Land Security and Mobility Frictions

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Big Picture

- Process of development is accompanied by a process of structural change and rural-urban migration.
- Yet, in less developed countries this process has been slow.
- This is despite, the large gap in labor productivity and wages between agriculture and non-agriculture
  - ...even after accounting for human capital and other measurement differences (Gollin, Lagakos, and Waugh 2013)
- Why aren't more people moving out of agriculture and into cities in less developed countries?

Motivation

- Many barriers to labor mobility across sectors, occupations, and space.
  - migration restrictions, registration requirements, transport infrastructure, insurance networks, monetary cost, risk, service access, housing
- We instead focus on insecure property rights over farm land as an implicit barrier to sectoral mobility and rural-urban migration.
- Research Question:
  - How much does insecure land tenure vs. other labor mobility frictions account for labor flows across sectors, occupations, and space?

What We Do

- Focus on China: migration restrictions & insecure property rights
- Access to rich household and individual-level panel data from China (2004-2018)
- Build an equilibrium quantitative framework with *frictional sorting* of workers/households across occupations and locations
  - Individual occupational choice as in Roy '51
  - Nests family decision of whether to farm and choice of farm operator $\rightarrow$ selection within the household
  - Insecure family land rights
  - Idiosyncratic barriers to labor mobility
- Disentangle the role of land security and labor mobility barriers and their evolution over time
- Quantify their impact on agricultural productivity and structural change

What We Find

- Mobility cost associated with land insecurity is substantial
  - in magnitude similar to all other labor mobility barriers
- With land security, more than half of village households stop operating farms and agricultural labor productivity increases by 18 percent
- Over time overall mobility cost decreases
  - Mostly accounted from increase in land security (e.g. certification reform)
  - Other labor mobility barriers barely change
- Interaction between land insecurity and misallocation: land security raises the productivity impact of reduced misallocation within agriculture

Related Literature

- Structural transformation and agriculture
  - Gollin-Parente-Rogerson '02 '05 '07, Restuccia-Yang-Zhu '08, Adamopoulos-Restuccia '14, Chen '17, Gottlieb-Grobovsek '19, Ngai-Pissarides-Wang '19, Adamopoulos et al '21, Tian et al '20, Chen '20, Storesletten et al '20
- Structural transformation and migration
  - Bryan-Morten '19, Lagakos et al '20, Schoellman '20, Hamory et al '21
    - Land security and migration: de Janvry et al '15, Giles-Mu '17
- Growth and development in China
  - Brandt-Zhu '10, Song et al '11, Brandt-Tombe-Zhu '13, Chari et al 20'

Institutional Environment in China

- Land rights:
  - Use rights over farmland on an egalitarian basis.
  - Reallocations within villages were common.
  - Limited rentals due to perceived "use it or lose it" practices.
  - Several land tenancy reforms: 1998, 2003, 2013, 2018.

- Migration restrictions:
  - Household registration system (*hukou*).
  - Individuals assigned agricultural or non-agricultural hukou.
  - Easing of restrictions over time, especially for smaller cities.
  - Harder to obtain hukou to larger coastal cities; limited access to education; rising housing prices.

Framework Overview

- General equilibrium model of occupational, sectoral, and spatial selection.
- Individual heterogeneity with respect to ability and idiosyncratic distortions.

- Four key novelties:
  1. Families choose which member operates the farm (if any).
  2. Insecure land rights perceived by families.
  3. Individual-specific sectoral labor mobility barriers.
  4. Allow for part-time work.

Environment

- Two goods produced at each date: agriculture and non-agriculture (numeraire) in two corresponding sectors
- Spatially the economy consists of the rural (villages) and urban areas:
  - villages $\rightarrow$ agriculture (a)
  - urban $\rightarrow$ non-agriculture (n)
- Urban area starts off with a mass of homogeneous households that only work and consume there.
- Village families consist of heterogenous individuals that make occupational and locational choices (focus of model):
  - operate a farm in the village
  - work in agriculture in the village
  - migrate and work in non-agriculture in the urban area

Village Families

- Village families indexed by i
- Each family has J individual members, indexed by $j = 1, ..., J$
- Each family member is endowed with:
  - a farm operating ability s_{ij}
  - a non-agricultural earning ability h_{ij}
- Family-level insecure land rights, $\eta_i \rightarrow$ captures perceived chance of reallocation/expropriation.
- Individual-specific farm distortions, $\tau_{ij} \rightarrow$ captures residual misallocation across farmers.
- Individual-level labor mobility frictions to working in non-agriculture, ξ_{ij}

Preferences & Production

Preferences

- Households have non-homothetic preferences over the agricultural and non-agricultural good $\rightarrow$ generates structural transformation.

