Labour Migration and Rural Industrialization in West Bengal in the backdrop of Harris-Todaro model

HSS648 Presentation

Rabsan Galib Ahmed (MS20024), Subham Das (MS20121)

Indian Institute of Science Education and Research, Mohali

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Introduction

What is migration?

Definition

Migration is defined as the movement of labour from rural areas to urban areas influenced due to better living standards, jobs, accessibility and income in urban areas and/or unemployment, poverty and conflict in rural areas.

The underlying reasons for migration can be classified into two broad-based categories:

- **Pull-based migration:** This involves differentials being driven by real differences in living standard, better jobs and income opportunities and access to various services.
- **Push-based migration:** This involves migration fueled by unemployment and poverty in rural areas. The living conditions of many rural and urban residents may have been difficult but they are increasingly vulnerable to other influences such as drought or earthquake.

Harris-Todaro model

- An economic model to explain issues regarding the rural-urban migration.
- Main assumption: **Migration decision is based on the expected income differentials between the urban and the rural sector**.
- An equilibrium is reached when the expected urban wage is equal to the marginal productivity of the rural agricultural worker.
- In equilibrium, the rural to urban migration becomes zero and there is a positive employment in the urban sector.

Rural to urban migration increases if

- Wages increase in the urban sector, increasing the expected urban income.
- Agricultural productivity decreases, lowering marginal productivity and wages in the agricultural sector (w_A), decreasing the expected rural income.

Harris-Todaro model: Formalism

In the article [2], the authors introduce a mathematical formalism to try to understand the migration dynamics between rural and urban areas. Let us take the following variables into account:

1. w_A: Wage rate (marginal productivity of labor) in the rural agricultural sector.
2. L_F: Total number of jobs available in the formal urban sector.
3. L_I: Total number of jobs available in the informal urban sector.
4. w_F: Wage rate in the formal urban sector, which could possibly be set by government with a minimum wage law.
5. w_I: Wage rate in the informal urban sector.

Harris-Todaro model: Formalism

Rural to urban migration will take place if:

$$w_A < \frac{L_F}{L_I + L_F} w_F + \frac{L_I}{L_I + L_F} w_I$$

Urban to rural migration will take place if:

$$w_A > \frac{L_F}{L_I + L_F} w_F + \frac{L_I}{L_I + L_F} w_I$$

In equilibrium (No migration):

$$w_A = \frac{L_F}{L_I + L_F} w_F + \frac{L_I}{L_I + L_F} w_I$$

Rural Industrial Entrepreneurship (RIE)

Rural Industrial Entrepreneurship is the principle mechanism towards increase of marginal productivity in rural sector mitigating rural-to-urban migration. It provides employment to the ever increasing rural labour force which remains unabsorbed by the urban industries.

- **Scope:** The scope of rural industries is considered basically a question of properly utilizing the unexploited natural and human resources and tapping vast material existing in the countryside.
- **Features:** The features of rural industrialization are ***low investment of capital***, ***labour intensity*** and ***use of simple technology*** by employing local human and material resources.

Types of RIE

The various types of village industries come under the following broad categories:

1. ***Agro Based Industries:*** Sugar industries, Jaggery, Oil processing from oil seeds, Pickles, Fruit juice, Spices, Dairy products etc.
2. ***Mineral based industry:*** Stone crushing, Cement industries, Red oxide making, Wall coating powders etc.
3. ***Textile Industry:*** Spinning, Weaving, Colouring and Bleaching.
4. ***Engineering and Services:*** Small and medium sized industries to produce agricultural machinery, tractors, pipes etc.
5. ***Handicrafts:*** These include making of wooden or bamboo handicrafts that are local to that area, traditional decorative products, toys and all other forms of handicrafts typical to the region.
6. ***Services:*** There are a wide range of services including mobile repair, agriculture machinery servicing, etc which are being undertaken under this category

Determinants

Determinants of migration

The following are the determinants of migration as obtained from the thesis [3]:

