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Sabine Liebenehm "New Insights from Behavioral Economics in Developing Countries", Leibniz University Hanover, 2015

Summary

The literature suggests that households, who are constrained in income and assets, and hence in their ability to cope with adverse shocks, are more likely to invest in low-risk and shortsighted options with low returns, thereby failing to escape from food insecurity and poverty. For example a poor and food-insecure farm household in sub-Saharan Africa, hit by a drought, is less likely to change from traditional farming to modem technologies such as drought-tolerant varieties, because of high levels of risk aversion. The same household would also be less likely to forego part of its current consumption to invest in longer-term investments such as smart water management systems that could stabilize yields under variable rainfall and produce sustainable returns in the future, because of high discount rate. Risk and time preferences, therefore, seem to be two important behavioral attitudes that affect agricultural management decisions under risk.

In my thesis, individual preferences, in particular risk and time preferences, and individual risk management take center stage. The overall objective of my thesis is to derive insights on the interrelation between risk and time preferences and agricultural risk management using data from economic field experiments and comprehensive household surveys conducted in West Africa and Southeast Asia. My thesis consists of three essays, each addressing one specific research question:

(1) How risk-averse and impatient are cattle-dependent farmers from West Africa and how much do their preferences differ from Asian farmers?

(2) Do risk and time preferences affect the efficiency of a West African farmer's risk management and if yes, to what extent?

(3) Are risk attitudes variable over time and if yes, to what extent are they affected by adverse shocks?

I investigate the first two research questions using data from 211 cattle-dependent farmers living in remote areas of Mali and Burkina Faso. Small cattle herds are farmers' major asset, however at risk of African animal trypanosomosis (AAT) -a vector-borne livestock disease transmitted by the tsetse fly. AAT decimates domestic cattle populations, decreases milk and meat offtake and cultivated land through the reduction in traction capacity, manure output for soil fertility and nutrition recycling. Furthermore, because of reductions in milk and meat as well as in crop production, AAT leads to malnutrition and food insecurity. The data set consists of socio-economic information on farmers' cattle herd production and AAT

management that I collected during two waves in 2007 and 2011. In addition to the second survey wave, I conducted economic field experiments with the household head in order to elicit his risk and time preferences. I took utmost care to facilitate respondents' comprehension and understanding of experiments for example by visualizing experimental choices on single picture cards. The third research question was addressed using a comprehensive panel data set containing demographic and socio-economic information of 2812 household heads from rural areas in Thailand and Vietnam collected in 2008 and 2010. In order to elicit individual risk attitudes, no experimental data was available, but a survey based measure, where respondents were asked to classify themselves on an eleven-point Likert scale. Although the survey-based measure is not sufficient to reflect the shape of the utility function, several studies have shown that it can predict the outcome of an experimental measure.

Methodologically, my thesis contributes to current research of behavioral economics in developing countries in several ways. First, I applied a discounted utility model, where the measurement of the risk and time preferences of West African cattle farmers was expanded beyond standard economic theory. In particular, I specified the utility function in accordance to prospect theory and the discounting function in accordance to quasi-hyperbolic discounting. This model allows explaining farmers' dynamic decision making behavior in cattle herd production under risk, i.e. predominantly the risk of AAT infection, taking into account additional behavioral information such as non-linear probability weighting, loss aversion or inconsistent discount rates. The maximum likelihood estimation of the discounted utility model provides empirical evidence on the relation between individual risk aversion, impatience and farm production characteristics for cattle farmers that live in risky environments in West Africa -a region that has long been unrecognized in behavioral economic studies. Second, together with epidemiologists from the International Livestock Research Institute (ILRI), I developed a bio-economic model that portrays farmers' cattle herd management under the risk of AAT infection in cattle. The bio-economic model simulates the economic consequences, i.e. production losses in terms of meat and milk production, of alternative AAT management strategies in a dynamic optimization framework that takes into account the interactions among the vector, host and livestock farmers. The model extends the economic literature on infectious diseases by allowing for the evolution of drug resistance caused by farmers' mismanagement and by simulating the observed behaviors of cattle farmers based on their individual risk and time preferences elicited earlier. The third novel methodological aspect in my thesis is that temporal variation in risk attitudes is explained by an exogenous measure of shocks instead of self-reported shocks that are likely to be biased by individual risk attitudes. Assuming that the impact of a shock is reflected in the variation in consumption, estimated variation in consumption serves as the exogenous shock measure. Hereby, multilevel modeling allows taking into account the different impact levels of shocks: idiosyncratic shocks at the individual level and covariate shocks that are correlated across individuals at the aggregate level.

The results obtained in my thesis provide insights into the interrelation between individual risk and time preferences and agricultural management decisions under risk. For example, one would expect that the small-scale cattle farmers from West Africa are risk-averse and have high discount rates, because of their vulnerability to multiple risks and immediate survival needs. However, the simultaneous estimation of farmers' risk and time preferences shows only partly the expected results, i.e. they are on average risk-averse as expected, but in contrast to expectations, they show relatively low discount rates. In comparison to similarly situated farmers from Asia, the average West African farmer appears more risk-averse and shows longer time horizons. Possibly, this result is connected to the nature of traditional cattle

farming in West Africa that involves long-term investments with relatively certain but lower returns at longer pay-off periods. In contrast, intensified rice production in Asia for example, operates with potentially risky but higher returns and a much shorter payback period. Allowing for individual heterogeneity and analyzing the correlation between cattle herd management and preferences, shows for example a positive correlation between herd size and loss aversion. This result suggests that farmers, who are in a loss situation such as in the advent of AAT infection in cattle, are more likely to smooth their assets, which may further impair farmers' future food security. The findings, however, highlight the importance of behavioral attitudes in the explanation of agricultural management decisions and suggest their consideration into the design of development interventions. Development strategies that were proven to be successful in Asia may not be easily transferred to Africa. Instead, pursuing indigenous development paths and considering cultural and socio-economic characteristics is recommended.

Having obtained cattle farmers' risk and time preferences, they are integrated into the bio-economic model of AAT management in order to portray farmers' disease management process. Simulation results show that the disease management of an average West African cattle farmer, who is risk-averse and patient, is not efficient. The adoption of the optimal AAT management strategy would save losses in terms of meat and milk production that corresponds to approximately 5% of a cattle farmer' s annual income. In addition, demonstrate that a reduction in a farmer's risk aversion is associated with the avoidance of additional losses. By contrast, an increase in a farmer' s discount rate is related with additional costs. My results suggest that individual risk and time preferences need to be considered in the development process of disease control interventions that can in turn improve the food security of livestock dependent households.

Having identified impacts of changes in individual risk and time preferences on agricultural management in hypothetical scenarios, I am finally testing the temporal stability of risk attitudes and their causes using a representative panel data set from rural Thailand and Vietnam. Results show significant changes in risk attitudes over time, which are caused by different kinds of shocks. Idiosyncratic shocks alter risk attitudes in Thailand, whereas covariate shocks affect risk attitudes in Vietnam. A possible explanation is the difference in political systems and consequently the focus of socio-political measures. The results suggest that Vietnamese respondents may be better in insuring idiosyncratic risks for example through safety nets. However this mechanism is less effective to cope with correlated risks. In Thailand, mutual insurance across individuals does not seem to work well and may point to a problem of social cohesion.

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