Do medium-scale farms improve market access conditions for Zambian smallholders?

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Context & Questions

- Changing land dynamics
  - Vast majority of rural Africans are still smallholders (e.g., farms less than 5 hectares)
  - Rapid increase in "medium-scale" or "emergent" farmers (5-100 ha) (Jayne et al., 2016)
    - Kenya – 20% of operated land
    - Ghana – 32%
    - Tanzania – 37%
    - **Zambia – 53%**
  - Much discussion on how/whether the rise of MS farms marginalizes smaller farms
  - Could there be benefits to smaller farms?
    - Scale economies for LSTs → Lower transaction costs
    - Competition
    - Higher farm-gate prices

Context & Questions

- Larger farms attract larger scale traders (LSTs)

Maize marketing activity by farm size categories

Farm category (defined by area cultivated)	Share of farmers	Share of group that sell maize	Share of sellers that sell to private sector	Share of sellers to private sector who sell to LST
"A"- farm <5 ha	95%	43%	50%	14%
"B"- 5 – 10 ha	4%	84%	44%	35%
"C"- 10 – 20 ha	1%	89%	53%	61%

Source: Indaba Agricultural Policy Research Institute; Rural Agricultural Livelihoods Surveys, 2012 & 2015

District-level simple regression:

(Share of sales to LSTs)$_t$ = 0.039 + 0.323*** x *(Share of land on farms > 5ha)$_{t-1}$*

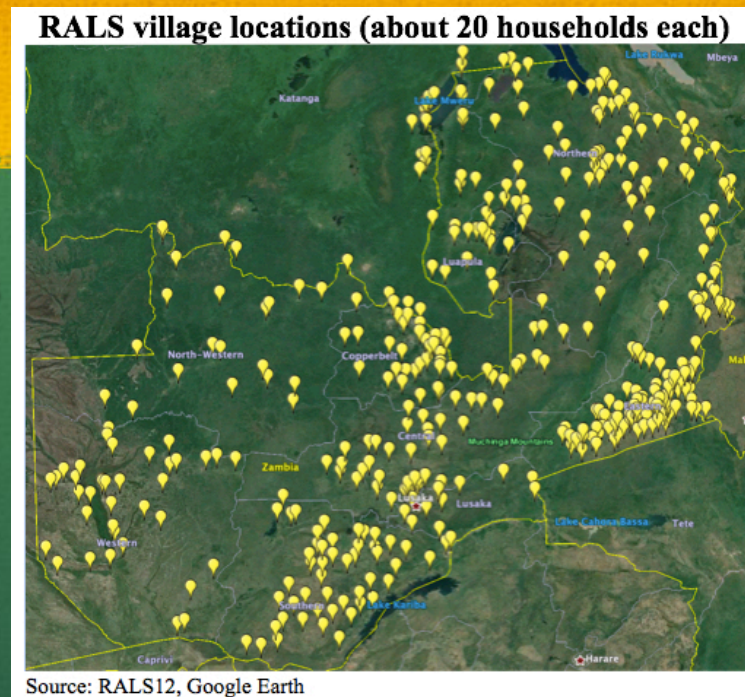[Standard errors]   [0.029]   [0.119]

