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Investing in land to change your risk exposure? Land transactions and inequality in a landslide prone region

Kewan Mertens *, Liesbet Vranken

Department of Earth and Environmental Sciences, KU Leuven, Celestijnenlaan 200E, 3001 Heverlee, Belgium

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ABSTRACT

The poor and vulnerable tend to be increasingly exposed to natural hazards such as landslides. Land markets are one of the channels through which farmers get exposed to such hazards. This paper investigates the consequences of land transactions for the (un)equal distribution of exposure to landslide risk and of total land holdings in a rural area in Western Uganda. We propose and empirically test a mechanism through which land holdings and exposure to landslide risk evolve over a farmer's lifetime. A structured household survey and detailed information on land transaction as well as georeferenced information on plots was used to construct a panel dataset of land transactions. Regressions with household fixed effects were run to identify how landholdings and exposure to landslide susceptibility evolves over a farmer's lifetime. We find that farmers that are initially more exposed to landslides manage to reduce their average exposure to some extent by acquiring plots outside landslide prone areas. This goes at a cost, as farmers that are initially highly exposed acquire land more slowly than farmers that have a lower exposure on their first plot. Over a lifetime, in our case study, land transactions therefore have a somewhat levelling effect on inequality in exposure to landslides, but increase the inequality in land ownership. As such, one of the ways through which unequal risk exposure contributes to propagating inequality in total land ownings is theoretical and empirically identified.

1. Introduction

Worldwide, the poor and powerless are disproportionally exposed to natural hazards (Kim, 2012; Wisner et al., 2003). While in some cases this is due to poor people being pushed into hazardous environments (Collins, 2009; Wisner et al., 2003), our study investigates another mechanism whereby initially exposed households end up being poorer because of their disaster avoidance behaviour.

In the presence of close-to-subsistence livelihoods and in the absence of insurance and well-functioning credit markets it is well-known that poor households tend to prefer low risk investments (Dercon, 2006; Rosenzweig and Binswanger, 1993). This is due to the actual, post-smoothing consumption risk being greater among poor households than among richer ones (Morduch, 1995; Zimmerman and Carter, 2003). Using wealth as a proxy for the risk of falling below a level of minimum consumption, these studies have shown that the rational decisions to minimize risk among poor households can be perpetuating inequality in asset holdings (Zimmerman and Carter, 2003). Instead of using wealth, our study exploits differences in exposure to a natural hazard in order to directly measure the susceptibility of facing a serious income shock and the consequences for asset accumulation. Purchases of land, the single most important productive asset of crop farmers, are used to evaluate the evolution in quality and quantity of asset holdings over a lifetime.

An adequate investigation of the role of land transactions is missing in the literature on natural hazards and disasters as well as in the literature on investments in the presence of risks in agriculture. Many studies on the impact of natural hazards and risk tend to treat exposure as given to the households and therefore fail to acknowledge the strong, endogenous process of self-selection on the land market (Olbrich, Quaas, Haensler, & Baumgärtner, 2012). Meanwhile, to our knowledge, only one study on investment strategies among poor farmers included investments in land, and it thereby did not take into account the particularities of land as an asset (Dercon, 1998). This is deplorable, as land is far from homogenous and as heterogeneity in plot characteristics is frequently exploited by farmers to reduce risk (plot fragmentation is one, widely studied, example (Blarel, Hazell, Place, & Quiggin, 1995; Rao, 2014)). Geo-recorded data now make it possible to

* Corresponding author.
E-mail addresses: Kewan.mertens@kuleuven.be (K. Mertens), liesbet.vranken@kuleuven.be (L. Vranken).

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include spatial differences in land quality when analysing land investment decisions.

The current study on land transactions in Uganda exploits detailed information on past land transactions as well as geographical information on the size and location of plots to propose and test for one of the mechanisms, i.e. exposure to natural hazards, that could be keeping farmers land poor, and hence also income poor. We find that farmers manage to somewhat reduce initial inequalities in exposure to landslide susceptibility over time, but at the cost of an increased inequality in land holdings.

Landslides can cause serious idiosyncratic income shocks to farmers, by destroying crops and soil fertility, and therefore stand as a typical example of nature induced risks which are likely to increase in frequency due to climate change (Petley, 2012). Western Uganda is particularly interesting as a case study on landslides and land transactions because landslides are known to cause serious hardship in the country, while land markets are typically very active in the region (Deininger, Ali, & Yamano, 2008; Mertens et al., 2016).

Contributing to the case for social justice and to the fight against poverty, this paper illustrates how inequalities can evolve in a risky environment. Our research draws on and adds to the literature on land markets, risks and inequality, and our findings are relevant for studies that investigate ways to reduce inequalities and exposure to natural hazards. This is particularly relevant because climate change is likely increasing the frequency of natural hazards (UNISDR, 2015).

