The Welfare Effects of Encouraging Rural-Urban Migration

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The Context: The Migration Experiment in Rural Bangladesh

The Migration experiment of Bryan, Chowdhury, and Mobarak (2014)

- 100 randomly selected villages in the Rangpur region of Bangladesh. Selected 19 households in each village.
- Villages randomly put into four groups: cash, credit, information, control.

Households in the cash group given 600 Taka ($8.50) conditional on migration. Given 200 Taka if they reported in at the destination. What happened?

- 22% increase in migration in treatment relative to control (58% vs 36%).
- 9% increase in migration in the subsequent year.
- Migrants increased consumption by 10%, OLS.
- *Induced* migrants increased their consumption by 30% relative to the average household. Also known as the "LATE".

What We Do...

Build a spatial incomplete markets model, discipline it using the experiment, then ask questions:

1. What happened in the experiment?

- In bad states of the world, urban migration is relatively more beneficial $\Rightarrow$ migration is insurance.
- And negative selection (LATE $>$ OLS) in the data reveals this.

2. What are the welfare gains from conditional migration subsidies?

- Gains because they target those who need transfers the most, even if tax financed.

3. What is the socially optimal outcome?

- Directly provide insurance with **less** movement of households across locations.

Model

Model: Households and Preferences

Unit mass of households; preferences:

$$\sum_{t=0}^{\infty} \beta^t u(c_t) \bar{u}^{x_t}$$

- $\bar{u}$ is disutility of migration
- $x_t \in \{0, 1\}$, takes on value 1 iff household is "inexperienced at migration" and in the urban area.
- $u(c_t) = \frac{c_t^{1-\alpha}}{1-\alpha}$

Also face additive taste shocks across moving options, which are iid across time and options and drawn from a Type-1 EV distribution with scale parameter σ_ν

Model: Experience

A household is either "experienced" or "inexperienced" at migration.

Experience is acquired by being in the urban area, is lost by being away...

After each period in the urban area,

- Inexperienced households remain so with probability λ, and become experienced with probability $1 - \lambda$,
- Experienced households stay experienced.

After each period in the rural area,

- Experienced households stay experienced with probability π and loose experience with probability $1 - \pi$,
- Inexperienced households stay inexperienced.

Model: Production Technologies and Seasons

One homogenous good produced in both locations and competitive markets. Production technology in rural area:

$$Y_r = A_{ri} N_r^{\phi}$$

where $0 < \phi < 1$; A_{ri} is rural productivity indexed by season i, with $A_{rg} > A_{rl}$

- Deterministic transition: If rural productivity is A_{rg}, then the economy transits to A_{rl} next period.
- Idea: mimic seasonal agricultural crop cycles

Production technology in urban area

$$Y_u = A_u N_u$$

Model: Household Location-Specific Productivity

Each household has permanent productivity types as in Roy (1951)

- z permanent productivity in urban area. $z \sim \text{Pareto}(\theta)$.
- no permanent productivity differences in the rural area.

Each household experiences transitory shocks s that follows an AR(1) process

$$\log s_{t+1} = \rho \log s_t + \epsilon_{t+1} \quad \text{with} \quad \epsilon_{t+1} \sim \mathcal{N}(0, \sigma_s).$$

Household-specific efficiency units of labor in each location:

- s in the rural area.
- zs^{γ} in the urban area.
- γ is affecting relative returns and volatility in different areas.

Model: Options

Households in the rural area can...

1. Work in the rural area.
2. Pay fixed cost m_T, work in the urban area the next period, return to rural.

   This is seasonal migration.
3. Pay fixed cost $m_p > m_T$, move to urban area next period, stay indefinitely.

   This is permanent migration.

Households in the urban area can...

1. Work in the urban area.
2. Pay fixed cost m_p, work in rural area for the indefinite future.

Model: Asset Choices

Households can accumulate a non-state contingent asset, a, with gross rate of return, R. Assets move with the household.

- Asset holdings can not be negative (no borrowing).
- R is exogenous (small open economy).

Who moves? When do they move?

All else equal, seasonal migration more likely:

- In the lean season,
- Among agents with higher z,
- When experienced.