- **SECTOR** - Households located in the Rural area
- **LDDIST** - Households located in the Rural area in the Less Developed Areas
- **HHSZ** - Number of Household Members
- **HHAGE** - Age of the Household head (Primary earning member)
- **LANDMAR, LANDSSM, LANDSM, LANDML** - Size of land holdings
- **LTR** - Literacy Rate
- **CONST** - Percentage of Construction workers
- **SERV** - Percentage of Service workers
- **PDEN** - Population Density
- **UNEP** - Unemployment
- **AGLP** - Agricultural Productivity
- **CASTE-SC, CASTE-ST, CASTE-OBC** - Number of workers based on lower castes

Determinants of RIE

The following are the determinants of Rural industrial entrepreneurship as obtained from the article [1]:

- **CHILMARS** - Marital Status-cum-Children
- **CROP** - Number of Crops cultivated
- **AGE** - Age of the farmer
- **FSUP** - Availability of Financial Family Support
- **RISK** - Attitude toward Risk
- **INNOV** - Innovativeness
- **WEALTH** - Wealth
- **STATUS** - Professional Status
- **EDU** - Education
- **LANDC** - Cultivable land
- **LANDH** - Homestead land

Common Determinants

Migration	RIE	CD
HHSZ	CHILMARS	HH
AGLP	CROP	AGRO
HHAGE	AGE	AGE
LANDMAR, LANDSSM, LANDSM, LANDML	LANDC	LAND
LTR	EDU	EDU
UNEP	STATUS	UEMP

Table 1: Common determinants (CD) between Migration and RIE

Inferred Impact from HT Model

The Harris-Todaro model assumes that migration is caused by the expected wage differential between the rural and the urban sector. RIE has been proposed to decrease this wage differential. Hence, it can be inferred from the HT model that the common determinants of migration and RIE to should impact each of them in an opposite fashion. Thus, the impact of each of the CD on migration and RIE is illustrated below:

1. **HH (Household Size)** - If this parameter negatively impacts migration, due to lack of mobility of large households, then one can say that it shall positively impact RIE.
2. **AGRO (Agricultural productivity)** - If this parameter negatively impacts migration due to higher rural wage expectation, one can say that RIE shall be positively impacted.
3. **AGE (Age of the Household head)** - If younger farmers are more prone towards entrepreneurship, one can say that tendency of migration among younger generation shall be less.

Inferred Impact from HT Model

The impact of each of the CD on migration and RIE is illustrated below:

4. **LAND (Cultivable land owned)** - The migration decision can be negatively impacted by owners of cultivable land with small/medium holdings. This implies that RIE must increase with larger land ownership.
5. **EDU (Literacy rate)** - Higher literacy rate may dissuade the youth from indulging into the risky business of RIE, instead opting for secure government jobs, indicating higher migration.
6. **UEMP (Unemployment)** - A high rural unemployment rate incentivizes migration to urban areas due to higher wage expectation as per the H-T model. Hence RIE must decrease due to lack of incentives to start and invest in rural businesses.

Analysis

Data

Variable	*Coefficient*	*Robust Standard Error*	*z*	*P > z*	
SECTOR	0.2592***	0.036	7.170	0.000	
LDDIST	-0.0059	0.031	-0.190	0.850	
HHSZ	-0.0122	0.017	-0.720	0.473	
HHAGE	0.0495***	0.007	6.970	0.000	
HHAGESQ	-0.0002***	0.000	-2.630	0.009	
CASTST	-0.1878***	0.064	-2.940	0.003	
CASTSC	-0.0177	0.034	-0.520	0.605	Wald χ^2 **(19)** = 1248.18
CASTOBC	-0.1091*	0.058	-1.870	0.061	Prob. > χ^2 = 0.000
FHEADHH	0.9303***	0.045	20.700	0.000	Pseudo R^2 = 0.1370
LANDMAR	-0.6167***	0.122	-5.060	0.000	Log pseudo
LANDSSM	-0.1691	0.117	-1.440	0.149	Likelihood = -5191.133
LANDSM	0.0647	0.119	0.550	0.586	n = 8770
HHSZLANDMAR	0.0395**	0.023	1.730	0.044	
HHSZLANDSSM	-0.0360*	0.021	-1.720	0.086	
HHSZLANDSM	-0.0442**	0.021	-2.120	0.034	
EDUILLIT	0.0935***	0.035	2.660	0.008	
EDUPRMY	0.0648**	0.037	1.730	0.043	
EDUSECND	0.0486	0.031	1.550	0.121	
EDUHS	-0.0032	0.046	-0.070	0.945	
_CONS	-2.1399	0.207	-10.330	0.000	

