultivated by the HH (Figure 2). We opted for a separate choice experiment for each of the plots because this allows for testing interactions between plot characteristics such as landslide susceptibility on the one hand, and preferences with regard to the hypothetical buyer on the other hand. Hence, playing the same DCE for each plot owned and cultivated by a single farmer (both plots with landslides and plots without landslides) addresses unobserved contextual issues which are not related to the plots themselves.

Choice experiments are based on random utility theory, thereby assuming that the respondent makes a choice based on rational weighting of utility losses and gains related to the attributes of each choice (McFadden, 1973). These losses and gains are driven by both monetary and non-monetary considerations. In our case the non-monetary motivations are both internally (personal feeling of doing well, given a set of norms) and externally driven (benefit of showing to others that one is a good person).

Attributes and attribute levels are determined by our research question, qualitative interviews and try-outs in the field. They consist of some characteristics of the potential buyer, as well as on the price offered. A labelled choice experiment is used. That means that one of the attributes, the label, is considered more important and that its levels are always present in a structured way (see Figure 3 for an illustration). The label represents three different scenarios reflecting the relatedness between the respondent and the buyer. A possibility for opting-out, i.e. to refuse to sell the plot to any of the proposed buyers, is also provided. For each labelled alternative, there are three attributes: 1) the wealth status of the buyer; 2) the spatial origin of the buyer; and 3) the price offered for the plot (Table 2). As such the choice options differ only in three characteristics of the buyer and the price that is offered for the plot.

Figure 2: Structure of the choice experiment. We made use of a D-efficient design of 12 blocks of 4 choice cards each. Blocks were randomized over the plots and within each block the order of the choice cards was randomly reshuffled every time. This is possible because tablets have been used for the survey. The sample consists of 397 respondents which each have 2.7 plots on average.

1 Relatedness with the potential buyer was included as a label, rather than a simple attribute,
2 because we expect preferences for certain attributes to be different depending on whether the
3 potential buyer is from the extended family, from the same clan but a different family or from
4 neither family nor clan¹³. The label on the relatedness between the respondent and the buyer
5 reflects the importance that is attributed to the kinship and cultural ties, both for transacting
6 land and for demanding assistance in times of need.

7 The wealth status, measured by the number of plots currently owned by the hypothetical buyer,
8 reflects its current need for land (which is supposed to be high if the buyer does not have any
9 plot) and its future capacity to cope with landslide shocks (which is supposed to be higher if the
10 buyer already has several plots). Of course, these reflections were not mentioned to the
11 interviewers nor the respondents and we just presented them as a buyer which either has a lot
12 of land (two plots or more), only one plot or no land at all.

13 The origin of the buyer, whether s/he is from this area or not, reflects the cultural affinity with
14 the respondent, and is a proxy for the likelihood of being neighbours in the future¹⁴.

15 The price offered by the buyer is a monetary attribute and explicitly states how much money the
16 buyer is offering for the plot. Since plot prices are often the result of a long bargaining process,
17 we stressed that it represents the price offered at the end of the bargaining process. Due to
18 differences in accessibility, climate and market integration, prices for land vary strongly within
19 our study area, ranging from prices as low as 2 million Ush/ha (1950 USD/ha) in the remote areas
20 to prices above 10 million Ush/ha (9720 USD/ha) in the cocoa region (purchasing power parity in
21 2010-2014 from The World Bank (2015)). We therefore opted to work with relative price,
22 expressed as a percentage of the average plot price in the village. To limit the cognitive burden
23 for the respondent, we asked for average plot prices in the village (per ha) first and used this
24 price to calculate the plot prices which then automatically appeared in the alternative scenarios
25 in the choice cards of the DCE.

26 The opt-out option allowed respondents to decide not to sell the plot to any of the proposed
27 buyers if these buyers, or the prices they offer, did not correspond with preferences of the
28 respondent. We included an opt-out to refrain from forcing respondents into a choice if s/he
29 wouldn't want to do so.

¹³ For this reason our analysis also treats the different attributes as alternative (i.e. label) specific.

¹⁴ The likelihood of being neighbours is probably highly correlated with the number of plots already owned by the potential buyer (if the buyer does not own a plot, s/he is likely to become a neighbour if you sell a neighbouring plot) and might therefore not been adequately captured by the 'origin' attribute.

Table 2: Overview of attributes and levels of the DCE. The attributes in this choice experiment are about the buyer, not about the plot. The price reflects the maximum price the buyer is willing to give for the plot. We used the existing plots for this hypothetical sale.

Label = relatedness with buyer	Within extended family Same clan and ethnicity, but not extended family Different clan, different ethnicity [baseline in analysis]
Wealth status buyer	Very rich = has a lot of land [baseline in analysis] Average = has one other plot Very poor = has no other plot
Origin buyer	From this or neighbouring village [baseline in analysis] Not from nearby village
Price	Very cheap: 33 % of normal plot price [baseline in analysis] Somewhat cheap: 50 % of normal plot price Average-cheap: 67 % of normal plot price Average-expensive: 150 % of normal plot price Somewhat expensive: 200 % of normal plot price Very expensive: 300 % of normal plot price

We made use of 42 choice cards in 12 blocks of 4 cards (D-error = 0.0246)¹⁵. Only 4 cards were shown per plot so that farmers with many plots would not be confronted with an excessively long interview. To avoid ordering effects, choice cards were shown in a random order (Day et al., 2012).

Several measures have been taken to make the DCE as realistic as possible. First, the DCE was implemented for each of the plots owned and cultivated by the HH. The use of real productive assets (i.e. land plots) as (hypothetical) stakes in the DCE likely increased the concreteness of the game. The use of real plots allowed us to investigate interactions between attributes in the DCE and existing plot characteristics, like landslide susceptibility, without having to explicitly include these plot characteristics as attributes in the experiment. To make sure that it was clear to the HH which plot was being 'sold', several characteristics of the plot, as previously mentioned by the respondent, were reiterated at the beginning of each DCE. These characteristics include walking distance from the house, plot size (in own units), year of acquisition and self-assessed landslide probability on the plot (Figure 3).

Secondly, the choice experiment and its separate attributes were carefully explained and a cheap talk script of a few introductory sentences was used to limit the hypothetical bias and the social desirability bias which arise from doing an hypothetical choice experiment on decisions involving norms (Silva et al., 2011). According to Silva et al. (2011) cheap talk which is generic with respect to the good, easy to understand and short enough might help in reducing the social desirability bias. Despite the hypothetical nature of the experiment, enumerators stressed the importance of providing answers that correspond with real life transaction.

¹⁵ A full factorial design of unique choice cards with trade-offs between buyer characteristics as well as price could be created from the attributes and their levels, but this would result in 108 possible combinations (36*3) for each potential buyer, which would imply (108*107*109) = 1,224,936 possible choice cards. A D-efficient design was therefore necessary to limit the number of choice cards while retaining maximal variation. Ngene software was used for the optimization.

