UNDERINVESTMENT IN A PROFITABLE TECHNOLOGY: THE CASE OF SEASONAL MIGRATION IN BANGLADESH

Gharad Bryan[a] Shyamal Chowdhury [b] Ahmed Mushfiq Mobarak[c]

[a]London School of Economics

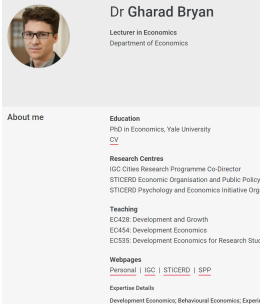
[b]School of Economics, The University of Sydney

[c]Yale School of Management

By Yi Wang, 2022 年 9 月 6 日

Journals and Authors

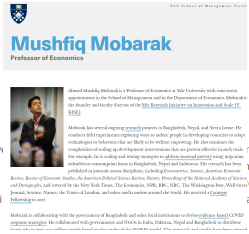
- **Econometrica**, Vol. 82, No. 5 (September, 2014), 1671–1748, 89, 103682.
- https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA10489
- **Authors**:



Shyamal Chowdhury
Research Fellow
University of Sydney
shyamal.chowdhury@sydney.edu.au
External Homepage
CV

Shyamal Chowdhury is an associate professor at the School of Economics, Univ
Policy Research Institute (from 2003-2006), and the World Bank (2006-2007)
Dhaka, Bangladesh with a BSc (Hons.) in Economics, an MA in Economics from
Shyamal specializes in development economics. His current research interests i
development in developing countries.

He joined IZA as a Research Fellow in November 2012.



Overview

Introduction

1. Introduction

- This paper studies the causes and consequences of **internal seasonal migration** in **northwestern Bangladesh**, a region where over 5 million people **live below the poverty line**, and must cope with a **regular pre-harvest seasonal famine**.
- **monga**—**work opportunities** are scarce between planting and harvest in agrarian areas, and **grain prices** rise during this period.
- We explore one obvious **mitigation option**—temporary migration to nearby urban areas that offer better employment opportunities.
- We randomly assign a **cash or credit incentive** (of \$8.50, which covers the round-trip travel cost)
  - We document very **large economic returns to migration**.
  - To explore why people who were induced to migrate by our program were not already migrating despite these high returns, we build a **model with risk aversion, credit constraints, and savings**.

1. Introduction

- **The first part: estimating the returns to migration**
  - Migration induced by our intervention increases **food and non-food expenditures** of migrants' family members remaining at the origin by 30–35%.
  - Improves their **caloric intake** by 550–700 calories per person per day.
  - Households in the treatment areas **re-migrate** at a higher rate in subsequent seasons, even after the incentive is removed.
  - The **migration rate** is 10 percentage points higher in **treatment areas** 1-3 years later.
- However, an important **puzzle**: why did our subjects not already engage in such highly profitable behavior?

1. Introduction

- **The second part: rationalizes the experimental results using a simple benchmark model**
  - Migration is **risky**:
    - Households may fear an unlikely but **disastrous outcome** in which they **pay the cost of moving**.
    - **Return hungry** after **not finding employment** during a period in which their family is already under the threat of famine.
  - Our **grant or loan** of inducing:
    - Lead to long-run benefits where households either **learn how well their skills fare** at the destination.
    - Improve future prospects by **allowing employers to learn about them**.
  - It is important for individuals to experience **migration for themselves**, they cannot learn about returns from others.
  - Experimentation is **deterred** by two key elements**:**
    - Individual-**specific** risk.
    - Individuals are close to **subsistence**, making migration failure very costly. The model is related to the **"poverty as vulnerability"**

1. Introduction

- **The third part**: Return to our **data** to **assess** whether empirical relationships are consistent with some of the **qualitative predictions of the model**.
  - Households that are close to subsistence are the **most responsive to** our intervention.
  - The households induced to migrate by our incentive are **less likely to have pre-existing network connections** at the destination.
  - **Conduct a new round of experiments in 2011** to test further predictions of the model.
    - Migration is **more responsive to** incentives (e.g., credit conditional on migration) than to unconditional credit.

1. Introduction

- **The fourth part: Calibrates the model allowing for buffer stock savings**
  - For reasonable levels of **risk aversion**, very few households that would be induced to migrate by our interventions.
  - Risk aversion required to quantitatively account for our data appears to be **implausibly high**.

1. Introduction

- **Main results:**
  1. **Migration** in this setting is very **profitable**, and in some sense **underutilized**.
  2. Our qualitative exploration of the **model** shows that the three components of **risk**, **incomes close to subsistence**, and **learning about the returns to migration** are important elements in explaining the **low utilization**.
  3. Our quantitative results show that **we do not fully understand** the migration choices of these households:
     - Some departures from full information and rationality
     - Other market imperfections (such as savings constraints).
  4. **Any additional element** that is needed to match the data may **change** the conclusions from our baseline model.

The Context: Rangpur and the Monga Famine

2. The Context: Rangpur and the Monga Famine

- Experiments were conducted in 100 villages in two districts.

