

# Trust, Social Capital, and Adaptation to Climate Change: *Survey and Experimental Evidence from Rural Ethiopia*



Christopher Paul, Erika Weinthal, Marc Bellemare, Marc Jeuland

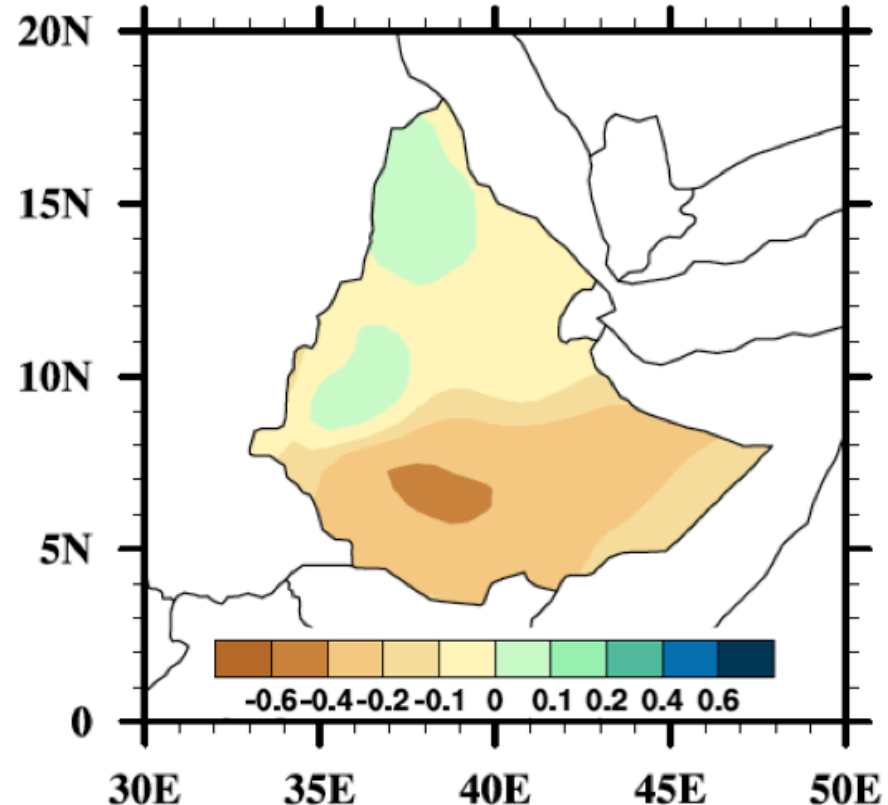
2015 August 3

# Climate Change in the Ethiopian Rift Valley

Map of Ethiopia, identifying Rift Valley



Rainy Season Precipitation Change, mm/day 2050-2099



# Social Capital and Adaptation



Social capital is the value of relationships that facilitate cooperation and collective action through trust.

(Ostrom and Ahn, 2003)

“Adaptation is a dynamic social process: the ability of societies to adapt is determined, in part, by the ability to act collectively.”

(Adger, 2003, p.1)

# Overview



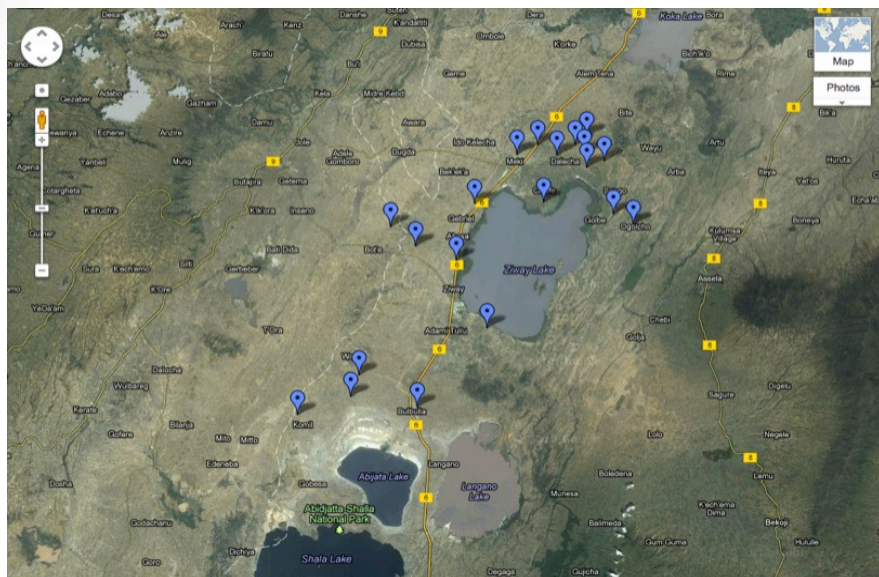
- Motivation: Social Capital and Climate Adaptation
- Case: Climate Change in the Ethiopian Rift Valley
- Methods: Survey, Experiments, Interviews
- Analysis: Regression of Private and Community Adaptation on Trust
- Results: Social capital positively related to community adaptation, but negatively to private adaptation
- Discussion: Social Capital and Climate Adaptation Policy