Third, we supplemented our analysis with the results from Likert-scale subjective questions and tentative indications of actual behaviour. We made sure to ask these questions after the choice experiment in order to not influence our results. A bimodal 5-point Likert scale was used (1 = yes, very much/totally agree; 5 = no, not at all/totally disagree). Means were calculated for the whole sample and differences in answers between some questions were tested with a t-test, with Bonferroni correction for multiple hypothesis testing (6 tests were performed, so that significance levels of 10, 5 and 1 percent respectively boil down to * $p < 0.016$, ** $p < 0.008$ and *** $p < 0.0016$).

Let's first make sure we are talking about the same plot:
 Plot **PlotID = 1** is at a walking distance of **40** minutes. It has an area of **0,5 ha**. You acquired the plot in **1978**.
 Landslide susceptibility is **Not Susceptible** and
 "has a landslide ever happened: **NO**"

In case you really decided to sell plot **PlotID = 1**, to whom would you sell it?

	To Extended Family Has no other land	To Clan members (not family) Has no other land	To Others (not clan/family) Has a lot of land	None of these
wealth				
origin	From this or neighbouring village 	Not from nearby village 	From this or neighbouring village 	
price	Average expensive 	Average expensive 	Somewhat expensive 	

Very cheap: **1 Million** Ugandan Shilling
 Somewhat cheap: **1.5 Million** Ugandan Shilling
 Average-cheap: **2 Million** Ugandan Shilling
 Average-expensive: **4,5 Million** Ugandan Shilling
 Somewhat expensive: **6 Million** Ugandan Shilling
 Very expensive : **9 Million** Ugandan Shilling

Figure 3: Example of a choice card, as was presented during the interview. In this example the average plot price in the village, as mentioned by the respondent, was 6 Million Ush/ha (2917 USD/ha in purchasing power parity for 2010-2014; The World Bank (2015)). Text in **Botalic** are automatically calculated based on previous answers given by the respondent. The information on landslide susceptibility is therefore stated by the respondent and not measured by the researcher.

In order to account for attribute non-attendance, each choice experiment was followed by a question whether some attributes had never been taken into account during that choice

experiment (Hess and Hensher, 2010). This information on stated attribute non-attendance has been used to confirm our results during robustness checks (Appendix A1).

4.3. EMPIRICAL ANALYSIS

A multinomial random parameter logit model (mixed logit model) is used to estimate the preference for specific buyer characteristics (Hensher and Greene, 2003; Hole, 2007). Compared to the multinomial conditional logit model, this model does not assume independence of irrelevant alternatives (IIA) and allows for heterogeneity in taste across the respondents (Hensher and Greene, 2003).

The utility U associated with the sale of a plot to a potential buyer k in a choice card t , as evaluated for each respondent-plot combination j , is represented as follows:

$$U_{ktj} = X'_{ktj}\beta_{kj} + \varepsilon_{ktj} \quad Eq. 7$$

$$\text{In which } \beta_{kj} = \beta_k + \eta_{kj} \quad Eq. 8$$

Whereby X_{ktj} is a vector of explanatory variables relating to buyer k (= alternative k). This vector includes an alternative specific constant (ASC_k), i.e. an intercept for each choice, as well as dummies for the attributes of the choice alternative, being wealth and origin of the buyer, as well as the price that is offered. β_{kj} is a random parameter composed of a vector of alternative specific means (β_k) and a vector of deviations from these means (η_{kj}). β_k is a vector of 4 alternative-specific preference parameters associated with the ASC_k and three attributes of the potential buyers. η_{kj} is a vector of alternative-specific random deviations that account for individual-specific heterogeneity in taste. Alternative-specific means and standard deviations of this parameter η_{kj} are estimated through random Halton draws (Greene, 2000). A normal distribution of the random component is thereby assumed. Please note that the subscript 'k' in both parameters indicate that these are estimated separately over the different alternatives (i.e. the buyers)¹⁶. We thereby fully exploit the advantage of using a labelled choice experiment instead of an unlabelled experiment. The error component ε_{ktj} is assumed to be independent and identically distributed (IID) extreme value type I (Gumbel).

Within each alternative k , coefficients for the various dummy variables are estimated against a baseline in that alternative. For each alternative, except the opt-out, the baseline is chosen to be a buyer who is wealthy (has a two or more plots) and from the same village as the respondent. The coefficient of the ASCs are also compared with a baseline, which has been chosen to be a buyer who is not from the same family or clan. The ASC for opting out is thus a measure for the preference to not sell the plot as compared to selling it to a person that is from a different family

¹⁶ The analysis was done in NLogit Software because of this Software's long-standing capacity to analyse data from Discrete Choice Experiments (Greene, 2000).

or clan¹⁷. While we do not actually measure the utility U with this discrete choice experiment, choosing one alternative over the others implies that the utility of the chosen alternative exceeds the utility derived from the other alternatives (Ben-Akiv and SR Lerman, 1985).

Heterogeneity in equation 7 is allowed across respondents, but it is not clear where that heterogeneity is derived from. The hypothesis of this research (H2) is that the plot characteristics, and their interaction with buyer characteristics, are important for the utility respondents would derive from a potential sale. We therefore also estimate the following equation:

$$U_{ktj} = X'_{ktj}\beta_{kj} + \gamma_k X_{ktj} * PC_p + \varepsilon_{ktj} \quad \text{Eq. 9}$$

Whereby X_{ktj} is again a vector of explanatory variables relating to alternative k, while β_{kj} is a random parameter composed of a vector of alternative specific means (β_k) and a vector of deviations from these means (η_{kj}). PC_p stands for 'plot characteristics' and represents either the measured landslide susceptibility on the plot (continuous variable), or the self-reported presence of landslides (dummy = 1 when a landslide has ever happened on the plot). γ_k is a vector of alternative-specific parameters associated with the interaction of plot characteristics with attributes of the potential buyers. It should be interpreted as how much the effect of X_{ktj} is larger or smaller among plots that have characteristic PC_p than among plots that do not have that characteristic. The impact of plot characteristics can be measured independently from respondent characteristics because a different choice experiment is ran for each respondent-plot combination j . The error component ε_{ktj} is again assumed to be IID. In order to not overload the model, random coefficients are only allowed at the level of the single variable, and not for their interactions (Greene, 2000; Revelt and Train, 1999; Train, 2002).

Alternative plot characteristics PC_p in Eq. 9 have been introduced to test for the robustness of the results. The purpose of these robustness checks is (1) to confirm that our main findings regarding landslide susceptibility are not a statistical artefact of our research design; and (2) to check for other plot characteristics that might influence preferences regarding the characteristics of the buyer of these plots. We investigated the interaction with a dummy for whether the land can be sold to people external to the clan, for whether the land was inherited or received, as opposed to purchased, for whether permission from the extended family is needed for sales, for whether the family house is present on the plot and for whether perennial crops are cultivated on the plot. We also investigated an interaction with the walking distance (in minutes) between the plot and the house.

