

*Shock-responsive social protection: Using index insurance to improve nutrition and alter poverty dynamics in the face of climate change*

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Aligning the Food System for Improved  
Nutrition in Animal Source Foods

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# Food Insecurity: Looking Beyond the Averages

- Few of us are average (who has 1.87 children?), and none of us live exclusively in average years
- Trivial observation, but living outside the averages matters a lot for families dependent on agriculture

<i>Per cent of long term mean rainfall in relevant agricultural year by scheme</i>	<i>Relevant agricultural year</i>			
	<i>1992/93</i>	<i>1993/94</i>	<i>1994/95</i>	<i>1995/96</i>
Mupfurdzi	107	116	74	131
Mutanda	106	104	68	156
Sengezi	142	104	80	111
<i>Incomes by crop year</i>				
Gross crop income (1992 Zimbabwe \$)	5815	4857	1817	6055
Total income (1992 Zim\$)	6982	6296	4051	8146

Source: Hoddinott, J. and B. Kinsey (2001) 'Child Growth in the Time of Drought',  
*Oxford Bulletin of Economics and Statistics*

# Hunger & Health in Time of Drought

- So what do we think happened in this time of drought to:
  - Adult male body mass?
  - Adult female body mass?
  - Growth of children?
- And what about 4 years after drought?
- Impacts even more striking if look at wealthier and less wealthy households

# Hunger & Health in Time of Drought

- So what do we think happened in this time of drought to:
  - Adult male body mass?
    - Fell by maybe a couple of %; Recovered quickly
  - Adult female body mass?
  - Growth of children?
- And what about 4 years after drought?
- Impacts even more striking if look at wealthier and less wealthy households

# Hunger & Health in Time of Drought

- So what do we think happened in this time of drought to:
  - Adult male body mass?
  - Adult female body mass?
    - Fell by 10-15%; Recovered
  - Growth of children?
- And what about 4 years after drought?
- Impacts even more striking if look at wealthier and less wealthy households

# Hunger & Health in Time of Drought

- So what do we think happened in this time of drought to:
  - Adult male body mass?
  - Adult female body mass?
  - Growth of children?
    - Growth of all children fell significantly, especially the youngest
- And what about 4 years after drought?
- Impacts even more striking if look at wealthier and less wealthy households

# Hunger & Health in Time of Drought

- So what do we think happened in this time of drought to:
  - Adult male body mass?
  - Adult female body mass?
  - Growth of children?
- And what about 4 years after drought?
  - Older children had compensatory growth;
  - Youngest remained stunted
- Impacts even more striking if look at wealthier and less wealthy households

# Hunger & Health in Time of Drought

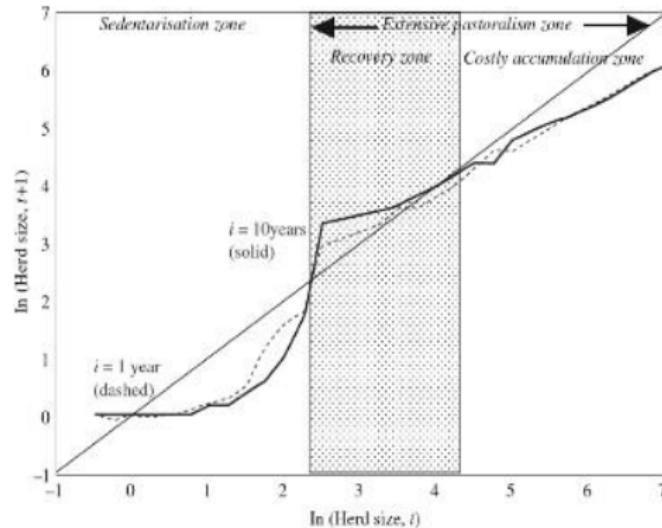
- So what do we think happened in this time of drought to:
  - Adult male body mass?
  - Adult female body mass?
  - Growth of children?
- And what about 4 years after drought?
- Impacts even more striking if look at wealthier and less wealthy households
  - Short & long-term growth impacts twice as high for poorer households
  - In addition, these nutritional shocks persist and result in reduced adult stature & lower levels of schooling attainment

# Topics for Remainder of Talk

- 1 Coping with risk & shocks without financial instruments
- 2 Innovative financial instruments to stabilize food security in risk-prone regions of Africa
- 3 Use these instruments as part of a 3-prong strategy to reduce food insecurity
- 4 Stress-testing this strategy with climate change scenarios

