Underinvestment in a Profitable Technology: The Case of Seasonal Migration in Bangladesh

Research by
Gharad Bryan, Shyamal Chowdhury, and Ahmed Mushfiq Mubarak (2014)

*Presentation by*
Sajid Al Sanai
University of Washington

Outline

- Context

- Research Question

- Experiment Design

- Estimation and Results

- Model

- Findings

Bangladesh

- Bangladesh is subdivided (in order of precedence) into:

  - Divisions, districts, sub-districts, and villages

- Rangpur is a division lying in northwest of country

- Accounts for 7% (9.6 million) of national population

- 5.3 million (57%) of people live below the poverty line

- Experiences higher rates of poverty compared to rest of country

- Must regularly cope with pre-harvest seasonal famine known as *monga*
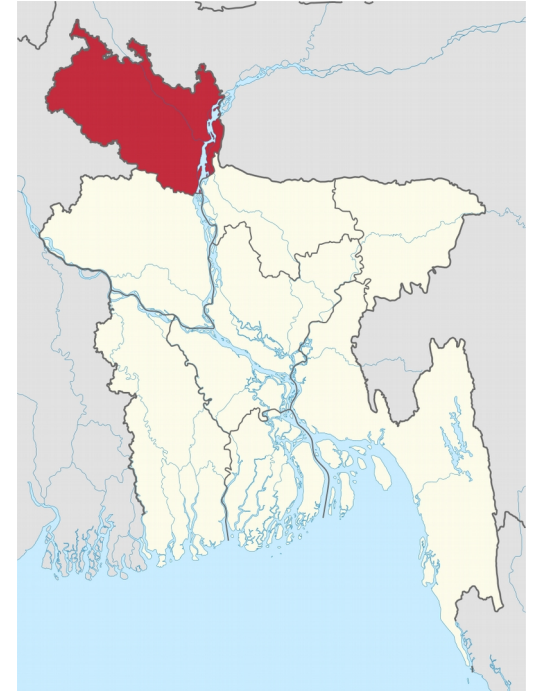
- *Monga* occurs during post-planting and pre-harvest between September-November

- *Amman* rice (staple crop) harvest occurs in December

- Employment opportunities scarce during *monga* in largely agrarian areas

- Similar lean seasons experienced widely throughout South Asia and Sub-Saharan Africa

- During *monga*, households exhibit seasonal patterns of income and spending

  - Seasonality most pronounced in Rangpur out of all divisions in Bangladesh

  - Total household incomes p.c. decrease by 50-60%

  - Total household expenditures p.c. decrease by 15-20%

- Source: HIES (2005)

- Rice prices highly linked to food expenditure p.c. (staple)

- Rice prices rise, with diminishing incomes

- Households while facing higher food expenditure p.c., also reduce rice consumption by 22% in famine