Marginal rates of substitution between attributes and the price offered by a potential buyer have been calculated by means of the Krinsky Robb (parametric bootstrap) method with 1000 draws

¹⁷ Categorical variables can be coded as dummy variables or effects coded (Bech and Gyrd-Hansen, 2005). While both are appropriate, the interpretation is different (Lancsar et al., 2017). The interpretation of the coefficients of the attributes is more easy when those are dummy coded. For the interpretation of the ASC it is recommended to work with effect coded variables (Bech and Gyrd-Hansen, 2005). Results of dummy coded regressions are presented here, but effect-coded regressions have been used to validate our interpretation of the ASCs.

from a multivariate normal distribution (Hole, 2007; Krinsky and Robb, 1986a, 1986b)¹⁸. This marginal rate of substitution is equivalent to calculating the willingness to accept lower or higher prices depending on specific buyer characteristics ($MRS_k = \frac{\beta_{attribute\ k}}{\beta_{price\ k}}$). We only use this result as a measure for comparing the relative importance of the different attributes. Confidence intervals for the MRS_k of different parameters have been computed empirically after testing their distribution¹⁹.

5. RESULTS

5.1. DESCRIPTIVE STATISTICS

A summary table of HH characteristics in our sample is presented in Table 3. All HHs in our sample derive most of their income from agriculture and average income per adult equivalent is 2.83 USD (purchasing power parity in 2010-2014; The World Bank (2015)). Cash crops are mainly coffee, cocoa or banana plants, while the most important food crops are cooking banana, cassava, cocoyam, beans, maize and potatoes, frequently grown in mixed cropping arrangements. The farmers in our sample own on average 2.6 plots each, with an average size of 0.4 ha. Frequently farmers own plots with a low landslide susceptibility as well as plots with a high landslide susceptibility (not shown; see Mertens and Vranken (2018)).

Table 3: Socio-economic characteristics of households in the sample: averages, followed by standard deviations between brackets.

Household characteristics at the time of the survey	
Age household (HH) head	47 (15)
Years of formal education HH head	5.8 (4.0)
Adult equivalents (OECD scales)	3.5 (1.2)
Income [Ush/adult equivalent/day]	3221 (4291)
% of income from agriculture	86 (23)
Total area owned [Ha]	1.21 (1.25)
Number of plots owned	2.62 (1.84)
Number of plots purchased	1.43 (1.59)
Average distance between plots [m]	536 (650)
Sample characteristics	
Total # of plots	1041
Percentage of plots that are mapped	75
Observations (# HHs)	397

¹⁸ Calculations were made with a self-written command in Stata 16. The command can be accessed together with the data in the Mendeley repository with the following DOI number: 10.17632/396f96vx66.2

¹⁹ Shapiro-Wilk tests and visual analysis of the histograms have been used to evaluate the distribution. None of the distributions was found to significantly deviate from normality.

1 An overview of the plot characteristics for the whole sample, and subdivided according to
2 whether the measured susceptibility on the plot is above or below the Sub-County median, is
3 presented in Table 4²⁰. In total, the HHs in our sample own 1041 plots. Half of the plots have ever
4 been affected by a landslide, according to the respondents, while 27% have been affected by a
5 landslide in the past 15 years. While all plots in Table 4 are owned by the HH, and more than 50%
6 of these plots have been purchased, only 58% of all the plots can be sold without agreement
7 from the extended family. However, 69% of the plots that require agreement could in theory be
8 sold to people outside the extended family or clan. No differences exist in landslide susceptibility
9 between plots that need agreement or not. Interestingly, more susceptible plots tend to be
10 acquired at a later age and less frequently harbour the family house than less susceptible plots.

11 Table 4 also shows how frequently a hypothetical buyer was selected in the DCE. In approximately
12 half of the choice situations a family member was preferred, rather than another buyer or
13 refusing to sell. The opt-out, being a refusal to sell the plot under any of the proposed conditions,
14 was only selected in 2% of the cases. This is likely a consequence of the way in which our choice
15 experiment was formulated, and should therefore not be interpreted as a general willingness to
16 sell land.

²⁰ A threshold at Sub-County level was chosen because individuals base their choices on the experiences and observations of their surroundings. A farmer's choice is determined by what s/he learned to consider as a normal level of exposure by observing and discussing with neighbours, family and friends. The median was chosen because it represents this best (Mertens and Vranken, 2018).

Table 4: Plot characteristics for the whole sample (column 1) and subdivided according to whether the measured susceptibility on the plot is above or below the Sub-County median (columns 2 and 3 respectively). The result of T-tests on differences between groups are given between the columns (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Since not all plots have been mapped, column 2 and column 3 only include the 794 plots that were mapped. Landslide susceptibility ranges between min: -2.23; and max: 1.77.

	Column 1 All	Column 2 Low susceptibility	Column 3 High susceptibility
Landslides			
Measured landslide Susceptibility	0.02 (0.98)	-0.58 (0.91)	*** 0.59 (0.67)
Did a landslide ever happen on the plot? (1 if yes)	0.51 (0.50)	0.50 (0.50)	*** 0.62 (0.49)
Has a landslide occurred on the plot in the last 15 years? (1 if yes)	0.27 (0.44)	0.18 (0.39)	*** 0.37 (0.48)
Plot characteristics			
Plot size (Ha)	0.40 (0.49)	0.41 (0.53)	0.41 (0.40)
Age at which the plot has been acquired	32 (15)	30 (14)	** 32 (15)
Purchased (= 1 if plot was purchased)	0.53 (0.50)	0.52 (0.50)	0.50 (0.50)
The previous owner of the plot was richer than me at the time of the acquisition (1 if yes)	0.28 (0.45)	0.25 (0.43)	0.23 (0.42)
Would you be allowed to sell this plot without agreement from the extended family or the clan members? (1 if yes)	0.58 (0.49)	0.55 (0.50)	0.60 (0.49)
Would you be allowed to sell this plot to a person which is not member from the community/ clan/region? (1 if yes)	0.69 (0.46)	0.69 (0.46)	0.68 (0.47)
Land use			
The family house is on the plot (1 if yes)	0.43 (0.50)	58 (49)	*** 0.47 (0.50)
Cash crops or other perennial crops on the plot (1 if yes)	0.71 (0.45)	76 (43)	0.72 (0.45)
Responses during choice experiment			
Percentage of the times that a hypothetical buyer was selected which is from the same (extended) family	53 (33)	54 (32)	51 (35)
Percentage of the times that a hypothetical buyer was selected which is from the same clan	25 (26)	23 (25)	26 (27)
Percentage of the times that a hypothetical buyer was selected which is neither from the same family nor clan	20 (29)	21 (28)	20 (30)
Percentage of the times that the opt-out (not selling) option was chosen	02 (09)	02 (08)	02 (11)
Observations	1041	379	400

5.2. MIXED LOGIT RESULTS

Table 4 presents the results of a multinomial mixed logit estimation without interaction terms (column 1) and with interaction with self-reported landslide occurrence (column 2) and measured landslide susceptibility on the plot (column 3). The baseline scenario in this Table is chosen to be a sale of the plot to a buyer who is not a member of the extended family or clan. The ASC's in Table 4 therefore indicate the preference to accept one of the proposed options (sale to family members, sale to clan members or opt-out from selling) over the baseline option.

