

**Weather, agriculture and rural migration:
evidence from state and district level migration in India**

BRINDA VISWANATHAN

Madras School of Economics, Gandhi Mandapam Road, Chennai – 600025, India. Email:
brinda@mse.ac.in; brindav3@gmail.com

K.S. KAVI KUMAR

Madras School of Economics, Chennai, India. Email: kavi@mse.ac.in

ONLINE APPENDIX

Weather, Agriculture and Rural Migration: Evidence from State and District Level Migration in India

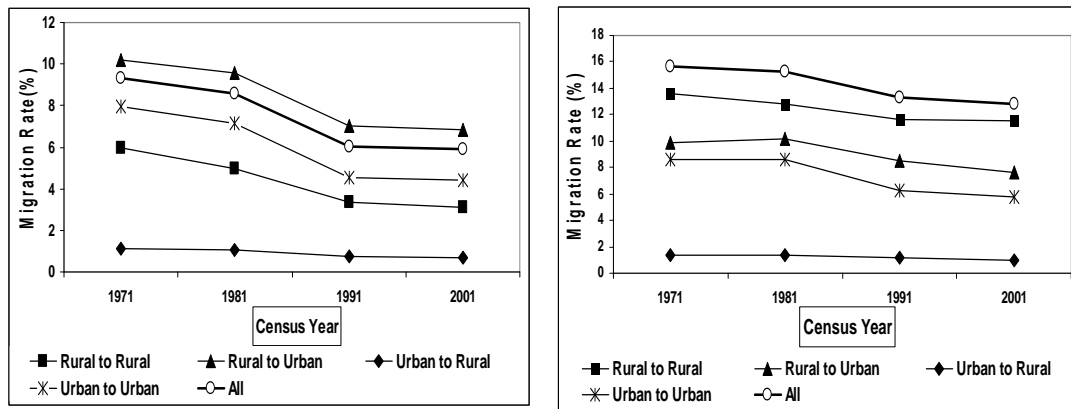
Part A: Migration Patterns in India

Migration in India is primarily documented in two databases: Census data and National Sample Survey (NSS) data. While most studies have used either Census data or NSS data for their analyses (Singh, 1998; Lusive and Bhagat, 2006; Kundu and Sarangi, 2007; Bhagat, 2009), a few have used data from primary surveys (Deshingkar and Akter, 2009) to study migration patterns. Since emigrants from India are less than one percent of the total number of migrants within and outside the country, most studies focus on trends in internal migration.

As shown in figures A.1(a) and A.1(b) for males and females respectively, internal migration rates (that is, the ratio of the migrants of a particular category as a proportion of the population in that category) in India are low and have been declining over the years (Jayachandran, 2006; Sivaramakrishnan *et al.*, 2007; and Topalova, 2010). Of the two, male migration rates are lower than female migration rates as marriage is commonly cited as the reason for migration by women given the practice of exogamy in many parts of India.

Moreover, male migration rates have declined more sharply than female migration rates, and more so between 1981 and 1991, which according to Sivaramakrishnan *et al.* (2007) is a reflection of the jobless growth in India during this period. While the decade of 1991 to 2001 recorded a higher economic growth rate in India, the migration rates remained more or less the same as that observed in the previous decade. Though the official data on migration rates for the period 2001 to 2011 based on the latest census are still yet to come, estimates by some research studies show that migration rates may have gone up compared to

the previous decades. Some studies moreover indicate that the substantially higher migration rate from the rural areas compared to the earlier inter-Census period could be attributed to distressed conditions in agriculture (Sainath, 2011) though, in the absence of detailed information, it is difficult to attribute the increase in migration to agricultural distress alone.



(a) Male Migration Rates

(b) Female Migration Rates

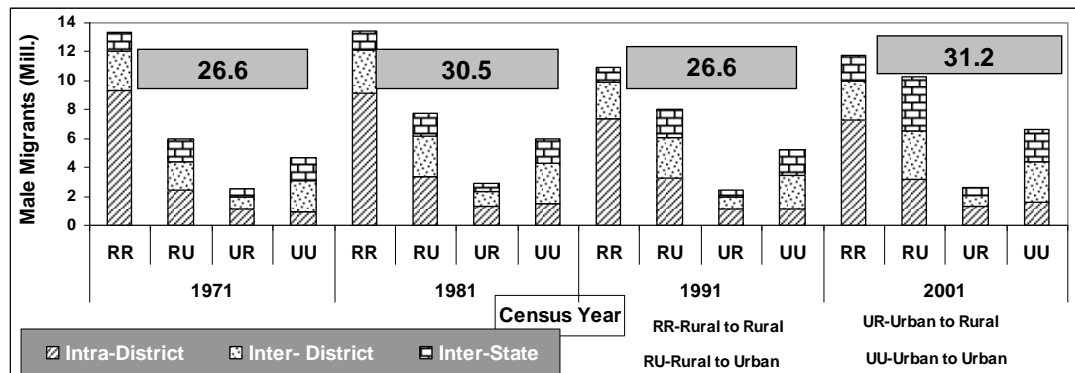
Note: Migration rate the ratio of the migrants of a particular category as a proportion of the population of that category.