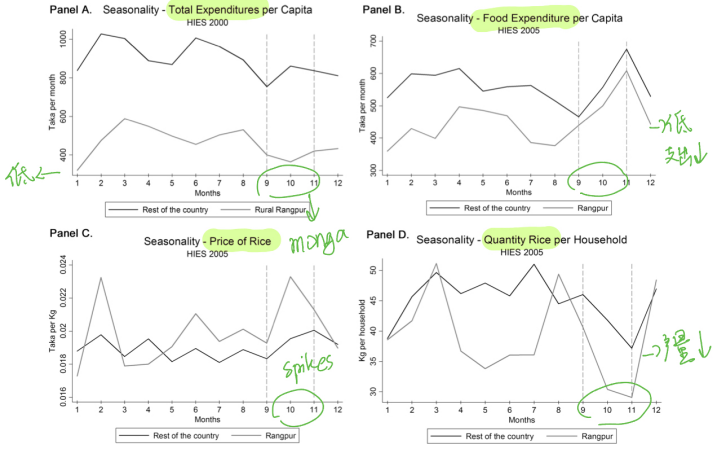


Figure 1.—Seasonality in consumption and price in Rangpur and in other regions of Bangladesh. *Source*: Bangladesh Bureau of Statistics 2005 Household Income and Expenditure Survey.

2. The Context: Rangpur and the Monga Famine

- **Several puzzling stylized facts**:
  - Seasonal out-migration from the monga-prone districts appears to be **low**.
  - **Inter-regional variation** in income and poverty between Rangpur and the rest of Bangladesh have been shown to be much larger than the **inter-seasonal variation** within Rangpur——take advantage of inter-regional arbitrage opportunities (i.e., migration) rather than inter-seasonal variation (e.g., savings, credit)
  - Both government and large NGO monga-mitigation efforts have concentrated on **direct subsidy programs** like free or highly subsidized grain distribution (e.g., "Vulnerable Group Feeding"), or food-for-work and targeted microcredit programs.——**expensive, keep households from engaging in profitable migration**.

The Experiment and the Data Collected

3. The Experiment and the Data Collected

- Randomly selected **100 villages** in these two districts and first conducted a **village census** in each location in **June 2008**.
- Randomly selected **19 households** in each village from the set of households——**(a)** owned less than 50 decimals of land, and **(b)** that a household member was forced to miss meals during the prior (2007) monga season.
- Randomly allocated the 100 villages into four groups: **Cash, Credit, Information, and Control**.

3. The Experiment and the Data Collected

APPENDIX A: Description of 2008 Treatments

Out of the 100 villages selected to participate in the study, 16 (304 households) were assigned to the control group, while the remaining 84 villages (1596 households) were assigned to one of three treatments:

Information (16 villages/304 households): Potential migrants were provided with information on the types of jobs available in each of four areas: Bogra, Dhaka, Munshigonj, and Tangail. In addition, they were told the likelihood of finding such a job, and the average daily wage in each job. This information was provided using the following script:

> "We would like to give you information on job availability, types of jobs available, and approximate wages in four regions—Bogra, Dhaka, Munshigonj, and Tangail. They are not in any particular order. NGOs working in those areas collected this information at the beginning of this month.
> Three most commonly available jobs in Bogra are: (a) rickshaw-pulling, (b) construction work, (c) agricultural labor. The average wage rates per day are Tk. 150 to 200 for rickshaw-pulling, Tk. 120 to 150 for construction work, and Tk. 80 to 100 for agricultural laborer. The likelihood of getting such a job in Bogra is medium (not high/not low).
> Three most commonly available jobs in Dhaka are: (a) rickshaw-pulling, (b) construction work, (c) day labor. The average wage rates per day are Tk. 250 to 300 for rickshaw-pulling, Tk. 200 to 250 for construction work, and Tk. 150 to 200 for day laborer. The likelihood of getting such a job in Dhaka is high.

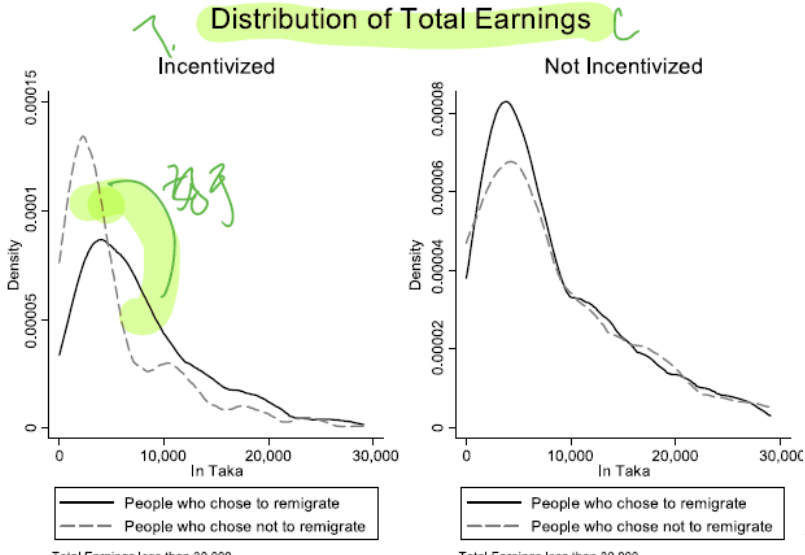
3. The Experiment and the Data Collected

> Three most commonly available jobs in Munshigonj are: (a) rickshaw-pulling, (b) land preparation for potato cultivation, (c) agricultural laborer. The average wage rates per day are Tk. 150 to 200 for rickshaw-pulling, Tk. 150 to 160 for land preparation, and Tk. 150 to 160 for agricultural laborer. The likelihood of getting such a job in Munshigonj is high. Three most commonly available jobs in Tangail are: (a) rickshaw-pulling, (b) construction work, (c) day laborer in brick fields. The average wage rates per day are Tk. 200 to 250 for rickshaw-pulling, Tk. 160 to 180 for construction work, and Tk. 150 to 200 for brick field work. The likelihood of getting such a job in Tangail is medium (not high/not low).
> Based on the above information, would you/any member of your family like to go to any of the above locations during this monga season? If so, where do you want to go? Note that the job market information given above might have changed or may change in the near future and there is no guarantee that you will find a job, and we're just providing you the best information available to us. Note also that we or the NGOs that collected this information will not provide you with any assistance in finding jobs in the destination."