# Chronic Poverty in N Kenya & S Ethiopia

- Evidence of critical threshold or tipping point in these regions
- Irreversible consequences of falling below threshold
- Threshold will also discourage accumulation by those already below—perpetuating poverty
- Climatic & other shocks become critically important



Nadaraya-Watson estimates using Epanechnikov kernel with bandwidth ( $h = 1.5$ )

# Risk & Chronic Poverty

- Drought is the main risk faced by pastoralists in N. Kenya.
- During and after drought, households face a difficult choice:
  - Sell off remaining livestock (at a low price) to keep eating (smooth consumption)
  - Reduce consumption (preserve assets) to avoid falling below threshold (asset smoothing)
- Both strategies undercut future productivity, but expect vulnerable households near the threshold to engage in asset smoothing, contributing to the inter-generational transmission of poverty

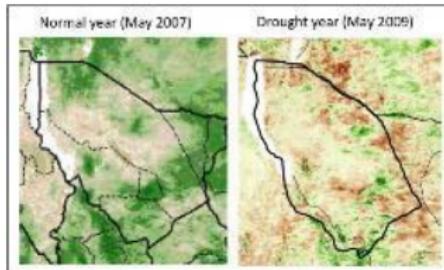


- 'Emergency' food aid is one response
- But as these dynamics have persisted the predictable amount of emergency aid needed every year have continued to grow
- In response, the Governments of Kenya & the UK launched a regular cash transfer scheme targeted at the 40% of the population in this region who live on less than \$0.40 per-day
- While the humanitarian basis for this aid is clear, it does not address the dynamics driving chronic poverty
- More pointedly, if we are prepared to pay \$15 per-month to a family that has collapsed into indigence, how much would we pay to alter dynamics and prevent the vulnerable from falling into this trap
- How about \$14 per-year?
- Can we save money and reduce hunger & aid dependence by being smarter?

# Index-based livestock insurance (IBLI)

- How might we change poverty dynamics & get at the root causes of problem?
- Might risk transfer contracts (insurance) be used to alter these dynamics?
  - Break the fall of vulnerable families into indigence
  - Eliminate costly asset smoothing which contributes to the inter-generational transmission of poverty
  - Incentivize accumulation for families below threshold
- Let's look at a pilot project & its surrounding research design intended to see if this idea works

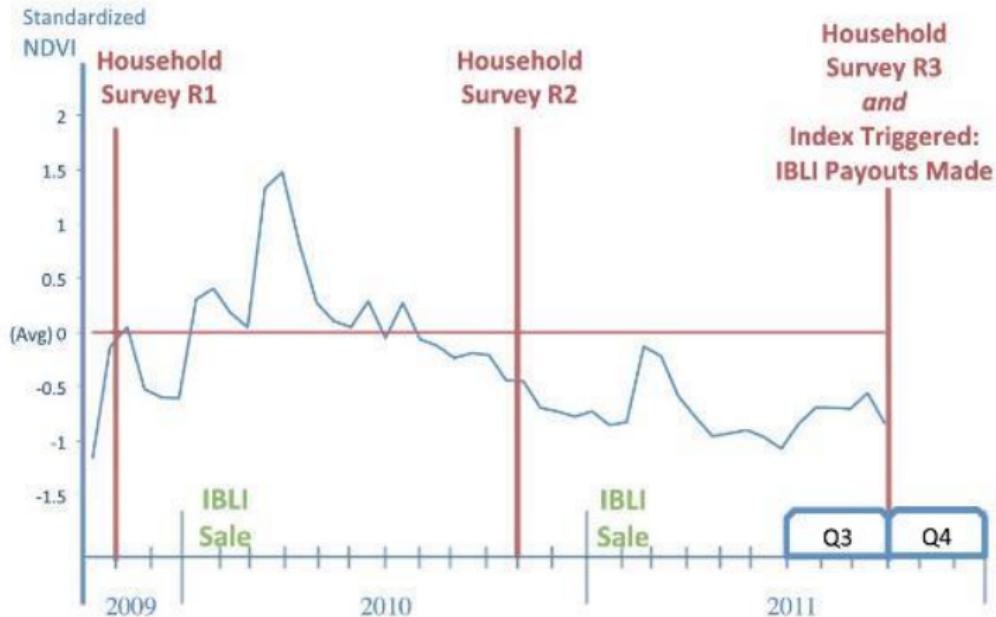
# IBLI Experiment in Northern Kenya



- Drought insurance for livestock launched in January 2010
- International Livestock Research Institute, Cornell University, Syracuse University and the BASIS Research Program at UC Davis.
- “Index-based”: uses satellite-based NDVI (normalized difference vegetation index) measures of available vegetative cover to predict livestock mortality
- Substantial training efforts
- Use of mobile payment technology to reduce costs
- Same technology can be used to scale out social payments in times of extreme need