Figure A.1: Migration Rates in India: 1971 to 2001

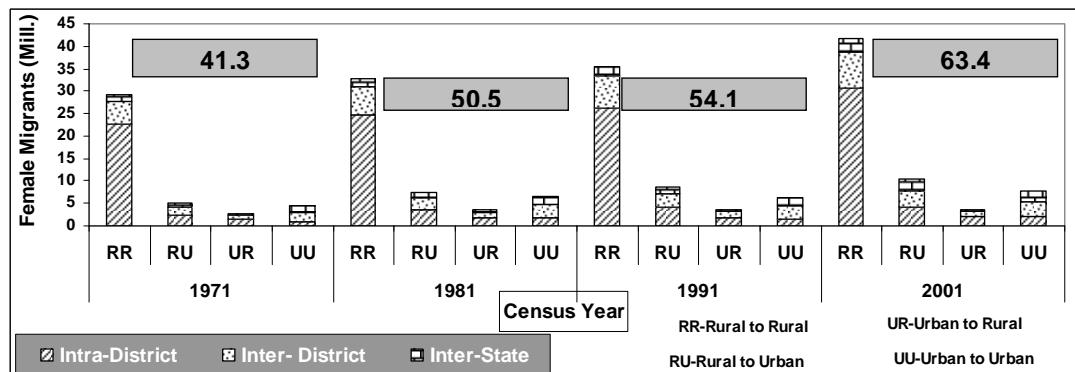
During the three decades of the declining/non-increasing migration rates, the absolute numbers of migrants have grown except for the period between 1981 and 1991 as shown in figures A.2 (a) and A.2 (b). Since, for administrative purposes, India is subdivided into states and further into districts within each state, the nature and type of migrant movement can be further classified into (a) *intra-district* movement capturing within district movement from one village to another, (b) *inter-district* movement capturing movement between districts within a state, and (c) *inter-state* movement capturing movement between the states of India. Figure A.2 juxtaposes these types of movement within each segment of rural-urban combinations.

In the case of males, intra-district rural to rural movement over time is being replaced largely by inter-state rural to urban and, to some extent, by urban to urban movement with a

marginal contribution from inter-district movement. Kundu (2007) observes that more developed states like Maharashtra, Punjab and Gujarat registered high levels of in-migration between 1991 and 2001 while backward states like Bihar, Uttar Pradesh, Orissa and Rajasthan either reported net out-migration or very low in-migration. Based on NSS data, Ozden and Swadeh (2010) observe a similar pattern of migration corridors drawing people from the economically lagging states to the economically leading states due to differentials in the per capita domestic product of the states.



(a): Number of Male Migrants across Rural and Urban Areas



(b): Number of Female Migrants across Rural and Urban Areas

Note: Numbers inside the figure denote the total inter-censal migrants in millions.

Figure A.2: Absolute Number of Internal Migrants in India: 1971-2001

Source: Author's own estimation from the Census for the respective years.

The above information on migration is confirmed by NSS data which also shows declining rates of migration (Kundu and Saraswathi, 2012) over the past three decades while

indicating an increase in the absolute number of migrants with a higher growth rate for the period 1993 to 2000 than for the period 1987-88 to 1993 (Nagaraj and Mahadevan, 2011).

With regard to structural reasons for migration in India, poverty is the most commonly cited factor for migration with poor people migrating to urban areas, especially during the agricultural lean seasons, to avail themselves of employment opportunities in urban areas in an attempt to smoothen their income flows (Deshingkar, 2004). However, economic opportunities have become more diverse after the changes in the economic environment brought on by liberalization and accelerated globalization, which would also account for the increasing mobility of people between rural and urban areas. But, as mentioned above, the official statistics in India show that the incidence of migration has not been on the rise in the post-liberalisation period, with several studies (see Kundu and Sarangi, 2007; Sivaramakrishnan *et al.*, 2007; Nagaraj and Mahadevan, 2011) attributing this to the inability of the Indian statistical system to correctly estimate the temporary movements of poor migrants, who resort to circular migration as one of their livelihood strategies.