N=74; R²=0.09

**Mean=0.155;
About 7% are 0;
About 5% >0.4**
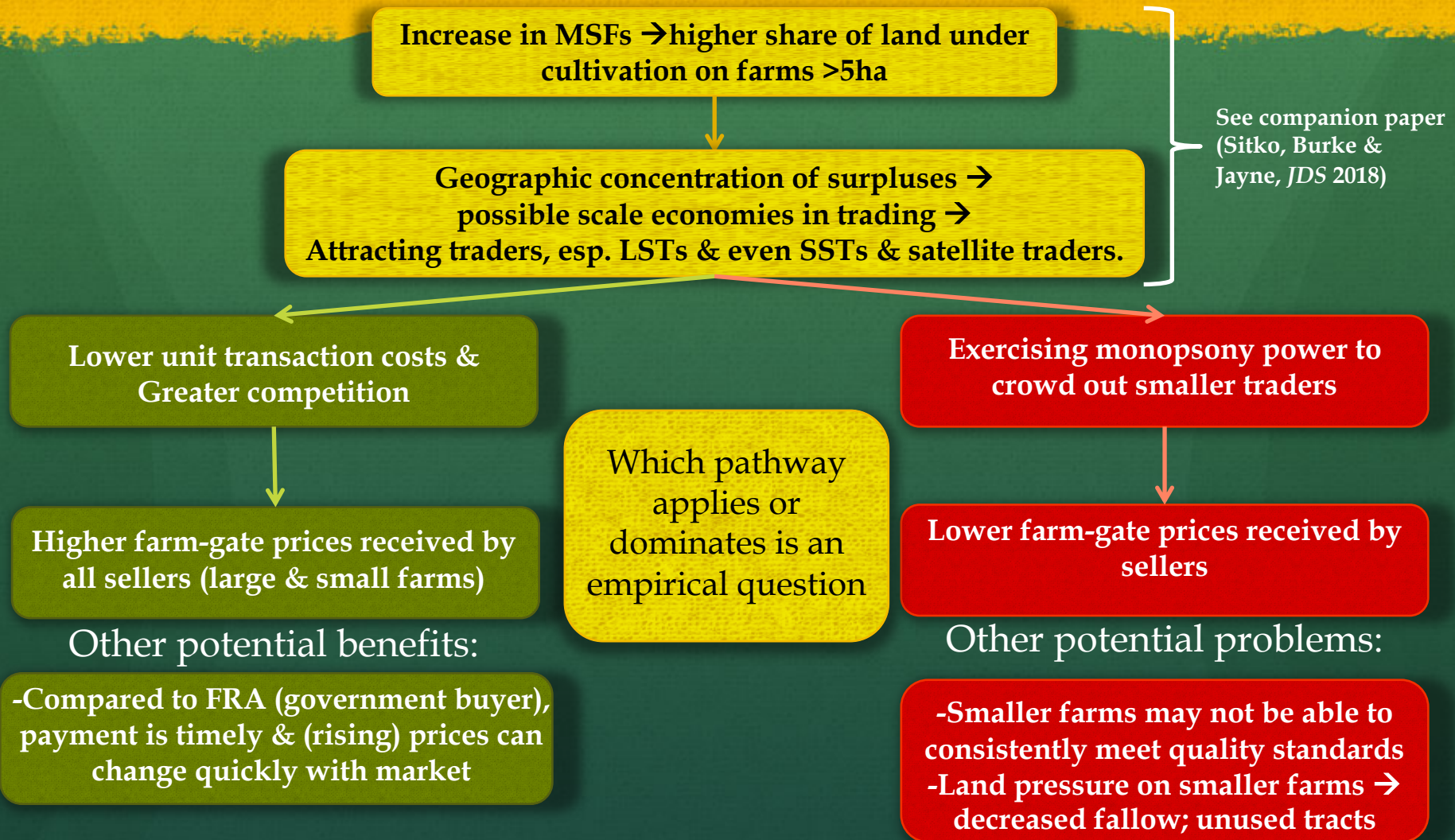
Context & Questions

- Are smallholder farm maize sales to LSTs higher in areas with more medium-scale farms?
  - Sales to small scale traders?

- Do LSTs offer higher prices to farmers than other private traders, holding other factors constant?

- "Spillover" effects suggest the rise of MSFs could mean market access and better prices for *all* farmers.

