Explaining Ambiguity Aversion in Three African Countries: Results from Behavioral Experiments

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Introduction

Numerous studies predict that climate change will impact agricultural productivity in Africa owing to higher temperatures and changes in rainfall regimes(Lobell et al. 2008). The degree of impact is variable and dependent upon crops, location, agricultural systems and the ability of famers to adapt to climatic stress through land use change (Schlenker, Lobell 2010, Mendelsohn, Dinar 2009, Seo et al. 2009). Surveys of African farmers indicate perception of numerous changes to their growing environments including not only temperature and rainfall disruption, but others including shifting dates of rainfall onset, duration, intensity, and a perception that the bimodal distribution of rainy seasons are merging into a single one in East Africa.

As climate evolves, patterns of adaptation can take many courses. Some adaptations will be autonomous, that is without conscious awareness of the stimulus or response, while others will be made as a response to climate change (Reilly, J. and Schimmelpfennig, D., 2000).

As the frequency, timing and periodicity of agroclimatic indicators change, so do the signals and information provided to farmers. These signals are often used to delineate the start of the agricultural season and provide key indicators on which crops to farm, when to prepare land for crop cultivation, plant and whether to replant in the case of a failure. These indicators are changing and affecting the information sets used by farmers to form and update subjective probability distributions on the expected quality of the climatic conditions for agricultural production. As argued by Quiggin and Horowitz (2003):

> "Another way of looking at this is that the information held by economic actors about the climate becomes more diffuse, and hence less valuable in the presence of a new source of uncertainty. Thus climate change may be regarded as destroying information. This information may in some cases be represented by formal probability distributions over temperature and rainfall derived from historical records. More frequently, it is the informal knowledge of particular local climates that is acquired by attentive individuals over a long period."

Objective and Approach

This paper will examine the impact of information loss on farmer decision making in three African nations. We estimate the impact of changes in climatic signals from the perspective of farmer decision making under risk. In particular, we are interested in determining whether or

not the loss of information due to climate change affects behavior by diluting key signals used to make management decisions. To do so, we estimate the cost of ambiguity aversion in a similar way that others have estimated coefficients of partial risk aversion(Tanaka, Camerer & Nguyen 2010). We develop an experimental method to elicit ambiguity aversion in order to segment the premium associated with it apart from risk and loss aversion by adapting laboratory experiments to farm-level conditions in three African countries (Baillon, Cabantous 2009, Cabantous, Hilton 2006, Abdellaoui et al. 2010, Baillon, L'Haridon & Placido 2010). We sample small holder farmers in Kenya, Tanzania and South Africa and conduct framed field experiments with each.

We design the experiment to estimate participants' certainty equivalents (CEs) for two kinds of binary prospects: risky prospects (gains-only, and gains-and-loss games), and ambiguous (interval) prospects. The first six prospects are risky prospects of the form p:x;y. The next four prospects are also risky prospects of the form p:x;y but they involve actual loses in case of a bad outcome. The last five prospects are imprecise ambiguous prospects with probability intervals. They give x with probability which can be either (p-r) or (p+r) and y (with x<y) otherwise. In the context of agricultural adaptation, we can think of P as incidence of drought and chances of complete crop failure in a given season. The experiments are combined and premia are derived for each.

Findings

Ambiguity aversion is found among all three samples and the premium associated with it can be differentiated from the premium associated with risk aversion under certain conditions. Under conditions of a low probability of a positive payoff, ambiguity does affect decisionmaking but the results are inconsistent across nations. Under conditions of a high probability of a positive payoff to a gamble, ambiguity aversion does impact decisionmaking and it magnifies the deviation from the optimal decision under expected utility. The implication of this finding is that ambiguity aversion can create sub-optimal allocation of inputs and outputs and create welfare losses when weather information and signals are vague and unclear. This opportunity cost is only present when conditions for the gamble are favorable for a gain. Ambiguity aversion may provide an alternative explanation for limited uptake of new technology similar to the time-honored explanation of risk (and more recently loss) aversion.

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