# Multiple Methods: Data Summary

Component	2012 (Pilot)	2013	2014
Household Surveys	399	400*	398*
Risk Field Experiments	-	684	686
Trust Field experiments	-	614	-
Local Interviews	21	22	37
National Interviews	7	19	23

\*With replacement of 21 HH in 2013, 14 HH in 2014, for overall 3-wave retention of 92%

# Household Characteristics



## Characteristic

## Average or Percentage

Household size

6.5 people

Household annual income

13200 Birr (USD 691)

Land holdings

2.2 hectares

Muslim

49.7%

Oromo Ethnicity

90%

Primary Crops (% of HHs)

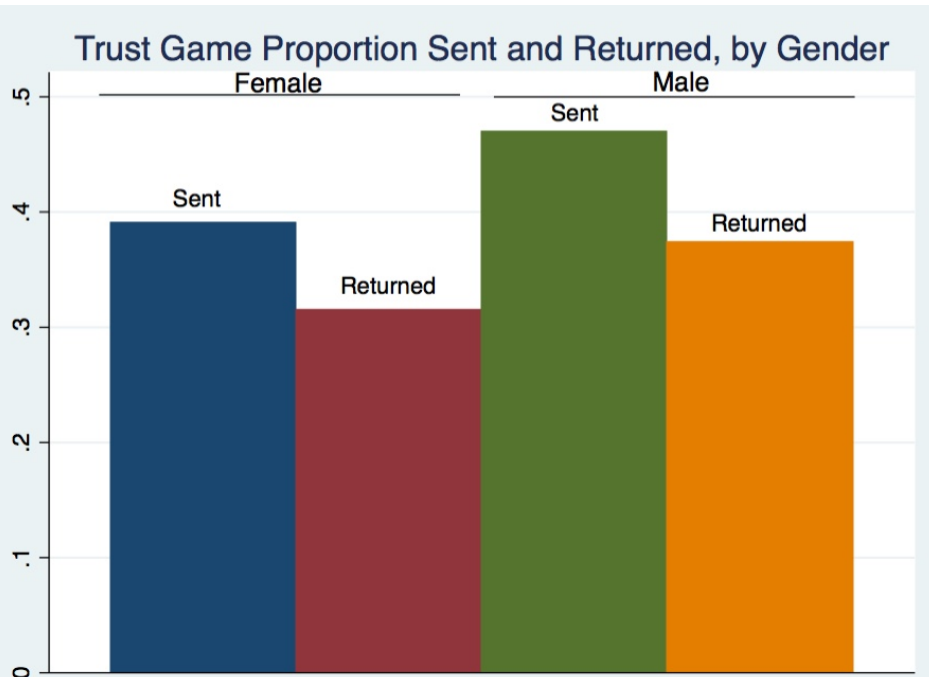
Maize (84%), Teff (57%)

# Key Survey Variables

- **Community adaptation:** participation or contribution to community activities such as terracing, water harvesting, and tree planting
- **Private adaption:** “adaptation index” is a simple count (sum) index of twelve adaptation behavior categories, e.g: crops; improved seed; Timing of planting; livestock; Work outside the farm
- **Survey trust:** “In general, would you say that most people in your village can be trusted or that you cannot trust people in your village?”

# Field Experiment: Trust

- Investment game played with cash following Schechter 2007, played with community participants as a group (separated by gender).
- Participants have ability to entrust and reciprocate anonymously.













# Field Experiments: Risk

Risk lottery games, played individually in series with actual cash payouts, following Tanaka et al (2010) and Liu (2013).

## Risk Game Series 1, Pair 1

Yellow Bag		Red Bag	
3 Blue Balls	7 Gray Balls	1 Blue Ball	9 Gray Balls
			
20 Birr	5 Birr	34 Birr	3 Birr
			

# Regression Analysis

Ordinary least squares regression approach, with village fixed effects and clustered standard errors

- Survey and experimental trust
- Community adaptation on trust
- Private adaptation on trust

Controls: Male, Age, Education, Marital Status, Household Size, Log Land Area, Dependency Ratio, Livestock, Log Income Per Capita, Log Household Assets

