WHAT IS THE RELATIONSHIP OF LIVELIHOOD STRATEGIES TO FARMERS' CLIMATE RISK PERCEPTIONS IN BOLIVIA?

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Introduction

This study expands the boundaries of existing risk perception literature by examining; climate hazards distinct from health and safety, and Latin American instead of the United States or Europe. Research on risk perceptions and communication has concentrated on the individual's cognitive mechanisms for processing risk, and has ignored the social system that communicates risk to a person. In this paper, indicators common to the development literature, gender, capital and diversification, combined with Paul Slovic's (1987) model on risk, provides insight to the development and risk perception literature.

People assess risks using a rules and association based experiential systems (Slovic and Weber, 2002).This means, that in the case of rural farmers in Bolivia, if the results of traditional (association) and expert forecasts (rules) conflict, they will use the traditional model (Slovic et al, 2002).

The Bolivians from the Andean Highland region mostly sustain themselves through production agriculture, the returns are greatly effected by variable climate events and how the perceptions of climate uncertainty effect rational economic decision-making. The purpose of this study is to examine the dominant factors in decision rules, to inform strategies that incorporate information on forecasts that lead to adaptation strategies, linking both of the rules and of association systems on risk.

Objectives

Understand how livelihood strategies are developed in response to farmer perceptions of the relative risks of these changes; and how these perceptions are linked to their assets (livelihoods)

Specific Objectives-
Bolivian Farmers' perceptions

1. Measure climate risk perceptions
2. Identify how capitals and gender are related to farmers' climate risk perceptions

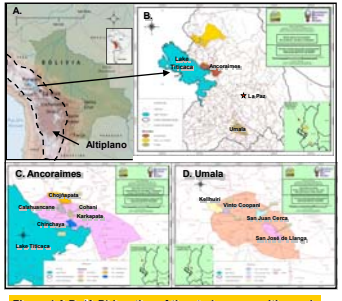

Figure 1 A-D. (A-D) location of the study communities and villages in the Altiplano of Bolivia.

Figure 2 . Female focus group on climate risks held in Umala (July 2007).

Conceptual Framework

This study incorporates sustainable livelihood strategies in addition to Slovic's model factors of unknown and dread. When combining the theories from livelihood strategies and risk perceptions, it leads to the following hypotheses-

Hypothesis 1: Individuals with fewer assets will have higher perceptions.
Hypothesis 2: Individuals with less diversification in their portfolio will have higher risk perceptions.
Hypothesis 3: Individuals who face more shocks will have higher dread perceptions, resulting in higher risk perceptions.

Methods and Procedures

Analysis

Ordinal logistic regression-
The survey data is analyzed by using ordinal logistic models. The model is used as a mechanism to study the relationship between climate risk perceptions and diversification, assets and shocks.

This model includes the explanatory variables of gender, other income, credit access, shocks, livestock diversification with dread, network proxy (being able to speak Spanish), crop farm size and location as controls, while the dependent variable is climate risk perceptions.

The explanatory variable of dread and shock would be thought to be correlated to some degree according to theory. However, the review of the correlation matrix for all explanatory variables showed that no two variables were even correlated enough to cause estimation problems. Each factor variable will have one level that will not be calculated in an effort to avoid multicollinearity. For example, Cohani was left out of the estimation for this reason.

The dependent variable was created by summing each individual's climate risk perception to five climate hazards. Each individual climate risk was measured on a likert scale from one to five. The transformed variable ended up having twelve levels represented between the range of 12-24, with 13 not being represented.

The odds ratios are calculate by taking the exponential of the coefficients (betas). The odds ratio for a dichotomous factor variable, as access to credit, the odds for access to credit of being at or above j category level (dependent variable) are about .552 times the odds for no access to credit. This indicates that a farmer having access to credit has odds that would make him less likely to have high risk perceptions. However, the interpretation would be the opposite if the odd ratio was above 1. For a multi-level scale variable, the odds ratio is interpreted by just associated that single level to being at or above j category level (dependent variable).

Data Collection
Survey- SANREM investigators conducted a survey in the Altiplano region of Bolivia.

Table 1. Logistic Ordinal Regression Output (N=229)

