# Rural Land Rental Markets in Southern Africa:

## trends, participation and impacts on household welfare in Malawi & Zambia

Jordan Chamberlin (Michigan State University)

Jacob Ricker-Gilbert (Purdue University)

*Inaugural Conference on Land Policy in Africa*
*Addis Ababa, 11th-14th November 2014*

PURDUE UNIVERSITY

IAPRI

MICHIGAN STATE UNIVERSITY

# Outline

- Motivation
  - Theory
  - Context: Malawi & Zambia
- Study objectives & contribution
- Methods
  - Conceptual model
  - Estimation issues
  - Data
- Results
- Conclusions and next steps

# Motivation

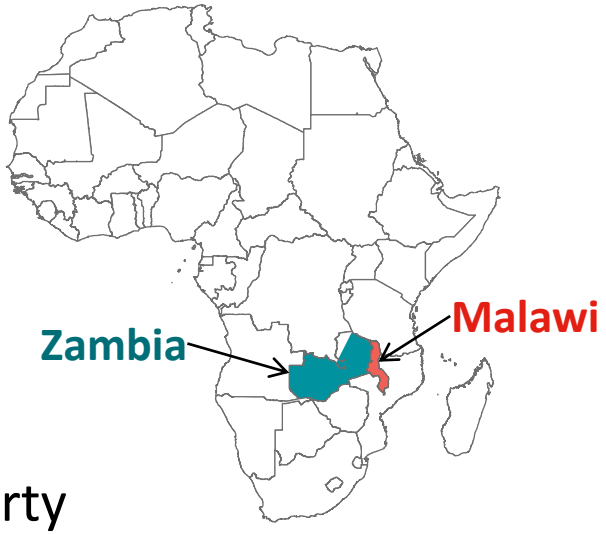
- Land is a key productive resource
  - Especially important in agrarian economies with limited non-farm sectors (e.g. Jayne et al. 2014)
- High and rising land scarcity in many parts of SSA
  - Smallholders report limited expansion potential even in low density areas! (e.g. Chamberlin 2013, for Zambia)
- High and rising inequality in landholdings
  - Even *within* the smallholder sector (e.g. Jayne et al. 2003, 2014)

# Role of land markets?

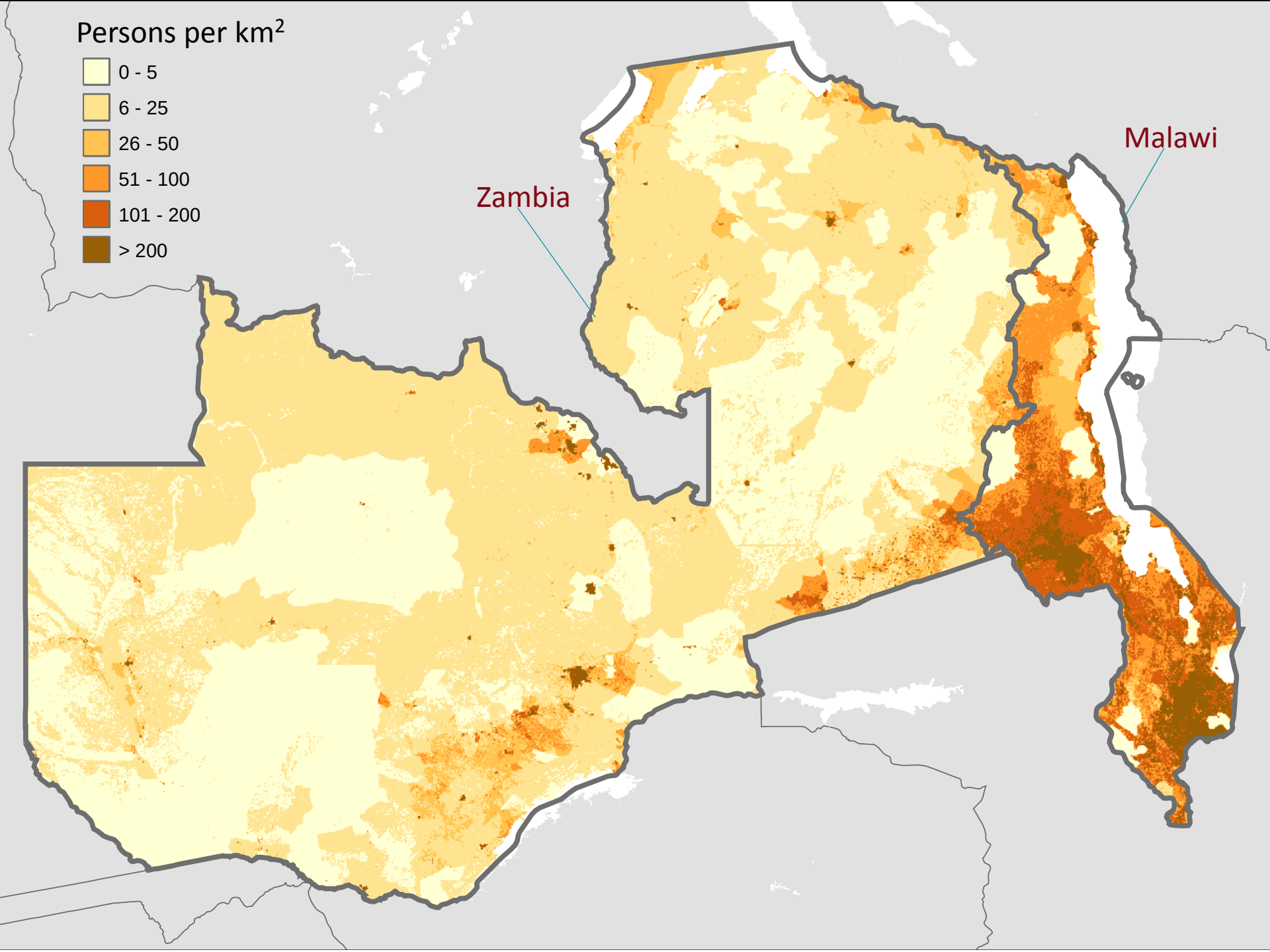
- Rental and sales markets should enable net transfers of land
  - From land-rich to land-poor → equity gains
  - From less-able to more-able farmers → efficiency gains
- Enable productive livelihoods → welfare gains
  - Especially for households with insufficient land…
- Such gains are conditional on efficient rental prices, transactions costs of participation, etc.