In line with recurrent statements that land should not leave the extended family, a strong preference to sell to extended family members is observed: we find a significant and positive

coefficient of the alternative specific constant ASC_Family. The negative alternative specific constant for opting out (ASC_O) is surprising, since this suggests that selling the plot to persons who are not from the family or clan is preferred over not selling the plot at all (the status-quo). This can suggest that the proposed deals were considered to be attractive to the respondent, or it can be due to our framing of the question as a case in which the respondent would be in an urgent need for money.

While preferences for higher prices are strong and significant across all alternatives, preferences for specific buyer characteristics are only significant in case of sales to members of the extended family. In the model without interaction term (Table 4, column 1), there is a strong preference to sell to buyers that have zero or only one plot and that are not coming from a more distant village, but only if the plot is sold to a member of the extended family. There is a strong heterogeneity regarding preferences for the relatedness, as well as various buyer characteristics when the hypothetical buyer is a member of the extended family (not displayed here: see Appendix A2 for the results on preference heterogeneity).

Including an interaction between buyer attributes and the variable that captures landslide susceptibility, be it self-reported landslide occurrence or the measured landslide susceptibility, nuances this finding. First, the self-reported presence of landslides and the objective landslide susceptibility measure have very similar effects. Both of them do not have an effect on the preference to sell to family members, which remains high even in the presence of landslides, and both reduce the preference to sell plots to members of the extended family that do not have other plots. So, on average there is a preference to sell plots to poor family members, but this preference is reduced when landslides (can) happen on these plots. These findings allow us to confirm the validity of hypotheses H1 and H2 for members of the extended family, but not for potential buyers without familial ties. As such the zero-contribution hypothesis is not confirmed (this would have been confirmed if we would have been able to reject H2, but not H1). Thus, redistributive choices for land sales within extended family networks are not only driven by insurance considerations, but also by other factors.

For measured landslides susceptibility, but less so for landslide occurrence, there is also a negative interaction term with 'origin'. This suggests that there is a lower preference to sell to family members which are not from the region when the plot is prone to landslides, but that this preference is not as significantly reduced in case an actual landslide occurred on the plot in the recent past. If a landslide happened on a plot, this remains visible for several years and is thus known by both people from the village and from outside. If no landslide actually happened, farmer experience in the area is needed to know the landslide susceptibility on a plot (Mertens et al., 2018). The difference between column 2 and column 3 of Table 5 could therefore suggest

that respondents wouldn't want to sell a plot to a family member that wouldn't be aware of the risks involved in buying the plot²¹.

Table 5: Results for multinomial mixed logit regression without (column 1) and with interaction terms (columns 2 and 3). In this table the interaction with "landslide" indicates a dummy for mentioned landslide occurrence in column 2 and a continuous variable for measured landslide susceptibility in column 3. The baseline scenario is a buyer who is not from the extended family or clan, has more than 1 plot, is from the same village and offers a 'very low price'. Dummy codes are used for the attributes of the DCE. Standard errors are in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

	Column 1: No interaction	Column 2: Interaction Landslide occurrence	Column 3: Interaction Landslide susceptibility
To Family	Coefficient	Coefficient	Coefficient
ASC_Family	1.30*** (0.27)	1.07*** (0.36)	1.10*** (0.32)
ASC_Family * Landslide		0.51 (0.45)	0.20 (0.28)
Buyer has 1 other plot	0.58*** (0.19)	0.97*** (0.26)	0.40* (0.22)
Buyer has 1 other plot * Landslide		-0.81** (0.37)	-0.11 (0.22)
Buyer has no plot	1.19*** (0.21)	1.64*** (0.28)	1.06*** (0.24)
Buyer has no plot * Landslide		-0.88** (0.38)	-0.60** (0.24)
Buyer is not from this village	-0.54*** (0.16)	-0.38* (0.22)	-0.52*** (0.19)
Buyer not from this village * Landslide		-0.36 (0.31)	-0.59*** (0.20)
Price offered	0.0219*** (0.002)	0.0217*** (0.0020)	0.0250*** (0.0026)
To clan member (but not family)			
ASC_Clan	-0.20 (0.27)	0.42 (0.34)	-0.34 (0.31)
ASC_Clan * Landslide		-0.88** (0.44)	0.12 (0.19)
Buyer has 1 other plot	-0.29 (0.21)	-0.54* (0.28)	-0.03 (0.23)
Buyer has 1 other plot * Landslide		0.56 (0.37)	0.38* (0.22)
Buyer has no plot	0.08 (0.20)	0.19 (0.27)	0.16 (0.25)
Buyer has no plot * Landslide		-0.21 (0.40)	-0.14 (0.24)
Buyer is not from this village	0.32* (0.17)	0.02 (0.23)	0.36* (0.20)
Buyer not from this village * Landslide		0.65** (0.31)	-0.20 (0.19)
Price offered	0.0166*** (0.0020)	0.0167*** (0.0014)	0.0182*** (0.0017)
To person who is not family nor clan [baseline]			
Buyer has 1 other plot	0.16 (0.23)	0.02 (0.31)	0.26 (0.23)
Buyer has 1 other plot * Landslide		0.28 (0.41)	0.03 (0.24)
Buyer has no plot	-0.05 (0.25)	0.15 (0.33)	0.07 (0.24)
Buyer has no plot * Landslide		-0.36 (0.41)	-0.12 (0.25)
Buyer is not from this village	-0.30 (0.22)	-0.40 (0.30)	-0.42* (0.24)
Buyer not from this village * Landslide		0.13 (0.35)	-0.26 (0.21)
Price offered	0.0126*** (0.0014)	0.0127*** (0.0015)	0.0140*** (0.0016)
Opt Out			
ASC_O	-2.37*** (0.52)	-2.04*** (0.56)	-2.93*** (0.78)
ASC_O * Landslide		-0.50 (0.52)	-0.01 (0.34)
Log likelihood	-3419	-3407	-2435
Chi sq.	4706***	4730***	3768***
McFadden Pseudo Rsq	0.41	0.41	0.44
# observations	4164	4164	3116
	(1041 groups)	(1041 groups)	(779 groups)

²¹ Three additional robustness checks have been run for the regressions in Table 5: (1) Stated attribute non-attendance has been taken into account by omitting non-attended attributes; (2) Attributes have been effects-coded instead of dummy coded in order to check whether the sign and levels of significance of the ASCs are correct; (3) Regressions in Column 1 and Column 2 of Table 5 have also been run with the same sample as the regression in column 3 (i.e. restricting the sample to only those plots that were mapped, instead of mapped and unmapped plots). The results of the three checks are not shown because the original results were not affected. They can be looked up in the dataset attached to this paper.

