

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

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PSE-CEPR Policy Forum
2024

June 7, 2024



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Background

- Climate change is one of the most pressing issues of our time (IPCC, 2021).
- Its effects are most acutely felt in developing countries, where it can potentially amplify the existing **economic inequalities** (Carleton & Hsiang, 2016; Dell et al., 2012; Castells-Quintana et al., 2017).

Background

- One way that economic inequalities can worsen is through the **demographic** channel.
- Climate change can distort demographic structures in the long run by variably affecting the most vulnerable populations, such as the poor and women (Carleton & Hsiang, 2016).
- This study investigates the **long-term impact of climate change on the migration patterns of women in rural India.**

Research Questions

- 1 How do rising temperature levels affect female rural-rural and rural-urban migration in India?
- 2 What are the potential underlying mechanisms?

The study is conducted at district level, and changes in intra-district migration rates are examined.

Study Context

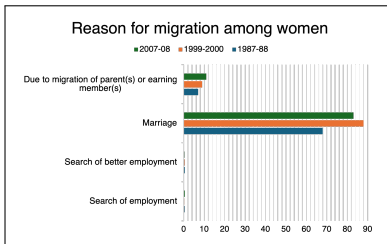


Figure 2: Reason for migration among married working-age women.

Source: Own illustration using NSS data

- In India, there is a tradition of **patrilocality**, where most internal migrants are women who move after getting married.
- The tradition of **village exogamy** is common. However, most marriage migrations happen to nearby places (Fulford, 2013).
- According to the Rural Economic Development Survey of India (REDS) 1999, **78.3% of marriages** occurred within the **same district** (Chipunkar & Weaver, 2023).

Study Context

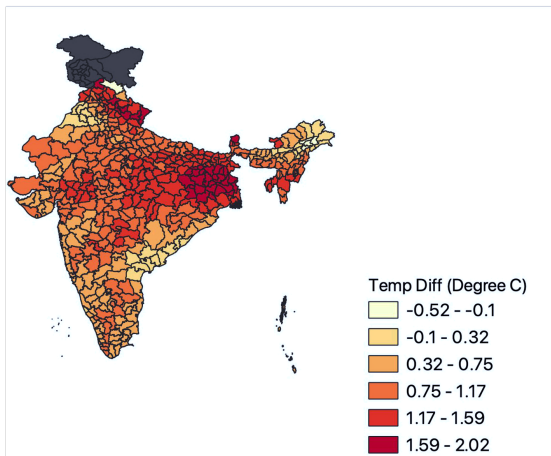
- Marriage of a woman is typically accompanied by marriage payments, that is, transfer of **dowry**.
- Dowry payments involve the transfer of wealth from the bride's to the groom's household during the event of marriage - often several times the income of a typical rural household (Anukriti et al., 2022).
- The custom has been historically prevalent in the **northern states** of the country (Srinivasan & Lee, 2004).
- Marrying a high-quality urban groom requires a higher amount of dowry (Chiplunkar & Weaver, 2023).
- Despite the Dowry Prohibition Act passed by the government of India, the issue of dowry has remained largely unresolved (Calvi & Keskar, 2021).

Data & Methodology

- **Data on intra-district rural-rural and rural-urban migration:** Census of India 1991, 2001, and 2011.
- **Data on marriage migration:** National Sample Survey (NSS) Household Surveys 1987, 2000, and 2007
- **Data on climate:** Gridded weather data on temperature and precipitation from ERA5 for years 1981-2010.
- **Additional data:** Rural Economic Demographic Survey (REDS) 1999 data on dowry, ICRISAT data on agricultural productivity, Reserve Bank of India data on bank branches.

Analysis period: 1981-2011

Change in Average Temperature Levels between 1981 & 2010



Empirical Specification

To estimate the effect of rising temperatures on intra-district migration rates, a district-level panel estimation with fixed effects is conducted:

$$Y_{it} = \beta_1 T_{it} + \beta_2 P_{it} + \alpha_i + \delta_t + \epsilon_{it} \quad (1)$$

- Y_{it} is the share of rural-urban / rural-rural intra-district female migrants in the total female population in district i and census year t
- T_{it} is the average temperature in the past decade ending in year t
- Also controlling for average precipitation, P_{it} .
- α_i are district-fixed effects and δ_t controls for year effects.
- The standard errors are clustered at the district level.