The open question is how migration depends upon:

- The transitory shock, s
- Asset holdings, a.

Model flexible; experimental data disciplines whether e.g. agents migrate when transitory shock and assets are sufficiently high or sufficiently low.

Calibration

Calibration Overview

Parameterize productivity distribution & shocks, pre-assign some values

Remaining parameters picked to minimize distance between model & data

1. Experimental moments: Perform the Bryan et al. (2014) experiment in model.
2. Cross-sectional moments: urban-rural wage gap, rural share, variances of consumption and earnings.

Pre-Assigned Parameters

Pre-Assigned Parameters

Parameter	Value	Source
Time period	Half year	—
Risk aversion, α	2.0	—
Discount factor, β	0.95	—
Gross real interest rate, R	0.95	1/ gross inflation rate
Rural seasonal productivity, A_{rl}/A_{rg}	50% drop in rural inc.	—
Returns to Scale in Rural P.F.	ϕ	AKM (2018) experiment
Seasonal moving costs, m_T	10% of rural consumption	Bryan et al. (2014)
Permanent moving costs, m_p	$2 \times m_T$	–

Parameters to Calibrate

- Productivity urban area: A_u
- Shape parameter, urban permanent productivity: θ
- Standard deviation of transitory shocks: σ_s
- Urban relative risk parameter: γ
- Persistence of transitory shocks: ρ
- Disutility of migration: $\bar{u}$
- Probability of gaining experience: $1 - \lambda$
- Probability of losing experience: $1 - \pi$
- Additive Type-1 EV taste shocks: σ_ν

plus two sources of measurement error. . . to match 11 moments.

Calibration: The BCM (2014) Field Experiment

The BCM (2014) field experiment results / our calibration targets:

- 22% increase in migration in treatment relative to control (58% vs 36%).
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Calibration: Performing the BCM (2014) Experiment in the Model

1. Solve for optimal policies of households when offered m_T, if they move.

- Offer is one-time, unanticipated, no general equilibrium effects.

2. Randomly sample rural households in the stationary distribution consistent with BCM (2014) sample selection...

- Offer households m_T, and follow.
- Compare with the actions of the same households absent the offer.

3. Compute statistics in the model as done with the data.

Moments Targeted in the Estimation

Moments	Data	Model
Control: Variance of rural log consumption growth	0.19 (0.03)	0.19
Control: Percent of rural households with no liquid assets	47 (1.13)	48
Control: Seasonal migration rate	36 (2.64)	36
Control: Share of Repeat Migrants in year 2	68 (0.46)	70
Control: Consumption increase of migrants (OLS)	10 (4.47)	10
Treatment: Seasonal migration relative to control	22 (2.39)	21
Treatment: Seasonal migration relative to control in year 2	9 (2.44)	4
Treatment: Consumption increase of induced migrants (LATE)	30 (9.67)	29
Urban-Rural wage gap	1.89 (0.18)	1.89
Percent in rural area	62 (1.36)	60
Variance of log urban wages	0.56 (0.06)	0.56

Note: The table reports the moments targeted using simulated method of moments, their values in the data and in the model, and the standard errors of the empirical moments.