- Erosion of purchasing power drives households below subsistence during *monga*

- Expected detrimental effects

- Source: HIES (2005)
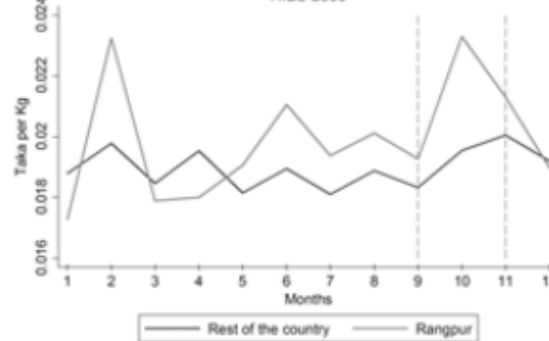

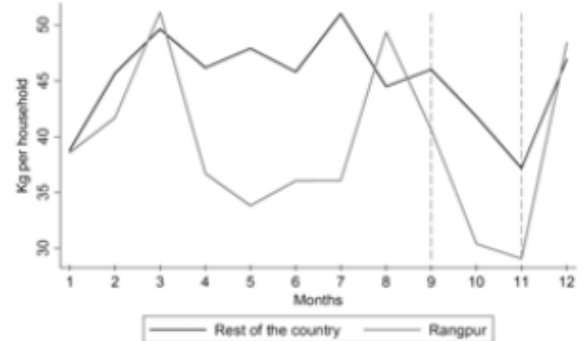Panel A. Seasonality - Total Expenditures per Capita — HIES 2000
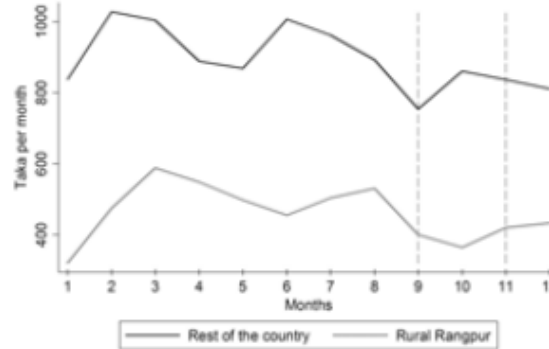
Panel B. Seasonality - Food Expenditure per Capita — HIES 2005
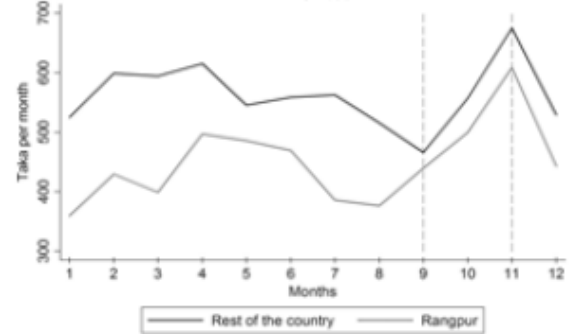
Panel C. Seasonality - Price of Rice — HIES 2005

Panel D. Seasonality - Quantity Rice per Household — HIES 2005

- Question-driven research agenda

- Try to understand how a famine can occur annually despite existence of potential mitigation strategies, through the lens of migration

- Seasonal migration a primary mechanism households use to diversify income sources in India (Bannerjee and Duflo, 2007)

- Puzzle:

  - Seasonal out-migration from *monga*-prone districts in Rangpur low despite absence of local non-farm employment opportunities

  - Inter-regional variation in income and poverty between Rangpur and the rest of Bangladesh are much larger than inter-seasonal within variation

  - Suggests that potential inter-regional arbitrage opportunity for smoothing incomes exists through migration for employment

- Posit that out-migration to urban areas for employment is an underutilised technology

- Technology is developed through migration episodes with the underlying impact of developing networks and local knowledge et cetera

- Offers returns to investment from migratory employment through remittance to origin

- Migration outcomes are uncertain and households are risk-averse

- Fear high cost of failure which may be unlikely

- Posit that alternative technology adoption slow due to:
  - Individual-specific risk
  - Poverty vulnerability

- Leads to low levels of experimentation and diffusion of technologies

- Randomised intervention allowed researchers to generate first experimental estimates of the effects of migration (which they use to build a baseline model)

Experiment Design

- In 2008, two most *monga*-prone districts in Rangpur chosen

  - Kurigram & Lalmonirhat

- From each district, randomly selected 100 villages

- Randomly selected 19 households in each village satisfying the following criteria:

  - Own <50 decimals of land

  - ≥1 household member forced to miss meals in 2007 *monga* season

- 1900 households obtained

- Each of 100 villages are randomly assigned to control and treatment groups

- (19 households in each village all assigned to same group)

- Control – 16 villages

- Treatment

  - Incentivised

    - Cash – 37 villages

    - Credit – 31 villages

    - $8.50 for ticket + $3 on arrival claimed within x days of arrival

  - Non-incentivised

    - Information – 16 villages

Timeline

- Baseline survey – July 2008

- Experiment – August 2008

- Consumption survey:
  - Dec 2008
  - May, Dec 2009

- Migration survey:
  - Dec 2008
  - May, Dec 2009
  - Jul 2011

- Baseline survey
  - Household roster, characteristics, assets, economic activity, production, credit and savings use, consumption, expenditure, previous migration, migration expectations

- Migration survey:
  - Migration episodes, employment, remittance

- Consumption survey:
  - Assets, credit and savings use, economic activity, production, consumption, expenditure

Program Take-Up Rates[a]

	Incentivized	Cash	Credit	Not Incentivized	Info	Control	Diff. (I − NI)
Migration rate in 2008	58.0%	59.0%	56.8%	36.0%	35.9%	36.0%	22.0***
	(1.4)	(1.9)	(2.1)	(2.0)	(2.8)	(2.8)	(2.4)
Migration rate in 2009	46.7%	44.6%	49.1%	37.5%	34.4%	40.5%	9.2***
	(1.4)	(1.9)	(2.1)	(2.0)	(2.8)	(2.9)	(2.5)
Migration rate in 2011[b]	39%			32%			7.0**
	(2.1)			(2.5)			(3.3)

