



IMPACTS OF SEED SUBSIDIES ON
POVERTY AND INEQUALITY
AMONG SMALLHOLDER MAIZE GROWERS
IN ZAMBIA

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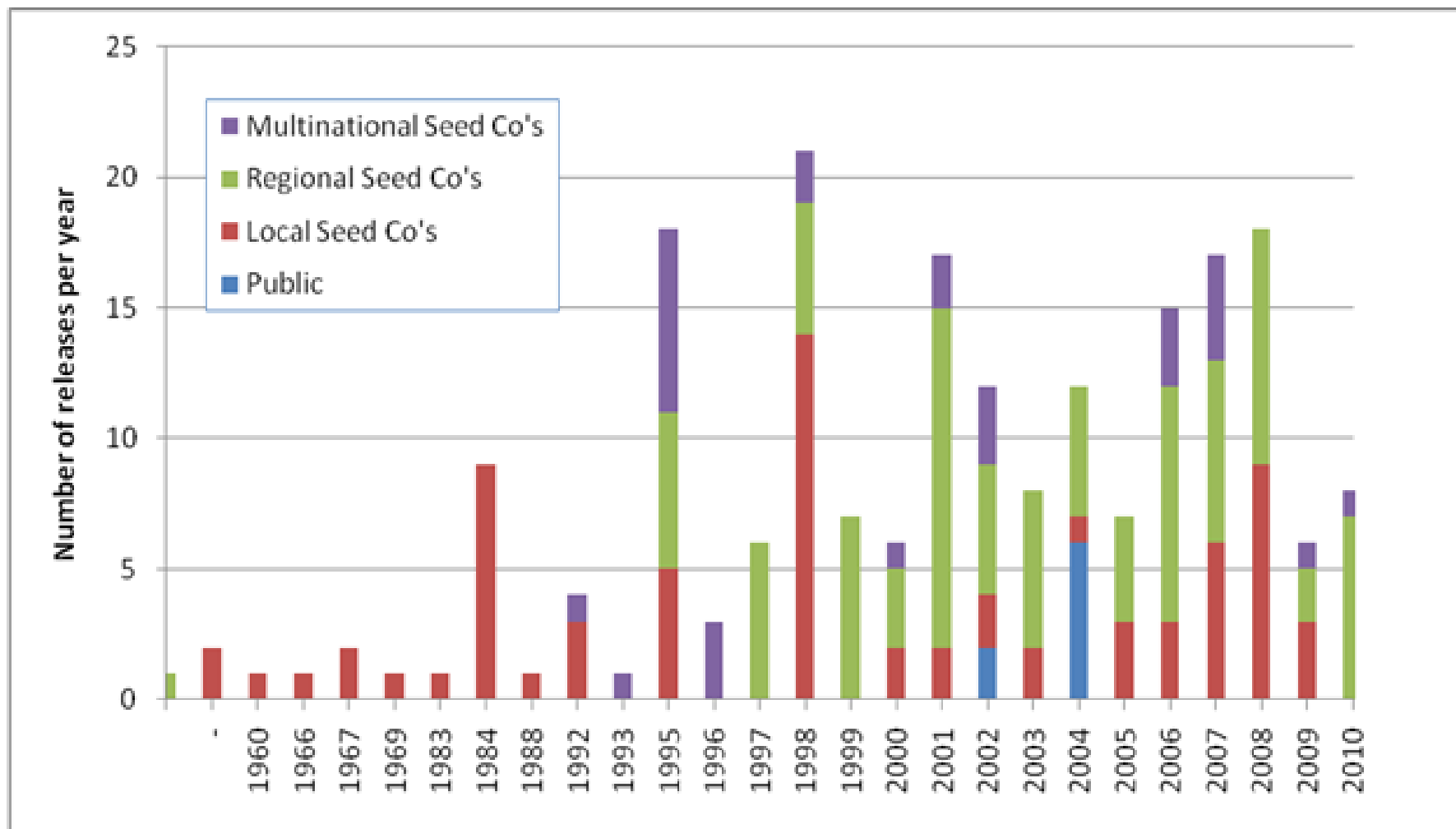
Preview

- I. Context
- II. Hypotheses
- III. Methods
- IV. Results
- V. Implications
- VI. Future research

