Networks and Misallocation:
Insurance, Migration, and the Rural-Urban Wage Gap

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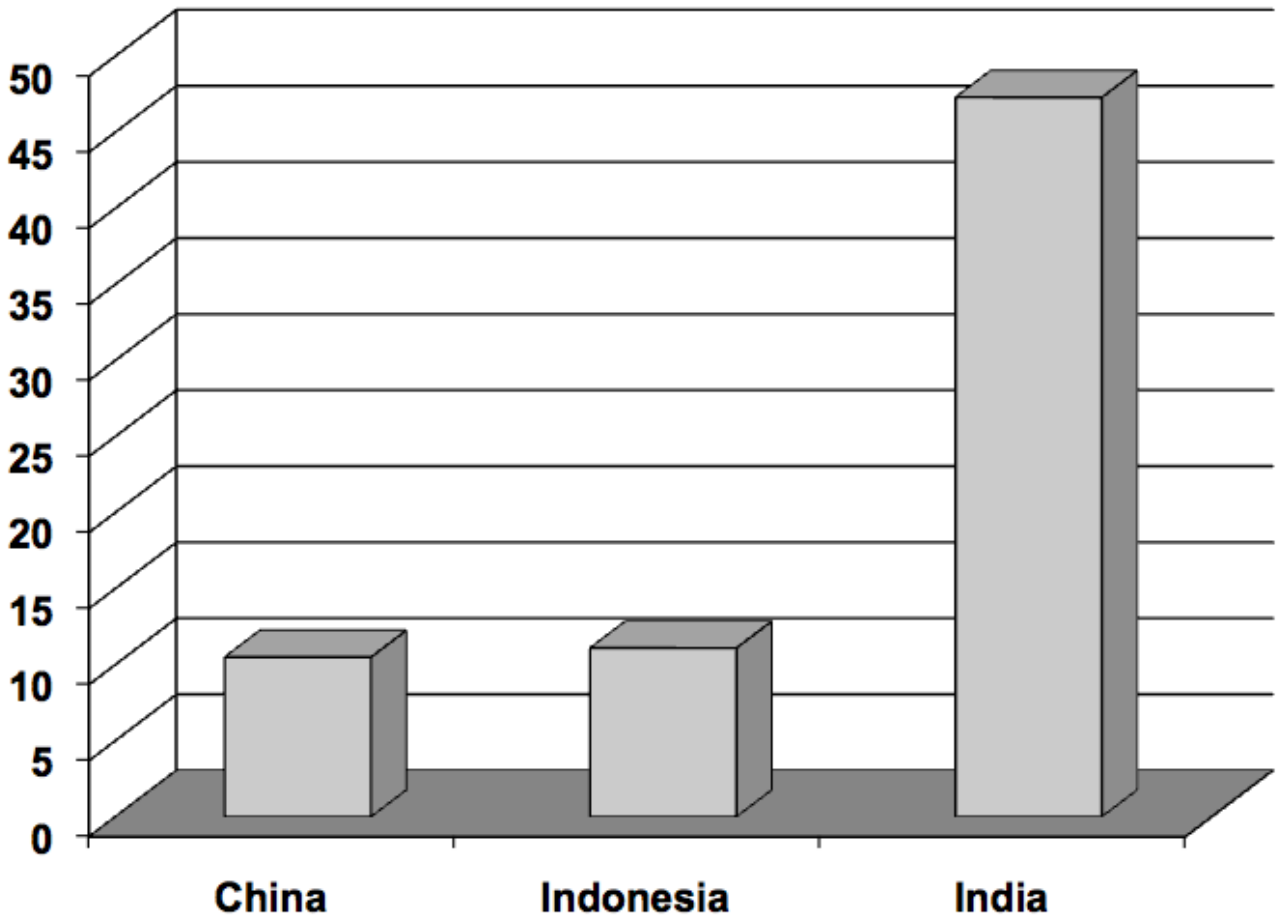
Introduction

- Misallocation of resources may explain much of the variation in productivity across countries
  - Differences in productivity across firms in developing countries (Restuccia and Rogerson 2008, Hsieh and Klenow 2009)
  - Differences in productivity across sectors; e.g. rural-urban wage gap (Caselli 2005, Restuccia, Yang, and Zhu 2008, Vollrath 2009, Gollin, Lagakos and Waugh 2012)

