

Growth and Development: Misallocation

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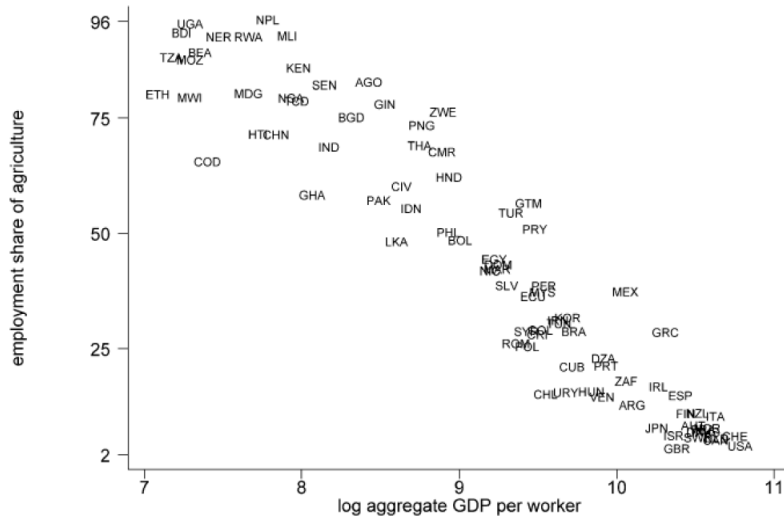
Lecture Notes for PhD Growth and Development (EC8510)

Misallocation Across Sectors/Space?

Rural-Urban Wage Gaps

- ▶ The shift out of agriculture into more “modern” sectors has long been viewed as central to economic development.
- ▶ The share of labor in the agricultural sector correlates strongly with levels of per capita income,
 - ▶ Most workers in the poorest countries work in agriculture while few do in wealthy countries.
- ▶ On average there are substantial wage gaps between agriculture/rural and non-agriculture/urban areas.

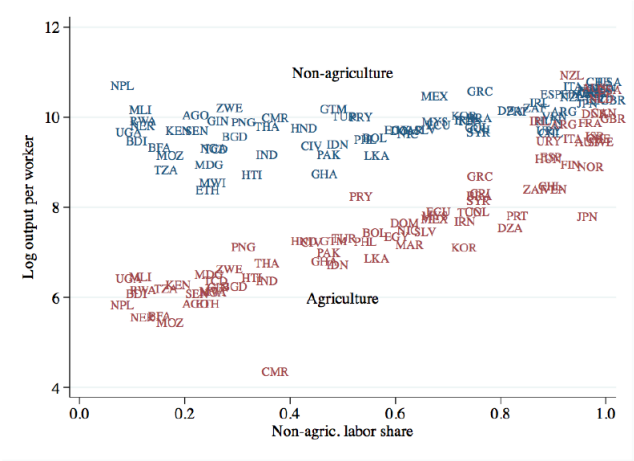
Poor Countries Work in Agriculture



Rural-Urban Wage Gaps

- ▶ Why are there so many people in developing countries working in a sector where they appear to be relatively so unproductive?
- ▶ Ricardian comparative advantage suggests that countries should specialize in sectors that are relatively most productive, compared to the rest of the world.

Agriculture vs. Non-Agricultural Productivity



Rural-Urban Wage Gaps

- ▶ Are these wage gaps *causal*, i.e., workers employed in non-agricultural industries are more productive than the same worker employed in agriculture.
- ▶ Or do they reflect *worker selection*, i.e., differences reflect the fact that workers of varying ability and skill are concentrated in certain sectors.
- ▶ If differences are causal then a rural-urban wage gaps reflect a misallocation of labor across sectors.
- ▶ Policy debate: Should we encourage movement out of agriculture, or target the agricultural sector for investments?
 - ▶ How amenable are frictions to policy?

Gollin, Lagakos, and Waugh (2014)

- ▶ GLW examine labor productivity gaps in non-ag employment vs. ag using a combination of national accounts and repeated cross-sections from micro-data.
- ▶ They define the agricultural productivity gap (APG) to be:

$$APG \equiv \frac{VA_n/L_n}{VA_a/L_a}$$

- ▶ Under some moderately restrictive assumptions, APG should be close to 1
- ▶ A typical developing country has an APG of 4. Some have an APG of 8 or more!
- ▶ Can we trust these highly aggregate numbers?