Non-Agricultural Production

- Representative firm produces competitively:

$$Y_n = A_n H_n$$

Agricultural Production

- Heterogeneous farms operated by village families using DRTS technologies:

$$y_{ij} = A s_{ij} \left(\ell_{ij}^{\theta} n_{ij}^{1-\theta} \right)^{\gamma}$$

- Family farm's productivity determined by operator's ability s_{ij}.

Land Rights

- Each family is allocated use rights over land $\bar{\ell}$ (egalitarian allocation).
- A farmer can adjust their farm operation by renting-in ($\ell_{ij}^{rent} > 0$) or renting-out ($\ell_{ij}^{rent} < 0$) land, with profits in unfettered land markets:

$$\pi(s_{ij}, \tau_{ij}) = \tau_{ij} p A s_{ij} \left[\left(\bar{\ell} + \ell_{ij}^{rent} \right)^{\theta} n_{ij}^{1-\theta} \right]^{\gamma} - q \left(\bar{\ell} + \ell_{ij}^{rent} \right) - w n_{ij},$$

- However, a land reallocation/expropriation may occur.
  - out-renters: lose rights over the rented-out land thereafter
  - in-renters: receive reallocated land ℓ^* each
- Let η_i be the probability that family i's farm is subject to reallocation/expropriation.

Farm Operator Returns

- Farmers choose ℓ_{ij}^{rent} to maximize expected profits.
- Expected profits if farmer rents-in:

$$\pi_{ij}^{rent-in} \equiv (1-\eta_i)\,\pi(s_{ij},\tau_{ij}) + \eta_i \pi\left(\bar{\ell}+\ell^*, s_{ij}, \tau_{ij}\right)$$

- Expected profits if farmer rents-out:

$$\pi_{ij}^{rent-out} \equiv (1-\eta_i)\,\pi(s_{ij},\tau_{ij}) + \eta_i \pi\left(\bar{\ell}+\ell_{ij}^{rent}, s_{ij}, \tau_{ij}\right) + \eta_i \underbrace{\varphi(q)\ell_{ij}^{rent}}_{income\ loss}$$

- Choice of operator j in family i:

$$\pi_{ij} = \max\left\{\pi_{ij}^{rent-in}, \pi_{ij}^{rent-out}, \pi_{ij}^{no-rent}\right\}$$

Individual Incomes Across Occupations

- full-time family farm operator π_{ij}
- full-time agriculture worker $i_{ij}^{FA} = w$
- full-time non-agricultural worker $i_{ij}^{FN} = w_n h_{ij}(1 - \xi_{ij})$
- part-time worker

$$i_{ij}^{PT} = \underbrace{h_{ij} w_n (1 - \xi_{ij})(1 - c - n_{ij})}_{\text{non-agr. income}} + \underbrace{w \kappa n_{ij}^{\nu}}_{\text{agr. income}}$$

Family Decisions

- If individual j is the farm operator, then household income is

$$I_i(\text{operator} = j) = \pi_{ij} + \sum_{k \neq j} i_{ik} = \pi_{ij} + \sum_{k \neq j} \max\{i_{ij}^{FN}, i_{ij}^{FA}, i_{ij}^{PT}\}$$

- Family chooses operator j that maximizes household income:

$$I_i = \max_{j \in J}\{I_i(\text{operator} = j)\}$$

- Family may choose not to operate a farm
- Household income if not operating a farm:

$$I_i^n = \sum_j \max\{i_{ij}^{FN}, i_{ij}^{FA}, i_{ij}^{PT}\} - \eta_i \varphi(q)\bar{\ell}$$

- Family operates a farm if $I_i \geq I_i^n$

Estimation Strategy

1. Parameterize distributions for sectoral abilities, land market institutions, and labor mobility frictions.

   ▸ Distortions

2. Estimate parameters to match model moments with empirical moments from the survey and aggregate data for China in 2004.