Context

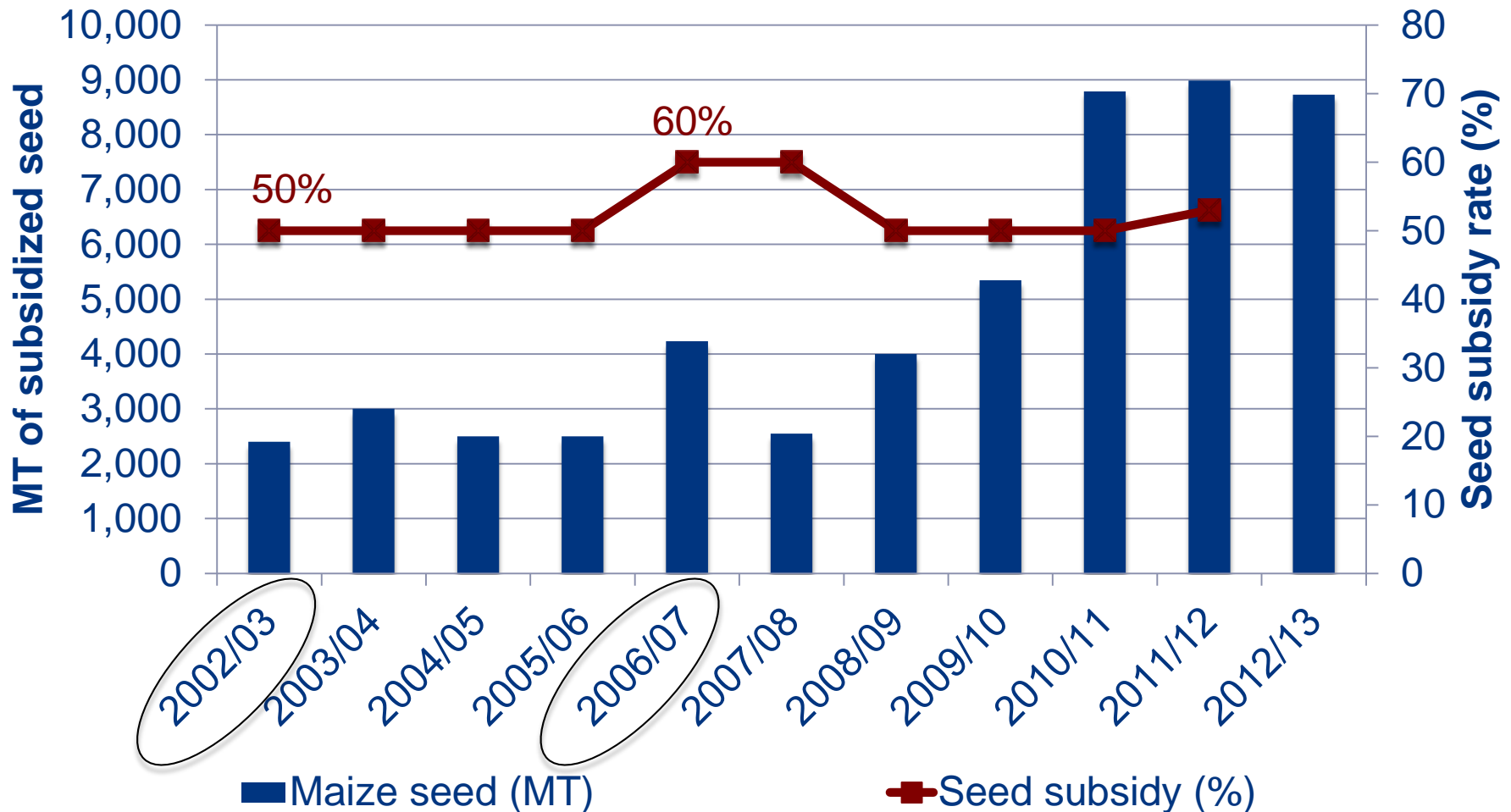
strong seed industry and adoption history

