

Scorching Heat and Shrinking Horizons: The Impact of Rising Temperatures on Marriages and Migration in Rural India

Discussant: Sisir Debnath

Indian Institute of Technology Delhi

2/20/2024

Interpreting the Marginal Effects

- Examines the long-run impacts of climate change or temperature levels on within-district migration by gender and residence (rural vs. urban)
- 1°C increase in mean decadal temperature is associated with
 - 5% decline in female rural-urban migration
 - 13% decline in female rural-rural migration
- These marginal effects may be discussed in the context of long-term changes in temperature

Interpreting the Marginal Effects

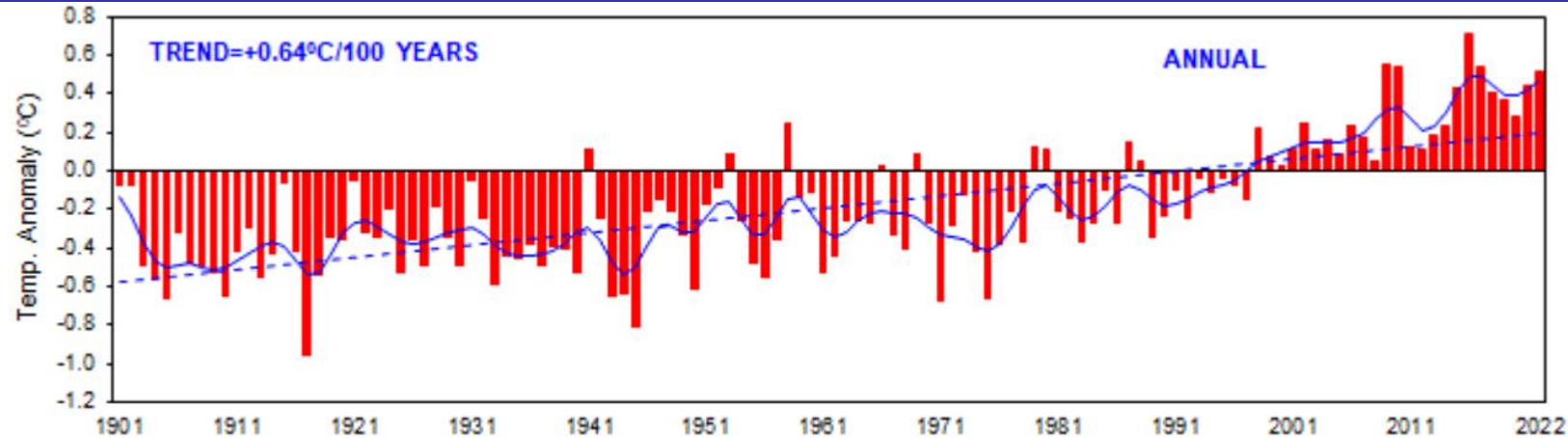


Fig.1: Annual mean land surface air temperature anomalies averaged over India for the period 1901-2022. The anomalies were computed with respect to the base period of 1981-2010. The dotted line indicates the linear trend in the time series. The solid blue curve represents the sub-decadal time scale variation smoothed with a binomial filter.

- Source: Statement on Climate of India during 2022: IMD
- The annual mean land surface air temperature averaged over India during 2022 was $+0.51^{\circ}\text{C}$ above the long-term average (1981-2010 period).

Interpreting the Marginal Effects

Year	Mean	SD
Annual Temperature (°C)		
1981-1990	24.0	4.51
1991-2000	24.1	4.44
2001-2010	24.4	4.43

- Author's own calculations show that average annual temperature changed by $+0.4^{\circ}\text{C}$ over a period of 30 years
- Predicting marginal effects out of sample or for some districts experiencing large deviations?
- Are these effects linear in nature?