Cash (37 villages/703 households): Households were read the same script on job availability as given above, and were also offered a cash grant of Tk. 600 conditional on migration. This money was provided at the origin prior to migration, and was framed as defraying the travel cost (money for a bus ticket). Migrants had an opportunity to receive Tk. 200 more if they reported to us at the destination.

Credit (31 villages/589 households): Households were read the same script on job availability as given above, and were also offered a zero interest loan of Tk. 600 conditional on migration. This money was provided at the origin prior to migration, and was framed as defraying the travel cost (money for a bus ticket). Migrants had an opportunity to receive Tk. 200 more if they reported to us at the destination. Households were told that they would have to pay back the loan at the end of the monga season.

3. The Experiment and the Data Collected



3. The Experiment and the Data Collected

- **Data**
  - Conducted a baseline survey of the 1900 sample households in **July 2008**, just before the onset of the 2008 monga.
  - Collected follow-up data in **December 2008**, at the end of the 2008 monga season.
  - These two rounds involved detailed consumption modules in addition to data on **income, assets, credit, and savings**. The follow-up also asked detailed questions about **migration experiences** over the previous four months.
  - Conducted a short follow-up survey in **May 2009** to get more complete information about households' migration experiences.
  - Study the longer-run effects of migration, and re-migration behavior during the next monga season, we conducted another follow-up survey in **December 2009**.——consumption module and a migration module.
  - Collected an additional round of follow-up data on the re-migration behavior of this sample in **July 2011**.

3. The Experiment and the Data Collected

TABLE I

Randomization Balance on Observables at Baseline[a]

	Incentivized		Non-Incentivized			
	Cash	Credit	Control	Info	Diff. (I – NI)	*p*-Value
Consumption of food	805.86	813.65	818.68	768.64	15.84	0.638
	(19.16)	(40.91)	(31.76)	(18.00)	(33.57)	
Consumption of non-food	248.98	262.38	248.4	237.35	12.23	0.278
	(5.84)	(6.74)	(9.28)	(7.99)	(11.20)	
Total consumption	1054.83	1076.03	1067.08	1005.99	28.06	0.465
	(21.11)	(42.08)	(34.55)	(22.77)	(38.29)	
Total calories	2081.19	2079.51	2099.3	2021.31	20.25	0.585
(per person per day)	(20.34)	(22.76)	(30.44)	(32.56)	(36.99)	
Calories from protein	45.66	45.3	46.26	44.75	−0.01	0.992
(per person per day)	(0.54)	(0.57)	(0.77)	(0.85)	(0.92)	
Consumption of meat products	25.04	18.24	27.13	20.71	−1.97	0.594
	(2.58)	(2.0)	(3.24)	(2.90)	(3.69)	
Consumption of milk and eggs	11.74	9.77	9.96	10.77	0.48	0.675
	(0.79)	(0.80)	(1.12)	(1.19)	(1.13)	
Consumption of fish	42.17	39.86	41.36	45.98	−2.56	0.496
	(1.83)	(1.79)	(2.76)	(2.89)	(3.74)	
Consumption of children's education	24.14	27.14	22.31	16.95	6.01	0.016**
	(1.75)	(2.31)	(2.34)	(2.1)	(2.44)	
Consumption of clothing and shoes	37.31	38.8	39.24	38.35	−0.80	0.693
	(0.79)	(0.90)	(1.41)	(1.30)	(2.02)	
Consumption of health for male	52.39	52.9	63.72	47.45	−2.86	0.696
	(5.14)	(5.23)	(8.15)	(6.48)	(7.28)	
Consumption of health for female	37.34	52.5	39.36	49.75	−0.31	0.961
	(3.52)	(5.75)	(5.68)	(7.51)	(6.26)	
Total saving in cash	1345.55	1366.37	1418.29	1611.05	−160.56	0.255
(conditional on positive savings)	(97.54)	(121.26)	(135.04)	(185.56)	(140.09)	
HH size	3.93	3.98	3.99	4.05	−0.07	0.473
	(0.05)	(0.05)	(0.08)	(0.08)	(0.10)	
HH head education	0.25	0.24	0.25	0.22	0.01	0.628
1 = Educated	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	
Number of males	1.19	1.22	1.18	1.18	0.03	0.515
Age > 14	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)	
Number of children	1.01	1.05	1.08	1.15	−0.09	0.093
Age < 9	(0.03)	(0.04)	(0.05)	(0.05)	(0.05)	
Household has pucca walls	0.29	0.32	0.27	0.30	0.02	0.55