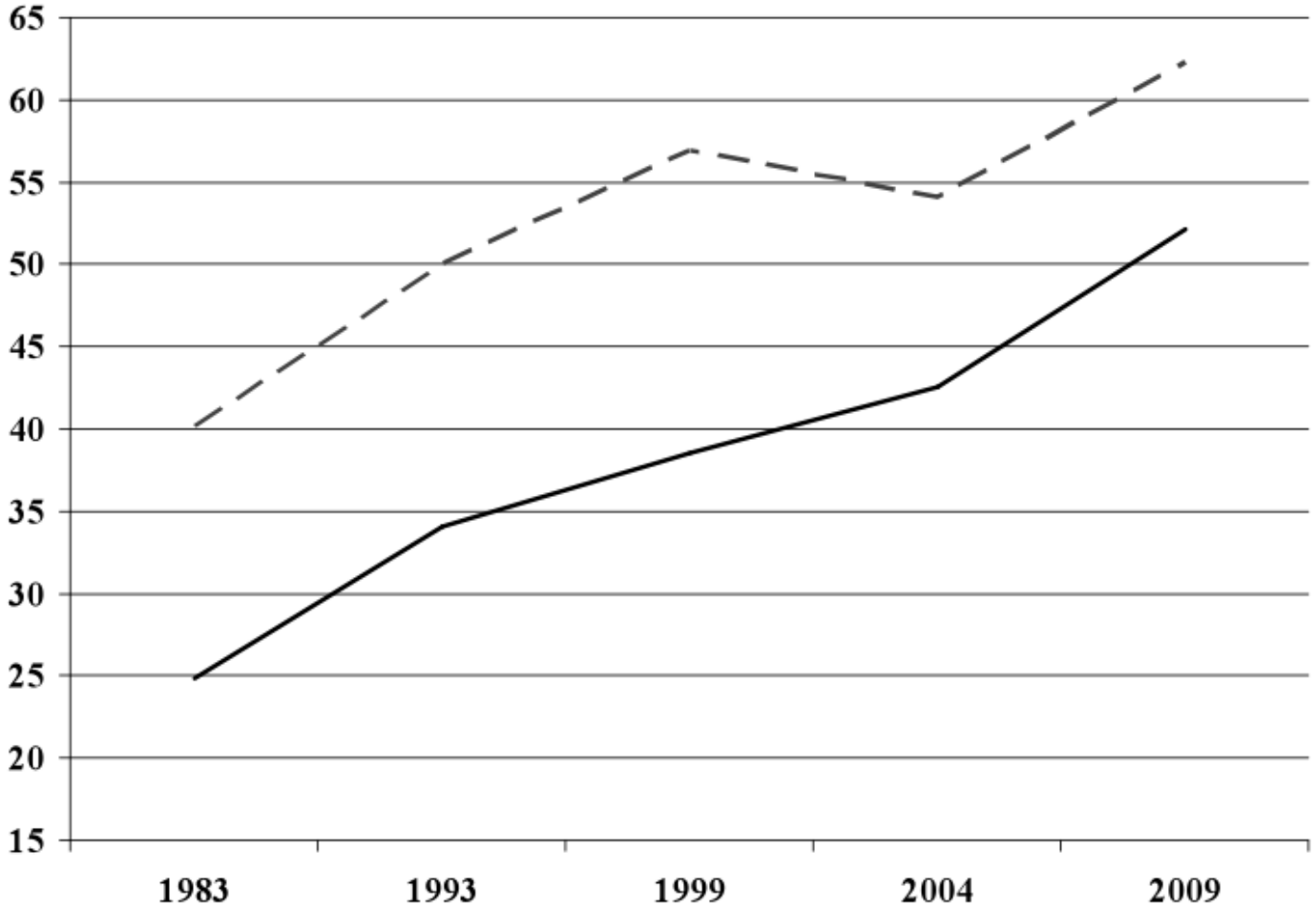
Introduction

- In India, (real) rural-urban wage gaps exceed 25%, and have remained large for decades
- Nevertheless, migration rates are extremely low