   ▸ Indirect inference

Experiments: Land Security and Labor Mobility

- Disentangle relative importance of land security (η_i) and residual labor mobility barriers (ξ_{ij})
- Counterfactual "Land Security": From benchmark economy, set $\eta_i = 0$ for all i, i.e., eliminate risk of reallocation/expropriation
- Counterfactual "No Labor Barriers": From benchmark economy, set $\xi_{ij} = 0$, no labor mobility barriers

Results: Land Security and Labor Mobility

	Baseline	Land Security	No Labor Barriers
Village families operating farms (%)	71.7	29.3	50.6
Ag. emp. share among villagers (%)	56.6	47.9	40.8
Δ Agricultural labor productivity (%)	–	+18.0	+9.5
Δ Median log farm operator ability (%)	–	+15.6	−9.2
Δ Real GDP per capita (%)	–	+3.0	+1.8
Within-household selection in farming:			
% of farm operators with highest s_{ij}	56.7	64.1	48.5

- Land security η has a substantial impact on the percentage of village families operating farms
  - Data: prevalence of (subsistence) farms that do not sell to the market
  - Land insecurity encourages farm operation to secure the land
- Residual labor mobility barriers have weaker effects on agr. productivity

Evolution of Frictions over Time

Recalibrate to 2018, and feed implied η_i and ξ_{ij} distributions to 2004 economy.

	Baseline	2018 Land Security	2018 Labor Barriers
Village households operating farms (%)	71.6	46.2	75.5
Ag. emp. share among villagers (%)	56.6	51.4	60.9
Δ Agricultural labor productivity (%)	–	+11.0	−2.3
Δ Median log farm operator ability (%)	–	+6.9	+1.6
Δ Real GDP per capita (%)	–	+2.0	−0.3
Within-household selection in farming:			
% of farm operators with highest s_{ij}	56.7	59.8	59.9

- Overall migration cost falls over time
  - mostly from improvement in land security—consistent with land reform
  - "residual" labor mobility barriers barely change

Land Security and Misallocation within Agriculture

	Baseline	Land Security	No Output Wedges	+ Land Security
Δ Agricultural labor productivity (%)	—	+18.0	+266.2	+320.4
Within-household selection in farming:				
% of farm operators with highest s_{ij}	56.7	64.1	75.7	95.0

- Large effects of misallocation within agriculture on agricultural labor productivity
- Land security raises the productivity impact by 1/5: land freed up from "zombie" farms reallocated to more productive farms

Conclusions

- Land insecurity prevalent in developing countries
- Model nesting individual occupational choice with family farming decision
  - highlights the importance of within-family selection
- Estimate model using rich individual- and household-level panel data
- Land insecurity quantitatively as important as all other mobility barriers
- Overall mobility barriers fall over time
  - mostly from improvement in land security associated with land reforms
  - other mobility barriers barely change
- Land security amplifies productivity effect of reduced misallocation, highlighting value of comprehensive reforms

Extensions

1. Rural and Urban Non-agricultural Sectors
   - Motivation: About half leaving agriculture work in rural non-agriculture
   - Value Added: Land insecurity hurts equally non-agricultural employment in rural and urban

2. Age Cohorts
   - Motivation: Old (45+) substantially more engaged as farm operators
   - Value Added: Land insecurity contributes about 40% to age gap in farm operators

3. Regional Heterogeneity
   - Motivation: Peri-urban villages have better access to off-farm opportunities
   - Value Added: Land insecurity less severe in peri-urban than remote villages

Parameterization of Distortions

- Family land insecurity:

$$\eta_i = \frac{\exp(\mu_\eta + \varepsilon_i^\eta)}{1 + \exp(\mu_\eta + \varepsilon_i^\eta)}, \quad \varepsilon_i^\eta \sim \log \mathcal{N}(0, \sigma_\eta)$$

- Individual labor mobility barriers:

$$\xi_{ij} = \frac{\exp(\mu_\xi + \varepsilon_{ij}^\xi)}{1 + \exp(\mu_\xi + \varepsilon_{ij}^\xi)}, \quad \varepsilon_{ij}^\xi \sim \log \mathcal{N}(0, \sigma_\xi)$$

- Distortions bounded between zero and one.

◂ Return

Identification of η_i

Use indirect inference to back out level μ_η and dispersion across HHs σ_η.

- μ_η chosen to match the share of village families that operate farms
- if $\sigma_\eta = 0$ then high non-agricultural ability individuals move out of agriculture and low non-agricultural ability individuals stay in agriculture $\rightarrow$ counterfactually large non-agricultural wage gap between farming and non-farming HHs.
- Choose σ_η to exactly match the non-agricultural wage gap between HHs that operate farms and HHs that do not.

Identification of ξ_{ij}

Use indirect inference to back out level μ_ξ and dispersion across individuals σ_ξ.

- μ_ξ chosen to match difference between farming and non-agricultural wage income.
- Choose σ_ξ to match the correlation of non-agricultural labor supply and wages for part-time workers.

Return