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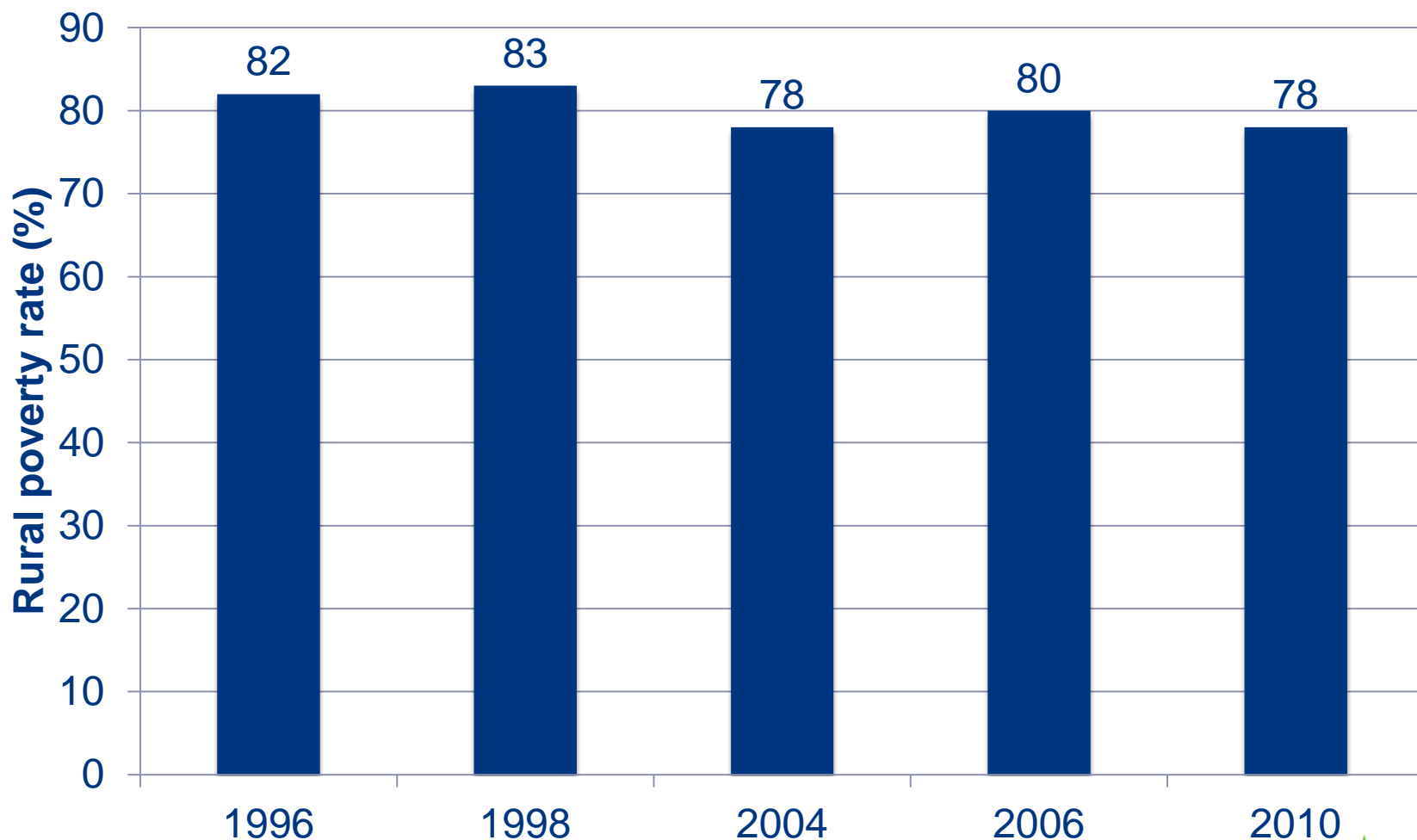
rising amounts of subsidized seed but few analyses

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raising incomes is one program objective but rural poverty rates remain high

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hypotheses

Subsidies on hybrid maize seed affect

- total household income (farm and nonfarm)
- depth of household poverty
- income inequality

III

methods

- non-separable farm household model
- outcomes
- chain rule
- estimation strategy

farm household model

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- maximization of utility rather than profits
- non-separable case
 - Input demand functions include factors that affect endogenous prices (household characteristics) as well as observed prices
- impact pathway via income change

outcomes

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- total household income
 - *Gross value of crop production*
 - *Gross value of livestock production*
 - *Salaries, formal/informal wage income, business income*
 - *Remittances, pensions, dividends*

outcomes

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- Foster-Greer Thorbecke poverty gap

Computed for each household

$$FGT_{\alpha} = (1/n) \sum_{i=1}^h \left(\frac{z - y_i}{z} \right)^{\alpha}$$

- Stark and Taylor's index of relative deprivation

$$RD(y) = AD(y) * P(y)$$

chain rule

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$$(1) \quad y = y[h(s, z), x]$$

$$(2) \quad \frac{\partial y}{\partial s} = \underbrace{\frac{\partial y}{\partial h(s, z)}}_{(B)} \cdot \underbrace{\frac{\partial h(s, z)}{\partial s}}_{(A)}$$