5.3. MARGINAL RATES OF SUBSTITUTION

The marginal rates of substitution (MRS) between the different buyer characteristics and price are presented in Table 6. For the full sample there is a clear preference to sell plots to poor members of the extended family who are from the neighbourhood. The difference between the sales price to a family member and the sales price to a person who is neither from the same family nor the same clan equals 59% of the average plot price. As an example, if the average plot price (as stated by the respondent) is 3 million Ush/ha, an average respondent would demand 1.8 million Ush more to a buyer who is not from the family or clan than to someone from his/her own family (e.g. 2.5 million Ush vs. 4.3 million Ush for 1 ha). This is a large difference.

While the coefficients of different regressions cannot be compared statistically, some patterns are observed. First, no clear preference can be found to sell plots to clan members, as compared to buyers who are not from the same clan. Secondly, while prices are reduced for family members, regardless of the presence of landslides, the preference to sell to poor family members appears to be less significant when landslides occurred on the plot (Table 6, column 3) as compared with plots that have not experienced landslides (Table 6, column 2). Third, preferences regarding wealth and origin of buyers that are not from the same family are relatively small and inconsistent. High significance levels are driven by the high significance of the price attribute and should therefore be interpreted with care.

Table 6. Marginal Rate of Substitution, expressed as a percentage of the average plot price, between various buyer characteristics and the price for the full sample (column 1) and for subsamples of plots that have never been affected by landslides (column 2) and plots that have had a landslide according to the respondent (column 3). The baseline scenario is a buyer who is not from the extended family nor clan, has more than 1 plot, is from the same village and offers a 'very low price'. Ttests have been used after parameters have been empirically tested for normality. Standard errors are in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

	(1) Full sample	(2) No landslides	(3) Landslides
To Family			
WTA: ASC_Family	-59*** (14)	-62*** (21)	-70*** (21)
WTA: Buyer has 1 other plot	-26*** (9)	-46*** (15)	0 (13)
WTA: Buyer has no plot	-54*** (11)	-73*** (18)	-35*** (14)
WTA: Buyer not from this or neighbouring village	25*** (8)	14*** (11)	37*** (12)
To clan member (but not family)			
WTA: ASC_Clan	-1 (17)	-39*** (24)	24*** (26)
WTA: Buyer has 1 other plot	18*** (13)	30*** (20)	-11*** (16)
WTA: Buyer has no plot	-4*** (12)	-8*** (18)	-4*** (17)
WTA: Buyer not from this or neighbouring village	-19*** (10)	1* (16)	-36*** (15)
To person who is family nor clan [baseline]			
WTA: Buyer has 1 other plot	-12*** (19)	-4*** (25)	-16*** (28)
WTA: Buyer has no plot	5*** (20)	-8*** (26)	6*** (26)
WTA: Buyer not from this or neighbouring village	25*** (18)	26*** (26)	13*** (25)
# of observations	4164	2068	2096

5.4. ROBUSTNESS CHECKS

INTERACTIONS WITH OTHER PLOT CHARACTERISTICS

Several interaction terms different from landslide occurrence and landslide susceptibility have been considered. Only those yielding significant interaction terms are presented in Table 7, but also non-significant interactions give interesting information. The presence of the homestead, or the presence of perennials on a plot do not influence preferences regarding the characteristics of a potential buyer (not shown). This makes sense, since we are not investigating the actual intentions to sell a plot, but the preferences for a specific buyer characteristics in case of a sale. Also the interaction with a dummy for whether the plots has been inherited or received, as opposed to purchased, does not yield significant results (not shown). Preference to keep the land within the extended family is unaltered, while there is a larger preference to sell an inherited or received plots to clan members than to people from outside.

The results of an interaction with a dummy for whether the farmer has the permission to sell the plots without the agreement from clan members is presented in column 1 of Table 7. Plots that do not need permission are clearly less preferentially sold to clan members. The distance of the

plot, on the other hand, slightly reduces preference to sell to family members (Table 7, column 2).

Table 7. Results for multinomial mixed logit regression with an interaction between a buyer characteristic and specific plot features. Standard errors are in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

	Column 1: plot feature = dummy for the permission to sell without agreement from clan (1 if yes)	Column 2: plot feature = walking distance from the house (minutes)
To Family	Coefficient	Coefficient
ASC_F	1.68*** (0.38)	1.42*** (0.31)
ASC * Plot feature	-0.68 (0.45)	-0.002* (0.003)
Buyer has 1 other plot	0.49* (0.28)	0.71*** (0.22)
Buyer has 1 other plot * Plot feature	0.11 (0.37)	-0.003 (0.003)
Buyer has no plot	1.20*** (0.29)	1.16*** (0.24)
Buyer has no plot * Plot feature	-0.04 (0.36)	0.000 (0.003)
Buyer not from this village	-0.38 (0.23)	-0.68*** (0.19)
Buyer not from this village * Plot feature	-0.15 (0.30)	0.003 (0.002)
Price offered	0.0211*** (0.0018)	0.0216*** (0.0020)
To clan member (but not family)		
ASC_C	0.54 (0.36)	0.02 (0.30)
ASC * Plot feature	-0.91** (0.43)	-0.000 (0.003)
Buyer has 1 other plot	-0.62** (0.31)	-0.25 (0.25)
Buyer has 1 other plot * Plot feature	0.71* (0.37)	-0.001 (0.003)
Buyer has no plot	-0.08 (0.29)	0.05 (0.24)
Buyer has no plot * Plot feature	0.22 (0.38)	0.001 (0.003)
Buyer not from this village	0.26 (0.25)	0.24 (0.20)
Buyer not from this village * Plot feature	0.09 (0.31)	0.002 (0.002)
Price offered	0.0162*** (0.0014)	0.0165*** (0.0014)
To person who is not family nor clan [baseline]		
Buyer has 1 other plot	-0.07 (0.35)	0.20 (0.27)
Buyer has 1 other plot * Plot feature	0.23 (0.41)	-0.001 (0.003)
Buyer has no plot	0.12 (0.35)	-0.011 (0.27)
Buyer has no plot * Plot feature	-0.28 (0.40)	-0.001 (0.003)
Buyer not from this village	-0.27 (0.29)	-0.19 (0.24)
Buyer not from this village * Plot feature	0.06 (0.34)	-0.003 (0.003)
Price offered	0.0130*** (0.0014)	0.0126*** (0.0014)
Opt Out		
ASC	-2.51*** (0.62)	-2.43*** (0.57)
ASC * Plot feature	0.91* (0.53)	0.001 (0.003)
Log likelihood	-3408	-3411
Chi sq.	4718	4711
McFadden Pseudo Rsq	0.41	0.41
# observations	4164	4164
	(1041 groups)	(1041 groups)

COMPARISON WITH LIKERT-SCALE QUESTIONS

To our knowledge this study is the first application of a DCE to investigate attitudes which might be related to personal and social norms. In order to evaluate the validity of our result we

1 therefore compare them with the (coarse) information obtained through Likert-scale questions
2 (Table 8). The t-tests have been corrected for multiple hypotheses testing (Bonferroni method).