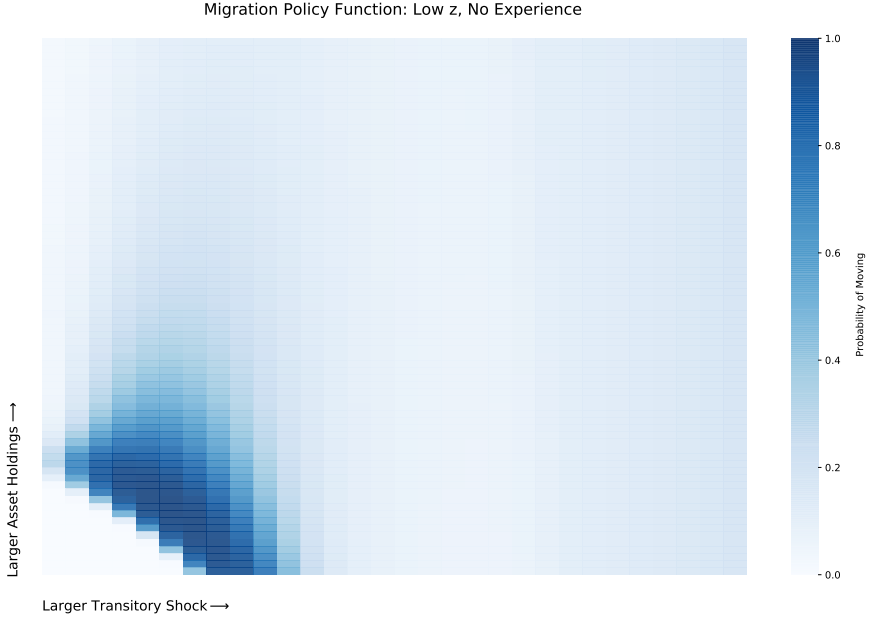
Calibration Results — Parameters

Calibration Results: Parameters

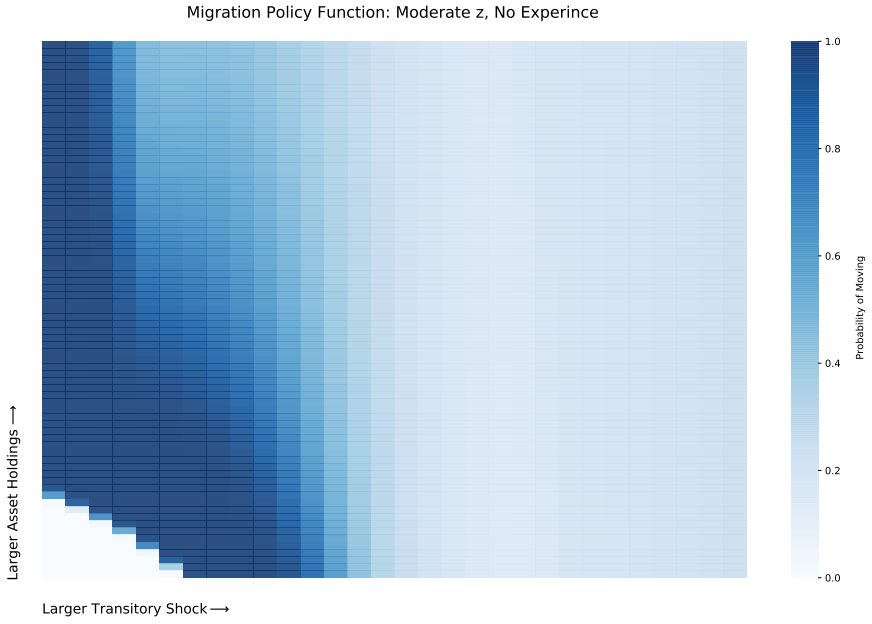
Parameter	Value
Shape parameter, urban talent, $1/\theta$	0.55 [0.42, 0.60]
Migration disutility, $\bar{u}$	1.54 [1.34, 1.90]
Probability gaining experience, λ	0.66 [0.40, 0.90]
Probability losing experience, π	0.60 [0.23, 0.88]
Urban relative shock, γ	0.52 [0.15, 0.85]
Productivity urban area A_u	1.55 [1.40, 1.70]
Standard deviation of transitory shocks	1.30 [0.80, 2.25]
Persistence of transitory shocks	0.75 [0.59, 0.87]
Type-1 EV scale paremeter	0.13 [0.01, 0.21]

Note: The table reports the values of nine jointly estimated parameters and their bootstrapped 95-percent confidence intervals.

