Selected Presentation at the 2020 Agricultural & Applied Economics Association Annual Meeting, Kansas City, Missouri, July 26-28

Copyright 2020 by authors. All rights reserved.
Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Salient Risks and Contract Quality: Estimating Demand for Index Insurance in Mozambique and Tanzania

Jonathan G. Malacarne (University of Maine) Laura Paul (University of Delaware) Jon Einar Flatnes (Ohio State University)
Steve Boucher (UC Davis) Michael Carter (UC Davis)

Abstract

As index insurance products become more prevalent, attention is quickly turning to the quality of the protection that they offer. Farmers, insurance providers, and researchers alike are aware that low quality insurance products are not insurance products at all. Rather, they transfer income from bad periods to good periods (Clarke, 2016). Even when insurance payments correlate highly with losses, perceptions of quality can vary significantly across farmers. The risks most salient to a farmer, her understanding of the insurance process, and the stochastic learning opportunities afforded to her by nature can all influence her perceptions of insurance quality (Carter et al., 2017).

High quality index insurance products must reliably track farmer experiences, cover appropriate risks, and deliver real value in a timely fashion (Carter & Chiu, 2018). Even when objective quality measures are satisfied, substantial demand is unlikely unless farmers perceive and value these characteristics. We address all of these issues by matching weather and yield data to survey measures of farmer perceptions and individual demand for index insurance in a sample of 3,133 farmers in Tanzania and Mozambique.

We use data from a randomized controlled trial promoting drought-tolerant maize seed (DTM) with and without a complementary index-based drought insurance (Boucher et al, 2020). The insurance was designed to replace a farmer's investment in DTM seed in the case of a severe drought. Substantial demand for DTM and index insurance was observed in both countries. In this paper, we dig deeper into both self-reported and revealed willingness to pay for DTM and Index Insurance, with particular attention to a farmer's recent drought experience and her perceptions of contract quality.

Salient Risks

Offering an insurance contract that is perceived as valuable by decision-makers starts with targeting risks they view as salient to their well-being. Farmers in this sample had many concerns. In pairwise comparisons, drought and pests emerged as two of the most salient.

Figure 1: Which of the following is of greater concern? Pairwise comparison of risk factors.

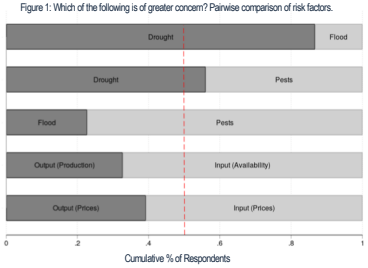
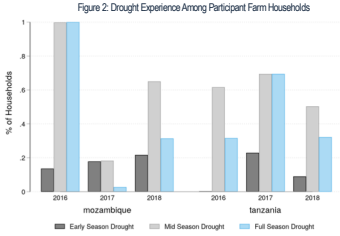


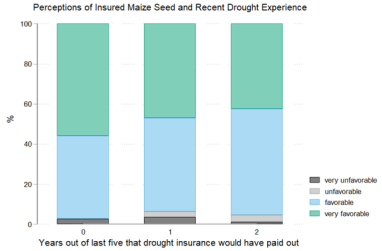
Figure 2: Drought Experience Among Participant Farm Households



The index insurance product offered by local maize seed and insurance companies targeted drought risk. The contract was designed to complement the drought protection inherent to the drought-tolerant maize seed it accompanied. As Figure 1 shows, drought is among the risks most on the mind of farmers in the sample. Figure 2 shows why: over the period of the study (2016-18) nearly all households experienced some form of drought event.

Perceptions of Quality and Recent Weather Experience

Figure 3:
Perceptions of Insured Maize Seed and Recent Drought Experience



In our paper, we undertake a systematic analysis of contract quality both from the view of farmers and through the lens of Minimum Quality Standards laid out in Carter & Chiu (2018). Here, we focus on a simple subjective perception of quality question to describe whether the insured maize seed being promoted was viewed favorably. In the full sample, the insured drought-tolerant maize seed was viewed favorably by most respondents.

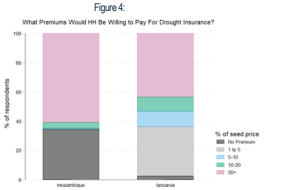
One might expect the value placed on both drought-tolerant maize seed and index insurance to depend on recent exposure to drought. Using matched weather data, we can determine the number of years (out of the last five) in which the index insurance contract would have paid out. Note that the actual contract was only offered in two years. Expanding the time period we consider allows for a fuller picture of drought risk. Focusing on drought risk, rather than just direct experience, also allows us to consider areas in which insured maize seed were not available for sale during the study period.

Simple stated perceptions of quality are not strongly associated with recent drought experience.