In addition to analyzing the trends in and patterns of internal migration, the migration literature in India has addressed the following issues: (a) migration as an instrument of economic well-being; (b) inter-relationship between migration and human development; (c) internal-migration and regional disparities in India; and (d) impact of globalization on migration. In this strand of migration literature, there is perhaps no study which uses secondary data sources (from the Census and/or the NSS) to study the linkage between agricultural performance and migration. The present study attempts to fill this gap with its focus on the nexus between weather, agriculture and migration.

Part B. Organisation of State-level Migration Data

Table B.1: Organisation of State-level Migration Data based on Duration of Stay

| Census Year | Duration of Stay | Migrated out between |
|-------------|------------------|----------------------|
| 1981 | 5 to 9 years | 1972 to 1976 |
| 1981 | 1 to 4 years | 1977 to 1980 |
| 1991 | 5 to 9 years | 1982 to 1986 |
| 1991 | 1 to 4 years | 1987 to 1990 |
| 2001 | 5 to 9 years | 1992 to 1996 |
| 2001 | 1 to 4 years | 1997 to 2000 |

Part C: Summary of Data

Table C.1: Summary of Data Used in the Study

| Variable | Source/Definition | Unit |
|---|--|--|
| Rural 'out' migrants between states – used in state-level analysis | Census of India | Numbers |
| Rural 'in' migrants into a district – used in district-level analysis | Census of India | Numbers |
| Rural Population | EOPP India Database (state); Census of India 2001 (district) | Numbers |
| Net State Domestic Product from Agriculture | EPW Research Foundation | Rs. (lakhs) at 1970-71 constant prices |
| Rural Out Migration Rate (Dependent Variable in state-level analysis) | Ratio of rural out migrants to total rural population of origin State | Proportion |
| Rural In Migration Rate (Dependent Variable in district-level analysis) | Ratio of rural in migrants to total rural population of destination district | Proportion |
| Total and Seasonal Rainfall (Independent Variables) | India Meteorological Department | Millimeters |
| Average and Seasonal Temperature (Independent Variables) | India Meteorological Department | Degrees Celsius |
| (Logarithm of) Rice Yield (Independent Variable) | www.indiastat.com/agriculture/ ; <i>India Harvest</i> (CMIE) | Tonnes per hectare |
| (Logarithm of) Wheat Yield (Independent Variable) | www.indiastat.com/agriculture/ ; <i>India Harvest</i> (CMIE) | Tonnes per hectare |
| (Logarithm of) Per capita net state domestic product (Independent Variable) | Ratio of net state domestic product to total rural population | Rs. per person |

Part D: Inter-state Variation in Migration Rate, Yield, and Weather

Inter-state out-migration rates from rural areas form a very small proportion of total migration rates. However, differences exist among states both with regard to these rates and

their annual temporal variations as shown in figure D.1. Similarly, (the logarithm) of per capita net state domestic product from agriculture also varies sufficiently across states (see figure D.2). Figure D.3 shows the variability in rice and wheat yields across states and highlights that the southern Indian states grow predominantly rice and that wheat is grown mostly in the north-western states. In regions where both these crops are grown such as Punjab, Haryana, or Rajasthan, it may be noted that yield for wheat has improved more than that for rice. Variations in temperature and rainfall across the states are shown in figures D.4 and D.5, respectively. Given relatively small time-scales involved, the temporal variation in the weather variables is not substantial but inter-state variations are quite obvious.