3. The Experiment and the Data Collected

	Incentivized		Non-Incentivized			
	Cash	Credit	Control	Info	Diff. (I – NI)	*p*-Value
Subjective expectation: Monga occurrence this year	78.79 (0.77)	78.62 (0.88)	78.38 (1.15)	75.72 (1.35)	1.66 (2.32)	0.47
Subjective expectation: Will get social network help in Dhaka	58.53 (1.07)	60.82 (1.21)	58.38 (1.64)	57.40 (1.61)	1.68 (2.04)	0.41
Subjective expectation: Can send remittance from Dhaka	52.53 (1.13)	52.90 (1.25)	52.42 (1.78)	51.15 (1.72)	0.91 (2.40)	0.70
Ratio of food expenditure over total consumption in round 1	0.77 (0.003)	0.75 (0.09)	0.77 (0.01)	0.77 (0.004)	−0.01 (0.01)	0.21
Average skill score received by network	6.53 (0.05)	6.49 (0.27)	6.24 (0.07)	6.20 (0.07)	0.27 (0.23)	0.24
Applied and refused for credit or did not apply because of insufficient collateral	0.03 (0.01)	0.04 (0.004)	0.04 (0.01)	0.04 (0.01)	−0.00 (0.01)	0.75
Received credit from NGO, family and friends, or money lender	0.68 (0.02)	0.65 (0.02)	0.70 (0.03)	0.60 (0.03)	0.02 (0.04)	0.55
Migration to Bogra in round 1	0.11 (0.01)	0.10 (0.01)	0.16 (0.02)	0.12 (0.02)	0.03 (0.03)	0.30

Program Take-up and the Effects of Seasonal Migration

4. Program Take-up and the Effects of Seasonal Migration

1. Document the impact of the incentive on migration during the 2008 monga season, then document the ongoing impact of the incentive on migration in 2009 and 2011.
2. Look at the effect of the treatment on consumption at the origin (both in the short run: 2008, and the long run: 2009).——intent-to-treat (ITT) and local average treatment effect (LATE). Also look at the ongoing impact of the incentives on consumption in 2009.
3. Look at migration income and savings at the destination.

4. Program Take-up and the Effects of Seasonal Migration

4.1. Migration and Re-Migration

- Define a household as having a seasonal migrant if at least one household member migrated away in search of work **between September 2008 and April 2009**.—— All the migration associated with monga.

TABLE II

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)

4. Program Take-up and the Effects of Seasonal Migration

4.1. Migration and Re-Migration

- Two important things from this re-migration behavior:
  1. The propensity to re-migrate absent further inducements serves as a revealed preference indication that **the net benefits from migration were positive** for many, and/or that migrants developed some asset **during the initial experience** that makes future migration a positive expected return activity.
  2. The persistence of re-migration from 2009 to 2011 (with four potential migration seasons in between) suggests that **households learned something valuable or grew some real asset from the initial migration experience**. This persistence makes it unlikely that some households simply got lucky one year.

4. Program Take-up and the Effects of Seasonal Migration

- **4.2. Effects of Migration on Consumption at the Origin**
  - Study the effects of **migration on consumption expenditures** amongst **remaining household members** during the monga season.
  - Our consumption data are detailed and comprehensive: we collect expenditures on 318 different food (255) and non-food (63) items (mostly over a week recall, and some less-frequently-purchased items over bi-weekly or monthly recall), and aggregate up to create measures of **food and non-food consumption** and **caloric intake**.

4. Program Take-up and the Effects of Seasonal Migration

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

where Y_{ivj} is per capita consumption (money spent on food, non-food, total calories, protein, meat, education, etc. in turn) for household i in village v in subdistrict j in 2008, and φ_j are fixed effects for subdistricts. Standard errors are clustered by village, which was the unit of randomization (and this will be true for all our analysis). The first three columns in Table III show $\hat{\beta}_1$, $\hat{\beta}_2$, and $\hat{\beta}_3$—the coefficients on cash, credit, and information—and each row represents a different regression on a different dependent variable. Panel A studies

4. Program Take-up and the Effects of Seasonal Migration

TABLE III

Effects of Migration Before December 2008 on Consumption Amongst Remaining Household Members[a]

	ITT			ITT	ITT	IV	IV	OLS	Mean
	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***	726.80
	(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***	274.46
	(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***	1000.87
	(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***	2090.26
	(62.974)	(59.597)	(76.337)	(47.196)	(48.057)	(248.510)	(250.317)	(41.110)	

(*Continues*)

TABLE III—*Continued*

	ITT			ITT	ITT	IV	IV	OLS	Mean
	Cash	Credit	Info						
Panel B: 2009 Consumption									
Consumption of food	34.273	22.645	−30.736	−43.983**	34.042*	230.811**	186.279*	1.687	872.69
	(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	323.31
	(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	1196.01
	(30.728)	(34.057)	(39.781)	(23.838)	(24.713)	(134.029)	(131.851)	(21.044)	
Total calories (per person per day)	83.242	23.995	−81.487	95.621**	78.564*	510.327**	434.602**	20.361	2001.27
	(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	

4. Program Take-up and the Effects of Seasonal Migration

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

where $Migrant_{ivj}$ is a binary variable equal to 1 if at least one member of household migrated during monga in 2008 and 0 otherwise, and X_{ivj} is a vector of household characteristics at baseline that we sometime control for. The endogenous choice to migrate is instrumented with whether or not a household was randomly placed in the incentive group:

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

where the set of instruments Z_v includes indicators for the random assignment at the village level into one of the treatment (cash or credit) or control groups.