# Results: Experiment and Survey

	Experimental trust
Survey trust	0.0304 (0.0251)
Risk alpha	0.0298 (0.0570)
Risk sigma	-0.00654 (0.0402)
Risk lambda	0.00848 (0.00641)
Constant	0.332*** (0.109)
Observations	360
R-squared	0.257
Controls	Yes
Village Fixed Effects	Yes

# Results: Community Adaptation

	Community Participation	Community Contribution
Survey trust	0.0499** (0.0189)	0.156** (0.0678)
Experimental trust	-0.0568 (0.0429)	0.163 (0.135)
Risk alpha	-0.0811 (0.0810)	-0.0474 (0.130)
Risk sigma	0.0624 (0.0630)	0.0665 (0.105)
Risk lambda	0.00923 (0.00625)	0.0231 (0.0135)
Constant	0.739*** (0.193)	-0.487* (0.253)
Observations	360	360
R-squared	0.222	0.175
Controls	Yes	Yes
Village Fixed Effects	Yes	Yes

# Results: Private Adaptation

	Adaptation Index	Adaptation PCA Index
Survey trust	-0.956** (0.369)	-0.448** (0.175)
Experimental trust	-0.542 (0.758)	-0.247 (0.358)
Risk alpha	0.0315 (0.983)	0.0146 (0.469)
Risk sigma	0.489 (0.599)	0.227 (0.279)
Risk lambda	0.192** (0.0708)	0.0871** (0.0334)
Constant	0.852 (2.639)	-1.866 (1.239)
Observations	360	360
R-squared	0.183	0.178
Controls	Yes	Yes
Village Fixed Effects	Yes	Yes
Clustered Standard Error	Yes	Yes

# Conclusions

- Social capital is positively correlated to community adaptation, but,
- Social capital is negatively correlated with private adaptation
- Loss aversion is associated with private adaptation
- Policy should accommodate the potentially heterogeneous effects of social capital in decision-making
- Particular attention is needed for rural households and communities in climate adaptation



# Thanks



Thanks to all study participants, who welcomed us into their homes. Courtney Harrison, Tewodros Rango, Eshetu Lemma, and all our colleagues in Ethiopia were essential for this project.

This paper was completed with support from a USAID Conflict Management and Mitigation grant, the Duke University Global Health Institute, and the Nicholas School of the Environment.

Kim Marion Suiseeya, Shana Starobin, Kate Neville, Laura Paul, and many colleagues at the Nicholas School of the Environment gave us valuable feedback to improve this paper.

Email me at [cjp2@duke.edu](mailto:cjp2@duke.edu)



This study is made possible by the support of the American people through the United States Agency for International Development (USAID). The opinions expressed herein are those of the authors and do not necessarily reflect the views of USAID.