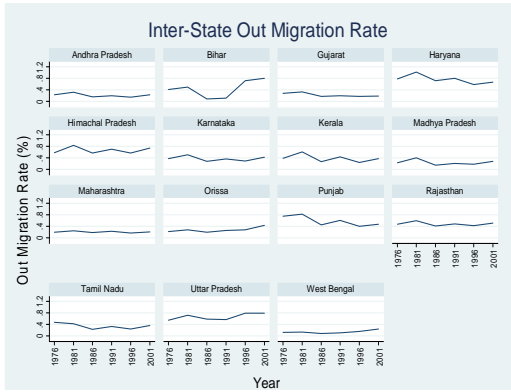


Figure D.1: Out Migration Rates

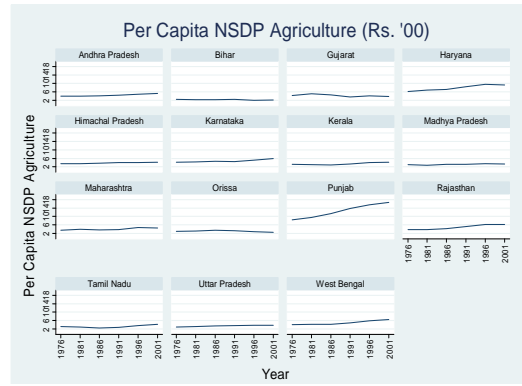


Figure D.2: Per Capita Net State Domestic Product in Agriculture

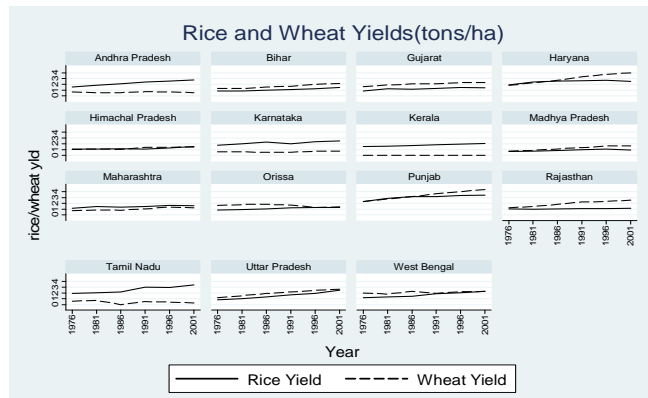


Figure D.3: Rice and Wheat Yields

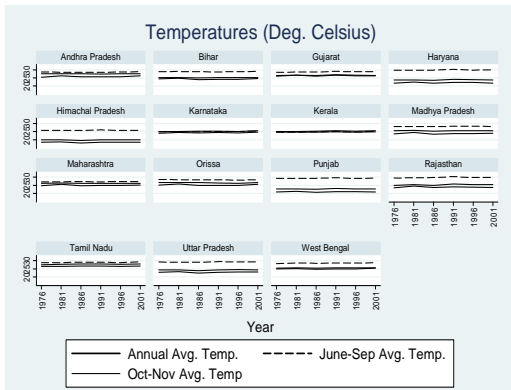


Figure D.4: Temperature

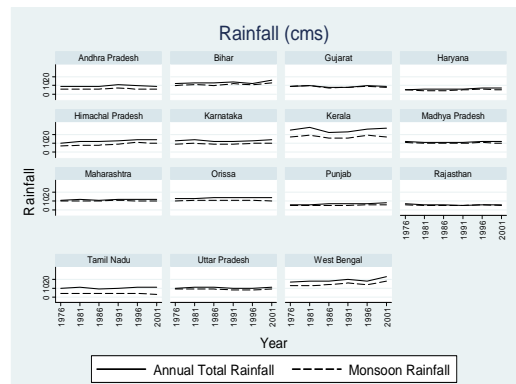


Figure D.5: Rainfall

References

- Bhagat, R.B (2009), 'Internal migration in India: are the underclass more mobile?', Paper presented at the 26th IUSSP General Population Conference, Marrakech, Morocco, 27 September - 2 October.
- Deshingkar, P. (2004), 'Understanding the implications of migration for pro-poor agricultural growth', Overseas Development Institute, DAC POVNET Agriculture Task Group Meeting, Helsinki, 17-18 June.
- Deshingkar, P. and S. Akter (2009), 'Migration and human development in India', Human Development Research Paper, 2009/13.
- Jayachandran, S. (2006), 'Selling labour low: wage responses to productivity shocks in developing countries', *Journal of Political Economy* **114**(3): 538-575.
- Kundu, A. and N. Sarangi (2007), 'Migration, employment status and poverty: an analysis across urban centres in India', *Economic and Political Weekly* Jan 27.
- Kundu, A. and L.R. Saraswati (2012), 'Migration and exclusionary urbanisation in India', *Economic and Political Weekly*, Vol. XLVII (26-27): 219-227.
- Kundu, A. (2007), 'Proceedings of Dr C. Chandrasekaran Memorial Lecture on Migration and Exclusionary Urban Growth in India', *IIPS Newsletter* **48**(3-4): 5-23.
- Lusome, R. and R.B. Bhagat (2006), 'Trends and patterns of internal migration in India, 1971-2001', paper presented at the *Annual Conference of Indian Association for the Study of Population (IASP)*, Thiruvananthapuram, 7-9 June.
- Nagaraj, K. and R. Mahadevan (2011), 'Globalisation and migration', Unpublished Monograph, Asian College of Journalism: Chennai.
- Ozden, C. and M. Swadeh (2010), 'How important is migration'. in E. Ghani (ed.) *The Poor Half Billion in South Asia: What is Holding Back Lagging Regions?*, New Delhi (India): OUP.

- Sainath , P. (2011), 'Census Findings Point to Rural Distress', *The Hindu*, September 25.
- Singh, D.P. (1998), 'Internal migration in India: 1961-1991', *Demography India* **27**(1): 245-261.
- Sivaramakrishnan, K.C., A. Kundu, and B.N.Singh (2007), *Handbook of Urbanisation in India*, OUP: New Delhi.
- Topalova, P. (2010), 'Factor immobility and regional impacts of trade liberalization: evidence on poverty from India,' *American Economic Journal: Applied Economics* **2**(4): 1–41.