Estimation

$$Y_{ivj} = \alpha + \beta_1 Cash_{ivj} + \beta_2 Credit_{ivj} + \beta_3 Information_{ivj} + \varphi_j + v_{ivj},$$

EFFECTS OF MIGRATION BEFORE DECEMBER 2008 ON CONSUMPTION AMONGST REMAINING HOUSEHOLD MEMBERS[a]

	ITT			ITT	ITT	IV	IV	OLS
	Cash	Credit	Info					
Panel A: 2008 Consumption								
Consumption of food	61.876**	50.044*	15.644	48.642**	44.183*	280.792**	260.139**	102.714***
	(29.048)	(28.099)	(40.177)	(24.139)	(23.926)	(131.954)	(128.053)	(17.147)
Consumption of non-food	34.885***	27.817**	22.843	20.367**	16.726*	115.003**	99.924*	59.085***
	(13.111)	(12.425)	(17.551)	(9.662)	(9.098)	(56.692)	(51.688)	(8.960)
Total consumption	96.566***	76.743**	38.521	68.359**	60.139**	391.193**	355.115**	160.696***
	(34.610)	(33.646)	(50.975)	(30.593)	(29.683)	(169.431)	(158.835)	(22.061)
Total calories (per person per day)	106.819*	93.429	−85.977	142.629***	129.901***	842.673***	757.602***	317.495***
	(62.974)	(59.597)	(76.337)	(47.196)	(48.057)	(248.510)	(250.317)	(41.110)

	ITT			ITT	ITT	IV	IV	OLS
	Cash	Credit	Info	ITT	ITT	IV	IV	OLS
Panel B: 2009 Consumption								
Consumption of food	34.273	22.645	−30.736	43.983**	34.042*	230.811**	186.279*	1.687
	(23.076)	(23.013)	(29.087)	(17.589)	(18.110)	(100.536)	(96.993)	(14.687)
Consumption of non-food	3.792	31.328*	−8.644	21.009*	14.877	110.324*	74.216	6.133
	(16.186)	(18.135)	(20.024)	(11.954)	(12.031)	(65.333)	(63.792)	(10.312)
Total consumption	38.065	53.973	−39.380	64.992***	48.919*	341.135**	260.495**	7.820
	(30.728)	(34.057)	(39.781)	(23.958)	(24.713)	(137.029)	(131.851)	(21.044)
Total calories	83.242	23.995	−81.487	95.621**	78.564*	510.327**	434.602**	20.361
(per person per day)	(52.766)	(62.207)	(60.141)	(39.187)	(40.600)	(221.010)	(216.670)	(28.392)
Controls?	No	No	No	No	Yes	No	Yes	No

Estimation

$$Y_{ivj} = \alpha + \beta Migrant_{ivj} + \theta X_{ivj} + \varphi_j + \upsilon_{ivj},$$

$$Migrant_{ivj} = \lambda + \rho Z_v + \gamma X_{ivj} + \varphi_j + \varepsilon_{ivj},$$

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Controls?	No	No	No	No	Yes	No	Yes	No

- Data of migrant's earnings (non-experimental) and savings collected at the destination

- Incentivised households earned BDT 7451 (~USD 100) on average during *monga* and saved half of it

- Non-incentivised groups earned higher, suggesting they are more experienced and have engaged in this activity prior to the newly induced

MIGRANT EARNINGS AND SAVINGS AT DESTINATION
(DATA FOR MIGRANTS ONLY; NON-EXPERIMENTAL)[a]

	All Migrants	Incentivized	Not Incentivized	Diff.
Total savings by household	3490.47	3506.59	3434.94	71.65
	(97.22)	(110.83)	(202.80)	(232.91)
Total earnings by household	7777.19	7451.27	8894.40	-1443.129^{**}
	(244.77)	(264.99)	(586.14)	(583.83)
Savings per day	56.76	56.46	57.79	-1.33
	(1.15)	(1.29)	(2.56)	(2.77)
Earnings per day	99.39	96.09	111.15	-15.06^{**}
	(1.75)	(1.92)	(4.0)	(4.2)
Remittances per day	18.34	16.94	23.33	-6.39^{**}
	(1.06)	(1.19)	(2.28)	(2.55)
One-way travel cost per episode	264.55	264.12	266.00	-1.88
	(3.41)	(3.80)	(7.62)	(8.16)