# Study Timeline

- Survey 673 Households in October 2011
- All households had access to insurance
- Individually randomized encouragement design
- 25% of households purchased insurance



# Summary of Drought-Coping Behavior

**Table 3. Consumption and Asset Smoothing in Northern Kenya**

Variable	By Livestock Wealth				By Insurance Purchase		
	Average Response	Lowest Quartile	Highest Quartile	Difference in Means	Insured	Uninsured	Difference in Means
<u>Asset smoothing</u>							
Q3 Probability reduce meals (%) (prior to payout)	72 (1.7)	82 (3.0)	61 (3.8)	21*** (4.9)	64 (3.8)	75 (1.9)	10.9*** (4.0)
Q4 Probability reduce meals (%) (after receiving payout)	62 (1.8)	72 (3.5)	51 (4.0)	21*** (5.3)	33 (3.7)	71 (2.0)	37.9*** (4.1)
<u>Consumption smoothing</u>							
Q3 Probability sell livestock (%) (prior to payout)	29 (1.7)	12 (2.6)	44 (3.9)	32*** (2.5)	34 (3.7)	28 (1.9)	-.053 (4.1)
Q4 Probability sell livestock (%) (after receiving payout)	27 (1.7)	12 (2.6)	42 (3.9)	30*** (4.7)	11 (2.5)	32 (2.0)	20.7*** (3.9)
Observations	675	163	161		161	514	

# Causal Impacts of Insurance

- Using the IBLI experiment, we find *On average*, that after the drought insurance leads to:
  - A 61%-point decrease in livestock sales
  - A statistically insignificant 12%-point decrease in meal reduction
- However, average impacts can obscure as well as illuminate—as mentioned:
  - Conventional consumption smoothers
  - (Less conventional) asset smoothers
- Use 'threshold econometrics' to split the sample along the asset continuum & find that:
  - Households above the threshold are most likely to consumption smooth and insurance leads to a 71-96%-point drop in asset sales
  - Households below that threshold are most likely to asset smooth and insurance to a 31-49%-point reduction meal reduction as a coping strategy

# Summary & New Directions for Anti-poverty Programs

- Data reveal ample evidence of costly, differentiated coping strategies:
    - Households below critical threshold much more likely to asset smooth
    - Households above critical threshold more conventionally consumption smooth, with predictable consequences on livestock prices & own future well-being
  - Insurance has large impacts on both strategies:
    - Cuts in half asset smoothing (or its severity)
    - Similar reduction in asset sales
  - Government of Kenya has adopted adopted innovation with KLIP & 'scalable' social transfer payments to poor and near poor
- So what do we know about most effective policy approaches
- (important question in a world with limited budgets)?

# Effective Policy in Theory

- As a first step toward understanding what to do, let's fall back on economic models of how people behave:
- Specifically:
  - Consider an infinitely lived household dynasty, which is comprised of a sequence of generations & each generation lasts for 25 years
  - Enjoys initial endowments of physical assets and human capabilities
    - Assets and human capital combine to produce income using either a low or high (fixed cost) technology
    - Assets are subject to random depreciation (mortality) shocks
    - Consumption cannot be more than cash on hand (value of income plus assets) as no borrowing is assumed possible
    - Can allow human capabilities to evolve over time in a way that is sensitive to food insecurity
  - Households optimally manage resources to optimize dynasty's stream for economic well-being

## Effective Policy in Theory—Looks Ugly?

$$\max_{\{c_{dgt}\}} E_{\theta} \left[ \sum_{g=1}^{\infty} \sum_{t=1}^{25} u(c_{dgt}) \right]$$

subject to :

$$c_{dgt} \leq A_{dgt} + f(A_{dgt}, H_{dgt})$$

$$f(A_{dgt}, H_{dgt}) = H_{dgt} \max[A_{dgt}^{\gamma^h} - F, A_{dgt}^{\gamma^l}]$$