Dependent Variable	Low Climate Risk Perception- 1					
	Risk-2					
	Risk-3					
	Risk-4					
	Risk-5					
	Risk-6					
	Risk-7					
	Risk-8					
	Risk-9					
	Risk-10					
	Risk-11					
	High Climate Risk Perception- 12					
		B	Odds Ratio	S.E.	Sig	
Parameter Estimates						
	Farm Size	0.185	1.204	0.071	0.009	a
	Other Income	-0.004	0.996	0.001	0.000	a
	Access to Credit	-0.594	0.552	0.297	0.045	b
	No access	0.000	1.000	.	.	
	Able to Network Proxy	-0.133	0.876	0.384	0.729	
	Not able to Network	0.000	1.000	.	.	
	Male	0.131	1.140	0.494	0.790	
	Female	0.000	1.000	.	.	
	Chinchaya	-0.971	0.379	0.605	0.109	
	Karcapata	-0.231	0.794	0.822	0.779	
	Chojnapata	-0.628	0.437	0.704	0.239	
	San Jose Llanga	1.344	3.836	0.705	0.057	
	San Juan Circa	1.014	2.757	0.908	0.264	
	Vinto Coopani	1.814	6.022	0.724	0.026	b
	Kellhuiri	2.667	14.394	0.773	0.001	a
	Calahuancani	1.129	3.091	0.713	0.113	
	Cohani	0.000	1.000	.	.	
	Low Dread- 1	0.017	1.017	1.073	0.993	
	Dread-2	-1.627	0.196	1.311	0.215	
	Dread- 3	-2.376	0.093	1.096	0.030	b
	Dread- 4	0.691	1.995	0.550	0.209	
	Dread-5	-2.217	0.109	0.472	0.000	a
	Dread-6	0.116	1.123	0.504	0.818	
	Dread-7	-0.445	0.641	0.348	0.200	
	Dread-8	-0.382	0.683	0.354	0.281	
	High Dread- 9	0.000	1.000	.	.	
	Experience Shocks- 1	0.233	1.263	1.175	0.842	
	Shocks-2	0.997	2.710	0.426	0.019	b
	Shocks-3	0.583	1.791	0.288	0.043	b
	No experience shocks-4	0.000	1.000	.	.	
	Low Livestock Diversification- 1	-1.579	0.206	1.091	0.148	
	Livestock Diversification- 2	-1.617	0.198	1.031	0.117	
	Livestock Diversification- 3	-2.014	0.133	1.027	0.050	
	Livestock Diversification- 4	-2.033	0.131	1.032	0.049	b
	Livestock Diversification- 5	-2.914	0.054	1.161	0.012	b
	High Livestock Diversification- 6	0.000	1.000	.	.	

a-Significant at <1% level, b-Significant at <5% level

Focus Groups- Four focus groups were organized in the municipality of Umala (July 12, 2007). Three focus groups were organized in the municipality of Ancoraimes (July 26, 2007). The focus group participants were determined from the survey data.

Model Fitting Information				
Model	-2Log Likelihood	Chisq	df	Sig.
Intercept	995.962	126.705	29.000	0.000
Final	869.257			

Goodness of Fit			
	Chi Sq	df	Sig.
Deviance	856.484	2683.000	1.000

Pseudo R-Square	
Nagelkerke	0.431

Figure 3. Male focus group on climate risks in Umala (July 2007).

Results and Discussion

The preliminary analysis of the focus groups shows that farmers' rely on climate indicators to help them make cropping decisions. Most of the people distrust the information they receive from the radio because it is not region specific information. The participants discussed coping mechanisms they use when faced with a shock; these include using reserve food storages, requesting help from different governmental levels and institutions, and migrating to find work in other places

The model results emphasized the significance between risk perceptions and the controls of dread, farm size and location. Dread showed to be significant is the middle range of this variable indicating at the associated levels it is less likely to be in the high perception range.

This doesn't conflict with Slovic's model because only the middle range of dread was significant, which means it could be associated with high or low risk perceptions.

The control of farm size indicated that larger farms are more likely associated with high risk. The location variable showed that farmers from the communities of Vinto Coopani and Kellhuiri are more likely to have high risk perceptions. Both of these locations are located in Umala. There maybe a spatial dimension between these locations to risk perceptions.

The model indicated that the explanatory variables of other income, credit accessibility, experience of shocks and livestock diversification appeared significant in the model. The variable of other income revealed that farmers who had more other income were less likely to have high risk perceptions. This other income variable can be thought as another form of diversifying income outside of agriculture. Farmers with credit accessibility showed to be less likely associated with high risk perceptions. Farmers who faced more shocks were more likely to have higher risk perceptions. This variable shows an experience dimension and what role experience has in developing ones risk perceptions. In addition, when farmers have more livestock diversification, they tend to have lower risk perceptions. Livestock diversification can be an important livelihood buffering technique.

Hypothesis one was supported by the other income variable. Hypothesis two was supported by the livestock diversification variable, while hypothesis three held up according to the shock variable. It appears that farmers try to diversify their portfolio to hedge against risk events. It appears that these farmers us both ex-ante and ex-post mechanisms to manage risk. Networks are social capital; animals are natural capital; also savings account, so these are consistent with theory. Those who have insurance (credit, animals, buffers) mechanisms to protect against events have a lower levels of risk perceptions.

It appears that Bolivian farmers use a traditional (association) model to create their risk perceptions because their expert (rules) model was in conflict with the former. Currently, climate change has become a very important issue, particularly among policy-makers, who struggle to grasp a proper framework to examine the effects on economic decision making through risk perceptions, either based on associations and rules, or both, and how policy can better link rules and association based risk perceptions to improve economic decisions. The more that is learned about how people create their perceptions, the better one can help them through creating linkages.