Model

$$B(x) = \max_{c \leq x}\left[u(c) + \delta \int_S B(y_S + R(x - c)) \, d\mu(s) \right],$$

$$G(x) = \max_{c \leq x + m}\left[u(c) + \delta \int_S G(y_S + R(x + m - c)) \, d\mu(s) \right].$$

$$V(x) = \max\left\{\max_{c \leq x}\left[u(c) + \delta \int_S V(y_s + R(x-c))\,d\mu(s)\right],\right.$$
$$\left.\pi_G G(x) + (1 - \pi_G)B(x - F)\right\}.$$
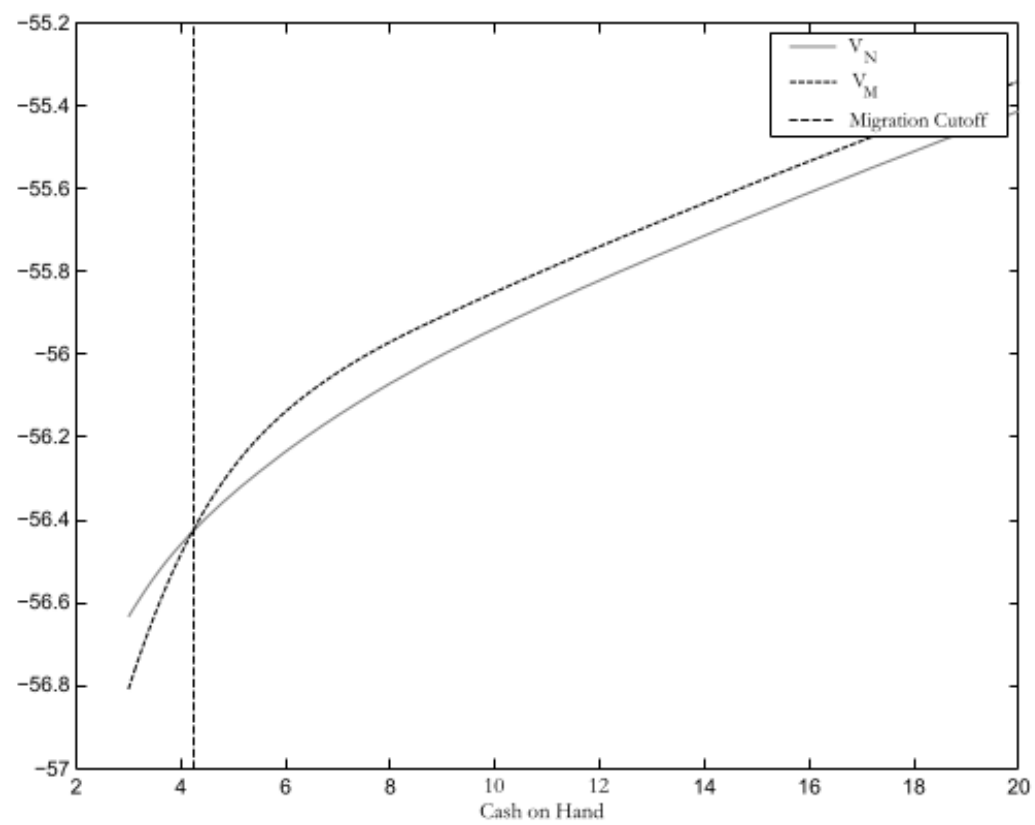
- Calibration yields results that do not match data

  - Simulate for cutoff points for cash and credit

  - Overlay interval on distribution of consumption in control group

  - Region within interval is proportion of control group predicted as induced to migrate

- For risk aversion (1.5), estimates matched data

- However, only the case without forward-looking households and without savings

- (When households are assumed forward-looking and can save, risk aversion needed to be implausibly high to match data)

- Qualitative evaluation of model shows that

    - Risk

    - Subsistence

    - Learning / experience

- … are important explanations of experimental findings

- Income variability found empirically is realised through draws of state-dependent y

    - Absolute deviations of s.d. of consumption between surveys greatly differ

- Background risk motivates buffer stock savings

    - Given households are prudent and impatient, risk of income variability motivates households to engage in buffer stock savings