3 From questions 3 and 4 in Table 8 it is clear that the opinion of family members and clan members
4 matters during land transactions. Even though plots with landslides are generally cheaper
5 (question 2), most farmers say that they would reveal the landslide susceptibility of their plot,
6 but more so if this buyer is from the same family or clan and when the buyer is poor (questions
7 5-9). This is fully in line with our conceptual framework and with the findings of the choice
8 experiment. It also illustrates the importance of information on landslide susceptibility during
9 land transactions. People from the region are generally very aware of landslide susceptibility and
10 can estimate it by looking at the soil type and topography (Mertens et al., 2018). Since most land
11 is transacted among people from the same region information asymmetries are thus not likely to
12 play a major role in decisions to sell a plot. While there is a slight preference not to sell a plot
13 with landslides to a member of the clan or family (answers on questions 10-11), it is clear that
14 landslide risk does not matter for sales when the potential buyer is considered to be rich
15 (questions 12 and 13). This is also in line with our previous findings. Social (or financial)
16 consequences matter, since farmers tend to agree with question 14, which enquires for the
17 importance of buyer characteristics in case one would leave the village.

18 Of course, these questions very bluntly ask opinions about norms and therefore strongly suffer
19 from problems related to their hypothetical nature and social desirability bias.

Table 8. Attitudes measured with a bimodal 5-point Likert scale. A Likert scale was used (1 = yes, very much/totally agree; 5 = no, not at all/totally disagree). Differences in answers between some questions have been tested with a ttest with Bonferroni correction for multiple hypothesis testing. Consecutive values with a # sign have been tested for differences, but are not significantly different from each other. Consecutive values with *, ** or *** differ significantly from each other, with significance levels of respectively 10, 5 and 1 percent.

Personal attitudes towards landslide risk		
1	I prefer not to buy a plot with landslide risk, even if it is cheaper	1.88 (1.48)
2	In general, plots with landslide risk are cheaper than other plots (all other characteristics being equal)	1.20 (0.63)
Other people's opinions		
3	Regarding decisions about selling and buying of land, what is the importance of the opinion from members of the extended family?	1.38# (0.81)
4	Regarding decisions about selling and buying of land, what is the importance of the opinion of clan members?	1.35# (0.83)
Sharing information on landslide risk (relation with buyer)		
5	If I would sell a plot of which I know it has a landslide risk, I would tell this information if the buyer was from my extended family	2.07# (1.48)
6	If I would sell a plot of which I know it has a landslide risk, I would tell this information if the buyer was from my clan	2.03# (1.45) ***
7	If I would sell a plot of which I know it has a landslide risk, I would tell this information if the buyer was from a different clan and a different ethnicity	2.76 (1.63)
Sharing information on landslide risk (wealth buyer)		
8	If I would sell a plot of which I know it has a landslide risk, I would tell this information if the buyer was very poor	2.50 (1.61) ***
9	If I would sell a plot of which I know it has a landslide risk, I would tell this information if the buyer was very rich	3.08 (1.76)
Selling a plot with landslides (relation with buyer)		
10	I would NOT sell a plot of which I know there is a landslide risk to a member of my extended family	2.28# (1.44)
11	I would NOT sell a plot of which I know there is a landslide risk to a person from the same clan	2.23# (1.41)
Selling a plot with landslides (wealth buyer)		
12	I would NOT sell a plot of which I know there is a landslide risk to a person who is very poor	2.65 (1.49) ***
13	I would NOT sell a plot of which I know there is a landslide risk to a person who is very rich	3.56 (1.56)
14	If I would leave the village after selling my land, the characteristics of the buyer would matter less to me than if I would stay	2.03 (1.30)
N		397

6. DISCUSSION

6.1. NORMS AND LAND TRANSACTIONS

We find clear preferences to sell land to members of the extended family, regardless of landslides susceptibility. Among members of the extended family there is also a clear preference to sell land without landslides to the poorest people²². We do not find this preference for land with landslides

²² While this might seem to contradict with literature illustrating class segregation on the land market (Macours et al., 2010), the situation in our case is different since our finding only applies to land that is being transacted within the extended family.

1 or for potential buyers from outside the extended family. Our findings are confirmed by both the
2 discrete choice experiment and the Likert-scale questions and are in line with recent findings in
3 Gambia (Beck and Bjerger, 2017).

4 Our conceptual framework suggests that choices driven by a risk pooling behaviour cannot be
5 the sole driver of a diminished intention to sell to poor people when there is a landslide hazard
6 on a plot. Therefore our results confirm both H1 and H2 for members of the extended family.
7 Choosing between an insurance-based and a norms-based explanation, we have conclude that
8 our results are most in line with the latter. Yet, a combination of insurance considerations and
9 norms is of course possible.

10 Economists tend to view norms as internalized outcomes of an optimization at group level over
11 time (Fafchamps, 2003; Platteau, 1994; Townsend, 1994), while others see them as the result of
12 an evolutionary optimization (Basov, 2016; Kasper and Mulder, 2015; Young, 2007) or,
13 alternatively, as the result of human tendency to get passionate about certain fields of activity
14 (Bourdieu, 1994). These perspectives on social norms are not mutually exclusive and all fit our
15 case study well. Norms for mutual solidarity tend to be strongest among kin or close neighbours
16 and when the reasons for distress are considered to be outside the power of the affected
17 individuals (Fafchamps and Gubert, 2007; Kasper and Mulder, 2015; Ostrom, 2000). This might
18 explain why we find preferences for pro-poor sales among members of the extended family, but
19 not for other potential buyers.

20 6.2. WEAKNESSES

21 REAL LIFE CONSEQUENCES

22 The strong findings from our choice experiment raise the question as to what extent these norms
23 effectively translate in real life transactions. The large values obtained in Table 6 for marginal
24 rates of substitution between buyers' characteristics and demanded price suggest that our
25 results might be driven by the hypothetical nature of the questions and the desire to give a good
26 impression to the interviewer. Yet, since real market interactions are also subject to the
27 consideration and judgement of members of the extended family, the clan and the neighbours,
28 it is likely that 'social desirability bias' also plays a role in real life transactions. We therefore
29 expect the norms to be applied in real life.

30 This is hard to prove, though, since we only observe the outcome of decisions. We do not have
31 access to a counterfactual, where no norms or informal insurance would be present, and land
32 transactions might have been different. Yet, the fact that more susceptible plots tend to be
33 acquired at a later age and less frequently harbour the family house, which is most often built on
34 the first plot acquired by the HH, could be in line with our observations (Table 4). Also the
35 observation that highly exposed farmers tend to reduce their exposure, while the opposite is
36 found for farmers with a low exposure (Mertens and Vranken, 2018), could be interpreted as an
37 outcome of the presence of norms that prevent the sale of plots with landslides to farmers that
38 cannot cope with the shock.