4. Program Take-up and the Effects of Seasonal Migration

TABLE A.I

First-Stage: Migration as a Function of Treatments in 2008[a]

	Migration in 2008	
Cash	0.169***	0.178***
	(0.045)	(0.044)
Credit	0.164***	0.165***
	(0.044)	(0.044)
Info	−0.012	−0.000
	(0.044)	(0.044)
Sub-district fixed effects?	Yes	Yes
Additional controls?	No	Yes
Observations	1868	1824
R-squared	0.101	0.145
1st *F*-test	12.74	12.58
1st *p*-value	0.000	0.000
1st partial R2	0.027	0.028

Verify that the random assignments to cash or credit treatments are **powerful predictors** of the decision to migrate.

4. Program Take-up and the Effects of Seasonal Migration

TABLE A.II

Intensive and Extensive Margin Changes Due to Incentive (Cash or Credit)[a]

	2008	2009	2011
Total number of migration episodes per household	0.385***	0.186***	0.019
	(0.070)	(0.071)	(0.026)
Total number of migrants per household	0.190***	0.074**	0.071*
	(0.034)	(0.035)	(0.036)
Changes on Intensive Margin			
Total number of migration episodes per household (among migrant households)	0.111	0.110	−0.001
	(0.104)	(0.069)	(0.053)
Total number of migrants per household (among migrant households)	−0.017	−0.009	0.015
	(0.023)	(0.018)	(0.015)
Total number of episodes per migrant	0.127	0.110	−0.021
	(0.097)	(0.067)	(0.041)
Days away per migrant per episode	−11.722**	−2.705	3.336**
	(5.283)	(3.987)	(1.432)
Male	0.016	−0.004	−0.010**
	(0.015)	(0.007)	(0.004)
Age	2.625**	0.128	−0.153
	(1.106)	(1.012)	(0.832)
Migrant is head of household	0.070**	−0.027	−0.004
	(0.032)	(0.028)	(0.019)

4. Program Take-up and the Effects of Seasonal Migration

- The treatment does not significantly alter whether the household sends a male or female migrant, or the number of trips per migrant, or the number of migrants or trips per household (on the intensive margin, conditional on someone in the household migrating once).
- The effects are **concentrated on the extensive margin**, inducing **migration among households who were previously not migrating at all**.

4. Program Take-up and the Effects of Seasonal Migration

- **4.3 Income and Savings at the Destination**
- Migrants in the treatment group earn about $105 (7451 Taka) on average and save about half of that.

TABLE IV

Migrant Earnings and Savings at Destination
(Data for Migrants Only; Non-Experimental)[a]

	All Migrants	Incentivized	Not Incentivized	Diff.	Observations
Total savings by household	3490.47	3506.59	3434.94	71.65	951
	(97.22)	(110.83)	(202.80)	(232.91)	
Total earnings by household	7777.19	7451.27	8894.40	−1443.129**	952
	(244.77)	(264.99)	(586.14)	(583.83)	
Savings per day	56.76	56.46	57.79	−1.33	905
	(1.15)	(1.29)	(2.56)	(2.77)	
Earnings per day	99.39	96.09	111.15	−15.06**	926
	(1.75)	(1.92)	(4.0)	(4.2)	
Remittances per day	18.34	16.94	23.33	−6.39**	927
	(1.06)	(1.19)	(2.28)	(2.55)	
One-way travel cost per episode	264.55	264.12	266.00	−1.88	953
	(3.41)	(3.80)	(7.62)	(8.16)	

Theory

5. Theory

The model we provide emphasizes three key elements: **risk, subsistence, and learning about the profitability of migration**. These elements help to explain why a household would **not migrate despite positive returns**, and also the **strong re-migration rates**. Further, our model also incorporates the empirically realistic assumptions that households **face credit constraints and can save, both for migration and to buffer against income shocks**.

5. Theory

5.1. Baseline Model

We consider the migration and consumption choices of an infinitely lived household in discrete time. In each time period, a state of the world $s \in S$ is drawn according to the distribution μ and the household receives income y_s.[19] We refer to this as background income and assume the process is independent and identically distributed (i.i.d.).[20] A household that enters the period with assets A and receives background income y has cash on hand $x = A + y$. We assume that the household can save at a gross interest rate R, but cannot borrow for consumption purposes.[21] Therefore, consumption is less than cash on hand ($c \leq x$) in any period.

The household faces uncertainty. With probability π_G the household is type G—good at migrating—and receives a positive (net) return to migrating of m. With probability $(1 - \pi_G)$ the household is type B—bad at migrating—and receives no return to migrating, but faces a cost F if it does choose to migrate.

5. Theory

5.1. Baseline Model

We are interested in the behavior of a household that has never migrated before.

A household that knows it is bad at migrating will never migrate and is essentially a Deaton (1991) buffer stock saver. With cash on hand x, such a household solves

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

where u is a standard strictly increasing, strictly concave utility function and δ is the household's discount factor. A household that knows it is good at migrating will always migrate and solves a similar problem, but with a higher income. With cash on hand x, a household that is a good migrator has value

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

With this formulation, we are assuming that the household can migrate before it makes its consumption decision; this means that a household that knows it is a good migrator can always migrate regardless of credit constraints.

5. Theory

5.1. Baseline Model

consumption/savings. If it migrates, it discovers that it is a good migrator with probability π_G and has value $G(x)$. If, however, the household migrates and discovers that it is a bad migrator, then it has paid a cost F and receives value $B(x-F)$. We think of the cost F as being the cost of transport and lost income while the migrator searches for work. The household will choose to migrate if the expected utility of migration is greater than that of not migrating. Therefore, a household that has never migrated before, and has cash on hand x, solves

$$V(x) = \max\left\{\max_{c\leq x}\left[u(c) + \delta\int_S V\big(y_s + R(x-c)\big)\,d\mu(s)\right],\right.$$
$$\left.\pi_G G(x) + (1-\pi_G)B(x-F)\right\}.$$

5. Theory

5.1. Baseline Model

The model is a simple combination of well-known models, we provide only a brief description of its main implications; a longer discussion can be found in Appendix B.