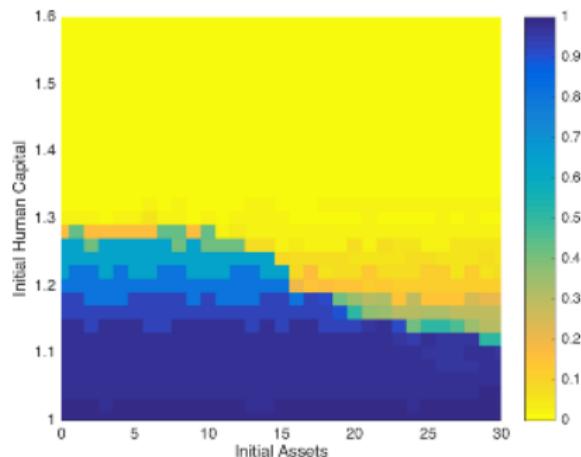
$$A_{dgt+1} = [f(A_{dgt}, H_{dgt}) + (1 - \theta_{dgt+1})A_{dgt}] - c_{dgt}$$

$$H_{dgt+1} = H_{d0}$$

$$A_{dgt} \geq 0$$

# Effective Policy in Theory—or Does It?

- Across full endowment space see the following:



- For fixed human capital, partitions space into: Always poor, Never poor; and, Multiple equilibrium potentially poor
- At any point in time, define the *Vulnerable* as those in the multi-color band
- It is this 'colorful' group that will find it optimal to asset smooth

- For a stylized economy comprised of families who optimally manage their resources in keeping with the ugly mathematical problem above, we consider what happens over time under the following thought experiment:
  - Government commits to a social compact, promising to make transfers to close the poverty gap for all families
  - Government can either react, providing aid as needed; or subsidize the creation &, or operation of an insurance market
  - In latter case, the total cost of social protection is the cost of closing the poverty gap plus insurance subsidies

# Further Insights into Efficacy of Alternative Schemes

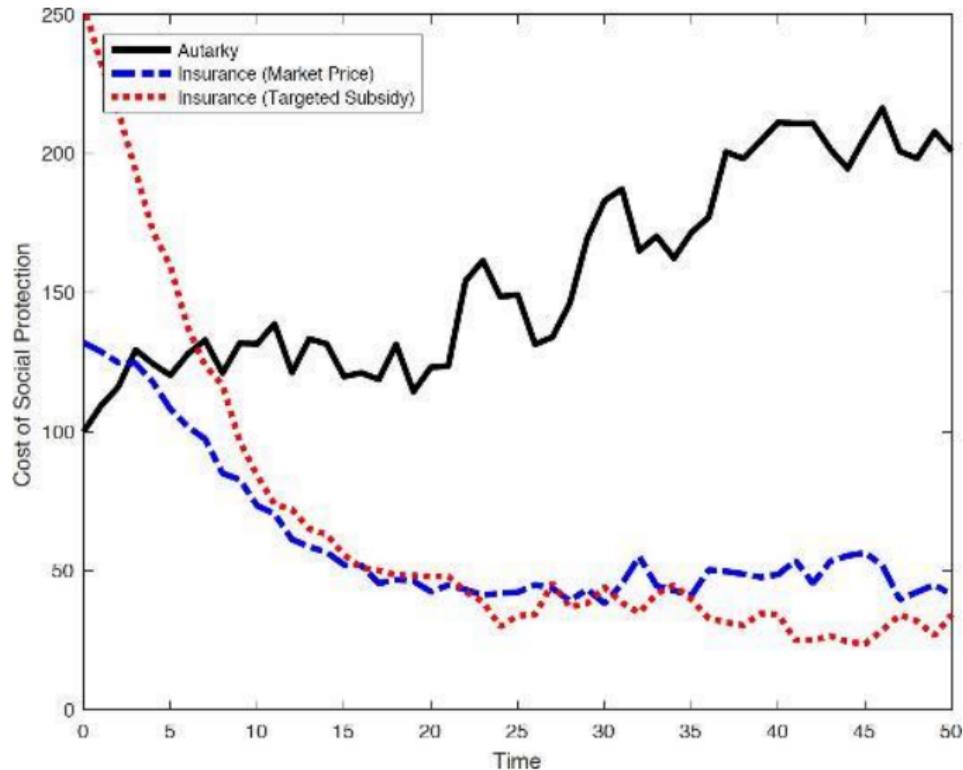
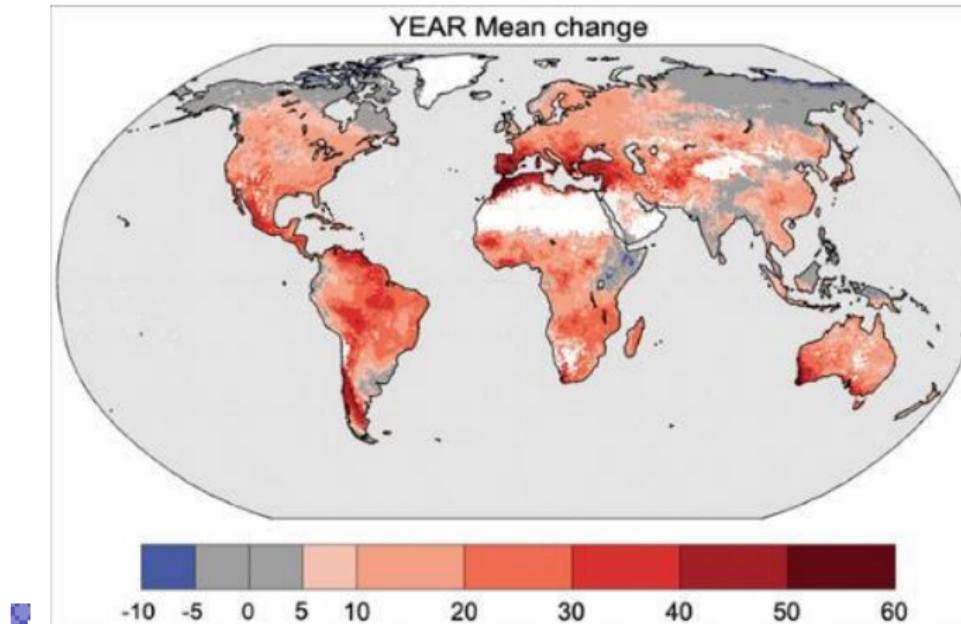