1 It should be stressed that the observed norm is not necessarily beneficial for the poorer farmers
2 in the village, since they end up having a more restricted access to land than the rich. The norm
3 aims at avoiding sudden income losses among poor, rather than at limiting poverty or inequality.
4 The long-term consequences are not clear. There is some similarity between the consequences
5 this norm might have at community level and studies that have shown that ex ante risk reduction
6 measures at HH level can contribute to poverty traps (Dercon, 2008, 1998).

7 A DCE TO ELICIT PREFERENCES

8 We investigate the presence of normative behaviour with a methodology, DCE, which was
9 developed from the rational choice theory. We thereby make an implicit assumption of
10 commensurability between the buyer attributes and money. As such, preferences for different
11 attributes receive an (ordinal) ranking in our study (Fourcade, 2016). Since humans often make
12 choices between incommensurable options, our results should not be interpreted ontologically
13 as a sign of commensurability or as a fixed ordering of preferences (Aldred, 2006). While the
14 empirical and theoretical consequences will have to be further investigated, we believe that our
15 method is useful to highlight the importance of choices which are likely driven by (social) norms.
16 This can feed a debate on how Ugandan society wants to structure land markets and tackle
17 disaster risk.

18 Our methodology also suffers from an hypothetical bias and a social desirability bias, but likely
19 not more than other measures such as questions on Likert scales (Hensher, 2010; Norwood and
20 Lusk, 2011). The advantage of a DCE as compared to Likert scale is that the former allows more
21 detailed investigation of complex norms, e.g. norms only holding for poor members of the
22 extended family, without bluntly asking many different and complex questions. A DCE moreover
23 tends to be more interactive and accessible for the respondents than standard Likert-scale
24 questions. Further research on the possible applications of DCE is therefore warranted.

25 EXPLAINING THE OBSERVED

26 This paper empirically measures choices made by respondents in a hypothetical scenario created
27 by the DCE. These choices are subsequently explained by means of a theoretical framework
28 which opposes social norms to the zero contribution hypothesis. Behind this opposition lies the
29 traditional opposition between culture and nature, as well as a whole range of moral and
30 ideological considerations (Callon and Latour, 2011; Latour, 1991). A different approach is
31 possible. Recent trends in social sciences suggest that our empirical observations can be
32 understood as the expression of different “modes of existence”: the choices that were measured
33 by the DCE likely express (1) attachments to land, family, income stability,...; as well as (2) the
34 organization of those communities through a distribution of property rights and responsibilities
35 for care and support; and (3) moral considerations on what is right when choosing between
36 incommensurable elements (Latour, 2013). Such an approach, which is not developed here, could
37 lead to additional insights relevant for policy making on land markets and disaster risk reduction.

38 7. CONCLUSION

We find clear choices in favour of selling plots to poor members of the extended family as long as the plots are not susceptible to landslides. We use a conceptual framework to differentiate our results from what would be expected from an informal insurance perspective within social networks. From this we conclude that norms play an important role in determining choices regarding land sales in our study area.

Our findings illustrate the importance of considering rationales which are different from monetary cost-benefit analyses when investigating the land market dynamics in developing contexts. This potentially has important policy implications. The consideration of alternatives to standard economic theories is necessary to truly understand ongoing dynamics and better predict the evolution and consequences of land transactions. Further development of free markets for agricultural land could go hand in hand with an erosion of locally existing landslide risk reduction measures. It is therefore important to carefully consider these potential adverse consequences when rolling out new policy measures, and eventually supplement such measures with new pathways for disaster risk reduction. Our results also illustrate the benefits, as well as the weaknesses, of discrete choice experiments (DCE) for eliciting preferences that are not easily revealed through market interactions. We believe that this provides interesting avenues for future research.

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APPENDIX A1: ATTRIBUTE NON-ATTENDANCE

An overview of stated attribute non-attendance is given in Table A1. More than a quarter of the respondents says the origin of the buyer was not taken into account, while 17% of the respondents does not seem to care about the wealth of the buyer. When taking attribute non-attendance into account in the estimation of equations 1 and 2, no differences are found (not shown), suggesting that respondents have been stating attribute non-attendance when actually just not finding these attributes sufficiently important. Given that there are only 4 attributes in this DCE it is unlikely that attribute non-attendance played an important role anyhow (Balcombe et al., 2011; Hess and Hensher, 2010).

Table A1. Overview of stated attribute non-attendance at HH level

	Stated attribute non-attendance
Label = relatedness with buyer	0.09 (0.28)
Wealth status buyer	0.17 (0.38)
Origin buyer	0.28 (0.45)
Price	0.06 (0.23)
N	397

1 **APPENDIX A2: FULL TABLES OF MULTINOMIAL MIXED LOGIT REGRESSIONS WITH**
2 **STANDARD DEVIATIONS**

3 The following tables (Table A2 and Table A3) correspond with Tables 5 and 6 in the manuscript. Standard
4 deviations have been included here. The sign and levels of significance of the ASC's do not change when
5 attributes are effects-coded. Also, the results do not change when regressions are ran for mapped plots
6 only.

1 Table A2. Results for multinomial mixed logit regression without (column 1) and with interaction terms (columns 2 and 3). The
2 interaction with “landslide” indicates a dummy for mentioned landslide occurrence in column 2 and a continuous variable for
3 measured landslide susceptibility in column 3. The baseline scenario is a buyer who is not from the extended family or clan, has
4 more than 1 plot, is from the same village and offers a ‘very low price’. Dummy codes are used for the attributes of the DCE.
5 Standard errors are in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