*Mixed evidence in the empirical literature (e.g. Holden et al. 2009)*

# This study




- Malawi & Zambia:
  - Most land under customary tenure
  - High levels of land inequality and rural poverty
  - Similar agroecological, socioeconomic & legal contexts
  - Vary significantly in rural pop. density & market access
- Research questions
  - What are the trends in rental market development?
  - Who is participating?
  - What are the benefits?
    - Efficiency
    - Equity
    - Implications for a variety of welfare outcomes
  - *Do participation and/or benefits vary with level of mkt dev't?*


Persons per km2
0 - 5
6 - 25
26 - 50
51 - 100
101 - 200
> 200
Zambia
Malawi

# Household model: participation

- Ability: from Cobb-Douglass production function:

$$\log(Q_{it}) = \log(\boldsymbol{x}_{it})\boldsymbol{\beta} + u_i + \varepsilon_{it}$$

we recover $ability_i = \hat{u}_i$ from FE estimation

*Jin & Jayne 2013*

- Rental regime decision: ordered probit

*Rents in* $r_{it}^{Tenant}$

$r_{it}^{Autarky}$

*Rents out* $r_{it}^{Landlord}$

$$= f(ability_i, \bar{A}_{it}, \boldsymbol{x}_{it})$$

- Rental amount decision (ha): tobit

$$R_{it}^{P} = f(ability_i, \bar{A}_{it}, \boldsymbol{x}_{it}), \mathrm{P} \in [T, L]$$

# Household model: impacts

- Welfare:

$$y_{it} = \gamma^T r_{it}^T + \gamma^L r_{it}^L + \zeta ability_i + \boldsymbol{x}_{it}\boldsymbol{\beta} + \epsilon_{it}$$

alt. specifications: binary vs continuous measures

| $y_{it}$ | MWI | ZMB |
|---|---|---|
| Value of crop production | X | X |
| Net crop income | X | X |
| Net off-farm income | X | X |
| Net total household income | X | X |
| Probability of expected deficit | X | |
| # months staples expected to last | X | |
| Subjective wellbeing (score: 1-5) | X | |
| Probability of poverty | X | X |

# Endogeneity in welfare model

- Concern that self-selection into rental market participation may be an issue
  - Omitted variable bias:
  - Positive impact of "social capital" or something similar on both participation decisions and on welfare outcomes

$$y_{it} = \boldsymbol{x}_{it}\boldsymbol{\beta} + \mu_i + u_{it}$$

*FE? FD? Okay, but would lose key time-invariant regressors of interest…*

# Endogeneity in welfare model

Mundlak-Chamberlain device

Correlation between covariates and unobserved heterogeneity $\mu_i$ controlled for using MC device:

Auxiliary model:

$$\mu_i = \psi + \overline{\boldsymbol{x}}_i\boldsymbol{\xi} + a_i \text{ where } a_i = (0, \sigma^2)$$

the estimating equation is:

$$y_{it} = \boldsymbol{x}_{it}\boldsymbol{\beta} + \psi + \overline{\boldsymbol{x}}_i\boldsymbol{\xi} + a_i + u_{it}$$

# Endogeneity in welfare model

- What about correlation between $\boldsymbol{R_{it}^{L}}$, $\boldsymbol{R_{it}^{T}}$ and $u_{it}$?
  - Omitted variable bias time-varying?
- Still need an instrumental variable (IV) strategy…
  - We use village share of renters as an instrument
  - Control function approach (Blundell 1986)
  - CF residuals are not significant, suggesting this is not a problem (so CF results not reported here)

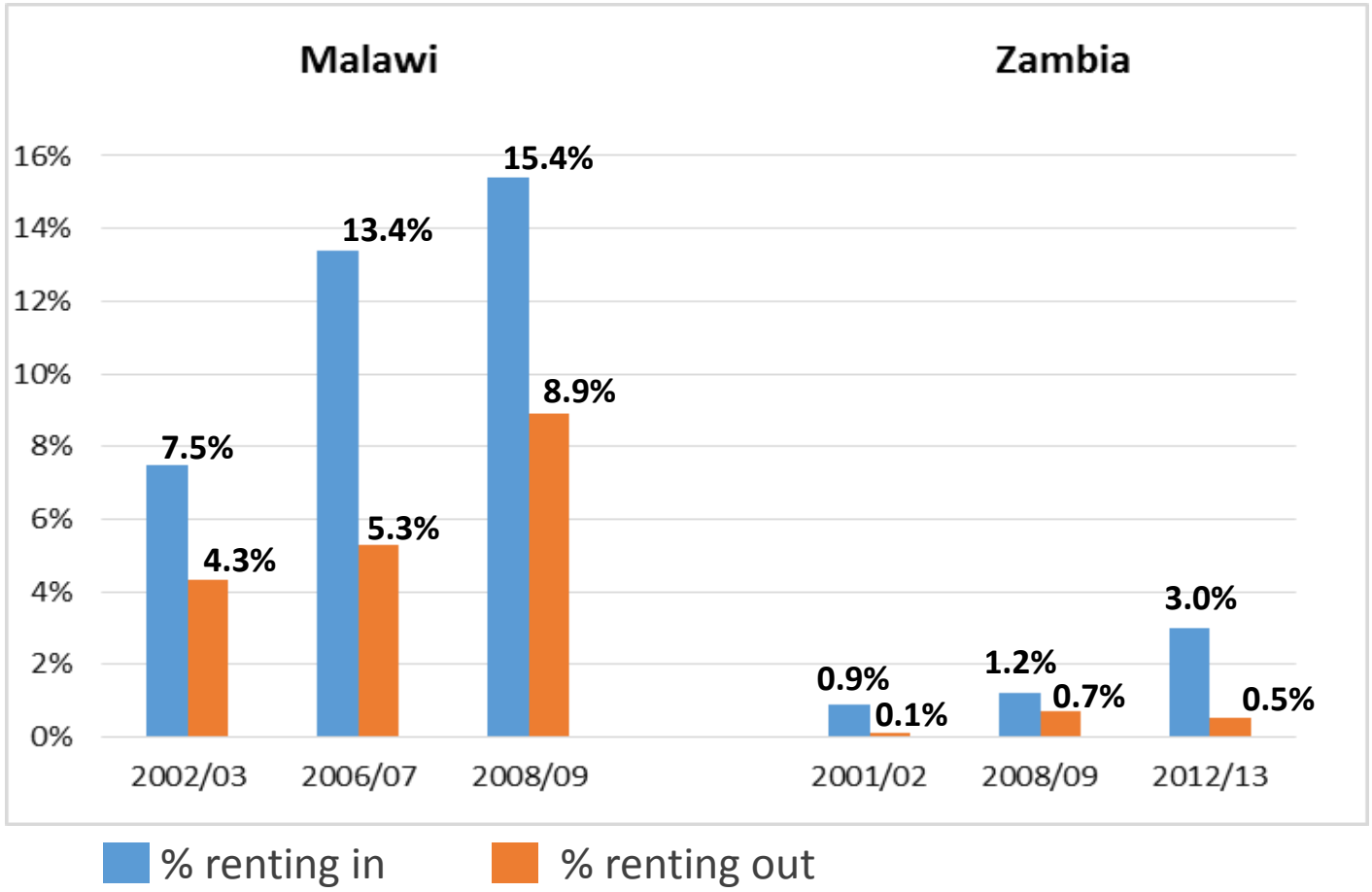
# Data

| Malawi household panel data | Zambia household panel data |
|---|---|
| 3 rounds: 2003/4, 2007, 2009 | 2 rounds: 2001, 2008 |
| 1,375 households in all waves | 3,736 households in both waves |
| Nationally representative | Nationally representative |
| **Geospatial controls (both countries)** | |
| Rural population density | |
| Access to markets | |
| Rainfall | |

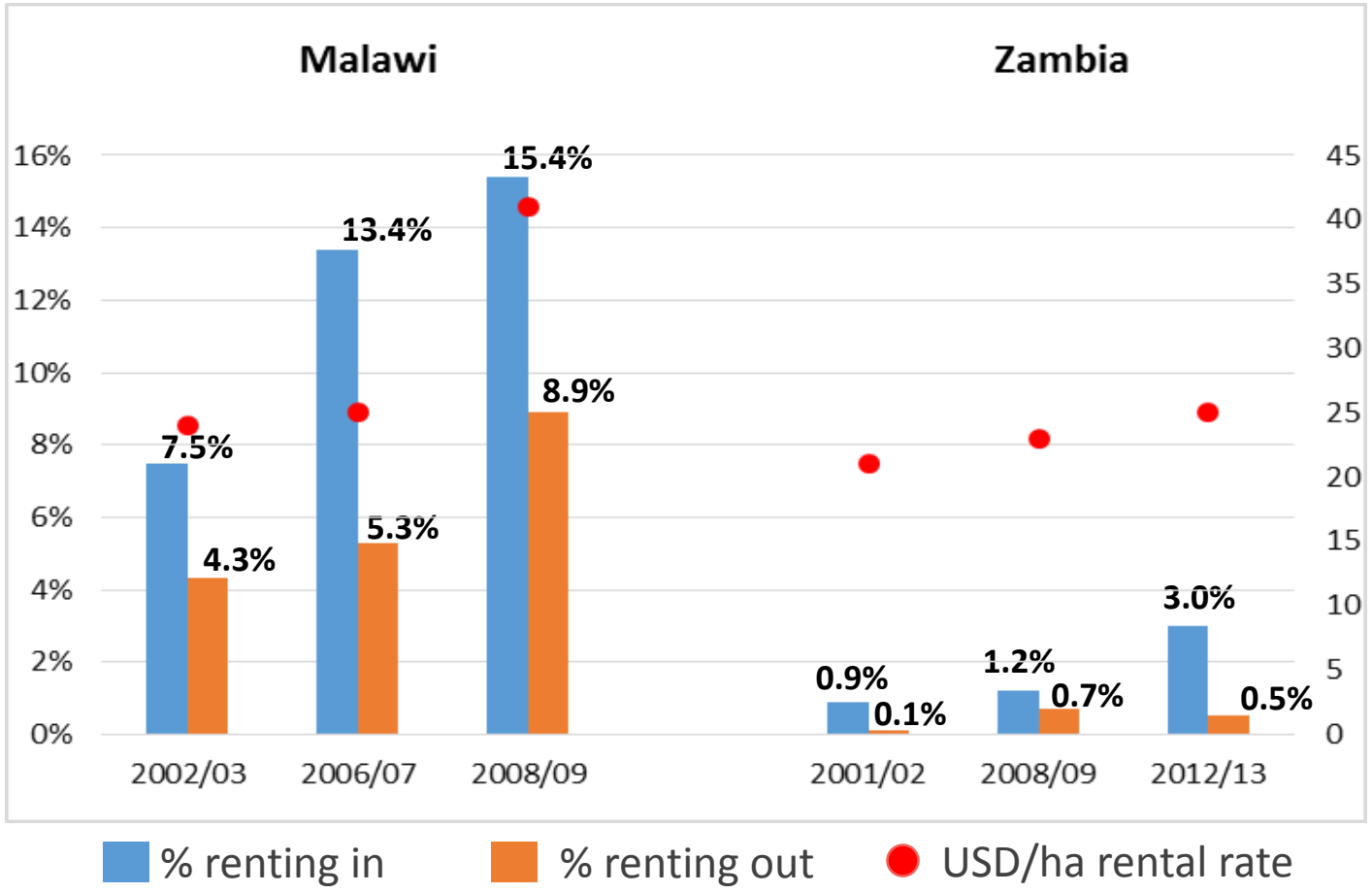
# This presentation

- Motivation
  - Theory
  - Context: Malawi & Zambia
- Study objectives
- Methods
  - Conceptual model
  - Estimation issues
  - Data
- **Results**
- Conclusions and next steps