2. Study area

We conducted our research in the Rwenzori region, in Western Uganda. This region covers an area of approximately 3000 km^2 spread over 31 sub-counties in four districts: Bundibugyo, Kasese, Kabarole and Ntoroko (Fig. 1). This study area is particularly relevant for our research because of frequent land transactions and the presence of a high landslide risk.

2.1. Land markets in the Rwenzori region

Land sales markets in Western Uganda are very active (Deininger and Ali, 2008; Deininger and Castagnini, 2006; van Leeuwen, 2014). Farmers frequently buy and sell land, while also *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 titling. Despite attempts to introduce a national titling scheme, only 7% of the plots in our sample have an official land title.

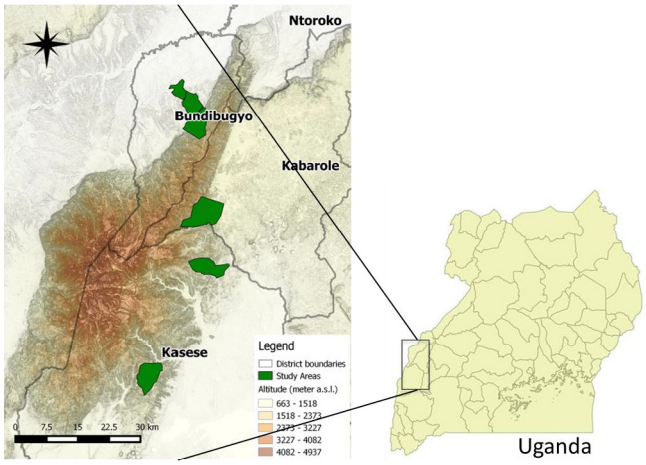

Fig. 1. Overview of the study area. Darker areas have a steeper slope (adapted from Mertens et al. (2016)).

The official titles that are most frequently found in Western Uganda are freehold titles, which grant full private property, including the right to sell or rent the land, and customary titles, which allow land to be owned by a group of people rather than single individuals (Deininger and Ali, 2008; van Leeuwen, 2014). Two other official titling schemes exist in Uganda, but are absent in Western Uganda. While official titles are virtually absent in our sample, it is widely accepted that local tenure systems, without formal titling and *de jure* enforcement, can provide sufficient tenure security for land investments (Baland et al., 1999; Katz et al., 2000; Omura, 2008).

Land sales markets in Western Uganda are active, but they are not fully 'free'. Contrary to official regulation at national level, land in our study region is mostly owned, inherited and transacted by males only. Moreover, we noticed that there is a strong preference to keep land within ownership of members of the same ethnicity and community. Additionally, when mapping the plots owned by the households in our sample, we noted that several farmers felt tenure insecure and feared land grabbing. This is probably caused by the lack of titles and the consequential institutional multiplicity in the region (Deininger and Ali, 2008; van Leeuwen, 2014).

2.2. Landslides in the Rwenzori region

Every year, during the rainy seasons or following seismic activity landslides occur at different locations and elevations in this region (Jacobs et al., 2017). The location of these landslides is determined by the type of the soil, slope length and steepness, vegetation cover and local variations in topography (e.g. whether in a concavity or a convexity). Landslide susceptibility therefore shows a strong spatial auto-correlation (see further).

During prolonged rainfall, or during an earthquake, it frequently happens that several landslides are observed in the same village, thereby affecting multiple plots at the same time. These landslides destroy crops and productive assets such as soil fertility and therefore have a significant impact on the income of farmers in the region (Mertens et al., 2016). Reports suggest that landslides have rendered over 14,000 people homeless over the last 50 years (Jacobs et al., 2016). Landslide density in a recent field investigation has been shown to vary between 3 and 4.9 slides/ km^2 (Jacobs et al., 2017).

Previous studies in the region suggest that farmers are very aware of the threat caused by landslides, but that they have limited options to reduce landslide susceptibility (Mertens et al., 2018). The lack of formal insurance mechanisms compels farmers to rely on emergency measures and social networks to cope with the idiosyncratic[1] income shock caused by landslides (Mertens et al., 2016).

3. Land transactions and risk exposure: a conceptual framework

For our conceptual framework we assume a context of close-to-subsistence agriculture in a region with a heterogeneous landslide susceptibility and in the absence of formal insurance markets. This assumption corresponds with the circumstances that are observed in the field (Jacobs et al., 2017; Mertens et al., 2016). Landslides constitute an important threat for household income. Reciprocity

[1] Contrary to covariate shocks (e.g. droughts), which affect many people at the same time and can therefore have consequences for market equilibria, idiosyncratic shocks only affect one or a few households at a time.