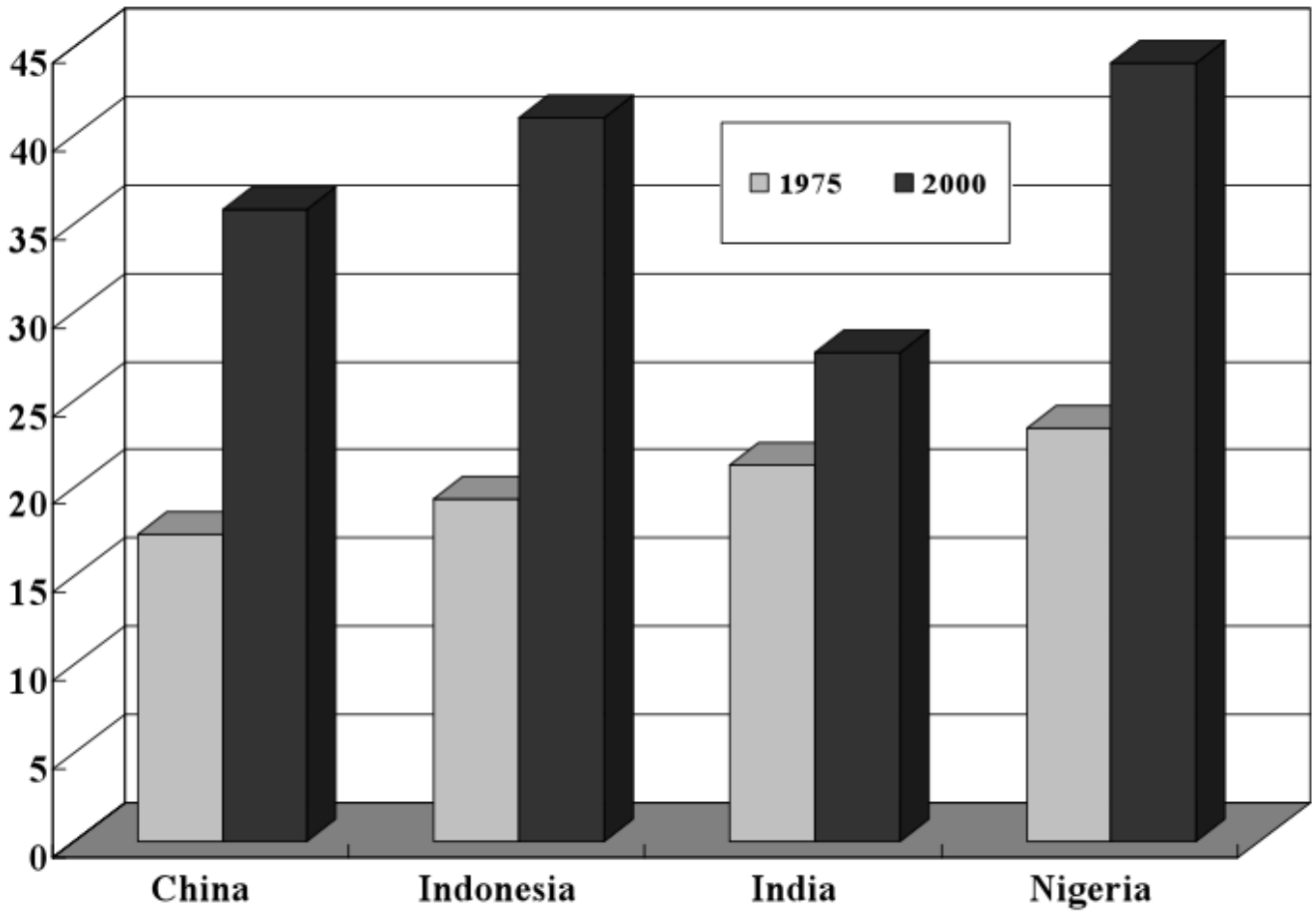
Rural-Urban Wage Gap, by Country



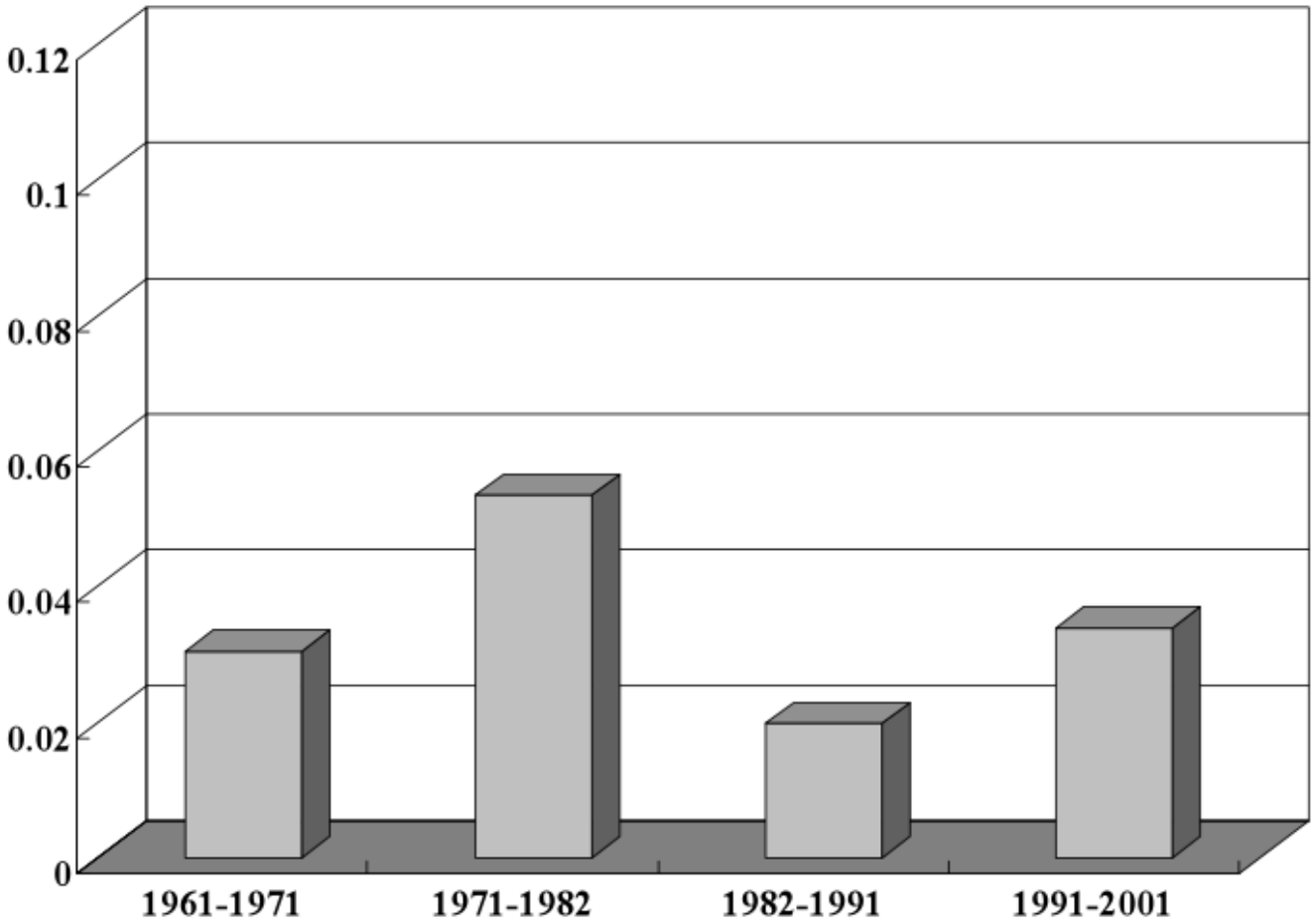
Real Rural and Urban Wages in India



Change in Percent Urbanized, by Country, 1975-2000



Change in Rural-Urban Migration Rates in India, 1961-2001



Introduction

- Why have rural workers not taken advantage of this arbitrage opportunity?
- Misallocation literature largely devoted to the effect of misallocation on growth (e.g. Parente and Prescott 1999, Lagos 2006, Buera and Shin 2013)
- We are interested in the determinants of the misallocation

Explanations

- Political economy explanation: landowning elites restrict the movement of labor to the city (Engerman and Sokoloff 1997, Acemoglu and Robinson 2012, Dell 2012, Naidu and Yuchtman 2012)
- Our explanation: rural caste-based networks restrict the movement of their members
  - Extremely efficient insurance networks organized around the (sub)caste in rural India (Caldwell, Reddy, and Caldwell 1986, Mazzocco and Saini 2012)
  - If individuals who migrate (and their families) lose the services of these networks, then they may choose to stay and forego the additional income that comes with mobility

Rural Caste-based Insurance Networks

Data source:	REDS	
Survey year:	1982	1999
	(1)	(2)
Households participating (%)	25.44	19.62
Income sent (%)	5.28	8.74
Income received (%)	19.06	40.26
Number of observations	4,981	7,405