Data

RALS village locations (about 20 households each)

Source: RALS12, Google Earth

- Rural Agricultural Livelihoods Surveys (RALS)
    - Indaba Agricultural Policy Research Institute (IAPRI)
    - Central Statistical Office (CSO)
    - Ministry of Agriculture & Livestock (MAL)
    - Data for maize sales & other farm/community characteristics
    - **8,838** households in 2012; **7,933** in 2015

- Crop Forecast Surveys
    - CSO/MAL
    - Measuring farmland concentration at district level
    - **13,265** households in 2012; **13,350** in 2015

Conceptual framework

Increase in MSFs →higher share of land under cultivation on farms >5ha

Geographic concentration of surpluses → possible scale economies in trading → Attracting traders, esp. LSTs & even SSTs & satellite traders.

See companion paper (Sitko, Burke & Jayne, *JDS* 2018)

Lower unit transaction costs & Greater competition

Exercising monopsony power to crowd out smaller traders

Which pathway applies or dominates is an empirical question

Higher farm-gate prices received by all sellers (large & small farms)

Lower farm-gate prices received by sellers

Other potential benefits:

-Compared to FRA (government buyer), payment is timely & (rising) prices can change quickly with market

Other potential problems:

**-Smaller farms may not be able to consistently meet quality standards
-Land pressure on smaller farms → decreased fallow; unused tracts**

Background – Data – Conceptual framework – Approach – Results - Conclusion
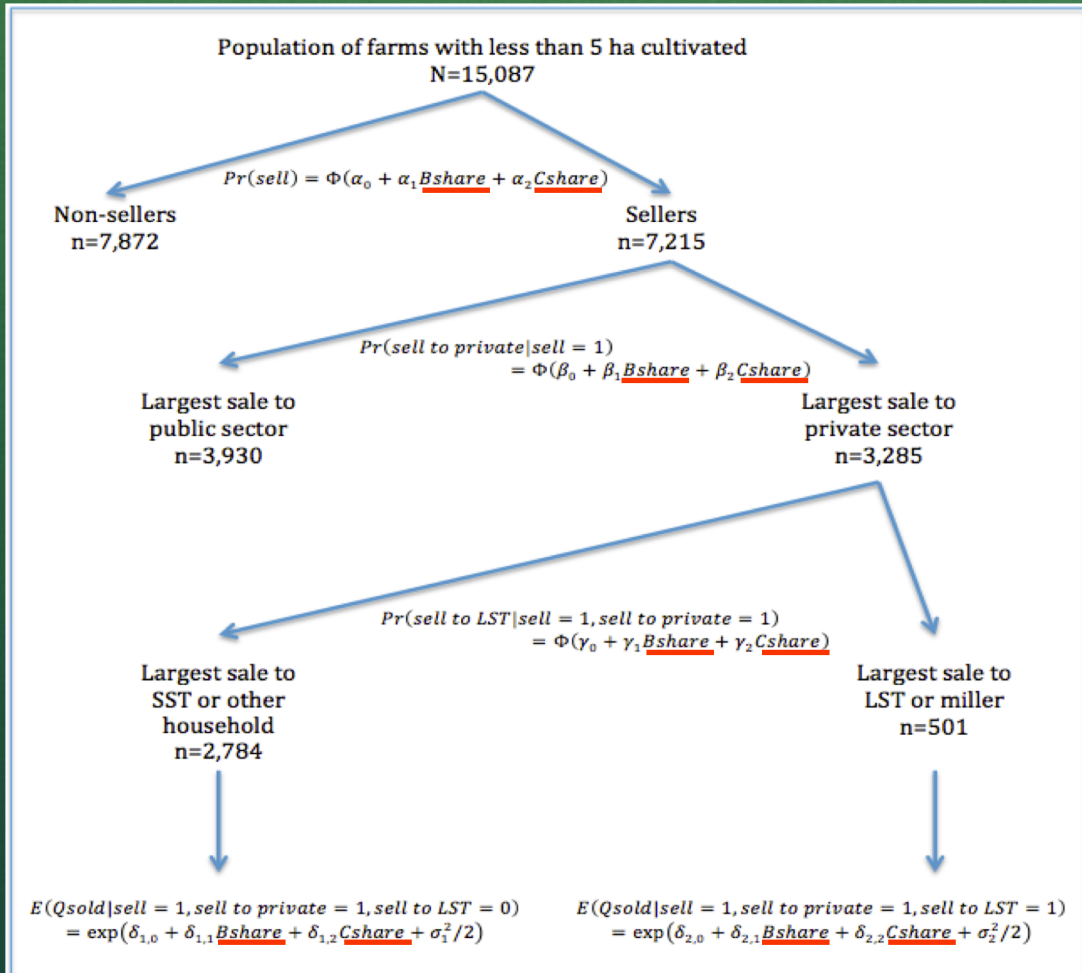
Defining a large-scale trader (LST)