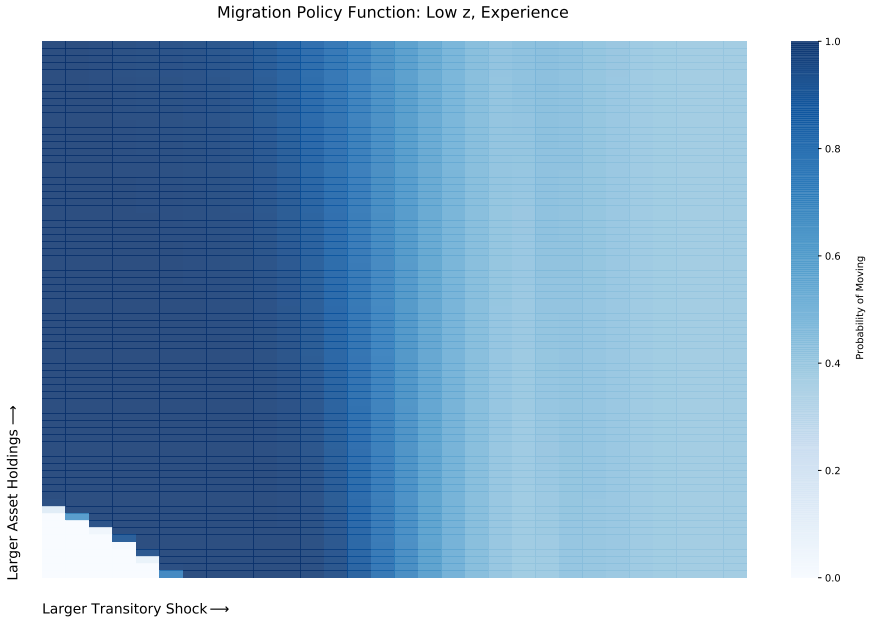
Migration Policy: Low z, Lean Season, No Experience



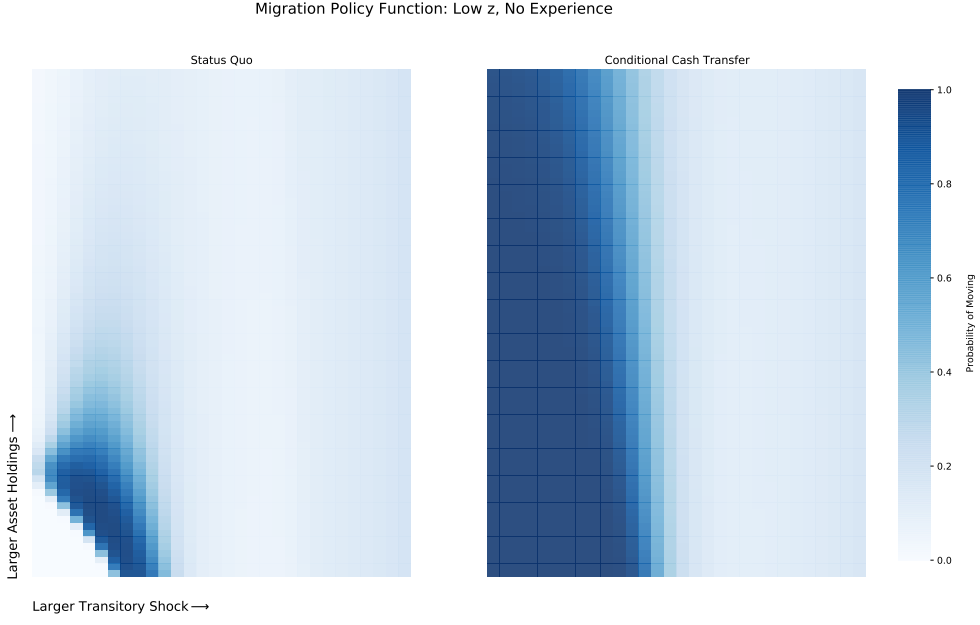
Migration Policy: Moderate z, Lean Season, No Experience



Migration Policy: Low z, Lean Season, Experience



Control vs. Experiment: Low z, Lean Season, No Experience



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Welfare Gains: One-time Partial Equilibrium

Welfare Effects of Conditional Migration Subsidies

		Migration Subsidy, Migration Endogenous		Migration Subsidy, Migration Policy Fixed		Unconditional Transfer, Migration Endogenous	
		Welfare	Migr. Rate	Welfare	Migr. Rate	Welfare	Migr. Rate
Income Quintile	1	1.16	85	0.76	48	1.05	45
	2	0.45	63	0.31	38	0.56	37
	3	0.28	51	0.20	33	0.40	33
	4	0.20	46	0.15	31	0.32	31
	5	0.12	41	0.10	31	0.20	31
Average							
Rural & Access to Subsidy		0.44	57	0.30	36	0.51	35
All Rural		0.22	44	0.15	31	0.25	33

Note: The table reports the lifetime consumption-equivalent welfare gains to rural assets with low assets from one-time conditional migration subsidies and from a one-time unconditional transfer. The rows are for different income quintiles of the rural households eligible for the subsidy, who are those in the bottom half of the rural asset distribution, with 1 being the poorest quintile and 5 being the richest.