Measurement Error?

- ▶ Sector differences in hours worked per worker?
 - ▶ Construct measures of hours worked by sector for 51 countries
- ▶ Sector differences in human capital per worker?
 - ▶ Construct measures of human capital for 98 countries
- ▶ Shortcomings of national accounts data?
 - ▶ Use household income/expenditure surveys for 10 countries

Main Results

- ▶ After adjustments, the average APG in developing countries falls from 4 to 2.
- ▶ Gaps are present in micro data and macro data.
- ▶ Needed: better understanding of why residual gaps so large + what are the productivity and welfare gains from moving workers out of subsistence agriculture?

Why are Residual Gaps So Large?

- ▶ Yet more measurement error – [Herrendorf and Schoellman \(2018\)](#)
- ▶ Selection of more productive workers out of agriculture – [Lagakos and Waugh \(2013\)](#), [Young \(2013\)](#), [Hamory et al., \(2020\)](#); [Alvarez, \(2020\)](#)
- ▶ Risk of Migrating – [Lewis, 1954](#); [Harris and Todaro \(1970\)](#), [Bryan et al. \(2014\)](#)
- ▶ Rural amenities – [Munshi and Rosenzweig, 2016](#); [Meghir et al., 2017](#))
- ▶ Urban disamenities (social alienation? crime? pollution? decline in relative social status?) – [Dercon et al. \(2012\)](#); [Bryan and Morten \(2018\)](#); [Lagakos et al., 2017](#)
- ▶ General point: the more important sorting is, the less room there is for “misallocation”. It’s hard to nail the quantitative importance of sorting ([Heckman and Honore, 1990](#))

Open Questions

- ▶ Spatial price differences
 - ▶ $APG > 1$ could reflect lower cost of living ([Chen et al., 2009](#))
 - ▶ In the U.S. more goods are available in U.S. cities – not simply the case that the same basket costs more ([Hanbury and Weinstein, 2014](#))
 - ▶ Is this true in developing countries?

Open Questions

- ▶ Seasonal migration
 - ▶ Bryan et al., (2014) – migration RCT
 - ▶ 30% consumption gains to migration in the “lean season”
 - ▶ Most households don’t send migrant in subsequent year
 - ▶ Lagakos et al., (2020) – structural model of experiment
 - ▶ Seasonal migration acts as an insurance mechanism ([Morten, 2018](#))
 - ▶ If no opportunities available in the village and assets low, migration is valuable
 - ▶ Not about workers being “stuck” in rural areas due to credit constraints
- ▶ Is temporary migration a gateway to more permanent moves? Are there negative effects on urban wages/areas? What’s the role for policy? What is the role of imperfect information?

Open Questions

- ▶ Household decision-making
 - ▶ Most models of migration have unitary households.
 - ▶ In practice, household may send a migrant and keep remaining members of the household in the village
 - ▶ Migration decisions are linked to lifecycle choices like education, marriage, and fertility
 - ▶ Women much less likely to move than man; could be gender-specific frictions to migration
 - ▶ Big picture: what is the role of within-household economics in understanding why gaps persist.

Conclusions

- ▶ In sum,
 - ▶ There are large APGs in most developing countries
 - ▶ There's been a lot of work on understanding what determines these gaps in both macro and micro
 - ▶ Lots of open questions, but the big picture is "what are the frictions that keep people in low-productivity agriculture work?" and "What (if anything) should policymakers do to get households out of subsistence farming?"

An Overview of the Spatial Equilibrium Model

- ▶ There are large differences in income and living standards across space within a country.
- ▶ Is this an equilibrium, or are we out of equilibrium?
 - ▶ If it is an equilibrium, what's driving the difference?
 - ▶ If we're out of equilibrium, what are the frictions and what policies may help to reduce differences.
- ▶ Again: Are gaps *causal* or do gaps reflect *selection*? If causal, how amenable are these gaps to policy intervention?
- ▶ Moretti (2011) "Local Labor Markets", *Handbook of Labor Economics* is a useful start.
- ▶ Moretti and Kline (2014), Greenstone (2017), Redding and Rossi-Hansberg (2017), Diamond and Gaubert (2023) are other very useful references.