- For transaction-specific data we must rely on farmers to tell us:
  - Does the trader purchase greater volumes of grain than the average trader in the area ?
  - Does the trader personally come to villages to buy grain or does he/she operate buying points and hire agents to buy on their behalf?
  - Does the trader have a company name or is the trader buying grain as an individual?

- Buyers are coded as "LST" if all three indications suggest they are large scale

Multi-Stage Model

Population of farms with less than 5 ha cultivated
N=15,087

- Probit models
  - Selling
  - Selling to private market
  - Selling to LSTs

- Lognormal model for quantity sold to
  - SST
  - LST

Multi-Stage Model

Population of farms with less than 5 ha cultivated
N=15,087

$$Pr(sell) = \Phi(\alpha_0 + \alpha_1 Bshare + \alpha_2 Cshare)$$

Non-sellers
n=7,872

Sellers
n=7,215

$$Pr(sell\ to\ private|sell = 1) = \Phi(\beta_0 + \beta_1 Bshare + \beta_2 Cshare)$$

Largest sale to public sector
n=3,930

Largest sale to private sector
n=3,285

$$Pr(sell\ to\ LST|sell = 1, sell\ to\ private = 1) = \Phi(\gamma_0 + \gamma_1 Bshare + \gamma_2 Cshare)$$

Largest sale to SST or other household
n=2,784

Largest sale to LST or miller
n=501

$$E(Qsold|sell = 1, sell\ to\ private = 1, sell\ to\ LST = 0) = \exp(\delta_{1,0} + \delta_{1,1} Bshare + \delta_{1,2} Cshare + \sigma_1^2/2)$$

$$E(Qsold|sell = 1, sell\ to\ private = 1, sell\ to\ LST = 1) = \exp(\delta_{2,0} + \delta_{2,1} Bshare + \delta_{2,2} Cshare + \sigma_2^2/2)$$

- Probit models
  - Selling
  - Selling to private market
  - Selling to LSTs

- Lognormal model for quantity sold to
  - SST
  - LST

- Key variables are district share of land under cultivation "B" & "C" farms in district

Price regression models

- Estimate price regressions using data from the 2,683 transactions with traders (SSTs & LSTs) to investigate the "ceteris paribus" price difference.

- A note on "ceteris paribus"
  - Careful about "controlling for the mechanism"
  - E.g., controlling for transaction specific characteristics (why would a seller choose an LST over SST if transport costs – and everything else – are constant?)
  - Takeaway point – Robustness across several specifications – is a useful part of this (and MSM) analysis

MSM results

Partial effect estimates of MSM of maize market participation for "A farms"