Throughout our discussion, we assume that the household faces a subsistence constraint. We model this by assuming that $u(c) = \tilde{u}(c - s)$ with $\lim_{x\to 0} \tilde{u}'(x) = \infty$, $\lim_{x\to 0} \tilde{u}(x) = -\infty$, and $\lim_{x\to 0} \frac{\tilde{u}''(x)}{\tilde{u}'(x)} = \infty$. That is, there is a level of consumption s at which the household is unwilling to consider decreasing consumption for any reason, and the household becomes infinitely risk averse. We think of s as a point at which survival requires the household to spend all its current resources on food, with the implication that household members face a threat of serious illness or death if they do not consume at least s. The possibility that consumption is close to this point in our data is highlighted by the fact that the monga famine regularly claims lives. We also show below that many households' expenditure seems to fall below what would be required for a minimal subsistence diet. We believe it reasonable to assume that a household that has such a low consumption level would not be willing to take on any risk. For our simulations, we use a fairly standard utility function that incorporates a subsistence point: $u(c) = \frac{(c-s)^{1-\sigma}}{1-\sigma}$.

Qualitative Evaluation of the Model's Assumptions and Central Implications

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

Provide some **descriptive and some experimental evidence** in favor of the main assumptions and implications of the **model**.

Our aim is to **show that risk, subsistence, and learningexperience are important explanations** of our experimental findings.

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

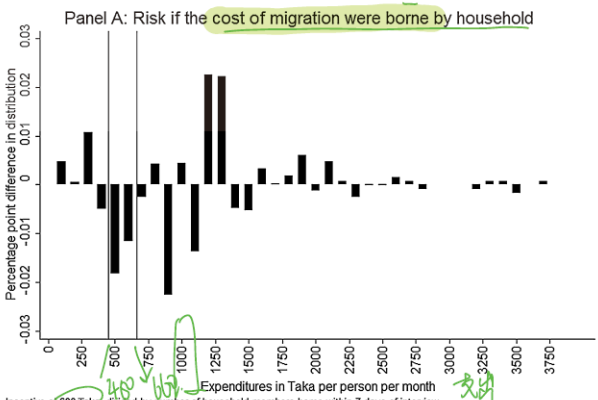
- **6.1. Descriptive Evidence on Income Variability and Buffering**
  - **Two pieces of evidence in favor of income variability**:
    Our consumption data show a great deal of variability.
    High income-variability should lead to buffer stock savings.
  - Our model also suggests, given the assumption of a subsistence constraint, that **households close to subsistence** should hold very little savings.

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.2. Descriptive and Experimental Evidence on Migration Risk**
  - Our model assumes both that migration is risky, and that risk takes a particular form: risk is assumed to be idiosyncratic. We begin by discussing evidence on migration risk.

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.2. Descriptive and Experimental Evidence on Migration Risk**



6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.2. Descriptive and Experimental Evidence on Migration Risk**
  - We subtract the histogram for distribution of consumption in the control (non-incentive) villages from this histogram for the distribution of consumption in the treatment (incentive) villages, less the value of the migration incentive paid out.
  - The results show significant amounts of risk.
  - Those that are close to subsistence in the data are less likely to **have savings**, suggesting that they would not be able to spread the cost of migration over time and further suggesting that the choice to **migrate is associated with a risk of a very bad outcome**.

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.2. Descriptive and Experimental Evidence on Migration Risk**

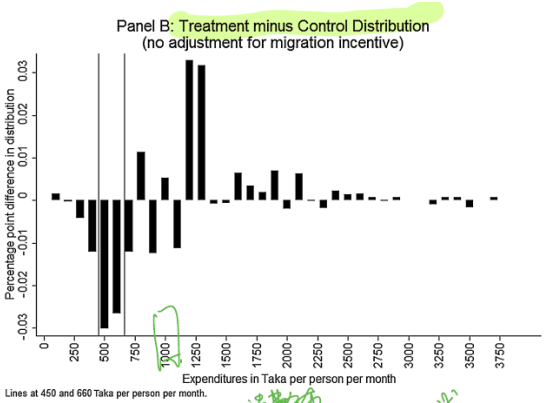


FIGURE 3.—Distribution of consumption in control villages subtracted from distribution of consumption in treatment villages.

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.2. Descriptive and Experimental Evidence on Migration Risk**
  - **The risk all but disappears when** we account for the **incentive** and suggests that households at greatest risk were the ones induced to migrate by our incentive, a result we will explore more precisely below.

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.2. Descriptive and Experimental Evidence on Migration Risk**
- Households that had a **pre-existing affinity** to Bogra face lower basis risk than others.