Welfare Gains: Permanent, Tax Financed, General Equilibrium

Welfare Effects of Permanent Migration Subsidies

	Migration Fixed No Taxation	Migration Fixed Tax Financed	Migration Endogenous Tax Financed (G.E.)
Rural & Access to Subsidy	**3.00**	**2.00**	**1.50**
All Rural	1.48	1.07	1.55
All Urban	0.11	-0.31	-1.14
All Households	0.93	0.59	0.63
Percent in Rural Area	60	60	66
Percent of Rural Seasonally Migrating	31	31	69
Percent of Rural with Access to Subsidy	50	50	72
Tax Rate (% of labor income)	0	0.40	1.20

Note: The first column reports the effects of permanently offering conditional migration subsidies to rural households with sufficiently low assets, as in the migration experiments, but holding migration policies fixed and without any taxation to pay for the transfers. The second column is the same but financing the migration subsidies through labor taxation. The third column considers the full effects of the migration transfers, where migration responds endogenously and the migration subsides are financed through labor taxation.

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The Planners Problem

Choose migration rates $\mu_{j'j}$ and consumption for all source j and destination j' pairs, states, and dates:

$$\max \sum_{t=0}^{\infty} \sum_{j} \int_{z} \int_{s} \int_{x} \beta^t \left\{ u(c_{j',j}(z,s,x,t),x) + E[\nu \mid \{\mu_{j',j}(z,s,x,t)\}_{j'}] \right\} \lambda_j(z,s,x,t)\ dz\ ds\ dx$$

subject to

feasibility $[\ \chi(\mathrm{t})\ ]$,

law of motion on the probability mass of hh, $\lambda_j(z,s,x,t)$ $[\ \chi_{3\mathrm{j}}(\mathrm{z},\mathrm{s},\mathrm{x},\mathrm{t})\ ]$,

migration probabilities, $\sum_{j'} \mu_{j',j}(z,s,x,t) = 1$, $[\ \chi_{2\mathrm{j}}(\mathrm{z},\mathrm{s},\mathrm{x},\mathrm{t})\ ]$,

and an inital condition, $\lambda_j(z,s,x,0)$.

Proposition 1: Efficient Consumption and Migration Consumption allocations equate the marginal utility of consumption in all locations, productivity and experience states for each date t:

$$u'(t) = u'(c_{j',j}(z,s,x,t)) = u'(c_{\tilde{j}',\tilde{j}}(z,s',x',t)) \quad \forall\ j,\ z,\ s,\ x$$

Migration probabilities $\mu_{j'j}(z,s,x,t)$ satisfy:

$$\exp\left(\frac{-u'(t)\ m_{j',j} + \beta\ \mathbb{E}_{s,x}\left[\chi_{3j'}(z,s,x,t+1)\right]}{\sigma_\nu}\right) \Bigg/ \sum_{j'} \exp\left(\frac{-u'(t)\ m_{j',j} + \beta\ \mathbb{E}_{s,x}\left[\chi_{3j'}(z,s,x,t+1)\right]}{\sigma_\nu}\right),$$

with the multipliers $\chi_{3j'}$ satisfying the following recursive relationship

$$\chi_{3j'}(z,s,x,t+1) = u_{j'}(x,t+1) + u'(t+1)\kappa_{j'}(z,s,x,t+1) + \beta\mathbb{E}\left[\chi_3(z,s,x,t+2)\right],$$

where

$$\kappa_{j'}(z,s',x',t+1) = \mathtt{mpl}_{j'}(z,s',t+1) - c(z,s',x',t+1) - \sum_{j''} m_{j'',j'}\ \mu_{j'',j'}(z,s',x',t+1).$$

The Efficient Allocation in Words

What the planner does:

1. Equate the marginal utility of consumption across locations and states—full risk sharing result.

2. Dynamically move households based on current costs and future net social benefits:

- current costs: the moving costs evaluated at the marginal utility of consumption.
- Future net social benefits:

  how much utility a household gets and their marginal product of labor, net of...

  the consumption cost to provide that utility and cost of moving elsewhere in the future,

  plus the next periods discounted, expected future net social benefits.

