

How Does Output Price Risk Affect Smallholder Input Use Decisions? The Case of Kenya and Zambia

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Outline

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Introduction

- Low productivity and productivity growth a source of concern in southern Africa
 - Low fertilizer and hybrid seed adoption rates
- Previous adoption studies have been static
 - One-time decisions to adopt or continue using existing technologies
- However, survey evidence suggests that smallholder farmers switch back and forth!
 - *Transient use* of improved technologies

Introduction (2)

- No study has addressed this issue:
 - Role of output price risk?
 - With cross-sectional data, lagged behavior is unobserved
 - Perceived expected sale price?



Two major objectives

- Develop a dynamic theoretical model capable of explaining transient use
- Apply the framework to Kenya and Zambia

Why Kenya and Zambia

- Kenya and Zambia present very good case studies
 - They both have a large maize sub-sector
 - Input use is relatively high in both countries
 - Political concern that sustainable intensification may be compromised by maize price instability
 - They have different levels and types of public sector involvement

Significance of transient input use

Number of Seasons	Purchased Hybrid Seed		Fertilizer	
	Kenya	Zambia	Kenya	Zambia
	-----Percent (%)-----			
One Round	5.2	25.3	5.3	21.3
Two Rounds	24.8	19.7	25.7	15.8
Three Rounds	10.4	13.1	10.8	20.5
Four Rounds	28.2		25.5	
Transient use (among users)	58.9	77.5	62.1	64.4
Consistent Non-users	31.4	41.8	32.7	42.4