	Column 1: No interaction		Column 2: Interaction Landslide occurrence		Column 3: Interaction Landslide susceptibility	
To Family	Coefficient	St. Dev.	Coefficient	St. Dev.	Coefficient	St. Dev.
ASC_Family	1.30*** (0.27)	1.85*** (0.24)	1.07*** (0.36)	1.83*** (0.24)	1.10*** (0.32)	2.43*** (0.27)
ASC_Family * Landslide			0.51 (0.45)		0.20 (0.28)	
Buyer has 1 other plot	0.58*** (0.19)	0.69 (0.46)	0.97*** (0.26)	0.65 (0.48)	0.40* (0.22)	0.56 (0.49)
Buyer has 1 other plot * Landslide			-0.81** (0.37)		-0.11 (0.22)	
Buyer has no plot	1.19*** (0.21)	1.19** (0.51)	1.64*** (0.28)	1.12** (0.55)	1.06*** (0.24)	0.53 (0.85)
Buyer has no plot * Landslide			-0.88** (0.38)		-0.60** (0.24)	
Buyer is not from this village	-0.54*** (0.16)	1.76*** (0.31)	-0.38* (0.22)	1.78*** (0.32)	-0.52*** (0.19)	1.23*** (0.43)
Buyer not from this village * Landslide			-0.36 (0.31)		-0.59*** (0.20)	
Price offered	0.0219*** (0.002)	0.0170*** (0.0018)	0.0217*** (0.0020)	0.0168*** (0.0018)	0.0250*** (0.0026)	0.0192*** (0.0025)
To clan member (but not family)						
ASC_Clan	-0.20 (0.27)	0.69** (0.30)	0.42 (0.34)	0.74** (0.29)	-0.34 (0.31)	0.68 (0.44)
ASC_Clan * Landslide			-0.88** (0.44)		0.12 (0.19)	
Buyer has 1 other plot	-0.29 (0.21)	1.25*** (0.44)	-0.54* (0.28)	1.24*** (0.43)	-0.03 (0.23)	0.48 (0.74)
Buyer has 1 other plot * Landslide			0.56 (0.37)		0.38* (0.22)	
Buyer has no plot	0.08 (0.20)	1.23*** (0.34)	0.19 (0.27)	1.27*** (0.35)	0.16 (0.25)	1.17* (0.60)
Buyer has no plot * Landslide			-0.21 (0.40)		-0.14 (0.24)	
Buyer is not from this village	0.32* (0.17)	1.59*** (0.33)	0.02 (0.23)	1.56*** (0.34)	0.36* (0.20)	1.46*** (0.41)
Buyer not from this village * Landslide			0.65** (0.31)		-0.20 (0.19)	
Price offered	0.0166*** (0.0020)	0.0120*** (0.0014)	0.0167*** (0.0014)	0.0117*** (0.0013)	0.0182*** (0.0017)	0.0135 (0.0018)
To person who is not family nor clan [baseline]						
Buyer has 1 other plot	0.16 (0.23)	0.99* (0.51)	0.02 (0.31)	1.04* (0.55)	0.26 (0.23)	2.96*** (0.60)
Buyer has 1 other plot * Landslide			0.28 (0.41)		0.03 (0.24)	
Buyer has no plot	-0.05 (0.25)	0.82 (0.54)	0.15 (0.33)	0.73 (0.60)	0.07 (0.24)	0.05 (0.93)
Buyer has no plot * Landslide			-0.36 (0.41)		-0.12 (0.25)	
Buyer is not from this village	-0.30 (0.22)	1.57*** (0.42)	-0.40 (0.30)	1.62*** (0.40)	-0.42* (0.24)	0.36 (0.68)
Buyer not from this village * Landslide			0.13 (0.35)		-0.26 (0.21)	
Price offered	0.0126*** (0.0014)	0.0159*** (0.0017)	0.0127*** (0.0015)	0.0160*** (0.0017)	0.0140*** (0.0016)	0.0141*** (0.0019)
Opt Out						
ASC_O	-2.37*** (0.52)	2.89*** (0.39)	-2.04*** (0.56)	2.83*** (0.38)	-2.93*** (0.78)	2.96*** (0.60)
ASC_O * Landslide			-0.50 (0.52)		-0.01 (0.34)	
Log likelihood	-3419		-3407		-2435	
Chi sq.	4706***		4730***		3768***	
McFadden Pseudo Rsq	0.41		0.41		0.44	
# observations	4164 (1041 groups)		4164 (1041 groups)		3116 (779 groups)	

1 Table A3. Results for multinomial mixed logit regression with an interaction between a buyer characteristic and specific plot
2 features. Standard errors are in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

	Column 1: plot feature = dummy for the permission to sell without agreement from clan (1 if yes)		Column 2: plot feature = walking distance from the house (minutes)	
To Family	Coefficient	St. Dev.	Coefficient	St. Dev.
ASC_F	1.68*** (0.38)	1.97*** (0.24)	1.42*** (0.31)	1.83*** (0.24)
ASC * Plot feature	-0.68 (0.45)		-0.002* (0.003)	
Buyer has 1 other plot	0.49* (0.28)	0.63 (0.42)	0.71*** (0.22)	0.74* (0.43)
Buyer has 1 other plot * Plot feature	0.11 (0.37)		-0.003 (0.003)	
Buyer has no plot	1.20*** (0.29)	0.79* (0.45)	1.16*** (0.24)	1.17** (0.49)
Buyer has no plot * Plot feature	-0.04 (0.36)		0.000 (0.003)	
Buyer not from this village	-0.38 (0.23)	1.67*** (0.34)	-0.68*** (0.19)	1.76*** (0.31)
Buyer not from this village * Plot feature	-0.15 (0.30)		0.003 (0.002)	
Price offered	0.0211*** (0.0018)	0.0161*** (0.0016)	0.0216*** (0.0020)	0.0166*** (0.0018)
To clan member (but not family)				
ASC_C	0.54 (0.36)	0.72*** (0.25)	0.02 (0.30)	0.66** (0.30)
ASC * Plot feature	-0.91** (0.43)		-0.000 (0.003)	
Buyer has 1 other plot	-0.62** (0.31)	1.08* (0.56)	-0.25 (0.25)	1.24*** (0.44)
Buyer has 1 other plot * Plot feature	0.71* (0.37)		-0.001 (0.003)	
Buyer has no plot	-0.08 (0.29)	1.13** (0.52)	0.05 (0.24)	1.20*** (0.37)
Buyer has no plot * Plot feature	0.22 (0.38)		0.001 (0.003)	
Buyer not from this village	0.26 (0.25)	1.65*** (0.32)	0.24 (0.20)	1.56*** (0.33)
Buyer not from this village * Plot feature	0.09 (0.31)		0.002 (0.002)	
Price offered	0.0162*** (0.0014)	0.0116*** (0.0015)	0.0165*** (0.0014)	0.0120*** (0.0014)
To person who is not family nor clan [baseline]				
Buyer has 1 other plot	-0.07 (0.35)	0.63*** (0.24)	0.20 (0.27)	1.02** (0.49)
Buyer has 1 other plot * Plot feature	0.23 (0.41)		-0.001 (0.003)	
Buyer has no plot	0.12 (0.35)	0.53* (0.27)	-0.011 (0.27)	0.84* (0.51)
Buyer has no plot * Plot feature	-0.28 (0.40)		-0.001 (0.003)	
Buyer not from this village	-0.27 (0.29)	0.66*** (0.16)	-0.19 (0.24)	1.56*** (0.42)
Buyer not from this village * Plot feature	0.06 (0.34)		-0.003 (0.003)	
Price offered	0.0130*** (0.0014)	0.0070*** (0.0010)	0.0126*** (0.0014)	0.0159*** (0.0017)
Opt Out				
ASC	-2.51*** (0.62)	1.62*** (0.31)	-2.43*** (0.57)	2.91*** (0.41)
ASC * Landslide	0.91* (0.53)		0.001 (0.003)	
Log likelihood	-3408		-3411	
Chi sq.	4718		4711	
McFadden Pseudo Rsq	0.41		0.41	
# observations	4164		4164	
	(1041 groups)		(1041 groups)	