Dependent Variables	*Independent Variables*	*Adjusted R-square*	*Beta*	*t*	*Sig. t*	Constant (Intercept)	*Explanation or Remarks*
Volume of Inter-District Male In-Migration **(VIMIG)**	Percentage of Construction Workers (CONST)	0.19	24112.5	2.8	0.007	132.7	More construction workers, more volume of in-migration
	Population Density (PDEN)	0.22	53.4	3.1	0.004	14159.9	More density of population, more in-migration
	Urbanisation (URBANS)	0.30	2596.8	3.7	0.000	10169.5	More urbanization, more volume of in-migration
	Literacy Rate (LTR)	0.21	1897.4	2.6	0.002	-41643	More literacy rate, More volume of in-migration
	Percentage of service worker (SERV)	0.33	27214.0	2.9	0.000	158.3	More service workers, more volume of in-migration
	Agricultural Productivity (AGLP)	0.39	-39.2	2.8	0.002	-11589.3	Low agricultural productivity, low in-migration
	Unemployment rate (UNEP)	0.36	-1245.3	3.1	0.013	2965.4	High unemployment rate, low in-migration

Figure 1: Impact of the determinants on migration (Source: Computed from Secondary NSSO (2007-08)) [3]

Data

	RIE	*CHILMARS*	*CROP*	*FSUP*	*RISK*	*INNOV*	*WEALTH*	*STATUS*	*AGE*	*EDU*
RIE	**0.15380**	**0.07316**	**0.03120**	-0.00478	**0.05473**	**0.01964**	**-0.02878**	**-0.00702**	**-0.16583**	0.02085
	(0.02333)	(0.01838)	(0.00382)	(0.00538)	(0.01850)	(0.00557)	(0.00828)	(0.00351)	(0.02254)	(0.01660)
	6.59264	3.97962	8.16921	−0.88695	2.95902	3.52659	−3.47587	−1.99689	−7.35610	1.25608
CHILMARS	**0.05639**	-0.01794	**-0.03469**	**-0.01660**	**-0.01142**	**-0.03074**	**0.03045**	**0.01367**	**0.16927**	0.02100
	(0.01552)	(0.01497)	(0.00884)	(0.00548)	(0.00410)	(0.00881)	(0.00541)	(0.00366)	(0.02224)	(0.01142)
	3.63419	−1.19826	−3.92626	−3.03004	−2.78327	−3.48857	5.63389	3.73905	7.61239	1.83888
CROP	**-0.13201**	-0.00983	**-0.06175**	0.00495	**-0.00626**	**-0.01685**	**-0.04577**	**0.00749**	**0.22179**	**-0.06949**
	(0.02075)	(0.00876)	(0.01501)	(0.00816)	(0.00233)	(0.00508)	(0.00991)	(0.00231)	(0.02986)	(0.03054)
	−6.36232	−1.12256	−4.11440	0.60640	−2.68249	−3.31889	−4.61723	3.23945	7.42762	−2.27541
FSUP	**0.10504**	**-0.08080**	**0.13253**	**0.05750**	**0.04123**	**0.11097**	**-0.09924**	**-0.04933**	**-0.63301**	**-0.10973**
	(0.02567)	(0.02253)	(0.02818)	(0.01637)	(0.01449)	(0.02994)	(0.01420)	(0.01277)	(0.05062)	(0.03911)
	4.09286	−3.58705	4.70246	3.51238	2.84488	3.70585	−6.99025	−3.86305	−12.50478	−2.80608
RISK	**0.12912**	-0.00754	**0.02370**	**0.01634**	**0.00807**	**0.01648**	0.00113	**-0.00726**	**-0.09665**	-0.02300
	(0.03421)	(0.00553)	(0.00656)	(0.00723)	(0.00399)	(0.00682)	(0.01044)	(0.00293)	(0.02597)	(0.01344)
	3.77370	−1.36224	3.61469	2.26155	2.02459	2.41651	0.10784	−2.47661	−3.72232	−1.71181
INNOV	**0.05106**	-0.02205	**0.00937**	0.02139	0.00319	**0.00652**	**-0.05323**	0.01141	**-0.15989**	-0.00910
	(0.01605)	(0.01362)	(0.00299)	(0.01334)	(0.00184)	(0.00305)	(0.01383)	(0.01036)	(0.02902)	(0.00591)
	3.18099	−1.61912	3.12972	1.60348	1.73714	2.13706	−3.84899	1.10092	−5.50920	−1.54014
WEALTH	**-0.08135**	**0.05529**	**-0.09578**	**-0.03948**	**-0.02895**	**-0.07792**	**0.06570**	**0.03464**	**0.45269**	**0.07141**
	(0.01558)	(0.01506)	(0.02200)	(0.01461)	(0.00983)	(0.02061)	(0.00997)	(0.00814)	(0.05439)	(0.02568)
	−5.21975	3.67015	−4.35289	−2.70230	−2.94612	−3.77995	6.58866	4.25687	8.32332	2.78085
STATUS	0.05107	0.00545	0.00723	0.00608	0.00253	0.00652	-0.01340	-0.00095	-0.05154	0.02545
	(0.03462)	(0.01575)	(0.00608)	(0.00359)	(0.00190)	(0.00479)	(0.00688)	(0.00393)	(0.03114)	(0.01692)
	1.47534	0.34569	1.18924	1.69567	1.33231	1.36091	−1.94787	−0.24299	−1.65489	1.50463