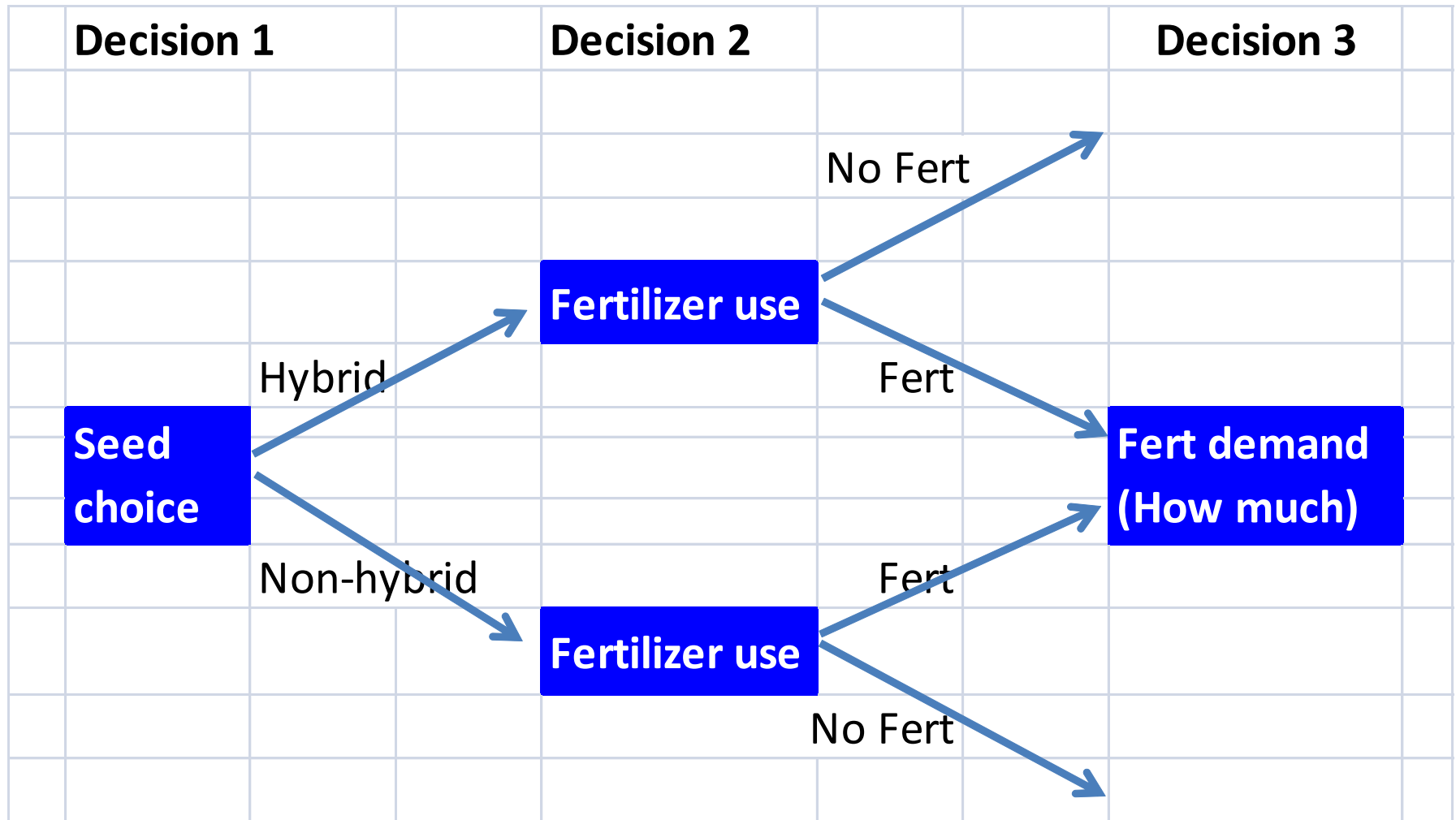
Modeling downside price risk

$$\text{Risk} = \text{Prob} \left(\begin{array}{l} \text{Expected} \\ \text{output price} \end{array} < \begin{array}{l} \text{Break - even} \\ \text{unit cost} \end{array} \right)$$

$$\text{Expected output price} = f \left(\begin{array}{l} \text{Past prices; Farm \& farmer} \\ \text{characteristics} \end{array} \right)$$

$$\text{Break - even unit cost} = \frac{\text{Cost [MK/ha]}}{\text{estimated yield [kg/ha]}}$$

Sequential decision framework



Data and data sources

- Balanced panel data from nationally representative surveys
 - Kenya: 4 waves - 1997, 2000, 2004, 2007
 - Zambia: 3 waves - 2001; 2004; 2008
 - Consistent maize growing households
- Focus Group Discussions

Key Results

Results - Zambia

- Downside output **price risk**, not predicted price, significantly influences decisions to use hybrid seed but not fertilizer
- **Historical use** of these technologies is important in all input use decisions
- **Government fertilizer** enhances hybrid use while significantly lowering the propensity to purchase fertilizer among hybrid seed users
- Access to **extension** enhances the propensity to use hybrid seed and fertilizer application rates but not the propensity to apply fertilizer