TABLE V

TREATMENT EFFECTS IN 2011 ACCOUNTING FOR BASIS RISK IN THE INSURANCE PROGRAM[a]

Bogra Variable:	Assigned to Travel to Bogra		Went to Bogra Before 2008
Dep. Var.: Migrated in 2011	Full Sample	Full Sample	Full Sample
Impure control	0.064	0.043	0.045
	(0.048)	(0.046)	(0.045)
Conditional credit	0.156**	0.191**	0.162**
	(0.077)	(0.093)	(0.074)
Rainfall insurance	0.139**	0.084	0.143**
	(0.056)	(0.065)	(0.055)
Unconditional credit	0.009	0.080	0.110*
	(0.065)	(0.075)	(0.065)
Bogra		−0.096	0.142**
		(0.087)	(0.065)
Bogra × Rain insurance		0.216	0.122
		(0.136)	(0.115)
Constant	0.214***	0.200***	0.198***
	(0.064)	(0.071)	(0.062)
Observations	2051	1569	2050
R-squared	0.041	0.051	0.055
District fixed effects?	Yes	Yes	Yes
Mean of assigned to Bogra	0.0835		
p-value for F-test:			

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.3. Learning and Idiosyncratic Risk**
- 6.3.1 Is Risk Idiosyncratic in This Setting?

We next examine the determinants of 2009 re-migration to study directly whether households are able to learn from others. As discussed above, our 2008 experiments contained several subtreatments where additional conditions were imposed: some households were required to migrate to specific destinations, some were required to form groups, etc. This variation is within village and implies that we have exogenous variation in the number of a household's friends that migrated. We also collected data at baseline on social relationships between all our sample households to identify friends and relatives within the village. To test for learning from others, we run regressions of the form

$$y_i = \alpha + \beta M_i + \gamma F_i + \epsilon_i,$$

where y_i is an indicator for second-round migration, M_i is an indicator for first-round migration, and F_i is a measure of how many of a household's friends migrated. We instrument M_i and F_i with all our treatments (incentives and conditions on the migrant, and incentives and conditions on his friends), and report OLS and IV results in Table VI. If there is learning from others, we expect to see $\hat{\gamma} > 0$, because of the strong positive returns to migration. Ta-

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.3. Learning and Idiosyncratic Risk**
- 6.3.1 Is Risk Idiosyncratic in This Setting?

TABLE VI

Learning From Own Experience and Others' Experiences in 2009 Re-Migration Decision[a]

Dep. Var.: Migration in 2009	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Did any member of the household migrate in 2008?	0.392*** (0.02)	0.410*** (0.145)	0.392*** (0.02)	0.486*** (0.136)	0.393*** (0.021)	0.436*** (0.132)	0.392*** (0.02)	0.476*** (0.13)
Number of friends and relatives who migrated			0.007 (0.01)	−0.001 (0.025)				
Number of friends who migrated					−0.012 (0.025)	−0.048 (0.049)		
Number of relatives who migrated							0.01 (0.011)	0.007 (0.027)
Constant	0.097*** (0.037)	0.088 (0.083)	0.095** (0.038)	0.050 (0.080)	0.098*** (0.037)	0.078 (0.076)	0.095** (0.038)	0.052 (0.077)
Observations	1818	1818	1818	1818	1797	1797	1797	1797
R-squared	0.207	0.206	0.207	0.198	0.208	0.206	0.209	0.202

[a] *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses.

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.3. Learning and Idiosyncratic Risk**
- 6.3.1 Is Risk Idiosyncratic in This Setting?
- Our treatment induced migrants among those that had not already determined their status, as implied by the model.

TABLE VII

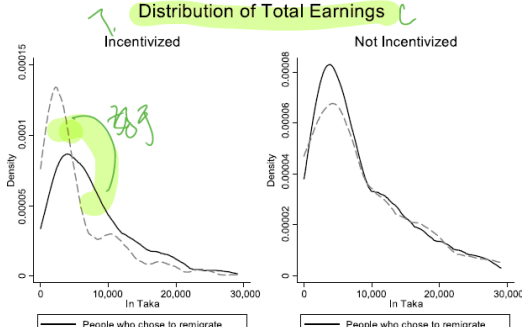
DIFFERENCES IN CHARACTERISTICS BETWEEN MIGRANTS IN TREATMENT AND IN CONTROL GROUP[a]

	Incentive	Non-Incentive	Diff.
Panel A: Percentage of Migrants That Know Someone at Destination			
First episode	47%	64%	17***
	(1.84)	(3.30)	(3.8)
Any episode	57%	66%	8.3**
	(1.83)	(3.63)	(3.82)
Panel B: Percentage of Migrants That Had a Job Lead at Destination			
First episode	27%	44%	17***
	(1.64)	(3.41)	(3.55)
Any episode	32%	46%	14.5***
	(1.72)	(3.43)	(3.69)
Panel C: Percentage of Migrants Traveling Alone			
First episode	30%	32%	1.6
	(1.70)	(3.20)	(3.6)
Any episode	38%	39%	0.65
	(1.79)	(3.35)	(3.79)

[a] *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are in parentheses.

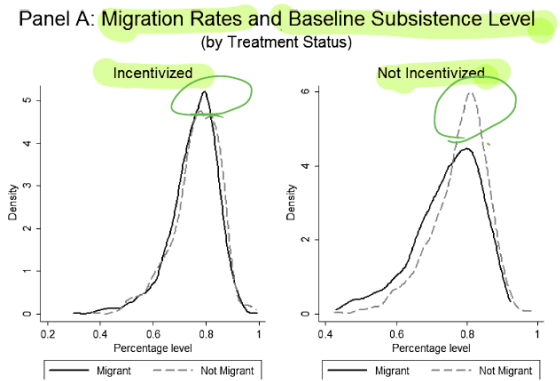
6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.3. Learning and Idiosyncratic Risk**
- 6.3.2 Evidence on Learning
- In the treatment groups (credit or cash), those that chose to re-migrate in 2009 had a **significantly better migration experience** in 2008 than those who chose not to re-migrate. In the control group, however, we see no such effect.