Note: Standard error in parenthesis and *t* value at the bottom. Significant coefficients are in given in boldface.

Figure 2: Impact of the determinants on RIE (Source: Survey by contributors of [1]

Inferred Impact of common determinants

The impact of the common determinants as computed from the data is tabulated as below

CD	Migration	RIE
HH	Negative	Negative
AGRO	Negative	Positive
AGE	Positive	Negative
LAND	Negative	Negative
EDU	Positive	Negative
UEMP	Positive	Positive

Impact of CD as inferred from Data

Inferred Impact of common determinants

The impact of the common determinants as computed from the data is tabulated as below

CD	Migration	RIE
HH	Negative	Negative
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LAND	Negative	Negative
EDU	Positive	Negative
UEMP	Positive	Positive

Impact of CD as inferred from Data

Proposed modifications

A proposed modification to the HT model

The rate of migration as proposed by HT is given as [2]

$$\dot{N}_u = \psi(W_u^e - W_A), \qquad \psi(0) = 0, \psi' > 0 \tag{1}$$

We propose the following modifications based on our observation and the cited data:

1. As far as the common determinants of RIE and migration is concerned, the following two rate equations describes the primary dynamics of our model:

$$\dot{N}_u = \Psi(W_u^e - W_A, HH, AGE, LAND, EDU) \tag{2}$$

$$\dot{R} = \Phi(\text{Det. of RIE}) \tag{3}$$

   where $\partial\Psi/\partial(CD)$ and $\partial\Phi/\partial(Det)$ is as given by the coefficients in (1) and (2) respectively and *AGRO* and *UEMP* has been absorbed inside the wage differential in case of migration.

A proposed modification to the HT model

2. For simplicity let's consider the linear regime

$$\dot{N}_u = \Psi(W_u^e - W_A) - 0.0122HH + 0.0495AGE - 0.407LAND + 0.2037EDU \tag{4}$$

   Similar dynamical equations can be written for the endogenous variables in case of RIE using the coefficients in Fig. 2
3. We further assume that all other determinants of migration works as exogenous parameters in this model. That includes urban expected wage. Moreover, for simplicity we assume the following expression for Ψ:

$$\Psi(W_u^e - W_A) = -0.5(AGRO + R) \tag{5}$$

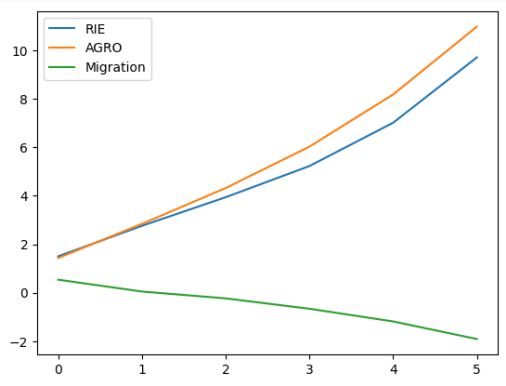
4. Our goal is to decrease the rural-to-urban migration rate while increasing rural employment and productivity.