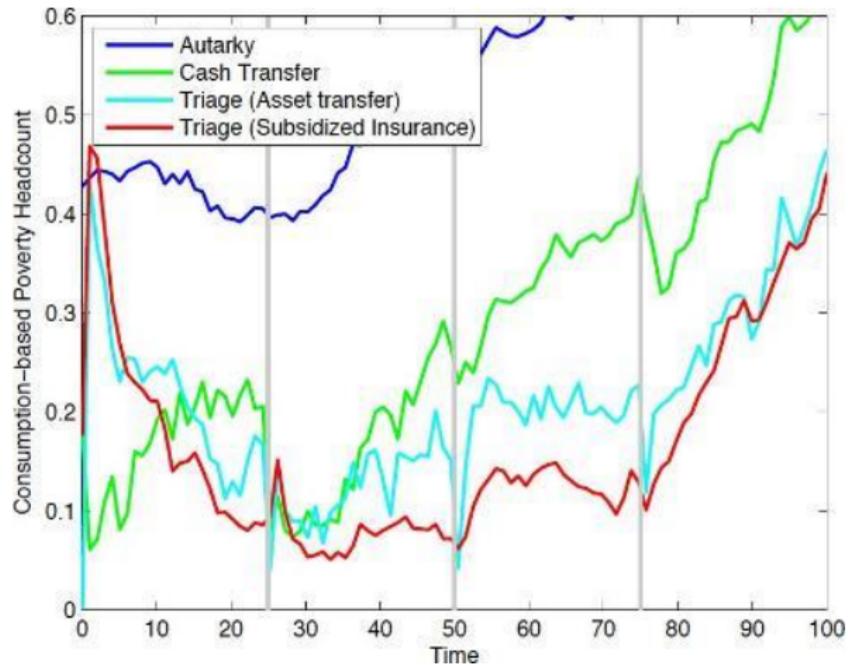
Figure taken from a similar model without the capabilities dynamics

# Climate Change Stress Test of Social Protection



- Capture this in a simple way and all climate and drought chances to worsen across generations
- Reprice insurance based on new disaster probabilities

# Climate Change Stress Test of Social Protection



- Weather & other shocks may be an important driver of poverty
- Coping strategies of the vulnerable are partially effective in the short-term, but may fail in the longer-term as the consequences of reduced nutrition are transmitted through to the next generation

Logic of reducing vulnerability is clear:

- Prevent the growth of the number of destitute (which crowds the social protection budget & increases the poverty gap) Reduce the inter-generational transmission of poverty caused by asset smoothing

Insurance can in principal serve at least a partially self-financed form of

- social protection for the vulnerable

However, if climate change & risk become too severe, then even

- vulnerability-targeted program lose their efficacy.

So will we see these synergies work in practice?



- BOMA graduation program
  - 24 month program transferring hard and soft skills, as well as business assets to groups of women
  - Remarkable 30% income increase in the short term (Gobin et al., 2016)
  - But does not solve the problem of vulnerability (including for the new graduates from poverty)
- Index-based Livestock Insurance Program
- Combining them holds promise of sustainable change in poverty dynamics
- Stay tuned!

Thank you!