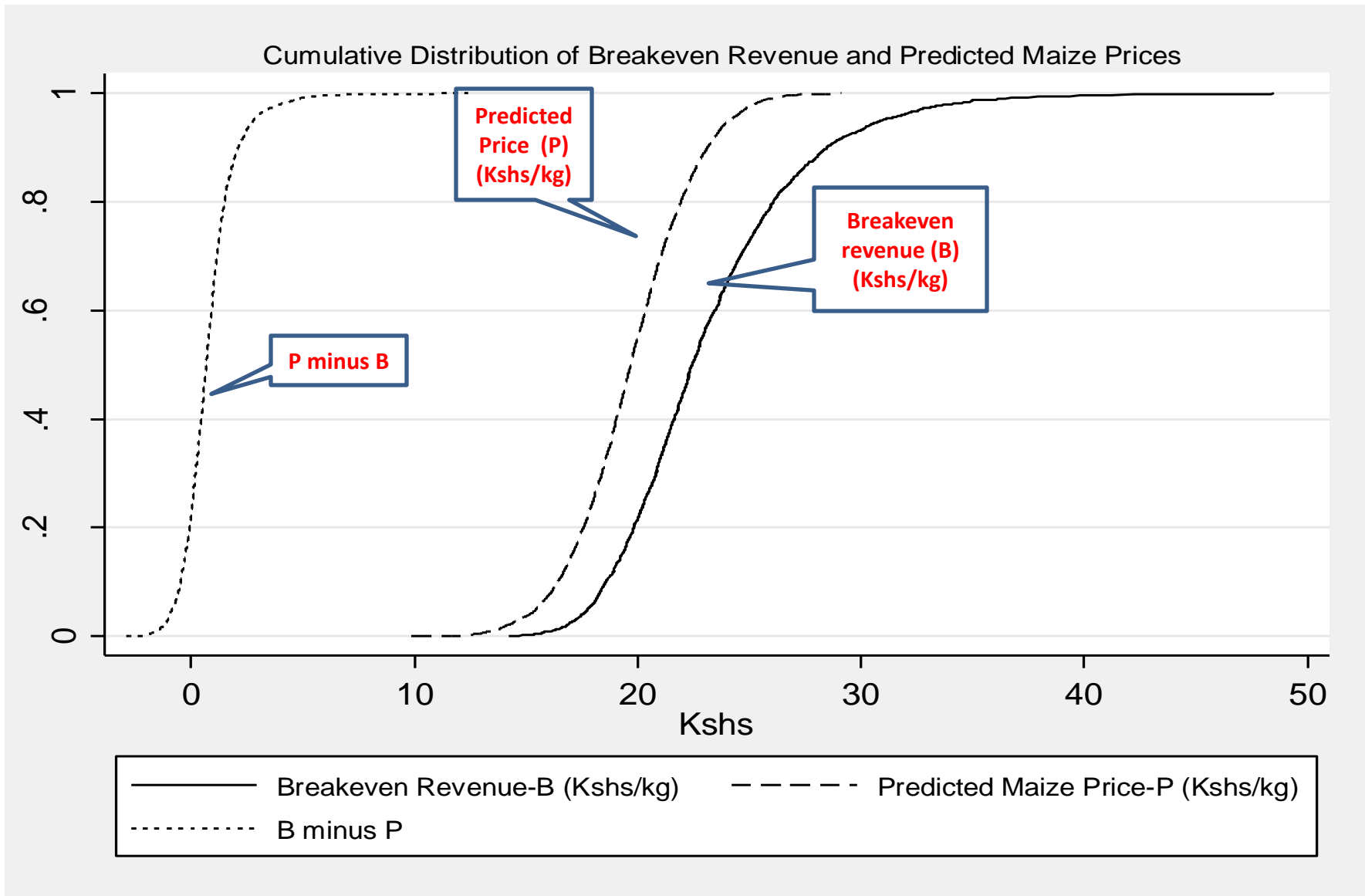
Results – Zambia (2)

- Membership to **cooperatives** and access to market **information** encourage use of purchased hybrid seed but do not affect fertilizer use decisions
- **Asset** ownership explains fertilizer use and rate decisions but not the propensity to use purchased hybrid seed
- Participation in maize markets as a **net seller** raises the propensity to use hybrid seed and fertilizer but not fertilizer rates
- **Proximity** to towns and roads enhances the propensity to use both hybrid seed and fertilizer but not fertilizer application rates

Results - Kenya

- Predicted **prices** have no effect on decision to adopt fertilizer
- Downside output price **risk** has no impact on fertilizer use
- **History** of fertilizer and hybrid use is a predictor of fertilizer use
- **Fertilizer price** reduces hybrid adoption but not vice versa
- Breakeven **revenue** is higher than predicted price
 - Suggesting failure to recover all costs of maize production

Comparing Breakeven Revenue and Predicted Price



Policy Implications (1)

- Inability to breakeven rather price risk (even for subsistence farmers) may constrain commercialization.
- Food self provision comes at a steep cost due to poor market participation
- Investments to lower costs of or improve input use efficiency (improved land management)
 - Should be at the core of maize sector growth
 - Rather than relying on the distributionally ambiguous producer price policies .

Policy Implications (2)

- Efforts to reduce downside price risk are likely to significantly improve hybrid seed uptake
 - Making output prices more predictable:
 - Productivity-enhancing practices
- Farmers are aware of the importance of fertilizer
 - Extension needs to focus on improving application rate
 - Improved purchasing power and market participation key to adoption and extent of adoption
- Improved roads & market participation could enhance hybrid and fertilizer uptake

Murakoze!!

Thank You!!