Results and policy recommendation

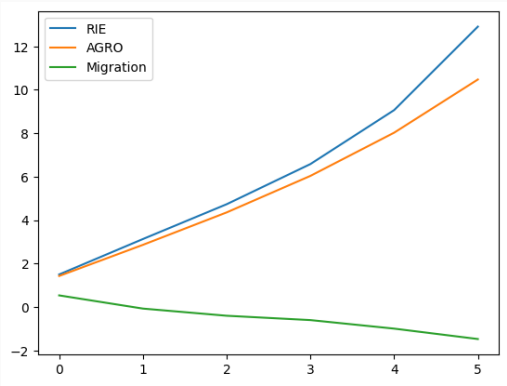
Results from the model

- The model, including all the endogenous variables is too complicated to solve analytically. Hence, we resort to numerical simulation.
- We focus on a five-year long plan, beyond which the assumption regarding the constant coefficients might break down, and we need to renew the parameters while using the same proposed model.
- Based on the results of our simulation, we hope to recommend policies to mitigate migration.

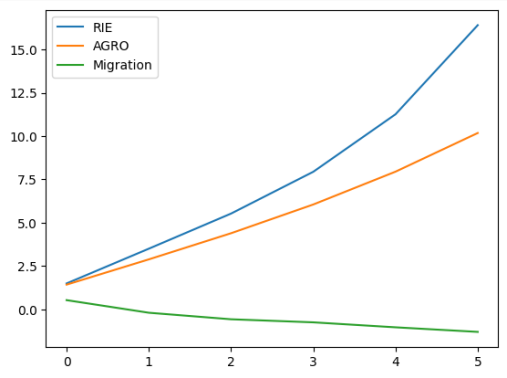
Importance of financial support



(a) Low financial support



(b) Medium financial support



(c) High financial support

Figure 3: Keeping everything else fixed (just above average, except for slightly below average land), we vary the initial support provided to the farmer. Note that with increasing financial support, farmers from such background tend to prefer RIE to agriculture.

More results...