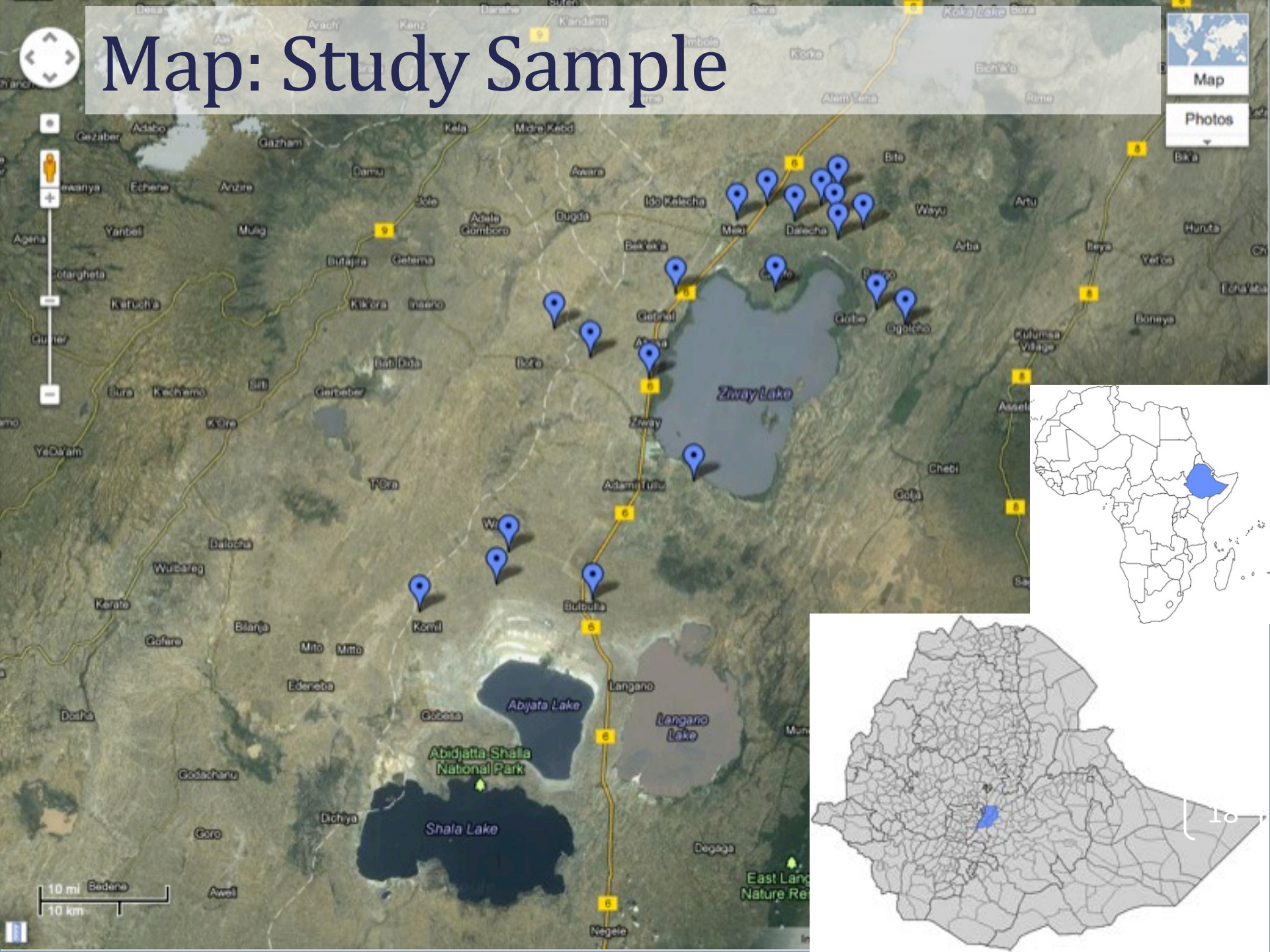
# APPENDIX



# Selected References

- Adger, W.N., 2003. Social Capital, Collective Action, and Adaptation to Climate Change. *Econ. Geogr.* 387–404.
- Liu, E.M., 2013. Time to Change What to Sow: Risk Preferences and Technology Adoption Decisions of Cotton Farmers in China. *Rev. Econ. Stat.* 95, 1386–1403.
- Nelson, D.R., Adger, W.N., Brown, K., 2007. Adaptation to Environmental Change: Contributions of a Resilience Framework. *Annu. Rev. Environ. Resour.* 32, 395–419.
- Ostrom, E., Ahn, T., 2003. *Foundations of social capital*. Edward Elgar Pub., Northampton, MA.
- Schechter, L., 2007. Traditional trust measurement and the risk confound: An experiment in rural Paraguay. *J. Econ. Behav. Organ.* 62, 272–292.
- Tanaka, T., Camerer, C., Nguyen, Q., 2010. Risk and Time Preferences: Linking Experimental and Household Survey Data from Vietnam. *Am. Econ. Rev.* 100, 557–71.

# Map: Study Sample



# Analysis

$$A_i = \alpha + \beta_1 X_{1,i} + \beta_2 X_{2,i} + \delta W_j + \gamma Z_k + \varepsilon_i$$

- We estimate a model of trust (A) and survey measures of trust ( $X_1$ ), controlling for individual risk preferences, ( $X_2$ ), individual characteristics ( $X_3$ ), household level characteristics ( $W$ ), and with village fixed effects ( $Z$ )









$$Y_i = \alpha + \beta_1 X_{1,i} + \beta_2 X_{2,i} + \delta W_j + \gamma Z_k + \varepsilon_i$$

- We estimate a model of trust (A) and survey measures of trust ( $X_1$ ), controlling for individual risk preferences, ( $X_2$ ), individual characteristics ( $X_3$ ), household level characteristics ( $W$ ), and with village fixed effects ( $Z$ )

# Field Experiments: Risk

- Risk lottery games, played individually in series with actual cash payouts, following Tanaka et al (2010) and Liu (2013).








## Risk Game Series 1, Pair 1

Yellow Bag		Red Bag	
3 Blue Balls	7 Gray Balls	1 Blue Ball	9 Gray Balls
			
20 Birr	5 Birr	34 Birr	3 Birr
			

# Field Experiments: Ambiguity

- Risk/Ambiguity lottery games, played individually in series with actual cash payouts, following Tanaka et al (2010) and Liu (2013).

## Ambiguity Series 1, Pair 11

Yellow Bag		Red Bag	
3 Blue Balls	7 Gray Balls	? Blue Balls	? Gray Balls
			
20 Birr	5 Birr	42 Birr	3 Birr
			

# Results: Risk versus Ambiguity

Histograms of Switchpoint to Higher Payoff for Risk and Ambiguity Series 1