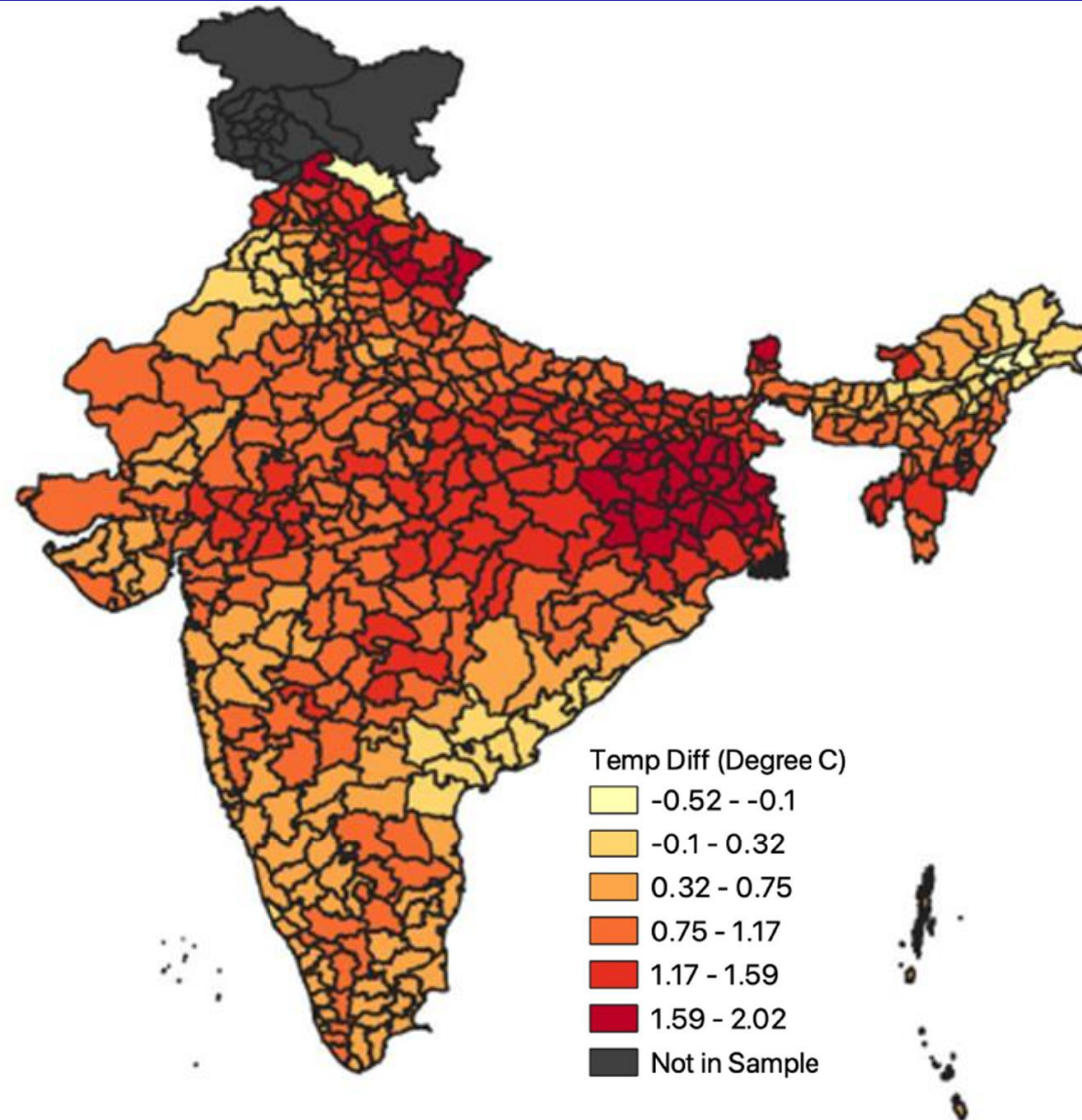
Are Marriage Markets Expanding?

- What fraction of migrating women travel outside their native district?
- Can expansion of marriage markets due to climate uncertainties explain the decline in intra-district migration for females?
 - “Farm households afflicted with more variable profits tend to engage in longer-distance marriage cum migration.” - Rosenzweig and Stark (1989)
- Extensive literature on the effect of climate change on agriculture
 - Guiteras, R. (2009); J. Hansen et. Al. (2004); Deschenes, O., and M. Greenstone (2007)
- This paper also estimated a marked decline in agricultural yields
- Inter-district marriage migration could be a confounding factor.

North vs. South Heterogeneity

- To investigate the dowry mechanism, the paper estimates the heterogeneity in the effect of decadal temperature by northern and southern states
- Note that the variation in the temperature changes also varies by northern and southern states

Changes in Temperature: 1981-2010



North vs. South Heterogeneity

- To investigate the dowry mechanism, the paper estimates the heterogeneity in the effect of decadal temperature by northern and southern states
- Note that the variation in the temperature changes also varies by northern and southern states
- The large negative effect on female migration for the northern states can be explained by larger temperature changes

Selection Issues

Census year	Urban Population (in million)	Percent urban	Annual exponential urban growth rate (%)
1961	78.94	17.97	-
1971	109.11	19.91	3.23
1981	159.46	23.34	3.79
1991	217.18	25.72	3.09
2001	286.12	27.86	2.75
2011	377.1	31.16	2.76

- Source: Urbanization in India: Trends, Patterns, and Policy Issues: IIPS Working Paper
- Rapid urbanization between 1991-2011
- Urban peripheries defined as rural areas in 1991 Census are likely to be classified as urban areas in the later rounds.
- The nature of rural population (including their distance to an urban area) may have changed over time
- 2011 Census rural areas are relatively more remote on an average with different marriage migration patterns

Spatial Correlations

- Estimation of standard errors involving climatic data are often biased as they ignore spatial correlations
- A typical solution is to account for spatial correlation using Conley (1999) which often corrects for the underestimation of the standard errors
- Most often, se's increase substantially after correcting for spatial correlation
- Surprisingly, at times Conley se's are smaller than the errors clustered at the district levels

Spatial Correlations

Variable	Standard error	Distance cut-off	Temperature	Precipitation
Male rural-urban migration rate				
	Conley standard error	100	(0.0060)	(0.0015)
	Conley standard error	150	(0.0059)	(0.0014)
	Conley standard error	200	(0.0061)	(0.0013)
	Clustering District		(0.0025)	(0.0021)
Female rural-urban migration rate				
	Conley standard error	100	(0.0030)**	(0.0031)
	Conley standard error	150	(0.0035)*	(0.0031)
	Conley standard error	200	(0.0038)*	(0.0041)
	Clustering District		(0.0031)**	(0.0030)
Male rural-rural migration rate				
	Conley standard error	100	(0.0051)	(0.0029)***
	Conley standard error	150	(0.0054)	(0.0030)***
	Conley standard error	200	(0.0058)	(0.0032)**
	Clustering District		(0.0060)	(0.0033)**
Female rural-rural migration rate				
	Conley standard error	100	(0.0111)***	(0.0060)*
	Conley standard error	150	(0.0120)***	(0.0066)
	Conley standard error	200	(0.0125)**	(0.0069)
	Clustering District		(0.0124)**	(0.0065)
Observations			1,341	1,341

Empirical Specification

$$Y_{jt} = \beta_0 T_{jt} + \beta_1 P_{jt} + \phi_j + \phi_t + \epsilon_{jt}$$

- May consider including a time trend