An Overview of the Spatial Equilibrium Model

- ▶ Types of research question:
 - ▶ What explains differences in income (other outcomes) across locations?
 - ▶ What happens to welfare/the distribution of welfare when a location gets a productivity shock?
 - ▶ What happens to welfare productivity when we connect places?
- ▶ Workhorse model: Rosen-Roback
 - ▶ We'll work through $n = 2$ case
 - ▶ Extendable to $n > 2$ locations and can be applied to other settings e.g., trade, commuting, etc.

Why Isn't Income Equalized Across Space?

- ▶ People maximize utility, not income
- ▶ Places may have different amenities
- ▶ Places may have different costs of living
- ▶ Places may require different skills
- ▶ People usually differ in the individual preferences for locations (informal risk-sharing, preferences for being close to family, etc.)
- ▶ There may be frictions:
 - ▶ migration costs
 - ▶ trade costs
 - ▶ housing frictions (zoning, geography)
 - ▶ information

Rosen-Roback Model: Exogenous Prices, 2 Locations

- ▶ Assume wages, rents, amenities are exogenous
- ▶ Person i 's indirect utility of being in A:

$$V_A^i = \underbrace{wage_A - rent_A + Amenities_A}_{\text{common to A } (V_A)} + \epsilon_A^i$$

- ▶ Person i 's indirect utility of being in B:

$$V_B^i = \underbrace{wage_B - rent_B + Amenities_B}_{\text{common to B } (V_B)} + \epsilon_B^i$$

- ▶ Common piece + idiosyncratic piece

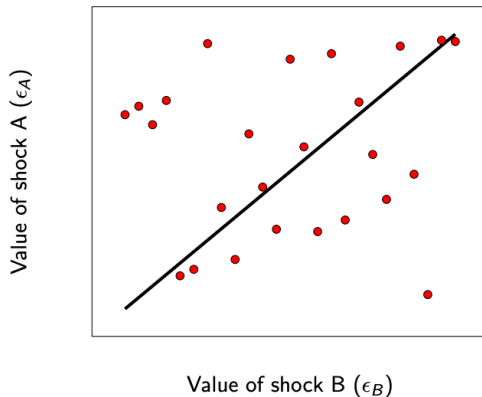
Quick check: If people can freely move, what is equalized across space?

- ▶ Wages?
- ▶ Rents?
- ▶ Observed Utility (i.e., V_A, V_B)?
- ▶ Average Welfare (i.e., $V_A + \epsilon_A, V_B + \epsilon_B$)?

Quick check: If people can freely move, what is equalized across space?

- ▶ Wages?
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- ▶ Observed Utility (i.e., V_A, V_B)?
- ▶ Average Welfare (i.e., $V_A + \epsilon_A, V_B + \epsilon_B$)?
- ▶ Can we be in a spatial equilibrium, even if none of these equalized?

Migration decision: choose location that maximizes utility



Live in A if: $V_A + \epsilon_A > V_B + \epsilon_B$
 $\epsilon_A > \epsilon_B + (V_B - V_A)$

Migration choice – Uniform Distribution Assumption

- ▶ Assume that the difference in shocks is uniform: $\epsilon_B - \epsilon_A \sim U(-S, S)$:

- ▶ Live in A if:

$$V_B - V_A > \epsilon_B - \epsilon_A$$

- ▶ Note the role of S :

- ▶ People are less responsive to differences in indirect utility
 - ▶ Changes labor supply elasticity
 - ▶ Could be thought of as a migration cost.
 - ▶ If S is really dispersed then even if you could earn $10 \times$ more in location A people may choose B .
 - ▶ It could look like people are leaving lots of money on the table.

Spatial Equilibrium: What share of people live in each location?

- ▶ Person i will choose to live in A if:

$$V_A + \epsilon_A^i > V_B + \epsilon_B^i$$

- ▶ Using uniform distribution: $F(X) = \frac{x-a}{b-a}$

$$\begin{aligned} P(\epsilon_B - \epsilon_A < V_A - V_B) &= F_{\epsilon_B - \epsilon_A}(V_A - V_B) \\ &= \frac{V_A - V_B + S}{2S} \\ &= \frac{1}{2} + \frac{V_A - V_B}{2S} \end{aligned}$$

Is this a Spatial Equilibrium?