# Rental status of the sample



# Rental status of the sample



# HH characteristics by rental status

| Tenants | | Landlords |
|---|---|---|
| More education | > | Less education |
| More assets | > | Fewer assets |
| More labor | > | Less labor |
| Less land | < | More land |
| | | |
| Immigrants | ≠ | Local households |

# Determinants of rental market participation: Malawi

Partial effects from ordered probit model

| | (1) Renting in | | | (2) Autarky | | | (3) Renting out | | |
|---|---|---|---|---|---|---|---|---|---|
| | APE | | p-value | APE | | p-value | APE | | p-value |
| Ability | 0.0235 | *** | (0.000) | -0.0101 | *** | (0.000) | -0.0134 | *** | (0.000) |
| Land owned (ha) | -0.0367 | *** | (0.000) | 0.0158 | *** | (0.000) | 0.0209 | *** | (0.000) |
| Adult equiv. | 0.0126 | *** | (0.000) | -0.0054 | *** | (0.000) | -0.0072 | *** | (0.000) |
| Female (=1) | -0.0029 | | (0.684) | 0.0012 | | (0.685) | 0.0016 | | (0.684) |
| Education (yrs) | 0.0046 | *** | (0.000) | -0.0020 | *** | (0.000) | -0.0026 | *** | (0.000) |
| Age of head | -0.0005 | * | (0.072) | 0.0002 | * | (0.085) | 0.0003 | * | (0.068) |
| Assets (USD) | 0.0014 | | (0.671) | -0.0006 | | (0.664) | -0.0008 | | (0.677) |
| Immigrant (=1) | 0.0835 | *** | (0.000) | -0.0519 | *** | (0.000) | -0.0316 | *** | (0.000) |
| Mortality (=1) | 0.0028 | | (0.823) | -0.0012 | | (0.838) | -0.0015 | | (0.812) |
| Matrilineal (=1) | -0.0111 | | (0.263) | 0.0049 | | (0.288) | 0.0062 | | (0.247) |
| Lag. mz price (rainy) | -0.1502 | | (0.542) | 0.0647 | | (0.548) | 0.0855 | | (0.540) |
| Lag. mz price (harv.) | 0.4842 | ** | (0.043) | -0.2085 | ** | (0.047) | -0.2756 | ** | (0.044) |
| Log rainfall | 0.0283 | | (0.523) | -0.0122 | | (0.533) | -0.0161 | | (0.519) |
| Log pop. dens. | 0.0163 | ** | (0.019) | -0.0070 | ** | (0.029) | -0.0093 | ** | (0.015) |
| Km to road | 0.0002 | | (0.208) | -0.0001 | | (0.236) | -0.0001 | | (0.194) |
| Central | 0.0358 | *** | (0.000) | -0.0131 | *** | (0.001) | -0.0228 | *** | (0.002) |
| South | 0.0254 | * | (0.050) | -0.0080 | ** | (0.036) | -0.0174 | * | (0.064) |
| N | 6946 | | | 6946 | | | 6946 | | |