- Household perception is that migration is risky and behave as if risk averse

    - Experiment repeated in 2011 at time of survey with 33 additional villages

    - Control, Conditional Credit, Unconditional Credit, and Conditional Credit with Bogra Rainfall Insurance

- Excessive rainfall limits employment at destination in rickshaw transport and construction

- The higher the rainfall, the less this treatment group would repay

- If little to no rainfall, the treatment group pays an additional premium

- Basis risk: Probability that income is low at destination while full loan + premium remains payable due to little rainfall

- Treatment group induced to migrate with insurance is decreasing in basis risk

  - Households assigned to Bogra in 2008 30% likelier to migrate with insurance

  - Others are 8.4% more likely to migrate with insurance

  - Those with less asset developed bear greater basis risk

  - Basis risk factors into decision-making

- Learnings from migration are individual-specific

    - Data on social relationships within village collected in baseline survey

    - Upon regressing remigration in 2009 on

        - past migration in 2008

        - no. of friends who migrated

        - no. of family who migrated

    - … latter variables had no significant impact on likelihood of remigration compared to own past migration.

    - People learn from their own experiences but not from those of others

- 60% of 2011 migrants say they returned to same employer at same destination

- Employers have incomplete information on workers

- Asymmetry is cleared in time suggesting migrants build an asset which yields returns

- Difficult for migrants to resolve this uncertainty through learning from others

- Subsistence
    - Daily caloric intake 800-1300 p.c.
    - According to model, households may not migrate when close to subsistence
    - Compared distribution of expenditure against cost of minimum calorie requirement
    - Verifies that high proportion of households in control are close to subsistence
- If households are risk averse to falling below subsistence
    - Those at margin should not be migrating in control group
    - Treatment should have largest effect on households at subsistence

Panel A: Migration Rates and Baseline Subsistence Level (by Treatment Status)
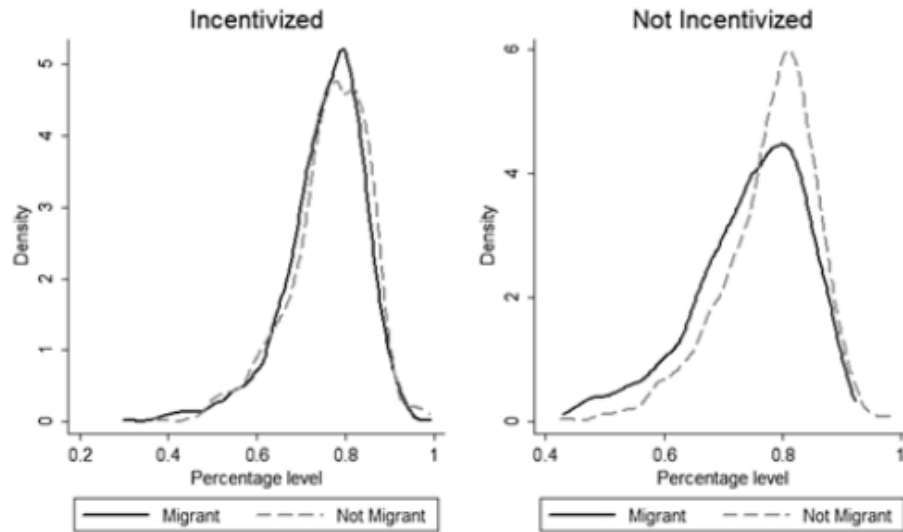
Subsistence is defined as percentage of food expenditures on total expenditures

- Proportion of individuals within calorie intake interval defined as subsistence by treatment group

- Those not incentivised saw a greater proportion of non-migrants

- Those incentivised saw a higher proportion of migrants

Findings

- Small incentive lead to large seasonal migration

- On average, migration was successful

- Households given incentive likelier to remigrate

- Model captured poverty trap where households at margins faced risk of falling below subsistence from migration

- Hesitant to draw policy implications due to limitations of quantitative model

- Unable to explain fully why households choose not to save to migrate

- Migration support programs are helpful to alleviate effects of *monga*

- More cost-effective than on-going food subsidies (current anti-famine tool)

- Microcredit currently focused on entrepreneurial development

- Can be augmented to facilitate spatial and seasonal labour market matching with urban employment opportunities