	$\partial\text{Pr}(\text{sell})/\partial x$	$\partial\text{Pr}(\textit{sell to private} \mid \textit{sell=1})/\partial x$	$\partial\text{Pr}(\textit{sell to LST or miller} \mid \textit{sell=1, sell to private=1})/\partial x$	$\partial\text{E}(\textit{Qsold} \mid \textit{sell=1, sell to private=1, sell to SST})/\partial x$	$\partial\text{E}(\textit{Qsold} \mid \textit{sell=1, sell to private=1, sell to LST})/\partial x$	$\partial\text{E}(\textit{sales to SST or other hh})/\partial x$	$\partial\text{E}(\textit{sales to LST or miller})/\partial x$
	(n=15,087)	(n=7,215)	(n=3,285)	(n=2,784)	(n=501)	(n=15,087)	(n=15,087)
Model (i) – Farmland concentration only as explanatory variables							
District share of land under "B-farms"	0.2287***	0.1048	0.2277**	1,778.5***	-2,487.2	376.9***	68.47
	(0.074)	(0.101)	(0.107)	(513.2)	(2,362.5)	(96.7)	(66.0)
District share of land under "C-farms"	0.4429***	1.242***	0.1955	942.07*	4,410.09	747.1***	433.4***
	(0.114)	(0.153)	(0.138)	(548.3)	(3,165.3)	(125.8)	(94.4)
Model (ii) – Controlling for household characteristics, weather & climate, transaction costs characteristics							
District share of land under "B-farms"	0.119	0.288**	0.063	3,236.3***	-12,551.3**	381.1***	-107.5
	(0.08)	(0.13)	(0.11)	(796.0)	(5,647.0)	(112.2)	(82.3)
District share of land under "C-farms"	0.674***	0.983***	0.568***	4,969.3***	11,214.9***	886.5***	700.1***
	(0.12)	(0.17)	(0.15)	(1,156.0)	(4,312.5)	(165.4)	(109.6)
Model (iii) – Controlling for household characteristics; weather & climate; transaction costs characteristics; provincial, time & province-time effects							
District share of land under "B-farms"	0.640***	0.121	0.364**	3,983.9***	-9,523.1	504.6***	103.1
	(0.10)	(0.16)	(0.18)	(1,149.2)	(6,466.8)	(136.7)	(117.2)
District share of land under "C-farms"	0.150	0.022	-0.071	-934.6	4,219.7	22.56	78.1
	(0.13)	(0.18)	(0.16)	(712.0)	(4,126.2)	(151.2)	(134.6)

Sources: Household sales data from the Rural Agricultural Livelihood Surveys (2012, 2015); District farmland concentration variables from the Crop Forecast Surveys (2012; 2015)
Notes: Bootstrapped standard errors from 200 replications in parentheses, *, **, *** indicates statistical significance at the 1, 5 and 10% levels respectively..

Price regression results

Lognormal maize price regressions from Zambia's 2012 & 2015 marketing seasons

ln(real price)[a]=	Variables added to each model				
	(1)	(2)	(3)	(4)	(5)
Sale was to LST (1=yes)	0.044*** (0.01)	0.075*** (0.01)	0.040*** (0.01)	0.044*** (0.01)	0.029** (0.01)
ln(km to sale)			0.026*** (0.00)	0.025*** (0.00)	0.022*** (0.00)
Month & year of sale	*No*	*No*	*No*	*Yes*	*Yes*
ln(quantity sold) (tonnes)					0.020*** (0.01)
District fixed effects	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	-0.228*** (0.01)	-0.273*** (0.03)	-0.310*** (0.04)	-0.409*** (0.06)	-0.399*** (0.06)
Observations	2,683	2,683	2,682	2,682	2,681
R-squared	0.006	0.143	0.163	0.205	0.213

Source: IAPRI Rural Agricultural Livelihoods Surveys (2012 & 2015). a-Prices are deflated to a common base using a monthly consumer price index for Zambia published by the IMF and available at data.imf.org

Conclusions

- The increasing number of medium-scale farms are inducing large-scale private investments in grain trading

- Rise of MSFs associated with a greater likelihood that small farms
  - Sell maize
  - Sell to private traders
  - Sell to one or more LSTs

- Average sales to LSTs (and SSTs) from farms<5ha increases, ceteris paribus (marginal effect on "unconditional" expected values are positive & significant)

- Depending on controls, we estimate prices paid by LSTs to farmers are 2.9% - 7.5% higher than SSTs

- At least with respect to the evolution of grain marketing channels, the rise of MSFs seems, on balance, to also benefit even the smallest farms.

Thank you

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