Source: Rural Economic Development Survey (REDS) 1982 and 1999

Loans by Purpose and Source

Purpose:	investment	operating expenses	contingencies	consumption expenses
	(1)	(2)	(3)	(4)
Source:				
Bank	64.11	80.80	27.58	25.12
Caste	16.97	6.07	42.65	23.12
Friends	2.11	11.29	2.31	4.33
Employer	5.08	0.49	21.15	15.22
Moneylender	11.64	1.27	5.05	31.85
Other	0.02	0.07	1.27	0.37

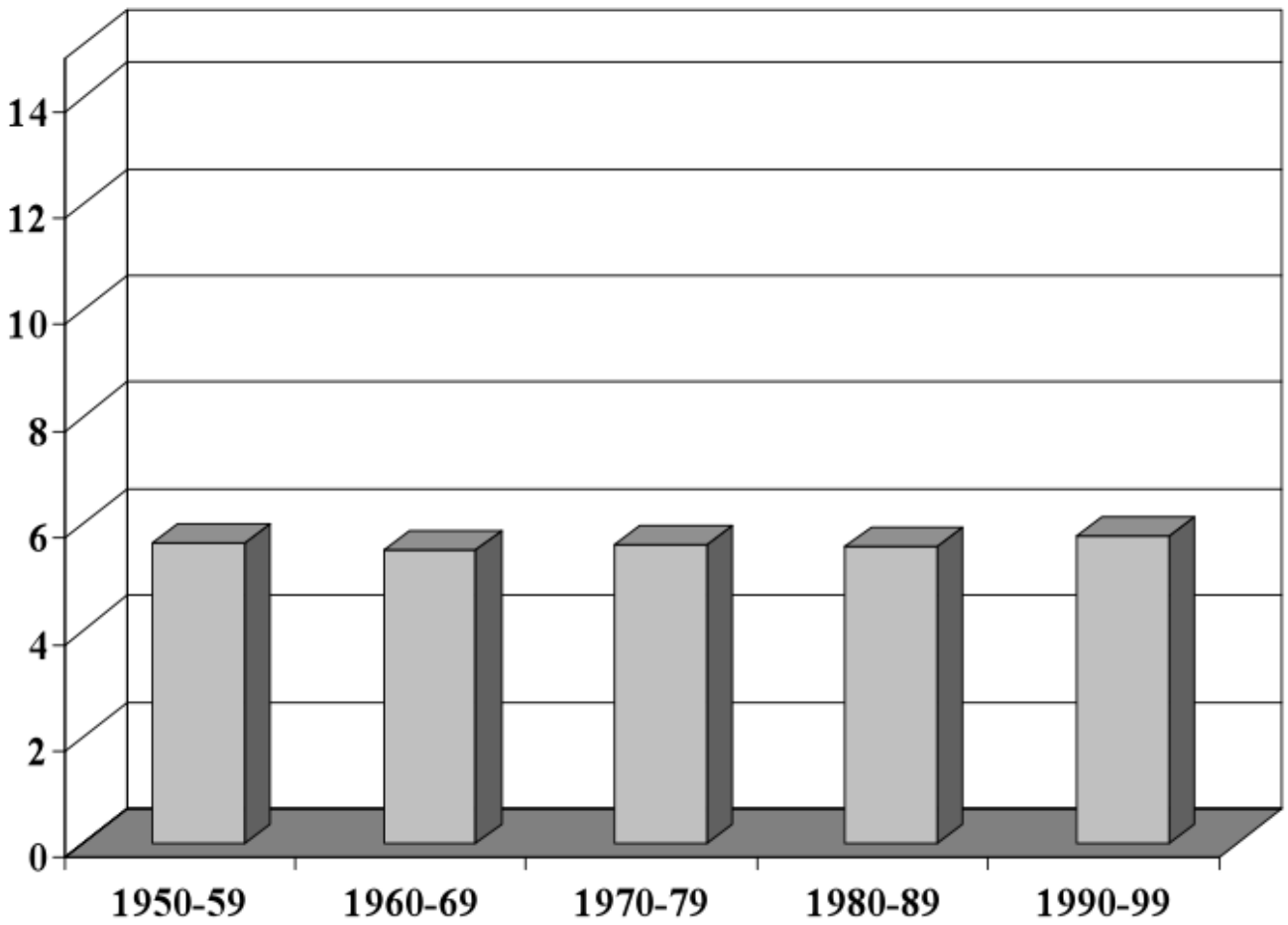
Source: 1982 REDS

Loans by Type and Source

Data source:	1982 REDS			2005 IHDS
Loan type:	without interest	without collateral	collateral or interest	without interest
	(1)	(2)	(3)	(4)
Source:				
Bank	0.57	23.43	0.38	0.00
Caste	28.99	60.27	20.38	44.62
Friends	9.35	91.72	3.89	21.5
Employer	0.44	65.69	0.44	10.75
Moneylender	0.00	98.71	0.00	0.27