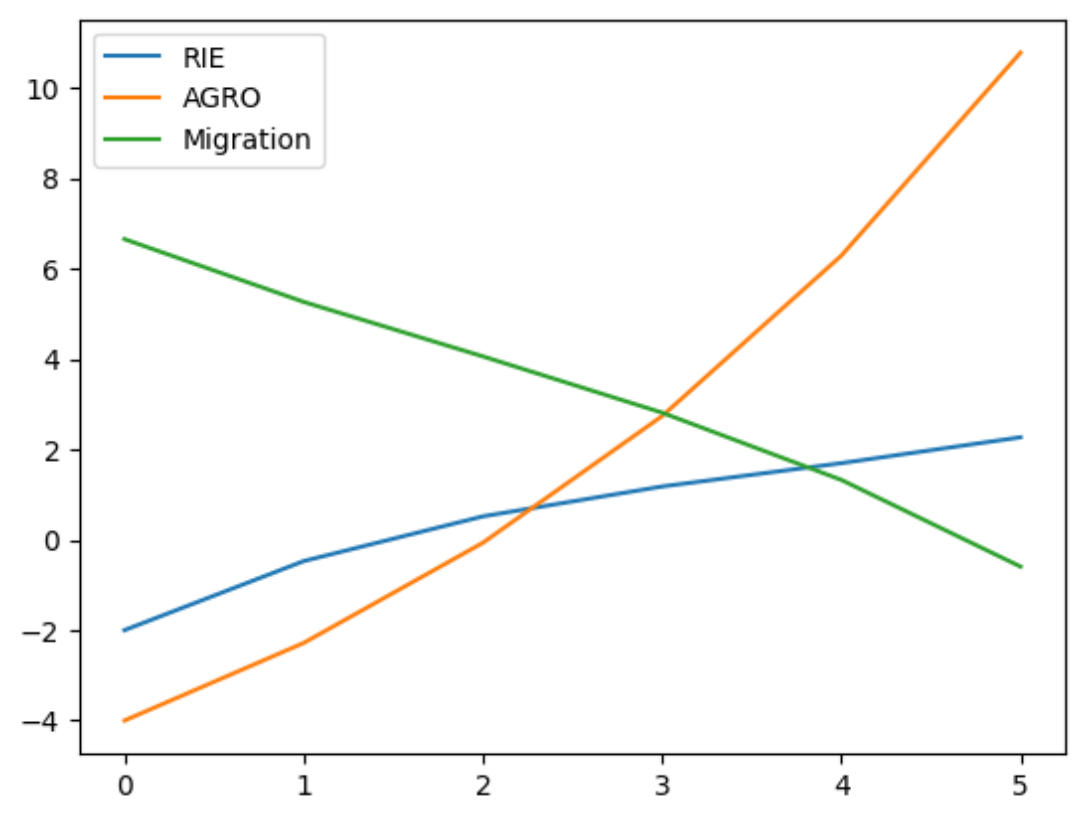


Figure 4: Poor farmers with below average education, below average agriculture, unwilling to take risk, with high financial support

More results...

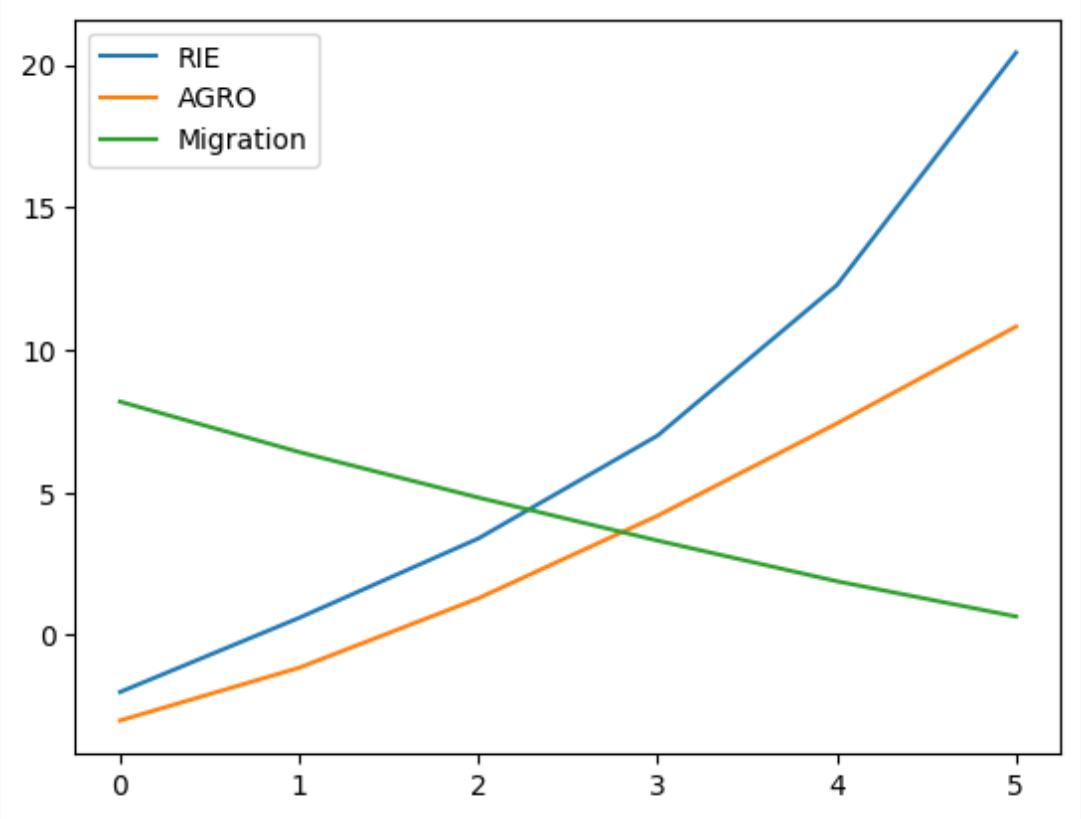
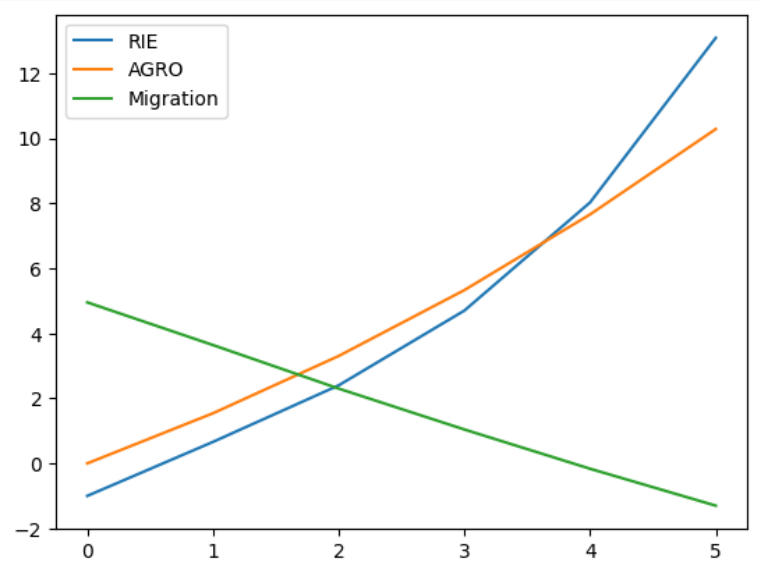
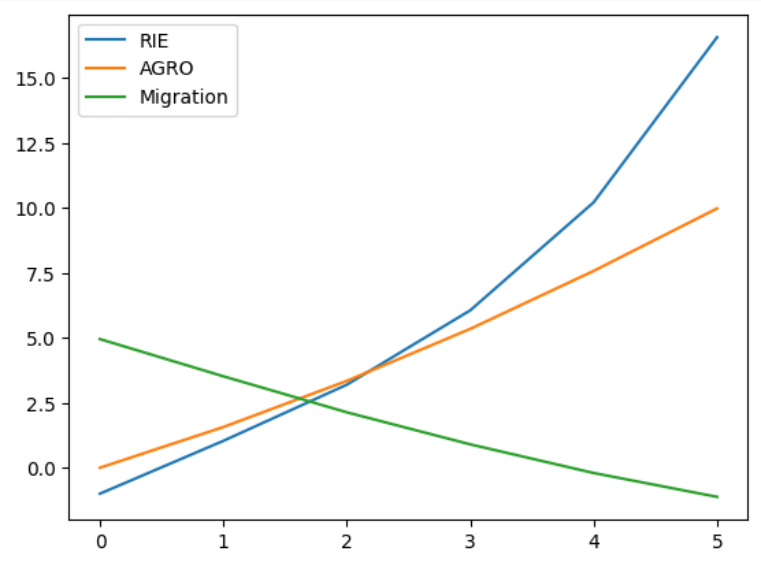