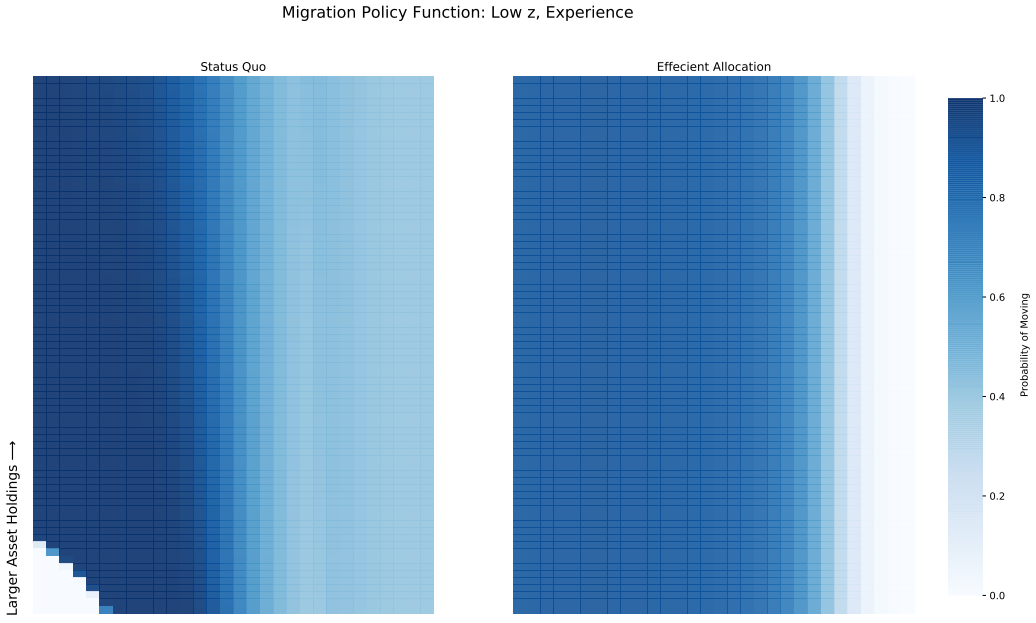
Competitive Equilibrium vs The Social Planner's Allocation

	Competitive Equilibrium	Full Insurance Migration Fixed	Full Insurance Migration Endogenous
Average Welfare Gain (%, Relative to C.E.)	—	46.5	48.0
Percent in Rural Area	60	60	53
Percent of Rural Seasonally Migrating	31	31	27
Rural-Urban Wage Gap	1.88	1.88	1.56

Note: The first column reproduces features of the competitive-equilibrium outcome. The second column reports the welfare gains from moving to an allocation with full consumption insurance but holding migration policies fixed, and features of this allocation. The third column reports the welfare gains from moving to the efficient allocation, with full consumption insurance and allowing for endogenous migration decisions, and features of this allocation.

Status Quo vs. Efficient Migration: Low z, No Experience

Status Quo vs. Efficient Migration: Low z, Experience



Final Thoughts

Big Question: Are people in the wrong place?

The experiment suggest yes (we thought that for years). Plot twist: not really.

The experiment's results are symptomatic of market incompleteness and lack of insurance. Not that "there are people who want to move but can't."

Once you understand this pervious point, the normative implications follow:

- Incentivizing migration provides welfare benefits because it "tags" vulnerable rural households and directs resources toward them.
- But this is a second best intervention. From the planners perspective, the first best intervention is to directly provide insurance with less movement of households across locations.

References I

Bryan, G., S. Chowdhury, and A. M. Mobarak (2014): "Underinvestment in a Profitable Technology: The Case of Seasonal Migration in Bangladesh," *Econometrica*, 82, 1671–1748.