Source: 1982 REDS and 2005 India Human Development Survey (IHDS)

Change in Out-Marriage Percent in Rural India, 1950- 1999



Designing a Test

- Simple test of the hypothesis that rural networks restrict mobility compares populations with and without caste-based insurance
  - This exercise is infeasible
- We look *within* the caste and identify which households benefit the least from caste-based insurance
  - We then test whether members of those (relatively wealthy) households are most likely to migrate
  - Counter-factual simulations of the structural model predict increase in migration if market insurance were available

The Model

- When the insurance network is active, the income generated by its members is pooled in each period and redistributed on the basis of a pre-specified sharing rule
  - This smooths consumption over time, making risk-averse individuals better off
- With full insurance, the sharing rule is independent of the state of nature, generating simple statistical tests
  - Full risk-sharing is rejected, but high risk-sharing is obtained (Townsend 1994, Grimard 1997, Fafchamps and Lund 2003)
  - Parallel literature characterizes and tests state (and history) dependent sharing rules with partial insurance (Coate and Ravallion 1993, Ligon, Thomas and Worrall 2002)

The Model

- Mutual insurance literature is concerned with *ex post* risk-sharing, taking the size of the network (N) and the sharing rule (λ) as given
- Our analysis considers the *ex ante* participation decision, together with the optimal design of the income sharing rule
  - Both N and, therefore, migration, as well as λ are endogenized

The Model

- With diminishing marginal utility, total surplus can be increased by redistributing income within the network
  - This must be weighed against the decline in network size since the relatively wealthy will leave
- Under reasonable conditions, there will still be redistribution in equilibrium
  - Relatively wealthy households within their caste benefit less from the network and are more likely to migrate

Solving the Model

- Logarithmic preferences and full insurance *ex post*
  - Expected utility can be specified as a separable function of (log) mean income and CV^2
  - Ratio of consumption across income classes is constant over time
- Individual participation depends on mean and variance of consumption with insurance, mean and variance of income, risk parameter (β), and rural-urban income gap (ε)

Equilibrium Participation and Relative Consumption

- Strategic element to the participation decision since it depends on the decisions of other individuals
  - Equilibrium participation is the solution to a fixed-point problem
  - Derive the implicit solution
- Maximize total surplus from the insurance arrangement, subject to the fixed-point condition
  - Show that there is always some redistribution in equilibrium

Reduced Form Estimation

1. 2006 REDS census data

$$M_i = \pi_0 + \pi_1 y_i + \pi_2 \bar{y}_i + \varepsilon_i$$

   - $\pi_2 < 0$
   - Use ICRISAT data to impute $y_i, \bar{y}_i$

2. 1982, 1999 REDS household sample

$$M_{it} = \pi_1 y_{it} + \pi_2 \bar{y}_{it} + f_i + \varepsilon_{it}$$

   - $\Delta M_{it} = \pi_1 \Delta y_{it} + \pi_2 \Delta \bar{y}_{it} + \Delta \varepsilon_{it}$
   - Use *interaction* of initial HYV-access and irrigation (1971), inherited land (1982) and triple interaction as instruments for $\Delta y_{it}, \Delta \bar{y}_{it}$

Reduced Form Migration Estimates

Dependent variable:	migration			
Sample-size restriction:	$N \geq 10$	$N \geq 30$	$N \geq 10$	
	(1)	(2)	(3)	(4)
Household Income	0.005	0.006	0.006	0.004
	(0.002)	(0.002)	(0.002)	(0.002)
Caste income	-0.016	-0.016	-0.019	-0.019
	(0.004)	(0.004)	(0.004)	(0.004)
Income Risk	- -	- -	- -	-0.0004
				(0.0001)
Infrastructure Variables	No	No	Yes	No
F-statistic (joint sig.)	- -	- -	4.43	- -
p-value	- -	- -	0.005	- -
Number of observations	20,985	19,362	20,985	20,985