6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.4. Subsistence**
- The regression and the graphs show that those closer to subsistence are significantly less likely to migrate in the control group, and their migration decisions respond most strongly to the treatment



Subsistence is defined as percentage of food expenditures on total expenditures

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.4. Subsistence**
- The regression and the graphs show that those closer to subsistence are significantly less likely to migrate in the control group, and their migration decisions respond most strongly to the treatment

Panel B: Migration Decision as a Function of Baseline Subsistence	
Incentivized	−0.223
	(0.186)
Ratio of food expenditure over total expenditure round 1	−0.828***
	(0.211)
Interaction: Ratio of food to total ∗ Incentivized	0.566**
	(0.246)
Constant	0.686***
	(0.189)
Observations	1856
R-squared	0.189

6. Qualitative Evaluation of the Model's Assumptions and Central Implications

- **6.5. Does the Model Rationalize Responses to All Treatments?**
  - We compare the impacts of several potential policies on which we have collected data.——For concave enough utility functions, the cash and credit have almost identical effects,
  - W e returned in 2011 and implemented new treatments.——Only increases household' s utility when it migrates, while the unconditional credit also increases the payoff to staying at home.

Quantitative Calibration of the Model

7. Quantitative Calibration of the Model

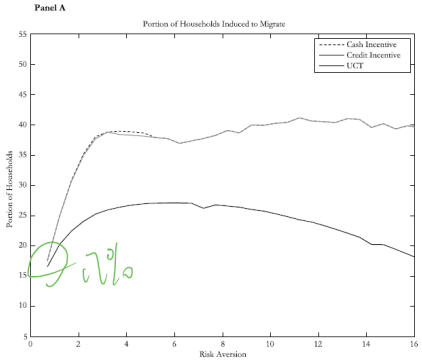
Calibrate all the free parameters of the model except risk aversion. We then ask what level of risk aversion would be required to match key aspects of the data.

TABLE VIII
PARAMETERS USED FOR CALIBRATION

Parameter	Calibration	Notes
$u(c)$	$\frac{(c-1)^{1-\sigma}}{1-\sigma}$	HARA utility function
s	*250* Taka per hh member per month	Enough for about 600 calories per hh member per month
π_G	*0.5*	The portion of induced migrants that re-migrate
F	*250* Taka per hh member per month	600 Taka for bus fare, plus 6 days of foregone labor at 60 Taka per day. Spread over 4 hh members
m	*550* per household member per month	Solution to: $\pi_G(m+I) = 350$ where 350 is our LATE estimate and I is the size of our incentive
$\mu(y)$	$N(700, 70)$ per household member per month	Designed to look like the distribution of the bottom half of the population
Time period	6 months	We assume the choice to migrate can be made after planting for either of the agricultural seasons
δ	0.99	
I (incentive size)	200 Taka per household member	Assumes a households size of 4

7. Quantitative Calibration of the Model

Shows the **portion of migrants** that would be induced assuming no repeat migration: the cash and credit incentives have the same effect, while the unconditional cash transfer has a smaller effect.



7. Quantitative Calibration of the Model

Shows the **number of inducable migrants** as a function of the **time period**. Once we allow for savings up and repeat migration, the model is no longer able to rationalize the data.

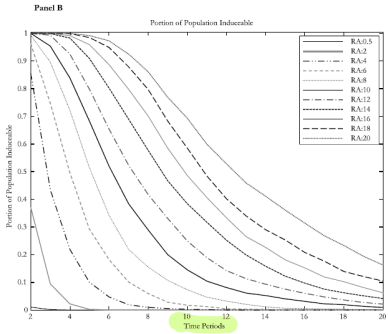


Figure 6.—Full model with buffer stock savings and possibility of saving up for migration.

Extensions

8. Extensions

The calibration exercise suggests that to match the magnitudes of responses to our treatments, we have to extend the model in some way.

1. Households would have to be very risk averse, "reasonable" values.
2. Improve the fit of the model.
3. There is high nonpecuniary disutility from migration. Incorrect beliefs about the returns to migration.
4. Migrating away may undermine network ties, and this may be a hidden cost of migration.
5. Behavioral economics.

Concludiing Remarks

9. Concludiing Remarks

We conducted a **randomized experiment** in which we incentivized households in a famine-prone region of Bangladesh to send a **seasonal migrant** to an urban area. The main results show that a small incentive led to a large increase in the number of seasonal migrants, that the migration was successful on average, and that households given the incentive in one year **continued to** be more likely to migrate in future years.

We argue that the results are qualitatively consistent with a simple (rational) **model** of a poverty trap where households that are close to subsistence face a small possibility that migrating will turn out badly, leaving household consumption below subsistence.

- Investment is risky
- Risk is individual specific
- The utility cost of the downside risk is large
- The poorest region of the country that regularly faces a seasonal famine.

Discussion

- 论文呈现的实验与一些经验事实类似：劳动力雇用市场提供就业信息和工作搜寻补贴的实例，新技术接受和学习的过程是缓慢的（可以联想到商品或者付费软件的免费试用期），可以做一些扩展性研究。
- 内容丰富，论证严谨，很多细节之处没有囊括进来，还需要进一步消化和研究。