- ▶ If $V_A > V_B$, more people will live in A than B
- ▶ Despite the different V s, we have a spatial equilibrium.
 - ▶ The marginal migrant (not the average one) is indifferent between A and B .
 - ▶ No one wants to live elsewhere.
- ▶ Note: usually observe equivalent of V_A and V_B , but that's not welfare
 - ▶ Need to account for the idiosyncratic shock, i.e.,
 $E(V_A + \epsilon_A | \text{choose } A)$ vs. $E(V_B + \epsilon_B | \text{choose } B)$
 - ▶ In the simple case this is hard to check since it's defined by the difference in the shock.
 - ▶ Can get this though (e.g., with Frechet), in which case average welfare is equalized across two locations, despite differences in V

Extending to more than 2 locations

► Model generalizes easily by assuming extreme value shocks:

- 1) Gumbel (Type 1): used in many IO and labor models – additively separable, often used for preference shocks,

$$F(x) = e^{-e^{-x+\alpha}}$$
$$\max_i v_i + \epsilon_i \quad \epsilon_i \sim EV1$$

- 2) Frechet (Type 2): used in many trade and migration models; often used for productivity shocks (Eaton and Kortum, 2002)

$$F(x) = e^{-x^{-\theta}}$$
$$\max_i v_i \epsilon_i \quad \epsilon_i \sim EV2$$

Extreme Value Magic

- ▶ Extreme value shocks are commonly used because they have closed form solutions

$$\text{Gumbel} : P(\text{choose } i) = \frac{e^{v_i}}{\sum_i e^{v_i}}$$

$$\text{Frechet} : P(\text{choose } i) = \frac{v_i^\theta}{\sum_i v_i^\theta}$$

- ▶ Can derive these expressions, as well as expected values conditional on choosing i
- ▶ General intuition of the simple model goes through.

Rosen-Roback Model (1979; 1982): Endogenous Prices

- ▶ Baseline assumptions:
 - ▶ Labor is homogenous; each person supplies one unit of labor
 - ▶ Each city produces homogenous good that is freely traded (consumption cost is the same across locations)
 - ▶ Land is the only immobile factor; quantity is fixed
 - ▶ Labor is perfectly mobile
 - ▶ Capital perfectly mobile (or no capital). Gives CRS.
- ▶ Original RR model didn't have individual heterogeneity. Added by Bayer et al., (2007). See Moretti (2011) and Redding and Rossi-Hansberg (2017) for overviews).

RR Model

► Migration driven by 4 factors:

1. Wages

2. Cost of living (rents)

3. Amenities

4. Individual preferences

Definition of a Spatial Equilibrium

- ▶ Given the economic environment (exogenous productivities and amenities), a spatial equilibrium (number of workers, rent, wages) solves the following equations:

- ▶ Labor supply: individuals choose location to maximize utility,

$$\max_d w_d - r_d + A_d + \epsilon_d^i$$

- ▶ Labor demand: firms pay workers their marginal product (here: assume only labor. Equivalent to assuming CRS in capital and labor, with international price of capital)

$$Y_d = X_d N_d$$

$$w_d = X_d$$

- ▶ Housing demand: each worker demands one unit of housing
- ▶ Housing supply: allow housing elasticity k_b

$$r_b = z + k_b N_b$$

Consider a Productivity Increase in Location d

- ▶ Wages increase in d
- ▶ Holding prices constant, more people want to live there
- ▶ If more people move, rents increase
 - ▶ Could easily add other spillovers, e.g., congestion, agglomeration
- ▶ So, not all people move (general eq. change < partial eq. change)
- ▶ End up with a new equilibrium where nobody wants to change location
- ▶ With more than 2 locations you have to simulate out the model (no closed forms).

The Spatial Model in Other Settings

- ▶ Trade: interpret idiosyncratic shock as distribution of productivity for producing different types of goods ([Eaton and Kortum 2002](#))
 - ▶ Under autarky, need to produce everything, even stuff with low productivity draws
 - ▶ Trade allows you to import things you aren't good at: increases average productivity in the economy
- ▶ Sorting on productivity:
 - ▶ Idiosyncratic draw can be your productivity in a location (e.g., [Lagakos and Waugh, 2013](#); [Bryan and Morten, 2019](#))
 - ▶ Delivers Roy model of sorting
- ▶ Include frictions (e.g., goods/people)
 - ▶ Only difference is one more term in the indirect utility function
 - ▶ No migration costs: $V_d = w_d - r_d + A_d$
 - ▶ Migration costs between o, d : $V_{od} = w_d - r_d + A_d - c_{od}$