Source: 2006 REDS census

FE-IV Participation, Out-Marriage, and Migration Estimates

Income variable:	wealth- and wage-based measure		
Dependent variable:	participation	out-marriage	migration
	(1)	(2)	(3)
Household Income	-0.520	0.166	0.262
	(0.680)	(0.074)	(0.172)
Caste income	0.327	-0.111	-0.110
	(0.139)	(0.066)	(0.045)
Time trend	0.010	0.030	0.060
	(0.130)	(0.020)	(0.020)
Number of observations	2,335	998	1,049

Source: REDS panel, 1982 and 1999

FE-IV Participation, Out-Marriage, and Migration Estimates

Income variable:	actual income		
Dependent variable:	participation	out-marriage	migration
	(4)	(5)	(6)
Household Income	-0.515	0.210	0.407
	(0.990)	(0.183)	(0.186)
Caste income	1.100	-0.292	-0.360
	(0.837)	(0.173)	(0.186)
Time trend	0.040	0.010	0.030
	(0.150)	(0.010)	(0.030)
Number of observations	2,316	994	1,047

Source: REDS panel, 1982 and 1999

FE-IV Participation, Out-Marriage and Migration Estimates (robustness tests)

Infrastructure variable:	1971 values		
Dependent variable:	participation	out-marriage	migration
	(1)	(2)	(3)
Household Income	-0.768	0.136	0.268
	(0.768)	(0.064)	(0.225)
Caste income	0.434	-0.097	-0.126
	(0.188)	(0.054)	(0.058)
Time trend	0.070	0.030	0.020
	(0.170)	(0.020)	(0.030)
χ^2 (joint sig. of infrastructure)	4.85	11.12	5.97
p-value	0.43	0.05	0.31
Number of observations	2,335	998	1,049

Source: REDS panel, 1982 and 1999

FE-IV Participation, Out-Marriage and Migration Estimates (robustness tests)

Infrastructure variable:	change from 1982 to 1999		
Dependent variable:	participation	out-marriage	migration
	(4)	(5)	(6)
Household Income	-0.452	0.176	0.185
	(0.651)	(0.074)	(0.183)
Caste income	0.350	-0.112	-0.128
	(0.137)	(0.070)	(0.044)
Time trend	-0.020	0.020	0.090
	(0.120)	(0.020)	(0.020)
χ^2 (joint sig. of infrastructure)	15.96	9.27	26.24
p-value	0.00	0.05	0.00
Number of observations	2,320	987	1,041

Source: REDS panel, 1982 and 1999

Structural Estimation

- Estimate income-gap out of sample (NSS)
- To estimate the risk-parameter β:
  1. For a given β, find the surplus maximizing λ_k, subject to the fixed-point conditions
  2. Derive N_k from the fixed-point conditions and compute the difference between the actual and predicted (overall) migration
  3. Find β that minimizes this difference

Income and Consumption within the Caste

Data source:	REDS 2006			ICRISAT		
	relative income	relative consumption	consumption-income ratio	relative income	relative consumption	consumption-income ratio
	(1)	(2)	(3)	(4)	(5)	(6)
Income class:						
1	0.316	0.843	2.665	0.119	0.460	3.871
2	0.416	0.854	2.052	0.281	0.625	2.224
3	0.513	0.871	1.697	0.373	0.626	1.680
4	0.627	0.887	1.413	0.510	0.673	1.319
5	1.000	1.000	1.000	1.000	1.000	1.000

Structural Estimates

	measured			baseline estimates	
	relative income	relative consumption	migration	relative consumption	migration
	(1)	(2)	(3)	(4)	(5)
Income class:					
1	0.316	0.843	0.032	0.831	0.000
2	0.416	0.854	0.034	0.845	0.015
3	0.513	0.871	0.051	0.860	0.040
4	0.627	0.887	0.046	0.886	0.061
5	- -	- -	0.051	- -	0.098
β		- -		1.971	
ω		- -		- -	

Source: 2006 REDS census

Structural Estimates

Results robust to:

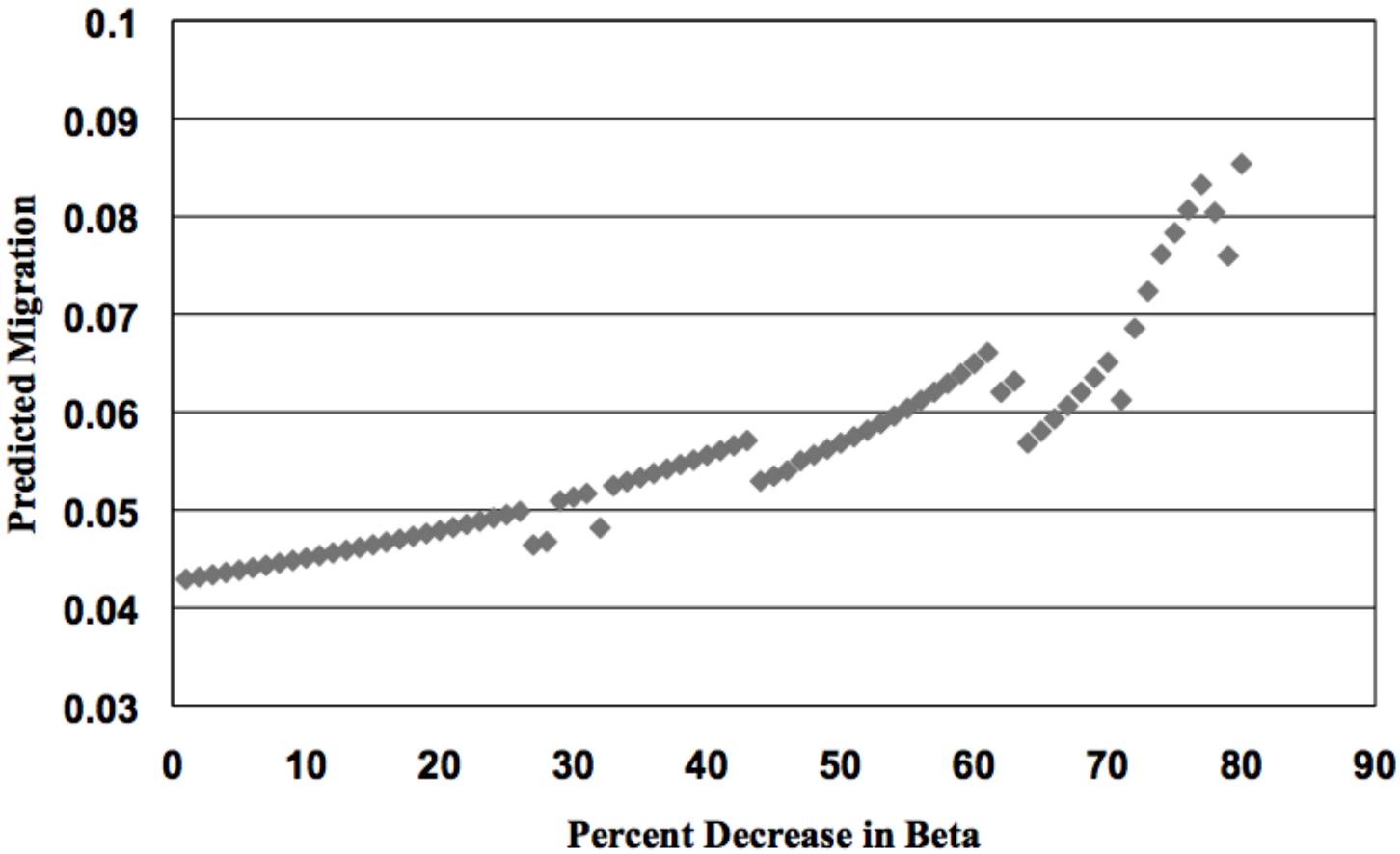
1. allowing income-gaps to vary by education class
2. allowing welfare weights to vary by income class
3. adjusting for moving costs
4. 4 and 6 income classes

Counter-factual Simulation

Specification:	baseline		50 % reduction in β	
Estimated:	relative consumption	migration	relative consumption	migration
	(1)	(2)	(3)	(4)
Income class:				
1	0.831	0.000	0.760	0.001
2	0.845	0.015	0.776	0.020
3	0.860	0.040	0.798	0.051
4	0.886	0.061	0.846	0.075
5	- -	0.098	- -	0.138
β	1.971		0.986	

Source: 2006 REDS census

Counter-factual Simulation



Conclusion

- Whether networks support or hinder mobility depends on
  - whether individuals or groups are moving
  - the nature of outside options
  - the stage in the life-cycle of the network
- Well established caste-based rural networks may contribute to low mobility and labor misallocation in India
  - Improvement in risk-sharing from no-insurance to 80% of full insurance would increase migration rates from 4% to 9%
- Further research on the links between networks and misallocation could improve our understanding of the limits to growth in developing economies