- Each outcome y is a function of hybrid seed use, other z
- Hybrid seed use h is a function of subsidy receipt s , other x
- Invoke chain rule

estimation strategy

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A. *Effect of subsidized seed (kgs) on hybrid seed use (kgs)*

- Correlated Random Effects (CRE) to control for time-invariant heterogeneity in Tobit model
- Control Function Approach (CFA) to test for endogeneity of subsidized seed

estimation strategy

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B. Effect of hybrid seed use (kg) on outcome

- Fixed effects for income, income inequality
 - FEIV to test for endogeneity of hybrid seed use
- CRE Tobit for poverty gap
 - CFA to test for endogeneity of hybrid seed use
- Instrument: maize seed subsidy (kgs)

estimation strategy

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(A)(B) Effect of subsidized seed on outcomes*

- compute overall effect of a 1-kg increase in subsidized seed on outcome via chain rule
- bootstrap standard errors (500 iterations)

estimation strategy

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Other control variables (x, z)

household	market	agroecology
female head	distances	crop richness
education of head	maize price	crop evenness
maximum adult education	groundnut price	rainfall
adults 15-59 years	mixed bean price	rainfall stress
farm size and sq	sweet potato price	expected rainfall and sq
own livestock	weeding wage	rainfall cv
off-farm employment	fertilizer price	

IV

results

- Descriptives
- Parameter estimates

descriptives

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	PLANTED HYBRID		DID NOT PLANT HYBRID
	SUBSIDY	NO SUBSIDY	
Hybrid seed planted (kg)	26.6	38.4	0
Income ('000 ZMK)	5,815	8,870	2,860
Poverty gap (%)	59.2	50.1	70.8
Relative deprivation ('000 ZMK)	3852	3656	4032

Differences significant at 1%

parameter estimates

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A) Effect of subsidized seed on hybrid seed

	APE
subsidized seed (kg)	0.31

B) Effect of hybrid seed use on outcomes

	Income (ln ZMK)	Poverty Gap (%)	Inequality
hybrid maize (kg)	0.00221	-0.076	-3.071

1% significance for all estimates

parameter estimates

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(A)(B) Effect of subsidized seed on outcomes*

	Poverty gap (%)	Income (ZMK)	Relative deprivation
1 kg	-0.0232 (0.006)	0.0689% (0.006)	-0.958 (0.001)
10 kgs	-0.2 pts	+0.7%	-0.2% at mean

v

Implications

- **subsidized seed was delivered to smallholders who produced much less maize, earned substantially less household income, were ranked lower with respect to income, and were deeper in poverty**
- **the seed component of the subsidy program reduced the poverty gap**

future research

- **Do these findings hold from 2006-present?**
- **Do they hold with respect to other outcome indicators?**

SECRET SLIDE parameter estimates

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Effect of hybrid seed (kg) on outcomes, CRE Tobit and FE

	Income (ln ZMK)		Poverty Gap		Inequality	
hybrid maize (kg)	0.00221	***	-0.076	***	-3.071	***
female household head	-0.231	***	2.03		161	***
education of head	0.0207	**	-0.505	*	-14.5	**
maximum adult education	0.0236	**	-0.695	**	-13.6	*
adults 15-59 years	0.0463	***	2.90	***	-38.9	***
farm size (ha)	0.0669	***	-1.97	***	-60.3	***
farm size, squared	-0.000826	***			0.558	***
crop richness	0.228	***	-5.81	***	-160	***
crop evenness	-0.128		17.1	***	482	***
own livestock	0.135	**	-0.652		-52.3	
off-farm employment	0.0000003	***	-0.00001	***	-0.000304	***
rain	-0.000135		0.00268		0.0692	
rainfall stress	0.0785	***	-0.617		-51.1	***
expected rainfall	0.302	**	-0.337		-232	**
expected rainfall, squared	-0.01327	**			10.8	**
rainfall cv	0.0105	***	-0.0657		-3.24	
maize price	0.307	***	-2.93		-32.8	
groundnut price	-0.238		7.97	*	410	***
mixed bean price	0.476	**	-8.04		-584	***
sweet potato price	-0.101		2.11		122	**
fertilizer price	0.0324		-1.42		-306	***