▶▶ More details

Results (1)

Table 1: Effect of Rising Temperatures on Female Migration, 1991-2011

	Rural-Urban	Rural-Rural
	Female	Female
	(1)	(2)
Temperature	-0.007 (0.003)**	-0.031 (0.012)**
Precipitation	0.004 (0.003)	-0.010 (0.007)
District FE	Y	Y
Year FE	Y	Y
Observations	1,341	1,341

Results (1)

- 1 °Celsius rises in temperature levels are associated with²:
 - **22%** decline in rural-urban female migration
 - **13%** decline in rural-rural female migration
- 2 Is this due to decreases in marriage migration?
- 3 Are the declines driven by regions in the north with high historical prevalence of dowry?

²Robust to multiple sensitivity tests. No statistically significant effects on male migration rates.

Results (2)

- Results suggest that the declines are **driven by districts in the north**.
- Analysis using household survey data on marriage migration shows that the decline is indeed linked to **reduced marriage migration by women** in the same districts, particularly the rural-urban migration.

Mechanisms: Decreasing Agricultural Yields & Dowry

- A **negative association between rising temperature and aggregate agricultural yields in districts** is observed between 1981 and 2010. This is harming rural incomes.
- Habit formation in rural consumption (Khanal et al., 2019):
 - 1 ..decreases savings
 - 2 ..fewer resources left for savings for dowry

Mechanisms: Decreasing Agricultural Yields & Dowry

- However, **the social and economic costs of an unmarried daughter are high.**
- Few households are able to adapt and save enough for dowry.
- Approximately 70% of the rural population in India has zero to little landholdings (Asher et al., 2022). Some of these households are resorting to **paying lower amounts of dowry** and settling for grooms in rural areas.

Mechanisms: Decreasing Agricultural Yields & Dowry

- Suggestive evidence indicates a negative association between dowry amounts paid by bride's households in rural North India and increasing temperatures.
- What if they are able to borrow during the year of marriage?

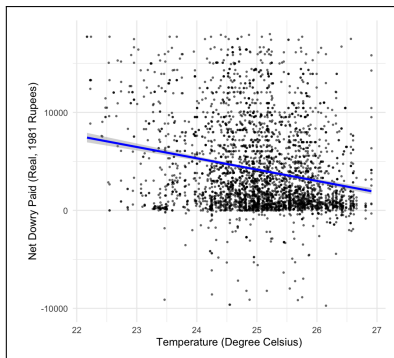


Figure 4: Real value of the net dowry paid and average temperature levels in rural areas in the northern districts for marriages between 1981 and 1998.

Source: Own illustration using the REDS 1999 and ERA5 data.

Access to Credit: Heterogeneity Analysis

- Access to credit can:
 - ① ...facilitate agricultural adaptation to climate change (Deressa et al., 2009)
 - ② ...enable borrowing during marriage years
- Results indicate declines are driven by **districts that had poor access to credit**, measured as bank branches per capita, in the baseline year of 1980.
- This is **amplified** in the districts in the north.

Conclusion

- Climate change is gradually **decreasing** women's migration from rural to urban areas, **trapping them in rural areas** and potentially rendering them vulnerable to its effects.
- The study contributes to the literature on the interaction of climate change, traditional gender norms, and gender-related economic outcomes.
- Policy implications regarding dowry are multifaceted and complex.
- Efforts to **enhance access to credit** could boost agricultural adaptation and enable borrowing for dowry.

Thank You!
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Empirical Specification

- This specification is reduced-form linear relationship between rural-urban and rural-rural migration rates and climate variables.
- Following the literature, both temperature and precipitation is included. This allows to derive unbiased estimates of rising temperature levels (Auffhammer et al., 2013; Cattaneo & Peri, 2016)
- Only include fixed effects as controls are included to ensure that the model stays parsimonious and to avoid overcontrolling. This is because the inclusion of other controls such as population, conflicts, and other socioeconomic characteristics that might themselves be correlated to agricultural productivity may introduce bias in the estimation due to over-controlling (Cattaneo & Peri, 2016).
- The possible channels are explored separately.

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