Figure 5: Extremely poor farmers with moderate household size, below average education, poor agricultural productivity, willing to take risk with high financial support

More results...



(a) Medium support



(b) High support

Figure 6: Rich farmers with moderate household size, above average education, average agriculture, willing to take risk

Policy recommendation

We conclude that the following policies are to be adopted to enhance RIE and mitigate rural-to-urban migration:

- In the beginning of the five years, the average farmers are to be provided with varying financial support to start an RIE depending on their willingness to take the risk, as it leads to decrease in the migration.
- The poor farmers with ‘below average’ attributes who are unwilling to take risk, should be assisted with high financial support for agriculture, to rapidly reduce the migration rate to 0 at the end of the five years.

Policy recommendation

We conclude that the following policies are to be adopted to enhance RIE and mitigate rural-to-urban migration:

- Extremely poor farmers who are willing to take risk are to be supported with high financial support incentivizing RIE which in turn reduces the migration rate.
- Rich farmers with ‘moderate’ and ‘above average’ attributes who are willing to take risk, should be financially supported to enhance RIE and mitigate migration of rich and educated farmers from rural to urban sectors. Rural unskilled labour force can be absorbed into the RIE.

Summary

Summary

- In this project we carefully studied the determinants of migration and RIE, in the context of West Bengal, respectively from the extensive quantitative work from the authors of [3][1]
- We have found out that the inverse relation between the determinants of migration and RIE as simply inferred from the HT model [2] is not well-substantiated.
- Motivated by these findings, we propose a modification to the HT model in the presence of RIE taking account of such complicated dependencies.
- Under the assumption of linearity, we observe the dynamics of the observables of interest and infer appropriate exogenous steps to be taken to decrease migration rate and enhance RIE and recommend policies accordingly.

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Questions?