Stated Willingness-to-Pay For Index Insurance

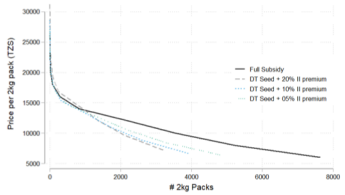
In both countries, maize farmers in areas where insured seed was available at market prices demonstrated a willingness to purchase the product. Thirty-eight percent of farmers in these areas purchased insured drought-tolerant maize seed, which carried a premium of 20% over the cost of DTM (Boucher et al, 2020). To build on this revealed demand, stated willingness-to-pay modules were conducted to gauge demand at various premiums among the full sample of farm households.

Figure 4:



In Tanzania, an iterative stated willingness-to-pay module was conducted that allows for the construction of implied demand curves at various subsidy levels. While demand falls as farmers face higher premiums, substantial demand can be achieved even when farmers bear the cost of the insurance.

Figure 5:
Stated Demand For Insured Maize Seed in a Sample of Tanzanian Farmers (n=1086)



Does Recent Experience Affect Stated WTP?

Figure 6:
What Premiums Would HH Be Willing to Pay For Drought Insurance?

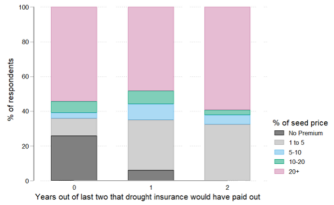


Figure 6 shows that recent experience largely affects whether households are willing to pay for insurance at all, rather than how much they are willing to pay, conditional on the acceptable premium not being zero.

Estimating Demand For Insurance With Random Price Variation in Mozambique

Working in coordination with maize seed and insurance providers in Mozambique, a series of experiments were carried out in which farmers were offered randomly chosen discounts on the price of DTM and Insured DTM.

Experimental variation in the price of maize seed allows demand to be estimated via Equation 1. This equation is then inverted and plotted in Figure 6. In both 2016 and 2017, farmers appear to value the protection offered by the insurance.

Figure 7:
(Inverse) Demand for OPV DTM Seed with and without Drought Insurance in Mozambique

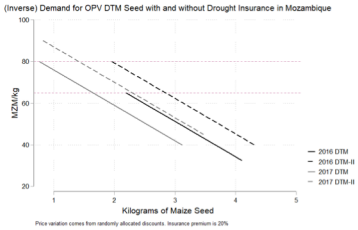


Table 1: Demand for Insured and Uninsured DTM

	Price (β_1)	Insured (β_2)	Year (β_3)
Coef.	-0.059***	0.65*	-0.55
SE	0.0160	0.3662	0.3358

*** $p < 0.01$, ** $p < 0.05$, *$p < 0.10$

$$q_i = \alpha + \beta_1 p_i + \beta_2 I_i + \beta_3 year + \epsilon_i \quad (1)$$

While this is good news for proponents of index insurance, it comes with a word of caution. As Table 2 demonstrates, demand for DTM with and without insurance is price sensitive. We estimate elasticities for both products near negative one.

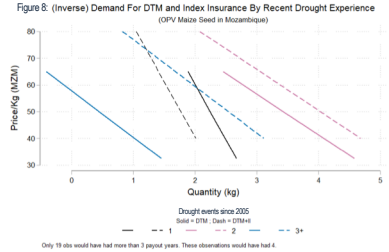
Table 2: Elasticities for insured and Uninsured

	DTM	DTM+II
Price Elasticity (β_1) (SE)	-0.9956***	-1.0158***
	(0.1315)	(0.1345)

$$\ln q_i = \alpha + \beta_1 \ln p_i + \epsilon_i \quad (2)$$

Does Recent Experience Affect Estimated WTP?

Figure 8: (Inverse) Demand For DTM and Index Insurance By Recent Drought Experience (OPV Maize Seed in Mozambique)



As with stated willingness-to-pay, we can estimate demand for DTM and Index Insurance conditional on recent drought experience. Those farmers who have experienced more than one drought event in are estimated to assign sufficient value to insurance to compensate for the higher price.

References

Boucher, S., Carter, M., Lybbert, T., Flatnes, J.E., Malacarne, J., Marenya, P., and Paul, L. (2020) "Can complementary risk management technologies crowd in investment? Experimental evidence on the impact of Drought Tolerant maize and index insurance on small-holder maize farmers in Mozambique and Tanzania". Working Paper.

Carter, M., de Janvry, A., Sadoulet, E., & Sarris, A. (2017). Index Insurance for Developing Country Agriculture: A Reassessment. Annual Review of Resource Economics, 9(1), 421–438.

Carter, MR, & Chiu, T. (2018). A Minimum Quality Standard (MQS) to Ensure Index Insurance Contracts Do No Harm. *AIMA Innovation Lab Policy Brief, 4.*

Clarke, D. J. (2016). A theory of rational demand for index insurance. *American Economic Journal: Microeconomics, 8*(1), 283–306.