# Determinants of rental market participation: Zambia

Partial effects from ordered probit model

| | (1) Renting in | | (2) Autarky | | (3) Renting out | |
|---|---|---|---|---|---|---|
| | APE | p-value | APE | p-value | APE | p-value |
| Ability | 0.0027 | (0.025)** | -0.0013 | (0.080)* | -0.0014 | (0.020)** |
| Land owned (ha) | -0.0003 | (0.012)** | 0.0002 | (0.023)** | 0.0002 | (0.039)** |
| Adult equivalents | 0.0000 | (0.989) | -0.0000 | (0.989) | -0.0000 | (0.989) |
| Female head | -0.0070 | (0.121) | 0.0034 | (0.126) | 0.0035 | (0.164) |
| Education (years) | -0.0009 | (0.243) | 0.0004 | (0.283) | 0.0004 | (0.236) |
| Prod. assets (ZMW) | 0.0000 | (0.003)*** | -0.0000 | (0.018)** | -0.0000 | (0.014)** |
| Mortality (=1) | 0.0006 | (0.925) | -0.0003 | (0.925) | -0.0003 | (0.926) |
| Matrilineal (=1) | 0.0032 | (0.437) | -0.0016 | (0.449) | -0.0016 | (0.440) |
| Lagged rainfall (mm) | 0.0000 | (0.325) | -0.0000 | (0.324) | -0.0000 | (0.349) |
| Population density | 0.0000 | (0.936) | -0.0000 | (0.935) | -0.0000 | (0.936) |
| Hours to market | -0.0001 | (0.697) | 0.0000 | (0.700) | 0.0000 | (0.697) |
| 2008 | 0.0003 | (0.926) | -0.0001 | (0.926) | -0.0001 | (0.926) |
| N | 6538 | | 6538 | | 6538 | |

# Welfare impacts: Malawi

| | Value of crop production (USD) | | Net crop income (USD) | | Net off-farm income (USD) | | Net total household income (USD) | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Tenant (=1) | 153*** | | 83** | | 272*** | | 286*** | |
| | (0.000) | | (0.014) | | (0.007) | | (0.005) | |
| Landlord (=1) | -70** | | -0.72** | | -174** | | -44 | |
| | (0.032) | | (0.020) | | (0.050) | | (0.403) | |
| Ha rented in | | 432*** | | 227** | | 34 | | 258** |
| | | (0.000) | | (0.025) | | (0.378) | | (0.020) |
| Ha rented out | | -58 | | -100** | | 66 | | -23 |
| | | (0.315) | | (0.026) | | (0.2824) | | (0.788) |

# Welfare impacts: Zambia

| | Value of crop production (USD) | | Net crop income (USD) | | Net off-farm income (USD) | | Net total household income (USD) | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Tenant (=1) | 188** | | 96.16 | | -377 | | -295 | |
| | (0.037) | | (0.120) | | (0.215) | | (0.584) | |
| Landlord (=1) | -52 | | -67 | | 481 | | 541* | |
| | (0.391) | | (0.296) | | (0.156) | | (0.085) | |
| Ha rented in | | 163*** | | 61*** | | -3 | | 192 |
| | | (0.000) | | (0.000) | | (0.977) | | (0.205) |
| Ha rented out | | -7 | | -6 | | 9 | | 34 |
| | | (0.804) | | (0.835) | | (0.908) | | (0.707) |

# Summarizing…

- Land rental markets more active in Mwi than Zmb
  - Likely driven by necessity with much higher PD
  - Market participation growing in both countries
- Land being rented in by smallholders from outside sector
- Mkt participation results very similar in Mwi & Zmb
  - Efficiency gains: more able farmers rent in, less able rent out
  - Equity gains: land-rich rent to land poor, and labor-poor rent to labor-rich

# Summarizing…

- Even with more participation in Malawi, transactions costs are higher in Malawi than in Zambia
  - More participation ≠ lower TCs
- Welfare impacts differ between Malawi & Zambia
  - Malawi:
    - Clear evidence of positive impacts on renting in, on average
    - Small or negative impact from renting out, on average -- potential evidence for distress rentals?
  - Zambia:
    - Smaller or no welfare impacts -- due to lower participation rates?

# Summarizing…

- Even if renting in impacts are positive on average in Malawi, cost of renting and other costs of production are high relative to output

*At the median, rental rates in Malawi equal 1/3 the gross value of production*

- Most returns to renting in captured at top of the distribution
  - Raises questions about who has access to these rental markets & liquidity required for up-front rental arrangements

# Policy recommendations

- Our findings suggest some key policy stances:
  - Focus on creating enabling environment for rental market participation
    - Clarifying rights within customary tenure systems
  - Complementary investments
    - Productivity growth on small farms
    - Welfare investments

# Next steps for this work

- Joint modeling of Mwi & Zmb panel data
  - Pooled panels
- More nuanced view of distributional effects
  - Quantile regression; other ideas?
- Better measures of soil quality
  - May affect land available to rent and thus impacts
- Take a closer look at rental rates
  - Determinants of rental rates over space
- Determinants of rental participation at community level
  - Account for spillovers via spatial econometric model

**Jordan Chamberlin, Michigan State University**

**chamb244@msu.edu**

**Jacob Ricker-Gilbert, Purdue University**

**jrickerg@purdue.edu**